United States
International Trade Commission

Seafood Obtained via Illegal, Unreported, and Unregulated Fishing: U.S. Imports and Economic Impact on U.S. Commercial Fisheries

February 2021
Publication Number: 5168
Investigation Number: 332-575

United States International Trade Commission

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Abbreviations and Acronyms

Term	Definition
ABC	acceptable biological catch
AIS	automatic identification system
ASMFC	Atlantic States Marine Fisheries Commission
AUV	average unit value
BLS	Bureau of Labor Statistics
BSAI	Bering Sea and Aleutian Islands
C188	ILO Work in Fishing Convention (identified by number)
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDS	catch documentation scheme
CEA	California Environmental Associates
CFFA	Coalition for Fair Fisheries Agreements
CFP	Common Fisheries Policy
COFA	China Overseas Fisheries Association
COFI	FAO Committee on Fisheries
DOF	Department of Fisheries
DWF	distant-water fishing
EC	European Commission
EEZ	exclusive economic zone
eFCR	economic feed conversion ratio
EJF	Environmental Justice Foundation
EU	European Union
EUFOMA	European Market Observatory for Fisheries and Aquaculture Products
FAO	Food and Agriculture Organization of the United Nations
FEP	fishery ecosystem plan
FFA	Pacific Island Forum Fisheries Agency
FFIF	Feed Fish Inclusion Factor
FIFO	Fish In: Fish Out (ratio)
FIPs	Forward Inspection Points
FL/CL/HT	forced labor, child labor, and human trafficking
FSIS	Food Safety and Inspection Service (of the U.S. Department of Agriculture)
GAPP	Genuine Alaska Pollock Producers
GDP	gross domestic product
GFCM	General Fisheries Commission for the Mediterranean
GFW	Global Fishing Watch
GSI	Global Slavery Index
GSMFC	Gulf States Marine Fisheries Commission
gt	gross tons
H&G	headed and gutted
HS	Harmonized System (international tariff classification system)
HTS	Harmonized Tariff Schedule of the United States
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
ILAB	Bureau of International Labor Affairs (U.S. Department of Labor)
ILO	International Labour Organization
IMO	International Maritime Organization (United Nations)
ICLS	International Conference of Labor Statisticians
Interpol	International Criminal Police Organization
IOTC	Indian Ocean Tuna Commission
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported, and Unregulated Fishing

Term	Definition
IU	illegal and unreported
IUU	illegal, unreported, and unregulated
JNRFC	Joint Norwegian-Russian Fishery Commission
kg	kilograms
KORUS	United States-Korea Free Trade Agreement
LAGC	limited access general category
MCS	monitoring, control, and surveillance
MFC	Marine Fisheries Commission
MLC	Maritime Labor Convention Number 186
MMAF	Ministry of Marine Affairs and Fisheries
MMPA	Marine Mammal Protection Act
MSC	Marine Stewardship Council
mt	metric tons
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North East Atlantic Fisheries Commission
NEFMC	New England Fishery Management Council
NGO	nongovernmental organization
NOAA	National Oceanic and Atmospheric Administration (U.S. Department of Commerce)
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NZPOA-IUU	New Zealand National Plan of Action to Prevent, Deter, and Eliminate IUU Fishing
OPAGAC	Organization of Associated Producers of Large Freezer Tuna Vessels
PIPO	port-in–port-out control center
PRIA	Pacific remote island area
PSMA	Port State Measures Agreement
PSMFC	Pacific States Marine Fisheries Commission
RFB	regional fishery body
RFE	Russian Far East
RFMC	regional fishery management council (U.S.)
RFMO	regional fishery management organization
RMB	Renminbi (Chinese currency)
SAFE Act	Maritime Security and Fisheries Enforcement Act
SEAFO	South East Atlantic Fisheries Organization
SIMP	Seafood Import Monitoring Program
SIOFA	Southern Indian Ocean Fisheries Agreement
SPRFMO	South Pacific Regional Fisheries Management Organisation
STECF	Scientific, Technical and Economic Committee for Fisheries
TMT	Trygg Mat Tracking
TVPA	Trafficking Victims Protection Act of 2000
UK	United Kingdom
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
USDOL	U.S. Department of Labor
USDOS	U.S. Department of State
VMS	vessel monitoring system
WCPFC	Western and Central Pacific Fisheries Commission
WFC	Work in Fishing Convention Number 188
WGI	World Governance Indicators
WWF	World Wildlife Fund

Executive Summary

Overview of Findings

- The Commission estimates that the United States imported $2.4 billion worth of seafood imports derived from illegal, unreported, and unregulated (IUU) fishing in 2019, or nearly 11 percent of total U.S. seafood imports.
- Over 13 percent of U.S. imports that had been caught at sea ("marine capture") in 2019 are estimated to be of seafood caught using IUU fishing practices. Among the major categories of marine-capture IUU imports (by value) were imports of swimming crab, wild-caught warmwater shrimp, yellowfin tuna, and squid.
- Of the major U.S. import sources, China, Russia, Mexico, Vietnam, and Indonesia are estimated to be relatively substantial exporters of marine-capture IUU imports to the United States, while Canada—the largest U.S. seafood import partner—is not.
- IUU products are often used to make fishmeal and fish oil, products that aquaculture industries rely on for feed. IUU marine-capture products used in feed ingredients are estimated to be equivalent to nearly 9 percent of the harvested weight of farmed seafood exported to the United States in 2019.
- The removal of IUU imports from the U.S. market would have a positive effect on U.S. commercial fishers, with estimated increases in U.S. prices, landings (catches of fish), and operating income for all species modeled.
- The removal of IUU imports would lead to an increase in imported seafood prices and a decline in total imports, despite some increases in non-IUU imports.
- The removal of IUU imports would increase total operating income of the U.S. commercial fishing industry by an estimated $60.8 million. The U.S. commercial fisheries with the largest increases in operating income include those targeting warmwater shrimp, sockeye salmon, bigeye tuna, and squid.

Introduction

This report is prepared by the U.S. International Trade Commission (USITC or Commission) in response to a request by the U.S. House of Representatives Committee on Ways and Means (Committee) for the Commission to investigate and prepare a report on the potential economic effects on U.S. fishers of competition with IUU seafood imports. In the request, the Committee defined IUU seafood to include products obtained in contravention of fisheries management regulations or in violation of labor laws, so for the purposes of this investigation IUU fishing is defined as such.

There are many fishing practices that can constitute an IUU violation. Often, a vessel may fish in an area where it is not authorized. Vessels may also fish during seasons in which particular fishing grounds are closed. IUU fishing also includes harvesting in excess of quotas set by fishery management authorities or misreporting the volume of landings to those authorities. Fishing with disallowed gear types or methods, or in violation of environmental restrictions such as those concerning bycatch, also constitute IUU fishing. Labor violations that have been widely documented in segments of the fishing industry include forced labor, human trafficking, child labor, and physical abuse of workers on board fishing vessels.

The Committee requested that the Commission's report provide, to the extent practicable:

- A review of the existing data and literature on the prevalence of IUU products in the U.S. import market, and an overview of international mechanisms for monitoring and enforcement to address IUU fishing;
- A description of the size and structure of the U.S. commercial fishing industry;
- A description of the major global producers of IUU products, including but not limited to China, and country practices related to IUU production and exports;
- An analysis of the extent to which IUU product is imported into the United States, as well as major U.S. import sources and the global supply chains of such products; and
- A quantitative analysis of the economic impact of IUU imports on U.S. commercial fishermen and U.S. commercial fishing production, trade, and prices.

International Mechanisms for Monitoring and Enforcement

International efforts to reduce the prevalence of IUU-sourced seafood in global supply chains began in the late 1990s. Before that time, the public had become increasingly aware of population collapse in major commercial species such as Atlantic cod and bluefin tuna, and of the fact that global wild-capture production had peaked in the 1980s. At the same time, increasing consumer purchasing power in developing countries, which bolstered demand for seafood, created extra incentives for some producers to engage in IUU fishing practices in order to boost supply.

As a result, the Food and Agriculture Organization (FAO) of the United Nations (UN) began to develop measures to curb IUU fishing. Since then, international organizations, particularly the FAO and other UN organizations, have developed global guidelines offering a general framework for identifying and addressing IUU fishing at the national and regional level. Major agreements and guidelines include the Agreement on Port State Measures (PSMA), which entered into force in June 2016 and became the first binding international agreement specifically targeting IUU fishing. The PSMA aims to prevent, deter, and eliminate IUU fishing by preventing violating vessels from landing IUU catch at ports in signatory countries, thus reducing the vessels' incentives to continue to engage in IUU fishing. PSMA parties include 66 countries and the European Union (EU). Government officials have cited the PSMA as one of the best examples of increased interest and global concern about IUU fishing leading to beneficial action.

Within the international framework developed by global organizations such as the UN, other actors—regional bodies, national governments, and nongovernmental organizations (NGOs)—also play important roles in curbing IUU fishing. In particular, because many of the commercially important fish species (such as tuna) cross countries' maritime boundaries, enforcement efforts often fall to regional bodies whose jurisdiction covers areas beyond the reach of governments of coastal countries. Most of these bodies are called regional fishery management organizations (RFMOs), and their members usually include all countries with waters adjacent to the areas of the ocean regulated by the RFMO, as well as any other countries authorized to fish in those waters. RFMOs vary in the extent of their efforts to address IUU fishing within the waters for which they are responsible, as described in chapter 2. RFMO regulations may, for example, restrict catch volume or allowable gear type, close fisheries during particular times, or require certain catch documentation. At the individual market level, the United States and the EU, among others, maintain measures designed to prevent IUU seafood from entering their respective markets, using catch documentation schemes among other approaches. Global, regional, and national authorities are aided in their efforts by NGOs, which play a meaningful role in gathering and disseminating data identifying potential IUU violations, building the capacity of countries to address IUU fishing, and working with commercial fishers to improve fishing practices.

While the above-mentioned efforts have focused on a definition of IUU tied to fisheries conservation and management, international mechanisms are also in place aimed at addressing concerns about forced labor, child labor, and human trafficking in the fishing sector. These have included efforts by the UN, NGOs, and others to identify and document labor violations in fishing, as well as the work of the UN's International Labour Organization to promote respect for fundamental labor rights and to advance implementation of its core conventions and the Work in Fishing Convention in the seafood sector.

Estimating IUU Products in U.S. Imports

The Commission adopted a multi-step approach to generating estimates of the extent to which IUU product is imported into the United States. The IUU estimates generated by the Commission cover both marine capture seafood and marine capture inputs into aquaculture and use a definition of IUU that is inclusive of both fisheries management and conservation and labor violations. The methodology and detailed results are provided in chapter 3. In the first step of this approach, the Commission combined data from existing sources to produce a detailed database covering marine capture landings and aquaculture production worldwide, including unreported marine capture landings. In the second step, the Commission estimated the amount of global marine capture landings that are from IUU fishing. These estimates were based on the consideration of landings data along with qualitative risk criteria associated with the likelihood of IUU fishing, IUU fishing estimates from literature, and evidence of labor violations. The third step estimated the extent of IUU product used as inputs in global aquaculture production for various species. The final step used these estimates of marine capture and aquaculture IUU production and global trade data to estimate the extent to which U.S. imports contained the products of IUU fishing practices based on a supply chain mapping analysis.

Using this method, the Commission estimates that in 2019 the United States imported 286,896 metric tons (mt) of seafood produced using IUU practices, worth $2.4 billion. Among the major species imported, the share sourced from IUU marine capture fishing ranged from lows of 2.5 percent (haddock) and 4.0 percent (Atlantic cod) to as high as 28.4 percent (swimming crab) and 33.1 percent (octopus). IUU marine capture import estimates also vary widely by partner country, with the lowest estimated IUU shares of imports from major partners coming from Iceland (1.2 percent) and Canada (3.4 percent), and the highest shares coming from the Philippines (33.0 percent) and Mexico (25.1 percent). By volume, China was estimated to be the largest source of IUU seafood imports, even though the estimated share of its imports sourced from IUU fishing is not the highest. This is largely because China is the world's largest seafood producer, owing to both its own enormous commercial fishing industry and its massive seafood processing sector, which uses imported inputs from many countries' fishing fleets. U.S. imports of IUU marine capture seafood from China were estimated to be worth about $204.3 million in 2019, making up 17.0 percent of U.S. seafood imports from China.

This report's methodology also takes into account the fact that many seafood-exporting countries process the catch of many different fleets and thus may incorporate products of IUU fishing practices by other countries. By no means is this true of all, or even most, imported seafood: in 2019, an estimated 84.4 percent of the value of U.S. seafood imports was originally captured by partner countries' own fleets or produced in their own aquaculture operations. Focusing only on marine capture products, an estimated 72.3 percent of U.S. imports of marine-capture-sourced imports were captured by partner countries' own fleets, with the remainder originating with other fleets. However, this share is lower for major processing countries such as Thailand; less than 45 percent of U.S. imports from Thailand were estimated to have been originally produced by that country. Instead, most U.S. imports from Thailand were of tuna caught by other countries' fleets and processed there. This complexity in seafood supply chains is incorporated in the fourth step of the methodology outlined above and is important to understanding the results of the estimation.

Major Global Producers of IUU Products

Significant global sources of IUU seafood imported into the United States include both major fishing nations and countries that are large seafood processors, for the reasons described above. As noted, some countries profiled, such as China, are both. The report provides country profiles that describe the country practices that contribute to IUU production in source countries, as well as the species and trade flows most affected. The countries profiled are China, Indonesia, Thailand, Vietnam, Russia, and Spain (table ES.1). China is profiled in chapter 4, and the remaining countries in chapter 5. Chapter 5 also provides an overview of the criteria used in selecting countries for the profiles.

Table ES.1 Countries estimated to be major sources of IUU seafood imports, IUU activities, and associated data, 2019

Country	Activities associated with IUU fishing	Estimated value of U.S. marine capture IUU imports (million $)	IUU share of total U.S. marine capture imports from the partner country (%)	Rank of country among suppliers of U.S. imports of IUU products
China	• Chinese vessels fishing without authorization in foreign and RFMO-managed waters • Use of destructive gear • Transshipment at sea • Unreported marine capture landings • Use of front companies and foreign registration (including flags of convenience) • Instances of violations of labor laws in the distant-water fishing (DWF) fleet • Failure to prevent imports of seafood obtained via IUU fishing	$204.3	17.0	1

Country	Activities associated with IUU fishing	Estimated value of U.S. marine capture IUU imports (million $)	IUU share of total U.S. marine capture imports from the partner country (%)	Rank of country among suppliers of U.S. imports of IUU products
Russia	• Fishing without authorization in Russian and foreign EEZs • Transshipment at sea • Not landing catch in domestic ports • Hazardous working conditions on Russian vessels • Exploitation of foreign workers on Russian vessels and hazardous working conditions	$113.8	16.5	2
Vietnam	• Vietnamese vessels fishing without authorization in foreign EEZs • Unreported wild-caught seafood • Child and forced labor in Vietnamese vessels • Fisher exploitation and debt bondage on Vietnamese vessels	$106.1	19.4	4
Indonesia	• Indonesian vessels fishing without authorization in RFMO-managed waters • Use of destructive gear • Transshipment at sea • Unreported wild-caught seafood • Instances of child labor and exploitation of fishers domestically • Foreign vessels fishing in its EEZ engaging in labor violations	$105.5	15.4	5
Thailand	• Thai vessels fishing without authorization in foreign EEZs • Thai and foreign vessels fishing illegally in Thai waters • Ineffective inspection for fishing vessels • Fisher exploitation by vessel operators and recruiters • Child and forced labor in shrimp processing • Forced labor on Thai vessels	$92.9	12.2	6
Spain	• Fishing above quota amounts • Smuggling networks bringing IUU seafood into Spain • Employing vessels identified as being involved in IUU fishing • Spanish-owned joint ventures in third-country suppliers	$34.3	22.4	12

Source: USITC IUU import estimates.

China

China is the largest global producer of seafood, by both wild capture and aquaculture production. As China is also the world's largest consumer of seafood, most Chinese capture and aquaculture production is consumed domestically. However, China is also the largest exporter of seafood to the world, particularly of processed products (e.g., frozen seafood and fillets), as it is a major processing hub for seafood. China's processors import a large amount of seafood from multiple countries, and most processed products are re-exported to third-country markets. Another portion of the Chinese exportable supply of seafood for processing is caught by the Chinese distant-water fishing (DWF) fleet—the fleet that has the capacity to fish outside Chinese waters—which is the largest in the world.

Many vessels from the Chinese DWF fleet have been linked to IUU fishing around the world, including throughout the Pacific Ocean and in the Atlantic Ocean in proximity to Africa and South America. Additionally, working conditions on these vessels vary, with several reports noting cases of hazardous conditions and forced labor. Historically, the Chinese government has incentivized the Chinese DWF fleet to expand in number of vessels and production volume, yet subjected the fleet to little regulation. Recently, the Chinese government has implemented a series of laws and regulations aimed at curbing IUU fishing activity by its DWF fleet; however, it is not clear how effective these will be. Further, while China is a member of some regional bodies and international mechanisms that aim to reduce IUU fishing and violations of labor laws, the country has not ratified others. In particular, China does not belong to the PSMA, which has been described as key in combating IUU fishing by preventing imports of seafood caught by these means.

Even where China is a member of relevant regional and international mechanisms to address IUU fishing and related labor violations, U.S. government and other observers have raised concerns about its compliance with its commitments under such mechanisms and the sufficiency of its actions with respect to Chinese vessels engaging in IUU. According to the U.S. Department of State *2019 Trafficking in Persons Report*, China is considered a Tier 3 country for human trafficking.[1] Further, in 2020, the U.S. Department of Labor (USDOL) added fish from China to the *2020 List of Goods Produced by Child Labor or Forced Labor*, noting that there are reports of numerous adults forced to work on board fishing vessels that are part of China's DWF fleet. Most of the workers—estimated to be in the tens of thousands—are migrants from Indonesia and the Philippines. The Chinese market and processing sector have thus been highlighted as having a high prevalence of and vulnerability to imports of seafood obtained via IUU fishing.

The Commission's analysis estimates that China is the largest single source of U.S. imports of seafood obtained via IUU fishing, with IUU imports from China valued at $204.3 million in 2019. These U.S. imports of IUU seafood from China include a wide range of products, given the Chinese fleet's involvement in fishing around the world and China's role as a processor of seafood from many other fleets. China's distant-water vessels were particularly likely to engage in IUU fishing in certain regions of the world; of China's IUU seafood exports to the United States, over 99 percent of the seafood that originated with the Chinese DWF fleet in African waters was estimated to be the product of IUU fishing,

[1] Tier 3 is defined as "countries whose governments do not fully meet the Trafficking Victims Protection Act's minimum standards and are not making significant efforts to do so." USDOS, *2019 Trafficking in Persons Report*, June 2019.

as was over 35 percent of the seafood originating with that fleet in South American waters, and over 23 percent originating with that fleet in Asian waters.

Russia

IUU fishing in Russian waters and by Russian vessels outside the country's waters has been widely documented. IUU fishing-related activities in Russia take multiple forms, including poaching and transshipment. Fishers often avoid the required landing of their catch in Russian ports, favoring foreign destinations. This activity is reportedly done to circumvent Russian government quotas and reporting requirements. For example, there is more exported Russian crab entering the global supply chain based on importing countries' trade data than should exist according to the official Russian catch statistics. The prevalence of seafood from Russia sourced via IUU fishing has reportedly caused financial harm to the fishing industries of other nations. The large amount of Russian pollock moving through China, for example, has reportedly depressed prices for U.S.-caught pollock in Europe. Further, Russia was classified as being at high risk of modern slavery by the Global Slavery Index on Fishing, due to evidence of trafficking of foreign nationals and a lack of effective government action.

However, there are examples of successes in Russia with regard to curbing IUU activity. Recently, some of Russia's snow crab fisheries achieved international Marine Stewardship Council certification, joining 26 other fisheries that had already achieved certification. Russia is also party to the PSMA and has been active in pursuing other diplomatic agreements. Although the presence of IUU crab is still a substantial problem in the supply chain, there has been some progress in reducing the overall catch volume. In addition, Russia has a history of engaging with U.S. law enforcement on IUU issues.

The Commission estimates that in 2019 about 16.5 percent, or an estimated $113.8 million, of U.S. seafood imports from Russia were obtained via IUU fishing. Most of the estimated U.S. imports from Russia of IUU marine-capture seafood were of various types of crab, salmon, and cod. Over a quarter (26.8 percent) of the catch by Russian vessels in Russian waters was estimated to be shipped to China before being exported to the United States.

Vietnam

IUU fishing in Vietnamese waters and by Vietnamese vessels outside the country's waters has been widely documented. While Vietnam recently enacted a new legal framework as a result of fishing violations identified by the EU, these reforms reportedly do not address the root causes of IUU fishing in the country. The overriding cause of IUU activity is said to be the continued pressure by the government to increase exports of fisheries products over the past several decades, which has led to the general depletion of stocks in local waters, forcing fishers to engage in unauthorized extraterritorial activity to maintain catches.

Documentation of IUU activities by the Vietnamese fleet are often the result of law enforcement actions by other nations.[2] While it is difficult to estimate such activity in domestic waters, reports by other nations provide details on the scope of the problem. Thailand, Malaysia, Indonesia, and non-bordering Pacific states with Vietnam have all reported continuing violations. These nations regularly arrest

[2] These vessels are often referred to as "blue boats," as their hulls are often painted blue.

Vietnamese fishers and impound or scuttle their vessels. Additionally, Vietnam has been identified by the U.S. Department of Labor as having goods produced with child labor and was classified as being at medium risk of modern slavery by the Global Slavery Index on Fishing.[3]

The Commission estimates that in 2019 about 19.4 percent, or an estimated $106.2 million, of U.S. marine-capture seafood imports from Vietnam were obtained via IUU fishing. Most of the estimated U.S. imports from Vietnam of IUU seafood were of various types of tuna (particularly yellowfin tuna), crab, and shrimp.

Indonesia

Indonesian vessels have been linked to IUU fishing activities, including fishing without authorization in RFMO-managed waters, in multiple instances throughout the years. A total of 11 Indonesian vessels have been included in various RFMO lists of vessels engaging in IUU fishing since 2004, including three vessels marked as “currently listed” as of March 31, 2020. Historically, Indonesian waters have also been a destination for a large number of foreign vessels engaging in IUU fishing in its EEZ, which has highly valuable tuna stocks, and estimates show that IUU fishing costs Indonesia about $4 billion per year. Between 2012 and 2014, over 90 percent of the foreign vessels fishing in the Indonesian EEZ were from China and Taiwan, generally ships of medium and large capacity. Indonesia has also been identified by the U.S. Department of Labor as producing fish with forced and child labor, and it was ranked by the U.S. Department of State as a Tier 2 country (one that is out of compliance with anti-trafficking standards, but making efforts to improve) in its 2019 Trafficking in Persons Report.

The government of Indonesia itself has highlighted IUU fishing and labor violations by foreign and domestic vessels as a persistent problem that it is aiming to combat and sees as a barrier to sustainability and growth in its industry. As a result, between 2014 and 2019, the Indonesian government implemented a moratorium that banned all foreign vessels from fishing in the Indonesian EEZ, sank any vessels determined to be engaging in IUU fishing in its EEZ, and prohibited transshipment of fish at sea, which resulted in a substantial reduction in overall fishing activity in Indonesia’s waters.[4] Industry representatives have indicated that certain policies such as the moratorium have been successful in reducing IUU fishing by foreign vessels and in helping restore the health of tuna stocks, particularly of skipjack tuna. However, other policies aimed at preventing the domestic fleet from engaging in IUU fishing have had limited success.

The Commission estimates that in 2019 about 15.4 percent, or an estimated $105.5 million, of U.S. marine-capture seafood imports from Indonesia were obtained via IUU fishing. Most of the estimated U.S. imports of IUU seafood from Indonesia were of swimming crab, various types of tuna, and octopus.

Thailand

IUU fishing and violations of labor laws in Thai waters and by Thai vessels outside the country’s waters have been widely documented and acknowledged by the Thai government as a persistent issue in its

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[3] Vietnam was downgraded from a Tier 2 country to Tier 2 watchlist country after 2018. USDOL, ILAB, *2018 List of Goods Produced by Child Labor or Forced Labor*, September 2018, 10.

[4] By 2019, the Indonesian government reported having sunk over 500 vessels. The vessel-sinking policy was ended in 2019.

industry. Over several decades, overfishing and overexploitation of Thai fish stocks has reduced catches in the Thai EEZ. This in turn has increased Thailand's need to source raw materials for its processing and aquaculture sectors outside of Thai waters, which has been linked to a higher risk of IUU fishing and labor violations on fishing vessels. In 2018, Thai authorities detained 22 Thai vessels and 67 foreign-flagged vessels in the Thai EEZ for suspected IUU fishing violations. Further, driven by the decline in valuable fish stocks in Thai waters, commercial Thai fishing vessels are reported to make incursions into neighboring waters, including Indonesian waters, to increase their catch, and many have been seized by local authorities for fishing without authorization.[5]

Thailand has also been identified by the U.S. Department of Labor as having goods produced with forced and child labor,[6] and it was ranked by the U.S. Department of State as a Tier 2 country in the 2019 Trafficking in Persons Report. Moreover, Thailand was classified as being at high risk of modern slavery by the Global Slavery Index on Fishing due to several factors. These included direct evidence that modern slavery occurs within Thailand as well as outside its own waters, where a high proportion of catch is taken at a greater than average distance from home waters; poor governance (high levels of unreported catch) in Thailand; and higher than average levels of fishing subsidies.

Thailand recently implemented a new legal framework as a result of attention from the global community to its fishing and labor violations, including the adoption of a new main fisheries law in the country to combat IUU fishing and improve the working conditions in its fishing industry. However, while the Thai government states that these reforms have been effective, certain experts state and reports show that these problems persist and that the new regulations have not been effective in curbing them.

The Commission estimates that in 2019 about 12.2 percent, by value, or an estimated $92.9 million of total U.S. marine-capture seafood imports from Thailand were obtained via IUU fishing. U.S. imports of IUU seafood from Thailand originate with vessels from a number of countries and include a wide range of species, including various species of tuna, swimming crab, and squid, mostly as processed fish products.

Spain

Spain's DWF fleet is the largest in the EU and among the largest in the world, with many vessels owned by companies that operate subsidiaries in West African and South American Atlantic fisheries. It also has a sizable domestic processing industry that requires a large amount of imports to operate efficiently, thus increasing the risk that IUU fish, shellfish, and mollusks will enter the Spanish supply chain. While Spain's fisheries in its own waters reportedly tend to be well managed, Spanish DWF fleets have been associated with IUU fishing and typically lack transparency and monitoring. Also of concern is the fact

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[5] Reportedly, Thai vessels have made fewer incursions into the Indonesian EEZ since Indonesia implemented the vessel-sinking policy in 2014.

[6] Thailand has been identified as having fish produced with child labor and shrimp produced with both forced and child labor. Thai shrimp has been identified as being produced with forced labor since the initial *List of Goods Produced by Child Labor or Forced Labor* report in 2009. ILAB has funded various efforts to combat labor abuses in several countries, including Thailand, since the late 1990s, including a 2010 project to combat the worst forms of child labor in the Thai shrimp- and seafood-producing sectors. USDOL, ILAB, *2018 List of Goods Produced by Child Labor or Forced Labor*, September 2018, 10, 42.

that landings of seafood by the EU DWF fleet (the majority of which is Spanish) increased by 40 percent during 2010–19. Despite Spanish regulations aimed at stopping IUU fishing, Spanish fishing companies continue to be accused of illegal activity, such as overfishing tuna quotas, smuggling bluefin tuna, and employing vessels identified as being involved in IUU fishing. For example, the Spanish fleet has been accused of overfishing its 2018 Seychelles tuna quota by more than 13,000 mt (30 percent). In addition, the Global Slavery Index rated Spain as being at high risk for slavery based on catch outside its waters, distant-water fishing, and subsidies.

The Commission estimates that about 22.4 percent, or an estimated $34.3 million, of U.S. marine capture imports from Spain was derived from IUU sources.[7] Most of these imports were of octopus, squid, and anchovies.

U.S. Commercial Fishing Industry Profile

In 2018, the United States was the world's fifth-largest producer of marine-capture seafood, accounting for about 6 percent of global production.[8] U.S. commercial fishers landed 4.3 million mt of fish and seafood that year worth about $5.5 billion in 2019. A substantial majority (88 percent in 2018) of commercial landings by volume in 2018 were of finfish, but shellfish accounted for over half (55 percent) of landed value. Catch and landings are influenced by a number of factors, including natural fluctuations in supply, catch limits and other measures to prevent overfishing, and, on a long-term basis, changes in consumer preferences.[9]

U.S. marine-capture commercial fishing is highly concentrated in a small number of species, particularly in terms of landings measured by quantity. During 2018–19, just 10 species accounted for over three-quarters of total U.S. commercial production by volume, and nearly 60 percent by value. U.S. production levels were relatively stable during 2015–19 due in part to the state and federal systems for managing U.S. fisheries, which control harvest levels for a number of species.

U.S. consumption is also highly concentrated in a few species, with the top 10 accounting for the vast majority (about 90 percent) of consumption. Despite an extensive coastline and a sizable domestic fishing industry, the U.S. market is highly dependent on imports to meet demand, including for some of the most popular species, such as shrimp and salmon. Broadly speaking, the United States tends to import higher-value seafood products and export lower-value ones. This reflects U.S. consumer demand for prized seafood products including lobster, crab, and shrimp and the steady demand abroad for the lower-value finfish that the United States produces and exports in large quantities. Some imports are of higher-value products which have been further processed in third-country markets (especially China) from U.S. commercial landings.

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[7] For details on how these estimates were produced, see chapter 3.

[8] According to the Food and Agriculture Organization of the United Nations (FAO), in 2018 the top four global producers of marine capture products were China (which accounted for 15 percent of global production), Peru (8 percent), Indonesia (8 percent), and the Russian Federation (6 percent). As of December 2020, 2018 is the most recent year for which FAO capture data are available. FAO, *The State of World Fisheries and Aquaculture 2020*, 2020, 13.

[9] Catch limits, which are mandated by the Magnuson-Stevens Fishery Conservation and Management Act, are explained below in chapter 6.

As a result of its reliance on imports to meet consumer demand for many types of seafood, U.S. marine fisheries products face competition in the U.S. market from both legal imports and imports harvested through IUU fishing.

Economic Effects of IUU Seafood Imports on U.S. Commercial Fishing

As described in the “key findings” section above, the removal of IUU imports from the U.S. market would have a positive effect on U.S. commercial fishers, who would receive a higher price for their landings. Increases in U.S. prices and U.S. landings are estimated to occur for all species that were included in the analysis. On average, the price of domestic-caught species would increase by 0.7 percent after IUU imports are removed (table ES.2). The average price effect, which includes both domestic prices and import prices, would be slightly higher because import price increases would be larger than domestic price increases. The model estimates an increase of about 70.5 million kg in landings, and a $60.8 million increase in operating income, for the U.S. commercial fishing industry after the hypothetical removal of IUU imports. The overall landings and price impacts are heavily influenced by the species-level results for Alaska pollock, as that species comprises about 59 percent of the total U.S. seafood market modeled. Because of this, average effects are also presented in table ES.2 without Alaska pollock included.

Table ES.2 Estimated average effects of removing IUU imports from the U.S. market for species modeled

Factor	Overall effects	Effects without Alaska pollock
Average landings, percent change	2.7	5.5
Average landings, total change in volume	70.5 million kg	59.0 million kg
Average domestic-caught price, percent change[a]	0.7	1.5
Average price index, percent change[a]	2.2	5.0
Average operating income effect for species modeled, change in million dollars	$60.8	$58.8

Source: USITC estimates.
Note: This table reports the weighted-average change in domestic prices and landings, and the total change in domestic operating income, for species modeled in this report. Weights were calculated using 2018 production volumes. Estimates of price and quantity changes by species were determined using customized partial equilibrium models.
[a] The average domestic-caught price is the average price received by U.S. fishers for their catch. The average price index includes both domestic landings prices and import prices.

Model results vary widely by species, so species-level results are presented wherever possible. For species where domestic fishers are nearing or reaching their U.S. catch limits, the removal of IUU products would primarily affect U.S. prices, not production levels (landings). These species are red snapper, Atlantic cod, Chinook salmon, chum salmon, coho salmon, Atlantic bigeye tuna, Pacific bluefin tuna, Pacific sardines, northern shrimp, and Atlantic mackerel. For species that are not catch-constrained, the effect of IUU fishing would be present in both U.S. prices and U.S. landings. In general, price and production effects would be greatest for species where the IUU share of U.S. imports is highest. Among the largest changes would be those for unprocessed bluefin tuna (which would experience a 10.2 percent increase in prices and a 17.6 percent increase in landings after IUU imports are removed), grouper (5.7 percent price increase and 25.0 percent landings increase), and mahi-mahi

(8.1 percent price increase and 38.8 percent landings increase). The largest changes in operating income would accrue to U.S. commercial fishing industries targeting shrimp, sockeye salmon, bigeye tuna, and squid.

Removing IUU imports from the U.S. market also has a positive impact on U.S. fishers' employment for each of the species and regions considered in the model. Regions and fisheries that are not constrained by catch limits show larger employment increases than those that are constrained. Of the fisheries for which employment effects could be estimated, the largest number of additional fishers was in the American lobster fishery and the largest increase relative to the existing number of fishers was in the snow and tanner crab fishery.

Chapter 1 Introduction

Overview

This report provides an examination of the extent to which U.S. seafood imports are sourced from illegal, unreported, and unregulated (IUU) fishing, as well as the potential economic effects on U.S. fishers of competition with such imports. On December 19, 2019, the U.S. House of Representatives Committee on Ways and Means (Committee) requested that the U.S. International Trade Commission (USITC or Commission) conduct an investigation and prepare a report on this subject, pursuant to section 332(g) of the Tariff Act of 1930. In its request, the Committee stated that "IUU fishing contributes to the overexploitation of fish stocks, threatens the livelihoods of coastal communities, jeopardizes food security, and harms marine ecosystems," as well as creating unfair competition for the U.S. fishing industry.

In order to understand the economic effects of harmful IUU fishing practices by countries that export seafood to the United States, the Committee requested that the Commission's report provide, to the extent practicable:

- A review of the existing data and literature on the prevalence of IUU products in the U.S. import market, and an overview of international mechanisms for monitoring and enforcement to address IUU fishing;
- A description of the size and structure of the U.S. commercial fishing industry;
- A description of the major global producers of IUU products, including but not limited to China, and country practices related to IUU production and exports;
- An analysis of the extent to which IUU product is imported into the United States, as well as major U.S. import sources and the global supply chains of such products; and
- A quantitative analysis of the economic impact of IUU imports on U.S. commercial fishermen and U.S. commercial fishing production, trade, and prices.

This chapter reviews the scope, organization, and methodology of the report and then introduces key terms and concepts that are foundational to the chapters that follow.

Scope

In its request, the Committee stated that IUU seafood includes products obtained in contravention of fisheries management regulations or in violation of labor laws. Regarding fisheries management regulations, the Food and Agriculture Organization (FAO) of the United Nations (UN) has promulgated an internationally accepted definition of IUU fishing that includes the following activities:

- Illegal fishing: Fishing conducted in waters under the jurisdiction of a state, without the permission of that state, or in contravention of its laws and regulations; or conducted by vessels flying the flag of states that are parties to a relevant regional fishery management organization

(RFMO) but operate in contravention of the conservation and management measures adopted by it; or in violation of other national laws or international obligations.

- Unreported fishing: Fishing that has not been reported (when required to be reported), or has been misreported, to the relevant national authority or relevant RFMO.
- Unregulated fishing: Fishing that occurs in the area of application of a relevant RFMO and is conducted by vessels without nationality, or by those flying the flag of a state not party to that organization, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with state responsibilities under international law.[10]

There are many fishing practices that can constitute an IUU violation under this definition. Among the most commonly documented violations are those in which a vessel fishes in an area where it is not authorized. This includes vessels that make incursions into another country's exclusive economic zone (EEZ, as defined below), as well as vessels fishing in areas of the high seas where RFMOs control access to fishing grounds. Similarly, vessels may fish during seasons in which fishing grounds are closed. Another common violation is fishing in excess of quotas set by relevant fishery management authorities or misreporting the volume of landings to those authorities. IUU fishing also includes fishing with disallowed gear types or methods, or in violation of environmental restrictions such as those concerning bycatch.[11] Further explanation of the concepts within this definition, as well as examples of IUU fishing practices meeting this definition, are provided throughout this report.

Information about unregulated fishing is generally less available than information about illegal and unreported fishing. Though the Commission collected evidence of unregulated fishing activities to the extent possible, the general lack of such information is a limitation in the scope of the report. The effect of this limitation is ultimately small, however, as the majority of "unregulated fishing" is likely also covered by the "unreported" or "illegal" definitions. The amount of unregulated fishing that does not fit within those two categories is likely minimal and simply not quantifiable.[12]

As defined by the Committee's request letter, IUU seafood also includes products obtained in violation of labor laws. While it is unclear if the FAO IUU definition may include labor violations under "violation of other national laws or international obligations," most major studies of IUU fishing have not historically included labor violations. Thus, the Commission undertook a data collection exercise and developed a methodology described later in the report to incorporate labor violations into the IUU estimates. The International Labour Organization (ILO) is the primary international agency responsible for setting labor standards through international conventions and principles, and developing programs and policies to promote decent work for women and men.[13] The "1998 Declaration on the Fundamental Principles and Rights at Work" sets forth core principles that all ILO members have an obligation to

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[10] FAO, "What Is IUU Fishing?" http://www.fao.org/iuu-fishing/background/what-is-iuu-fishing/en/, accessed November 5, 2020.
[11] Bycatch is the incidental capture of nontarget species in a fishery. WWF, "Bycatch: Overview," https://www.worldwildlife.org/threats/bycatch, accessed December 14, 2020.
[12] Box 3.2 in chapter 3 provides additional detail on the differences between unregulated and IUU fishing.
[13] ILO, "Mission and Impact of the ILO," n.d. https://www.ilo.org/global/about-the-ilo/mission-and-objectives/lang--en/index.htm, accessed November 16, 2020.

respect and promote, even if they have not ratified all of the ILO conventions.[14] These fundamental principles and rights are freedom of association and the effective recognition of the right to collective bargaining; elimination of all forms of forced or compulsory labor; effective abolition of child labor; and elimination of discrimination in respect of employment and occupation.[15] Other important ILO standards deal with conditions of work, including occupational safety and health, minimum wages, and hours of work.[16] Aside from international standards, failure to uphold national labor laws may also constitute a labor violation.

This report includes seafood products that are obtained in violation of labor laws within the scope of its analysis of IUU production to the extent possible. However, data on the incidence and prevalence of labor violations associated with fishing are particularly limited and are mostly focused in the areas of child labor, forced labor, and hazardous working conditions specific to the maritime and fishing industries. Labor violations in these categories that have been widely documented in segments of the fishing industry include debt bondage, human trafficking, child labor, and physical abuse of workers onboard fishing vessels. For this subset of labor violations, information is generally available linking the labor practices directly to seafood sectors in many countries. This information is incorporated in the estimation of U.S. imports of IUU product and the country profile chapters. The lack of freedom of association and collective bargaining is also a potential issue in a number of jurisdictions, but these were not covered in the estimates because information on these is more scarce. The study also did not undertake a comprehensive analysis of violations of each country's labor laws.

The Commission found that these labor violations were closely associated with IUU fishing violations; in other words, there is likely substantial overlap of IUU fishing and labor violations for many of the producers and countries that engage in IUU fishing. In most instances throughout the report, references to IUU seafood include products obtained in violation of fishing regulations, labor laws, or both. In some instances—particularly in chapters 4 and 5—fishing violations and labor violations are discussed separately for clarity.

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[14] ILO, "1998 Declaration on Fundamental Principles and Rights at Work (Annex revised 2010)," 2 https://www.ilo.org/dyn/normlex/en/f?p=1000:62:0::NO:62:P62_LIST_ENTRIE_ID:2453911:NO, accessed November 6, 2020.
[15] ILO, "1998 Declaration," June 18, 1998, 2; see also U.S. Department of Labor (USDOL), Bureau of International Labor Affairs (ILAB), "What Are Workers' Rights?" https://www.dol.gov/agencies/ilab/our-work/workers-rights, accessed November 6, 2020.
[16] The Bipartisan Trade Deal of May 10, 2007, adds acceptable conditions of work to the list of "internationally recognized labor principles," covered by the labor chapters of the U.S. free trade agreements with Colombia, Panama, Peru, and South Korea. Office of the U.S. Trade Representative (USTR), "Bipartisan Trade Deal," May 2007, https://ustr.gov/sites/default/files/uploads/factsheets/2007/asset_upload_file127_11319.pdf; see also USDOL, ILAB, "What Are Workers' Rights?"

Organization

The structure of the report is as follows:

- Chapter 2 provides an overview of international mechanisms for monitoring and enforcement to address IUU fishing, including associated labor violations. This includes those set up by international, regional, and national organizations, as well as efforts by nongovernmental organizations.
- Chapter 3 contains an analysis of the extent to which IUU product is imported into the United States, as well as major U.S. import sources and the global supply chains of such products. The Commission's methodology for producing its estimate of IUU seafood imports is described in detail in this chapter, with reference to relevant literature. Species- and country-level results from the estimation are presented, along with detailed descriptions of the IUU seafood supply chains for key products.
- Chapter 4 gives an overview of China's role as a major global producer of IUU products and its practices related to IUU production and exports. The chapter uses the IUU estimates to describe how seafood produced using IUU practices in China makes its way to the U.S. market.
- Chapter 5 offers summary country profiles for Indonesia, Thailand, Vietnam, Russia, and Spain; it describes their roles as major global producers of IUU products and their country practices related to IUU production and exports. These profiles also use the IUU estimates to describe how seafood produced using IUU practices in these countries makes its way to the U.S. market.
- Chapter 6 describes the size and structure of the U.S. commercial fishing industry. Attention is given to major species, producing regions, U.S. fishery management systems, supply chains and end markets for U.S. seafood products, and competition with imports. This chapter provides context for the estimated economic impact described in chapter 7.
- Chapter 7 gives the results of the Commission's quantitative analysis of the economic impact of IUU imports on U.S. commercial fishers and U.S. commercial fishing production, trade, and prices. This analysis covers the vast majority of the IUU seafood imports identified in chapter 3 and simulates the effects of removing these imports from the U.S. market.

Appendixes F–I contain additional detail on the data and methodology, particularly as used in the analyses in chapters 3 and 7.

Analytic Approach

Estimating IUU fishing, the prevalence of IUU-sourced seafood in U.S. imports, and the effect of these imports on the U.S. commercial fishing industry is inherently challenging due to the covert nature of IUU activity happening on the open ocean. Estimates are further hampered by the complexity of global seafood supply chains. Because IUU fishing is usually not observed directly, estimates of it must be derived from available evidence, which is often incomplete, indirect, or inconsistent. And because of differences in quality and availability of evidence for the vast array of global seafood production sources, there is no single accepted method for estimating IUU production that is applicable across all global fisheries. Connecting IUU fishing practices to U.S. seafood imports adds an extra layer of complexity due to the nature of global supply chains, where seafood can be distributed and processed in multiple countries before entering the U.S. market.

This report used multiple, linked steps to estimate the prevalence of IUU fishing at the point of harvest, trace the flow of seafood produced using IUU practices to the U.S. import market, and estimate the effect of these imports on U.S. producers. The first step in the Commission's estimation approach was to develop a baseline seafood production database, including initial estimates of reported versus unreported landings for "marine capture" products (i.e., wild-caught seafood from the ocean). The second step was to refine the marine capture landings information, the focus of this report, using evidence of IUU risk. Within the second step, estimates of the extent of production from practices that involve forced labor, child labor, and human trafficking were incorporated into the IUU estimates. The third step was to use IUU estimates for specific types of fish commonly used as aquaculture inputs (e.g., fishmeal) to approximate estimates of IUU-derived imports of seafood produced using aquaculture. The fourth step was to map IUU practices, which are estimated for both fishing and aquaculture sources, to U.S. imports using a supply chain analysis.

After these four steps, the analysis provided estimates of the share of any particular seafood species that is sourced from IUU fishing when imported from any partner country. These estimates were then used as inputs into a series of partial equilibrium models of the U.S. commercial fishing industry to estimate the economic impacts of removing IUU imports from the U.S. market. Of particular interest in performing this analysis was the economic impact of IUU imports on U.S. commercial fishermen and U.S. commercial fishing production, trade, and prices. The models were constructed to take into account species-specific market features. They account for possible substitution across related species, as well as for U.S. catch limits that may constrain producers from expanding supply after IUU imports are removed. The models also link unprocessed fish to the processing industry for species with significant processed IUU products.

Additional details on the methodology for all of the quantitative steps described above can be found in chapters 3 and 7, and in appendixes F and I. Throughout the preparation of this report, the Commission's research benefitted from the perspectives shared by knowledgeable industry representatives, a term used broadly to cover those who work in, collect data on, or otherwise closely follow the fishing industry. Throughout the report, "industry representative" may be used to describe fishers and processors, industry association members or employees, importers, exporters, academics, and the staff of NGOs and other non-profit organizations working on fishing matters, including those monitoring labor violations in the fishing industry.

Overview of Key Terms and Concepts

This section provides a specialized glossary defining terms that are used frequently throughout the report.

Aquaculture, in contrast to capture fishing (below), is the farming of aquatic species. Aquaculture may occur in marine, freshwater, or brackish environments using a wide range of techniques. These techniques can include production through open-water net pens (such as for Atlantic salmon), extensive or intensive ponds (such as for shrimp), or bottom- or suspended-culture systems (such as for mollusks).[17] As with capture fishing, aquaculture production can result in products intended for food, feed, or industrial use.

Bycatch is the incidental capture of nontarget species in a fishery.[18]

Capture fishing, or wild capture, refers to the harvest of aquatic species from the wild (in contrast to aquaculture). This may occur in either marine (saltwater) environments or freshwater environments (which include inland waterways), but products sourced from marine capture account for a far greater share of international trade than freshwater wild capture products. Products of capture fishing may be intended for human consumption, animal feed, or industrial (nonedible) uses.

Commercial fishing, which generally refers only to capture fishing, is the harvesting of fish, either in whole or in part, for sale, barter, or trade.[19] There are two main types of commercial fishing:

- **Artisanal fishing** is small-scale commercial fishing, with the catch often sold in the local market.[20]
- **Industrial fishing** is the term for large-scale commercial fishing. Industrial fishing operations often involve fishing vessels that are capable of being at sea for days at a time.[21] Common industrial fishing techniques include demersal or bottom trawling, gillnets, longlines, pole and line, pots and traps, dredges, and pelagic or midwater trawls.[22]

Distant-water fishing (DWF) is fishing that occurs outside of a country or territory's own EEZ (defined below). DWF may occur in another country's EEZ or on the high seas. Fishing in another country's EEZ may be IUU fishing or may be legal under a fisheries access agreement or other mutual arrangement between the two countries or territories.

Exclusive economic zones (EEZs) are ocean areas extending from 12 to 200 nautical miles off a country or territory's shore, under the United Nations (UN) Convention on the Law of the Sea.[23] Where two countries or territories have EEZs that overlap, as is common around the world, it is up to the parties to develop a maritime boundary. Countries and territories exercise sovereign rights over the resources within their EEZs. Throughout this report, unless otherwise specified, the term "EEZ" is used to refer to the combined area covering a country's territorial waters (defined below) and its EEZ.

Finfish is a term used to describe the biological group of fishes, sometimes called "true fishes" to distinguish them from other aquatic life whose common names also end in "fish" (e.g., shellfish),

[17] SeaChoice, "Aquaculture Methods," https://www.seachoice.org/info-centre/aquaculture/aquaculture-methods/, accessed November 2, 2020.
[18] WWF, "Bycatch: Overview," https://www.worldwildlife.org/threats/bycatch, accessed December 14, 2020.
[19] Commercial fishing is distinct from subsistence fishing, which is fishing for personal and household consumption, and from recreational fishing, which is fishing for sport or pleasure.
[20] Under some definitions, artisanal fishing may include small-scale fishing for both subsistence and commercial purposes. For purposes of this report, however, we distinguish subsistence from artisanal fishing and define artisanal fishing as small-scale commercial fishing. FAO, "Artisanal Fisheries," http://www.fao.org/family-farming/detail/en/c/335263/, accessed November 5, 2020.
[21] Pauly and Zeller, *Catch Reconstruction: Concepts, Methods, and Data Sources*, 2015, 6.
[22] MSC, "Fishing Methods and Gear Types," accessed November 5, 2020.
[23] A nautical mile is equal to one minute of latitude and is the equivalent of 1.1508 land miles, known as statute miles.

including mollusks, crustaceans, or any other aquatic life harvested in fisheries or aquaculture.[24] Finfish fall into two species groups:

- **Groundfish species** (also known as demersal fish) swim in deep waters. Common groundfish species include cod, pollock, and flounder.
- **Pelagic species** swim in sunlit waters up to about 655 feet deep (typically above the continental shelf).[25] Common pelagic species include anchovies, sardines, and tuna.

Fishing effort is the amount of fishing gear of a specific type used on fishing grounds over a given unit of time. For example, fishing effort may be measured in terms of hours trawled per day or number of hooks set per day. Fishing effort calculations help fishery managers, biologists, and economists determine the impact of the effort on fish populations and the ecosystem.[26]

Flag of convenience is the use of the flag of a state other than a fishing vessel's home country. Usually this is done in order to avoid financial obligations or regulatory oversight, but it may also be done for legitimate reasons, as described in greater detail in chapter 2.

High seas are areas of the ocean that are not part of any country or territory's EEZ. Management of fisheries in high seas areas often falls to regional fishery management organizations (RFMOs), as described below.

Highly migratory species are a group of pelagic fish that travel long distances and often cross domestic and international boundaries. Examples include tuna, swordfish, and mahi-mahi.[27]

Purse seine is a large wall of netting deployed around an entire area or school of fish, used on fishing vessels called purse seiners. There are floats along the top of the net, and a line is threaded through rings along the bottom. Once a fishing vessel has encircled a school of fish with the net, the line is pulled in, "pursing" the bottom of the net closed to prevent fish from escaping.

Seafood includes all aquatic species that are harvested for human consumption. This includes finfish, shellfish, and other species such as sea urchins. Seafood may be the product of aquaculture or capture fishing. For purposes of the analysis in chapter 3, the term "seafood" is used more broadly to also include aquatic species harvested for animal feed and industrial uses.

Shellfish are aquatic species with a hard shell. They include species of mollusks (such as oysters and clams) and crustaceans (such as lobsters, crabs, and shrimp).

Territorial waters are ocean areas extending from a country or territory's shore to 12 nautical miles offshore, under the UN Convention on the Law of the Sea. Countries and territories have full sovereignty over their territorial waters.

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[24] ISSF, "Finfish," https://iss-foundation.org/glossary/finfish/, accessed November 5, 2020.
[25] NOAA, "What Are Pelagic Fish?" https://oceanservice.noaa.gov/facts/pelagic.html, accessed November 5, 2020.
[26] FAO, "Fishing Effort," http://www.fao.org/cwp-on-fishery-statistics/handbook/capture-fisheries-statistics/fishing-effort/en/, accessed December 18, 2020.
[27] Mahi-mahi is also known as dolphinfish. NOAA, "Highly Migratory Species," https://www.fisheries.noaa.gov/highly-migratory-species, accessed November 5, 2020.

Transshipment is defined for purposes of this report as the unloading of cargo from one vessel to another in order to complete transport of the cargo to its destination, and it can occur both at sea and in port.[28]

Vessel flagging and flag state refer to the state under whose laws a fishing vessel is registered or licensed; in the case of a fishing vessel that is not registered or licensed under the laws of any state, the flag state is the state whose flag the fishing vessel is entitled to fly.[29] Vessel flagging is important because fishing vessels do not always use the flag of their home country. Fish captured by a vessel are generally considered the product of the flag state until they undergo some form of processing in another country.

Introduction to Global Fisheries Production and Trade

Global production of seafood, including all seafood exported to the United States, begins with the harvesting and capture of live animals from marine and freshwater sources using two broadly defined methods: capture fishing and aquaculture, as defined above. Both capture and aquaculture production are important sources of seafood, with aquaculture accounting for an increasing share of global production as wild stocks have declined. In 2019, an estimated 51.1 percent of U.S. seafood imports was produced using aquaculture, while 48.3 percent was produced using capture methods.[30]

Capture Fishing

Global trade of capture seafood involves products produced through commercial fishing, most often industrial fishing as defined above. Capture of marine species for human consumption as seafood may occur in countries' territorial waters, in EEZs, or on the high seas. Because industrial fishing vessels are capable of being at sea for extended periods, these vessels are the type that may engage in fishing in the high seas or in other countries' waters (that is, DWF).

The largest producers of marine capture products are generally those that have a long coastline (such as the United States) and/or those producers that have fleets that commonly fish outside their own EEZ (such as Taiwan). While some countries' fishing fleets operate largely within their own territorial waters and EEZ, others have fleets that often fish in the EEZs of other countries or on the high seas. Fishing in a foreign EEZ may be illegal or may be done under a mutual agreement in which a country grants another

[28] This is somewhat different from the definition of transshipment used in international trade data, where it is defined as the transfer of merchandise from the country of origin to an intermediary country before shipment to the country of ultimate destination. Census, "Trade Definitions," https://www.census.gov/foreign-trade/reference/definitions/index.html, accessed February 3, 2021.
[29] OECD, "Flag State (for Fishing Vessel)," https://stats.oecd.org/glossary/detail.asp?ID=1001#:~:text=Definition%3A,vessel%20is%20entitled%20to%20fly, accessed November 5, 2020.
[30] These shares are based on the estimation method described later in this chapter and are consistent with statements by NOAA that approximately half of seafood eaten worldwide and in the United States, specifically, was produced using aquaculture. NOAA, "About Aquaculture," accessed October 23, 2020. Based on this study's estimates, an additional 0.6 percent of U.S. imports were not allocated to either aquaculture or capture production, as their sources were not estimated. See table 3.3 for additional details.

country's fleet access to its waters. Fishing on the high seas tends to be concentrated in a handful of fleets; one analysis found that just six fishing fleets (those of China, Taiwan, Japan, Indonesia, Spain, and South Korea) account for 77 percent of the global high-seas fishing fleet.[31] China, by far the world's largest producer of marine capture products, has a fishing fleet that harvests in all of these locations—in its own waters, in other countries' EEZs, and on the high seas—as described in chapter 4. As seen in the capture production volumes for the 10 largest global producers (table 1.1), China's production of wild-caught seafood is more than twice that of the next-largest producer (Indonesia).

Table 1.1 Capture fishing production by country, 2014–18, 1,000 metric tons (mt) (top 10 producers)

Producer	2014	2015	2016	2017	2018
China	16,118	16,386	15,788	15,373	14,648
Indonesia	6,460	6,691	6,543	6,737	7,216
Peru	3,573	4,824	3,797	4,157	7,170
India	4,981	4,843	5,176	5,531	5,320
Russia	4,259	4,457	4,759	4,865	5,109
United States	4,985	5,040	4,904	5,034	4,745
Vietnam	2,743	2,861	3,078	3,315	3,347
Japan	3,639	3,404	3,200	3,206	3,131
Norway	2,302	2,294	2,034	2,379	2,489
Chile	2,175	1,786	1,497	1,919	2,122
All other	41,033	40,602	40,331	41,924	42,249
Total	92,269	93,188	91,107	94,440	97,546

Source: FAO Fisheries database, "Marine Capture Production," accessed November 5, 2020.

After catching fish, producers may land their catch in their own countries for processing or ship it to countries that serve as processing hubs. China is by far the largest fish processor, but other countries, such as Vietnam and Thailand, also process large fish volumes for producers around the world. Because of this complexity in the seafood processing supply chain, the legal origins of fish can become obscured as the product changes hands several times.

Aquaculture Production

Aquaculture plays an increasingly important role in meeting global demand for seafood. Global production of seafood from aquaculture grew 527 percent from 1990 to 2018, compared with 14 percent growth in capture production over the same time period.[32] During that time, aquaculture came to account for nearly half of global seafood production, and it is now the main source of many commercially important products, including warmwater shrimp, Atlantic salmon, tilapia, catfish, trout, and mussels. In general, species produced using aquaculture are products that have substantial global

[31] Sala et al., "The Economics of Fishing the High Seas," June 6, 2018, 1.
[32] FAO, "SOFIA 2020: Interactive Story," http://www.fao.org/state-of-fisheries-aquaculture/en/, accessed January 11, 2021.

demand and are conducive to commercial breeding and harvesting.[33] The majority of edible seafood production from aquaculture is in freshwater environments.[34]

Among countries engaged in aquaculture production, China plays an even more predominant role than in capture production. China's aquaculture production is between six and nine times larger than that of India, the next-largest producing country (table 1.2), and primarily serves the Chinese domestic seafood market, though some Chinese aquaculture products, such as tilapia, are heavily exported. Additional information on the Chinese aquaculture industry is provided in chapter 4.

Table 1.2 Aquaculture production by country, 2014–18, 1,000 mt (top 10 producers)

Producer	2014	2015	2016	2017	2018
China	42,299	43,750	45,818	46,825	47,560
India	4,890	5,260	5,700	6,180	7,066
Indonesia	4,298	4,380	4,952	5,571	5,452
Vietnam	3,340	3,462	3,570	3,821	4,134
Bangladesh	1,957	2,060	2,204	2,333	2,405
Egypt	1,137	1,175	1,371	1,452	1,561
Norway	1,332	1,381	1,326	1,308	1,355
Chile	1,215	1,046	1,035	1,203	1,266
Burma	962	997	1,018	1,049	1,130
Thailand	898	920	963	894	891
All others	8,226	8,381	8,602	8,974	9,301
Total	70,554	72,812	76,558	79,610	82,122

Source: FAO Fisheries database, "Aquaculture production," accessed November 5, 2020.

Aquaculture production is heavily reliant on feed. Aquaculture feed inputs (the food needed by farmed animals to grow to harvest weight) often incorporate capture-produced products, such as fishmeal and fish oil products derived from anchovy and other small pelagic fish. These small fish are often caught deliberately as inputs for the aquaculture supply chain. However, fishmeal and fish oil can also be produced from byproduct trimmings that are generated by industrial processing of capture fish destined for human consumption, or from fish that are caught as bycatch. For certain products, particularly larger carnivorous fish such as Atlantic salmon, the volume of captured product that is used in feed is greater than the amount of farmed product that is produced.[35]

Because of the large volume of marine capture fish used in aquaculture feed, the Commission's analysis of IUU sources of U.S. seafood imports includes aquaculture products. A detailed description of the extent of byproduct and forage fish inputs used in the production of aquaculture products, including those fish inputs captured through IUU, is included in the estimates presented in chapter 3.

[33] For example, whiteleg shrimp (*Litopenaeus vannamei*) has several characteristics that have made it the predominant warmwater shrimp produced through aquaculture and traded globally. Whiteleg shrimp can be reared using highly intensive methods with high "stocking density" (use of certain quantities of post-larvae shrimp within a certain area), lower waste generation per unit of food mass produced, and greater yields per hectare per year than for species such as black tiger shrimp (*Penaeus monodon*). CEA, "Shrimp Aquaculture Landscape," January 25, 2018.
[34] FAO, *SOFIA 2020*, 3.
[35] Aas et al., "Utilization of Feed Resources in the Production of Atlantic Salmon," November 2019, 8.

Seafood Processing, Distribution, and Trade

After seafood is harvested, whether from capture production or aquaculture, it follows a supply chain of varying complexity in terms of processing and distribution before it ultimately is consumed by humans. On the most basic level, seafood caught by subsistence or recreational fishers may have a simple supply chain. Examples of this would include a fisher who catches a fish and then brings it home to their family to consume. On the other hand, seafood products entering international trade generally go through a series of processing steps before products reach the final consumer. Processing steps such as freezing, smoking, and canning extend the shelf life of seafood and allow for longer supply chains. Other processing steps, such as filleting and breading, add value to products and create foods preferred by many consumers. Each of these steps may result in a product changing hands, sometimes being traded between countries.

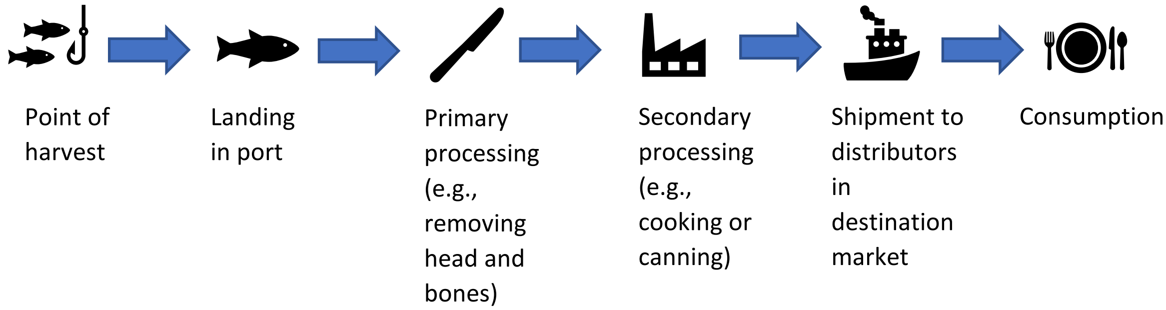
In capture fishing, fishing vessels frequently land their own products at port. However, many industrial capture fishing vessels may stay at sea for months, catching fish across wide areas of ocean. Therefore, it is also common for fishing vessels to offload their catch to other supporting vessels, usually refrigerated carrier vessels that will transfer the seafood products back to port. This process is known as transshipment, and while legal in many cases, it may also help disguise IUU practices and forced labor violations. Transshipment generally occurs at sea, but certain ports that are close to major high-seas fishing areas, such as those in the Marshall Islands, Fiji, Seychelles, Mauritius, and the Federated States of Micronesia, are frequently used for transferring catch and supplies between vessels.[36]

Fishing vessels and carrier vessels frequently begin processing catch at sea. At-sea processing activities can be as simple as freezing seafood for transport purposes or can include more sophisticated steps carried out using onboard fish processing plants. For example, the U.S. seafood company Trident Seafood operates a fleet of large catcher-processor vessels dedicated to capturing Alaska pollock that also have full processing plants below the fishing deck, with more than 100 workers producing frozen fish blocks and surimi while fishing activities are ongoing.[37] Trident also operates a fleet of specialized floating processors for processing herring and salmon, in addition to many smaller craft that are generally dedicated to harvesting or transport activities.[38]

Once seafood is landed at a port, a broader commercial distribution and processing system is engaged. Fishing vessels may be owned or chartered by onshore companies that may acquire fish landed at port, or fish may be sold in open markets to unrelated companies. Onshore companies may then further distribute or process products to unrelated customers or sell under contract to customers. Customers may include additional distributors, processors, wholesalers, retailers, or restaurant groups. Seafood processing steps that may be conducted in different countries from the one catching the fish include transforming whole fish into fillets, removing heads or shells from shellfish, cooking, smoking, or preparing downstream products such as breaded or canned seafood. A generalized seafood supply chain is shown in figure 1.1.

[36] Hosch et al., "Any Port in a Storm: Vessel Activity," 2019, 18–19.
[37] Surimi is a paste made from minced fish that can be formed to produce items such as imitation crab.
[38] Trident Seafoods, "Our Fleet," https://www.tridentseafoods.com/our-story/our-fleet/, accessed November 5, 2020.

Figure 1.1 Typical steps in a seafood supply chain



Source: Compiled by USITC.

Global trade data by product show that seafood moves around the world in many different stages of processing (table 1.3). The most commonly traded products (by value), as categorized by the Harmonized Commodity Description and Coding System (Harmonized System or HS) maintained by the World Customs Organization, are live, fresh, chilled, or frozen crustaceans (HS 0306) and filleted fish (HS 0304).[39] This is due to the popularity and relatively high value of crustacean seafood, such as shrimp and crab, as well as the frequency with which seafood products (both finfish and shellfish) are processed in countries other than the ones where they were caught, generating multiple international trade transactions. These trade patterns are described in additional detail in chapter 3.

Table 1.3 Global trade in seafood products by type, 2015–19, million dollars

HS heading	Description	2015	2016	2017	2018	2019
0306	Crustaceans	21,630	23,013	25,137	26,960	28,735
0304	Fresh, chilled, or frozen fish fillets and fish meat	21,391	22,303	24,211	26,029	25,996
0303	Frozen fish	20,205	21,344	23,813	24,733	22,950
0302	Fresh or chilled fish	16,291	19,362	20,057	21,873	21,559
1604	Prepared or preserved fish	13,619	13,529	14,685	16,131	15,939
0307	Mollusks	9,690	10,997	12,256	13,357	12,410
1605	Prepared or preserved crustaceans, mollusks, and other aquatic invertebrates	8,247	8,141	9,126	9,740	8,948
0305	Dried, salted, brined, or smoked fish	5,481	5,854	6,172	6,562	6,339
0308	Other aquatic invertebrates	685	731	806	819	928

Source: IHS Markit, Global Trade Atlas database, accessed November 5, 2020.
Notes: Data are based on total reported imports by all countries (i.e., mirror data). No totals are provided in the table because it is common for a fish to be traded once under HS heading 0302 (as a fresh fish), then again under HS heading 0304 (as a frozen fish fillet), and perhaps again under HS heading 1604 (prepared or preserved fish products, such as breaded fillets).

Since processors are not always in the same country as the flag state of the vessel, this also means that official export statistics do not always reflect the country responsible for the catch and instead show the processing country as the origin of the product. In addition, export statistics often do not differentiate between products of wild capture and products of aquaculture, so major seafood exporters include countries that do not have a large marine capture fishing fleet but do have major fish farming

[39] The term "chilled" in the Harmonized System generally refers to seafood that has been placed on ice (often on board a fishing vessel) but has not been frozen.

operations. For example, Norway's and Chile's large salmon farming operations put them higher in the export rankings than in the marine capture rankings. Overall, rankings for the 15 largest seafood exporters reflect countries' combined activities in marine capture, processing, and aquaculture, as shown in table 1.4.

Table 1.4 Seafood exports by country, 2015-19, million dollars (top 10 exporters)

Exporter	2015	2016	2017	2018	2019
Norway	9,619	11,209	11,935	12,773	12,637
China	11,684	12,124	13,034	13,693	12,364
Vietnam	5,899	6,105	6,893	7,631	7,676
Chile	4,868	5,152	6,088	6,769	6,577
India	4,208	4,421	5,512	5,846	6,322
Russia	3,956	4,485	5,041	6,238	6,260
Canada	5,027	5,277	5,511	5,815	5,950
United States	5,546	5,466	5,935	5,937	5,102
Thailand	5,165	5,035	5,146	5,074	4,999
Ecuador	2,928	2,774	3,100	3,586	4,891
All others	59,125	63,754	68,752	73,763	71,868
Total	118,026	125,803	136,947	147,126	144,645

Source: IHS Markit, Global Trade Atlas database for edible seafood (HS headings 0302–0308; 1604; and 1605), accessed November 5, 2020.
Note: Data are based on reported imports for all countries (i.e., mirror data).

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Chapter 2
Monitoring and Enforcement Mechanisms

Global focus on reducing the prevalence of illegal, unreported, and unregulated (IUU) seafood in global supply chains began in the late 1990s, as awareness of threats to global seafood supplies became widespread. Before that, it had become apparent that major commercial species such as Atlantic cod and bluefin tuna were facing population collapse, and that global wild capture production had peaked. At the same time, increasing consumer purchasing power and rising demand for seafood in developing countries created new incentives for some producers to engage in IUU fishing practices in order to boost supply. To address these problems, international organizations, nongovernmental organizations (NGOs), regional intergovernmental organizations, and national governments began to develop mechanisms to detect and eliminate IUU fishing. The sections that follow describe the contributions of these mechanisms toward addressing the problem.

Despite this progress, IUU fishing remains widespread in many areas of the world, as shown in chapter 3. There are opportunities at various stages along the seafood supply chain for participants engaging in IUU fishing to obscure the legal origins of the product and sell it in many markets, including the U.S. import market. IUU fishing and trade in these seafood products endangers the sustainability of global fishing stocks and, as shown in chapter 7, puts legitimate fishing practices at risk.

Understanding the negative impact that IUU fishing has on a global scale, the international community has implemented various monitoring and enforcement mechanisms designed to combat IUU fishing. International organizations, spearheaded by the United Nations (UN), have developed guidelines to provide a general framework for identifying and addressing IUU fishing at national and regional levels. Within this international framework, NGOs work with a wide range of parties to develop and implement various monitoring and enforcement mechanisms. For instance, NGOs work with regional bodies in their efforts to develop scientifically sound fishing standards. Because many commercially important species—such as tuna—cross boundaries beyond the jurisdiction of coastal governments, many of the enforcement measures rely on the jurisdiction of regional bodies. In addition to working with regional bodies, NGOs also help states with capacity building and implementation of best practices.

There are also many examples of monitoring and enforcement mechanisms designed to address IUU fishing at state or equivalent levels. The United States and European Union (EU) maintain measures, such as catch documentation schemes, designed to prevent illegally obtained seafood from entering their respective markets. New Zealand has implemented creative policies to address common IUU fishing-related loopholes, such as flags of convenience. South Korea demonstrates how proactive government regulations can reform a fishing industry once identified globally as a common IUU fishing offender.

International Organizations

International organizations, including the UN and the International Labour Organization, play an important role in coordinating cross-state efforts to combat IUU fishing (table 2.1). These organizations establish broad frameworks addressing IUU fishing, affording countries and regional bodies a foundation on which to build regulations as well as monitoring and enforcement mechanisms.

Table 2.1 Selected international organizations addressing IUU fishing

Organization	Aspects of IUU fishing covered
United Nations General Assembly (UN)	Foundational maritime definitions, territorial definitions, baseline acceptable fishing practices, monitoring, regulation development
United Nations Food and Agriculture Organization (FAO) of the United Nations	Baseline acceptable fishing practices, monitoring, regulation development, capacity building, data collection
United Nations International Maritime Organization (IMO)	Baseline acceptable fishing practices, labor standards, monitoring, data collection
International Labour Organization (ILO)	Labor standards, monitoring, enforcement
International Criminal Police Organization (Interpol)	Fishing activities, labor monitoring and enforcement, criminal prosecution

Source: The UN, FAO, IMO, ILO, and INTERPOL websites.

United Nations

The UN's efforts to address IUU fishing have adapted over time as global concern over sustainability of marine fisheries has grown, along with growth in seafood demand driven by rising global incomes.[40] The UN Convention on the Law of the Sea (UNCLOS) gives UN members a basic foundation of international maritime law within which to work, and it is the first piece of the UN's international framework to address IUU fishing (table 2.2). UNCLOS was adopted in 1982 but did not enter into force until 1994, when the required number of UN members ratified the convention. Several subsequent binding measures have similarly taken several years to enter into force.

[40] Holland, "Rising Incomes, Increased Urbanization," May 3, 2019.

Table 2.2 Select UN-established fisheries management measures and actions

Measure	Year entered into force	United States is a signatory?	Area of IUU fishing addressed	Key components
UN Convention on the Law of the Sea (UNCLOS)	1994	No[a]	Territorial definitions, catch limits	Establishes foundation of maritime territories and laws.
Code of Conduct for Responsible Fisheries	1995	Yes	Flag states, port states, regional fishery management organizations (RFMOs)	Establishes 19 principles geared toward the conservation and management of global fisheries. Provides advice on fisheries management and data gathering and reporting.
UN Fish Stocks Agreement	1996	Yes	Highly migratory species	Delineates flag state responsibilities for record keeping, establishing standards, compliance, and enforcement.
International Plan of Action to Prevent, Deter and Eliminate IUU Fishing (IPOA-IUU)	2001	Yes	Flag states, coast states, port states, RFMOs	Outlines measures and responsibilities of all states and RFMOs. Contains measures to prevent the products of IUU fishing from entering markets. Calls upon signatories to adopt their own plans.
Compliance Agreement	2003	Yes	Flag states, record keeping	Flag states liable for vessel activities, all party states required to maintain records of vessel activity.
Port State Measures Agreement	2016	Yes	Port state responsibilities	Establishes minimum standards and processes for port states. Implementing the Global Information Exchange System to facilitate data exchange. Undertakes capacity-building efforts for developing countries.
The Global Record of Fishing Vessels, Refrigerated Transport Vessels and Supply Vessels (Global Record)	2018[b]	n/a[c]	Data collection and information sharing	Assigns Unique Vessel Identifiers and creates a centralized source of data.

Source: Compiled by USITC staff from FAO, International Framework, accessed June 23, 2020.

[a] The United States has not signed UNCLOS but recognizes it as a codification of customary international law. *United States. v. Alaska*, 503 U.S. 569, 588 n.10 (1992).

[b] The Global Record was first launched as a pilot program in 2016 and the first working version was launched in 2017; the public version was launched in 2018.

[c] The Global Record is a tool designed to assist in the application of measures.

UNCLOS and Subsequent Measures

UNCLOS established the legal basis for control of specific areas of the ocean and for the production and use of resources within those territories. Before UNCLOS was adopted, coastal states arbitrarily extended territorial waters, resulting in a multitude of sovereignty disputes and endangering the sustainability of global fish stocks.[41] UNCLOS defines national territorial waters, exclusive economic zones (EEZs), and international waters. For example, UNCLOS defines a coastal state's national territorial waters to extend 12 nautical miles from the coastline.[42] Further, because these waters are considered a part of a coastal state's territory, the state can set and enforce its own laws or regulations on the use and exploitation of resources within its territorial waters. However, naval and merchant ships maintain the right of "innocent passage," provided they are not engaging in illegal activity.[43] Per UNCLOS, EEZs extend 12 to 200 nautical miles from shore, and states have the exclusive right to exploit, develop, manage, and conserve all resources, including fisheries, in the waters, ocean floor, and subsoil of the area. Almost 99 percent of the world's fisheries are covered by territorial waters and EEZs.[44]

In addition to establishing EEZs, UNCLOS also requires coastal states to set allowable catch levels by species and to grant other states access to the surplus.[45] Because many fish species are migratory and cross EEZs, determination and monitoring of catch levels is often undertaken by regional fishery management organizations (RFMOs). International waters, often referred to as the high seas, are not covered by any coastal state's laws. However, as discussed below, regional bodies (including RFMOs) may develop conservation and management regulations for these waters.

After UNCLOS entered into force in 1994, the UN worked to implement measures to ensure effective monitoring and enforcement of global fisheries. The Food and Agriculture Organization of the United Nations (FAO), through its Committee on Fisheries (COFI), develops and implements mechanisms to address IUU fishing globally. The first enforcement mechanism developed by COFI was the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement). The Compliance Agreement strengthens the role of flag states in ensuring their vessels comply with international and regional conservation and management measures. This agreement puts the onus on flag states to take responsibility for vessels they flag and seeks to prevent the re-flagging of vessels to states less willing or able to enforce international fisheries regulations. It also aims to combat IUU fishing by requiring states that are party to the agreement to maintain records of fishing activities. Under the Compliance Agreement, parties are required to keep a record of all fishing vessels flagged to their state that are authorized to engage in fishing activities on the high seas.[46]

The following year, in 1995, the UN General Assembly recognized that highly migratory species were at increased risk for IUU fishing because they crossed territorial and RFMO borders. In response, the UN

[41] UN, "United Nations Convention on the Law of the Sea," December 10, 1982; UN, "UNCLOS (A Historical Perspective)," 2012.
[42] A nautical mile is equal to one minute of latitude and is the equivalent of 1.1508 land-measured miles (known as statute miles). National Oceanic and Atmospheric Administration, "What Is the Difference?" accessed October 1, 2020.
[43] "Innocent passage" means naval and merchant vessels are allowed to pass through territorial waters.
[44] The size of an EEZ may be reduced where it overlaps with another country's EEZ, in which case the states with overlapping EEZs develop an agreement as to their maritime boundaries. If an agreement is not reached the boundaries are established at the median line between the two territories. UN, "United Nations Convention on the Law of the Sea," December 10, 1982; UN, "UNCLOS (A Historical Perspective)," 2012.
[45] UN, "United Nations Convention on the Law of the Sea," December 10, 1982; UN, "UNCLOS (A Historical Perspective)," 2012.
[46] Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (entered into force April 24, 2003, 2221 U.N.T.S. 91), 3–5.

developed the Agreement for the Implementation of the Provisions of the UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement). This agreement aims to ensure the long-term conservation of fisheries that are highly migratory (e.g., tuna and swordfish) or straddle EEZs and RFMO territories. The UN Fish Stocks Agreement establishes responsibilities of flag states for record keeping; monitoring, control, and surveillance standards; compliance; and enforcement related to these species.[47]

COFI recognized the need for further action to address IUU fishing, noting that previous efforts lacked the political will, priority, capacity, and resources necessary for effective implementation.[48] To address these challenges, COFI adopted the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU). This plan was one of the instruments initially developed under the 1995 Code of Conduct for Responsible Fisheries (Code of Conduct) and was adopted in 2001.[49] The IPOA-IUU outlines measures and responsibilities of flag states, coastal states, and port states to deter IUU fishing. The plan also recommends that states and RFMOs adopt market-related measures to deter IUU fishing and set out certain responsibilities of RFMOs. It further calls upon signatory states and RFMOs to adopt their own National Plans of Action based upon the recommendations of the IPOA-IUU. States and RFMOs must include details on the progress developing and implementing their plans to eliminate IUU fishing in the biennial reports they are to submit under the Code of Conduct.[50] To better understand the magnitude of IUU fishing, in 2016 FAO published the *Global Review of Studies* comparing IUU fishing studies since 2009 and reviewing each study's methodology in estimating IUU fishing.[51]

The Agreement on Port State Measures and Implementation Tools

Despite previous international agreements to address IUU fishing, periodic reviews of these mechanisms revealed the need for binding global measures to further reduce the scope of the problem.[52] The Agreement on Port State Measures (PSMA) was adopted in 2009 and entered into force in June 2016, becoming the first binding international agreement to solely address IUU fishing. The provisions of the PSMA apply with respect to vessels seeking entry into a port in a state different than their flag state.[53] The objective of the PSMA is to deter IUU fishing and prevent vessels from landing IUU catch by establishing minimum standards and processes for signatory port states.[54] It also calls upon parties whose inspections have discovered IUU fishing via inspections to work with the vessel's flag state to take

[47] FAO, "UN Fish Stocks Agreement," accessed August 16, 2020; UN, "Overview—Convention and Related Agreements," January 11, 2019.
[48] FAO, "IPOA-IUU," accessed November 4, 2020; FAO, "Instruments under the Code," accessed January 28, 2021.
[49] FAO, "Instruments under the Code," accessed January 28, 2021.
[50] FAO, "IPOA-IUU," accessed November 4, 2020; FAO, "International Plan of Action to Prevent," January 2001, 185–201, 4–5, 23–24.
[51] Described in FAO, "IUU Fishing Estimation and Studies," accessed August 17, 2020.
[52] FAO, "Agreement on Port State Measures," December 2016; FAO, "Agreement on Port State Measures (PSMA)," accessed December 8, 2020.
[53] FAO, "Agreement on Port State Measures," December 2016; FAO, "Agreement on Port State Measures (PSMA)," accessed August 19, 2020.
[54] FAO, "Parties to the PSMA," accessed August 4, 2020; FAO, "Designated Ports App," accessed August 4, 2020.

enforcement action.[55] PSMA parties include 66 countries and the European Union, and parties have designated 423 "designated landing ports" in accordance with the PSMA.[56]

According to U.S. government officials, the PSMA is one of the best examples of how increased interest and global concern surrounding IUU fishing can lead to beneficial action.[57] One of the most helpful aspects of the PSMA is reportedly its information exchange, which encourages states to implement monitoring tools which have previously proven effective in other states.[58] These tools include the use of a vessel monitoring system (VMS) and an automatic identification system (AIS) designed to transmit location data of fishing vessels in real time. VMS data are reported to flag states, which certify and distribute the information. The system is used on fishing vessels of various sizes by countries around the world. AIS, by contrast, is mandated only for larger vessels and is less commonly used on smaller ones.[59] AIS data are usually openly and freely available, rather than just being reported to flag states.[60] Both systems have been used by national governments, RFMOs, and NGOs to analyze fishing vessel activity and spot patterns associated with IUU fishing.

In addition, under the PSMA, FAO is in the process of implementing the global information exchange system to facilitate real-time data exchange for port state officials undertaking inspections. The system receives inputs directly from port officials, port states' national information systems, and RFMOs. The data are cross-checked with the FAO-managed database—the Global Record of Fishing Vessels, Refrigerated Transport Vessels and Supply Vessels (Global Record)—and necessary data are released to flag states and other relevant parties so that enforcement action can be taken where necessary.[61] While information exchange is a challenge, the global information exchange system in the PSMA affords port states, particularly those previously lacking sufficient monitoring capacity, the ability to identify known IUU fishing vessels.[62]

In addition to aiding signatory states through various forms of information exchange, under the PSMA FAO provides support for developing countries to improve their monitoring and enforcement capabilities. FAO has assisted 37 developing countries in capacity-building efforts; these countries were either parties to the PSMA or were in the accession process through technical cooperation programs. Additionally, FAO's Global Capacity Development Program conducts projects to help improve states' capacity for implementing port state measures and for monitoring, control, and surveillance (MCS)

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[55] FAO, "The PSMA as a Cost-effective Tool," March 6, 2019.
[56] FAO, "Parties to the PSMA," accessed August 4, 2020; FAO, "Designated Ports App," accessed August 4, 2020.
[57] U.S. government representative, telephone interview by USITC staff, April 9, 2020; U.S. government representative, telephone interview by USITC staff, April 16, 2020; U.S. government representative, telephone interview by USITC staff, July 16, 2020.
[58] U.S. government representative, telephone interview by USITC staff, April 9, 2020; U.S. government representative, telephone interview by USITC staff, July 16, 2020; Pew, "The Port State Measures Agreement," April 12, 2018; FAO, Report of the Second Meeting of the PSMA Working Group on Information Exchange, 2020, 3–4.
[59] AIS cannot support the large size of data transfers supported by VMS. Cauzac, "VMS or AIS for Sustainable Fisheries Management?," July 3, 2020.
[60] Cauzac, "VMS or AIS for Sustainable Fisheries Management?," July 3, 2020.
[61] Mosteiro Cabanelas, "UN/FLUX: Global Fisheries Information Exchange at FAO," February 4, 2020, slides 4, 6–8; FAO, Report of the Second Meeting of the PSMA Working Group on Information Exchange, 2020, App. 3.
[62] U.S. government representative, telephone interview by USITC staff, April 9, 2020; FAO, Report of the Second Meeting of the PSMA Working Group on Information Exchange, 2020, App. 3.

operations. Areas of project focus include building and strengthening legislative frameworks designed to combat IUU fishing, strengthening MCS enforcement systems, enhancing regional cooperation, and implementing market access measures like catch documentation schemes.[63] The full impact of the PSMA and global information exchange system mechanisms remains unknown because they are still in the process of being fully implemented.[64] However, FAO's capacity-building efforts have enabled several African nations—such as Ghana, Guinea, Madagascar, and Mozambique—to develop and implement measures to ratify the PSMA and combat IUU fishing.[65]

Voluntary Measures

FAO has also produced voluntary guidelines with the intention of preventing, deterring, and eliminating IUU fishing. While these measures are not binding, they provide states and RFMOs with guidance and a template for mechanisms to effectively combat IUU fishing. The first comprehensive voluntary measure was the Code of Conduct for Responsible Fisheries (Code of Conduct), a series of 19 voluntary principles promoting responsible fishing and fisheries activities.[66] More recently, FAO adopted several voluntary guidelines, including the Voluntary Guidelines on Catch Documentation Schemes. Those guidelines provide guidance to states, RFMOs, and other intergovernmental organizations when they are developing, implementing, and harmonizing catch documentation schemes (CDSs).

Unlike production-related measures designed to address the action of IUU fishing on the oceans, such as inspections and vessel monitoring systems, CDSs are market-related measures designed to prevent access to markets for IUU seafood. CDSs are developed and implemented by regional entities or national governments and track seafood from the point of harvest to landing and through the supply chain. CDSs contribute to combating IUU fishing by helping states identify fish offered for importation that may have been obtained via IUU fishing. Fish offered for importation without the required catch documentation may be barred from entering the relevant market.[67] Examples of CDS measures include the EU's catch certification requirement and the Seafood Import Monitoring Program (SIMP) certification required for U.S. seafood importers.[68] Both examples are discussed in greater detail below.

[63] FAO, "Ongoing Capacity Building Efforts," accessed August 19, 2020.

[64] FAO maintains an ongoing campaign to raise awareness and capacity building efforts to understand the gaps states are facing in their ability to implement the PSMA requirements. Implementation of the PSMA requires institutional and human resource capacity including legal authority in national legislation to enforce PSMA-related regulations; enough adequately trained staff to operate the monitoring, control, and surveillance system; systematic sharing of information; and systematic cooperation with other states, RFMOs, and other organizations. FAO, "Capacity Development: Overview," accessed December 18, 2020; FAO, "Capacity Development: Regional Workshops," accessed December 18, 2020; Pew, *Implementing the Port State Measures Agreement*, April 2017, 10, App 2.

[65] Stop Illegal Fishing, "Port State Measures to Stop Illegal Fishing," accessed November 1, 2020; FAO, "FAO Continues Ongoing Capacity Development Work," accessed December 8, 2020.

[66] UN, "Code of Conduct for Responsible Fisheries," 1995, 2.

[67] Hosch, "Catch Documentation Schemes: Practices and Applicability," accessed December 8, 2020.

[68] NOAA Fisheries, "Seafood Import Monitoring Program," September 19, 2020; European Commission, Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, October 29, 2008, chap. 3.

Data Collection

In addition to the various agreements developed, data are a crucial part of FAO's toolkit to disincentivize IUU fishing. As noted above, FAO has developed the Global Record, which provides certified data about vessels and vessel-related activities. Working with national authorities and RFMOs, the Global Record aims to provide a centralized source for data to improve transparency and traceability as a way to combat IUU fishing.[69] To this end, a key element of the Global Record is to assign each vessel a unique vessel identifier which remains with the ship regardless of its change of flag, ownership, or name.[70]

Fishing vessel information that can be used to combat IUU fishing is also held by the International Maritime Organization (IMO), a specialized UN agency. The IMO's overall mission focuses on maritime vessels, the safety and security of shipping operations, and the reduction of shipping pollution. Because of this overlap with the fishing sector, IMO's role has expanded to include collecting data on fishing vessels and working with other organizations to use these data to combat IUU fishing.[71] Through its Maritime Knowledge Centre, the IMO shares data supplied to its Global Integrated Shipping Information System by maritime administrations.

The Global Integrated Shipping Information System is also used to track data on specific ships via the IMO identification number system—an example of a unique vessel identifier. Under this numbering system, each vessel is assigned a permanent identification number which remains unchanged when the ship changes ownership or flag. At first, IMO identification numbers were applied only to maritime vessels larger than most fishing vessels (e.g., large cargo ships). However, beginning in 2013, these identifiers began to be applied to fishing vessels, and an IMO number is currently a prerequisite for registry on the Global Record.[72] The IMO numbering system aims to help identify vessels known to engage in IUU fishing that attempt to circumvent sanctions by changing ownership or flying a flag of convenience.[73]

Box 2.1 Flags of Convenience

Under the United Nations Convention on the Law of the Sea (UNCLOS), every vessel must sail under a state's flag. Vessels are subject to the flag state's laws and regulations and fall under the flag state's jurisdiction.[a] As efforts have increased to address IUU fishing, much of the responsibility of enforcement falls to flag states. As a result, vessels looking to engage in IUU fishing may opt to fly a "flag of convenience"—i.e., the flag of a country with which it has no genuine link or connection (such as being the country of the vessel's ownership). In choosing a "flag of convenience," a vessel seeking to engage in IUU fishing would choose a flag of a country that it believes lacks the will or the capacity to effectively enforce fisheries conservation and management measures.

Fishing vessels often register in countries other than their country of ownership for a variety of reasons. These include requirements by a flag state, such as New Zealand, that vessels fishing in the flag state's exclusive economic zones be registered in and/or flagged to that flag state.[d] An estimated 35 countries

[69] FAO, "Global Record of Fishing Vessels," accessed August 17, 2020.
[70] FAO, "About," accessed August 17, 2020.
[71] IMO, "Introduction to IMO," accessed August 16, 2020.
[72] FAO, "IMO Numbering Scheme Extended to More Fishing Vessels," March 7, 2018.
[73] In 2013 the IMO allowed voluntary application of the IMO Ship Identification Number Scheme to fishing vessels greater than or equal to 100 gross tons. IMO, "IMO Identification Number Schemes," accessed August 16, 2020.

allow vessels to easily register and re-flag to their country; such countries are known as open registries or flag of convenience nations. Many of these open registries fail to ensure that the vessels they flag are properly authorized to fish or that they otherwise abide by fisheries conservation and management measures. This lack of oversight over vessels undermines responsible fishery management, threatens the sustainability of global fish stocks, and puts valid fishing operations at a disadvantage.[e] Vessel owners often seek to fly a flag of convenience to reduce costs associated with regulation, registration fees, taxes, and labor laws.[f] The use of these flags obscures a vessel's origin and the traceability of its activities. Further, a high proportion of the vessels identified as engaging in IUU fishing activities reportedly fly a flag of convenience.[g] For workers on these vessels, such flags can signal low wages and poor working conditions due to a lack of regulatory oversight.[h]

Several organizations—including the FAO, IMO, and nongovernmental organizations like Global Fishing Watch—are actively working to address issues related to using a flag of convenience. In 2000, FAO and IMO established the Joint FAO/IMO ad hoc Working Group on IUU fishing. Spearheaded by the Committee on Fisheries, a subsidiary body of the FAO Council, the working group allowed FAO to receive assistance from the IMO specifically to address the problem of fishing vessels flying flags of convenience and frequently re-flagging to different countries.[i] Additionally, under the Code of Conduct, the FAO urges states to limit the operation of open registries, and the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing includes recommended measures to address vessels' use of flags of convenience.[j]

[a] UN, "United Nations Convention on the Law of the Sea," December 10, 1982; UN, "UNCLOS (A Historical Perspective)," 2012.
[b] Van Houtte, "Report of the Expert Consultation," September 2003, appendix E.
[c] ITF, "Flags of Convenience," accessed October 24, 2020; Doulman, "Report of the Expert Consultation," September 2003, appendix D.
[d] Gutiérrez et al., "China's Distant-Water Fishing Fleet," June 2020, 21–23.
[e] Doulman, "Report of the Expert Consultation ," September 2003, appendix D.
[f] Van Houtte, "Report of the Expert Consultation," September 2003, appendix E.; ITF, "Flags of Convenience," accessed October 24, 2020.
[g] Cutlip, "Flag of Convenience or Cloak of Malfeasance?," February 22, 2017.
[h] ITF, "Flags of Convenience," accessed October 24, 2020.
[i] FAO, "Joint Working Group on IUU Fishing," accessed August 16, 2020.
[j] Van Houtte, "Report of the Expert Consultation," September 2003, appendix E.; Doulman, "Report of the Expert Consultation," September 2003, appendix D.

Labor Violations

In addition to efforts to address IUU fishing activities, the UN has also played a role in documenting labor violations associated with these activities. In 2011, the UN Office on Drugs and Crime published the report *Transnational Organized Crime in the Fishing Industry*, which focused on trafficking in persons, smuggling of migrants, and illicit drug trafficking on fishing vessels. This report was among the first to describe certain fishing activities as intentional and coordinated exploitation of oceans, resources, and people.[74] It noted the severity of the abuse onboard fishing vessels, which it described as "cruel and inhumane," observing that fishers are often held as prisoners. The UN also pointed to the level of sophistication of the fishing operators involved in transnational organized crime and human trafficking, highlighting the complexity in registration strategies[75] and logistical coordination among

[74] Liberty Shared, written submission to USITC, October 9, 2020, 2.
[75] The report noted that there are indications that several aspects of registration—fishing licensing and control systems, awarding foreign fleets access rights to fishing grounds in developing states' EEZs, and the system of allowing foreign corporate entities the right to operate commercial ship registers—are vulnerable to corruption. United Nations Office on Drugs and Crime, *Transnational Organized Crime in the Fishing Industry*, 2011, 4.

vessels, as well as the linkage with other forms of crime, including "marine living resource crimes."[76] The report identified vulnerabilities in the fishing industry to transnational organized crime and other criminal activity, including the global reach and overcapacity of fishing vessels and the lack of governance and rule of law in the industry. At the Commission's hearing in this investigation, multiple experts pointed to the lack of governance and limitations in laws and regulations as factors preventing improved transparency and accountability in the fishing industry, which enable IUU fishing and human trafficking, among other activities.[77]

International Labour Organization

The ILO is a UN agency working to bring together the governments, employers, and workers of member countries to promote workers' rights, encourage opportunities for decent employment, enhance protections for workers, and strengthen global dialogue on work-related issues. The agency maintains a tripartite structure, giving equal voice to governments, employers, and workers when developing labor standards and shaping policies and programs.[78] In 1998, ILO members adopted the Declaration on Fundamental Principles and Rights at Work and its Follow-up ("ILO Declaration"). The ILO Declaration commits ILO members to respect and promote certain labor principles and rights. In particular, these include freedom of association and the effective recognition of the right to collective bargaining; the elimination of forced or compulsory labor; the abolition of child labor; and the elimination of discrimination in respect of employment and occupation.[79] In 2008, the 1998 ILO Declaration was supplemented by the ILO Declaration on Social Justice for a Fair Globalization, which institutionalized the concept of "Decent Work."[80]

The ILO also develops binding standards in the form of conventions. Once a member state ratifies the convention, the member state is obligated to ensure that its domestic laws and actions comply with it.[81] There are eight fundamental ILO conventions—known as the core conventions—covering the fundamental principles and rights identified in the ILO Declaration. These conventions cover child labor, forced labor, discrimination, and freedom of association and collective bargaining (table 2.3). The ILO Declaration states that all ILO members, even if they have not ratified the conventions, have an obligation arising from their membership to "to respect, to promote and to realize, in good faith" the fundamental principles and rights identified in the declaration.

[76] The report notes that although "illegal fishing" is defined as an environmental crime, the concept of IUU fishing groups multiple activities, some of which are not criminal. Because "illegal fishing" does not include upstream and downstream activities or aquaculture, the report refers to a broader category of "marine living resources crimes," defined as criminal activity that may cause harm to the marine living environment. United Nations Office on Drugs and Crime, *Transnational Organized Crime in the Fishing Industry*, 2011, 3, 99.
[77] Liberty Shared, written submission to USITC, October 9, 2020, 2–3; USITC hearing transcript, September 2, 2020, 250 (testimony of Juno Fitzpatrick, Conservation International); USITC hearing transcript, September 2, 2020, 253–57 (testimony of Sara L. McDonald, Seafood Slavery Risk Tool, Inc., and Monterey Bay Aquarium Seafood Watch).
[78] ILO, "About the ILO," 2020.
[79] ILO, "Text of the Declaration," June 15, 2010; ILO, "ILO Declaration on Fundamental Principles," accessed February 4, 2021.
[80] ILO, "ILO Declaration on Social Justice for a Fair Globalization," August 13, 2008.
[81] U.S. government representative, telephone interview by USITC staff, April 30, 2020.

In addition to the fundamental conventions, the ILO has developed several technical conventions targeting specific labor scenarios or particular industries.[82] Of these technical conventions, ILO developed two aimed at deterring IUU fishing: the Maritime Labor Convention No. 186 (MLC) and the Work in Fishing Convention No. 188 (WFC) (table 2.3).[83] Along with the WFC, the ILO produced the Work in Fishing Recommendation and guidelines for port state and flag state officials carrying out work under the auspices of the WFC to help promote effective implementation.[84] In 2018, South Africa became the first nation to successfully detain a fishing vessel for labor violations under the provisions of the WFC.[85]

The ILO also works with individual member states to assist with implementing reforms, enabling ratification, and, ultimately, fostering compliance with ILO conventions. An example of this is the Ship to Shore Rights Project. Under this project, with funding from the EU, ILO works with the government of Thailand and other key stakeholders to analyze current labor conditions and help the Thai government take steps to strengthen the legal, policy, and regulatory framework in the fishing sector. The project aims to enhance the capacity of officials to effectively implement these policies and impose sanctions against entities violating Thai labor laws. Additionally, the project looks to improve compliance with the ILO's core conventions and the WFC, and to support Thai workers.[86] While industry representatives indicate there are still problems the Thai government needs to address, through work with ILO and other partners, Thailand was able to meet the requirements to ratify the WFC in 2019.[87]

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[82] Hantyanto, "International Conventions and Guidelines," November 11, 2018.
[83] ILO, "MLC, 2006," accessed December 8, 2020; ILO, "Ratifications of ILO Conventions: Ratifications by Convention," accessed December 8, 2020.
[84] ILO, Recommendation R199—Work in Fishing Recommendation, 2007; ILO, "Guidelines for Port State Control Officers Carrying out Inspections under the Maritime Labour Convention, 2006," February 13, 2009; ILO, "Guidelines on Flag State Inspection of Working and Living Conditions on Board Fishing Vessels," June 8, 2017.
[85] Industry representative, telephone interview by USITC staff, December 10, 2020; ILO, "First Fishing Vessel Detained under ILO Fishing Convention," July 17, 2018.
[86] ILO, "ILO Ship to Shore Rights," accessed December 8, 2020.
[87] ILO, "Thailand Ratifies Work in Fishing Convention," January 30, 2019; industry representatives, telephone interview by USITC staff, August 14, 2020. For more information on Thailand and IUU fishing see chapter 5.

Table 2.3 International Labour Organization (ILO) conventions relevant to IUU fishing, year effective, U.S. participation, and coverage

ILO Convention	Year entered into force	United States a party? [a]	Type of convention and description
Forced Labour Convention (No. 29)	1930[b]	No	Fundamental: Prohibits forced or compulsory labor extracted from any individual under threat of penalty for which the individual did not offer themself voluntarily.
Freedom of Association and Protection of the Right to Organise Convention (No. 87)	1948	No	Fundamental: Workers and employers have the right to establish and join and/or affiliate with organizations of their own choosing, including international organizations of workers and employers.
Right to Organise and Collective Bargaining Convention (No. 98)	1949	No	Fundamental: Workers have the right to collectively bargain. Prohibits anti-union employment discrimination.
Equal Remuneration Convention (No. 100)	1951	No	Fundamental: Prohibits wage discrimination based on gender. Ensures equal wages for men and women doing work of equal value.
Abolition of Forced Labour Convention (No. 105)	1957	Yes	Fundamental: Prohibits the use of any form of forced or compulsory labor including as a punishment means of political coercion or education; as a means of discipline; as punishment for participating in a strike; or as a means of racial, social, national, or religious discrimination.
Discrimination (Employment and Occupation) Convention (No. 111)	1958	No	Fundamental: Prohibits employment discrimination based on race, color, sex, religion, political opinion, national extraction, or social origin
Minimum Age Convention (No. 138)	1973	No	Fundamental: Specifies a minimum age for work not less than the age of completion of compulsory schooling and not less than 15 years old.
Worst Forms of Child Labour Convention (No. 182)	1999	Yes	Fundamental: Defines a child as any person under the age of 18. Prohibits all forms of child slavery, including sale and trafficking, debt bondage and serfdom, and compulsory labor including for use in armed conflict; prohibits use of a child for prostitution and production of pornography; prohibits use of a child for illicit activities, including the production and trafficking of drugs; prohibits work which is likely to harm the health, safety, or morals of children.
Maritime Labour Convention (No. 186)	2013	No	Technical: Constitutes the "Seafarers Bill of Rights." Sets working and living conditions for all workers on ocean vessels. Covers commercially operated ships 500 gross tons or larger.
Work in Fishing Convention (No. 188)	2017	No	Technical: Covers workers on fishing vessels. Sets international standards for worker safety on board fishing vessels; food, accommodation, and medical care while at sea; and general employment practices, including insurance and liability. Aims to prevent forced labor, trafficking, and other labor abuses on vessels.

Source: Hantyanto, "International Conventions and Guidelines," November 11, 2018; ILO, "MLC, 2006," accessed December 8, 2020; ILO, "Ratifications of ILO Conventions: Ratifications by Convention," accessed December 8, 2020; ILO, Recommendation R199—Work in Fishing Recommendation, 2007; ILO, "Guidelines for Port State Control Officers Carrying out Inspections under the Maritime Labour Convention, 2006," February 13, 2009; ILO, "Guidelines on Flag State Inspection of Working and Living Conditions on Board Fishing Vessels," June 8, 2017.

[a] Additional information on U.S. ratification can be found below.

[b] In 2014, a Protocol to Convention Number 29 was adopted deleting transitional provisions.

Interpol

The International Criminal Police Organization (Interpol) is an intergovernmental organization comprising 194 member countries. The main function of Interpol is to enable member countries to share and access data on crimes and offer technical and operational support in apprehending criminals.[88] In 2013, Interpol launched its Global Fisheries Enforcement initiative, under the name Project Scale, to identify and deter fisheries crime and other transnational crimes linked to IUU fishing, including corruption, money laundering, fraud, and human and drug trafficking.[89] The goal of Project Scale was to leverage Interpol's international crime-fighting strategies to help authorities find and catch parties engaged in IUU fishing.[90] Interpol used its system of colored notices for this effort, issuing Purple Notices to seek or provide information on criminals' operations, objects, devices, and concealment methods.[91]

Interpol issued its first IUU fishing-related Purple Notice in December 2013 and as of 2019 had issued 51 total notices of all colors related to IUU fishing activities.[92] When issuing a Purple Notice, typically Interpol first looks at vessels known to have a history of IUU fishing. Member countries lead efforts to engage with Interpol on newer instances of vessels believed to engage in IUU fishing.[93] One of the first Purple Notices was issued at the request of Interpol member New Zealand and related to the vessel referred to as the *Thunder*, known to have changed names and flags several times. The notice allowed Interpol members to update each other as the name, flag, and location of the vessel changed. Ultimately, in 2014, as a direct result of Project Scale efforts, Interpol was able to coordinate with multiple countries to track, arrest, and prosecute the crew, managers, and owners of the *Thunder*.[94]

More recently, Interpol's Global Fisheries Enforcement initiative has developed the Fisheries Crime Working Group and has undergone operations to target illegal trade in abalone.[95] The initiative has also helped Indonesian and Panamanian officials apprehend the vessel *MV Nika*, a shipping vessel engaged in illegal fishing, and Thai officials capture the vessel *Uthaiwan*, which was a carrier (reefer) vessel that had repeatedly changed names and flags to evade detection. The *Uthaiwan* was thought to be part of a distant-water fleet of IUU vessels known as "Al Wesam" which has been associated with fishing violations, forced labor, and other crimes .[96]

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[88] Interpol, "What Is INTERPOL?," accessed September 28, 2020.

[89] Interpol, "INTERPOL Launches Project Scale to Combat Fisheries Crime," February 26, 2013; Interpol, "Fisheries Crime," November 21, 2019.

[90] Richardson, "Interpol Is Making Big Gains," March 28, 2017.

[91] In addition to Purple Notices, Interpol issues Blue and Red Notices. Blue Notices are issued to collect additional information about the identity, location, and/or activities of a person in relation to a crime; Red Notices seek the location and arrest of a person wanted for prosecution or to serve a criminal sentence. Interpol, "About Notices," accessed October 1, 2020.[92] Richardson, "Interpol Is Making Big Gains," March 28, 2017; Interpol, "Fighting Illegal, Unreported and Unregulated fishing," June 5, 2019.

[92] Richardson, "Interpol Is Making Big Gains," March 28, 2017; Interpol, "Fighting Illegal, Unreported and Unregulated fishing," June 5, 2019.

[93] Industry representatives, telephone interview by USITC staff, June 24, 2020.

[94] Pew, "How Interpol's Project Scale Is Changing the Game," March 2018, 16.

[95] Interpol, "Fisheries Crime," November 21, 2019.

[96] Interpol, "Fisheries Crime," November 21, 2019; Interpol, "INTERPOL Supports Apprehension of Vessel," July 22, 2019.

Role of Nongovernmental Organizations

Nongovernmental organizations (NGOs) play several important roles in promoting compliance with fisheries regulations and combating IUU fishing. These roles include (1) collecting and analyzing information about IUU fishing activities in order to inform enforcement authorities such as national governments and RFMOs, (2) building the monitoring and enforcement capacity of flag and port states, and (3) working with commercial fishers to either improve their fishing practices or certify them as well-managed and sustainable. In all of these areas, NGOs have had a notable impact in reducing IUU fishing practices, as described in the examples below.

Data Collection

Data collection and analysis of potential IUU activity has been a rapidly progressing area of involvement for NGOs in recent years. For instance, several NGOs have become key participants in monitoring, control, and surveillance systems. Global Fishing Watch (GFW)—an NGO created as a partnership between Google, satellite technology nonprofit SkyTruth, and environmental nonprofit Oceana—has created a large open data record aimed at improving the transparency of fishing vessels' activities. GFW data come from automatic identification system (AIS) and vessel monitoring system (VMS) tracking on board fishing vessels. GFW's analysis of these data has included identifying vessel movement patterns associated with the use of forced labor and with transshipment of catch at sea (a practice known to be associated with IUU fishing, as described in box 2.2).[97] As noted above, AIS data are usually only available for larger fishing vessels, but VMS is available for smaller ones. As a result, GFW's data coverage has expanded as governments, including Indonesia and Peru, have made smaller vessels' VMS data available to GFW.[98] National authorities, particularly those in Indonesia, have in turn used GFW data to support law enforcement efforts against parties engaging in IUU fishing. While GFW's efforts have been particularly integrated with national efforts in key countries highlighted in chapter 5, it is not the only NGO providing this type of data to aid national and RFMO enforcement efforts. For example, the Pew Charitable Trusts and the World Wildlife Fund also have partnerships with technology providers to collect and analyze vessel information.[99]

Trygg Mat Tracking (TMT), a Norwegian NGO, also plays a direct role in a variety of monitoring and enforcement activities, mostly related to vessel data. It tracks changes in fishing vessel ownership and other vessel-related information from many sources. (As described above, frequent changes in vessel ownership or flags are associated with higher risk for IUU fishing.) TMT also maintains a global list of vessels that are known to have engaged in IUU fishing. The TMT IUU vessel list is derived from information provided by the RFMOs, and it is meant to encourage cooperation among RFMOs and other entities with enforcement authority to better track and eliminate fishing by IUU-linked vessels.[100] This widely used vessel list is described in additional detail in chapter 5. In addition, TMT provides data and

[97] USITC, hearing transcript, September 2, 2020, 185 (testimony of David Kroodsma, Global Fishing Watch).
[98] USITC, hearing transcript, September 2, 2020, 186 (testimony of David Kroodsma, Global Fishing Watch).
[99] Guggisberg, "The Roles of Nongovernmental Actors," June 2019.
[100] Industry representative, telephone interview by USITC staff, May 28, 2020.

intelligence gathering to support the law enforcement efforts of countries that have limited enforcement capacity (particularly in Africa).[101]

Universities are also working to facilitate data collection necessary for effective monitoring and enforcement in fisheries. The Sea Around Us is a research initiative at the University of British Columbia and the University of Western Australia, providing reconstructed catch and fisheries data as well analysis assessing the impact of fishing activities on marine ecosystems. The database combines official national and FAO statistics with original research to estimate reported and unreported or missing landings. These data are publicly available and allow the user to analyze by EEZ, RFMO, or other geographic delineation.[102]

In addition to these data-gathering and -processing efforts that support monitoring and enforcement, NGOs have long been involved in efforts to detect IUU fishing on the water. Nongovernmental environmental organizations such as Greenpeace and the Environmental Justice Foundation have vessels at sea to observe suspicious activity and submit evidence to aid in law enforcement efforts. Another NGO, Sea Shepherd, has been known to not only observe IUU activity, but participate in inspections of vessels, often at the invitation of governments with limited capacity for enforcement. This has mostly been off of the western coast of Africa, and these joint efforts have led directly to arrests for IUU violations.[103]

Capacity Building

A second direct role for NGOs in combatting IUU fishing is in leading capacity-building efforts that seek to improve the ability of countries to enforce port state and flag state measures. For example, after the PSMA was adopted, the Pew Charitable Trusts partnered with two other NGOs to create a “capacity needs assessment” for countries seeking to implement that agreement. The assessment framework provides a set of tools for countries to identify which areas of their port management system need improvement in order to effectively enforce the PSMA’s provisions. These areas for improvement could include the country’s legal framework, the staffing and training of port inspectors, or the ability to share information and intelligence among relevant agencies. The assessment was conducted in six African coastal countries and published online for other countries to use.[104]

Improving Fishing Practices

A third main area of involvement for NGOs is through their efforts to improve fisheries management and promote transparent, sustainable fishing practices. These efforts are not always directly focused on addressing IUU fishing, but they have an indirect effect on it by promoting practices that make IUU fishing harder to execute and conceal. For example, the Marine Stewardship Council (MSC) is a nonprofit organization that was created through a partnership between World Wildlife Fund and Unilever.

[101] TMT, “What We Do,” accessed October 15, 2020.
[102] Further description of these data and their uses is given in chapter 3. Sea Around Us, “Fact Sheet,” accessed December 7, 2020; Pauly and Zeller, “Catch Reconstruction: Concepts, Methods, and Data Sources,” 2015, 2–14, USITC, hearing transcript, September 2, 2020, 231-32 (testimony of Rashid Sumaila, University of British Columbia Institute for the Oceans and Fisheries and Sea Around Us).
[103] Guggisberg, “The Roles of Nongovernmental Actors,” June 2019.
[104] Pew, *Implementing the Port State Measures Agreement*, April 2017, App 2.

Through its fishery certification program, which has become commercially important in many key markets, it verifies that any fishery that is certified has effective fisheries management practices in place and that there is traceability in the supply chain for the product.[105] This helps to reduce the risk of IUU seafood being sourced from that fishery.[106] Similarly, aquaculture certification programs have recently undertaken the development of new standards to ensure that the feeds used in certified aquaculture operations do not contain ingredients (e.g., fishmeal) sourced from IUU fishing.[107]

NGOs are also working to address labor violations in fisheries and aquaculture. For example, in April 2020, a coalition of NGOs including World Wildlife Fund and Conservation International drafted a set of three policy recommendations to address labor concerns in IUU fishing.[108] Conservation International is also leading an initiative to track trends and labor violations in fisheries.[109] Additionally, in 2015 the Monterrey Bay Aquarium Seafood Watch Program partnered with Liberty Shared and the Sustainable Fisheries Partnership to develop the Seafood Slavery Risk Tool, released in 2018. This tool has identified a list of 89 indicators of risk—including with respect to forced labor, human trafficking, and child labor in fisheries and across the supply chain—to help in gathering information about potential labor violations and IUU fishing.[110]

Box 2.2 Transshipment

Transshipment at sea, which is defined as the unloading of cargo from one vessel to another in order to complete transport to its destination, is particularly common in fishing industries.[a] Transshipments more broadly can occur at sea or in port, are usually legal, and can serve legitimate purposes—for example, allowing vessels away from port for extended periods to offload their catch to assisting vessels, as is not uncommon in Alaska pollock fisheries.[b] However, transshipping, particularly at sea, creates the potential for a significant loophole in the fight against IUU fishing because it can obscure the illegal origin of seafood products. Illegally procured fish can be commingled with legal fish, or IUU-listed vessels can transship on the high seas to a vessel without any known IUU fishing associations. High seas transshipment can make it impossible to identify the legal origin of fish products because transshipment vessels receiving cargo are essentially floating ports.[c] Because they are beyond the reach of most government jurisdictions, they lack the regulation that occurs in ports, which can lead to obscuring the origin of illegally procured fish, human rights abuses, and labor violations.[d] Conversely, most legitimate transshipment activities occur in ports, where they are subject to close inspection.[e]

In 2017, the FAO initiated a global review to better understand transshipment practices and their relationship to IUU fishing.[f] The study included a broad overview of the literature, field visits, expert interviews, a global survey, and specific case studies. The FAO analyzed transshipment activities to refrigerated cargo vessels (reefers), shipping containers in ports, floating storage vessels, small transport vessels, and other fishing vessels. Throughout the study, the FAO quantified IUU fishing risks and industry importance, as well as the prevalence of illegal transshipment both geographically and in terms

[105] MSC, "The MSC Fisheries Standard," accessed October 15, 2020.
[106] For further discussion, see chapter 3.
[107] ASC, "Feed," accessed October 15, 2020; BAP, "Program Standards," accessed October 15, 2020.
[108] USITC, hearing transcript, September 2, 2020, 248 (testimony of Juno Fitzpatrick, Conservation International).
[109] USITC hearing transcript, September 2, 2020, 250 (testimony of Juno Fitzpatrick, Conservation International).
[110] USITC hearing transcript, September 2, 2020, 253-57 (testimony of Sara L. McDonald, Seafood Slavery Risk Tool, Inc. and Monterey Bay Aquarium Seafood Watch).

of volume. FAO also analyzed the degree to which the transshipment is managed by RFMOs and coastal states and how well they apply these management measures.

The FAO concluded that transshipment to a reefer both occurred most often and at higher volumes with vessels with a relatively high IUU fishing risk. Transshipment to a shipping container and to a small transport vessel were shown to offer the most opportunities to engage in IUU fishing activities.[g] The FAO also concluded that while coastal states and RFMOs have regulations and work to implement monitoring, control, and surveillance measures related to transshipment, these regulations and measures appear insufficient to combat transshipment designed to obscure IUU fishing activities.[h]

[a] Eurostat, "Glossary: Transshipment," September 19, 2016; Cutlip, "Rendezvous at Sea," August 23, 2016.
[b] NOAA Fisheries, "Alaska Pollock: Management," accessed January 28, 2021."
[c] Global Fishing Watch, "Transshipment Reports for Commercial Fishing," accessed November 1, 2020.
[d] U.S. government representative, telephone interview by USITC staff, April 30, 2020.
[e] Cutlip, "Rendezvous at Sea," August 23, 2016.
[f] FAO, "Transshipment," accessed December 8, 2020.
[g] FAO, "Transshipment: A Closer Look," 2020, 3–7.
[h] FAO, "Findings of Global Study on Transshipment Publicly Presented," accessed November 1, 2020.

Regional Intergovernmental Organizations

Regional fishery bodies are composed of member states that manage or provide advice and coordinating functions for a regional fishery pursuant to an international agreement among the parties. Through regional fisheries bodies, members work together toward conservation, management, and development of their respective regional fisheries. Each regional fishery body has an established secretariat operating under a governing body of its member states. These bodies are important for combating IUU and for the successful implementation of international agreements such as the Agreement on Port State Measures. RFMOs are regional fishery bodies with a fisheries management mandate that adopt fisheries conservation and management measures that are binding on member states (table 2.4).[111] RFMOs exist for high-seas fisheries outside of the EEZ of any member.

[111] All RFMOs are regional fishery bodies. However, some regional fishery bodies may have only a nonbinding mandate and operate primarily in an advisory capacity. FAO, "What are Regional Fishery Bodies (RFBs)?" accessed August 20, 2020; FAO, "Regional Fisheries Bodies," accessed December 8, 2020.

Table 2.4 Select regional fishery management organizations (RFMOs), species covered, and U.S. membership

RFMO	Acronym	Species covered	U.S. membership
Convention for the Conservation of Antarctic Marine Living Resources [a]	CCAMLR	Toothfish	✓
Commission for the Conservation of Southern Bluefin Tuna	CCSBT	Bluefin tuna	
General Fisheries Commission for the Mediterranean	GFCM	All species of the Mediterranean	
Inter-American Tropical Tuna Commission	IATTC	Tuna, billfish	✓
International Commission for the Conservation of Atlantic Tunas	ICCAT	Tuna, swordfish, sailfish, marlin, sharks	✓
Indian Ocean Tuna Commission	IOTC	Tuna, mackerel, marlin, sailfish, swordfish	
Northwest Atlantic Fisheries Organization	NAFO	Most species excl. salmon, tuna, marlin, whales, shellfish	✓
North East Atlantic Fisheries Commission	NEAFC	Most species within the managed area	
South East Atlantic Fisheries Organization	SEAFO	Most species within the managed area	
Southern Indian Ocean Fisheries Agreement	SIOFA	Several, including toothfish, orange roughy, dogfish, and pelagic armourhead	
South Pacific Regional Fisheries Management Organisation	SPRFMO	Commercially important species other than tuna	✓
Western and Central Pacific Fisheries Commission	WCPFC	Highly migratory fish stocks	✓

Source: UN FAO, CCAMLR, CCSBT, GFCM, IATTC, ICCAT, IOTC, NAFO, NEAFC, SEAFO, SIOFA, SPRFMO, and WCPFC websites.
[a] While CCAMLR, which has a broad conservation mandate, is not technically an RFMO, it includes a mandate to monitor fisheries in its region and operates much like traditional RFMOs. Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight against IUU Fishing," February 14, 2019; industry representatives, telephone interview by USITC staff, June 24, 2020; CCAMLR, "Fisheries," May 31, 2017.

RFMOs typically focus on efforts to prevent overfishing of the commercially valuable fish stocks in their respective geographic regions. They often manage highly migratory stocks and "straddling" stocks, such as tuna, that cross the territorial waters of multiple countries or cross between national and international waters.[112] RFMOs also engage in efforts to reduce harm to marine mammals and other sea life as a result of fishing efforts in their respective fisheries which impact allowable commercial fishing activities.[113] RFMOs collect data, facilitate intergovernmental cooperation, and engage in monitoring

[112] Pew, "FAQ," February 23, 2012.
[113] See, e.g., WPCFC, "Conservation and Management Measure on Mobulid Rays," December 2019; WPCFC, "Conservation and Management Measure of Sea Turtles," December 14, 2018.

activities.[114] In addition to their monitoring activities, RFMOs adopt conservation and management measures, such as catch limits, fishing boundaries and seasons, and rules on fishing gear type. RFMO members are required to ensure that their vessels operating in the fishery comply with these measures. The efforts made by RFMOs to promote regulatory compliance are considered an important tool in enforcing measures to combat IUU fishing and serve to advance the goals of the international framework put in place by the FAO, the ILO, and other international organizations.[115]

Some RFMOs also maintain robust monitoring, control, and surveillance standards, which can be broadly grouped into five categories: catch documentation schemes, port measures, vessel listing, vessel monitoring systems, and at-sea observation programs (table 2.5). A 2019 report for the Organisation for Economic Co-operation and Development (OECD) listed several key measures, including monitoring, control, and surveillance standards, that help RFMOs to effectively combat IUU fishing.[116] The measures include adopting catch documentation schemes, publishing authorized vessel lists, maintaining lists of IUU vessels to cross-check with authorized vessels, mutually recognizing IUU vessel lists of other RFMOs, including as much data as possible in all vessel lists (such as IMO vessel numbers and beneficial owner identities),[117] requiring regular and transparent compliance reviews, and creating stringent and transparent mechanisms to sanction flag states failing to fulfill their obligations.[118] While each RFMO's use of these measures varies, overall the organizations OECD has identified as more effective implement most, if not all, of these types of measures to combat IUU fishing in their areas of competence.[119]

Table 2.5 Select regional fishery management organizations (RFMOs) and monitoring and enforcement mechanisms

RFMO	Catch documentation scheme	Port measures[a]	Vessel monitoring system	Vessel listing[b]	At-sea observation programs[c]
CCAMLR	✓	✓[d]	✓	✓	✓
CCSBT	✓	✓	✓	✓	✓[e f]
GFCM	✓[g]	✓	✓	✓	✓[h i]
IATTC[j]	✓[l]		✓	✓	✓[e]
ICCAT	✓[k]	✓	✓	✓	✓
IOTC	✓[l]	✓	✓	✓	✓[e f]
NAFO	✓[g]	✓	✓	✓	✓
NEAFC	✓[g]	✓	✓	✓	✓[i]
SEAFO	✓[g]	✓	✓	✓	✓
SIOFA	✓[g]	✓	✓	✓	✓[f m]
SPRFMO	✓[g]	✓	✓	✓	✓[i]
WCPFC	✓[g]	✓[d]	✓	✓	✓

Source: Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight against IUU Fishing," February 14, 2019; CCAMLR, CCSBT, GFCM, IATTC, ICCAT, IOTC, NAFO, NEAFC, SEAFO, SIOFA, SPRFMO, and WCPFC websites.
[a] Includes inspections in ports, designation of landing ports, and in-port transshipment monitoring.
[b] Includes a list of authorized vessels and a list of IUU fishing vessels.

[114] FAO, "Regional Fisheries Management Organizations and Deep-sea Fisheries," accessed August 20, 2020.
[115] FAO, "Regional Mechanisms," accessed December 8, 2020.
[116] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight against IUU Fishing," February 14, 2019, 12.
[117] Beneficial owner entities are the ultimate financial beneficiaries of the fishing-related economic activity. In cases of IUU fishing, vessels may be owned by multiple levels of shell companies in an attempt to conceal the identity of the real beneficiary of the illegal activity. EJF, "Out of the Shadows," 2018, 15, 17.
[118] OECD, "Combating Illegal, Unreported and Unregulated Fishing," accessed June 1, 2020.
[119] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight against IUU Fishing," February 14, 2019, 12.

[c] Includes observer programs for fishing, inspections at sea, and at-sea transshipment monitoring.
[d] Does not include designation of landing ports.
[e] Restricted to specific scenarios such as transshipments or use of specific gear. Does not include other inspections at sea.
[f] Observer program for scientific purposes.
[g] Standards on catch reporting only.
[h] At-sea inspections are spatially limited.
[i] Does not include fishing observer programs.
[j] Mechanisms included under IATTC include mechanisms developed in the Agreement on the International Dolphin Conservation Program (AIDCP).
[k] For Atlantic bluefin tuna only. For bigeye tuna and swordfish there are statistical document programs.
[l] Statistical document program for bigeye tuna only.
[m] Implementation in progress.

Catch Documentation Schemes

A catch documentation scheme (CDS), which is a way of providing tracking and traceability from the catch to the point of landing, can reduce the risk of IUU fish entering the global market. The nature and implementation of these CDSs, and thus their scope and effectiveness, vary across the RFMOs which use them.[120] Some of the RFMOs profiled limit their CDSs to certain species. Others limit their CDSs to the creation of standards for catch reporting but do not maintain a full standardized documentation system across species.[121]

One RFMO, the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), is widely considered to have implemented particularly effective systems to identify and combat IUU fishing in its toothfish fishery, particularly through its CDS.[122] CCAMLR's CDS is an electronic-based system for documenting toothfish exports and reexports. Participants include member states as well as cooperating noncontracting parties such as Ecuador and Singapore. Under the CDS, members and cooperating parties can accept imports only from a country that follows the CDS. The scheme has become an effective tool for identifying trade partners of member countries, allowing CCAMLR officials to engage with these trade partners and encourage participation.[123]

Port Measures

Port measures enable RFMOs to more easily monitor fishing activities than at-sea programs, providing another means to combat IUU fishing. Port measures include designation of landing ports and conducting inspections in ports, including the monitoring of in-port transshipments. Most RFMOs designate specific ports for landing of the species managed in order to concentrate resources for other port measures.[124] Port inspections can help verify whether catches adhere to conservation and management measures by collecting CDS data and scrutinizing fishing gear. Additionally, many RFMOs include transshipment monitoring as part of a port inspection scheme. For example, under the Conservation of Atlantic Tunas' (ICCAT) port inspection scheme, contracting parties with an authorized

[120] FAO, GLOBEFISH, Catch Documentation Schemes, accessed December 17, 2020.
[121] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight against IUU Fishing," February 14, 2019, 12–14.
[122] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight against IUU Fishing," February 14, 2019, 8; U.S. government representative, telephone interview by USITC staff, April 16, 2020; Constable, "CCAMLR: Implementation of the Ecosystem Approach on the High Seas," June, 2006; Ceo et al., "Performance Reviews by Regional Fishery Bodies," 2012, 12–13; Fabra and Gascón, "CCAMLR and the Ecosystem Approach," 2008, 589–90.
[123] Industry representatives, telephone interview by USITC staff, June 24, 2020.
[124] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight Against IUU Fishing," February 14, 2019, 14.

port granting access to foreign fishing vessels must undertake inspections and submit results to the ICCAT Secretariat. At least 5 percent of landing and transshipment operations conducted in a contracting party's port must be inspected, and evidence of any infringement of ICCAT conservation and management measures must be documented and promptly reported to the contracting party authorities, the ICCAT Secretariat, and the flag state of the vessel.[125]

Vessel Listing

Virtually all RFMOs maintain authorized vessel lists, and many maintain lists of noncompliant vessels that violate rules. Vessel listing as a sanction for noncompliance with the RFMO's conservation and management measures may deter IUU fishing because they alert enforcement officials to offenders. However, limits in the way many RFMOs administer these lists can reduce their efficacy. Reportedly, the most effective vessel-listing mechanisms include the IMO vessel number, which helps identify the ultimate beneficial owner of the ship to allow flag states to prosecute them.[126] Standing to submit information to support listing a vessel for violating rules varies by RMFO. According to the OECD, the wider the range of parties allowed to submit evidence against a vessel for listing, the more useful the information gathered, especially as beneficial owners are not always easily identified.[127]

Vessel violation listings are intended to trigger a number of actions which impact the vessel and limit its ability to continue to violate RFMO rules. Listing a vessel for violating rules prioritizes the ship for inspections and possible impoundment, facilitates arrests, and publicly discredits individuals associated with the vessel. It also obligates the flag state of the violating vessel to institute legal proceedings, impose sanctions, and report the steps taken to investigate and eliminate the IUU fishing activities. However, despite this obligation, reportedly almost no RFMOs sanction a flag state for failing to act against offending vessels.[128]

The variety of vessel-listing protocols and, in some cases, the fact that these lists are not shared across RFMOs creates potential difficulties identifying IUU vessels and other violators crossing regions, although many RFMOs are trying to improve cooperation.[129] Because many RFMOs cover highly migratory species, cooperation with other organizations is important; the cross-listing of vessel lists identifying IUU fishing offenders reportedly can be an effective tool enhancing cooperation. Several RFMOs, including CCAMLR, ICCAT, and the Western and Central Pacific Fisheries Commission (WCPFC),

[125] ICCAT, "Recommendation by ICCAT", 2018, 4–7.
[126] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight Against IUU Fishing at the Regional Level," February 14, 2019, 14–15; U.S. government representative, telephone interview by USITC staff, July 16, 2020; USITC hearing transcript, September 2, 2020, 119–120 (Robert DeHaan, National Fisheries Institute).
[127] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight Against IUU Fishing at the Regional Level," February 14, 2019, 14–17.
[128] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight Against IUU Fishing at the Regional Level," February 14, 2019, 17–20; industry representatives, telephone interview by USITC staff, June 24, 2020.
[129] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight Against IUU Fishing at the Regional Level," February 14, 2019, 20.

actively cross-list with other RFMOs and regional bodies.[130] Facilitating information sharing is something the Global Fisheries Enforcement and Global Record are striving to achieve by creating a centralized list, like the Trygg Mat Tracking (TMT) vessel list.

NGOs working on IUU fishing acknowledged that several RFMOs are making strides in the compilation and dissemination of vessel lists. However, NGOs working on IUU fishing believe RFMOs like the ICCAT and the General Fisheries Commission for the Mediterranean (GFCM) have potential for making further progress, such as via the mandatory inclusion of IMO numbers in authorized vessel lists and IUU fishing vessel lists.[131]

Vessel Monitoring Systems

Vessel monitoring systems (VMSs) are commonly used by RFMOs to track the locations of vessels at sea. The most successful VMSs operate in real time and at sea and cover overcatching of quotas; fishing outside permitted boundaries or during closed seasons; and violations of harvest and gear restrictions. They require vessels to transmit their position full time. VMSs are most effective in RFMOs that maintain a centralized system, as opposed to systems monitored by flag state members. Although the effectiveness varies by RFMO, VMSs also help track transshipments, an activity commonly associated with IUU fishing.[132]

At-sea Observation Programs

At-sea programs can help RFMOs combat IUU fishing and may include observer programs for fishing, inspections at sea, and, in rare cases, at-sea transshipment monitoring. However, these programs are often limited in nature. In some cases, RFMOs only maintain observer programs only for scientific purposes, such as to help determine catch limits.[133] Electronic monitoring, which uses cameras and gear sensors in place of human observers and can integrate with VMS, may eventually play an important role in RFMO-managed fisheries. To date, however, these electronic systems have been used in RFMO-managed fisheries only on a limited basis, on Ghanian and Fijian tuna vessels.[134]

Among the more rigorous at-sea observer programs is the ICCAT Regional Observer Programme for bluefin tuna. This program has been operating in the eastern Atlantic and Mediterranean and deploys observers to oversee activities on an ICCAT-authorized fishing vessel, farming facility, and/or trap

[130] ICCAT, "IUU Vessel List," accessed October 5, 2020; CCAMLR, "Authorised Vessels," June 29, 2016; industry representatives, telephone interview by USITC staff, June 24, 2020; WCPFC, "About WCPFC," accessed October 6, 2020. WCPFC is also thought by some industry representatives to promote good cooperation within Pacific island nations and between these nations and distant-water fleet flag states. U.S. government representative, telephone interview by USITC staff, April 16, 2020; USITC roundtable transcript, September 29, 2020, 54.
[131] von Kistowski et al., "Port State Performance," August 2010, 21; IUU Watch, "GFCM and ICCAT Urged to Step Up Efforts," November 4, 2019.
[132] USITC hearing transcript, September 2, 2020, 37-38 (Yu Lu, China Chamber of Commerce of Import & Export of Foodstuffs, Native Produce and Animal By-Products); USITC hearing transcript, September 2, 2020, 185–89 (David Kroodsma, Global Fishing Watch); Pew, "Best Practices for Transshipment," November 17, 2017; Cutlip, "Rendezvous at Sea," August 23, 2016.
[133] Hutniczak, Delpeuch, and Leroy, "Intensifying the Fight Against IUU Fishing at the Regional Level," February 14, 2019, 12.
[134] Michelin, Sarto, and Gillett, "Roadmap for Electronic Monitoring in RFMOs," April 2020, 40–41.

operation.[135] These observers confirm that fishers are operating within the guidelines outlined by ICCAT, including catch limits, fishing season, minimum size, and port operations. The Regional Observer Programme is working to ensure, with respect to bluefin tuna, complete observer coverage on all purse seine vessels and related activity, transfers and harvesting related to farms, and transfer-related traps into transport cages.[136] Purse seine vessels fishing for bluefin tuna are required to have an ICCAT regional observer to operate.[137] The Regional Observer Programme also covers transshipments at sea. If there is no observer present, all transshipments must take place in port.[138]

A handful of RFMOs, including CCAMLR, GFCM, ICCAT, IATTC and WCPFC, also use at-sea inspection programs, with additional RFMOs in the process of proposing and implementing them. These programs are often reported to be effective. While some RFMOs with a relatively small area of competence, like GFCM, include all fishing activities in at-sea inspection programs, most RFMOs target specific gear and/or species in at-sea inspections.[139] ICCAT, for example, maintains a rigorous inspection scheme that includes inspection at sea. Through the ICCAT Joint Scheme of International Inspection, officials from contracting parties board and inspect vessels engaged in swordfish and bluefin tuna fishing activities.[140]

State-level Measures

In addition to implementation and enforcement of measures by RFMOs, national-level programs address IUU in states' internal markets.[141] Ultimately, the effectiveness of efforts to combat IUU fishing at a national level is determined by the strength of laws and regulations, as well as the capacity to implement the appropriate actions. As described above, FAO and other international institutions have developed capacity-building measures to aid states' attempts to prevent, deter, and eliminate IUU fishing.

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[135] Bluefin tuna farming facilities covered under the ICCAT Regional Observer Programme are marine areas defined by a cage used for the fattening and/or farming of bluefin tuna caught on the high seas by traps and/or purse seine vessels. They may be located on the high seas or in member state territorial waters. ICCAT, Recommendation by ICCAT Amending the Recommendation 18-02, 2019; ICCAT, "ICCAT Record of BFT Farming Facilities," accessed January 29, 2021.

[136] A purse seine is a large wall of netting deployed around an entire area or school of fish. There are floats along the top of the net and a line is threaded through rings along the bottom. Once a fishing vessel has encircled a school of fish with the net, the line is pulled in, "pursing" the bottom of the net closed to prevent fish from escaping. NOAA Fisheries, "Fishing Gear," February 12, 2019.

[137] ICCAT, Recommendation by ICCAT, 2018; ICCAT, "ICCAT Regional Observer Programme for Bluefin Tuna," accessed October 5, 2020.

[138] ICCAT, "ICCAT Regional Observer Programme for Bluefin Tuna," accessed October 5, 2020.

[139] GFCM, "Compendium of GFCM Decisions," July 2019; IATTC, Resolution on Boarding and Inspection Procedures, Prop. IATTC-90 H1 Rev.1 (July 1, 2016); ICCAT, "ICCAT Regional Observer Programme for Bluefin Tuna," accessed October 5, 2020; CCAMLR, "System of Inspection," November 17, 2015; WCPFC, "High Seas Boarding and Inspection," May 20, 2019.

[140] ICCAT, "ICCAT Joint Scheme of International Inspection," accessed October 5, 2020.

[141] States in this context refers to flag states, coastal states, and nation states importing seafood. While the EU is not a state, it is included in the discussion of state-level mechanisms because as an intergovernmental political and economic union, it is the contracting party to regional bodies like RFMOs and develops binding regulations for members in a manner similar to states.

The section below describes monitoring and enforcement efforts implemented by the United States, the EU, New Zealand, and South Korea. The U.S. and EU examples show how government entities can effectively implement catch documentation schemes and generate changes in other countries' practices. The New Zealand example shows how even a smaller economy can develop and implement a robust plan of action through cooperation with other nations and find creative solutions to address circumvention attempts such as flags of convenience. Finally, the South Korean example shows how government action can successfully address known IUU fishing and reform its fishing industry.

United States

The U.S. government addresses IUU fishing though a variety of mechanisms, in addition to its involvement in RFMOs and management of U.S. fisheries.[142] These are aimed at identifying sources of IUU product and preventing IUU products from entering the U.S. market. There are several agencies involved in these efforts; foremost among them is the U.S. Department of Commerce's National Oceanic Atmospheric Administration (NOAA) National Marine Fisheries Service (NOAA Fisheries). NOAA Fisheries works in cooperation with the U.S. Department of State, the U.S. Coast Guard, and the U.S. Department of Labor to implement regulations addressing IUU fishing.

Under the Magnuson-Stevens Fishery Conservation and Management Act, the United States seeks to strengthen international efforts to address IUU fishing.[143] As required by the act, NOAA Fisheries publishes a biennial report listing flag states with vessels engaging in IUU fishing activities.[144] U.S. government officials identify flag states with vessels violating international regulations and enter into consultations with flag states that have not taken action against violating vessels.[145] The consultation process covers two years and allows identified flag states to enact appropriate corrective action before the next biennial report. If a flag state has not taken enough steps to correct the issues identified, the United States may issue a negative certification, including port restrictions of vessels from the flag state as well as import restrictions on fish products.[146] NOAA Fisheries acknowledges that all flag states, including the United States, have vessels engaged in IUU fishing; however, problems arise when neither a flag state nor an RFMO takes actions against violators.[147] NOAA Fisheries' definition of IUU fishing in its biennial reports generally only includes violations that occur in the U.S. EEZ or the high seas and does not include violations that occur in any other country's exclusive economic zone.[148]

In addition to the biennial report, the United States maintains the Seafood Import Monitoring Program (SIMP), a species-based traceability program requiring the documentation and reporting of data from harvest to entry into the U.S. market. SIMP focuses on 13 species identified as particularly vulnerable to IUU fishing.[149] These species are abalone, Atlantic cod, blue crab, mahi-mahi (dolphinfish), grouper, red

[142] See chapter 6 for more information on laws, regulations, and actions impacting U.S. fisheries and fishers.
[143] 16 U.S.C. §§ 1801(a)(12) and 1801(b)(3).
[144] NOAA Fisheries, "Laws & Policies: Magnuson-Stevens Act," December 30, 2020.
[145] 16 U.S.C. § 1826j(c)(2); NOAA Fisheries, "Identification of IUU Fishing Activities," June 23, 2020.
[146] 16 U.S.C. §§ 1826a(a) and 1826a(b); NOAA Fisheries, "Improving International Fisheries Management Fact Sheet, 2019.
[147] U.S. government representative, telephone interview by USITC staff, April 16, 2020.
[148] 16 U.S.C. § 1811(a); U.S. government representative, telephone interview by USITC staff, April 16, 2020.
[149] 81 Fed. Reg. 88975 (December 9, 2016); NOAA Fisheries, "Seafood Import Monitoring Program," September 19, 2020.

king crab, Pacific cod, red snapper, sea cucumber, shark, shrimp, swordfish, and tuna (all major species). Data on the fishing vessel—including flag state and gear used, fish species, landing dates and ports, and information on the importer of record, including any transshipment—are collected and housed in the International Trade Data System of the U.S. Department of Commerce. The importer of record is ultimately responsible for gathering and reporting the required data.[150]

Traceability measures like SIMP aim to facilitate legal trade for law-abiding fishers and seafood producers and prevent IUU products from entering the market. Several agencies, including the U.S. Department of State's Bureau of Oceans and International and Environmental and Scientific Affairs, work closely with NOAA Fisheries to coordinate with U.S. trading partners and support the effective implementation of SIMP.[151] There is, however, some concern that because SIMP is species-based, gaps may appear in coverage of species that are similar and substitutable, such as pollock (not covered by SIMP), which may substitute for cod (covered by SIMP). According to industry representatives, these species gaps, combined with the increasing use of foreign and secondary processors, reportedly lessen some of the effectiveness of SIMP.[152]

While NOAA Fisheries is the lead agency on much of the U.S. efforts to combat IUU fishing, it actively works with other U.S. agencies to implement the U.S. action plan to combat IUU fishing and seafood fraud. In 2014 the federal government's Task Force on Combatting IUU Fishing and Seafood Fraud (Task Force), co-Chaired by the U.S. Secretaries of State and Commerce, was established in response to a presidential memorandum calling for the creation of a comprehensive framework to combat IUU fishing.[153] In 2015, the Task Force published an action plan consisting of 15 discrete actions to strengthen enforcement, create and expand government partnerships with industry organizations and NGOs, and create a traceability program to track seafood throughout its supply chain. The action plan also laid the groundwork for cooperation with foreign partners.[154]

As a result of the Task Force's action plan, the United States has undertaken several initiatives to combat IUU fishing, including the creation of SIMP and the ratification of the Agreement on Port State Measures.[155] The actions of the Task Force also led to a longer 12-year effort under the Maritime Security and Fisheries Enforcement Act (SAFE Act), passed in 2019. The new working group under the SAFE Act consists of 21 agencies working together to strengthen maritime security and combat IUU fishing. Leadership of the working group rotates among NOAA Fisheries, the U.S. Department of State,

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[150] NOAA Fisheries, "Seafood Import Monitoring Program Facts," September 19, 2020.
[151] U.S. government representative, telephone interview by USITC staff, April 9, 2020; USDOS, "Illegal, Unreported, and Unregulated Fishing," *Office of Marine Conservation* (blog), accessed December 8, 2020.
[152] Industry representative, telephone interview by USITC staff, April 1, 2020; industry representative, telephone interview by USITC staff, March 18, 2020; USITC hearing transcript, September 2, 2020, 225–26 (testimony of Sara L. McDonald, Seafood Slavery Risk Tool, Inc., and Monterey Bay Aquarium Seafood Watch).
[153] In addition to the U.S. Departments of State and Commerce, the Task Force includes senior-level representatives from the U.S. Departments of Defense, Justice, Interior, Agriculture, Commerce, Health and Human Services, Homeland Security, the Office of Management and Budget, the Council on Environmental Quality, the Office of Science and Technology Policy, the U.S. Trade Representative, and the U.S. Agency for International Development.
[154] NOAA Fisheries, "U.S. Government Task Force," April 2, 2019.
[155] U.S. government representative, telephone interview by USITC staff, April 16, 2020.

and the U.S. Coast Guard.[156] In addition to intergovernmental cooperation, NOAA Fisheries represents the United States in several RFMOs including CCAMLR, IATTC, ICCAT, NAFO, NPFC, SPRFMO, and WCPFC.

In addition to the efforts led by NOAA, the U.S. Department of Labor, through its Bureau of International Labor Affairs (ILAB), addresses labor-specific issues in IUU fishing. While the United States has not ratified the ILO fishing-specific conventions, it has ratified two ILO core conventions: the Abolition of Forced Labour Convention and the Worst Forms of Child Labour Convention.[157] The United States is committed to respecting and promoting the fundamental labor principles and rights recognized in the ILO Declaration.[158] Additionally, ILAB has extensive technical assistance programs that work with governments and the private sector to combat labor-related IUU fishing violations. One program, called SAFE Seas (Safeguarding Against and Addressing Fishers' Exploitation at Sea), works with government officials, the private sector, and civil society to combat forced labor and human trafficking on fishing vessels in Indonesia and the Philippines.[159] ILAB has also implemented the Fair Fish (Fostering Accountability in Recruitment for Fishery Workers) program to engage directly with companies and labor recruiters to reduce forced labor and human trafficking in the fishing and seafood-processing sectors in Thailand.[160]

European Union

Like the United States, the EU implements a variety of mechanisms to address IUU fishing and prevent IUU-sourced product from entering the European market. These measures reportedly have had a global impact, encouraging change in the monitoring and enforcement mechanisms within other countries (see discussion of South Korea below).[161] Unlike the U.S. species-based CDSs to combat IUU fishing, the EU employs country of origin-based CDSs. The EU only accepts products validated as legal by "competent" flag or exporting states, and the EU Commission is actively working to ensure comprehensive application of regulations to prevent, deter, and eliminate IUU fishing.[162]

The EU also has regulations which allow it to identify states not addressing IUU fishing and sanction them accordingly.[163] Council Regulation No. 1005/2008 provides the EU's definition of IUU fishing, as well as the circumstances under which a fishing vessel is presumed to be engaged in IUU fishing such as

[156] NOAA Fisheries, "Maritime SAFE Act Interagency Working Group on IUU Fishing," November 24, 2020.
[157] U.S. government representative, telephone interview by USITC staff, April 30, 2020; ILO, "Ratification and implementation information for the Maritime Labour Convention, 2006," accessed December 8, 2020; ILO, "Ratifications of ILO Conventions: Ratifications by Convention," accessed December 8, 2020.
[158] ILO, "ILO Declaration," June 15, 2010; USDOL, "Our Work," accessed February 4, 2021; USDOL, "Laws and Regulations," accessed February 12, 2021.
[159] U.S. government representative, telephone interview by USITC staff, April 30, 2020; USDOL, "SAFE Seas," accessed October 18, 2020.
[160] U.S. government representative, telephone interview by USITC staff, April 30, 2020; USDOL, "Fair Fish: Fostering Accountability in Recruitment for Fishery Workers," accessed October 18, 2020.
[161] USITC hearing transcript, September 2, 2020, 13-14 (testimony of Pham Quang Huy, Ministry of Agriculture and Rural Development of S.R. Vietnam), 132-4 and 174 (testimony of Robert DeHaan, National Fisheries Institute), 286 (testimony of Rashid Sumaila, University of British Columbia Institute for the Oceans and Fisheries and Sea Around Us); Janovsky, "EU Fights Illegal Fishing, One Card at a Time," August 1, 2018; Sumaila, "A Carding System as an Approach to Increasing the Economic Risk of Engaging in IUU Fishing?," 2019.
[162] European Commission, "Illegal fishing," September 16, 2016.
[163] European Commission, "Illegal fishing," September 16, 2016.

fishing without a valid license or engaging in fishing activities contrary to the conservation and management measures established in the fishing area.[164] The regulation also sets out record-keeping requirements for EU member states and port measures empowering member states to carry out inspections and to deny port access to fishing vessels suspected to have engaged in IUU fishing.[165]

Some experts consider the most effective mechanism employed by the EU to be the "EU Carding System" to identify countries failing to address IUU fishing.[166] This system identifies non-cooperating countries barred from exporting seafood to the EU market.[167] Because the EU strategy to combat IUU fishing is country-based, the EU puts the responsibility on flag and coastal states to develop strong IUU fishing deterrents and promote compliance with international rules related to IUU fishing. If a country is determined to be neglecting its obligation to fight IUU fishing, the EU will issue a pre-identification yellow card. Issuing a yellow card formally opens a dialogue between the EU and the partner country. The EU will provide aid, if necessary, to enable the partner country to improve its systems to fight IUU fishing. If, after two years, the country has taken appropriate steps to improve the situation, the yellow card can be removed, and the country delisted. However, if the country does not take the necessary steps to address IUU fishing within its jurisdiction, the country will be identified as non-cooperating, and a red card will be issued. Once a country has received a red card, all imports of fishery products caught by fishing vessels flying the flag of the red-carded country are banned from entering the EU, until the red card is lifted as a result of improvements in the fishery.[168]

Since the institution of the carding system, the EU has issued 27 yellow cards and 6 red cards for failing to address IUU fishing concerns and has delisted (i.e., withdrawn the cards of) 16 countries who have sufficiently remedied IUU fishing concerns.[169] The carding system is credited with helping several countries address IUU fishing and related problems.[170]

The EU also requires catch certification for all fishery products imported and exported by member states. The CDS requires vessel flag states to validate that all catches have been made in accordance with the laws, regulation, and conservation and management measures laid out by the coastal state or RFMO. Furthermore, all catches made by fishing vessels flying the flag of an EU member state must be

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[164] European Commission, Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, Art. 2–3.
[165] European Commission, Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, Ch 2.
[166] USITC hearing transcript, September 2, 2020, 286 and 301-–2 (testimony of Rashid Sumaila, University of British Columbia Institute for the Oceans and Fisheries and Sea Around Us); Industry representative, telephone interview by USITC staff, October 15, 2020; Industry representative, telephone interview by USITC staff, June 24, 2020; industry representative, telephone interview by USITC staff, April 1, 2020; industry representative, telephone interview by USITC staff, May 14, 2020.
[167] Janovsky, "EU Fights Illegal Fishing, One Card at a Time," August 1, 2018; White, "EU reissues yellow card to Panama," December 19, 2019; Sumaila, "A Carding System as an Approach to Increasing the Economic Risk of Engaging in IUU Fishing?," 2019.
[168] European Commission, "Tackling Illegal, Unreported and Unregulated (IUU) Fishing Infographic", European Union, October 2019; European Commission, "Illegal Fishing." September 16, 2016.
[169] IUU Watch, "EU Carding Decisions," accessed October 20, 2020; White, "EU Reissues Yellow Card to Panama," October 2019; European Commission, "Illegal Fishing," September 16, 2016.
[170] Holland, "How the IUU Red Card Helped," February 29, 2016; IUU Watch, "EU Carding Decisions," accessed October 20, 2020; European Commission, "Illegal Fishing," September 16, 2016.

validated by that member state, even if the catch is destined for export outside the EU.[171] The CDS was digitized in 2019 to reduce the administrative burden associated with the scheme to promote compliance.[172]

Additionally, through cooperation with third countries and RFMOs, the EU maintains an IUU vessel list that is regularly disseminated to EU member states.[173] The EU is a party to UNCLOS, the Compliance Agreement, the UN Fish Stocks Agreement, and the PSMA.[174] The EU is also a member of 17 RFMOs, including CCAMLR, ICCAT, WCPFC, and GFCM.[175]

New Zealand

New Zealand has one of the largest EEZs in the world and is focused on the development of fisheries management and compliance programs in the Pacific region. In 2004 New Zealand launched a National Plan of Action to Prevent, Deter, and Eliminate IUU Fishing (NZPOA-IUU), one of the first of its kind. Developed with the guidance of FAO's IPOA-IUU, the NZPOA-IUU addresses measures targeting IUU fishing both within New Zealand's EEZ and vessels flagged to New Zealand on the high seas.[176] The action plan took stock of all IUU-related actions being undertaken under New Zealand law (chiefly the Fisheries Act of 1996) and outlined additional steps that still needed to be taken. To implement these additional steps under national law, New Zealand's Fisheries Act has frequently been amended, most recently in 2020. Recommendations in the NZPOA-IUU cover fishing permits, vessel registration, vessel monitoring system requirements, gear markings and restrictions, monitoring and control of landings, reporting and record-keeping requirements, and observer and vessel-inspection programs to all vessels flagged to New Zealand. The NZPOA-IUU also affirms that New Zealand will implement measures and regulations agreed upon by RFMOs of which New Zealand is a member.[177]

One of New Zealand's core efforts in countering IUU fishing is through monitoring, control, and surveillance (MCS) operations. The country uses satellite technology, aerial monitoring, patrols by fishery officers, and observers on commercial fishing vessels to monitor fishing activities in the EEZ to collect data on fishing activities, fishing volumes, and bycatch.[178] New Zealand's MCS operations also include inspections in port and on land.[179] Furthermore, industry representatives support New Zealand's policies addressing IUU fishing, and specifically those on the use of flags of convenience. Under an

[171] European Commission, Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, Ch. 3.
[172] European Commission, "CATCH – Information Note," 2019; European Commission, "Illegal Fishing." September 16, 2016.
[173] European Commission, Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, Art. 27-30, 37.
[174] UN, "Chronological Lists of Ratifications," September 3, 2020; FAO, "Parties to the PSMA," accessed August 4, 2020.
[175] European Commission, "Regional Fisheries Management Organisations (RFMOs)," September 16, 2016.
[176] Government of New Zealand, Ministry of Fisheries, "New Zealand Plan of Action to Prevent, Deter and Eliminate Illegal, Unregulated & Unreported Fishing," May 2004, 11.
[177] *NZ Herald*, "Plan to Combat Illegal Fishing," June 28, 2004.
[178] Bycatch is the incidental capture of nontarget species in a fishery. WWF, "Bycatch: Overview," accessed December 14, 2020.
[179] Government of New Zealand, Ministry for Primary Industries, "Monitoring and Observing Fishing Activity," November 16, 2020.

amendment to New Zealand law prompted by the NZPOA-IUU, New Zealand's policies dictate that any fishing vessel operating within its EEZ must be reflagged to New Zealand.[180] This prevents vessels from attempting to circumvent regulations by flagging to a state with fewer fishing regulations. (As discussed in box 2.2, the use of flags of convenience is a major hindrance to efforts to address IUU fishing).

Because many of the fish stocks important to New Zealand's fishing industry, such as tuna, are highly migratory and therefore likely to cross national boundaries, New Zealand cooperates with other countries to ensure fish stock sustainability and combat IUU fishing. New Zealand is a member of four RFMOs: the CCAMLR, the Commission for the Conservation of Southern Bluefin Tuna, the WCPFC, and the South Pacific Regional Fisheries Management Organization.[181] The country also actively works with other Pacific Islands Foreign Fisheries Agency member states to help capacity-building efforts to monitor fishing activities, collect and share data, and assist in surveillance operations in Pacific waters.[182] Additionally, New Zealand works closely with Interpol, as it did in helping to launch efforts to apprehend the IUU fishing vessel *Thunder*.[183] New Zealand is a party to UNCLOS, the Compliance Agreement, the UN Fish Stocks Agreement, and the PSMA.[184]

South Korea

South Korea has a large fishing industry and has one of the world's largest distant-water fleets.[185] Because much of the South Korean fishing activities occur on the high seas, there is a higher risk that South Korean-flagged vessel could engage in IUU fishing.[186] In 2013, South Korea was issued a yellow card by the EU for various IUU fishing-related violations by South Korean-flagged vessels. Issues included fishing without a valid license, fishing in closed areas or during closed seasons, using falsified documents, obstructing efforts of coastal and port state officials, not fulfilling record-keeping and reporting obligations, and engaging in illegal transshipments. It was noted these violations appeared to have occurred repeatedly and that the South Korean government did not take appropriate measures to detect and sanction these recurring IUU fishing activities.[187]

In response, the South Korean government took several measures related to the prevention of IUU fishing. The most substantial legislative action was the 2015 amendment to the Distant Water Fisheries

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[180] Industry representative, telephone interview by USITC staff, May 14, 2020.
[181] While CCAMLR, which has a broad conservation mandate, is not technically an RFMO, it includes a mandate to monitor fisheries in its region and operates much like traditional RFMOs. Government of New Zealand, Ministry of Foreign Affairs and Trade, "International Fisheries Management," accessed October 18, 2020.
[182] Government of New Zealand, Ministry of Foreign Affairs and Trade, "Fishing in the Blue Pacific," accessed October 18, 2020.
[183] Government of New Zealand, Ministry for Primary Industries, "New Zealand Requests INTERPOL Notice," December 6, 2013.
[184] UN, "Chronological Lists of Ratifications," September 3, 2020; FAO, "Parties to the PSMA," accessed August 4, 2020.
[185] Orlowski, "Five Countries Account for 90 Percent," November 12, 2019; EJF, "Bold Action Taken by Korea," January 29, 2015.
[186] Yozell, "Distant-Water Fishing Operations Must Become More Transparent," December 6, 2019.
[187] European Commission, Commission Decision of 26 November 2013 on notifying the third countries that the Commission considers as possible of being identified as non-cooperating third countries pursuant to Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, (November 26, 2013), 27–28.

Development Act.[188] The amendment gives the South Korean government more control over all IUU vessels and an increased ability to sanction South Korean nationals and South Korean-flagged vessels violating fisheries laws. Additionally, the amended act enhances South Korea's MCS measures, including the implementation of more comprehensive vessel monitoring systems.[189] As a result of these changes, the EU rescinded the yellow card in 2015, and in 2018 South Korea and the EU signed a joint statement pledging themselves to fight against IUU fishing.[190]

The Distant Water Fisheries Development Act was later amended, most notably in 2019 following an environmental consultation under the United States-Korea Free Trade Agreement (KORUS).[191] In its 2019 biennial report on IUU fishing, NOAA Fisheries placed South Korea on a preliminary list of IUU fishing countries after two South Korean-flagged distant-water fishing vessels were found to have violated CCAMLR's regulations. After consultation under KORUS, the South Korean government amended the Distant Water Fisheries Development Act to more easily allow deterrent sanctions to be imposed on vessels found to have engaged in IUU fishing.[192] South Korea is a party to UNCLOS, the Compliance Agreement, the UN Fish Stocks Agreement, and the PSMA.[193] South Korea is also a member of 18 RFMOs, including CCAMLR, ICCAT, and WCPFC.[194]

[188] Government of South Korea, Distant Water Fisheries Development Act, Pub. L. No. Act No. 13001, January 6, 2015; EJF, "Bold Action Taken by Korea," January 29, 2015.
[189] EJF, "Bold Action Taken by Korea," January 29, 2015.
[190] Maritime Executive, "South Korea's Fisheries Laws Improve," December 21, 2019.
[191] USTR, "USTR Welcomes Passage of Amendments to Korea's Distant Water Fisheries Development Act," November 1, 2019.
[192] Maritime Executive, "South Korea's Fisheries Laws Improve"; USTR, "USTR Welcomes Passage of Amendments to Korea's Distant Water Fisheries Development Act," November 1, 2019.
[193] UN, "Chronological Lists of Ratifications," September 3, 2020; FAO, "Parties to the PSMA," accessed August 4, 2020.
[194] Government of South Korea, Ministry of Oceans and Fisheries, "First-ever Korean Executive Secretary of a Regional Fisheries Management Organization," September 10, 2015; CCAMLR, "Members," October 15, 2019; WCPFC, "About WCPFC," accessed October 6, 2020; ICCAT, "Contracting Parties," accessed August 4, 2020.

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Chapter 3
Estimate of U.S. Imports Sourced from IUU Fishing

Introduction

This chapter provides an analysis of the extent to which seafood products sourced from IUU fishing ("IUU products" or "IUU seafood") are imported into the United States.[195] Although certain products are especially popular, the United States imports a diverse array of seafood sourced from marine capture and aquaculture production from a broad variety of partners. In addition, exporting countries source the raw materials used for these products—wild-caught fish and other aquatic animals used both for human consumption and as aquaculture inputs—from all over the world. The extent to which the United States imports IUU products varies substantially by partner and product. Based on a detailed, systematically applied methodological approach described in this chapter, the United States imported an estimated $2.4 billion worth of IUU products in 2019, or 10.7 percent of total U.S. seafood imports (table 3.1).[196]

Table 3.1 U.S. imports of seafood and estimated IUU products, 2019

Indicator	Marine capture	Aquaculture	All others	Total
Value of U.S. imports of IUU products (million $)	1,410.3	945.1	([a])	2,355.4
Value of total U.S. seafood imports (million $)	10,587.5	10,964.8	440.1	21,992.4
Quantity of U.S. imports of IUU products (mt)	181,777	105,119	([a])	286,896
Quantity of total U.S. seafood imports (mt)	1,217,259	1,378,555	61,771	2,657,585
Share of total U.S. import value sourced from IUU fishing (%)	13.3	8.6	([a])	10.7

Source: USITC IUU import estimate.

Note: U.S. imports of IUU products from marine capture refers to U.S. imports of products that were originally sourced from marine capture landings using IUU fishing methods. U.S. imports of IUU products from aquaculture are proportional to the quantity of IUU-sourced marine capture landings used as feed inputs in the production of aquaculture-raised products that are exported to the United States (see Step 3: Estimation of IUU Feed Inputs for Aquaculture, below). U.S. imports from "all others" includes imports from freshwater capture sources in addition to imports of roe, live decorative fish, and fish offal from all sources. Mt = metric tons.

[a] No estimates of the extent of U.S. imports of IUU products from "all other" sources were produced for this report.

[195] For purposes of this chapter, seafood products include all fish, crustaceans, mollusks, and other marine invertebrates, and products thereof, derived from capture and aquaculture methods in marine, brackish, and freshwater locations. Products derived from reptiles, amphibians, plants, algae, sponges, or corals are not included in this analysis. Within international trade data, products covered in this chapter include all products under Chapter 3 of the international Harmonized System (HS) of tariff classification and HS groupings 1604, 1605, and 2301.20. The full scope of products covered in this analysis includes those intended for human consumption, animal feed, or industrial (non-edible) uses.

[196] Unless otherwise stated, the values and quantities of U.S. imports (including U.S. imports of IUU products and all other seafood) referenced in this chapter are outputs from the USITC IUU estimation approach, described in this chapter and in appendix F ("USITC IUU import estimate"). These estimates are based on adjusted official U.S. general import statistics from USITC DataWeb/USDOC, accessed December 2, 2020. U.S. imports of IUU products include marine capture IUU imports and aquaculture IUU imports. No estimates were produced for the relatively small quantity of other U.S. seafood imports, including those from freshwater capture sources in addition to imports of roe, live decorative fish, and fish offal.

This chapter begins with a description of the major partners supplying U.S. seafood imports, as well as the products in which these imports are concentrated. The second section describes the approach used to estimate the extent to which IUU products are imported into the United States. (Additional detail on this approach is included in appendix F.) The third section presents these estimates using breakouts by species group, partner country (exporter), original source country, and FAO major fishing area. The fourth section includes more detailed analyses of supply chains for selected species groups that comprise large U.S. import flows, providing examples of how the estimation approach is applied.

Several terms are used repeatedly throughout this chapter, and these are described in table 3.2 below.[197]

Table 3.2 Key terms used in chapter 3

Term	Description
Marine capture	Capture fishing (harvesting of aquatic species from the wild) within marine and brackish environments (generally oceans, seas, and estuaries).
Freshwater capture	Capture fishing (harvesting of aquatic species from the wild) within freshwater environments (generally inland waterways such as rivers and lakes).
Aquaculture	Farming of aquatic species in marine, brackish, or freshwater environments using a wide range of techniques.
Fishing area	The EEZ or high seas area where marine capture fishing occurs.
FAO major fishing areas	Broad geographic regions defined by the FAO that cover the world's oceans, including EEZs and high seas areas within specific latitudinal and longitudinal areas.[198]
Source (in reference to a country or territory)	Within the seafood supply chain, this is the country or territory engaged in capture or aquaculture production.
Partner (in reference to a country or territory)	Within the seafood supply chain, this is the country or territory that directly supplies imports. A source that harvests seafood and a partner that trades seafood may not be the same within U.S. imports.
Coastal country	Country claiming rights over a specific fishing area (i.e., EEZ). For example, the coastal country for the Russian Far East ("RFE") EEZ is Russia.
Species group	A defined group of seafood products, consisting of one or more individual species, that is used to harmonize product descriptions across global production and trade data. Allocations of capture landings, aquaculture production, and trade data to species groups are considered estimates due to the existence of broad product categories within all data sources that are split into species groups proportionally based on global production and supply chain analyses (see appendix F).
Fishing sector	Refers to whether marine capture is "industrial" (large scale) fishing or "artisanal" (small scale) commercial fishing.[199]

[197] Additional relevant terms are defined in the chapter 1 glossary.
[198] FAO, "Fishing Areas for Statistical Purposes," accessed November 30, 2020.
[199] For purposes of this chapter, "industrial" fishing refers to fishing predominantly performed by larger motorized vessels, including all craft capable of long-distance fishing. "Artisanal" fishing refers generally to small-scale fishing activities limited to within 50 km of the coast or to 200 m depth or less. Both industrial and artisanal fishing sectors are considered "commercial" in that they predominantly sell their products into markets. Although artisanal fishers are small-scale, some artisanal fishing sectors may comprise most of the total output within source countries' marine capture landings and exports (e.g., U.S. landings of American lobster). By contrast, "subsistence" fishing refers to small-scale fishing primarily for the fishers' own family or community consumption, while "recreational" fishing refers to fishing for pleasure, neither of which is likely to produce for significant volumes of commercial sales. Pauly and Zeller, "Catch Reconstruction," 2015, 6.

Term	Description
Fishery	For purposes of this chapter, "fishery" refers to marine capture landings of a specific combination of source country or territory, fishing area, fishing sector, and species group.
Risk	A qualitative measure of the likelihood that IUU fishing is occurring, measured in terms of "low," "moderate," or "high" risk. May also refer to factors contributing to such measures (e.g., "flag of convenience risk"). Risk measures are described in greater detail in the estimation approach description below and in appendix F.
IUU marine capture products	Products that were landed from IUU marine capture fishing. "IUU marine capture landings" refers to the harvested quantity of these products. "IUU marine capture imports" refers to U.S. imports of these products.
Aquaculture IUU products	The output of aquaculture production that relies on IUU marine capture product inputs within aquaculture feed. The extent of IUU product within aquaculture products is measured based on the proportion of IUU marine capture product inputs relative to the quantity of farm-raised outputs. "Aquaculture IUU imports" refers to U.S. imports of aquaculture IUU products.

Source: Compiled by USITC staff.

U.S. Seafood Imports: Major Partners and Products

The United States is one of the largest and most product-diverse seafood import markets in the world, and it is the second-largest consumer of seafood in the world after China.[200] The United States imported 2.7 million metric tons (mt) of seafood in 2019, valued at $22.0 billion. The quantity and value of U.S. seafood imports increased between 2015 and 2019, rising by 6.5 percent and 17.9 percent, respectively, over these five years. The top 10 seafood products accounting for the highest value of imports included shrimp, Atlantic salmon, crab, tuna, lobster, tilapia, cod, Pacific salmon, catfish and pangasius,[201] and squid (table 3.3).

[200] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 116.
[201] For purposes of this chapter, the term "Catfish and pangasius" is used to refer to a group of competing products under the genera *Clarias*, *Ictalurus*, *Pangasius*, and *Silurus*.

Table 3.3 Estimated value and quantity of U.S. imports of major seafood products, 2019

Major seafood product	Value of imports (million $)	Share of total value (%)	Quantity of imports (mt)	Share of total quantity (%)	Share from capture (%)	Typical species and products	Top trading partners
Shrimp	6,018.0	27.4	701,539	26.4	12.1	Frozen warmwater shrimp, peeled or shell-on	India, Indonesia, Vietnam, Ecuador
Atlantic salmon	3,729.8	17.0	359,250	13.5	0.1	Fresh/chilled/frozen fillets; other cuts	Chile, Norway, Canada
Crab	2,183.9	9.9	109,513	4.1	96.3	Frozen snow/king crab; prepared/preserved swimming crabmeat	Canada (snow crab), Russia (king/snow crab), Indonesia (swimming crab)
Tuna	1,912.0	8.7	290,083	10.9	99.6	Canned skipjack/albacore tuna; frozen yellowtail fillets	Thailand, Vietnam, Indonesia, Ecuador, Philippines
Lobster	1,504.9	6.8	55,474	2.1	100.0	Frozen and live American lobster; lobster meat	Canada
Tilapia	584.9	2.7	166,810	6.3	11.4	Frozen tilapia fillets	China, Honduras
Cod	563.5	2.6	69,357	2.6	100.0	Frozen Atlantic/Pacific cod fillets	China, Iceland
Pacific salmon	523.1	2.4	67,500	2.5	88.6	Frozen Pacific salmon fillets	China, Canada, Chile
Catfish and pangasius	355.2	1.6	90,731	3.4	1.6	Frozen pangasius fillets	Vietnam
Squid	340.0	1.5	63,834	2.4	100.0	Frozen/dried/salted/brined squid	China, India, Taiwan, Thailand
All others	4,276.9	19.4	683,495	25.7	77.1		
Total	21,992.4	100.0	2,657,585	100.0	48.1		

Source: USITC IUU import estimate.

Note: "Major seafood products" are aggregations of multiple species groups. The Commission allocated U.S. import data to individual species groups based on the USITC IUU import estimate approach described below and in appendix F to generate the estimated import values and quantity by major seafood product group. "Share from capture" refers to the share of the quantity of U.S. imports of each major seafood product estimated to be sourced from capture landings (marine and freshwater). "Top trading partners" are the U.S. import partners supplying the largest quantities of each major seafood product; these partners collectively accounted for over 75 percent of total U.S. imports of those products. Mt = metric tons.

All forms of seafood products are traded internationally, and products may cross the U.S. border as imports at any processing stage.[202] For example, fish may be imported in bulk or pre-packaged shipments; as live, fresh, chilled, or frozen products; as processed products that may be filleted, minced, dried, salted, smoked, or brined; or in the form of further processed products such as fish sticks, among other forms. In 2019, approximately 37.6 percent of the value of all U.S. imported seafood entered in an unprocessed or semiprocessed form, while 62.4 percent entered in a processed form.[203]

Although a small group of partners consistently supply most U.S. seafood imports, the United States is also a major destination market for a broad set of global seafood-exporting countries. Between 2015 and 2019, Canada was the top supplier of U.S. seafood imports in terms of value each year (averaging about $3.2 billion annually), while China was the top supplier in quantity terms (averaging about 535,000 mt annually). In addition to these two countries, India, Chile, Indonesia, Vietnam, and Thailand are major suppliers of U.S. seafood imports, each providing over $1 billion and over 140,000 mt in each year between 2015 and 2019. These seven countries have consistently accounted for most U.S. seafood imports. Overall, however, in 2019, the United States imported seafood from 143 partner countries, 26 of which supplied over $100 million worth of imports.

U.S. import statistics do not identify the original source country where capture or aquaculture production occurred, and for this reason, the estimation approach used in this report incorporates a supply chain mapping process. Based on this approach, approximately 84.4 percent of the value of U.S. imports was originally captured by partner countries' own fishers or produced in that country's aquaculture operations. Focusing only on marine capture products, an estimated 72.3 percent of U.S. imports of marine capture-sourced imports were captured by partner countries' own fishers. Certain partner countries, however, are major suppliers of seafood harvested by other countries, and these linkages are described in table 3.4.

The United States itself is estimated to be one of the largest source countries within U.S. import supply chains, as large quantities of U.S. marine capture landings pass through foreign processing industries before being exported back to the United States. In 2019, an estimated $695.4 million in U.S. imports were of products originally harvested by U.S. fishers. This trade takes place primarily through three supply chains: American lobster from the Northeast United States that is processed in Canada;[204] finfish (Pacific salmon, flatfish, and certain groundfish such as pollock and Pacific cod) that is captured off the

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[202] In general, U.S. seafood imports must have been previously landed in foreign ports. U.S. law generally prohibits foreign vessels from unloading in a U.S. port fish taken on board on the high seas or fish products processed from such fish, or any fish or fish products taken on board on the high seas from a vessel engaged in fishing operations or in the processing of fish or fish products, except as provided by a treaty or convention. 46 U.S.C. § 55114. This prohibition is not absolute. For example, there is an exception for certain halibut and albacore landings from Canadian vessels. 19 C.F.R. § 4.96.

[203] For purposes of this chapter, "unprocessed" or "semiprocessed" finfish products include live fish (HS 0301), most fresh or chilled fish (other than roes) (HS 0302), and most frozen whole fish (other than roes) (HS 0303). "Processed" finfish products include fish fillets and other fish meat (whether or not minced) in fresh, chilled, or frozen form (HS 0304); dried, smoked, salted/brined, and fish flours, meals, and pellets fit for human consumption (HS 0305); and all prepared or preserved fish products (1604). Mollusks, crustaceans, and other invertebrates (HS 0306, 0307, 0308, and 1605) are divided along similar lines. All fishmeal and other products unfit for human consumption (HS 2301.20) are considered processed products.

[204] USITC, Lobster hearing transcript, 16 (Nadia Bourely, Canadian Embassy to the United States), 48–46 (Geoff Irvine, Lobster Council of Canada), 64 (Annie Tselikis, Maine Lobster Dealers' Association); Gardner Pinfold Consulting Economists, *Benchmarking Study on Canadian Lobster,* March 2006.

coast of Alaska and then processed in China;[205] and tuna caught by U.S. vessels in the Pacific Ocean and processed in Asia and South America.[206]

Table 3.4 U.S. imports by partner country and estimated value of imports originating with fishers other than those of the partner country, 2019

Partner	Total U.S. imports (million $)	U.S. imports originating with fishers other than those of partner (million $)	Share of total imports originating with fishers other than those of partner (%)	Key products, and their sources, that are processed and distributed by partner before being exported to the United States
China	1,905.4	755.8	39.7	Finfish (e.g. cod, pollock, Pacific salmon) from United States, Russia, and Norway
Thailand	1,236.7	694.4	56.1	Skipjack and albacore tuna from Asia and Western Pacific
Canada	3,373.7	468.1	13.9	Lobster from the United States
Vietnam	1,502.1	192.0	12.8	Yellowfin and albacore tuna from other Asian countries
Ecuador	808.4	159.1	19.7	Skipjack and albacore tuna from many sources in Pacific; mahi-mahi from Peru
Spain	177.5	126.4	71.2	Octopus products sourced from Morocco, Mauritania, and Portugal
Netherlands	124.9	113.8	91.1	Atlantic salmon from elsewhere in Europe
Germany	72.1	63.4	88.0	Atlantic salmon from elsewhere in Europe
Philippines	234.4	62.7	26.7	Yellowfin, albacore, and skipjack tuna from other Asian countries
Mauritius	60.6	59.4	98.1	Skipjack, yellowfin tuna, and bigeye tuna from Indian Ocean high seas fishing
All others	12,496.5	740.4	5.9	
Total	21,992.4	3,435.4	15.6	

Source: USITC IUU import estimate.

Approach to Estimating U.S. Imports of IUU Products

Estimating the extent of global marine capture IUU landings, aquaculture IUU production, and IUU seafood in U.S. imports is inherently challenging due to the concealed nature of IUU fishing activities as well as the complexity of global seafood supply chains. Unlike certain economic statistics that are derived from counting and summing transactions, estimation of IUU fishing must be derived from

[205] McDowell Group, *The Economic Value of Alaska's Seafood Industry*, September 2017, 3, 7, 29; Alaska Fisheries Science Center, *Wholesale Market Profiles for Alaska Groundfish*, 2019, 2.

[206] Based on the USITC IUU import estimate, Thailand and Vietnam are the largest partner countries re-exporting U.S.-captured tuna to the United States. (This approach is described in greater detail below and in appendix F.) Ecuador is also likely a large processor of U.S.-captured tuna; however, its sources of tuna are hidden within global trade data due to its reporting of large import volumes of skipjack, yellowfin, and bigeye tuna from "international waters." Therefore, the quantity and value of U.S. tuna imports originally captured by U.S. fishers is likely understated. IHS Markit, Global Trade Atlas database, accessed December 3, 2020; Hamilton et al., *Market and Industry Dynamics in the Global Tuna Supply Chain*, June 2011; industry representative, virtual roundtable, October 13, 2020, 35–36.

disparate information sources that are often incomplete, indirect, or inconsistent. Because of differences in the quality and availability of information related to the prevalence of IUU fishing across the vast array of global marine capture sources, there is no single well-established method for estimating IUU marine capture that is applicable across all global fisheries.[207] Moreover, global estimates of IUU marine capture fishing are focused on fishing that is noncompliant with fisheries management regulations, predominantly for human consumption. Labor violations in fishing or use of IUU products in aquaculture supply chains are challenging to estimate and such violations are not included in the major literature. Further, connecting IUU fishing practices to U.S. seafood imports adds an additional layer of complexity due to the nature of global supply chains, where seafood can be distributed and processed in multiple countries before entering the U.S. market.

Many studies have attempted to measure the extent of IUU fishing in specific regions and fisheries, and these studies have used a broad variety of estimation techniques. Such techniques have included measuring potential IUU landings based on observed instances of IUU fishing; use of surveys or expert opinions; association of quantities of IUU landings with qualitative evidence of such practices; identification of possible IUU activities based on satellites, automatic identification systems, and other remote sensing technology; and estimation of unreported fishing based on analyses of trade data and stock assessments. Each of these techniques has strengths and weaknesses for determining the extent of IUU fishing. As such, some studies have used combinations of techniques and data sources to strengthen their analyses. A description of these techniques, as well as examples of studies that have used them, is provided in appendix E.

Relatively few studies have estimated the global extent of IUU fishing or the extent of IUU product in U.S. imports. The few studies that have attempted this have generally relied on aggregation of many available quantitative and qualitative information sources, including more targeted studies focused on individual fisheries or regions. The results of these studies are presented later in this chapter and described in more detail in appendix E. Among the most frequently referenced studies is a 2009 study by Agnew et al., which is used as a benchmark within this report, as discussed below.[208] A 2014 study by Pramod et al. built off the primary data sources and IU estimates developed by Agnew et al., among other research, to produce the only previous estimates of the extent of illegal and unreported (IU) products in U.S. imports.[209] Most recently, a 2020 study by Sumaila et al. used data on unreported landings to estimate the global extent of illicit trade in the global fishing sector.[210]

For this report, the Commission produced estimates of the extent of IUU seafood in U.S. imports designed to incorporate a broad variety of quantitative and qualitative information sources, including these previous studies. In doing so, the Commission adopted a multi-step approach to generating estimates. The approach is described in this section, with additional detail provided in appendix F.

[207] Macfadyen, Caillart, and Agnew, "Review of Studies," 2016.
[208] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
[209] Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014.
[210] For further information on the concept of illicit trade and its relation to IUU fishing, see appendix E. Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020. This study used data from Sea Around Us Reconstructed Catch estimates of unreported landings, which were used extensively in this report, as described below and in appendix F. Pauly and Zeller, "Catch Reconstruction," 2015.

- **Step 1: Compile initial capture and aquaculture database**. In the first step of this approach, the Commission combined data from existing sources to produce a detailed database covering global capture landings and aquaculture production ("capture and aquaculture database").
- **Step 2: Estimate IUU marine capture landings**. In the second step, the Commission estimated global IUU marine capture landings based on the consideration of reported and unreported landings data along with qualitative risk criteria associated with the likelihood of IUU fishing, IUU fishing estimates from literature, and evidence of labor violations.
- **Step 3: Estimate the use of IUU marine capture products as feed inputs in aquaculture**. The third step estimated the extent of IUU product used as feed inputs in global aquaculture production for species whose production involves appreciable volumes of fishmeal and fish oil inputs. As a result of the second and third steps, estimates for marine capture and aquaculture IUU production for each fishery were incorporated within the capture and aquaculture database.
- **Step 4: Link IUU practices to U.S. imports**. Using the information generated in the prior steps, the fourth step estimated the extent to which U.S. imports contained the products of IUU fishing practices based on a supply chain mapping analysis.

Step 1: Capture and Aquaculture Database Creation

IUU fishing is defined primarily with reference to fishing practices that produce seafood directly for human consumption or for use as inputs in aquaculture production (see chapter 1). Therefore, in order to estimate the extent to which IUU product is imported into the United States, much of this report's approach involved the quantification of marine capture and aquaculture IUU production on a detailed global basis. As a first step in this process, the Commission compiled a capture and aquaculture database that formed the foundation for establishing IUU estimates for each fishery. Capture and aquaculture data at this level of detail were derived from two sources. Commercial landings data from the Sea Around Us Reconstructed Catch database were used to measure marine capture landings, while Food and Agriculture Organization of the United Nations (FAO) Global Production data were used to measure freshwater capture landings as well as all marine and freshwater aquaculture production.[211] Capture and aquaculture data were compiled for a single year, 2016, the most recent year for which both databases were available.[212] These two sources classified aquatic species differently, so the

[211] Sea Around Us is a research initiative at the University of British Columbia (see chapter 2). Additional information about both of these data sources and the methods used to produce these data are provided in appendix F. Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020; FAO Fisheries, Capture and Aquaculture Production database, accessed May 19, 2020.

[212] The Sea Around Us Reconstructed Catch data for high seas areas were available only for 2014. These data were combined with 2016 data for other capture and aquaculture production. High seas landings accounted for less than 1 percent of global landings in the capture and aquaculture database.

Commission developed species groups specifically for this report that made it easier to harmonize these data with each other and with international trade data.[213]

The Sea Around Us Reconstructed Catch data were used for marine capture landings because they extend the FAO Global Production data by estimating, for each source country, the fishing sectors engaged in the capture of various species and the fishing areas where landings occurred. These data also include estimates of "unreported landings," which are the quantity of landings that are not reflected within official landings data (particularly those provided by the FAO), often due to the non-reporting of catch by vessels to national authorities.[214] The availability of these data on a detailed basis provided an important foundation for estimating IUU marine capture landings and mapping supply chains across the breadth of U.S. import sources. As described in step 2, unreported landings data provided an initial basis for IUU marine capture landings estimates, and detailed landings observations also made it possible to assign specific IUU risk criteria in the adjustment of these estimates.[215] Additional advantages of the Reconstructed Catch data include the accessibility of this information on a public website as well as the continuous refinement of estimates of reported and unreported landings over a long timespan.[216]

As with all potential methodologies to measure IUU fishing, use of the Sea Around Us Reconstructed Catch data to measure recent marine capture landings is subject to uncertainty. This is in part because the Reconstructed Catch methodology uses layered estimates to divide all landings data into detailed parameters and approximates the extent of unreported catch.[217] Unreported landings estimates from this database are based on original studies that draw from a wide variety of primary and secondary sources, including in some cases other older studies and anonymous expert opinions that may not fully represent current conditions.[218] These limitations are common to all bottom-up quantitative estimations of unreported landings or IUU fishing based on disparate granular information from specific fisheries,

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[213] For example, "walleye pollock," known also as "Alaska pollock" or "pollock," is a species group that is represented within all databases used in this report. Data referring to walleye pollock include data for *Theragra chalcogramma* (the scientific name used in the Sea Around Us Catch Reconstruction data), *Gadus chalcogrammus* (the scientific name used for the same species by FAO Global Production data), and HS codes such HS subheading 0303.67 (frozen Alaska pollock).
[214] Pauly and Zeller, "Catch Reconstruction," 2015; Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020.
[215] For similar reasons, a 2009 study of global marine capture illegal and unreported (IU) fishing by Agnew et al. used an earlier set of Sea Around Us estimates as a basis for measuring reported marine capture landings by detailed area. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009, 5.
[216] Macfadyen, Caillart, and Agnew, "Review of Studies," 2016, 65; Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020, 4.
[217] Sea Around Us approximates the extent of uncertainty within its estimates within the Reconstructed Catch database. Pauly and Zeller, "Catch Reconstruction," 2015, 10–11.
[218] Pauly and Zeller, "Catch Reconstruction," 2015; Macfadyen, Caillart, and Agnew, "Review of Studies," 2016, 16–19, 39, 42. For example, a 2015 study by Sobolevskaya and Divovich forms the basis for Sea Around Us Reconstructed Catch estimates of reported and unreported landings within the Russian Far East (RFE) region. These authors used a 2005 study to estimate this region's unreported landings of king crab, a product that constitutes one of the largest sources of supply for global seafood exports to the United States. Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015, 18–19. These estimates reflect the notably high levels of IUU fishing for king crab that occurred within this region in the 2000–2010 era, but likely do not reflect the improvements that have been made in monitoring, control, and surveillance (MCS) systems within the RFE since that time, as described in greater detail below in the supply chain analysis of snow crab and king crab.

which are generally considered stronger when "triangulated" with other supportive information.[219] For these reasons, this report considered multiple additional sources of information to reinforce or update these data where appropriate within its analysis (see step 2).

Step 2: IUU Marine Capture Estimation

The second step estimates IUU marine capture landings on a global basis using a multistage process. As a starting point in this analysis, unreported landings are used as initial IUU marine capture estimates for each fishery.[220] The approach then adjusts and finalizes estimates for IUU marine capture landings as follows. For each of these detailed estimates, the Commission characterized marine capture landings as fitting one of 12 possible "risk profiles" that qualitatively described the likelihood of IUU fishing according to criteria described below. Each possible risk profile was assigned a range of possible IUU estimates, derived from the previously described study by Agnew et al.[221] The initial IUU marine capture estimates for each fishery were then adjusted if necessary to fit within this range of possible IUU estimates based on the risk profile of that fishery. IUU marine capture estimates were further adjusted based on evidence of forced labor, child labor, or human trafficking violations within source country fleets in order to account for the existence of labor violations occurring in otherwise non-IUU fishing operations. Each of these estimation steps is briefly described below, with additional detail provided in appendix F.

Inclusion of Labor Violations within IUU Marine Capture Landings Estimates

As described in chapter 1, the scope of this report includes IUU seafood products obtained in contravention of fisheries management regulations (covered by most IUU fishing definitions) or in violation of labor laws. These two concepts are intrinsically connected. Conditions that facilitate the contravention of fisheries management regulations—such as inadequate monitoring, control, and surveillance (MCS) systems, the remote nature of industrial fishing, poverty, and overall poor national governance—also foster environments where labor violations can occur.[222] Human trafficking and forced labor, in particular, are linked with other illegal maritime activities that use the unobserved nature of fishing to commit crimes, including those related to fisheries management regulation violations and associated crimes such as document fraud, corruption, and tax evasion.[223] Fishing vessels using unscrupulous methods to save costs and increase profits by engaging in illegal activities use similar methods to avoid detection and enter their landings into global supply chains, including use of open-

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[219] Macfadyen, Caillart, and Agnew, "Review of Studies," 2016, 16–19.

[220] As noted above, the term "fishery" is used in this chapter to refer to marine capture landings of a specific combination of source country, fishing area, fishing sector, and species group.

[221] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.

[222] ILO, "Forced Labour in Fishing," November 24, 2015; EJF, *Blood and Water*, May 6, 2019.

[223] ILO, "Forced Labour and Human Trafficking in Fisheries," accessed December 9, 2020; Belhabib, Le Billon, and Wrathall, "Narco-Fish," June 26, 2020, 2–3.

water and in-port transshipment, flying flags of convenience, and engaging in long-term distant water fishing (fishing outside of their own EEZ).[224]

Fishers' efforts to profit by engaging in IUU fishing (including labor violations) are in part driven by the self-reinforcing nature of illegal overfishing: when widespread, IUU fishing has depleted fish stocks, undermined coastal livelihoods, and encouraged fishers to engage in illegal fishing behavior, frequently in distant waters.[225] In an analysis of the linkages between labor violations and the economic and governance performance of fisheries, a 2018 study by Tickler et al. found correlations between elevated levels of slavery in national economies, higher levels of unreported landings within national marine capture fishing, and low landed unit values of catch (used as a proxy for fisheries profitability).[226]

Within the IUU marine capture estimation of this report, all but the final process—which explicitly dealt with labor violations—were based on a definition of IUU fishing focused on contravention of fisheries management regulations only. This is the definition most commonly considered in global and regional estimates of IUU fishing. However, due to the linkages between labor violations and more traditional IUU fishing definitions described above, it is likely that these estimation steps also incorporated a substantial share of global fishing that violates labor laws. In particular, inclusion of risk criteria related to flag of convenience use, transshipment, port obscurity, distant water fishing, national governance, and prevalence of illegality (described in greater detail below) reinforced these conceptual linkages. Despite this overlap, it is likely that some labor violations occur in fishing that is not otherwise IUU fishing, which is the basis for the final process that further adjusts IUU marine capture estimates based on labor risk factors.[227]

Initial IUU Marine Capture Estimates

Because unreported fishing is an important component of IUU fishing, the unreported landings data derived from the Sea Around Us Reconstructed Catch database provided an initial estimate of IUU marine capture landings for each fishery. For example, within the capture and aquaculture database produced in step 1, the unreported landings estimate for walleye pollock captured by the Russian industrial fleet in the Russian Far East (RFE) EEZ was 587,573 mt. This quantity was used as the initial estimate of IUU marine capture landings for this fishing activity and could be expressed as 24.7 percent

[224] Oceana, *Illegal Fishing and Human Rights Abuses at Sea*, June 2019; EJF, *Blood and Water*, May 6, 2019; USITC, hearing transcript, September 3, 2020, 212–15 (testimony of Juno Fitzpatrick, Conservation International), 367–68 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc. and Monterey Bay Aquarium Seafood Watch); industry representative, interview by USITC staff, December 10, 2020.
[225] Sarto and Smith, "Overfishing, Human Rights Abuse, and the Pathway," in post-hearing submission to USITC, October 9; USITC, hearing transcript, September 3, 2020, 214 (testimony of Juno Fitzpatrick, Conservation International).
[226] Tickler et al., "Modern Slavery and the Race to Fish," November 7, 2018. This study used data from the Sea Around Us Reconstructed Catch database as a measure of unreported catch.
[227] USITC, hearing transcript, September 3, 2020, 224 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc., and Monterey Bay Aquarium Seafood Watch).

of total landings (2,382,189 mt) within this fishery or 32.7 percent of reported landings (1,794,616 mt).[228]

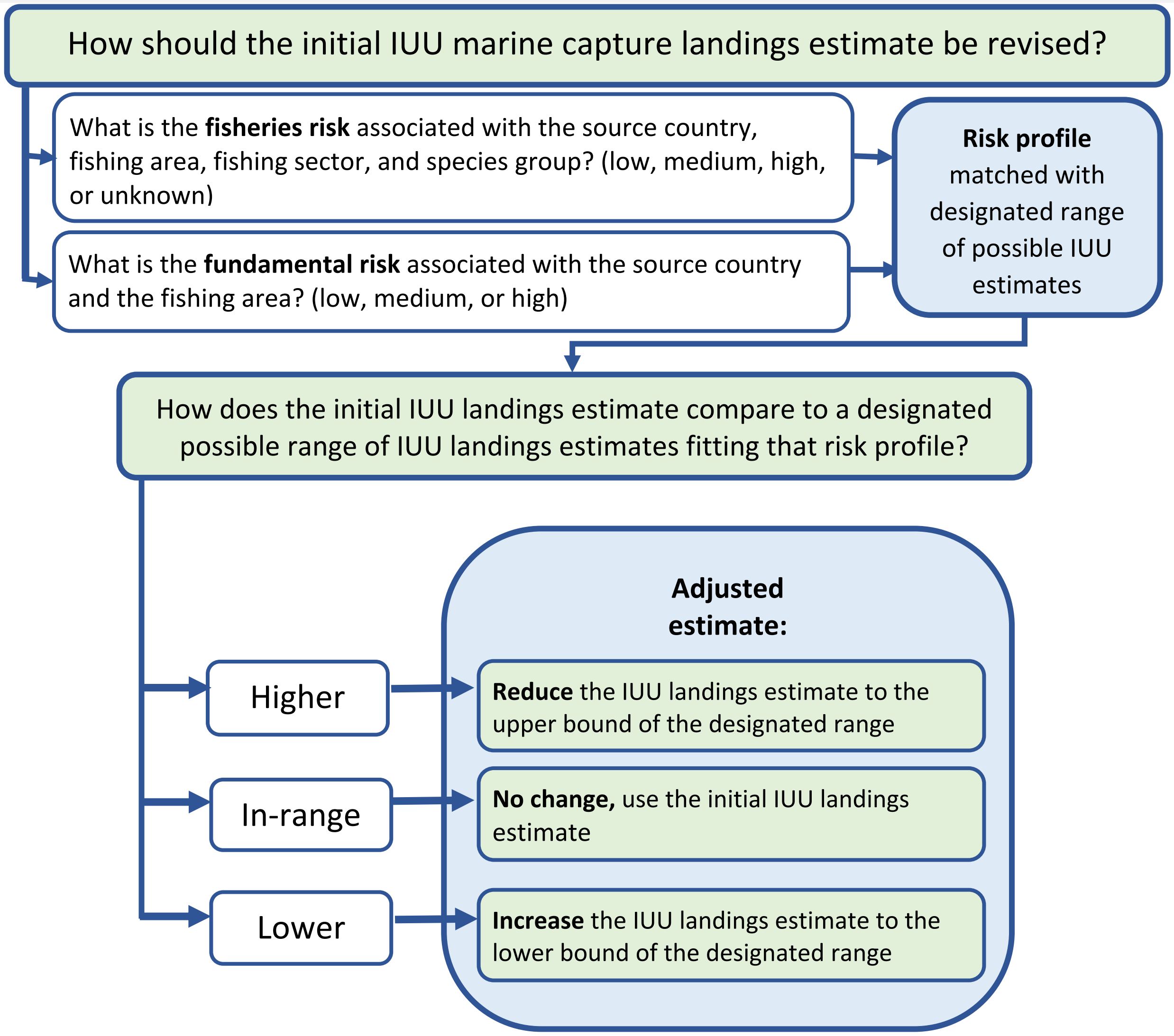
Unreported landings are a reasonable but imperfect proxy for IUU marine capture landings. The concept of unreported landings overlaps considerably with the definition of IUU fishing: many illegal or unregulated landings are also likely unreported.[229] However, the concepts of "unreported landings" and "IUU fishing" are not coextensive. Unreported landings data would not cover reported landings where other illegal practices were occurring. For example, fishers that use illegal gear or fish in restricted areas but report their landings would not be included within unreported landings data, yet would still be engaged in IUU fishing. Conversely, unreported landings data covering fishing where no reporting was required would not be IUU fishing if no other violations occurred. For example, unreported landings data would include artisanal fishers who are not required to report landings but who otherwise comply with fishing laws (e.g., they use legal gear and fish only in designated areas)—such landings would not be IUU fishing. Commercial fishing, however, is frequently required to be reported.[230]

Adjustment of IUU Marine Capture Estimates Based on Risk Profiles

Because of the likely inclusion of some IUU fishing within reported landings data and the possible inclusion of non-IUU fishing within unreported landings data, and due to the other limitations with these data described above in Step 1, the Commission adjusted initial IUU marine capture estimates based on a systematic risk assessment and use of possible IUU estimates (see figure 3.1).

[228] For many fisheries, unreported landings quantities within the capture and aquaculture database may be greater than those provided by the Sea Around Us Reconstructed Catch database, as unreported landings associated with each species group may include quantities that have been allocated to that species group from broader taxonomic groupings. See appendix F for more information about how landings associated with broad product groupings were disaggregated into individual species groups.
[229] Illegal fishing activities, such as poaching (fishing without a license), fishing in closed areas or seasons, fishing with prohibited gear, and catching over prescribed quotas, frequently overlap with nonreported fishing activities, particularly in jurisdictions where MCS systems are weak. Previous studies have used unreported landings data as a direct proxy for IUU fishing, either by considering differences between official trade statistics and reported landings as a representation of the scale of IUU fishing, or referring to estimates of unreported landings (or a portion of those estimates) as illicit product. Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020; Clarke, McAllister, and Kirkpatrick, "Estimating Legal and Illegal Catches of Russian Sockeye Salmon," 2009; WWF, *Illegal Russian Crab*, 2014; Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009. Frequently, the underlying studies that Sea Around Us uses to support its estimates of unreported landings are derived from information related to IUU fishing generally or illegal or unreported fishing specifically. Belhabib et al., "Lots of Boats and Fewer Fishes," 2013; Pauly and Budimartono, "Marine Fisheries Catches of Western, Central and Eastern Indonesia," 2015; Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015. In addition, studies that have analyzed individual elements of IUU within specific fisheries have identified non-reporting and misreporting catch as a major component of IUU overall. MRAG Asia Pacific, *Towards the Quantification of IUU Fishing*, 2016.
[230] Industry representative, interview by USITC staff, May 18, 2020; USITC, hearing transcript, September 3, 2020, 273 (testimony of Rashid Sumaila, University of British Columbia Institute for the Oceans and Fisheries and Sea Around Us).

Figure 3.1 Adjustment of IUU marine capture estimates based on risk profiles



Source: Compiled by USITC.

Risk assessment is commonly used by criminologists, authorities involved in crime prevention, and insurance industries to identify the likelihood that crimes will occur (either in specific areas, industries, or individuals) based on a combination of quantitative and qualitative factors.[231] In studies of IUU fishing activities, the emphasis on risk assessment focuses not only on making predictive applications, but also on determining the extent to which such practices are presently occurring (or have occurred), given the challenges associated with measuring IUU fishing. Risk analyses have been used to explicitly approximate the extent of IUU fishing by associating factors linked with IUU practices with likely quantities of production.[232] Other studies have developed risk indices based on IUU-related factors in order to assess the relative "exposure" of various supply chain participants to IUU fishing (or products generated through these practices).[233]

Based on the consideration of a variety of information sources, this report developed risk profiles for each fishery that provided a qualitative characterization of the extent of IUU fishing within those landings. Each risk profile has two component findings based on separate analyses: (1) a "fisheries risk" component that used detailed information about fisheries management and enforcement in individual fisheries to characterize the prevalence of IUU fishing within those specific operations; and (2) a "fundamental risk" component that used more broadly applicable information, such as fishing fleet characteristics commonly associated with IUU fishing, to assess the likely prevalence of IUU fishing within source countries and fishing areas.

Fisheries Risk

Fisheries risk characterizations incorporate fishery-specific information about the effectiveness of enforcement efforts in reducing or preventing IUU fishing, as well as any affirmative evidence of IUU fishing. Multiple sources of information were used in this analysis, and mixed evidence was weighed on a case-by-case basis. The key sources of information used were Marine Stewardship Council (MSC) certifications and associated assessments; Monterey Bay Aquarium Seafood Watch ratings related to "management effectiveness" (particularly those related to "enforcement of and compliance with

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[231] See, e.g., Chohlas-Wood, "Understanding Risk Assessment Instruments in Criminal Justice," June 19, 2020; Rose, "Government and Control," July 10, 2013; Wortley and Mazerolle, "Environmental Criminology and Crime Analysis," April 1, 2009; Kemshall, *Risk, Actuarialism, and Punishment*, 2017.

[232] See, e.g., MRAG, *Review of Impacts of Illegal, Unreported and Unregulated Fishing*, November 2015; MRAG Asia Pacific, *Towards the Quantification of IUU Fishing*, 2016. A similar type of analysis, commonly used in IUU estimates over time, involves the use of qualitative "influence factors" (such as shifts in fisheries management practices) to adjust "anchor point" quantitative estimates over a time series. See, e.g., Pitcher et al., "Estimating Illegal and Unreported Catches from Marine Ecosystems," 2002; Ainsworth and Pitcher, "Estimating Illegal, Unreported and Unregulated Catch," 2005; Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009; Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014; Pauly and Zeller, "Catch Reconstruction," 2015.

[233] See, e.g., Macfadyen et al., *The IUU Fishing Index*, 2019; Hosch et al., "Any Port in a Storm," 2019; Petrossian and Clarke, "Explaining and Controlling Illegal Commercial Fishing," 2014; WWF, *Illegal Fishing: Which Fish Species Are at Highest Risk?*, 2015; USITC, hearing transcript, September 3, 2020, 221-25 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc., and Monterey Bay Aquarium Seafood Watch); Global Slavery Index, "Importing Risk: Fishing," 2018.

management regulations”); and scores from FishSource.org (a website created by the Sustainable Fisheries Partnership) related to “Fishers’ Compliance.”[234]

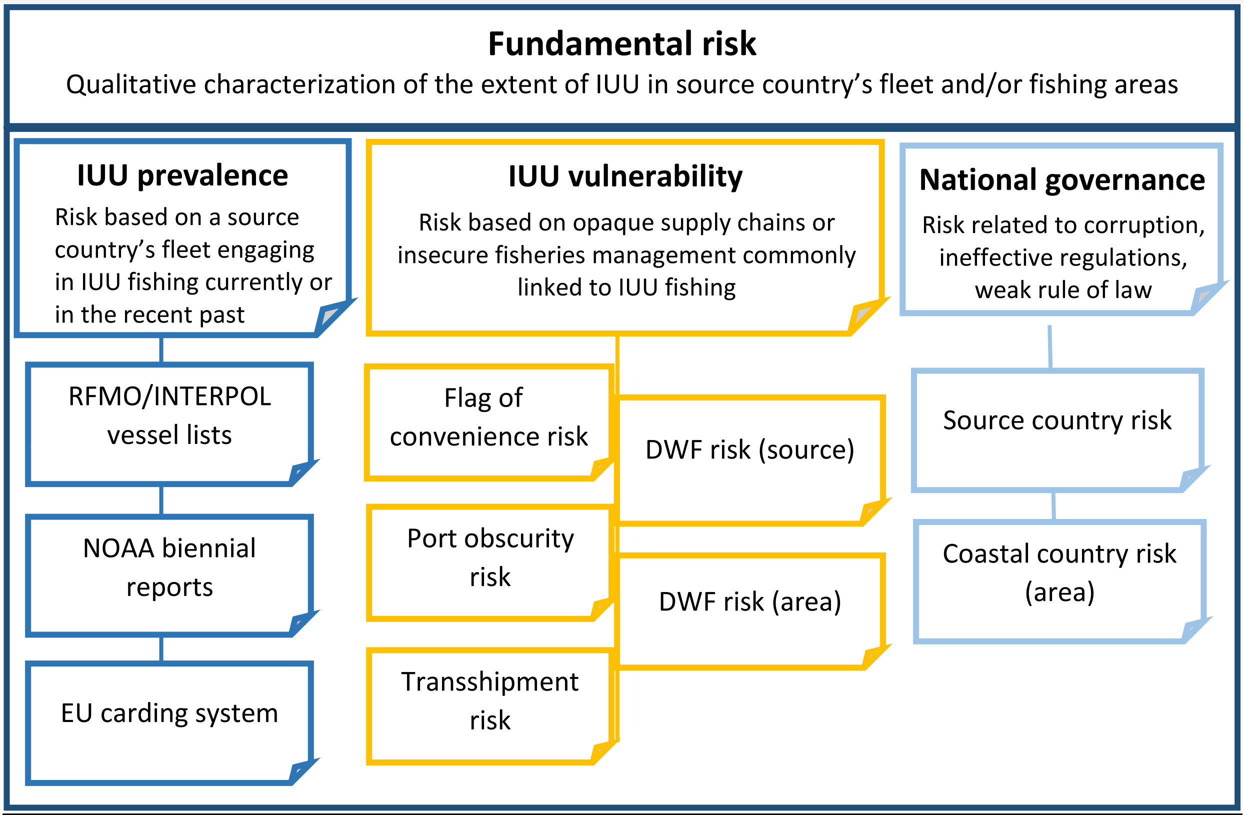
Fisheries risk characterizations of “low,” “moderate,” or “high” risk were developed for over 3,500 global fisheries that supplied about 75 percent of U.S. imports. Fisheries risk was considered “unknown” for thousands of other global fisheries based on data limitations and practical research constraints. Examples of how fisheries risk findings were developed for selected species groups are described below in the section entitled “Extent of IUU Product within Supply Chains for U.S. Imports of Selected Species Groups.” Additional detail on how fisheries risk was assigned appears in appendix F.

Fundamental Risk

Fundamental risk refers to the likely extent of IUU fishing within marine capture landings based on consideration of source country and fishing area characteristics. Fundamental risk therefore covers broader criteria relevant to IUU fishing than those used in the more targeted fisheries risk analysis described above. These criteria are organized within three overarching fundamental risk components: IUU prevalence, IUU vulnerability, and national governance risk (see figure 3.2).[235] The criteria forming each of these fundamental risk components are described briefly below, with additional detail regarding the justification and sourcing of these criteria provided in appendix F. The use of these criteria and the underlying resources to determine fundamental risk are based on assumptions unique to this report, and do not necessarily reflect the viewpoint of the authors of those resources.

[234] MSC, Track a Fishery database, accessed October 15, 2020; Seafood Watch, Recommendations database, accessed October 15, 2020; SFP, FishSource, accessed October 15, 2020.
[235] Certain fundamental risk criteria are similar to those considered in a 2019 study and database produced by Macfadyen et al. that used globally consistent and largely transparent data sources to compare countries’ risks of exposure to IUU fishing. This study developed an index of IUU fishing risk for 152 countries, with risk measured in terms of IUU prevalence, vulnerability, and response (actions taken by governments to address issues) across the dimensions of each country’s responsibilities on four levels: coastal (EEZ management), flag (fleet management), port, and general. Macfadyen et al., *The IUU Fishing Index*, 2019.

Figure 3.2 Fundamental risk criteria



Source: Compiled by USITC.
Note: NOAA = National Oceanic and Atmospheric Administration; DWF = distant-water fishing.

IUU prevalence is based on documented instances of a source country's fleet engaging in IUU fishing. Criteria for IUU prevalence are based on U.S., EU, and international resources described in greater detail in chapter 2, including:

- **RFMO/Interpol IUU vessel lists**: If a source country's flagged vessels appear frequently on RFMO and Interpol IUU vessel lists, the source country's enforcement of its industrial fishing fleet is likely inadequate to prevent IUU fishing.[236]
- **NOAA biennial reports**: Recent or repeated references to a specific source country within NOAA biennial reports suggest that IUU marine capture landings have been problematic in U.S. fisheries and/or areas governed by RFMOs, supporting an increased likelihood of IUU prevalence.[237]

[236] These lists are regularly updated and published in a single Combined IUU Vessel List by Trygg Mat Tracking (TMT), a nonprofit organization based in Norway. TMT, "IUU Vessel List," accessed December 10, 2020.
[237] NOAA reports are published biennially, with the most recent being published in 2019. NOAA Fisheries, *2019 Report to Congress*, 2019.

- **EU carding system**: Current or recent "red card" or "yellow card" listing of a source country provides evidence that IUU fishing has been prevalent and inadequately addressed by that country's MCS systems.[238]

IUU vulnerability is based on risk factors indicating the existence of opaque supply chains or insecure fisheries management commonly linked with IUU fishing, which include:

- **Flag of convenience risk**: As described in chapter 2, vessels engaged in IUU fishing frequently use flags of convenience to avoid the costs associated with legal fishing, reduce exposure to potential penalties from illegal fishing, and obscure the origin of catch.[239] If a source country frequently allows foreign vessels to use their flags, landings attributed to that source country are considered to have elevated IUU vulnerability.[240]

- **Port obscurity risk**: Source countries that have ports with substantial foreign fishing or carrier vessel traffic relative to their reported landings may be hubs for foreign transshipment of IUU marine capture products.[241]

- **Transshipment risk**: Open-water transshipment has frequently been linked with IUU fishing. This is particularly the case where transshipment is itself illegal, where transshipment mixes seafood harvested through IUU methods with non-IUU seafood, and/or where transshipment occurs between vessels of different nationalities.[242] If transshipment between vessels of different nationalities is common within an FAO major fishing area, all fishing within that area is considered to have greater IUU vulnerability.[243]

- **Distant-water fishing (DWF) risk**: DWF by fleets of industrial vessels operating outside of countries' home EEZs is likely responsible for a large amount of global IUU production.[244] If DWF accounts for a major share of a source country's fishing effort or landings, that source country's fishing likely has greater IUU vulnerability unless the source country has good national governance (see below). Similarly, if DWF accounts for a major share of a fishing area's total

[238] EC, "Overview of Existing Procedures as Regards Third Countries," accessed September 17, 2020.
[239] EJF, *Lowering the Flag*, 2009, 7, 10–12.
[240] Data used in measuring flag of convenience risk were drawn from a 2020 study by Petrossian et al. which included measures on the percentage of flag of convenience use by flag state. Petrossian et al., "Flags for Sale," June 2020.
[241] Data used in measuring port obscurity risk were drawn from FAO Global Production data and a 2019 study by Hosch et al. FAO, Capture and Aquaculture Production database, accessed May 19, 2020; Hosch et al., "Any Port in a Storm," 2019.
[242] Boerder, Miller, and Worm, "Global Hot Spots of Transshipment of Fish Catch at Sea," July 25, 2018.
[243] Data used for measurement of transshipment risk were drawn from Global Fishing Watch (GFW) transshipment data and FAO Global Production data. GFW, Transshipment Data and Report, 2020, accessed September 25, 2020; FAO, Capture and Aquaculture Production database, accessed May 19, 2020.
[244] CEA, *Distant Water Fishing*, October 2018.

fishing effort or landings, that fishing area likely has greater IUU vulnerability unless the coastal country governing that area has good national governance.[245]

- **National governance risk** is based on national-level governance data produced by the Worldwide Governance Indicators (WGI) project related to corruption, regulatory quality, the rule of law, and government effectiveness.[246] The assessment of national governance risk for a given fishery is based on governance data for both the source country (the country responsible for the landing) and the coastal country that manages the fishing area.

Fundamental risk characterizations of "low," "moderate," or "high" risk were assigned based on a threshold approach driven by underlying findings for IUU prevalence, IUU vulnerability, and national governance risk.[247] If any of these three components was considered high risk, fundamental risk was also considered to be high. If not, in cases where one of the three components were considered moderate risk, fundamental risk was also considered to be moderate. If there was neither moderate nor high risk of IUU prevalence or vulnerability, and if there was low national governance risk, overall fundamental risk was also considered to be low. IUU prevalence, IUU vulnerability, and national governance risk were similarly determined based on whether underlying criteria met certain thresholds (described in greater detail in appendix F).

Risk Profiles and Associated Possible IUU Ranges

Risk profiles that combine fisheries and fundamental risk were assembled for each global marine capture fishery. For any given fishery, there were 12 possible risk profiles based on a combination of (1) low, moderate, high, or unknown fisheries risk and (2) low, moderate, or high fundamental risk. For example, Russia's industrial fishing operations for walleye pollock in the RFE were considered to have low fisheries risk due to evidence of specific actions taken by the Russian government and increased Russian pollock fishers' compliance in this region. Russia was also considered to have moderate fundamental risk for all of its fishing operations in the RFE due to moderate IUU prevalence and moderate national governance risk. Therefore, the risk profile for the RFE pollock fishery was considered to be "low fisheries risk, moderate fundamental risk." This risk profile reflected a combined consideration of detailed analysis that IUU fishing practices were likely to be low in this specific fishery (Russian industrial fishing for RFE pollock), which was tempered by a globally applied analysis that IUU fishing practices likely still existed to a certain extent for all of this country's vessels operating within this fishing area (Russian fishing in the RFE).

Risk profiles were then associated with a range of possible alternative IUU estimates derived from the 2009 study by Agnew et al., which allowed the Commission to adjust initial IUU estimates based on

[245] Data used for measurement of DWF risk were drawn from the location of marine capture landings within the capture and aquaculture database (based on Sea Around Us Reconstructed Catch data), GFW fishing effort data, and Worldwide Governance Indicators (WGI). Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020, accessed September 7, 2020; GFW, Fishing Effort: Datasets and Code, 2020, accessed July 14, 2020; Kaufmann and Kraay, "Worldwide Governance Indicators," accessed September 22, 2020.
[246] Kaufmann and Kraay, "Worldwide Governance Indicators," accessed September 22, 2020.
[247] In the rare instances where there was an absence of information about IUU prevalence, IUU vulnerability, or national governance risk for a given source country and fishing area, moderate fundamental risk was assumed.[248] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.

qualitative risk analysis.[248] The Agnew et al. study produced estimates of global illegal and unreported (IU) fishing practices over a time series for FAO major fishing areas and broad seafood groups (estimates from this study are referred to here as the “benchmark estimates”). For each FAO major fishing area, IU estimates were expressed as low- and high-end ranges, reflecting uncertainty associated with these analyses. For the most recent period covered in this study (2000–2003), benchmark estimates ranged from 1.2–7.3 percent of reported landings for FAO Major Fishing Area 81 (Southwest Pacific) to 25.5–48.7 percent of reported landings for FAO Major Fishing Area 34 (Eastern Central Atlantic).

The benchmark estimates for major fishing areas are now relatively dated and are not detailed enough to be directly implemented within fishery-specific estimates in this report. As discussed in box 3.1, use of these benchmark estimates as possible alternatives to initial IUU marine capture estimates is also subject to certain conceptual and factual limitations. Nonetheless, the benchmark estimates are considered reasonably accurate on a macro basis and are the most widely used global estimates of IUU fishing, while more recent studies either do not have the same global focus or use the same basis as the initial IUU estimates (unreported landings data).[249] Therefore, specific benchmark estimates were used to produce ranges of reasonable possible IUU estimates associated with specific risk profiles, which were then compared against initial IUU marine capture estimates for fisheries meeting those risk profiles. Benchmark estimates from the Agnew et al. study were compiled and expressed as a share of reported landings, allowing for a basis of comparison to initial IUU marine capture estimates in fisheries of any size. (The latter estimates could also be expressed as IUU landings as a share of reported landings, as demonstrated above with respect to industrial walleye pollock fishing in the RFE).[250] The Commission then assigned ranges of possible IUU estimates for each risk profile using benchmark estimates for FAO major fishing areas considered to have common characteristics with those risk profiles. (See appendix F for more details on how possible ranges were established from benchmark estimates.) Ranges of possible IUU estimates and major products included within each risk profile are shown in table 3.5.

Box 3.1 Limitations of Benchmark Estimates for Use in Ranges of Possible IUU Marine Capture Estimates

Estimates from a study by Agnew et al. on the extent of global illegal and unreported (IU) fishing were linked with the specific risk factors of each global fishery, allowing for a risk-based adjustment of IUU marine capture landings. However, the assumptions used in the Commission’s analysis were subject to

[248] Agnew et al., “Estimating the Worldwide Extent of Illegal Fishing,” 2009.
[249] The benchmark estimates from the Agnew et al. study have been regularly used in subsequent studies and statements regarding the extent of global IUU fishing. See, e.g., WWF, *An Analysis of the Impact of IUU Imports on U.S. Fishermen*, 2016; WWF, *Illegal Fishing: Which Fish Species Are at Highest Risk*, 2015; MRAG Asia Pacific, *Towards the Quantification of IUU Fishing*, February 2016; Cutlip, “IUU: Illegal, Unreported, Unregulated Fishing,” October 18, 2016. In a literature review by Macfadyen, Caillart, and Agnew of studies that have estimated the extent of IUU fishing, the authors considered the Agnew et al. study to be “probably reasonably accurate at a global scale” despite inconsistencies in source data and the use of assumptions. Authors further noted that this was the only global study at that time. Macfadyen, Caillart, and Agnew, “Review of Studies,” 2016, 16, 37. A subsequent study by Sumaila et al. of illicit trade in seafood also has a global focus, but was not used as a basis for alternative IUU estimates within this report because of its use of the Sea Around Us Reconstructed Catch data, which also form the basis for the initial IUU marine capture estimates in this report. Sumaila et al., “Illicit Trade in Marine Fish Catch,” February 2020.
[250] The Agnew et al. study estimated IU landing quantities for case study fisheries that accounted for large shares of each region’s total catch. In this study, IU estimates are expressed by FAO major fishing area as lower and upper quantities in metric tons, along with quantities of reported landings.

several limitations related to the conceptual and factual applicability of the benchmark estimates within the Commission's estimation of IUU marine capture fishing.

First, the benchmark estimates are based on slightly different concepts than those of the Commission, although the impact of this difference is uncertain. The benchmark estimates, focused on IU fishing, do not cover specifically "unregulated" fishing activities.[a] However, the scope of "unregulated" fishing that is not otherwise covered under an IU definition would likely be minimal, as most of this fishing would likely be either illegal, unreported, or both.[b] If unregulated industrial landings were reported (or unreported with no reporting requirement) and not otherwise illegal, this type of IUU fishing would not be covered by the benchmark estimates, which could have resulted in certain IUU practices not being incorporated within adjustments of the Commission's IUU marine capture estimates.

In addition, the benchmark estimates do not cover unreported artisanal landings.[c] In the Commission's report, initial IUU marine capture landings for artisanal fisheries (based on unreported artisanal landings) were adjusted along with those of industrial fisheries, using ranges based on the benchmark estimates. Because the Agnew et al. study's analysis of industrial fisheries informed the benchmark estimates, this approach created additional uncertainty for estimates of IUU landings in artisanal fisheries. Violations that occur within industrial operations (e.g., unlicensed fishing in distant waters) likely differ in type and scale from violations that occur within artisanal fishing (e.g., widespread use of illegal gear).[d] However, as described in greater detail in step 4 below and in appendix F, artisanal fisheries are also less likely to enter international trade channels and were systematically weighted downward within the supply chain mapping approach of linking fisheries to U.S. imports. IUU marine capture estimates for these fisheries therefore have less bearing on overall estimates of U.S. imports of IUU products, unless such products were predominantly captured by artisanal fishers.

The second group of assumptions involves the accuracy of the benchmark estimates for specific FAO major fishing areas as reference points for IUU fishing activities across diverse global fisheries. The Commission drew comparisons between average marine capture IU landings from 2000 to 2003 in FAO major fishing areas and the more recent operations of different fisheries with assumed similar levels of fundamental risk. Because these comparisons were made across fishing activities that diverge across time, geography, and product concentrations, adjustments made based on them are subject to uncertainty.

[a] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009, 1, 5.
[b] Tsamenyi, Kuemlangan, and Camilleri, "Defining IUU Fishing," February 2015; Urrutia, "Combating Unregulated Fishing through Unilateral Trade Measures," November 15, 2018. See chapter 1 for the definition of unregulated fishing, which primarily focuses on fishing by vessels not party to RFMOs within RFMO-administered high seas areas.
[c] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
[d] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009; Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020; Macfadyen, Caillart, and Agnew, "Review of Studies," 2016; Industry representatives, interview by USITC staff, May 11, 2020; Oyanedel, Gelcich, and Milner-Gulland, "A Synthesis of (Non-)Compliance Theories," 2020.

Table 3.5 Ranges of possible IUU estimates for possible risk profiles, and shares of U.S. marine capture imports falling into each risk profile, 2019

Risk profile	IUU landings as a share of reported landings (%)	Share of U.S. import value (%)	Largest products and source countries within U.S. import supply chains associated with risk profile
Low fisheries risk; low fundamental risk	1.2–4.0	27.9	Major products from the United States, Canada, and N. Europe: American lobster, snow crab, Atlantic cod, halibut, haddock, pink salmon, and scallop
Low fisheries risk; moderate fundamental risk	1.2–12.2	7.2	Certain products from Russia: Atlantic and Pacific cod, Barents Sea crab, and walleye pollock
Low fisheries risk; high fundamental risk	1.2–25.5	2.4	Tuna (specific island countries in the Pacific)
Moderate fisheries risk; low fundamental risk	4.0–14.8	2.2	Chum and Chinook salmon (Canada)
Moderate fisheries risk; moderate fundamental risk	12.2–26.2	18.5	Tuna (many regions); crab, Pacific salmon (RFE); shrimp (Argentina)
Moderate fisheries risk; high fundamental risk	25.5–48.7	6.1	Tuna (Vietnam, Ecuador, China); shrimp (Mexico)
High fisheries risk; low fundamental risk	14.8–all	0.3	Toothfish (certain high seas fishing through Chile)
High fisheries risk; moderate fundamental risk	26.2–all	6.0	Crab (Indonesia); octopus (Morocco, Mauritania, Indonesia); rock lobster (Brazil, Honduras)
High fisheries risk; high fundamental risk	48.7–all	3.8	Squid (China)
Unknown fisheries risk; low fundamental risk	1.2–14.8	3.3	Most additional imports sourced from U.S., Japan, N. Europe
Unknown fisheries risk; moderate fundamental risk	4.0–48.7	8.0	Most additional imports sourced from Argentina, Indonesia, South Korea
Unknown fisheries risk; high fundamental risk	25.5–all	10.0	Most additional imports sourced from China, India, Vietnam, Mexico

Source: USITC IUU import estimate; Agnew et al., “Estimating the Worldwide Extent of Illegal Fishing,” 2009, 2.
Note: Where upper bound shares of reported landings are expressed as “all,” the fisheries involved had no reported landings by the source country operating in that region (such as fishers operating without licenses of fisheries access agreements). “Share of U.S. import value” refers to the percent of total U.S. marine capture imports in 2019 that were originally produced in fisheries meeting that risk profile. These shares do not sum to 100 percent, as 4.5 percent of U.S. marine capture imports could not be traced to any specific fishery. “Largest products and source countries” refers to the products and source countries that account for the largest quantities of U.S. marine capture imports in 2019 within each risk profile. These estimates are based on additional supply chain analysis conducted in step 4, described below.

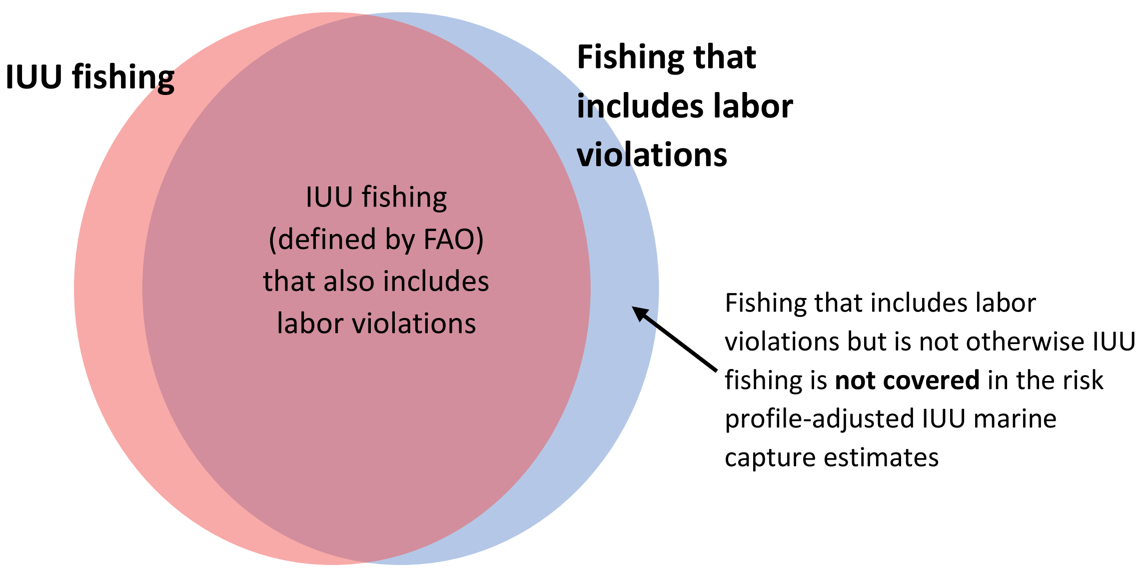
Ranges of possible IUU estimates were used to determine whether the initial IUU marine capture estimates should be adjusted. For each fishery, initial IUU marine capture estimates based on unreported landings data were compared against these possible estimate ranges. If initial IUU estimates were outside of a specific range established for that risk profile, they were adjusted to the low or high boundary of that range depending on whether the initial estimates were lower or higher, respectively, than the range. For example, as described above, the initial IUU estimate for Russian industrial pollock production in the RFE was 32.7 percent of reported landings. Given the risk profile of this fishery (low fisheries risk, moderate fundamental risk), IUU fishing was more likely to be within the range of 1.2–12.2 percent of reported landings. Because the initial IUU estimate was higher than that range, it was adjusted to be equivalent to the upper bound of this range: 12.2 percent of reported landings.

This approach ensured that the IUU marine capture estimate combined the conclusions of four separate analyses, including (1) detailed and updated information for most products focused on the degree of enforcement and compliance within specific fisheries (fisheries risk); (2) globally applied qualitative analysis related to the IUU prevalence, IUU vulnerability, and broader governance of specific source countries and fishing areas (fundamental risk); (3) the Sea Around Us Reconstructed Catch database that provided comprehensive detailed estimates of unreported landings; and (4) broad estimates of possible IUU ranges derived from an authoritative global study on IUU fishing.

Adjustment of IUU Marine Capture Estimates Based on Evidence of Labor Violations

As described above, most labor violations that occur in global fishing are likely included within the IUU marine capture estimates when adjusted using the techniques described above due to substantial overlap between different types of illegal activities in fishing. However, there is likely to be some degree of labor violations that occur within otherwise legal fishing (see figure 3.3).

Figure 3.3 Overlap between IUU fishing as defined by FAO and labor violations in fishing



Source: Compiled by USITC.
Note: This figure is conceptual and not a representation of scale.

Because there are no global estimates of labor violations in fishing activities,[251] qualitative evidence of forced labor, child labor, and human trafficking ("FL/CL/HT risk") was used as a basis for estimating the extent of labor violations that exist within otherwise legal fishing. Forced labor, child labor, and human trafficking are among the most common serious labor violations occurring and tracked within global fishing (see chapters 4 and 5).[252] Reliable resources exist that specifically identify country-specific practices with respect to these violations on a global basis. One resource used in this analysis is the U.S. Department of State's *Trafficking in Persons Report*, which places countries into one of four tiers that

[251] ILO, "Forced Labour in Fishing," November 24, 2015.
[252] WWF, written submission to USITC, October 9, 2020; industry representative, interview by USITC staff, December 10, 2020.

reflect the extensiveness of government efforts to address human trafficking problems within their economies and includes country reports that identify where outstanding problems continue to exist.[253] Another resource used in this analysis was the *List of Goods Produced by Child Labor and Forced Labor* issued by the U.S. Department of Labor's Bureau of International Labor Affairs (USDOL, ILAB), which identifies the existence of child labor or forced labor within specific sectors, including fishing sectors.[254] Based on these sources, FL/CL/HT risk for specific source countries was considered either "moderate" or "high" or was left as unknown.[255] (The basis for reaching moderate and high FL/CL/HT risk findings is described in appendix F.)

In order to account for labor violations that occur in otherwise legal fishing, the Commission used standard approximations to increase IUU marine capture landings based on FL/CL/HT risk on a source country-wide basis. If FL/CL/HT risk was considered "moderate" for a source country, IUU marine capture estimates for that country's landings (as a share of reported landings) were increased by 5 percent. If FL/CL/HT risk was considered "high" for a source country, these estimates increased by 10 percent. For example, both India and Ireland were determined to have moderate FL/CL/HT risk, justifying an increase in these source countries' IUU marine capture estimates as a share of reported landings by 5 percent. As a result of these adjustments, the IUU marine capture estimate for Indian industrial landings of cuttlefish in the Indian mainland EEZ increased from 48.7 percent of reported landings to 51.1 percent, while Irish industrial landings of mackerel in the Norwegian EEZ increased from 4.0 percent of reported landings to 4.2 percent. The upward adjustment in IUU marine capture estimates for the Indian fishery was greater due to the higher amounts of illegality already determined to exist within this fishery.

These relatively small additions to the IUU marine capture estimates were based on assumptions that labor violations in otherwise legal fishing were (1) relatively uncommon but greater than zero (justifying small, but positive additions); and (2) higher in source countries with greater amounts of IUU fishing (justifying proportional additions to IUU estimates expressed as a share of reported landings). In order to test the significance of these assumptions in estimates of the extent of IUU product within U.S. imports, more substantial additions based on different assumptions were included within alternative analyses, which are presented in appendix F.

These adjustments for labor violations did not incorporate different kinds of labor violations within global seafood supply chains. Within processing facilities, forced labor, child labor, and human trafficking as well as breaches of health and safety protocols are known problems, as described in greater detail in chapters 4 and 5.[256] The lack of freedom of association and collective bargaining is also

[253] USDOS, *2019 Trafficking in Persons Report*, June 2019.
[254] USDOL, ILAB, *2020 List of Goods*, September 2020.
[255] Only countries referenced in these sources in connection with these labor practices in fishing were assigned a level of FL/CL/HT risk. Countries not referenced in the either source were not assigned a level of FL/CL/HT risk, and no additional labor adjustment was made to IUU marine capture estimates for specific countries that were not referenced in these reports.
[256] See, e.g., Wongsamuth, "Major Brands Found Failing to Help," December 4, 2019. Processing sector labor violations, particularly child labor, are particularly prevalent in "tier 2" processing operations, such as shrimp peeling "sheds," that are part of extended supply chains. Processing sector labor violations are likely more uncommon within "tier 1" processing operations (where seafood is packaged), a pattern that may be due to the need for more rigorous and formal processing practices related to food safety. Industry representative, interview by USITC staff, December 10, 2020.

a potential issue in a number of jurisdictions.[257] These violations were not covered within the IUU marine capture estimates, except to the extent that seafood produced under these conditions was incorporated because it was the product of IUU fishing otherwise covered under the estimation methodology.

Final IUU Marine Capture Estimates and Limitations of These Estimates

Based on the various adjustments described above, the Commission produced final IUU marine capture estimates for each global marine capture fishery. Such estimates could be expressed (1) as a share of reported landings (e.g., 12.2 percent of reported landings for the Russian walleye pollock fishery described above); (2) in terms of landings quantities (e.g., 12.2 percent times reported landings of 1,794,616 mt was equal to 219,321 mt for that fishery); or (3) as a share of total landings (e.g., 10.9 percent of total landings for that fishery).[258] These estimates were used as a basis for aquaculture IUU estimation (step 3) and estimates of U.S. IUU marine capture imports based on supply chain mapping (step 4).

The data produced through these methods are reasonable estimates of the extent of IUU fishing, not summations of comprehensive and complete accountings of landings produced through IUU fishing. The Commission did not make its own determinations of whether specific fishing activities were in contravention of fisheries management regulations or in violation of labor laws. Quantifications or characterizations of the extent of IUU fishing in various fisheries were based on other organizations' research and data presented by national and intergovernmental organizations. The authors of the two primary studies that were used as sources of quantitative IUU marine capture estimates in this report—the Sea Around Us Reconstructed Catch database and the study by Agnew et al.—also based their findings on estimation techniques. Therefore, the estimates of IUU marine capture landings in this report are highly uncertain and are based on the best information available and reasonable assumptions, as opposed to direct quantifications of IUU fishing activities. They are also designed primarily for the purpose of estimating the extent of IUU products within U.S. imports, and therefore these data are presented in that context after the supply chain mapping process (step 4).

Step 3: Estimation of IUU Feed Inputs for Aquaculture

As stated in the request letter, trade in IUU products includes IUU raw material inputs that are further processed into aquaculture feed. The Commission estimated the quantity of IUU marine capture product used in the production of aquaculture feed that, in turn, is used to produce aquaculture-raised

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[257] USITC, hearing transcript, September 3, 2020, 253 (testimony of Juno Fitzpatrick, Conservation International). Seafood-producing countries with weak unions may not have laws in place that allow unionization of migrant workers, who often comprise large shares of fishing crews, so the extent to which violations occur within these countries is uncertain. Industry representative, interview by USITC staff, December 10, 2020.
[258] Total landings were calculated as the sum of non-labor-adjusted IUU landings and reported landings, which may have resulted in an understatement of the extent of IUU fishing as a share of total landings. See appendix F for more information.

seafood that is exported to the United States.[259] In doing so, it followed several steps. First, it used the Commission's IUU marine capture estimates (step 2) to develop global aggregate IUU estimates for the mix of species commonly used in aquaculture feeds. Second, the Commission estimated the quantity of whole fish needed to produce the amount of fishmeal and fish oil required to produce quantities of each aquaculture-raised species group.[260] Using the information from these two steps, it was possible to estimate the quantity of IUU marine capture landings that were used as inputs in aquaculture production.[261] These estimates were used to determine the extent of U.S. aquaculture IUU imports based on a supply chain analysis described in step 4.

The IUU capture of fish used as aquaculture feed inputs is only one type of violation that may occur in global aquaculture production. Labor violations in the aquaculture industry include not only those occurring in upstream marine capture fisheries, but also the processing of those inputs (from whole fish into derivative products that are then used in fishmeal and fish oil) as well as aquaculture outputs (such as the peeling of farm-raised shrimp).[262] Illegal practices and labor violations also occur at the farm level within aquaculture production itself, which frequently takes place in remote areas and is therefore subject to inherent weaknesses in enforcement and compliance similar to those of marine fishing operations.[263] Other illegal practices in aquaculture are known to include environmental violations—such as the destruction of mangroves to clear land for aquaculture, which is illegal in many countries—as well as the use of banned chemicals and veterinary drugs in fish farming operations.[264] Therefore, U.S. aquaculture IUU imports based on these estimates do not include the full scope of illegality within global supply chains for these products.

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[259] Previous studies of global IUU fishing have omitted estimates of IUU fishing within aquaculture supply chains, focusing entirely on marine capture landings that are sold direct to end markets or are further processed for human consumption. See, e.g., Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009; Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014; Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020.

[260] Aquaculture IUU estimates were not produced for certain aquaculture-raised species groups, including filter-feeding bivalves such as mussels, scallops, oysters, and clams. Aquaculture production of these species groups does not typically rely on aquaculture feed. Such estimates were also not developed for the small quantities of global aquaculture production of cockles/ark shells, sea cucumbers, jellyfish, sea urchins, abalones, octopus, other miscellaneous invertebrates, and other miscellaneous mollusks for which aquaculture feed use data were unavailable or not relevant.

[261] These steps were used for all aquaculture IUU production estimates used in this report, with the exception of aquaculture-raised tuna (mostly bluefin tuna species). The Commission's approach to producing aquaculture IUU estimates for aquaculture-raised tuna is described in appendix F.

[262] USITC, hearing transcript, September 3, 2020, 47 (testimony of John Williams, Southern Shrimp Alliance), 258, 303-04 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc. and Monterey Bay Aquarium Seafood Watch); industry representative, interviews by USITC staff, August 14, 2020, and August 28, 2020.

[263] USITC, hearing transcript, September 3, 2020, 303-04 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc. and Monterey Bay Aquarium Seafood Watch). There may be fewer labor violations in aquaculture operations, in terms of the number of workers affected, than in marine capture or processing operations, as relatively fewer workers are employed directly in aquaculture operations such as warmwater shrimp ponds. Industry representative, interview by USITC staff, December 10, 2020.

[264] Aronson, "Mangroves Are at Risk, Companies Can Help," July 14, 2020; USITC, hearing transcript, September 3, 2020, 52-53 (testimony of Acy Cooper, Louisiana Shrimp Association), 55–56 (testimony of Ronald Anderson, Louisiana Shrimp Association); FDA, "Enhanced Aquaculture and Seafood Inspection Report to Congress," December 1, 2018.

Determining IUU Estimates for Aquaculture Inputs

Aquaculture feed production employs a diverse range of fish and other marine species, which can be separated into two categories: forage fish and byproducts trimmings.[265] The Commission estimated the share of specific "aquaculture input groups" (aggregated groups of species groups) used in coldwater and warmwater feeds based on data from a report by Cargill, which broke down the proportions of specific aquaculture input species used in its warmwater and coldwater feeds. This report was used because Cargill is a major global feed producer, the data in the report were highly detailed, and its inputs were representative of a broad range of species known to be included in aquaculture feed supply chains.[266] (See appendix F for a more detailed description of how this report's data were used.)

Using this information, the Commission estimated that the fishmeal and fish oil used in warmwater feed primarily consist of small forage fish considered generally unfit for human consumption (e.g., Peruvian anchoveta and Gulf menhaden), a mix of species from Vietnam and Thailand, and byproduct trimmings from skipjack and yellowfin tuna processing (see tables 3.6 and 3.7, box 3.2). Fishmeal and fish oil used in coldwater feed primarily consisted of blue whiting, sardines, and small forage fish considered generally unfit for human consumption, and byproduct trimmings from herrings and a mixed grouping of various groundfish species from Denmark, Iceland, Ireland, Norway, and the United Kingdom.

Table 3.6 Estimates of shares of major aquaculture input types within warmwater feed ingredients

Aquaculture input type	Share of fishmeal (%)	Share of fish oil (%)	Estimated IUU share of global landings (%)
Forage fish	37.3	38.1	14.8
Anchoveta, menhaden, and other forage fish	22.3	22.8	10.1
Mixed fish from Thailand and Vietnam	10.0	10.2	22.0
Sardines	2.3	2.3	22.6
All other input groups	2.7	2.7	21.0
Byproduct trimmings	62.6	61.8	10.6
Skipjack	18.4	18.2	8.5
Yellowfin tuna	12.7	12.5	8.5
Mixed fish from Thailand and Vietnam	6.1	6.1	12.1
All other input groups	25.3	25.0	12.9
All aquaculture input types used in fishmeal	100.0	([a])	12.2
All aquaculture input types used in fish oil	([a])	100.0	12.2

Source: USITC IUU import estimate; Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.
[a] Not applicable.

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[265] For purposes of this analysis, "forage fish" include any whole fish that are harvested and used solely in fishmeal and fish oil production. Forage fish include large quantities of several species of small fish that are harvested in large quantities explicitly for use in fish oil and fishmeal, such as Peruvian anchoveta (see box 3.2). Forage fish may also include a vast array of species captured either deliberately or incidentally as bycatch, where the most economic use for those products are in fish oil or fishmeal production. "Byproduct trimmings" include the raw materials that remain after fillets and other products for human consumption are removed from whole fish, and may be derived from either capture or aquaculture sources. IFFO, "Forage Fish and Whole Fish," accessed December 8, 2020; IFFO, "By-Product," accessed December 8, 2020; Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.

[266] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020. *See also* IFFO, "Forage Fish and Whole Fish," accessed December 8, 2020.

Table 3.7 Estimates of shares of major aquaculture input types within coldwater feed ingredients

Aquaculture input type	Share of fishmeal (%)	Share of fish oil (%)	Estimated IUU share of global landings (%)
Forage fish	59.0	71.8	10.9
Anchoveta, menhaden, and other forage fish	25.5	31.1	10.1
Blue whiting	17.0	20.6	4.0
Sardines	9.6	11.7	22.6
All other input groups	6.9	8.4	14.6
Byproduct trimmings	40.5	27.8	8.6
Herrings	19.2	13.2	8.5
Various North Atlantic groundfish	9.9	6.8	1.3
Mackerel	3.0	2.1	13.2
All other input groups	8.3	5.7	15.7
All aquaculture input types used in fishmeal	100.0	([a])	9.9
All aquaculture input types used in fish oil	([a])	100.0	10.2

Source: USITC IUU import estimate; Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.
[a] Not applicable.

Based on the proportion of each aquaculture input type within fish oil and fishmeal production for use in warmwater and coldwater feeds, IUU marine capture estimates for aquaculture input groups were aggregated on a weighted basis to form estimates of the amount of IUU product within the fishmeal and fish oil used in these feeds. On a global basis, IUU marine capture products were estimated to comprise 9.9 percent of fishmeal and 10.2 percent of fish oil used to produce coldwater feeds and 12.2 percent of fishmeal and fish oil used to produce warmwater feeds.[267] Estimates for coldwater feeds were used within calculations of aquaculture IUU estimates for salmon and marine fish species, whereas estimates for warmwater feed were used within calculations for crustacean and freshwater species (see appendix F).

Box 3.2 Peruvian Anchoveta Fishmeal and Fish Oil Industry and IUU Fishing

Peru is a global leader in the production and export of fishmeal and fish oil, produced from fishery inputs supplied by its domestic fleet, sometimes by means of IUU fishing. The input for this industry in Peru is primarily Peruvian anchovy, commonly known as anchoveta, though fish waste and residual trimmings from frozen, canned, and cured fish processing are also used to produce fishmeal. Peru's anchoveta fishery is the largest single-species fishery in the world by volume.[a] During 2014–18, anchoveta represented 77.9 percent of Peru's reported landings according to FAO; in 2018, they reached a high of 85.9 percent (nearly 6.2 million mt).[b] The vast majority of anchoveta landings are used in the growing fishmeal industry, although Peruvian reports suggest that a small share (2.0 percent as of 2018) are used for human consumption.[c] Close to three-quarters of Peruvian fishmeal and fish oil are exported.[d] In 2019, Peru exported nearly 1.1 million mt of fishmeal products; the vast majority were to China (73.2 percent), followed by Japan (7.4 percent).[e] Peru's shipments of fishmeal to the United States decreased from 2,509 mt in 2015 to 638 mt in 2019 (74.6 percent decrease).

The Peruvian industrial anchoveta fleet is highly regulated and monitored. However, IUU anchoveta fishing problems have been identified in the less regulated artisanal fleet. Peruvian industrial fishing vessels and artisanal fishing vessels (including small-scale vessels) capturing anchoveta are largely

[267] Differences in estimates between fish oil and fishmeal were due to different use of forage fish compared to byproduct trimmings in the two ingredients. Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.

regulated and managed separately.[f] Both systems annually set scientifically derived maximum catch limits for anchoveta. The industrial catch limit is allocated per vessel and is subject to a limited fishing season, which may be closed when measurements indicate that the stock is not mature enough to be fished (10 percent or more juveniles). The industrial catch limits are highly effective because they are allocated to individual vessels, creating an ownership interest resulting in a high degree of compliance. The artisanal fleet, by contrast, is allocated a global total catch limit for anchoveta for direct human consumption (150,000 mt in 2020), and the fleet has no seasonal restrictions within a 10 nautical mile range of the coast.[g] By law, the industrial anchoveta landings must go to the fishmeal processing industry, whereas the artisanal landings are to be exclusively used for processing for direct human consumption.[h]

Numerous sources indicate that anchoveta caught by the artisanal fleet are often diverted to fishmeal and fish oil production in contravention of Peruvian regulations. Increasing global demand for fishmeal and fish oil make anchoveta more valuable to fishmeal processors. This means that prices are higher in the fishmeal processing industry than for direct human consumption, thus incentivizing the diversion of the artisanal anchoveta landings to the production of fishmeal.[i] An Oceana report identified lack of transparent supply chains, local corruption in smaller coastal communities, and lack of monitoring among the small-scale and artisanal fleet as factors facilitating this diversion.[j] The U.S. Department of Agriculture (USDA) also found that nearly all of Peru's artisanal anchoveta catch is illicitly channeled to the fishmeal industry.[k]

Though the amounts of fishmeal produced from illegally diverted anchoveta are small relative to Peru's total fishmeal production and exports, the quantities are substantial relative to other countries' production and the amount of aquaculture this allegedly illegal production supports. The Oceana report estimated that in just one Peruvian state, 22,000 mt of fishmeal was produced from illegally diverted anchoveta.[l] It also identified a Peruvian government study that estimated 90,000 mt of fishmeal was produced from illegally diverted inputs during 2014–16 (approximately 30,000 mt per year). Although this represented only 3.7 percent of total Peruvian fishmeal production during that period, the quantity was large by global standards.[m] For example, this quantity was equivalent to approximately 8.2 percent of China's 2018/19 domestic fishmeal production and was nearly equivalent to all New Zealand production (the 20th-largest fishmeal producer). Based on estimates by the IFFO, each 10,000 mt of fishmeal can support average production of 100,000 mt of aquaculture output. Although the aquaculture IUU estimates in this chapter do not incorporate country-specific analyses, these quantities provide an illustrative example of how illegally derived marine capture inputs can result in illegality within aquaculture supply chains. Based on the Peruvian government estimates and conversion factor described above, 30,000 mt of illegal fishmeal would annually support about 300,000 mt of aquaculture production.[n]

[a] FAO, Capture and Aquaculture Production database, accessed May 19, 2020.
[b] Peruvian anchoveta landings vary significantly annually. During 2014–19 they ranged from a low of low of 2.3 million mt in 2014 to their high in 2018. FAO, Capture and Aquaculture Production database, accessed May 19, 2020.
[c] FAO, Capture and Aquaculture Production database, accessed May 19, 2020; Government of Peru, PMP, *Anuario Estadistico: Pesquero y Acuícola 2018* (statistical yearbook of fishing and aquaculture 2018), November 2019.
[d] Government of Peru, PMP, *Anuario Estadistico: Pesquero y Acuícola 2018* (statistical yearbook of fishing and aquaculture 2018), November 2019.
[e] Includes products classified under HTS 2301.20 (flours, meals, and pellets, of fish or of crustaceans, mollusks or other aquatic invertebrates, unfit for human consumption). Peru's shipments to China increased by 50.1 percent from 2015 to 2019, while, shipments to all other destinations increased by 47.7 percent. IHS Markit, Global Trade Atlas, accessed December 8, 2020.
[f] The General Law of Fisheries (Decree Law No. 25977) applies to both sectors. The Law on Maximum Catch Limits per Vessel (Legislative Decree No. 1084) applies only to the industrial vessels. The Regulation of Fishery Management of the Anchovy Resource for Direct Human Consumption (Decree Supreme No. 008-2017-PRODUCE) applies only to artisanal/small-scale fishing vessels. FAO, FAOLEX Database, accessed December 2020.
[g] USDA, FAS, *Peru: Oilseeds and Products Annual*, March 1, 2020.
[h] Processing for direct human consumption covers freezing, canning, and curing.

[i] Grillo et al., "Producción ilegal de harina de pescado en Perú" (illegal production of fishmeal in Peru), February 2019; USDA, FAS, *Peru: Oilseeds and Products Annual*, March 1, 2020.
[j] Grillo et al., "Producción ilegal de harina de pescado en Perú" (illegal production of fishmeal in Peru), February 2019.
[k] USDA also indicated that this is troubling for the long-term health of the fishery because artisanal/small-scale vessels normally operate where the anchoveta spawn, and juveniles congregate, which can disrupt stock growth. Peru closes an industrial anchoveta fishing season if 10 percent of sampled fish are below 12 cm in length (i.e., juveniles). However, USDA reports that these efforts have not succeeded in adequately protecting stocks because artisanal vessels are allowed to catch anchoveta year-round. USDA, FAS, *Peru: Oilseeds and Products Annual*, March 1, 2020.
[l] Grillo et al., "Producción ilegal de harina de pescado en Perú" (illegal production of fishmeal in Peru), February 2019.
[m] USDA, PSD database, Fish meal production, accessed December 12, 2020.
[n] IFFO is an international trade organization which identifies itself as representing the marine ingredients industry. IFFO, "Key Facts," accessed December 8, 2020.

Estimating the Extent of IUU-derived Inputs Used in Global Production of Aquaculture Products

Although IUU marine capture products comprised approximately 10–12 percent of fishmeal and fish oil used in aquaculture feed globally, the extent of IUU product used in specific aquaculture operations varied considerably depending on the species group being produced. Aquaculture-raised species groups that rely minimally on fish oil and fishmeal to reach harvest weight, such as carp and tilapia, require correspondingly low amounts of forage fish and byproducts derived from both IUU and non-IUU sources. By contrast, aquaculture-raised species groups that rely more heavily on fish oil and fishmeal, including most coldwater species such as Atlantic salmon, require relatively large amounts of forage fish and byproducts from IUU and non-IUU sources.

In order to determine the amount of whole fish, including IUU marine capture-landed products, needed to produce aquaculture-raised species groups, "Fish In: Fish Out" (FIFO) ratios were used. FIFO ratios have been used by researchers and organizations to compare the amount of wild marine life used (fish in) to the amount of aquaculture products harvested (fish out). Although techniques used to measure FIFO ratios vary by study and organization, the basic components include (1) information about the yield of fishmeal and fish oil from whole fish;[268] (2) the use of fishmeal and fish oil within feeds as a share of all feed ingredients; and (3) economic feed conversion ratios (eFCRs), which measure the amount of feed (including fish oil, fishmeal, and other ingredients) needed to produce harvested aquaculture products.[269] The Commission's FIFO calculations are described in greater detail in appendix F.

The extent of IUU marine capture product used in aquaculture production was measured by dividing the quantity of IUU-produced "fish in" by the quantity of aquaculture harvested "fish out" and then multiplying these ratios by source country-specific aquaculture production quantities, derived from FAO aquaculture statistics, for each aquaculture-raised species group. These calculations were applied to all aquaculture production within the capture and aquaculture database (developed in step 1) to estimate quantities of IUU inputs within aquaculture production.

While aquaculture IUU estimates were developed on a source country level in order to inform the supply chain mapping analysis described in step 4 of the estimate, estimates of IUU products used in

[268] In this report, standard yield figures were used for fishmeal (22.5 percent) and fish oil (4.8 percent). These figures indicate that processing of a whole fish generates 22.5 percent of its body weight in fishmeal and 4.8 percent of its body weight in fish oil. IFFO, "FIFO Ratios," October 2017.
[269] eFCRs and the use of fishmeal and fish oil within feeds varied by aquaculture-raised species group. Fishmeal and fish oil use, broken out by aquaculture-raised species group, is described in appendix F.

global aquaculture were based on global averages and approximations of aquaculture input groups used, feed conversion ratios, fish oil and fishmeal use in feed, and fish oil and fishmeal yield ratios. Aquaculture industries that source a greater share of their inputs from sources with lower IUU marine capture fishing or that convert or use fish oil and fishmeal more efficiently likely would have lower amounts of IUU-derived aquaculture inputs within their production. By contrast, aquaculture industries that have less control or oversight of their supply chains or that use greater quantities of fishmeal and fish oil in production likely would have higher amounts of IUU-derived aquaculture inputs within their production. For these reasons, estimates of IUU inputs used in global aquaculture production likely diverge considerably from many country-specific practices and are therefore presented in this study on a global basis.

Step 4: Supply Chain Mapping

After the development of IUU marine capture landings and aquaculture IUU estimates and the incorporation of these estimates within the capture and aquaculture database (steps 2 and 3), the Commission conducted a supply chain analysis to map these upstream production practices to U.S. imports. While U.S. import data provide reliable quantities of U.S. seafood imports at the detailed product level and for specific partners, these data do not necessarily provide information about the original source of seafood capture or aquaculture production. Therefore, the proportional weight of IUU and non-IUU landings within all underlying species groups, partner countries, source countries, fishing areas, and fishing sectors were used as a basis for estimating the extent of IUU product within U.S. imports.

The Commission based its estimates of U.S. imports of IUU products on individual partner countries' "exportable supply" of species groups, which was the total supply of such products that partners could have exported to the United States. Exportable supply consisted of partner countries' own marine capture and aquaculture production as well as their imports of unprocessed or semiprocessed marine capture products from other countries.[270] The extent of IUU product within a partner country's exportable supply for a given species group was determined by combining underlying capture and aquaculture IUU estimates for each source of exportable supply, weighted based on the quantities from each source.[271] Partner countries' imports of aquaculture products and processed marine capture

[270] Although this two-step supply chain mapping method would not have documented the original source of seafood that was routed between three or more countries before being exported to the United States, this method likely covered most original sourcing for U.S. seafood import supply. Despite the potential complexity of seafood supply chains, most U.S. imports from top partner countries are of products that those countries produce in far larger quantities than they import. Exceptions include products such as canned tuna imports from Thailand and Ecuador, lobster imports from Canada that were originally captured in U.S. fisheries, and various frozen fillets and other fish imports from China that are consistent with supply chains that are well understood and documented, as described in the "U.S. Seafood Imports" section above.

[271] Partner countries' import data were based on global trade data from IHS Markit from 2019. IHS Markit, Global Trade Atlas database, accessed May 12, 2020. Partner countries' imports used in the calculation of exportable supply were converted to a live weight (whole fish) basis using specific conversion factors for individual HS subheadings. This conversion was used in order to ensure that the two components of exportable supply—partner countries' own capture and aquaculture production and partner countries' imports—were comparable. Thus, exportable supply can be considered the extent of global capture and aquaculture production of individual species groups that could have been exported to the United States by a partner country in any form.

products were considered unlikely to be re-exported, and therefore were mostly excluded from exportable supply quantifications.[272]

Several sources of supply (individual species groups, fishing sectors, production methods, or combinations of these) were considered less likely to enter global supply chains or to be exported to the United States, specifically. These assumptions were made based on U.S. consumer preferences, well-known supply chain characteristics, and other information developed in this report. Within exportable supply aggregations, quantities of these sources of supply were often reduced based on standard adjustments. These adjustments had the effect of accentuating sources of supply that were disproportionally likely to enter U.S. import supply chains. Of particular importance, most artisanal marine capture landings and freshwater capture landings, both of which consisted predominantly of fishing activities by small-scale fishers, were weighted downward within exportable supply calculations. These adjustments are described in greater detail in appendix F.

In this report, it was assumed that IUU products were mixed with non-IUU products and were therefore passed through proportionally along the supply chain—in other words, there were no unique attributes of importing countries (either in the United States or in intermediary partner countries) that resulted in more or less IUU product importation when compared to any other consuming destination for these products. Therefore, the extent of IUU product within imports is driven predominantly by supply-side factors. This approach does not incorporate the extent to which U.S. importers and the U.S. government, particularly through the Seafood Import Monitoring Program (SIMP), restrict the entry of IUU-sourced product into the United States (these efforts are described in greater detail in chapter 2).

Although these import market efforts and initiatives likely do reduce U.S. exposure to IUU products within import supply chains, the extent of that reduction is unclear. For example, SIMP is a relatively new program, and industry representatives have noted that because SIMP implementation has not generally resulted in visible enforcement actions to date, the effectiveness of the program at reducing U.S. market exposure to IUU seafood imports has been limited.[273] In addition, SIMP only covers certain species, several of which have substitute products that are not covered by SIMP. All fish species may enter the United States through complex supply chains involving multiple levels of processing that may make tracing difficult.[274]

Several industry witnesses provided testimony at the Commission hearing indicating that seafood importers had not changed their sourcing practices due to SIMP. They also stated that they had not seen evidence of the program's effectiveness at reducing IUU product within U.S. imports due to the lack of any public reporting showing reductions of either IUU fishing in partner countries or U.S. imports of IUU

[272] Industry representatives, interviews by USITC staff, May 20, 2020, and August 27, 2020. If partner countries' own import partners had unknown sourcing, these imports were included within exportable supply calculations. Global proportions were used to estimate whether those products were predominantly from marine capture landings or aquaculture production. This assumption had limited effects in most cases but resulted in large quantities of European countries' exportable supply of Atlantic salmon being allocated to aquaculture production (see table 3.4 above).
[273] Industry representative, interviews by USITC staff, August 14, 2020, and August 28, 2020; USITC, hearing transcript, September 3, 2020, 170 (testimony of Nathaniel Rickard, Southern Shrimp Alliance), 226, 294 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc. and Monterey Bay Aquarium Seafood Watch).
[274] WWF, written submission to USITC, October 9, 2020, 5–10.

products.[275] In addition, industry representatives noted that SIMP does not trace the sources of feed used in aquaculture.[276] Nonetheless, other industry representatives at the Commission's hearing indicated that they had noted shifts in import supply chains (for species like grouper and shark) that likely occurred due to SIMP's traceability requirements.[277] Because these import market-side efforts and initiatives likely do reduce the extent of U.S. imports of IUU product entering the United States, the lack of adjustments to incorporate these practices is likely to overstate U.S. IUU imports. However, other assumptions used in this analysis were conservative and would have had the opposite effect on the estimates.[278]

The supply chain mapping analysis can be illustrated using the example of U.S. imports of certain frozen walleye pollock fillets (HTS 0304.75.50.00) from China (see figure 3.4). In 2019, the value of U.S. imports of these products from China was $62.2 million. In order to estimate the extent to which these U.S. imports included IUU products, China's various sources of exportable supply for walleye pollock were considered, including (1) all Chinese capture and aquaculture production of this species group and (2) Chinese imports of unprocessed or semiprocessed walleye pollock from Russia, the United States, and other countries.

As described above, an estimated 10.9 percent of Russian industrial landings of pollock in the RFE EEZ (which comprises all Russian production of this species group) were captured through IUU fishing, and therefore this percentage was also used to estimate the extent of IUU product within Chinese imports from Russia. Using similar extrapolations based on other source country estimates for the remainder of Chinese imports of this species group, an estimated 10.3 percent of Chinese re-exportable imports of walleye pollock were IUU products. China's own marine capture landings of walleye pollock, which were captured primarily in other countries' EEZs, were estimated to include 22.3 percent IUU products. China's exportable supply was roughly split between its own fleet's production and its imports of unprocessed and semiprocessed pollock, and as a result, an estimated 15.9 percent of China's exportable supply of pollock was IUU product. This percentage was used without adjustment within the estimate of the value and quantity of U.S. imports of frozen pollock fillets from China, and as a result, an estimated 15.9 percent of U.S. imports of this seafood, worth $9.9 million, was considered IUU product.

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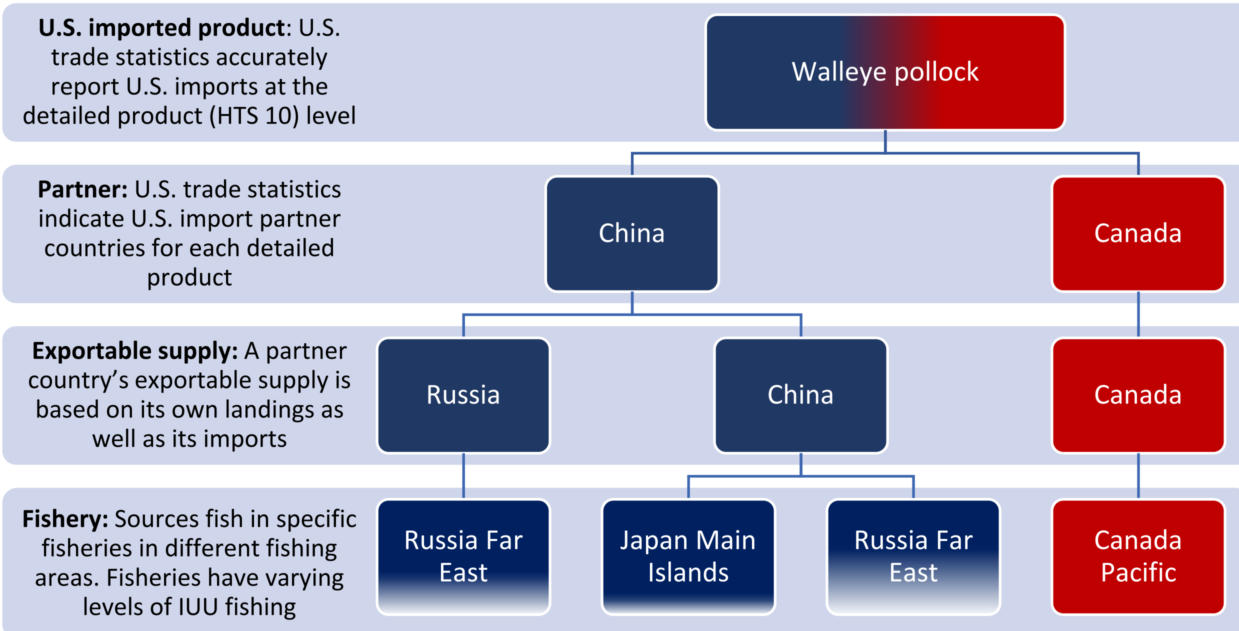
[275] USITC, hearing transcript, September 3, 2020, 60–61 (testimony of Erling Jacobsen, Inter-Cooperative Exchange), 68–71, 104–05 (testimony of Katherine Alvarez, Alfa International Seafood, Inc.), 77–78 (testimony of Robert DeHaan, National Fisheries Institute), 86–93 (testimony of Matthew Fass, Maritime Products International).
[276] Industry representative, interviews by USITC staff, August 14, 2020, and August 28, 2020.
[277] USITC, hearing transcript, September 3, 2020, 122 (testimony of John Williams, Southern Shrimp Alliance), 110–11, 115–16, 142–43, 170 (testimony of Nathaniel Rickard, Southern Shrimp Alliance), 225–26 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc. and Monterey Bay Aquarium Seafood Watch).
[278] As described elsewhere in this chapter and in appendix F, several other assumptions within the overall approach likely had understating effects on IUU estimates at the source in capture and aquaculture production. These include the lack of unregulated fishing within the benchmark estimates used to adjust IUU marine capture estimates; the use of a measure of total landings based on the sum of reported landings and IUU landings without accounting for some degree of double-counting within those totals; non-incorporation of various labor violations (e.g., in the processing sector) within the upward adjustment of IUU marine capture landings estimates; and the exclusion of various illegal practices in aquaculture supply chains within the aquaculture IUU estimates. If labor violations in processing and aquaculture were included in the definition of IUU for purposes of this analysis, the IUU estimates may have been higher.

Figure 3.4 Simplified example of the supply chain mapping system for U.S. imports of walleye pollock



Source: Compiled by USITC.
Note: HTS 10 = 10-digit statistical reporting numbers in the Harmonized Tariff Schedule of the United States (HTS) (the most detailed code level).

Similar estimates conducted systematically across all U.S. seafood imports were combined within a database of U.S. import estimates, which was used as the basis for the estimates presented in this chapter.[279] This database was produced at the most granular level of the Harmonized Tariff Schedule of the United States (HTS), the 10-digit statistical reporting level, and allowed the tracing of specific seafood products to various capture and aquaculture operations in source countries, fishing areas, and fishing sectors. Because these estimates were based on a series of approximations and assumptions, the accuracy of these estimates diminishes at more detailed levels. Point estimates, rather than ranges of estimates, were used due to a lack of clarity about the appropriate lower and upper bounds for estimates that included many different assumptions with mixed understating and overstating effects. These data should be considered reasonable but uncertain estimations of the extent of IUU product within U.S. imports.

[279] U.S. imports and global trade data covering seafood products include product categories that are specific to individual species groups as well as broader product categories that include multiple species groups. U.S. imports of these broader product groupings were divided into component species groups based on the proportional exportable supply of each species group within partner countries. Global trade data covering partner countries' imports of broader product groupings were similarly divided into component species groups based on the proportional capture and aquaculture production of their partner countries.

Extent of IUU Product in U.S. Imports of Seafood

Based on the approach described above, this study estimates that in 2019, the United States imported 286,896 mt of seafood produced using IUU practices, worth $2.4 billion. These imports accounted for 10.7 percent of the total value of U.S. seafood imports in 2019.[280]

Estimated IUU marine capture imports accounted for 13.3 percent of the total value of imports of U.S. marine capture products. These estimates were consistent with lower-bound estimates from the 2009 study by Agnew et al., which estimated that between 13.2 and 30.9 percent of reported global marine capture landings, worth between $10 billion and $23.5 billion, were produced through illegal or unreported (IU) fishing.[281] These estimates were lower on a percentage basis than those of a 2014 study by Pramod et al. of U.S. imports of IU products, which estimated that between 20 to 32 percent of the quantity of U.S. imports obtained through marine capture methods, worth between $1.3 billion and $2.1 billion, were from illegal and unreported catches.[282]

[280] Estimated values and quantities of U.S. imports, including total and IUU product values and quantities, are based on the USITC IUU import estimate. U.S. imports of IUU products include marine capture IUU imports and aquaculture IUU imports. No estimates were produced for the relatively small quantity of other U.S. seafood imports, including freshwater capture sources in addition to imports of roe, live decorative fish, and fish offal.

[281] Although the Agnew et al. study's estimates of the extent of IU fishing in global catch were higher as a share of reported landings than the estimated share of U.S. imports that consisted of IUU product, this is likely driven in part by two factors. First, U.S. imports are more concentrated within supply chains that source marine capture landings from Canadian and U.S. fisheries, which are less likely to contain high levels of IUU fishing. Second, the Agnew et al. study's estimates were expressed as a share of reported landings, whereas U.S. import estimates provided in this report are expressed as a share of total landings. The consistency between this report's estimates and those of the Agnew et al. study is related in part to the use of the Agnew et al. study's estimates as a key component within USITC's approach. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.

[282] The differences between estimates in this report and those of the 2014 Pramod study could be due to several factors. Unlike the approach used in this report, which produced granular estimates for all global marine capture fisheries, the Pramod et al. study based overall findings on 30 partner-product combinations of particular importance in U.S. import supply chains covering 10 of the largest U.S. import partner countries. Based on these analyses, Pramod et al. estimated far higher quantities of IU product entering the United States from several partner countries that had substantial processing of third-country seafood inputs, including China (29–44 percent of U.S. imports estimated to be IU product) and Thailand (24–39 percent). This study's estimates for IU product within U.S. imports from these partner countries are similar to USITC's estimates of U.S. imports of products that were originally captured by these countries' fleets. This study's estimates are also more similar to USITC's estimates for imports from partner countries with less foreign-input processing, such as Canada, Mexico, India, and Chile. Therefore, the higher Pramod et al. estimates for China and Thailand suggest either that the Pramod et al. supply chain methodology relied to a greater extent on partner countries' own marine capture practices than on those of their import partners when forming these estimates, or that there have been significant improvements in the fisheries that supply partner countries' exportable supply to the United States that occurred since that study was produced. As one example of the latter possibility, USITC's analysis estimated lower amounts of IUU marine capture landings within Russian fisheries for Pacific salmon and walleye pollock which supply a large share of Chinese exports to the United States, due primarily to evidence of major improvements made in monitoring, control, and surveillance (MCS) systems and fishers' compliance within the RFE over the past decade. Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014.

U.S. marine capture imports of several of the species groups accounting for the highest value of U.S. imports—American lobster, snow crab, Pacific salmon, Atlantic cod, toothfish, and haddock—were estimated to consist of relatively low levels of IUU product (see table 3.8). Other products, including wild-caught warmwater shrimp, swimming crab, squid, and octopus, had higher than average IUU levels within U.S. imports. Most of the major tuna products, including yellowfin, skipjack, and albacore products, were similar to the global average.

Table 3.8 U.S. imports of marine capture products, by species group, total value and estimated value share of IUU marine capture imports, 2019

Species group	Total U.S. imports (million $)	IUU imports (million $)	IUU share of total (%)
American lobster	1,241.1	47.8	3.9
Snow crab	913.2	48.2	5.3
Yellowfin tuna	753.6	101.1	13.4
Warmwater shrimp	712.0	142.7	20.0
Skipjack	644.5	69.2	10.7
Swimming crab	566.8	161.1	28.4
King crab	463.8	75.5	16.3
Pacific salmon	404.7	36.5	9.0
Atlantic cod	400.4	16.1	4.0
Squid	340.0	92.7	27.3
Albacore	309.9	41.5	13.4
Rock lobster	259.6	54.5	21.0
Toothfish	211.9	12.7	6.0
Octopus	200.1	66.3	33.1
Haddock	169.7	4.3	2.5
All others	2,996.0	440.1	14.7
Total	10,587.5	1,410.3	13.3

Source: USITC IUU import estimate.

The extent of IUU products within U.S. marine capture imports varies by partner country. U.S. IUU marine capture imports from Canada, the largest U.S. import partner for marine capture seafood, and from several smaller partners (Japan, Iceland, and many other European countries) were relatively low (see table 3.9). By contrast, estimates for IUU marine capture imports as a share of total marine capture imports from 11 of the top 15 largest partners for these products were higher than the global average of 13.3 percent.

Table 3.9 U.S. imports of marine capture products by top trading partners, estimated total value and value share of IUU marine capture imports, 2019

Partner	Total U.S. imports (million $)	IUU imports (million $)	IUU share of total (%)
Canada	2,554.0	87.6	3.4
China	1,201.4	204.3	17.0
Thailand	764.0	92.9	12.2
Russia	690.2	113.8	16.5
Indonesia	686.8	105.5	15.4
Vietnam	548.2	106.2	19.4
Mexico	451.2	113.4	25.1
India	307.5	73.8	24.0
Argentina	259.1	42.6	16.4
Ecuador	258.2	43.3	16.8
Japan	208.0	8.4	4.1
Iceland	200.0	2.3	1.2
Spain	153.2	34.3	22.4
Brazil	151.8	29.6	19.5
Philippines	151.2	49.8	33.0
All others	2,002.7	302.4	15.1
Total	10,587.5	1,410.3	13.3

Source: USITC IUU import estimate.

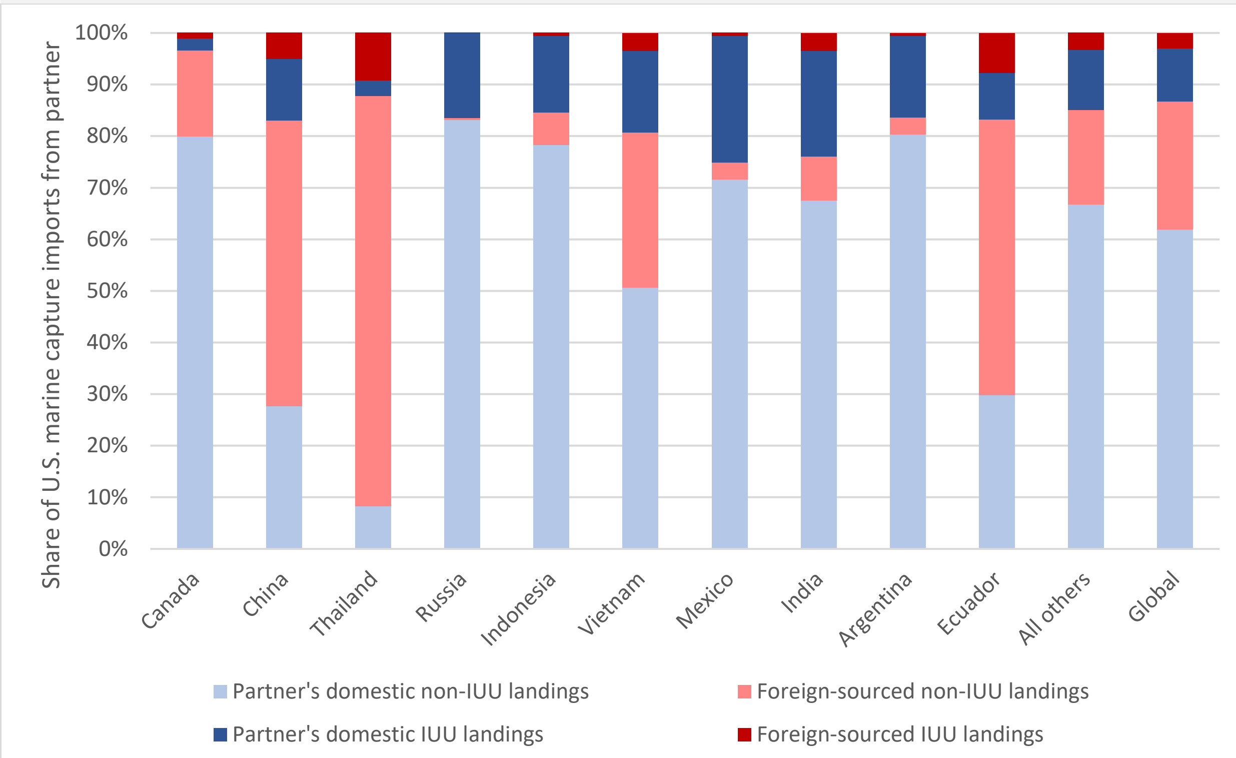
Each partner country's IUU estimate for marine capture products is driven by the practices of both its own fleet and the fleets of its import partners. For example, the total estimate for Canada, the largest exporter of marine capture seafood to the United States, reflects low levels of IUU fishing within Canada's domestic fisheries as well as within an extended supply chain that includes processing of products from U.S. fisheries, particularly American lobster.

China, Thailand, and Ecuador are large processors and distributors of marine capture products caught by other countries, and in these extended supply chains, the fleets of the source countries frequently have less IUU fishing than the fleets of the processing countries. For example, only 11.2 percent of total U.S. marine capture imports from Thailand were landed by Thai fishers, but a disproportionally high share—23.9 percent—of U.S. IUU marine capture imports from Thailand were originally captured by Thai fishers. Thailand is a major processing hub for many Western Pacific fleets that catch tuna. Therefore, most of Thailand's foreign-derived IUU product that is exported to the United States is tuna fished by a broad array of countries, while most of the IUU product originating from its own fleet is swimming crab and squid that face global pressure from IUU fishing practices.

Like Thailand, the majority (60.4 percent) of China's exports of marine capture seafood to the United States were derived from the fishing practices of other countries. These products were primarily frozen fillets of marine finfish caught by other Northern Pacific countries' fleets, and most of the IUU product within these foreign-sourced trade flows were originally produced by Russia. However, unlike Thailand, most of the IUU product that China exported to the United States (70.3 percent) was harvested by its own fleet. Other products exported to the United States include several major products harvested by China's domestic and distant-water fleets, primarily squid from North Asian and South American coasts, pollock and cod from the RFE, and flatfish captured off the western coast of Africa.

Certain partner countries, such as Russia, Indonesia, Mexico, and Argentina, are the primary source of marine capture-landed products (as well as the corresponding volumes associated with IUU fishing) that they export to the United States (see figure 3.5). IUU fishing within each of these countries' marine capture supply chains was generally concentrated within a small handful of domestic fisheries. Russian IUU fishing was largely within its industrial landings of king and snow crab in the RFE EEZ. Indonesian IUU fishing was largely within its own artisanal and industrial landings of swimming crab and tuna caught throughout the Indonesian archipelago. The Russian and Indonesian crab supply chains are described in greater detail below.

Figure 3.5 Estimated U.S. marine capture imports from top 10 trading partners, share of products from partner's domestic and foreign-sourced IUU and non-IUU sources, 2019



Source: USITC IUU import estimate.
Note: "Partner's domestic" landings refer to partner's exports to the United States estimated to consist of partner's own marine capture landings, whereas "Foreign-sourced" landings refer to partner's exports to the United States estimated to be derived from partner's own imports of marine capture products from other countries. Corresponds to appendix table J.1.

Because U.S. imports of marine capture seafood frequently do not originate in U.S. import partner countries' fishing practices, an examination of U.S. imports by original source country provides a clearer depiction of where IUU fishing actually occurs (see table 3.10). There is little evidence of IUU fishing in some of the source countries that harvest seafood entering U.S. import supply chains, including Canada, Japan, Iceland, Norway, and the United States itself. These countries have low fundamental risk of IUU: high governance scores, low to moderate vulnerability to IUU in most fisheries in which they operate, and no apparent prevalence of IUU fishing within their fleets. In addition, many of the specific fisheries of these countries that are important sources of U.S. imports were MSC certified or were otherwise considered to have strong enforcement and compliance mechanisms, resulting in low fisheries risk characterizations.

Several other top sources of seafood entering U.S. import supply chains are featured within chapters 4 and 5 of this report, including Russia, Indonesia, China, and Vietnam.[283] Many of the same issues described in those chapters drive the relatively higher IUU marine capture estimates for these sources.

Table 3.10 U.S. imports of marine capture products by top sources, estimated total value and value share of IUU marine capture imports, 2019

Source	Total U.S. imports (million $)	IUU imports (million $)	IUU share of total (%)
Canada	2,149.3	61.1	2.8
Russia	1,114.3	170.0	15.3
United States	689.4	27.0	3.9
Indonesia	676.0	107.1	15.8
China	616.5	180.4	29.3
Mexico	439.4	111.4	25.3
Vietnam	384.7	91.7	23.8
India	310.9	69.5	22.3
Argentina	302.6	50.0	16.5
Taiwan	281.0	41.9	14.9
Japan	259.9	6.9	2.7
Iceland	210.9	2.5	1.2
Norway	207.5	4.8	2.3
South Korea	197.6	18.8	9.5
Peru	162.8	23.8	14.6
All others	2,584.5	443.6	17.2
Total	10,587.5	1,410.3	13.3

Source: USITC IUU import estimate.

The broader geographic origin of IUU marine capture imports is a function of where source countries are located as well as the primary global destinations for DWF fleets (see table 3.11). The largest quantities of IUU marine capture imports were captured in the Northwest Pacific (primarily by Russia and China) and the Western Central Pacific (primarily by Asian countries operating in home EEZs or in distant-water operations). Despite their large overall size, U.S. imports of seafood captured within the Northwest Atlantic and Northeast Pacific (primarily from Canada or U.S. marine capture landings that are processed in partner countries) and from the Northeast Atlantic (Northern Europe) contained low amounts of IUU-derived product.

[283] Although they do not have their own profiles in chapter 5, Taiwan and Peru are also analyzed in different contexts elsewhere in this report.

Table 3.11 U.S. imports of marine capture products by FAO major fishing area, total value and estimated value share of IUU marine capture imports, 2019

FAO major fishing area	Key regions covered	Total U.S. imports (million $)	IUU imports (million $)	IUU share of total (%)
Northwest Atlantic (21)	U.S. and Canadian East Coast	2,331.5	70.1	3.0
Northwest Pacific (61)	Russian Far East, Japan, China	1,640.7	312.3	19.0
Western Central Pacific (71)	Pacific Southeast Asia, Western Pacific Islands	1,443.3	279.1	19.3
High seas and unknown fishing areas		951.6	128.7	13.5
Northeast Atlantic (27)	Northern Europe	826.7	28.0	3.4
Southwest Atlantic (41)	Argentina, Brazil	526.1	86.5	16.4
Western Central Atlantic (31)	Caribbean and Gulf of Mexico	525.4	121.7	23.2
Eastern Indian Ocean (57)	India, Western Indonesia, Burma	499.4	103.1	20.6
Northeast Pacific (67)	Alaska, U.S. and Canada West Coast	490.5	9.2	1.9
Eastern Central Pacific (77)	Pacific Mexico and Central America	456.4	105.3	23.1
Southeast Pacific (87)	Peru, Chile, Ecuador	324.9	51.4	15.8
Eastern Central Atlantic (34)	West Africa	273.8	78.8	28.8
Western Indian Ocean (51)	Maldives	65.5	11.4	17.4
Southwest Pacific (81)	New Zealand	58.2	4.1	7.0
Antarctic Atlantic (48)		52.7	4.6	8.7
All others		120.7	16.4	13.6
Total		10,587.5	1,410.3	13.3

Source: USITC IUU import estimate.

Note: Although FAO major fishing areas do include both high seas and EEZ regions, all FAO major fishing areas reported in the USITC IUU import estimate do not include high seas landings. Therefore, “High seas” refers to the global high seas regions that are outside of national EEZs.

According to Commission estimates, aquaculture IUU imports (a measure of the proportion of IUU marine capture inputs in feed used to produce aquaculture products exported to the United States) accounted for 8.6 percent of the total value of U.S. aquaculture imports. Carnivorous fish, such as Atlantic salmon and trout, had more IUU inputs within their supply chains than for other aquaculture-raised products, reflecting the concentration of fishmeal and fish oil inputs within their feed (see table 3.12 below). By contrast, U.S. imports of tilapia and catfish and pangasius, which have limited quantities of fishmeal and fish oil within their feed, were considered to have low quantities of IUU product within their supply chains. U.S. imports of warmwater shrimp, the largest U.S. aquaculture import product, had moderate quantities of IUU product within its global supply chains at 6.6 percent.

Table 3.12 U.S. imports of aquaculture products, estimated total value and value share of aquaculture IUU imports, by species group, 2019

Species group	Total U.S. imports (million $)	IUU imports (million $)	IUU share of total (%)
Warmwater shrimp	5,235.8	346.6	6.6
Atlantic salmon	3,727.7	444.1	11.9
Tilapia	522.5	14.0	2.7
Catfish and pangasius	348.6	14.8	4.3
Trout	171.7	20.4	11.9
Mussels	126.3	[a]	[a]
Pacific salmon	102.1	12.2	11.9
Swimming crab	90.3	6.8	7.5
Eel	75.3	21.9	29.0
Scallop	72.4	[a]	[a]
Oyster	71.3	[a]	[a]
Miscellaneous jacks (amberjack)	66.7	9.2	13.7
Sea bass	56.9	7.8	13.7
Miscellaneous crustaceans (crayfish)	43.4	3.3	7.5
Clam	33.7	[a]	[a]
All others	220.2	44.1	20.0
Total	10,964.8	945.1	8.6

Source: USITC IUU import estimate.
Note: Aquaculture IUU estimates were not produced for mussels, scallops, oysters, and clams, as these species groups are filter feeders that likely do not rely on aquaculture feeds.
[a] Not applicable.

Extent of IUU Product within Supply Chains for U.S. Imports of Selected Species Groups

This section describes the extent of IUU product in U.S. imports of several commercially significant species groups. Each description contains information about the value and type of imports that enter for each species, as well as information on the supply chains that move marine capture landings to U.S. import markets. These sections also contain a description of IUU fishing trends over time, including outstanding specific problems as well as government and industry efforts to address these problems. In addition, these sections contain a detailed analysis of the data, risk factors, and tradeoffs that went into the development of IUU estimates for key products.

Pacific Salmon

U.S. imports of Pacific salmon primarily consist of five commercially fished species: Chinook salmon (*Onchorhynchus tshawytscha*); sockeye salmon (*Onchorhynchus nerka*); coho salmon (*Onchorhynchus kisutch*); pink salmon (*Onchorhynchus gorbuscha*); and chum salmon (*Onchorhynchus keta*). Salmon products that are redder in color have higher oil content, are considered to have more desirable taste, and are, by extension, higher priced. Sockeye salmon, which has red flesh and is one of the highest-priced salmon species,[284] was estimated to account for the largest amount of Pacific salmon derived from IUU fishing that entered U.S. import supply chains (see table 3.13). In 2019, the United States imported an estimated $149.1 million of sockeye salmon and $523.1 million in Pacific salmon overall, which accounted for 0.7 percent and 2.4 percent of total U.S. seafood imports, respectively. This study estimates that in 2019, 17.9 percent of U.S. imports of sockeye salmon and 9.3 percent of U.S. imports of Pacific salmon overall were harvested using IUU fishing.

Table 3.13 U.S. imports of Pacific salmon, total value, total quantity, and estimated value and quantity of IUU imports, by species group and source, 2019

Product and source	Total value of imports (million $)	Value of IUU imports (million $)	Total quantity of imports (mt)	Quantity of IUU imports (mt)	IUU share of total import value (%)
Sockeye salmon	149.1	26.7	22,180	4,075	17.9
From Russian RFE capture	109.1	22.7	16,572	3,442	20.8
From all other sources	40.0	4.1	5,608	633	10.2
Pink salmon	135.3	6.3	20,547	1,022	4.7
Coho salmon	90.8	8.4	8,598	673	9.3
From aquaculture	66.2	7.9	4,981	594	11.9
From capture	24.6	0.5	3,617	79	2.2
Chum salmon	84.6	1.8	11,623	233	2.2
Chinook salmon	63.3	5.3	4,552	396	8.4
From aquaculture	35.9	4.3	2,742	326	11.9
From capture	27.4	1.1	1,809	70	3.9
Total Pacific salmon (all products and sources)	523.1	48.6	67,500	6,398	9.3

Source: USITC IUU import estimate.
Note: IUU estimates were not developed for freshwater capture landings.

U.S. imports of sockeye salmon are primarily caught in remote coastal regions of the northern Pacific Ocean EEZs of Russia, the United States, and Canada and then processed into frozen fillets in China, Russia, Canada, and Thailand before being exported to the United States. Within these supply chains, the greatest U.S. exposure to imports of IUU-derived sockeye salmon was through landings occurring in

[284] NOAA Fisheries, "Sockeye Salmon," accessed January 4, 2021; Knapp, Roheim, and Anderson, *The Great Salmon Run*, January 2007; Alaska Department of Fish and Game, "Commercial Salmon Fishery Exvessel Prices Statewide," accessed October 26, 2020.

the RFE, primarily in the rivers and coastal areas of the Kamchatka Peninsula.[285] These fisheries, as with many Pacific salmon fisheries, are highly remote operations involving a mix of marine industrial, marine artisanal, and freshwater catches due to the anadromous nature of these species.[286] Because Russian production from the RFE supplies a large share of Chinese imports of unprocessed or semiprocessed sockeye salmon, along with smaller quantities captured by the Chinese and U.S. fleets, it is likely that U.S. imports of processed sockeye salmon from China include substantial quantities from the RFE.[287]

In the 1990s and early 2000s, limited fisheries inspection capabilities spread over a wide geographic area, regional poverty and corruption, and sophisticated criminal and black market operations contributed to high levels of illegal salmon fishing throughout the river systems and marine areas of the RFE.[288] These IUU catches included commercial catch exceeding allocated quotas, organized criminal poaching, and local small-scale poaching for profit.[289] However, MCS agencies in Russia have substantially improved their coordination and active enforcement efforts in recent years in the RFE, and policies have changed to both disincentivize and penalize IUU fishing. In particular, the increasingly consolidated commercial salmon sector has a high rate of compliance with fishery regulations and laws, as these companies have an incentive to preserve valuable 20-year leases for fishing parcels. Because these commercial fishers control a large amount of coastal landings of Pacific salmon, their cooperation with fisheries laws and regulations substantially reduces marine IUU fishing. However, small-scale poaching operations, particularly in freshwater systems with accessible roads, remain widespread.[290]

There are currently eight MSC certifications covering relatively small sockeye salmon-producing operations (including freshwater operations) in the RFE region, reflecting in part these improvements over the past decade or more.[291] Despite the existence of these MSC certifications, certifiers have noted the continuation of IUU fishing, as evidenced by the high level of anti-poaching activities performed by both legitimate companies and state agencies as well as inconsistent MCS coverage across the region.

[285] Clarke, McAllister, and Kirkpatrick, "Estimating Legal and Illegal Catches of Russian Sockeye Salmon," April 1, 2009; Wild Salmon Center, "A Review of IUU Salmon Fishing," May 2009; Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015, 8–9. There was limited evidence of IUU fishing in the primary capture fisheries outside the RFE that supplied U.S. imports of Pacific salmon. The largest source country of Pacific salmon imports was the United States itself. The Alaska salmon fishery is by far the largest MSC-certified Pacific salmon fishing operation in the world, with tonnage of 520,523 mt in 2017. In the 2019 re-assessment of this certification, the fishery received a 100 out of 100 score for performance indicator 3.2.3 (which measures whether "monitoring, control and surveillance mechanisms ensure the management measures in the fishery and associated enhancement activities are enforced and complied with"). This was based on the strength of the MCS systems in place, consistent application of sanctions for noncompliance with fisheries regulations, and high confidence that fishers themselves comply with the management system in place. MSC, Track a Fishery database, accessed October 15, 2020; Stern-Pirlot, Beamesderfer, and Marshall, *MSC Third Reassessment: Alaska Salmon Fishery*, March 19, 2019, 321–22.
[286] Anadromous species hatch in freshwater streams, rivers, or lakes and then migrate to the ocean to grow before returning to spawn. Knapp, Roheim, and Anderson, *The Great Salmon Run*, January 2007.
[287] Several additional analyses were undertaken to more appropriately allocate U.S. imports of Pacific salmon to source countries and across species groups, as described in greater detail in appendix F.
[288] Wild Salmon Center, "A Review of IUU Salmon Fishing," May 2009, 9–11; Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015, 4–5.
[289] Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015, 9–10; Beamesderfer and Lajus, *MSC Assessment: VA-Delta Kamchatka Salmon Fisheries*, August 2016, 25.
[290] Stern-Pirlot, Beamesderfer, and Lajus, *MSC Assessment: Karaginsky Bay Salmon Fisheries*, April 2020, 21, 180–83.
[291] MSC, Track a Fishery database, accessed October 15, 2020.

These reports frequently conclude that the Russian government's efforts in this region to reduce IUU have not eliminated chronic underlying problems or well-organized criminal distribution networks.[292]

Due to the substantial improvements that have been made in recent years combined with continuing concerns over IUU fishing, the Commission considered fisheries risk for Russian-sourced sockeye salmon (and all Pacific salmon) from the RFE to be moderate. This characterization indicates that there is qualitative evidence that some IUU product likely continues to enter global supply chains from these fisheries. In addition, there is moderate fundamental risk associated with all Russian fishing within the RFE due to moderate IUU prevalence and national governance risk. Although some sources have indicated that human trafficking and other labor violations occur within Russian fishing activities (as described in chapter 5), the extent of these labor violations is uncertain. The Commission did not assign an FL/CL/HT risk characterization to Russian fishing, as Russian fishing violations were not explicitly described in the resources used to determine this risk criterion.

For products with moderate fisheries risk and moderate fundamental risk, the Commission's IUU estimate range is 12.2–26.2 percent of total landings. However, because initial IUU marine capture estimates based on unreported landings were higher than this range, at 78.3 percent of reported landings, they were reduced to the high end of the range (26.2 percent) within the Commission's revised IUU estimate for marine capture landings of Russian sockeye salmon in the RFE used in this study.[293] Based on supply chain mapping, U.S. imports of sockeye salmon directly from China, Russia, Canada, and Thailand were estimated to contain 18.8 percent, 20.4 percent, 9.1 percent, and 13.3 percent IUU product, which was largely dependent on the concentration of Russian-captured sockeye salmon from the RFE within their supply chains.

[292] Stern-Pirlot, Beamesderfer, and Lajus, *MSC Assessment: Karaginsky Bay Salmon Fisheries*, April 2020, 163, 182; Beamesderfer and Lajus, *MSC Assessment: VA-Delta Kamchatka Salmon Fisheries*, August 2016; Beamesderfer and Lajus, *MSC Assessment: Kamchatka River Salmon Fisheries*, October 15, 2019. In the most recent MSC assessment for the Karaginsky Bay Salmon Fisheries, the fishery received a score of 75 out of 100 for performance indicator 3.2.3 (which measures whether "monitoring, control and surveillance mechanisms ensure the management measures in the fishery and associated enhancement activities are enforced and complied with"). This score triggered a condition for the certification requiring the fishery to meet certain improvement milestones. Stern-Pirlot, Beamesderfer, and Lajus, *MSC Assessment: Karaginsky Bay Salmon Fisheries*, April 2020, 252.

[293] The Sea Around Us Reconstructed Catch estimates of unreported landings were informed by a study by Sobolevskaya and Divovich (2015). As described in the literature review section of appendix E, another study by Clarke, McAllister, and Kirkpatrick estimated similarly high amounts of unreported sockeye salmon fishing in this region. The reduction in the IUU estimate to a lower share of total landings reflects improvements made in this fishery, including those described above, which have largely taken place since these prior studies were published. Clarke, McAllister, and Kirkpatrick, "Estimating Legal and Illegal Catches of Russian Sockeye Salmon," April 1, 2009; Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015.

Cod, Pollock, Haddock, and Other Codlike Fish

Atlantic and Pacific cod, pollock, haddock, hake/whiting, and other codlike coldwater groundfish ("codlikes") are among the most important commercially harvested fish species in the world.[294] In 2019, the United States imported $1.0 billion of these products, which accounted for 4.6 percent of total U.S. seafood imports (see table 3.14). This report estimated that 7.9 percent of U.S. imports of codlike products were captured using IUU fishing. U.S. imports of these products can be divided into two primary groups: (1) species sourced primarily from the North Atlantic fisheries (Atlantic cod, haddock, and Atlantic pollock), which have experienced substantial reductions in IUU fishing in recent years; and (2) species sourced primarily from Pacific fisheries (walleye pollock, Pacific cod, and various other codlikes), which continue to have IUU fishing issues despite recent improvements. An example of the group of Pacific products—walleye pollock from Russian industrial marine capture in the RFE—is used throughout this chapter to illustrate the estimation approach. This discussion focuses primarily on the group of Atlantic products.

Table 3.14 U.S. imports of cod, pollock, haddock, and other codlikes, total value, total quantity, and estimated value and quantity of IUU imports, by species group and source, 2019

Product and source	Total value of imports (million $)	Value of IUU imports (million $)	Total quantity of imports (mt)	Quantity of IUU imports (mt)	IUU share of total import value (%)
Atlantic cod	400.6	16.1	46,472	2,092	4.0
Haddock	169.7	4.3	26,025	710	2.5
Walleye pollock	167.7	25.5	53,787	8,255	15.2
Sourced from Russia	82.3	9.0	26,546	2,890	10.9
Sourced from China	71.2	15.9	23,231	5,186	22.3
From all other sources	14.2	0.6	4,010	178	4.5
Pacific cod	162.9	19.2	22,885	2,737	11.8
Sourced from China	61.0	13.6	8,642	1,930	22.3
Sourced from Russia	36.9	4.0	5,646	614	10.9
From all other sources	65.0	1.5	8,598	193	2.4
Hake/whiting	47.0	8.1	13,190	2,718	17.3
Sourced from Argentina	10.0	2.4	3,078	733	23.8
Sourced from China	3.9	3.9	1,372	1,372	100.0
From all other sources	33.0	1.8	8,740	613	5.4
Atlantic pollock	13.4	0.2	4,145	60	1.5
Blue whiting	2.7	0.1	374	25	4.0
Other codlike	46.9	6.4	13,746	2,028	13.7
Total codlike products (all products and sources)	1,010.9	80.0	180,624	18,626	7.9

Source: USITC IUU import estimate.

294 FAO, "*Gadus macrocephalus*," accessed October 8, 2020; FAO, "*Gadus morhua*," accessed October 8, 2020; FAO, "*Melanogrammus aeglefinus*," accessed October 8, 2020; FAO, "*Merluccius merluccius*," accessed October 8, 2020; FAO, "*Pollachius virens*," accessed October 8, 2020. For this analysis, codlike fish include Atlantic cod (*Gadus morhua*); Pacific cod (*Gadus macrocephalus*); Greenland cod (*Gadus ogac*); Atlantic pollock (*Pollachius virens* or *Pollachius pollachius*); walleye pollock (*Gadus chalcogrammus* or *Theragra chalcogramma*); haddock (*Melanogrammus aeglefinus*); hakes and whitings (*Merlangius* spp., *Meruluccius* spp., and *Urophycis* spp.); and blue whiting (*Micromesistius* spp.). Other species of the Gadiformes order are also included in this group and are referred to within the species group "Other Codlike."

The large majority of U.S. imports of codlike products from Atlantic regions consist of Atlantic cod and haddock. These are sourced from Iceland, Russia, Norway, and Canada, either directly from these countries or through China, where they are processed into frozen fillets. In previous decades, overfishing and IUU fishing in particular were prevalent in the North Atlantic, including in the Barents Sea, which contains fisheries that are shared by Russia and Norway's fleets and is the most important source of U.S. imports of Atlantic cod.[295] Atlantic cod products, which are estimated to account for the majority of U.S. imports of this species group sourced from the North Atlantic regions, has been considered a high-risk species due to a reported prevalence of IUU fishing in many North Atlantic fisheries.[296] In 2004, the World Wildlife Fund reported a 70 percent drop in cod populations over the previous 30 years in the Barents Sea, indicating severe depletion of the last remaining major global supply of Atlantic cod following collapses in fish stocks off the Atlantic coast of Canada in earlier years.[297]

In recent years, however, there have been substantial improvements made by Norway and Russia in the regulation and enforcement of sustainable fishing practices for these Barents Sea fisheries. The Joint Norwegian Russian Fishery Commission (JNRFC) has been the primary mechanism that both countries have used to cooperate in harmonizing management, regulating, and enforcing fisheries within the Barents and Norwegian seas.[298] Since 2004, the JNRFC has taken a more precautionary joint approach toward setting quotas as a means of rebuilding fish populations in the region. Improvements in MCS systems were also made, particularly through stepped-up inspection efforts. These efforts included increased inspections through random boarding by enforcement officials, daily reporting of removals to fishery inspection services, reporting of transshipped removals while at sea, mandatory use of VMS systems, and random inspections at port off-loadings. Penalties associated with illegal fishing in both countries are also relatively severe, including possible fines, compulsory work, or prison sentences.[299]

As a result of these improvements, there is a high prevalence of MSC certification for Atlantic cod and haddock fisheries in the North Atlantic, including several large MSC certifications for operations in the Barents and Norwegian Sea regions.[300] Therefore, the Commission considered the fisheries risk of IUU for most major U.S. imports of Atlantic cod and haddock to be low. Fundamental risk for most North Atlantic countries operating in their own or neighboring EEZs was also considered low, although Russian fishing operations were considered to have moderate fundamental risk due to broader evidence of IUU prevalence in the Russian fleet as well as national governance risk. None of the major North Atlantic countries supplying these products were characterized as having moderate or high FL/CL/HT risk based on the Commission's analyses of these factors. Based on a consideration of these risk profiles and initial IUU estimates based on unreported landings, the Commission estimated the total value of U.S. imports of IUU-sourced Atlantic cod and haddock in 2019 to be $16.1 million and $4.3 million, respectively,

[295] WWF, *The Barents Sea Cod*, April 2004.
[296] Petrossian and Clarke, "Explaining and Controlling Illegal Commercial Fishing," January 1, 2014, 5.
[297] WWF, *The Barents Sea Cod*, April 2004.
[298] FAO, "JNRFC," accessed October 30, 2020; Knapman et al., *MSC Assessment: FIUN Barents and Norwegian Seas Cod and Haddock Fishery*, August 2018.
[299] Knapman et al., *MSC Assessment: FIUN Barents and Norwegian Seas Cod and Haddock Fishery*, August 2018.
[300] MSC, Track a Fishery database, accessed October 15, 2020.

equivalent to 4.0 percent and 2.5 percent of all U.S. imports of these products.[301] Most of these IUU products were processed in China before being exported to the United States as frozen cod and haddock fillets.

Swimming Crab

Swimming crab refers to a group of small crabs of the family Portunidae, such as *Callinectes sapidus* (blue crab) and *Portunus pelagicus* (blue swimmer crab), that can be harvested with traps, nets, or dredges or, for some species, through aquaculture operations. Most U.S. imports of these products enter in processed form, primarily as crabmeat in airtight containers.[302] In 2019, the United States imported $658.7 million in swimming crab products (3.0 percent of total U.S. seafood imports), with an estimated 25.5 percent of those imports coming from IUU sources (see table 3.15). The large majority of U.S. imports of swimming crab were estimated to have single-country supply chains based in Southeast Asia or South and Central America, with U.S. import partners sourcing primarily from their own fleets' capture in coastal areas or through aquaculture. U.S. imports of swimming crab enter from many partner countries, including Indonesia (39.4 percent by value), the Philippines (11.9 percent), China (7.4 percent), Vietnam (7.4 percent), Venezuela (6.0 percent), and India (5.8 percent).

Table 3.15 U.S. imports of swimming crab, total value, total quantity, and estimated value and quantity of IUU imports, by harvest method and source, 2019

Harvest method and source	Total value of imports (million $)	Value of IUU imports (million $)	Total quantity of imports (mt)	Quantity of IUU imports (mt)	IUU share of total import value (%)
Capture sources	568.4	161.1	31,236	8,721	28.3
Indonesia	263.3	60.1	11,701	2,674	22.8
China	42.9	12.3	4,172	1,189	28.6
Vietnam	42.1	15.2	1,985	714	36.0
Venezuela	39.7	8.1	2,917	592	20.3
Mexico	35.6	9.5	3,134	833	26.6
India	34.0	11.8	1,458	507	34.6
Burma	31.9	7.1	1,565	349	22.3
United States	23.6	0.9	1,373	53	3.9
Philippines	17.8	16.2	673	615	91.3
Thailand	15.0	12.4	916	758	82.8
All other capture sources	22.6	7.6	1,342	437	33.4
Aquaculture sources	90.3	6.8	3,999	300	7.5
Total swimming crab (all harvest methods and sources)	658.7	167.8	35,236	9,021	25.5

Source: USITC IUU import estimate.
Note: Capture sources include small quantities of freshwater capture landings. IUU estimates were not developed for freshwater capture landings.

301 Revisions of initial IUU marine capture estimates based on the risk profiles of these fisheries were minimal, demonstrating consistency between the Sea Around Us Reconstructed Catch data and the evidence of low IUU risk for most of these fisheries. Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020. For these fisheries, unreported landings as a share of reported landings (the initial IUU marine capture estimate used in this study) for Russia were within the range of alternative IUU estimates for fisheries with moderate fundamental risk and low fisheries risk (1.2–12.2 percent), and so were left unrevised. Most other North Atlantic sources, including Iceland and Norway, had zero or near-zero initial IUU marine capture estimates, and these were increased to 1.2 percent of reported landings based on an assumption that there is unlikely to be any fishery with absolutely zero IUU fishing.
302 Seafood Source, "Blue Crab," January 23, 2014.

Indonesia's swimming crab fishery historically consisted of small-scale, unregulated production serving local markets with limited IUU issues until an export-oriented commercial fishing industry rapidly developed in the 1990s, in part due to the decline in U.S. landings of Chesapeake Bay blue crab.[303] Indonesia is now the largest producer of swimming crab in the world, and the United States is the primary importer of Indonesian swimming crab.[304] Within this large industry, these products are typically caught by small fishing vessels, brought live or already steamed to "miniplants" for aggregation and steaming if needed, and then processed by larger firms before being shipped to the United States as a picked and pasteurized product for distribution.[305]

The blue swimmer crab fishery in Indonesia became subject to increased regulation in 2007, when a Fishery Improvement Project was initiated that is currently led by the Indonesian processing industry (the Asosiasi Pengelolaan Rajungan Indonesia) and the Indonesian Ministry of Marine Affairs and Fisheries.[306] The Indonesian government has begun implementation of a Fisheries Management Plan that includes catch limits and has issued regulations that include prohibitions on landings of small crabs or egg-bearing females, as well as bans on the use of bottom and midwater trawls and seine nets. Implementation of these regulations is carried out by regional authorities, and regulations are expected to apply to industrial and artisanal fishers.[307] These efforts have been accompanied by a project of the U.S. Agency for International Development aimed at improving sustainable fisheries,[308] in addition to Indonesian government efforts to address IUU fishing more broadly. For example, the government has recently engaged in efforts such as publicly releasing vessel monitoring data[309] and strict enforcement of bans on foreign fishing vessels in Indonesian waters (see chapter 4).[310]

Notwithstanding these efforts, Indonesia's relatively recent implementation of various measures to improve sustainability within the fishery has not resulted in full compliance with these measures across the diverse archipelagic nation. Although there is a national Fisheries Management Plan, management plans are not fully implemented within the country's regions, where provincial and district fisheries services are responsible for fisheries administration, development, and management. Fishing gear remains primarily unselective, indicating apparent ineffectiveness of regulations limiting specific gear types (such as bottom trawls) and types of crab that can be harvested. In addition, there is reportedly a lack of resources for enforcement efforts aimed at addressing IUU fishing, particularly for targeting IUU

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303 Madduppa et al., "Setting Up Traceability Tools," September 28, 2016; Seafood Watch*, Blue Swimming Crab, Indonesia, Bottom Gillnet, Pots,* December 19, 2018, 11.
304 Friedrick, "Blue-Swimming Crab Market Stabilizes," July 16, 2013.
305 Wilderness Markets, *Blue Swimming Crab Value Chain Summary*, December 2015.
306 Wilderness Markets, *Blue Swimming Crab Value Chain Summary*, December 2015; Seafood Watch*, Blue Swimming Crab, Indonesia, Bottom Gillnet, Pots,* December 19, 2018; SFP, "Blue Swimming Crab Java Sea," January 16, 2020; Fishery Progress, "Indonesia Blue Swimming Crab: Trap," accessed January 5, 2021.
307 Seafood Watch*, Blue Swimming Crab, Indonesia, Bottom Gillnet, Pots,* December 19, 2018, 34-36; SFP, "Blue Swimming Crab Java Sea," January 16, 2020.
308 Chemonics, *Improving Sustainable Fisheries and Climate Resilience*, September 29, 2015.
309 Global Fishing Watch (GFW), "Indonesia's Vessel Monitoring System," accessed September 25, 2020.
310 Bhwana, "Indonesia Has Sunk 516 Vessels Since 2014 for Illegal Fishing," July 7, 2019.

activities of local small-scale vessels that are not as prioritized as larger-scale foreign industrial vessels. As a result, underreporting of catches remains a persistent problem.[311]

In addition, labor abuses involving Indonesian fishers are reportedly common throughout Southeast Asia, the Pacific Ocean, and the Indian Ocean, with reports of forced labor, unpaid salaries, physical abuse, and even murders at sea. Although the Indonesian Ministry of Marine Affairs and Fisheries reportedly requires Indonesian fishery businesses to comply with international human rights standards in order to obtain fishing permits, among other initiatives, other nonprofit observers have indicated that the government has not effectively implemented these regulations. (Labor abuses involving Indonesian fishers are described in greater detail in chapter 5).

The Commission considered several factors in making the IUU marine capture estimate for Indonesia's local EEZ swimming crab fisheries. These included high fisheries risk, based on the information described above; moderate fundamental risk for all Indonesian fishing activity due to IUU prevalence and national governance risk; and evidence of high FL/CL/HT risk. As a result of these factors, IUU marine capture estimates for swimming crab captured by Indonesian vessels were adjusted to 28.8 percent of reported landings (or 22.8 percent of total landings).[312] Indonesia is not alone in having IUU issues in swimming crab marine capture landings: it was estimated that most of the fleets supplying U.S. imports of swimming crab had IUU fishing activities that accounted over 20 percent of their landings of these products. In addition, the IUU-derived inputs that are used in the aquaculture production of swimming crab exported to the United States are estimated to equate to 7.5 percent of those products' harvested weight.

Snow and King Crab

Snow crab (species within the genus *Chionoecetes*) and king crab (species within the crab-like family *Lithodidae*) are large bottom-dwelling species that are caught in large wire pots and are primarily exported to the United States in frozen, whole, or semiprocessed (e.g., crab legs) form. In 2019, the United States imported $913.2 million in snow crab and $463.8 million in king crab, which together accounted for 6.3 percent of total U.S. seafood imports (see table 3.16). Snow crab is imported in large quantities from Canada and Russia, while king crab is primarily imported from Russia, with smaller quantities entering from Argentina. This study estimates that in 2019, 5.3 percent of U.S. imports of snow crab and 16.3 percent of U.S. imports of king crab were captured using IUU fishing.

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[311] Wilderness Markets, *Blue Swimming Crab Value Chain Summary*, December 2015; Seafood Watch*, Blue Swimming Crab, Indonesia, Bottom Gillnet, Pots,* December 19, 2018; SFP, "Blue Swimming Crab Java Sea," January 16, 2020; U.S. industry representative, interview by USITC staff, August 27, 2020; U.S. industry representatives, interview by USITC staff, October 15, 2020. These combined issues are reflected in several aggregated metrics, including (1) the most recent Seafood Watch report on blue swimming crab (caught by bottom gillnets and pots), in which all fisheries were considered to have an overall "ineffective" management strategy, in part due to the unknown nature of processes to enforce regulations; and (2) a FishSource fishers' compliance score of less than 6 out of 10 due to ineffective implementation of gear type and size restrictions, egg-bearing female bans, and underreporting of catches. Seafood Watch*, Blue Swimming Crab, Indonesia, Bottom Gillnet, Pots,* December 19, 2018; SFP, "Blue Swimming Crab Java Sea," January 16, 2020.

[312] The Sea Around Us Reconstructed Catch generally had low estimates, at or around 0 percent, of unreported landings for Indonesian swimming crab fisheries. Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020.

Table 3.16 U.S. imports of snow and king crab, total value, total quantity, and estimated value and quantity of IUU imports, by product and source, 2019

Product and source	Total value of imports (million $)	Value of IUU imports (million $)	Total quantity of imports (mt)	Quantity of IUU imports (mt)	IUU share of total import value (%)
Snow Crab	913.2	48.2	52,011	3,001	5.3
Canada	614.9	7.0	33,771	386	1.1
Russia (RFE capture)	179.5	37.3	11,463	2,381	20.8
Russia (all other regions)	31.4	0.9	2,010	61	3.0
United States	47.7	0.5	2,620	30	1.1
Greenland	23.0	0.3	1,267	17	1.4
All Others	16.7	2.1	881	127	12.7
King Crab	463.8	75.5	12,795	2,050	16.3
Russia (RFE capture)	342.6	71.1	9,020	1,873	20.8
Russia (all other regions)	95.1	1.6	2,501	41	1.6
Argentina	21.1	2.3	1,023	111	10.9
All Others	5.0	0.5	250	25	10.5
Total snow and king crab (all products and sources)	1,377.0	123.8	64,806	5,051	9.0

Source: USITC IUU import estimate.

IUU landings of both snow crab and king crab have been historically prevalent within the sprawling RFE EEZ, which covers the Russian EEZ within the Bering Sea and the Sea of Okhotsk.[313] A 2011 study by Erling Jacobsen of the Inter-Cooperative Exchange estimated that between 2000 and 2010, approximately 2.6 king crabs were captured illegally in Russia for every crab captured legally (72 percent of landings).[314] Focusing on a similar time period, a 2015 study by Sobolevskaya and Divovich, which informs the Sea Around Us Reconstructed Catch data for this region, estimated that king crab poaching in the RFE was 72 percent of reported landings (87.8 percent of total landings), while snow crab poaching was 100 percent of reported catch (50.0 percent of total landings).[315] These studies listed IUU fishing practices for crab in the RFE as including harvesting by Russian fishing vessels beyond legal quotas, as well as harvesting by unlicensed foreign fishing vessels operating illegally within Russian waters (i.e., poaching).[316] Vessels engaged in IUU activities in the RFE also reportedly include fishers from Southeast Asia operating under forced labor conditions.[317]

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313 Other major sources of snow and king crab are not known to have major issues related to IUU fishing. Although there is Russian crab production in the Barents Sea EEZ of Russia, this fishing is generally not considered likely to have substantial IUU practices. This is largely due to the fact that red king crab was introduced deliberately to the Barents Sea as an alien species in the 1960s as a means of providing Russia with a new commercial fishery, while snow crab has also emerged as an invasive species in the Barents Sea. Both king crab and snow crab have emerged as commercial fisheries in the Russian and Norwegian EEZs within the Barents Sea region, where they are considered to be both commercially important and potential threats to native ecosystems. Russia's only MSC-certified king crab fishery is in the Barents Sea. WWF, *Illegal Russian Crab*, October 2014, 9; MSC, "Russian Red King Crab Fishery Is MSC Certified," February 23, 2018.
314 Jacobsen, written testimony to USITC, September 2, 2020, 1; Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014.
315 Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015, 18–19.
316 WWF, *Illegal Russian Crab*, October 2014, 10; Stupachenko, "Russia Mulls Expansion of Auctions," April 2, 2020; Stupachenko, "After Quota Auctions in Russia, New 'Crab King' Emerges," December 9, 2019.
317 Jacobsen, post-hearing submission to USITC, October 4, 2020, 4.

In recent years, the Russian government has made efforts to substantially reduce IUU landings in the RFE EEZ, as discussed in greater detail in chapter 5 and in other species group discussions above. Among the most relevant measures for reducing IUU fishing in snow and king crab production is the rule that all seafood products caught in Russia's sprawling EEZs must be landed in Russian ports and reported to Russian customs authorities.[318] In addition, the government of Russia and its import partners, particularly Japan, South Korea, and the United States, have implemented agreements as well as unilateral measures (like SIMP) to ensure that the catch that enters international trade channels is accompanied by certificates of origin.[319]

However, these reporting and landing requirements are undermined by vessels misdeclaring product quantities in ports, mislabeling products, and falsifying documents. In addition, both Russian and foreign vessels may bypass Russian landing requirements by transporting crab directly to foreign ports, where false certificates of origin can be produced.[320] Transshipment of crab from fishing vessels onto refrigerated cargo vessels, which is a common and frequently legal practice in the RFE due to the remote nature of fishing in the region, may also facilitate illegal movement of product directly to foreign ports in contravention of Russian landing requirements.[321] The routing of illegally captured Russian crab through Asian trading countries into international trade channels has reportedly shifted over time from Japan to South Korea and, increasingly, to networks that run through North Korea and China.[322]

Reflecting the progress made by the Russian government and some of its import partners in addressing IUU fishing practices in the king and snow crab markets, studies focusing on the 2010 to 2020 period have produced estimates demonstrating continuing, but declining, IUU fishing for both of these crab

[318] WWF, *Illegal Russian Crab*, October 2014, 14; Miller et al., "Identifying Global Patterns of Transshipment Behavior," 2018; Government of Russia, Federal Agency for Fisheries, post-hearing submission to USITC, September 28, 2020, 2.
[319] Government of Russia, Federal Agency for Fisheries, post-hearing submission to USITC, September 28, 2020, 7–8; Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014; Jacobsen, post-hearing submission to USITC, October 4, 2020, 2–3.
[320] WWF, *Illegal Russian Crab*, October 2014, 10; McDonald, *Commercially Important Crabs: Russian Far East*, December 10, 2015, 8; Jacobsen, written testimony to USITC, September 2, 2020, 2–3.
[321] Recent analysis conducted using AIS data collected by Global Fishing Watch has demonstrated that transshipment events in the RFE are consistently followed by Russian port calls by transshipment vessels before continuing on to foreign ports such as Busan, South Korea, consistent with Russian regulatory requirements. Miller et al., "Identifying Global Patterns of Transshipment Behavior," 2018. However, other analyses have noted that foreign-flagged vessels frequently do not broadcast AIS signals or may engage in transshipment around the Russian maritime border. Boerder, Miller, and Worm, "Global Hot Spots of Transshipment of Fish Catch," July 25, 2018, 6-7; WWF, *Illegal Russian Crab*, October 2014, 1, 10, 13, 15.
[322] Jacobsen, written testimony to USITC, September 2, 2020, 1–3; Jacobsen, post-hearing submission to USITC, October 4, 2020, 3; WWF, *Illegal Russian Crab*, October 2014; Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014.

products.[323] Erling Jacobsen of the Inter-Cooperative Exchange, who had made one of the highest IUU estimates for king crab production based on landings from the prior decade, indicated that current Russian IUU fishing of king crab would likely account for 10 to 20 percent of Russian king crab landings.[324] Moreover, he noted that while SIMP was effective in reducing U.S. exposure to IUU seafood in this area upon its inception, participants in the supply chain had found means of circumventing these reporting requirements, including through fraudulent or incorrect documentation and the triangular trade channels described above.[325]

Based on these mixed factors—substantial and historical IUU activity in the RFE snow and king crab fisheries, some uncertainty regarding the fleets harvesting these products, and mitigation of these problems by recent intergovernmental efforts—the Commission considered the fisheries risk for Russian RFE landings of these products to be moderate. Fundamental risk for all Russian marine capture landings in home regions was also considered moderate due to IUU prevalence and national governance risk. As described above, no FL/CL/HT risk characterization was made for Russian fishing. The Commission's IUU estimates for Russian landings of both products within the RFE were revised downward from very high levels based on unreported landings data to the upper-bound estimate for products with moderate fisheries and fundamental risk, which is 26.2 percent of reported landings (20.8 percent of total landings).

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[323] WWF estimated that in 2013, aggregate imports of all types of crab from Russia by Japan, United States, China, and South Korea exceeded the Russian reported harvest of crab by 69 percent, meaning that unreported product as a share of total imports by these countries was at least 40.8 percent. This analysis also estimated that the Russian harvest of king crab, specifically, included roughly half to two-thirds unreported catch in excess of the total allowable catch for these products. The McDowell Group estimated that in 2013, 18 percent of global king crab supply was from Russian IUU landings and 45 percent was from Russian legal landings: by extension, 28.6 percent of Russian king crab supply was from IUU fishing. A 2019 study by Pramod et al. estimated that in 2015, 17–25 percent of Japanese imports of crab from Russia were from illegal or unreported (IU) fishing. WWF, *Illegal Russian Crab*, October 2014, 22–25; Alaska Fisheries Science Center*, Wholesale Market Profiles for Alaska Groundfish,* May 2016, 130; Pramod, Pitcher, and Mantha, "Estimates of Illegal and Unreported Seafood Imports to Japan," October 2019.

[324] Jacobsen, post-hearing submission to USITC, October 4, 2020, 3–4.

[325] Jacobsen, post-hearing submission to USITC, October 4, 2020, 3.

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Chapter 4
Country Profile: China

Introduction

China is the largest global producer of seafood, both by wild capture and by aquaculture production. As China is also the world's largest consumer of seafood, most Chinese capture and aquaculture production is consumed domestically. At the same time, however, China is the largest exporter of seafood to the world, particularly of processed products (e.g., frozen seafood and fillets), as it is the world's largest processing hub for seafood. China's processors import substantial amounts of seafood from multiple countries, and most processed products are re-exported to third-country markets. Another portion of the Chinese exportable supply of seafood for processing is caught by the Chinese distant-water fishing (DWF) fleet, which is the fleet that has the capacity to fish in extraterritorial waters. China's DWF fleet is the largest in the world.

Many vessels from the Chinese DWF fleet have been linked to IUU fishing around the world, including in exclusive economic zones (EEZs) in Asia, the Pacific Ocean, Africa, and South America. Additionally, working conditions on these vessels vary, with several reports noting cases of hazardous and forced labor conditions on Chinese vessels fishing in distant waters. The Chinese DWF fleet has historically been subject to little regulation by the Chinese government, which has instead incentivized it to expand in size and catches in response to growing domestic and global demand for seafood.

As presented in this chapter, research has identified a number of activities associated with IUU fishing occurring in China and/or the Chinese fleet, including the DWF fleet. These include Chinese vessels fishing without authorization in foreign EEZs and in waters managed by regional fisheries management organizations (known as RFMOs), as well as the use of front companies and foreign registration, including flags of convenience. Chinese vessels are known to transship their catch at sea, and there are recorded instances of labor violations in China's DWF fleet. The Chinese fleet has also been linked with the use of destructive fishing gear. There are also reports of unreported landings of wild-caught seafood and a failure to prevent imports of seafood obtained via IUU fishing.

Recently, China adopted a series of laws and regulations aimed at curbing IUU fishing activity by its DWF fleet;[326] however, it is not clear how effective these will be. Further, while China is a member of some regional bodies and international mechanisms that aim to reduce IUU fishing and violations to labor laws, the country has not ratified others. One of those not ratified is the Port State Measures Agreement, which has been highlighted as key in combating IUU fishing because it prohibits imports of seafood caught by these means. Based on the quantitative analysis in chapter 3, the Commission estimates China to be the largest single source of U.S. imports of seafood obtained via IUU fishing, with

[326] For example, China adopted the Distant Water Fishing Management Regulations and the Management Measures for High Seas Squid Fishery in 2020 (see "Fisheries and Fleet Management" section for more information).

the Chinese share of these imports valued at $204.3 million (about 17.0 percent of the total U.S. imports of marine-capture products from China) in 2019.[327]

Overview of the Chinese Seafood Industry and Market

Seafood production, including wild-capture and aquaculture production as well as seafood processing, is an important economic activity in China. The value of the sector has grown at an annual rate of 4.9 percent on average from 2015 to 2019. The value of seafood production in China exceeded 1.2 trillion renminbi (RMB)—about $180 billion—in 2019 and was estimated to account for about 1.3 percent of the economy.[328] Further, the fishing industry is a substantial source of employment, representing about 14 million direct jobs as of 2015, with 5.1 million jobs in the aquaculture sector alone. The sector is estimated to employ an additional 15.9 million workers in "associated services," including input supply, processing, and marketing.[329]

Production

China is the largest producer of wild-capture and aquaculture products in the world. In 2018, China reported output of about 81 million metric tons (mt) of wild-capture and aquaculture products, which represented about 38 percent of global reported production (table 4.1).[330] Wild-capture production in China is varied, composed of the marine capture and freshwater capture subsectors. Most reported wild-capture production in the country is of marine products, although freshwater capture, while small, is important for multiple provinces in China.[331] The main products obtained by marine capture in 2018 were miscellaneous marine fishes not specified (24.6 percent by volume). These were followed by miscellaneous coastal fishes (14.1 percent), particularly threadfin breams, yellow croaker, and miscellaneous croakers and drums, and miscellaneous pelagic fishes (10.6 percent), mainly miscellaneous scads, Pacific chub mackerel, and miscellaneous silver pomfrets.[332]

The composition of reported marine capture in the Chinese EEZ has transformed throughout the years. The species that are predominantly captured have shifted from those that have higher value in the Chinese market, such as large yellow croaker, to species that are lower valued, such as chub mackerel

[327] USITC, IUU import estimates. See chapter 3 for more information.
[328] Textor, "Gross Value of Production of Fisheries in China," January 20, 2020; World Bank, "GDP (Current US$)—China," accessed October 26, 2020.
[329] In 2013, about 7.1 million of the fishing industry jobs were estimated to be held by traditional fishers. Employment data for 2015 are the most recent data available as of December 2020. FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020; Hongzhou, "China's Fishing Industry," July 9, 2015, 5.
[330] FAO, Global Production database, accessed May 19, 2020.
[331] China is the largest producer of inland capture in the world. However, this subsector is of importance for local communities and is not as export oriented as marine capture and seafood processing. Inland capture production has remained stable since 1999, averaging about 2.1 million metric tons (mt) per year. FAO, *The State of World Fisheries and Aquaculture*, 2020, 9, 18.
[332] FAO, Global Production database, accessed May 19, 2020.

and anchovies, as overfishing of the higher-valued species has reduced their availability.[333] Mostly via its DWF fleet, China is also a large supplier of multiple heavily traded species, such as tuna, octopus, and squid.[334] Most of the Chinese marine capture, particularly of species caught in its own EEZ, is destined for domestic consumption; however, seafood is one of the main Chinese exports to the world.[335] Reported marine-capture production declined 4.8 percent for the third consecutive year in 2017–18 after increasing at an annual average rate of 1.7 percent between 2010 and 2015.[336] The decline in marine-capture production in China is attributed in part to the effects of a catch-reduction policy implemented by the Chinese government.[337] Despite this decline, China's reported marine-capture production is about 15.0 percent of the world's total, which is almost twice as large as that of the next-largest producer, Indonesia (see chapter 5).[338]

Table 4.1 China: Total seafood production (wild capture and aquaculture), exports, and U.S. imports

Seafood production, 2018 (million mt)	Global ranking, 2018	Seafood exports, 2019 (billion $)	Value of U.S. imports of seafood, 2019 (billion $)	Share of U.S. seafood imports (%)	Ranking as U.S. supplier of imported seafood	Estimated value of U.S. imports obtained via IUU fishing (million $)
81	1	$19.3	$1.9	9.9	4	$204.3

Source: FAO, Global Production database, accessed May 19, 2020; IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.10, accessed September 22, 2020; USITC DataWeb/USDOC, HTS 03, 1604, 1605, 2301.10; accessed May 19, 2020; USITC IUU import estimates..

Aquaculture production is an important source of seafood products in China, and production is mostly destined for the domestic market. About 81.7 percent of total reported Chinese production of seafood in 2018 was from aquaculture, with the remaining 18.3 percent from capture production.[339] Aquaculture production in China has experienced substantial growth in recent decades, while wild-capture production has remained fairly constant.[340] In 2018, reported aquaculture production increased about 2.8 percent from 2017, but this represented a slower pace than the average annual growth of 4.2 percent between 2010 and 2017.[341] In 2018, China produced 66.1 million metric tons (mt) of aquaculture products, closely split between marine (52.8 percent) and freshwater environments (44.9 percent). Aquaculture production in China is concentrated in inland regions, and most production is destined for domestic consumption. Generally, it is marketed in live form at wholesale markets, with less than 5 percent estimated to be processed for domestic consumption or export markets.[342]

The Chinese aquaculture sector is large and diverse, producing a wider range of species than other large aquaculture producers. The main species groups produced by aquaculture in China are carp (e.g., grass

[333] FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.
[334] Industry representatives, virtual roundtable, September 29, 2020, 20; FAO, *The State of World Fisheries and Aquaculture*, 2020, 86–88.
[335] FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.
[336] FAO, Global Production database, accessed May 19, 2020.
[337] FAO, *The State of World Fisheries and Aquaculture*, 2020, 10.
[338] FAO, Global Production database, accessed May 19, 2020.
[339] FAO, Global Production database, accessed May 19, 2020.
[340] FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.
[341] The remaining 2.4 percent was brackish water production. FAO, Global Production database, accessed May 19, 2020.
[342] FAO, "National Aquaculture Sector Overview: China," accessed October 23, 2020.

and silver carp) and mollusks (e.g., cupped oysters and Japanese carpet shells).[343] Aquaculture production has shifted in recent decades towards production of higher-valued species such as prawns and mitten crab, which accounted for about 30 percent of total production in 2015.[344] The Chinese government is reportedly enforcing more stringent environmental controls, which has resulted in the closure of some aquaculture operations in the country. However, total reported aquaculture production does not yet appear to have declined—only to have slowed its growth compared to previous years.[345]

Fleet

The Chinese fishing fleet is known to be vast and to include small, non-motor-powered fishing vessels as well as larger motorized ones able to fish outside of China's EEZ. Chinese boats are estimated to account for about half of the world's overall fishing activity.[346] Detailed global estimates of countries' fleets in general, and the Chinese fleet in particular, are constrained by data shortfalls, as small vessels are often not registered or included in national statistics. In 2018, China's total fleet was estimated to contain 864,000 vessels.[347] In 2017, a collaboration between the Food and Agriculture Organization of the United Nations (FAO) and various nongovernmental organizations (NGOs) estimated that about two-thirds of the world's fishing vessels over 24 meters in length were Chinese, although these estimates are likely incomplete due to limited use of automatic identification systems among many fleets.[348] Trawlers are the most common vessels in China's DWF fleet. While the largest number of these trawlers operate in the Northwest Pacific, the largest fishing effort of these types of boats is centered on squid fisheries in the Southeast Pacific and Southwest Atlantic.[349]

The Chinese DWF fleet, which accounts for a substantial portion of China's seafood supply, is composed of Chinese-owned, Chinese-flagged vessels as well as vessels with various links to China that are owned and/or registered in foreign countries. It is the largest DWF fleet in the world, with estimates regarding its exact size varying substantially. Until recently, consensus on the size of the DWF fleet had centered around 3,400 vessels classified as DWF vessels by the Chinese government, with a lower-bound estimate of 2,900 vessels; China pledged to cap the fleet at 3,000 vessels in 2020.[350] However, there are indications that the DWF fleet size may be much larger, as a 2020 study classified nearly 17,000 Chinese

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[343] FAO, Global Production database, accessed May 19, 2020.
[344] FAO, "National Aquaculture Sector Overview: China," accessed October 23, 2020.
[345] Godfrey, "Massive Shift Underway in China's Aquaculture," July 16, 2019; FAO, "National Aquaculture Sector Overview: China," accessed October 23, 2020.
[346] Urbina, "How China's Expanding Fishing Fleet Is Depleting," August 17, 2020.
[347] The Chinese fleet was estimated at 1,071,000 vessels in 2013. FAO, *The State of World Fisheries and Aquaculture*, 2020, 41–42; Urbina, "How China's Expanding Fishing Fleet Is Depleting," August 17, 2020.
[348] FAO, *The State of World Fisheries and Aquaculture*, 2020, 45.
[349] In this case, the density of AIS signals was used as a proxy for fishing effort. Gutiérrez et al., *China's Distant-Water Fishing Fleet: Scale, Impact and Governance*, June 2020, 17.
[350] However, the fleet's capacity was not capped. Mallory, "Policy Discussion of Illegal, Unreported, and Unregulated Fishing," December 2020; Fitt, "China Issues New Sustainability Rules," August 14, 2020; CEA, *Distant Water Fishing*, October 2018, 23.

vessels as DWF vessels.[351] This study noted that ownership and operational control of these vessels is complex and opaque, and a labyrinth of company structures and lack of transparency hamper monitoring and enforcement efforts. It also highlighted that the expansion of China's DWF fleet has been supported by tax exemptions and subsidies for fuel and ship construction. Fuel subsidies are of particular importance because of the distances traveled from ports in China to distant fishing waters.[352] However, transparency regarding these subsidies, as well as about other benefits such as tax breaks given to the industry, has reportedly decreased over time.[353]

Regardless of the size of China's DWF fleet, there are a number of indications that its landings are increasing. Catches from the fleet have increased with the expansion of its size and activities, from a reported 1 million mt in 2015 to a reported 2.3 million mt in 2018.[354] During the first half of 2020, local authorities in two of China's primary DWF fleet bases, Fujian and Zhejiang, reported that DWF catches for vessels based in each were up 25.8 percent and 15.7 percent, respectively, compared to 2019.[355] About 40 percent of the catches from this fleet are estimated to be consumed in China, with the remainder contributing to the exportable supply of seafood from the country.[356] Chinese vessels fishing outside of China's EEZ have been known to fly other countries' flags and transship catch to foreign vessels, which adds to the difficulty of obtaining accurate landings estimates (see box 4.1 under "Pacific Island Countries' EEZs" for an example).

Processing

China is the largest seafood processor in the world, with an export-oriented seafood processing sector that produced about 577,000 mt in 2018.[357] In 2019, there were an estimated 8,667 frozen seafood processing establishments in China, owned by 1,802 enterprises. The estimated employment in this sector is 640,986 workers producing about $73.3 billion in revenue.[358] The largest segment of this sector is that producing frozen fish and fillets, which accounted for 60.0 percent of the total industry revenue

[351] This research attributes this discrepancy to differences in territorial definitions. China considers areas of the Yellow Sea, South China Sea, and East China Sea as territorial waters and does not report vessels fishing in these waters as part of its DWF fleet. Thus, this research identified 12,490 Chinese vessels as having operated outside of China's internationally recognized EEZ waters but within these areas that China claims as domestic waters. As China does not consider these vessels to be part of the DWF fleet, it does not report catch from these vessels as being from DWF. Gutiérrez et al., *China's Distant-Water Fishing Fleet: Scale, Impact and Governance*, June 2020, 18.

[352] Gutiérrez et al., *China's Distant-Water Fishing Fleet: Scale, Impact and Governance*, June 2020.

[353] Mallory, "Policy Discussion of Illegal, Unreported, and Unregulated Fishing," December 2020.

[354] FAO, *The State of World Fisheries and Aquaculture*, 2020, 10; FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.

[355] Godfrey, "New Data Indicates Big Jump in China," August 18, 2020.

[356] The FAO notes in *The State of World Fisheries and Aquaculture 2020* that China only provided details on catches for species that were marketed in China, while information on catches of product that was exported was not provided. FAO, *The State of World Fisheries and Aquaculture*, 2020, 10. Recent estimates indicate that about 65 percent of the DWF landings are destined for the Chinese domestic market. Mallory, "Policy Discussion of Illegal, Unreported, and Unregulated Fishing," December 2020.

[357] Godfrey, "New Report: China's Seafood Processing Sector in Decline," April 11, 2019. Seafood processing in China consists of various types of processing, including secondary processing (e.g., filleting) and further processing, including canning and breading.

[358] Chen, *Frozen Seafood Processing in China*, June 2019, 11.

in 2019, followed by the segment producing frozen shellfish (other than crustaceans) and frozen crustaceans, which accounted for 23.0 percent and 11.0 percent of the seafood processing sector's revenue in that same year, respectively.[359] Frozen seafood processing facilities are concentrated in the Chinese East Coast, particularly in the provinces of Shandong and Liaoning, which accounted for 41.5 percent and 21.4 percent, respectively, of the sector's revenue in 2019. About 30.6 percent of the frozen seafood processing establishments and 40.5 percent of workers were located in Shandong province, while 16.1 percent and 17.0 percent, respectively, were located in Liaoning.[360]

Among the main products processed in China are those made from imported seafood species such as cod, pollock, tuna, salmon, and crab.[361] Although China's processing sector is fragmented, state-owned enterprises dominate large portions of the industry, including some of the top seafood brands by value and scale of distribution.[362]

One segment of the Chinese sector that processes seafood for exports relies on imported raw materials, and this segment has two main models. Under the "import for re-export" model, Chinese companies import raw seafood for processing, taking ownership of the product. Under the "contract processing" model, on the other hand, companies are contracted for processing but do not take ownership of the product. Contract processing accounted for about 17.4 percent of the total volume processed for export in China in 2018 and mostly involves species consumed in Western markets. However, the Chinese industry is attempting to shift away from contract processing towards processing fish owned by Chinese processors or caught by the Chinese DWF fleet, as it aims to retain more value domestically.[363] While, in general, processing for exports is reportedly in slight decline in China, processing for the domestic market is expanding as domestic demand for processed seafood increases in the country.[364]

Domestic demand for processed seafood products in China is growing at a faster rate than exports of those goods and is reportedly driving shifts in the Chinese processing industry.[365] China is said to be aiming to move seafood processing to higher-value products, such as breaded shrimp.[366] Chinese consumers are increasingly demanding higher-quality seafood as well as convenience foods, including

[359] Other segments include frozen seaweed production, which accounted for 3.2 percent of the revenue, and frozen cephalopods, which accounted for 1.0 percent. Chen, *Frozen Seafood Processing in China*, June 2019, 14.
[360] Chen, *Frozen Seafood Processing in China*, June 2019, 20.
[361] World Fishing and Aquaculture, "Chinese Processing Industry to Develop Domestic Market," March 10, 2015.
[362] The main seafood processing companies include Homey Group, Zhangzidao Group Co. Ltd., Qingdao Jiayuan Group Co. Ltd., Xixiakou Group Co. Ltd., and Chishan Group. While these companies together accounted for less than 2 percent of the market share for frozen seafood products in China in 2019, most have an expanded presence in China and outside, including various subsidiaries and joint ventures in the United States, Japan, and South Korea, Most also export processed seafood to those markets. Godfrey, "Sea Cucumbers, State-owned Firms," March 18, 2015; Chen, *Frozen Seafood Processing in China*, June 2019, 22, 26–30.
[363] This sector focuses on processing whitefish and shrimp products for Western markets. Margins in the Chinese contract processing sector are low and labor costs in China have been increasing, further reducing the profitability of the sector. Godfrey, "New Report: China's Seafood Processing Sector in Decline," April 11, 2019.
[364] Godfrey, "New Report: China's Seafood Processing Sector in Decline," April 11, 2019. Increasing costs in China are also contributing to the reduction of the processing-for-exports segment, as processing facilities relocate to reduce transportation costs, among other factors. For example, groundfish processing plants are reportedly relocating to Europe. FAO, *The State of World Fisheries and Aquaculture*, 2020, 86.
[365] Godfrey, "New Report: China's Seafood Processing Sector in Decline," April 11, 2019.
[366] Godfrey, "New Report: China's Seafood Processing Sector in Decline," April 11, 2019.

frozen products, shifting away from a predominantly live and fresh market.[367] As the Chinese domestic market has grown, Chinese processors and fishers serving this market are focusing on species consumed domestically.[368] Imports of frozen seafood, for example, have declined as a share of domestic demand, falling from 10.8 percent in 2014 to 6.8 percent in 2019, partly as a result of the expansion and improvement in the quality of the domestically produced seafood products.[369]

To support expanding production and meet increased demand for seafood products both in China and globally, as well as for fishmeal and fish oil used in aquaculture production, Chinese companies have invested in processing capabilities outside of China. This includes established business operations in large seafood-producing countries, including Spain, Australia, and Peru.[370] In 2016, the Chinese company Shanghai Kaichuang (now part of the Chinese food conglomerate Bright Food) purchased the Spanish processed seafood producer Hijos de Carlos Albo. Reportedly this was in response to the increased consumption of seafood in China (see "Consumption" below for more information) as well as the increased global demand for these products.[371] Also in 2016, Chinese conglomerate Legend Holdings acquired a majority stake of Australian firm Kailis Bros, which buys and handles about 70 percent of all commercial fish caught in West Australia.[372] Chinese investment is not focused only on fishery products for human consumption. For instance, in 2013, the China Fishery Group acquired the fishmeal and fish oil producer Copeinca, a Norway-based company with operations in Peru, where Copeinca controlled 17 percent of the total fishing production.[373]

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[367] Godfrey, "New Report: China's Seafood Processing Sector in Decline," April 11, 2019; Chen, *Frozen Seafood Processing in China*, June 2019, 8; USDA, FAS, *Continued Seafood Import Growth in 2019*, May 8, 2020.
[368] Fishers serving the sector include the distant-water fleet as well as Chinese companies abroad in countries such as Canada, Argentina, Spain, and the United States. Harkell, "China's Largest Seafood Companies Lose Ground," April 30, 2019; Godfrey, "New Report: China's Seafood Processing Sector in Decline," April 11, 2019.
[369] Chen, *Frozen Seafood Processing in China*, June 2019, 9.
[370] Chinese interest in seafood companies, whether or not deals have materialized, has been reported in various countries, including in Chile, with the purchase of farmed salmon producer Australis Seafoods by Joyvio Group, a subsidiary of Legend Holdings; in Malaysia, with the purchase of shrimp supplier Pegagau Aquaculture; and in Mauritania, with the establishment of a joint venture with a local company to produce fishmeal in the country. White, "Joyvio Group Agrees to Acquire Australis Seafoods," November 20, 2018; Undercurrent News, "Despite Tuna Deal Failure," August 6, 2019; Harkell, "New Sino-West Africa Fishing," accessed August 17, 2020.
[371] Shanghai Kaichuang is reported to have plans for expanding its presence in the Spanish market with a new facility that was expected to begin operating in 2020. Other Chinese companies have shown interest in purchasing Spanish seafood firms, including multinational, vertically integrated Nueva Pescanova and Iberconsa. Nueva Pescanova was acquired by Spanish bank Abanca, while Iberconsa was acquired by U.S.-based firm Platinum Equity. La Voz de Galicia, "El capital asiático se acomoda" (Asian capital makes itself at home), May 16, 2019; FIS, "Conservas Albo, S.A.—Hijos de Carlos Albo, S.A.," accessed September 29, 2020; White, "Platinum Equity Acquires Iberconsa from Portobello Capital," March 7, 2019; White, "Changes Coming to Nueva Pescanova after Abanca Takes Control," March 31, 2020.
[372] Brammer, "Kailis Brothers 'Leave' Seafood Company," March 21, 2019.
[373] While China Fishery Group filed for bankruptcy and announced it will sell Copeinca, a deal for the acquisition of Copeinca by another company has not been announced. Reportedly, the two main bidders for Copeinca are Chinese companies. Post, "Distressed Chinese Firm to Sell Peru's Largest Fishery," January 7, 2016; FIS, "CFG Investment S.A.C. Peru," accessed September 29, 2020; Seafood Source, "China Fishery Gets 98% of Copeinca," July 31, 2013; Copeinca, "Copeinca: Products," accessed September 29, 2020.

Consumption

Consumption of seafood products in China has increased in the last several decades and reached 36 percent of the total global consumption of seafood in 2017.[374] This contributed to the shift in the share of global consumption from the historically leading markets of Japan, the United States, and the European Union (EU) to China and other countries in Asia. In 2017, Asia —including Japan— accounted for 71 percent of global consumption.[375] In 2018, seafood represented over 20 percent of the animal protein consumed in China.[376] Estimates of seafood consumption in the country, however, are varied. While the FAO estimated that per capita consumption of seafood in China in 2015 was around 41 kilograms (kg) per year—two times the global average in that year—the Chinese government estimated the figure to be 14.3 kg in urban areas and 5.3 kg in rural areas.[377] Based on their estimate, the Chinese government has projected an increase in per capita consumption to 25 kg overall, and 30 kg in urban areas, by 2027.[378] The FAO projected that Chinese per capita seafood consumption would reach 35.9 kg in 2020.[379] In short, Chinese consumption of seafood has increased in the last several decades and is expected to continue to grow. To supply this increase, imports of seafood not produced in China—which have gained popularity among Chinese consumers—have grown in recent years.[380] For example, China has become an important market for exports of live lobsters, with imports of this product from multiple countries increasing substantially over the last three years.[381]

Trade

China was the world's largest exporter of seafood products in 2019, accounting for about $20 billion (14.1 percent) of global exports.[382] Most Chinese exports of seafood in 2019 were in the form of fresh or frozen fish fillets (21.5 percent), various mollusks products (14.8 percent) and frozen fish products, excluding fillets (14.3 percent).[383] In 2019, Chinese exports of seafood products decreased about 7.5

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[374] 2017 data are the most recent data available for global consumption as of December 2020. FAO, *The State of World Fisheries and Aquaculture*, 2020, 70.
[375] Multiple factors have contributed to this shift, including the increasing role of Asian countries in seafood production, as well as population and income growth. According to FAO, in 1961 Asia accounted for 48 percent of the total global consumption of seafood. FAO, *The State of World Fisheries and Aquaculture*, 2020, 70.
[376] FAO, *The State of World Fisheries and Aquaculture*, 2020, 67, 69.
[377] Other estimates have put this figure at 30 kg and between 40 and 45 kg per year. *The State of World Fisheries and Aquaculture,* 2018, 72; Harkell, "How Much Seafood Does China Consume?," May 23, 2019.
[378] Some estimates take into account factors such as domestic production and imports (minus exports) to estimate per capita consumption in China. The Chinese government, however, appears to use different metrics for estimating this figure, which are believed to not account for seafood consumed away from home. In China, as in other Southeast Asian countries, a substantial portion of the total seafood consumption is derived from fish that is purchased live and consumed at home. According to the Chinese government, 42 percent of the population in China eats seafood regularly, with seafood consumption being higher in coastal regions, including Fujian, Shanghai, and Hainan. Harkell, "How Much Seafood Does China Consume?," May 23, 2019; Godfrey, "Higher Seafood Consumption Predicted in China," February 22, 2019; FAO, *The State of World Fisheries and Aquaculture*, 2020, 61.
[379] Godfrey, "Higher Seafood Consumption Predicted in China," February 22, 2019.
[380] FAO, *The State of World Fisheries and Aquaculture*, 2020, 75.
[381] Harkell, "Live Lobster, Crab Exporters Rush," January 17, 2020.
[382] IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.20, accessed December 17, 2020.
[383] IHS Markit, Global Trade Atlas database, HS 0304, 0307, 0303, accessed December 17, 2020.

percent in value compared to 2018, after increasing 10.0 percent between 2015 and 2018.[384] The main markets for Chinese seafood exports are Japan (19.0 percent), the United States (12.1 percent), and the EU (11.0 percent, excluding the United Kingdom).[385]

In 2019, China was the third-largest global importer of seafood products, following the EU and the United States. China imported $23 billion of these goods, accounting for 13.2 percent of global imports in 2019. [386] Chinese imports of seafood products have leveled off in recent years, after increasing 6.8 percent in the 2014–17 period. Russia is the largest supplier of seafood products to China, accounting for about 17.6 percent of total Chinese imports of seafood in 2019, followed by Ecuador (8.6 percent) and the United States (7.9 percent). [387] The main seafood products imported into China are various crustacean products (39.1 percent), frozen fish products excluding fillets (27.5 percent), and fishmeal (12.3 percent).[388] Chinese imports of seafood products have more than doubled in value between 2015 and 2019, driven by an almost threefold increase in imports of crustacean products, particularly of shrimp and prawns, lobster, and crab products.[389]

U.S. Imports from China

Total U.S. imports of seafood from China increased between 2015 and 2018, averaging $2.7 billion annually in the period, but fell substantially ($1.9 billion; 34.2 percent) in 2019.[390] U.S. imports of marine-capture products on the whole fell by $530 million (30.6 percent) in 2019, partly due to trade disputes between the United States and China, which included the imposition of tariffs on certain seafood products from both countries.[391] While imports of most marine-capture products fell, U.S. imports of certain products from China increased in 2019.[392] U.S. imports of walleye pollock from China increased the most in that year, expanding by $30.3 million (24.7 percent).[393]

The Commission estimates that in 2019, 37.6 percent of U.S. imports of marine-capture products from China sourced by the Chinese fleet originated in the Chinese EEZ, with distant-water landings contributing the remaining 62.4 percent. Almost 50 percent of total U.S. imports of marine-capture

[384] IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.20, accessed December 17, 2020.
[385] IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.20, accessed December 17, 2020.
[386] IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.20, accessed December 17, 2020.
[387] IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.20, accessed December 17, 2020.
[388] IHS Markit, Global Trade Atlas database, HS 0306, 0303, 2301.20, accessed December 17, 2020.
[389] IHS Markit, Global Trade Atlas database, HS 0306, accessed December 17, 2020.
[390] USITC IUU import estimates.
[391] Products including tilapia and lobster were included on the list of products subjected to tariffs from both countries. For more information on the tariffs imposed by the United States and China in the trade dispute, see USITC, *Section 232 and 301 Trade Actions in 2018*, December 2019. Shifts in Chinese government priorities, including efforts to reduce fishing capacity as mentioned above, also impacted exports of seafood from China to the United States. FAO, *The State of World Fisheries and Aquaculture*, 2020, 75, 86.
[392] Decreases among top species were more modest in magnitude: Atlantic cod decreased by 11.7 percent; Pacific cod fell by 6.7 percent; sockeye salmon fell by 5.1 percent); other squid fell by 32.3 percent; and pink salmon fell by 17.9 percent. USITC IUU import estimates.
[393] Frozen pollock products (classified under HTS subheading 0304.75) are included within products subject to section 301 tariffs under subheading 9903.88.16 and represent the majority of U.S. imports of walleye pollock products from China. USITC IUU import estimates; USITC, Harmonized Tariff Schedule of the United States (2020) Revision 22.

products from China were estimated to originate in neighboring countries' EEZs, primarily those of Russia (28.8 percent), Japan (15.6 percent) and South Korea (4.0 percent). The remainder is captured further afield, with smaller amounts originating in African EEZs (about 5.4 percent) and South American EEZs (about 4.3 percent). The majority of the product sourced by the Chinese DWF fleet is imported into the United States from China itself, with a smaller fraction moving through other countries, particularly Thailand.[394]

China is a large supplier of many types of fishery products to the United States, including products imported into China from other countries for further processing.[395] In 2019, the main U.S. imports of seafood products from China were of tilapia, Atlantic cod, walleye pollock, Pacific cod, pink salmon, and certain squid products (table 4.2). However, as a large processing country, a large share of the U.S. imports of seafood products from China are derived from non-Chinese sources. For example, an estimated 69.4 percent of the total U.S. imports of Atlantic cod and 50.2 percent of the U.S. imports of walleye pollock from China were sourced by Russian vessels, while an estimated 28.4 percent of the total Pacific cod were sourced by U.S. vessels. In contrast, U.S. imports of tilapia and warmwater shrimp from China, which are mostly produced by aquaculture, are sourced from Chinese producers.[396]

Table 4.2 Total U.S. imports from China and estimates of source fleet, by value, 2019 (million dollars)

Product	Total U.S. imports from China	Chinese origin	Russian origin	Norwegian origin	U.S. origin	All other origins
Tilapia[a]	333	333	0	0	0	0
Atlantic cod	161	0	111	38	0	11
Walleye pollock	153	71	77	0	4	1
Pacific cod	130	60	26	0	37	7
Sockeye salmon	115	16	86	0	13	0
Warmwater shrimp[a]	103	98	0	0	0	5
Squid, other than Loligo	101	89	1	0	1	10
All other	810	482	49	37	141	101
Total	1,905	1,150	350	75	195	135

Source: USITC IUU imports estimates.
[a] Mainly produced by aquaculture.

Russia is the largest third-party source of U.S. imports of fishery products that are processed in China, most of which are sourced in Russian EEZs. Russia is the primary source for Atlantic cod and walleye pollock through this route.[397] The United States is the second-largest overall third-party source of seafood processed in China that is destined for re-export to the United States; in fact, 95.3 percent of the total U.S. seafood exports to China are for processing.[398] The vast majority of the estimated U.S.

[394] About 22.9 percent of the DWF catch is estimated to move through other countries. USITC IUU import estimates.
[395] Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood," September 2014; Mallory, Chen, and Leng, *A Traceability-for-Sustainability System Analysis of China's Fishery*, accessed December 9, 2020.
[396] USITC IUU import estimates.
[397] Further, walleye pollock sourced by the Chinese fleet is estimated to be caught in Russia's EEZ. USITC IUU import estimates.
[398] Haddon and Newman, "Fish Caught in America, Processed in China," August 9, 2018; USITC IUU import estimates.

imports of U.S. sourced products from China are from the EEZ waters around Alaska, which is reflected in the primacy of Pacific species, including walleye pollock, Pacific cod, and Pacific salmon.[399]

Farmed shrimp, eel, and tilapia are among the main species of aquaculture products exported from China. The United States is the main market for shrimp and tilapia and an important market for other types of seafood produced via aquaculture.[400] U.S. imports of aquaculture products from China declined by $437 million (41.4 percent) in 2019, with imports of tilapia and warmwater shrimp driving the decrease.[401] U.S. imports of farm-raised tilapia fell from $380 million to $290 million (a 23.7 percent decrease), while imports of farm-raised warmwater shrimp fell from $281 million to $87 million (a 68.9 percent decline).[402] In 2019, aquaculture products accounted for 46.7 percent of total U.S. imports of Chinese-origin seafood from all sources.[403]

Fisheries and Fleet Management

The main regulatory agency responsible for the administration of Chinese fisheries is the Bureau of Fisheries and Fisheries Management under the Ministry of Agriculture. This bureau oversees the creation of the national fisheries development strategy, drafts and supervises the enforcement of fisheries laws, regulations, and codes, and is charged with fisheries management and sustainability, among other functions. It is responsible for regulating processing facilities, performing fishing vessel inspections and licensing, overseeing fishing ports, and collecting and publishing fisheries information and statistics.[404] The bureau is also responsible for participating in the administration of international conventions and multilateral and bilateral fisheries agreements.[405]

The main fisheries legislation in China is the Fisheries Law of the People's Republic of China of 1986, as amended, which defines aquaculture and fishing in China and assigns jurisdiction over fisheries management, including allocation of fishing quotas and fishing licenses.[406] The law requires administrative departments for fisheries in the country to prepare plans and "take measures to increase the fishery resources in the waters under their jurisdiction," prioritizing aquaculture and research in

[399] Almost all of U.S. catch routed this way is derived from the U.S. EEZs. In addition to pink salmon, substantial amounts of U.S. sourced sockeye salmon, chum salmon, and flounder are imported into the United States from China, likely after further processing. USITC IUU import estimates.
[400] FAO, "National Aquaculture Department Profile: China (Chinese Version)," accessed December 8, 2020.
[401] USITC IUU import estimates.
[402] USITC IUU import estimates.
[403] USITC IUU import estimates.
[404] FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.
[405] FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.
[406] Other relevant laws and regulations include the Law of Environment Protection, the Law of Preventing Water Pollution, the Law of Environment Protection, the Provision of Fishing License Management, the Code of Aquaculture Products Quality Safety Management, the Regulation of Wild Aquatic Animal Protection, the Regulation of Wild Aquatic Animal and Plant Natural Conservation Management, and the Management Regulation of Preventing the Marine Engineering Pollution Impacted on the Marine Environment. FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.

fisheries science.[407] Finally, the law prohibits certain fishing practices, including the use of explosives, poison, and electricity, among others, and sets the penalties imposed for prohibited actions.[408]

Though management and regulation of China's DWF fleet, like other aspects of the Chinese fisheries sector, is controlled by the Ministry of Agriculture, regulations are implemented through the China Overseas Fisheries Association (COFA), the public face of China's distant-water fisheries.[409] All companies fishing outside China are required to be COFA members.[410] Though COFA's resources reportedly are limited, part of its ability to implement policies and monitor DWF vessels is based on compliance and support from state-owned enterprises, which own a large share of China's DWF fleet.[411] In 2013, the Ministry of Agriculture implemented a consolidation policy requiring DWF vessels to register annually and deposit a bond of RMB30 million (currently about $4.4 million) for every six registered vessels or 2,000 gross tons, thus reducing the number of entities to be monitored. Each such bond links the activities of the six vessels it covers: under the policy, violations by one vessel will lead authorities to stop operations by all vessels in the group until an investigation is completed.[412]

In early 2020, reportedly in response to international criticism, China adopted a series of rules aimed at improving the regulation and management of the DWF fleet, reducing IUU fishing, increasing transparency, and promoting sustainability.[413] These regulations have reportedly shifted the focus in Chinese policy from increasing landings to improving product quality by consolidating the supply chain to focus on seafood processing.[414] Among these rules are the Distant Water Fishing Management Regulations, the Management Measures for the High Seas Squid Fishery, the Rule for High Seas Transshipment, and the revision to the Administrative Measures of the Vessel Monitoring System.[415] The new regulations for the Chinese DWF fleet include harsher penalties for company managers that engage in IUU fishing activities, require transponder reporting every hour, and require reporting and onboard independent observers to be present for transshipment at sea.[416] To protect overfished squid stocks, the regulation indicated that it would implement seasonal closures for squid fishing in the high seas in the Southwest Atlantic Ocean between July and September, and in the eastern Pacific Ocean between September and November.[417] Although these policies are considered positive steps towards

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[407] Government of China, Fisheries Law of the People's Republic of China (promulgated by the Standing Comm. Nat'l People's Cong., January 20, 1986, as amended August 28, 2004), 4.
[408] Government of China, Fisheries Law of the People's Republic of China (promulgated by the Standing Comm. Nat'l People's Cong., January 20, 1986, as amended August 28, 2004), 4, 6.
[409] Campling, Lewis, and McCoy, *The Tuna Longline Industry*, 2017.
[410] As noted above, China's classification of DWF companies does not include ownership of vessels that fish in waters of the Yellow Sea, East China Sea, and South China Sea that China claims as territorial waters.
[411] Campling, Lewis, and McCoy, *The Tuna Longline Industry*, 2017.
[412] Companies had a four-year transition period to comply with the regulation. Information on the effectiveness and enforcement of the policy is not available. Campling, Lewis, and McCoy, *The Tuna Longline Industry*, 2017.
[413] Mallory, "Policy Discussion of Illegal, Unreported, and Unregulated Fishing," December 2020.
[414] Mallory, "Policy Discussion of Illegal, Unreported, and Unregulated Fishing," December 2020.
[415] Fitt, "China Issues New Sustainability Rules," August 14, 2020.
[416] The penalty for ship captains is the removal of their license for five years and for company managers, the removal of their managerial roles for three years. Previously, transponder reporting was required every four hours. Fitt, "China Issues New Sustainability Rules," August 14, 2020.
[417] Fitt, "China Issues New Sustainability Rules," August 14, 2020.

regulating the Chinese DWF fleet, it is not clear how these regulations will be implemented and enforced.[418]

While fisheries management in the Chinese EEZ is governed by domestic regulations, Chinese vessels are also subject to regulations set forth by fishery bodies and regional fisheries management organizations (RFMOs) to which the country is a party. China is a member of eight RFMOs that manage areas where Chinese vessels fish, as well as areas that host highly migratory species that Chinese vessels catch (appendix H). China is also a member of other regional fisheries bodies, including the Asia-Pacific Fishery Commission and the International Whaling Commission, among others.[419] In addition, China has signed fisheries agreements and bilateral fishery cooperation agreements with over 20 countries, including with neighboring countries such as Japan, South Korea, Vietnam, and Russia.[420] China has also ratified or acceded to a number of international conventions that regulate fishing and labor, including the United Nations (UN) Convention on the Law of the Sea (table 4.3). China is also a party to the two core International Labour Organization (ILO) conventions on child labor; however, the country has not ratified the two core ILO conventions on forced labor. China also has not ratified the Work in Fishing convention. Further, although China committed to ratifying the Port State Measures Agreement of 2009 (PSMA) in 2017, as of 2020 it had not done so.

Table 4.3 Chinese status of UN treaties and ILO conventions on fishing and labor

International agreement	China ratification status
UN Convention on the Law of the Sea	Ratified (1996)
UN Fish Stocks Agreement	Not ratified (signed in 1996)
UN Port State Measures Agreement	Non-party
UN Protocol to Prevent, Suppress and Punish Trafficking in Persons Especially Women and Children, supplementing the United Nations Convention against Transnational Organized Crime	Acceded (2010)
UN Convention on the Rights of the Child	Ratified (1992)
ILO Forced Labour Convention (C29)	Not ratified
ILO Protocol of 2014 to the Forced Labour Convention (P29)	Not ratified
ILO Freedom of Association and Protection of the Right to Organise Convention (C87)	Not ratified
ILO Right to Organise and Collective Bargaining Convention (C98)	Not ratified
ILO Equal Remuneration Convention (C100)	Ratified (1999)
ILO Abolition of Forced Labour Convention (C105)	Not ratified
ILO Discrimination (Employment and Occupation) Convention (C111)	Ratified (2006)
ILO Minimum Age Convention (C138)	Ratified (1999)
ILO Worst Forms of Child Labour Convention (C182)	Ratified (2002)
ILO Maritime Labour Convention (MLC)	Ratified (2015)
ILO Work in Fishing Convention (C188)	Not ratified

Sources: UN, "Law of the Sea," United Nations Treaty Collection, accessed August 2, 2020; Fish stocks; PSMA; UN, "Protocol to Prevent, Suppress and Punish Trafficking in Persons," United Nations Treaty Collection, accessed August 2, 2020; UN "Convention on the Rights of the

[418] Mallory, "Policy Discussion of Illegal, Unreported, and Unregulated Fishing," December 2020.
[419] For information on regional fisheries management organizations (RFMOs), see chapter 2. FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020.
[420] The monitoring of Chinese vessels in Russian waters is facilitated through the Sino-Russian Fisheries Cooperation Commission. FAO, "Fishery and Aquaculture Country Profiles: The People's Republic of China," accessed August 13, 2020; Godfrey, "China Scoops Access to Russian Waters," December 5, 2014.

Child," United Nations Treaty Collection, accessed August 3, 2020; ILO, "Ratifications for China," NORMLEX Information System on International Labor Standards, accessed August 18, 2020.
Note: ILO = International Labour Organization.

Not ratifying the PSMA has contributed to China being ranked as a poor performer in a recently published report, *The Illegal, Unreported, and Unregulated Fishing Index*, by Poseidon and The Global Initiative Against Transnational Organized Crime. The report ranked China as the overall worst-performing port country in terms of meeting its responsibilities to combat IUU fishing. The report took into account views from experts in port compliance and other factors to estimate the country's vulnerability to allowing imports of product obtained via IUU fishing. For example, factors like having a large number of foreign vessels in port were considered as increasing China's vulnerability, while ratification of the PSMA would have been considered a factor that mitigates these risks.[421]

This poor performance in its responsibilities as a port country has contributed to the Chinese seafood processing sector being called out as a potential source of seafood caught via IUU fishing by Chinese and other countries' vessels. The processing sector is large and fragmented, and largely relies on imported raw materials for export. In addition, the industry has been highlighted for its lack of traceability and transparency, which is compounded by an obscure Chinese customs schedule for fishery products. A clearer schedule would allow for analysis of imports and exports from the country.[422]

IUU Fishing Activities including Labor Issues

China has been linked to multiple IUU fishing activities, primarily by vessels from its DWF fleet fishing in in extraterritorial waters, including in neighboring EEZs, EEZs outside of East Asia, and the high seas. Historically, Chinese DWF vessels have been identified as major sources of seafood obtained via IUU fishing, which has led the Chinese government to announce a series of measures aimed at curbing these activities. Statistics reported by the Chinese government show a decline in overall marine-capture production, resulting in part from efforts to reduce fishing capacity in the country. However, independent research shows that the total Chinese catch could exceed the reported estimates and that large volumes of catch remain unreported.[423] Additionally, various reports point to the prevalence of activities associated with IUU fishing in the Chinese EEZ, including use of destructive fishing gear, instances of smuggling of seafood, and the mislabeling and adulteration of products for the Chinese

[421] The index evaluated and attributed a score to vulnerability, prevalence, and response aspects for all countries. The vulnerability measure, which ranks countries in terms of the vulnerability of IUU seafood entering their supply chains, showed 12 countries, including China, tied for first place. This measure of vulnerability reflects the number of fishing ports and visits by foreign or carrier vessels, while the indicator for prevalence relies on expert opinions on port compliance incidents gathered by the developers through surveys. Poseidon Aquatic Resource Management Ltd., Global Initiative Against Transnational Organized Crime, "About the IUU Fishing Index," accessed October 26, 2020; Poseidon Aquatic Resource Management Ltd. and Global Initiative Against Transnational Organized Crime, *The Illegal, Unreported, and Unregulated Fishing Index*, January 2019.
[422] Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood," September 2014; Sterling and Chiasson, "Enhancing Seafood Traceability Issues Brief," August 22, 2014.
[423] A study estimated that the total Chinese catch between 2000 and 2011 was 10 times greater than the reported catch. CEA, *Distant Water Fishing*, October 2018, 23.

market.[424] Further, Chinese ports have been highlighted as highly vulnerable to allowing imports of seafood obtained via IUU fishing to enter the country, both for domestic sale and for processing for the domestic or export markets.

Before its recent efforts aimed at reducing fishing capacity, the Chinese government had made significant investments in fishing technology and logistics in order to increase domestic production of fishery products. These investments enabled the country’s DWF fleet to expand and to operate widely in foreign EEZs and on the high seas. As noted earlier, China has the largest DWF fleet in the world, and satellite data show its fleet has the most widespread activity—i.e., it fishes in the highest number of extraterritorial waters. It is estimated that between 2013 and 2016, the fleet fished in over 50 foreign EEZs.[425] In 2013, Oceana reported that China’s DWF fleet largely operates around the globe without access agreements or under access agreements that are secret. The report noted that Chinese fleets catch well above the surplus they have been allocated in countries where they operate legally, and that Chinese authorities do not publish catch statistics or stock evaluations from the waters exploited by their DWF fleet.[426] While some of this fishing is permitted under bilateral agreements, the Chinese DWF fleet has been reported to have made illegal incursions into countries’ EEZs since the 1990s.[427]

Multiple IUU fishing activities of Chinese vessels operating in distant waters have been documented throughout the years. For instance, in its first biennial report to Congress in 2009, the National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NOAA Fisheries) identified China as having a number of Chinese-flagged vessels engaging in the unauthorized harvesting of toothfish in 2006 and 2007. This unauthorized harvesting took place in waters under the jurisdiction of the Convention on the Conservation of Antarctic Marine Living Resources, of which both the United States and China are members. China took corrective actions by revoking the licenses of the vessels identified by NOAA Fisheries and confining them to port, which resulted in a positive certification for the country in 2011.[428]

NOAA Fisheries has not since listed China as engaging in IUU fishing in its biennial report. The agency notes that despite the numerous allegations of incursions made by Chinese vessels fishing in contravention of conservation and management measures in multiple third-country EEZs, these activities do not serve as a basis for listing China in its biennial reports, since the activities have occurred

[424] For example, in 2015 Chinese officials charged seafood smugglers reported to have smuggled seafood into China and mislabeled salmon as mackerel to avoid high import duties. Godfrey, “Criminality Hampers Branding, Innovation,” April 16, 2018; Godfrey, “Chinese Authorities Bust Huge Seafood Smuggling Ring,” June 2, 2015.
[425] CEA, *Distant Water Fishing*, October 2018, 23.
[426] According to the U.N. Convention of the Law of Seas, coastal nations whose domestic fleets do not harvest the total allowable catch within their EEZs are obligated to give access to others to the surplus of the allowable catch not captured by domestic fishing within their EEZs. UN Division for Ocean Affairs and the Law of the Sea, *The United Nations Convention on the Law of the Sea*, 2012.
[427] Indonesian, Japanese, Philippine, and Vietnamese forces have arrested and fired upon Chinese fishers that have allegedly encroached into their territorial seas. U.S. National Intelligence Council, *Global Implications of Illegal, Unreported, and Unregulated (IUU) Fishing*, September 19, 2016, 14.
[428] For more information on NOAA Fisheries biennial reports, see chapter 2. NOAA Fisheries, *Report to Congress Pursuant to Section 403*, January 2009, 94; NOAA Fisheries, *Report to Congress Pursuant to Section 403*, January 2011, 84.

outside the U.S. EEZ or under the jurisdiction of RFMOs to which the United States is not a party.[429] However, in its 2019 biennial report to Congress, NOAA Fisheries highlighted issues with China's fishing practices, noting the agency's concerns with allegations of IUU fishing by Chinese-flagged vessels. The agency stated that these activities occur in almost every region of the world and might indicate "a possible pervasive problem from Chinese-flagged fishing vessels."[430] NOAA Fisheries also noted that a number of the stateless vessels on the North Pacific Fisheries Commission IUU vessel list appeared to have characteristics of Chinese registration, although the Chinese government denied these were Chinese-flagged.[431] In 2020, China had the most vessels —21— carrying any country's flag that were listed by RFMOs as engaging in IUU fishing, while 111 of the 168 vessels listed appear to be stateless.[432]

Chinese vessels have also reportedly been operating under conditions suggesting forced labor. According to the U.S. Department of State *2019 Trafficking in Persons* report, China is considered a Tier 3 country for human trafficking.[433] The report notes that the country is not only a source and destination for victims of human trafficking, but also serves as a "transit point to subject foreign individuals to trafficking in other countries throughout Asia and in international maritime industries."[434] African and Asian workers have reportedly been exploited aboard Chinese vessels operating in the Atlantic, Pacific, and Indian Oceans, and it is believed that fishers from other regions may be subjected to these conditions as well. Further, in 2020, the U.S. Department of Labor (USDOL) added fish from China to the *2020 List of Goods Produced by Child Labor or Forced Labor*. USDOL notes that there are reports of numerous adults forced to work on board fishing vessels that are part of China's DWF fleet. Most of the workers—estimated to be in the tens of thousands—are migrants from Indonesia and the Philippines. These workers, the report notes, are recruited using deceptive tactics and required to pay recruitment fees and sign debt contracts.[435]

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[429] Under U.S. regulations, only vessels fishing in the U.S. EEZ or vessels under the jurisdiction of RFMOs to which the United States is a party can be identified for engaging in IUU fishing by NOAA Fisheries. NOAA Fisheries notes that, although several RFMOs to which both the United States and China are parties prohibit fishing without authorization in a party's EEZ, the protocols place the responsibility on the aggravated party. Thus the country in which EEZ Chinese-vessels are fishing without authorization is responsible for initiating the discussion and, if unresolved, for bringing matters before the RFMO. NOAA Fisheries, *Improving International Fisheries Management*, 2019, 37.
[430] NOAA Fisheries, *Improving International Fisheries Management*, 2019, 37.
[431] For example, some vessels were observed broadcasting identification numbers assigned to China, and others had the name of a Chinese port painted on the side of the vessel, while others had the word "China" painted on the side in large lettering. NOAA Fisheries, *Improving International Fisheries Management*, 2019, 38.
[432] Twenty-one vessels carrying the Chinese flag were listed as engaging in IUU activities by RFMOs as of March 2020. A vessel is considered stateless if it doesn't fly a country's flag or if it flies multiple flags at once. TMT, "Combined IUU Vessel List," March 30, 2020; Industry representative, interview with USITC staff, May 28, 2020.
[433] Tier 3 is defined as "countries whose governments do not fully meet the Trafficking Victims Protection Act's minimum standards and are not making significant efforts to do so." USDOS, *2019 Trafficking in Persons Report*, June 2019.
[434] USDOS, *2019 Trafficking in Persons Report*, June 2019.
[435] Workers are reported to be held on board for months and not paid the promised wages. These workers face hunger and dehydration and live in degrading and unhygienic conditions. Many are subjected to physical violence and verbal abuse. USDOL, ILAB, *2020 List of Goods*, September 2020, 63. The addition of China and Taiwan to the report in 2020 represents the first economies that have been included for violations on vessels in their DWF fleets. Colby, "Policy Discussion of Illegal, Unreported, and Unregulated Fishing," December 2020.

The potential for labor violations against migrant workers on Chinese-flagged and Chinese-owned DWF vessels has recently been highlighted in a number of media and NGO reports. Reported issues primarily involve migrant workers: Chinese fishing companies are increasingly sourcing workers from Southeast Asian and African countries because Chinese workers are less willing to work on DWF vessels.[436] Moreover, some of these reports suggest that migrant workers are discriminated against relative to Chinese workers on the same vessels.[437] At least eight deaths have been reported on Chinese-flagged vessels since November 2019.[438] As a result of these reports, the Spain-based association of tuna fishers in the Atlantic, Indian, and Pacific Oceans (Organization of Associated Producers of Large Freezer Tuna Vessels, or OPAGAC) have called upon the EU to revise its import criteria to strictly apply the ILO's Work in Fishing Convention to seafood imports from China.[439] The association further states that this would require the EU to enact regulations to ensure European consumers do not consume fish from boats with slaves on board or from those that do not respect the minimum social conditions or salaries set by the ILO.[440]

Activities by Fishing Area

Chinese fishing practices vary by region and species and have been well documented in various areas, including in the EEZs of East and Southeast Asia, Pacific Island Countries, Africa, and South America. While satellite data show that Chinese vessels spend most of their time fishing in the Chinese EEZ, they also show that Chinese vessels are present in almost every fishing area in the world (table 4.4).

Table 4.4 Prominent fishing areas for distant-water fishing effort by Chinese vessels, 2018

Area	Fishing activity by Chinese vessels in area (hours)	Chinese vessels' share of total fishing activity in area (%)
East and Southeast Asia	519,499	20.8
East Asia (excl. China)	417,660	18.4
Southeast Asia	101,839	44.6
Pacific Islands	489,360	34.0
Africa	269,552	12.3
South America	105,533	8.3
All other	43,410	([a])
Total	1,427,354	([a])

Source: GFW, Fishing Effort: Datasets and Code, 2020, accessed July 14, 2020.
Note: Data track only fleet vessels that activate the automatic identification system transponder.
[a] Not applicable.

During 2018, Chinese vessels that went fishing outside of the Chinese EEZ were most likely to spend their time (in total fishing hours) in neighboring East and Southeast Asian EEZs. Chinese vessels reportedly spent 519,499 hours in these EEZs, accounting for about 20.8 percent of the total fishing activity in these areas. In close second place were the EEZs of small Pacific Island countries, in which Chinese vessels spent almost half a million hours fishing, likely for tuna. Chinese vessels accounted for

[436] Godfrey, "China Fishing Trawler Boss Faces Indonesian Prosecution," July 16, 2020.
[437] Chase, "Organizations Call for Investigation in Wake of Crew Deaths," May 1, 2020.
[438] Chase, "Organizations Call for Investigation in Wake of Crew Deaths," May 1, 2020.
[439] ILO Work in Fishing Convention sets forth international standards for work on board fishing vessels. For more information, see chapter 2. White, "OPAGAC Calls for EU to Scrutinize Seafood," May 29, 2020.
[440] White, "OPAGAC Calls for EU to Scrutinize Seafood," May 29, 2020.

over a third of the total fishing hours spent in the Pacific Islands' EEZs. Chinese vessels also spent a substantial amount of fishing hours (269,552) in African EEZs, accounting for about 12.3 percent of the area's total fishing hours. The last area where Chinese vessels spent over 100,000 fishing hours in 2018 was in South American EEZs, where they contributed about 8.3 percent of the total fishing hours in the region.

The following sections include examples of reported IUU fishing activities carried out by the Chinese DWF fleet in each of the known areas in which Chinese vessels spend a substantial amount of time fishing (over 100,000 hours). The examples are supplemented by publicly available information on IUU fishing, including labor activities. Each section also includes estimates of the value of U.S. imports from China of product sourced by the Chinese DWF fleet in each fishing area, as well as an estimate of the share of U.S. imports of these products that are obtained via IUU fishing.[441]

East and Southeast Asia

Chinese DWF vessels are reported to engage in IUU fishing in East and Southeast Asian EEZs and in waters disputed by multiple nations, particularly in the South China Sea.[442] Chinese vessels have been identified as making incursions into and engaging in illegal fishing in the EEZs of Japan and Taiwan EEZs as recently as March 2020.[443] Indonesia has reported sinking Chinese vessels identified as fishing illegally in its EEZ during the foreign vessel moratorium,[444] and Chinese vessels are reported to have a large presence in waters claimed by China near the Indonesian Natuna Islands (see chapter 5). Chinese incursions into the Philippines' EEZ have also been reported. Increased fishing by these vessels has reportedly contributed to the decline in round scad stocks, a staple in the Philippines, leading to an increase in imports of the product by the country.[445] The substantial IUU fishing activities by Chinese vessels, as well as by vessels from other Asian countries, in disputed waters in the South China Sea has reportedly reduced fish stocks there, although this cannot be properly assessed due to the high level of confrontations in the area.[446] Further, a recent study identified 700 to 900 Chinese vessels that were illegally fishing for Japanese flying squid in North Korean waters in 2017 and 2018, taking an estimated catch of 164,000 mt valued at $440 million, equivalent to what Japan and South Korea harvested legally.[447]

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[441] These are conservative estimates produced using the methodology described in chapter 3, which was consistently applied on a global basis. USITC IUU Imports Estimates.
[442] Varley et al., "Fight over Fish," September 1, 2020; U.S. National Intelligence Council, *Global Implications of Illegal, Unreported, and Unregulated (IUU) Fishing,* September 19, 2016, 14.
[443] VOA News, "Is China's Fishing Fleet a Growing Security Threat?," August 13, 2020.
[444] In 2014, Indonesia implemented a moratorium on registrations of foreign-built vessels, prohibiting these vessels from fishing in the country's EEZ. See chapter 5 for more information. For more information on Indonesia's foreign vessel moratorium and vessel-sinking policy, see the Indonesia country profile in chapter 5. Associated Press, "Indonesia Sinks 51 Fishing Boats," accessed October 26, 2020.
[445] Perez, "Regional and National Impacts of Illegal, Unreported, and Unregulated Fishing," December 2020; Dao, "Philippines Looking to Import Round Scad," accessed December 17, 2020.
[446] Varley et al., "Fight over Fish," September 1, 2020.
[447] Park et al., "Illuminating Dark Fishing Fleets in North Korea," July 1, 2020.

Estimates of Chinese Catch in Asian EEZs

The Commission's supply chain analysis indicates that in 2019, U.S. imports of marine-capture products from China that originated in East and Southeast Asian EEZs were primarily from the Russian and Japanese EEZs.[448] Most of these U.S. imports from China of seafood caught in the Russian Far East were pollock and Pacific cod products, while imports of seafood originating in the Japanese EEZ included various products such as Pacific cod, squid, and crab. The Commission estimates that about 23.6 percent of the total value of U.S. imports supplied by China of seafood caught by Chinese DWF vessels in East and Southeast Asian EEZs is obtained via IUU fishing. While most U.S. imports of the seafood sourced in Asian EEZs by Chinese vessels is likely to be imported into the United States from China itself (estimated at 83.6 percent in 2019, by value), a smaller fraction is estimated to be exported to other countries, particularly to Thailand and Mexico—likely for further processing—and then exported to the United States.

Pacific Island Countries' EEZs

Pacific Island EEZs are among the most fished in the world by DWF fleets, among them the Chinese fleet, due to the highly valuable fish stocks found in these places, including various tuna species.[449] The EEZs of Vanuatu, Solomon Islands, and Micronesia see the most recorded fishing activity by Chinese DWF vessels. Many of these Chinese-owned and -operated vessels, as well as vessels from other countries, are registered and/or flagged to these Pacific Island countries. This pattern complicates and obscures analysis and understanding of the activities these vessels engage in, including IUU fishing and labor violations (Box 4.1). For the period 2016–17, a 2018 analysis listed 104 Chinese vessels fishing in the waters of Vanuatu, 92 vessels in those of Kiribati, 74 vessels in those of Solomon Islands, and 34 in those of the Marshall Islands. These vessels accumulated over half a million fishing hours in these four EEZs.[450] After East and Southeast Asia, the Chinese DWF fleet is estimated to spend most of its fishing hours in the EEZs of about 16 Pacific Island countries, likely fishing for tuna.[451]

In order to combat IUU fishing in Pacific Island EEZs, the Pacific Island Forum Fisheries Agency (FFA) conducts regular surveillance activities, such as Operation Rai Balang, an annual two-week effort by FFA members and international partners, including the United States.[452] In multiple instances during these surveillance activities, authorities have identified Chinese vessels that have been determined to be engaging in IUU fishing. For example, in 2017, five Chinese-flagged vessels were caught fishing illegally in Vanuatu and one in Micronesia.[453]

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[448] As discussed in appendix F, estimates of U.S. imports by fishing area were derived from Sea Around Us Reconstructed Catch estimates. In these data, when certain zones are disputed (claimed by multiple countries), the same zone is treated as being "owned" by each claimant with respect to their own fisheries catches within that area. Therefore, Chinese vessel landings within all waters claimed by China are counted within these estimates as being within the Chinese EEZ and are not part of this analysis of Chinese DWF vessels.

[449] CEA, *Distant Water Fishing*, October 2018, 22.

[450] CEA, *Distant Water Fishing*, October 2018, 24.

[451] GFW, Fishing Effort: Datasets and Code, 2020, accessed July 14, 2020.

[452] FFA Media, "Extraordinary Surveillance with Operation Rai Balang," March 26, 2020; Coast Guard News, "Coast Guard, Partners, Wrap Up," accessed October 2, 2020.

[453] NOAA Fisheries, *Improving International Fisheries Management*, 2019, 38.

Box 4.1 Use of Foreign Registration (including Flags of Convenience) by Chinese DWF vessels in Pacific Islands' EEZs

Historically, due to limited regulation and enforcement of the activities of its fishing fleet, the Chinese flag has been considered "its own flag of convenience," disincentivizing flagging Chinese-owned vessels to a different county. (For more information on flags of convenience, see chapter 2.) However, a recent analysis found about 1,000 of the Chinese vessels operating in foreign exclusive economic zones (EEZs) registered to other countries in 2018. A small portion of those vessels—148—were flagged to countries known to have an open registry for flags of convenience; about 7.4 percent of these 148 vessels were flagged to Vanuatu. Further, the analysis identified 183 Chinese distant-water fishing (DWF) vessels as engaging in IUU fishing activities, 100 of which were flagged to other countries (54.6 percent). Among these countries were the Pacific Island of Fiji, which accounted for 40 of these vessels. In total, 55 of the 100 Chinese DWF vessels flagged to other countries that were identified as engaging in IUU fishing were flagged to Pacific Island countries.[a] According to experts, the majority of the vessels flagged to small Pacific Island countries are believed to be owned by Chinese companies (some may be owned by companies from South Korea or Taiwan). These vessels often re-flag or enter into agreements with Pacific Island governments and become exempt from certain regulations that apply to foreign vessels fishing in their EEZs. Reportedly, Chinese companies also engage in large infrastructure investments, including building wharves and cold storage facilities in these countries.[b]

Several small Pacific Island countries have been linked to various IUU fishing activities and labor violations, some of which have been attributed to foreign vessels fishing in their EEZs, including Chinese vessels. For example, Vanuatu is alleged to continuously underreport catch of tuna and other species, while the country has the largest average longline vessel capacity—454 metric tons—in the Western and Central Pacific Ocean.[c] One tuna longliner flagged to Palau was listed as having engaged in IUU fishing activities as of March 2020, for operating in the Inter-American Tropical Tuna Commission area without being on its record of vessels. In addition, two vessels flagged to Papua New Guinea and one flagged to Fiji had been listed for IUU activity in the past.[d] Further, the EU issued yellow cards to a number of small Pacific Island countries for failing to combat IUU fishing. (For more information on the EU's carding system, see chapter 2.) The yellow cards have since been removed: Papua New Guinea was yellow-carded in 2014 (removed in 2015), Solomon Islands in 2014 (removed in 2017), Vanuatu in 2012 (removed in 2014), Fiji in 2012 (removed in 2014), and Tuvalu in 2014 (removed in 2018). Kiribati, however, was issued a yellow card in 2016, and, as of October 2020, it is still in place.[e]

Moreover, the *2019 Trafficking in Persons* report ranked Solomon Islands as a Tier 2 country, highlighting reports of human trafficking on vessels fishing in its waters. The report noted efforts made by the country to combat human trafficking, which is reported to occur in foreign vessels fishing in its EEZ and docking at its ports, particularly on Taiwan-flagged vessels.[f] Further, a recent increase in deaths of fisheries observers in the Pacific Ocean has been linked to increased fishing activity in the area, especially by vessels from China and Taiwan.[g]

[a] Gutiérrez et al., *China's Distant-Water Fishing Fleet: Scale, Impact and Governance*, June 2020, 21–27.
[b] Industry representatives, virtual roundtable, October 13, 2020, 27–32, 69.
[c] Industry representatives, virtual roundtable, 69; Western Pacific Regional Fishery Management Council, written submission to USITC, 6.
[d] TMT, "Combined IUU Vessel List," March 30, 2020.
[e] IUU Watch, "EU Carding Decisions" accessed October 12, 2020.
[f] Tier 2 is defined as "countries whose governments fully meet the Trafficking Victims Protection Act of 2000's (TVPA) minimum standards for the elimination of trafficking." USDOC, *2019 Trafficking in Persons Report*, June 2019.
[g] Orlowski, "Kiribati Fishery Observer Dies at Sea," April 14, 2020.

Estimates of Chinese Catch in Pacific Island EEZs

China's DWF fleet is active in Pacific Island EEZs, sometimes participating in IUU fishing, and many of these Chinese-owned vessels are locally flagged. The Commission's supply chain analysis indicates that, in 2019, U.S. imports of seafood from China that originated in Pacific Island EEZs were primarily from the Kiribati EEZs, followed by the EEZs of the Federated States of Micronesia and Tuvalu. The Commission estimates that about 3.1 percent of the total value of U.S. imports from China of seafood caught in Pacific Island EEZs is obtained via IUU fishing. According to the analysis presented in chapter 3, most U.S. imports of seafood from China originating in Pacific Island EEZs in 2019 were caught by locally flagged fishing vessels. As mentioned above, satellite data show substantial Chinese DWF fleet activity in these small Pacific Island EEZs, while experts indicate that many Chinese vessels are flagged to Pacific Island countries. Therefore, it is likely that a portion of U.S. imports of product originating in Pacific Island EEZs is caught by Chinese-owned, Pacific Island-flagged vessels. The Commission estimates suggest that most of the U.S. imports of seafood originating in the region are caught by vessels flagged to the Marshall Islands or Taiwan. The main products caught in this region by all vessels are tuna species, mainly skipjack and yellowfin. While some Pacific Island seafood caught by Pacific Island-flagged vessels is exported directly into the United States, the Commission analysis finds that a substantial portion of the product is exported to Thailand and then re-exported to the United States.

Activities in African EEZs

The Chinese DWF fleet is known to have a large presence in African EEZs and has been linked to many IUU fishing activities off the coasts of Africa. It is particularly active in the waters off West and East Africa. Many African EEZs are home to highly valuable fish stocks (including tuna stocks); however, most African countries lack industrial fishing fleets that could harvest these resources.[454] Instead, some countries allow foreign fleets, including the Chinese DWF fleet, to fish in their waters. In 2018, over 50 percent of the Chinese-owned or -operated vessels registered in other countries were estimated to be flagged to African countries.[455] For example, most of the vessels fishing in Ghana's EEZ for tuna, the main seafood export from the country, are Ghanaian-flagged Chinese vessels, which operate as joint ventures with Ghanaian owners who have at least 50 percent of the shares.[456] It is estimated that about 90 percent of the total Ghanaian fishing fleet is Chinese-owned, while in Sierra Leone Chinese-owned vessels are estimated to be about 75 percent of the total industrial fleet.[457] Of China's DWF vessels flagged to African countries, Ghana represents 26.5 percent of the total, followed by Mauritania (25.5 percent) and Côte d'Ivoire (13.3 percent).[458]

Most African countries lack the resources and capabilities to monitor and enforce anti-IUU fishing regulations in their coastal waters, which are estimated to have the highest concentration of IUU fishing activity in the world.[459] By one estimate, about 25 percent of the Chinese vessels fishing in West Africa

[454] Industry representative, interview with USITC staff, May 28, 2020.
[455] Gutiérrez et al., *China's Distant-Water Fishing Fleet: Scale, Impact and Governance*, June 2020.
[456] Industry representative, interview with USITC staff, May 28, 2020; GEPA, "Sector Capabilities: Tuna from Ghana," 2017; FCWC, "Ghana," July 14, 2019.
[457] Undercurrent News, "EJF: Chinese-owned Trawler," August 26, 2020.
[458] Gutiérrez et al., *China's Distant-Water Fishing Fleet: Scale, Impact and Governance*, June 2020, 22.
[459] Industry representative, interview with USITC staff, May 28, 2020; Bamba, "Regional and National Impacts of Illegal, Unreported, and Unregulated Fishing," December 2020.

are engaging in IUU fishing activities.[460] Recent reports of Chinese-flagged vessels engaging in IUU fishing activities off the coast of various countries in Africa highlight the prevalence of these issues. In 2017, seven Chinese-flagged vessels were detained in Senegal for engaging in illegal fishing, while eight vessels were detained by Guinea-Bissau, Sierra Leone, and Guinea in that same year.[461] In Guinea, IUU fishing by Chinese trawlers has reportedly undercut the livelihoods of local fishers since the presence of Chinese vessels began to increase in the Gulf of Guinea in 2008.[462] Chinese vessels are also reported to circumvent regulations in Ghana, which since 2002 has required that industrial and semi-industrial vessels fishing in Ghanaian waters must fly a Ghanaian flag and be owned or controlled by Ghanaian companies.[463] However, the Environmental Justice Foundation (EJF) alleges that Chinese DWF firms use front companies to circumvent these regulations and illegally catch large quantities of small pelagic fish, such as sardinella, which are an important fish in Ghana.[464]

To combat this, some African countries have been trying to strengthen their monitoring, compliance, and surveillance activity on foreign vessels fishing in their EEZs. For example, the environmental NGO Stop Illegal Fishing, in partnership with other NGOs and African governments, has developed a series of initiatives and projects aimed at combating illegal fishing in African coastal waters by improving cross-governmental collaboration and transparency in the region. Joint efforts by Stop Illegal Fishing, other NGOs, and the government of Tanzania—a country with large tuna and shark stocks but without a commercial fleet or a port for landing catch—have resulted in increased inspection of vessels. These inspections have led to multiple detentions, fines, and a reported reduction in the number of vessels operating in the country's EEZ, which is viewed as a reduction in illegal fishing resulting from increased enforcement.[465]

Chinese vessels are also reported to engage in labor violations when fishing in African waters. Many of the Ghanaian-flagged trawlers licensed to operate in Ghanaian waters have been implicated in labor violations; as noted, 90 percent of these vessels are reported to be owned by Chinese interests.[466] Further, a 2018 campaign to inspect foreign vessels fishing in Tanzanian waters for IUU fishing also uncovered labor abuses on Chinese-flagged vessels. An inspection of the Chinese-flagged fishing vessel Tai Hong No 1, which found it had been shark finning in violation of Tanzanian law, also discovered that Tanzanian fishers had been refused water and food, and that 12 men shared a small unventilated cabin

[460] Telesetsky, "Scuttling IUU Fishing and Rewarding Sustainable Fishing," 2015, 1237.

[461] Two vessels detained in Guinea were caught with illegal fishing nets and illegal shark fins. NOAA Fisheries, *Improving International Fisheries Management*, 2019, 37.

[462] U.S. National Intelligence Council, *Global Implications of Illegal, Unreported, and Unregulated (IUU) Fishing,* September 19, 2016.

[463] A recent analysis of the activities of the Chinese DWF fleet supported the EJF's claim. The analysis found that 137 Ghanaian-flagged vessels were linked to Chinese interests, being constructed in China, previously flagged in China, and/or having Chinese names. Fitt, "China Issues New Sustainability Rules," August 14, 2020.

[464] Industry representative, interview with USITC staff, May 28, 2020; EJF, *Europe: A Market for Illegal Seafood from West Africa*, July 20, 2020; Fitt, "China Issues New Sustainability Rules," August 14, 2020; Gutiérrez et al., *China's Distant-Water Fishing Fleet: Scale, Impact and Governance*, June 2020; Undercurrent News, "EJF: Chinese-owned Trawler," August 26, 2020.

[465] Industry representative, interview with USITC staff, May 28, 2020; Stop Illegal Fishing, "Home," accessed October 25, 2020; Stop Illegal Fishing, *Operation Jodari*, January 2019, 2.

[466] EJF, *Europe: A Market for Illegal Seafood from West Africa*, July 20, 2020.

with two beds. In another example, the Chinese-flagged fishing vessel Jin Sheng No 2 was fined $50,000 for not allowing inspectors access to the bridge and for mistreatment of their crew.[467]

Estimates of Chinese Catch in African EEZs

China's DWF fleet is active in African EEZs, which are reported to have among the highest levels of IUU activities in the world, with local governments severely hampered by limited surveillance and enforcement capabilities.[468] The Commission's supply chain analysis suggest that in 2019, U.S. imports of seafood from China caught by the Chinese DWF fleet in African EEZs originated primarily along the west African coast, particularly in the EEZs of Guinea, Namibia, and Morocco. Most U.S. imports from China of seafood caught in African EEZs were species of true soles, sardines, hake/whiting, and jack/horse mackerel products.[469] The Commission estimates that about 99.8 percent of the total quantity of U.S. imports from China of seafood caught by Chinese DWF vessels in African EEZs is obtained via IUU fishing. The vast majority of U.S. imports of the product sourced by Chinese vessels in African EEZs are likely to be imported into the United States from China itself (this share is estimated at 95.4 percent in 2019, by value). Although small in volume and value, China is the United States' main import supplier of true sole, the vast majority of which originate in African EEZs, according to the Commission analysis.

Activities in South American EEZs

Numerous published reports highlight specific IUU fishing concerns associated with China's DWF fleet near South American EEZs (primarily those of Peru, Ecuador, and Argentina), where the fleet targets squid (box 4.2) but also fishes for other species.[470] Chinese vessels are said to fish indiscriminately in Ecuadorian, Peruvian, and Argentine waters in the Southern Pacific and Southwest Atlantic Ocean. As recently as 2017, the Ecuadorian navy seized a Chinese refrigerator vessel within the waters of the Galapagos Marine Reserve with 6,000 sharks in its hold, which suggested targeted shark fishing, a practice that is not allowed by Ecuadorian regulations.[471] Several Chinese vessel incursions into Argentina's EEZ have been documented over the years. For example, in 2016, an Argentine patrol vessel discovered, but was unable to apprehend, a Chinese vessel illegally fishing in Argentina's EEZ; in response, the Argentine government issued an international arrest warrant for the vessel. In another incident, the Argentine Coast Guard sunk another vessel that was caught fishing in its waters after it tried to collide with and flee from Argentine Coast Guard ships.[472] In 2018, Argentina issued an international capture order against five Chinese-flagged vessels, four of which belong to a state-owned enterprise involved in an IUU fishing incident.[473]

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[467] Stop Illegal Fishing, *Operation Jodari*, January 2019.
[468] Industry representative, interview by USITC staff, May 28, 2020.
[469] True soles, for the purposes of this analysis, refers to species of the genus *Solea.*
[470] Collyns, "'They Just Pull Up Everything!,'" August 6, 2020.
[471] Collyns, "'They Just Pull Up Everything!,'" August 6, 2020.
[472] The vessel was captured in Indonesia in April of 2016. NOAA Fisheries, *Improving International Fisheries Management*, 2019, 37. For more information on Interpol notices and efforts to combat IUU fishing, see chapter 2.
[473] One of the vessels was caught fishing in the Argentinean EEZ and fled with assistance from the other four vessels. NOAA Fisheries, *Improving International Fisheries Management*, 2019, 37.

These IUU activities in Argentine waters and beyond are apparently facilitated by the practice of vessels turning off identification and vessel monitoring systems (VMS), which has been linked to IUU fishing activity. In 2019, Chinese vessels accounted for the vast majority of the 294 vessels fishing in the southwest Atlantic Ocean. Moreover, in that year, 87 percent of the vessels fishing in the area during peak season turned off their VMS. Though it is too soon to determine their effectiveness, China issued new regulations (see Fisheries and Fleet Management section above) prohibiting Chinese-flagged DWF vessels from turning off their VMS.[474]

Box 4.2 Squid Fishing and IUU Landings in South American Waters

The Commission estimates that U.S. squid imports have among the highest rates of product groups obtained via IUU fishing, at 26.9 percent; moreover, an estimated 62.3 percent of IUU-sourced U.S. squid imports are sourced by Chinese vessels.[a] Chinese vessels are said to fish indiscriminately in South American waters, threatening the sustainability of the species that thrive in the area, including squid.[b] An estimated 15.0 percent of U.S. imports of IUU squid originate in the Southeast Pacific and Southwest Atlantic Oceans.[c] Recent reports have highlighted the increased presence of Chinese vessels—and to a lesser extent vessels from South Korea and Taiwan—fishing for squid near South American EEZs. The reports also mention concerns about IUU fishing activities by these DWF fleets in the area. Most of this fishing activity takes place near the EEZs of Peru, Ecuador, and Argentina.[d] These areas are major fishing grounds for Humboldt or jumbo flying squid (Ecuador and Peru) and Argentine shortfin squid; jumbo flying squid and Argentine shortfin squid account for nearly 44.2 percent of global squid landings.[e]

China's large DWF fleet seems to be engaged in both legal and IUU squid fishing in waters near South America. At least 516 Chinese vessels have Chinese authorization to fish for squid on the high seas, including in waters near South American EEZs. However, these vessels do not have authorization to fish in the EEZs of Ecuador, Peru, or Argentina. Nonetheless, a large fleet of China's DWF vessels arrives annually in waters just outside of the Galapagos Marine Reserve (Ecuadorian territorial waters) to fish. Squid fishing vessels are reported to navigate from the EEZ near the Galapagos Marine Reserve and the South Atlantic Ocean close to the Argentine EEZ, to congregate in the high seas region near Peru's EEZ between October and December each year.[f] Chinese vessels have been reported to be fishing near the Peruvian EEZ for over two decades, with the number of vessels expanding from 22 vessels in 2001 to 276 in 2016. These waters have become one of the most important fisheries in the world for Chinese vessels.[g] A government representative from Peru also highlighted that the working conditions on these vessels need to be evaluated and regulated to ensure they comply with labor laws and international standards.[h]

Peru and Ecuador have limited resources to effectively monitor and enforce the fishing activities of such a large contingent of Chinese vessels.[i] IUU fishing concerns in the area are mostly centered on misreporting of catch as well as unauthorized incursions into the countries' EEZs, particularly Peru's.[j] As recently as in early 2020, a Chinese squid fishing vessel that had previously been detected fishing illegally in Argentina's EEZ agreed to pay a fine imposed by an Argentine court in order to avoid arrest. The Argentine press noted that although as part of the penalty the vessel agreed to purchase its cargo from the Argentine government, it was likely that at least some of its catches had already been transshipped to another vessel.[k] The Chinese DWF vessels are reported to transship their catch to Chinese refrigerated cargo ships that land the combined cargo in Chinese ports while the fishing vessels

[474] Fitt, "China Issues New Sustainability Rules," August 14, 2020.

continue to fish in the area. These vessels are also reported to use some ports in Peru and Uruguay to refuel and change crew.[l]

Despite limited resources, countries in South America are working together on ways to combat IUU fishing for squid in the Southeast Pacific Ocean. In February 2020, the South Pacific Regional Fisheries Management Organization (SPRFMO) issued the first-ever conservation and management measure for jumbo flying squid in international waters covered by the SPRFMO Convention; China, Peru, and Ecuador are members. Various provisions of the conservation and management measure require that (1) only vessels duly authorized by member states can fish for jumbo flying squid in the Convention Area; (2) members will collect and report monthly catch data to the SPRFMO Secretariat; (3) members will implement vessel monitoring systems (VMS) on flagged vessels and provide the Secretariat with a list of vessels that are authorized to fish for jumbo flying squid; and (4) members participating in the jumbo flying squid fishery will ensure full-time observers and report observer results to the Secretariat, among other conditions.[m]

The SPRFMO conservation and management measure will not only affect landings directly from Chinese-flagged vessels but may also decrease IUU landings by Peruvian-flagged vessels. The latter vessels reported about 46 percent of global flying squid landings during 2014–18, some of which is exported to China for further processing.[n] The Peruvian squid fishery is almost exclusively artisanal and suffers from a high number of unlicensed and unregistered vessels (estimated at 60 percent of the fleet). The conservation and management measure is likely to reduce landings from unlicensed and unregistered Peruvian vessels because it would classify these landings as IUU.[o]

Although the activities of Chinese vessels are a substantial threat to the sustainability of the South Pacific squid fishery, multiple reports have highlighted the concerns about the IUU fishing activities from local fleets, particularly from Peru and Ecuador. Peru, for instance, has implemented regulations to better regulate its squid fleet, including sharing VMS data publicly, although progress has been limited.[p] Peruvian regulations have started to require licensing and have supported the formation of fishing cooperatives to overcome deficiencies in the Peruvian squid fishery, but global seafood buyers are still concerned. The Peruvian squid fishery likely suffers from the same lack of transparency and corruption in informal supply chains that is well documented among Peru's artisanal supply chains.[q] Considering these issues, in October 2020, 21 large international seafood chain participants sent a letter to the Peruvian Council of Ministers voicing concerns with Peru's progress on regulating and licensing its artisanal fishing fleet. They stated that failure of the Peruvian squid fishery to become 100 percent legal and regulated by January 2021 could result in the entire Peruvian squid catch being classified as IUU by the SPRFMO.

Reports also suggest that IUU fishing is prevalent within the Ecuadorean fleet, including by small vessels fishing for a variety of fish.[r] In 2019, the EU issued Ecuador a yellow card asking the country to step up its efforts to combat IUU fishing.[s] If Ecuador does not address the situation, the yellow card may be followed by a ban on Ecuadorean exports to the European Union.

[a] USITC IUU imports estimates.
[b] Collyns, "'They Just Pull Up Everything!,'" August 6, 2020; War on the Rocks, "The Great Fishing Competition," August 17, 2020.
[c] USITC IUU imports estimates.
[d] Aroni, "Follow the Lights," October 13, 2020.
[e] The fleet includes vessels equipped with longlines for squid jigging. Collyns, "'They Just Pull Up Everything!'," August 6, 2020.
[f] Aroni, "Follow the Lights," October 13, 2020.
[g] Aroni-Sulca, "Estimación de la captura ilegal de Dosidicus gigas" (estimate of illegal capture of *Dosidicus gigas*), 2018.
[h] Alfaro, "Regional and National Impacts of Illegal, Unreported, and Unregulated Fishing," December 2020.
[i] Middlehurst, "Ecuador Shark Seizure Exposes Illegal Fishing Network," August 25, 2017.
[j] Aroni, "Follow the Lights," October 13, 2020.

[k] Revista Puerto, "El potero chino que se 'fugó', fondeará hoy en Madryn" (the Chinese jigging vessel that "fled" will anchor today in Madryn), accessed December 6, 2020; FIS, "El Barco Potero Chino Será Liberado" (the Chinese jigging boat will be freed), accessed December 6, 2020.
[l] Aroni, "Follow the Lights," October 13, 2020.
[m] SPRFMO, "CMM 18-2020," May 20, 2020.
[n] In 2018, about 319,000 mt (88.1 percent) of Peruvian squid landings were frozen; frozen product is almost exclusively reserved for export markets. Government of Peru, PMP, *Anuario Estadístico: Pesquero y Acuícola 2018* (statistical yearbook of fishing and aquaculture 2018), November 2019; FAO Global Production database, accessed May 19, 2020.
[o] Aronson, "Peruvian Government Cracks Down on Illegal Fishing," July 12, 2018.
[p] Peru also requires that foreign vessels use VMS devices when using Peruvian ports. Aroni, "Follow the Lights," October 13, 2020.
[q] The Peruvian artisanal fishery historically has been largely unregulated. Thus, informal supply chains have developed that facilitate unreported and sometimes illegal fishing activity, through lack of transparency and sometimes corruption. The artisanal fishing fleet is more difficult to monitor because supply chains run through small fishing communities that lack transparency and the resources to monitor landings, and that are subject to local corruption. Amorós et al., "Peruvian Mahi Mahi Fishery (*Coryphaena hippurus*)," 2017; Future of Fish, "Project to Develop an Interoperable Seafood Traceability," 2019.
[r] *Economist*, "Ecuador, a Victim of Illegal Fishing," November 21, 2020.
[s] EC, "EU Notifies Ecuador to Step Up Action," accessed December 6, 2020.

Estimates of Chinese Catch in South American EEZs

The Commission's supply chain analysis indicates that U.S. imports of seafood from China that originated in South American EEZs were from both western South America (particularly the Peruvian EEZ) and eastern South America (particularly in the waters around the Falkland Islands). The vast majority of U.S. imports from China of seafood caught by the Chinese DWF fleet in both of these regions were squid products. The Commission estimates that about 35.6 percent of the total value of U.S. imports supplied by China of seafood caught by Chinese DWF vessels in South American EEZs is obtained via IUU fishing. While most U.S. imports of the squid sourced in South American EEZs by Chinese vessels is likely to be imported into the United States from China itself, a smaller fraction is estimated to imported into the United States via other countries, including New Zealand, Taiwan, and Thailand, likely for processing. The Commission results suggest that China was the largest supplier of U.S. imports of squid products caught in South American EEZs in 2019, and that most of these squid products were caught by Chinese DWF vessels.[475]

[475] However, most U.S. imports from squid from all partners that were sourced in South America were captured by Peruvian vessels. USITC IUU import estimates.

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Chapter 5
Country Profiles

Introduction

This chapter profiles a number of countries—Russia, Vietnam, Indonesia, Thailand, and Spain— which are major producers of seafood obtained via a range of IUU fishing activities, including labor violations (table 5.1). These five countries were selected based on publicly available reports that systematically evaluated IUU fishing activities and labor violations on a global basis, as explained in appendix G. While five countries were selected for profiles in this chapter, IUU fishing, including labor violations, is known to be a global issue. Virtually every coastal country is vulnerable to IUU fishing activities, which can be carried out within its EEZ or by its vessels in foreign EEZs.[476] While many countries have joined several international treaties covering fishing activities and workers' rights (appendix H), multiple reports highlight the persistence of problems in fishing fleets and processing plants around the world. Recently, many countries have taken a series of steps for combating IUU fishing, including labor violations, in their exclusive economic zones (EEZs) and by their vessels in extraterritorial waters. These measures include adopting new regulations and increasing inspection and enforcement activities, although many issues still persist.

Table 5.1 Summary of activities associated with IUU fishing and IUU activity, 2019, by country

Country	Activities associated with IUU fishing	Estimated value of U.S. marine capture IUU imports (million $)	Estimated IUU share of total U.S. marine capture imports from the partner country (%)	Rank of country among suppliers of estimated U.S. imports of IUU products
China (see chapter 4)	Chinese vessels fishing without authorization in foreign EEZs and RFMO-managed waters Use of destructive gear Transshipment at sea Unreported wild-caught seafood Use of front companies and foreign registration (including flags of convenience) Instances of violations of labor laws in DWF fleet Failure to prevent imports of seafood obtained via IUU fishing	$204.3	17.0	1

[476] For instance, the IUU Fishing Index estimated in 2019 that the lowest overall vulnerability score globally was 1.56 (Monaco) from a minimum score of 1.00. The index attempted to provide estimates of the prevalence, vulnerability, and response of all 152 coastal countries in the world by looking at their performance on coastal, flag, and port responsibilities. Poseidon Aquatic Resource Management Ltd. and Global Initiative Against Transnational Organized Crime, *The Illegal, Unreported, and Unregulated Fishing Index*, January 2019, 6, 20.

Country	Activities associated with IUU fishing	Estimated value of U.S. marine capture IUU imports (million $)	Estimated IUU share of total U.S. marine capture imports from the partner country (%)	Rank of country among suppliers of estimated U.S. imports of IUU products
Russia	Fishing without authorization in Russian and foreign EEZs Transshipment at sea Not landing catch in domestic ports Hazardous working conditions on Russian vessels Exploitation of foreign workers on Russian vessels	$113.8	16.5	2
Vietnam	Vietnamese vessels fishing without authorization in foreign EEZs Unreported wild-caught seafood Child and forced labor on Vietnamese vessels Fisher exploitation and debt bondage on Vietnamese vessels	$106.1	19.4	4
Indonesia	Indonesian vessels fishing without authorization in RFMO-managed waters Use of destructive gear Transshipment at sea Unreported wild-caught seafood Instances of child labor and exploitation of fishers domestically Foreign vessels fishing in its EEZ engaging in labor violations	$105.5	15.4	5
Thailand	Thai vessels fishing without authorization in foreign EEZs Thai and foreign vessels fishing illegally in Thai waters Ineffective inspection for fishing vessels Fisher exploitation by vessel operators and recruiters Child and forced labor in shrimp processing Forced labor on Thai vessels	$92.9	12.2	6
Spain	Fishing above quota amounts Smuggling networks bringing IUU seafood into Spain Employing vessels identified as being involved in IUU fishing Spanish-owned joint ventures in third-country suppliers	$34.3	22.4	12

Source: USITC IUU import estimates.

Several factors limit countries' abilities to combat IUU fishing, including labor violations. Variability in the composition and size of domestic fleets and fisheries, and their geographic distribution—including activities on the high seas—make it hard to regulate commercial fishing fleets.[477] The burden of these regulations on artisanal fishers is another limiting factor, especially in areas that depend on fishing revenues. Artisanal fleets also might underreport landings, a practice that limits the effectiveness of fisheries management and sustainability of fish stocks, as well as an understanding of the prevalence of IUU fishing practices among these fleets. Distant-water fishing (DWF) fleets—the fleets that fish beyond a country's waters, usually in larger vessels—are difficult to govern and regulate. A large portion of the widely publicized reports of IUU fishing activities, including labor violations, is linked to the activities of the DWF fleets, which are large contributors to global marine capture landings. Further, the existence of transnational networks engaged in fisheries crimes—which include IUU fishing and labor violations, as well as tax evasion and drug trafficking, among other crimes—also limit countries' abilities to combat IUU fishing including labor violations, within their EEZs and among their fleets (box 5.1).[478] Additionally, variability in countries' capabilities to develop policies and enforce laws and regulations, as well as corruption, render some nations more vulnerable to IUU fishing activities by domestic and foreign fleets.

Box 5.1 Example of a Transnational Network Engaging in IUU Fishing Including Labor Violations

Transnational networks engaging in IUU fishing and human trafficking for the purpose of forced labor-–which have been found to be interconnected—have been described in research conducted by various organizations.[a] For example, research has described the operations of a network employing workers in forced labor conditions on board fishing vessels in New Zealand waters between 2001 and 2014, as well as the chains through which product was then exported to the United States and Europe. It found that the complex operation exploited over 1,805 victims on vessels owned and managed by companies based in South Korea and New Zealand through various types of ventures. Two of the vessels previously had been identified as engaging in IUU fishing. The network generated over $400 million in profits in the period. The Indonesian crew had been recruited by companies registered in Indonesia via deception and coercion, had been charged recruitment fees, and did not receive the promised salary or living conditions. The vessels had been fishing for squid and eel, among other species. The catch is believed to have been distributed to companies in South Korea, New Zealand, and China for processing and then exported to companies in the United States and Canada, where it was distributed to retailers.[b]

[a] See, for example, Thorenfeldt et al., "The Victims of the Crab War," November 11, 2018; EJF, *Thailand's Seafood Slaves*, 2015. The links between IUU fishing and forced labor have been documented throughout the world, especially in Southeast Asia. See also de Rivaz et al., *Turning the Tide?,* November 29, 2019, 23.
[b] Industry representative, interview by USITC staff, June 4, 2020.

As a result of these common challenges, many countries beyond those profiled have been linked to substantial amounts of IUU fishing. These include Mexico, Canada, India, the Philippines, and Ecuador, which are estimated to be among the top 10 suppliers of U.S. imports of marine-capture products

[477] For purposes of this chapter, "industrial" fishing refers to fishing predominantly by larger motorized vessels, including all craft capable of long-distance fishing. "Artisanal" fishing refers generally to small-scale (hand lines, gillnets, etc.) and fixed-gear (weirs, traps, etc.) fishing activities limited to within 50 km of the coast or to 200 m depth or less. Both of these fishing sectors are considered "commercial" in that they predominantly sell their products into markets. By contrast, "subsistence" fishing refers to small-scale fishing primarily for the fishers' own family or community consumption, while "recreational" fishing refers to fishing for pleasure, neither of which is likely to produce for significant volumes of commercial sales. Pauly and Zeller, "Catch Reconstruction: Concepts, Methods, and Data Sources," 2015, 6.
[478] U.N. Office on Drugs and Crime, *Transnational Organized Crime in the Fishing Industry*, 2011; de Rivaz et al., *Turning the Tide?*, November 29, 2019, 1–2.

obtained from IUU fishing, discussed in chapter 3. Select activities associated with Taiwan are also described in box 5.3.

To the extent possible, the profiles in this chapter include a description of the available information on countries' fishing industries, fisheries and fleet management, as well as the activities associated with IUU fishing, including labor violations, that have been identified by reports from governmental and non-governmental organizations, academic literature, and the media. However, while IUU fishing, including labor violations, covers a wide range of activities, evidence related to these activities is limited due to their covert nature.[479] For example, many types of labor violations have been identified on an ad hoc basis. However, reports evaluating violations of fundamental workers' rights in the fishing sector on a global scale are focused on evidence of human trafficking and of forced and child labor and often do not focus on violations specific to the fishing industry. Information on other types of labor violations in the fishing sector, such as violations of the right to organize or to conduct collective bargaining, is even more scarce but is included below when available (mainly in the Thailand country profile).

Country Profiles

Russia

The commercial fishing industry is a minor, but developed, component of the Russian economy. The production of fisheries is estimated to employ 500,000–600,000 people across all facets of the sector.[480] The marine-capture fleet is primarily composed of large commercial vessels and is highly export oriented. In 2017, total exports exceeded $4.5 billion, compared to a total Russian gross domestic product (GDP) of $1.7 trillion.[481] Russian fish and shellfish consumption per capita is slightly above the global average of 19.6 kilograms (kg): about 21.3 kg annually during 2013–16.[482]

Production

Russia is a large seafood producer, primarily by means of wild capture. In 2018, Russia reported a total of 5.3 million metric tons (mt) of seafood production and was the seventh-largest producer globally (table 5.1).[483] The total seafood production exceeded 5 million mt annually during 2017–18.[484] The vast majority of this is from marine capture landings; a negligible amount is sourced from aquaculture production. The Russian EEZ is vast and encompasses swaths of the Northwestern Pacific Ocean (including the Bering Sea, like the U.S. EEZ), Arctic Ocean, and Baltic Sea. The fisheries of the far east

[479] NOAA Fisheries, "Understanding Illegal, Unreported, and Unregulated Fishing," December 30, 2019; NOAA Fisheries, "Combatting IUU Fishing in World Fisheries," November 22, 2019.
[480] FAO, "Fishery and Aquaculture Country Profiles: The Russian Federation," September 2019.
[481] Stupachenko, "Russia Wants to Double," February 12, 2019; FAO, "FAO Features Its Expertise," November 7, 2019; FAO, "Fishery and Aquaculture Country Profiles: The Russian Federation," September 2019.
[482] NOAA Fisheries, *Fisheries of the United States, 2018 Report*, February 2020, 120–21.
[483] FAO, Global Production database, accessed May 19, 2020; FAO, *The State of World Fisheries and Aquaculture*, 2020.
[484] Less than 5 percent of the total catch is attributable to aquaculture operations, leaving the bulk of those five million tons the product of capture fisheries. FAO, "Fishery and Aquaculture Country Profiles: The Russian Federation," September 2019.

provide the majority of Russia's catch: this region is the source for major species like pollock, salmon, and king crab.

Table 5.2 Russia: Total seafood production (wild capture and aquaculture), exports, and U.S. imports from Russia

Seafood production, 2018 (million mt)	Global ranking, 2018	Seafood exports, 2019 (billion $)	Value of U.S. imports of seafood, 2019 (billion $)	Share of U.S. seafood imports (%)	Ranking as U.S. supplier (2019)	Estimated value of U.S. marine capture IUU imports (million $)
5.3	8	$4.8	$697	3.2	10	$113.8

Source: FAO, Global Production database, accessed May 19, 2020; IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.10, accessed September 22, 2020; USITC DataWeb/USDOC, HTS 03, 1604, 1605, 2301.10; accessed May 19, 2020; USITC IUU import estimates.

Russia is reportedly aiming to substantially increase the size of its fishing industry. The Russian government is said to be investing in its domestic fleet and port facilities to better exploit its domestic waters.[485] Additionally, the country is pursuing efforts to increase aquaculture production.[486] The government has also added a goal to increase production of value-added products domestically, instead of sending raw materials to countries like China for processing.[487]

Fleet

The Russian fleet is relatively small, especially compared to those of many larger Asian producers. There are about 1,100 large commercial vessels in operation.[488] About 300,000 people are employed by the industry as fishers and in seafood processing operations.[489] Russia's DWF fleet is reportedly the world's ninth-largest DWF fleet, encompassing approximately 1.5 percent of global DWF activity.[490]

Trade

Russia is a substantial exporter of marine-capture fisheries products, exporting about $4.8 billion in 2019. The main seafood exports from Russia are pollock, crab, and cod, which accounted for 66.2 percent by value of the total exports of seafood from the country in 2019.[491] The top destinations include China (36.4 percent), South Korea (31.3 percent), and the Netherlands (16.6 percent).[492] The

[485] Stupachenko, "Russia to Push," January 31, 2020; Government of the Russian Federation, *Strategy for Development*, April 12, 2020.
[486] Stupachenko, "Russia's Aquaculture Industry," August 23, 2018.
[487] The overall success of that effort is yet to be seen, as building some of that infrastructure may be stymied by local governments, which have reportedly frustrated South Korean efforts to build a processing center in Russia. Industry representative, interview by USITC staff, May 20, 2020; Stupachenko, "Russia Wants to Double," February 12, 2019; Voloshchak, "A Closer Look," January 9, 2019.
[488] Large is defined as longer than 12 meters. FAO, "Fishery and Aquaculture Country Profiles: The Russian Federation," September 2019; USITC, hearing transcript, September 3, 2020, 22 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries).
[489] FAO, "Fishery and Aquaculture Country Profiles: The Russian Federation," September 2019.
[490] In comparison, China is the largest and is estimated to account for 38.0 percent of the global DWF activity. See chapter 4 for more information on China's DWF fleet. Yozell and Shaver, *Shining a Light*, November 1, 2019, 7, 15.
[491] IHS Markit, Global Trade Atlas database, HS 0302, 0303, 0304, 0305, 0306, 0307, 0308, 1604, 1605, and 2301.20, accessed December 3, 2020.
[492] IHS Markit, Global Trade Atlas database, HS 0302, 0303, 0304, 0305, 0306, 0307, 0308, 1604, 1605, and 2301.20, accessed December 11, 2020.

United States is only the 12th-largest market for direct Russian fisheries products at 4.1 percent of the total. However, as discussed below, Russian fisheries products like king crab and pollock often make their way to the United States through third-party countries, including China.

U.S. Imports from Russia

Russia is an important supplier of certain fisheries products to the United States, although not always directly. Collectively, five species—king crabs, snow crabs, Atlantic cod, sockeye salmon, and haddock—accounted for 94.6 percent of direct U.S. seafood imports from Russia in 2019 (table 5.3). By value, U.S. imports from Russia grew 21.7 percent on average annually between 2015 and 2019.[493] The increased trade has predominantly involved substantial increases in king crab and snow crab imports, which combined increased in value by 24.3 percent year-over-year since 2015.[494]

Table 5.3 Russia: Top U.S. imports of seafood from Russia, 2019

Product group	Value ($ million)	Share of total U.S. seafood imports from Russia (%)
King crab	432	62.0
Snow crab	179	25.8
Atlantic cod	21	3.0
Sockeye salmon	17	2.4
Haddock	11	1.5
All other	37	5.4
Total	697	100.0

Source: USITC staff calculations from USITC DataWeb/USDOC, accessed May 19, 2020.

Note: Imports may include products that originate in any fishing area and/or that are sourced by vessels from other countries.

A number of the species from Russia, including king crab, snow crab, and certain finfish such as pollock, enter the United States indirectly by means of transshipments through third countries. While most product is exported directly to the United States, reports indicate that a notable amount is transshipped through other nations, obscuring the true source of product. For king crab, Japan and South Korea are often cited as intermediaries.[495] Transshipments are also likely routed through China, as Russia is the source for about 5 percent of Chinese king crab imported by the United States.[496] China has also historically played a role in processing and then exporting Russian finfish products, including pollock, cod, haddock, and salmon, to the United States.[497] Commission estimates show that U.S. imports of walleye pollock from Russia were sourced by Russian vessels.[498] In previous years, much of this product

[493] This was a combination of increasing quantity (11.1 percent annual growth rate since 2015) and price (9.5 percent annual growth rate since 2015). IHS Markit, Global Trade Atlas database, HS 0302, 0303, 0304, 0305, 0306, 0307, 0308, 1604, 1605, and 2301.20, accessed December 11, 2020.
[494] USITC staff calculations from USITC DataWeb/USDOC, accessed May 19, 2020.
[495] WWF, *Illegal Russian Crab*, October 2014, 2; Pramod et al., "Estimates," September 2014; Taylor, "Searching," June 23, 2014.
[496] WWF, *Illegal Russian Crab*, October 2014, 15.
[497] Telesetsky, "Scuttling IUU Fishing," 2015, 1237; Pramod et al., "Estimates"; Wild Salmon Center, *A Review of IUU Salmon*, May 2009.
[498] USITC IUU import estimates.

was reportedly obtained via IUU fishing.[499] Asian ports are not the only ones to transship Russian products: Norway serves as a transshipment point for U.S. imports of snow crab, since about 10.2 percent of Russian snow crab exports are estimated to first move through Norway.[500]

Fisheries and Fleet Management

The Russian Ministry of Agriculture's Federal Agency for Fishery is the main regulatory agency responsible for the management of Russian fisheries at the national level.[501] All EEZs are controlled under the National Law on Fisheries.[502] The Ministry makes fisheries management decisions based on the scientific advice of fisheries institutes, and recordkeeping is handled through a centralized system.[503] The total allowable catch for the Russian fleet is set by the licensing of individual companies and granting of harvesting quotas for a species.[504] If a company is caught performing illegal activities, Russia reportedly revokes these permissions.[505] All vessels are required to carry tracking systems and if a company turns off the system, that is grounds for revocation of the company's fishing quota. Supervision of the fleet is handled by the Russian Federal Agency for Fisheries and the Russian Coast Guard.[506]

The government of Russia has implemented multiple policies since 2000 that impact IUU fishing, with the goal of limiting crab transshipment and other activities associated with IUU fishing.[507] For example, since 2008, there has been a legal requirement to land all catches obtained in the Russian EEZ in a Russian port to properly document the harvest before export.[508] The most current fisheries governance

499 Pramod et al., "Estimates," September 2014.
500 USITC IUU import estimates. Transshipments are not exclusive to the U.S. market. For example, the EU also imports transshipped product including Russian pollock from China and Russian-caught Atlantic cod from Norway. Telesetsky, "Scuttling IUU Fishing"; Stokke, "Trade Measures," March 2009, 339–49.
501 This body also regulates the conduct of foreign vessels permitted to fish in the Russian EEZ. Government of the Russian Federation, "Federal Agency for Fishery," accessed November 30, 2020. USITC, hearing transcript, September 3, 2020, 22–23 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); Government of Russia, written submission to USITC, September 16, 2020, 1, 4–5.
502 FAO, *Federal Law No. 166-FZ*, July 26, 2019.
503 USITC, hearing transcript, September 3, 2020, 23–24 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); Government of Russia, written submission to USITC, September 16, 2020, 7–11.
504 USITC, hearing transcript, September 3, 2020, 22 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries).
505 USITC, hearing transcript, September 3, 2020, 22 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); Government of Russia, written submission to USITC, September 16, 2020, 3.
506 USITC, hearing transcript, September 3, 2020, 24 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); Government of Russia, written submission to USITC, September 16, 2020, 4.
507 A 2007 policy banned the export of live crab but was rescinded in 2011 because it resulted in increased poaching. USITC, hearing transcript, September 3, 2020, 23 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); Government of Russia, written submission to USITC, September 16, 2020, 2; WWF, *Illegal Russian Crab*, 12; Sobolevskaya and Divovich, *The Wall Street of Fisheries*, 2015.
508 USITC, hearing transcript, September 3, 2020, 28–30 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); WWF, *Illegal Russian Crab*, October 2014, 12.

for combating IUU fishing derive from the 2015 decree No. 2661-R.[509] Following the implementation of these policies, up to 90 percent of Russian fisheries exports are now reportedly certified as non-IUU.[510]

Russia has made multiple efforts in the past decade to curb IUU fishing activity through diplomacy.[511] At the multilateral level, the country signed the Port State Measures Agreement in 2010. Bilateral agreements include 2009 and 2019 agreements with South Korea to try to limit the amount of black-market catch that is laundered through South Korean ports.[512] This was followed by an agreement in 2013 to increase the quota for pollock harvested in the Russian EEZ by South Korean vessels if South Korea clamps down on IUU crab catch entering its ports.[513] Other efforts include agreements with China and Japan in 2014 to counteract IUU fishing activity.[514] Russia also signed an agreement with the United States in 2015 on IUU fishing and is the two countries have a history of law enforcement cooperation.[515]

Not all diplomacy around fisheries has been successful.[516] There are issues of other nations illegally fishing in Russian waters, especially from North Korean vessels.[517] There have been over 1,000 reported arrests of North Korean nationals in 2019 alone, and reports place up to 3,000 vessels operating in Russian waters without authorization.[518] More dramatically, shots were fired between Russian and North Korean fishing vessels in 2019 over illegal fishing.[519] Diplomatic efforts are reportedly still in progress.[520]

In addition to domestic regulations on fisheries and fleet management, Russia is a member of six RFMOs in addition to other international bodies that regulate fishing (appendix H).[521] Russia has also ratified the United Nations Convention on the Law of the Sea, among other international treaties on fishing and labor (appendix H).[522] However, although Russia signed the Port State Measures Agreement in 2010, it has not ratified it as of November 2020. Russia has ratified all International Labour Organization (ILO)

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[509] Government of Russia, written submission to USITC, September 16, 2020, 1.
[510] Part of the certification procedure is to ensure compliance with EU regulations and requirements. Government of Russia, written submission to USITC, September 16, 2020, 2, 8.
[511] USITC, hearing transcript, September 3, 2020, 23–24, 29–30 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); Government of Russia, written submission to USITC, n.d., 5.
[512] Parties meet annually to this end. Government of Russia, written submission to USITC, September 16, 2020, 3, 7–8.
[513] WWF, *Illegal Russian Crab*, October 2014, 12.
[514] Government of Russia, written submission to USITC, September 16, 2020, 8.
[515] Government of Russia, written submission to USITC, n.d., 6; USITC, hearing transcript, September 3, 2020, 29 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); WWF, *Illegal Russian Crab*, October 2014, 16; NOAA Fisheries, "United States and Russia," September 11, 2015.
[516] USITC, hearing transcript, September 3, 2020, 26 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries).
[517] Government of Russia, written submission to USITC, September 16, 2020, 2.
[518] USITC, hearing transcript, September 3, 2020, 26 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); USITC, hearing transcript, September 3, 2020, 187 (testimony of David Kroodsma, Global Fishing Watch).
[519] Ferris and Macdonald, "Russia and North Korea," April 22, 2020.
[520] USITC, hearing transcript, September 3, 2020, 26 (testimony of Erling Jacobsen, Inter-Cooperative Exchange); Government of Russia, written submission to USITC, September 16, 2020, 8.
[521] These include the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP) and the Joint Norwegian Russian Fisheries Commission (JointFish). FAO, "Fishery and Aquaculture Country Profiles: The Russian Federation," September 2019; Government of Russia, written submission to USITC, September 16, 2020, 5–7.
[522] UNTC, "United Nations Convention on the Law of the Sea," December 14, 2020.

core conventions on forced and child labor, as well as the Maritime Labor Convention, but the country has not joined the ILO Work in Fishing Convention (appendix H).

IUU Fishing Activities, including Labor Issues

IUU fishing in Russian waters and by Russian vessels outside the country's EEZ has been widely documented. The Russian EEZs include waters in the Mediterranean Sea and the Black Sea, as well as in the Northwest Pacific Ocean. A large number of species in these two areas are experiencing high levels of IUU fishing, resulting in this region being deemed by the World Wildlife Fund (WWF) as a "high risk" region for illegal fishing.[523] Russia was identified by NOAA Fisheries in its 2017 biennial report for violating conservation measures between 2014 and 2016.[524] NOAA Fisheries noted that a Russian vessel had been identified as engaging in activities associated with IUU fishing, including having inconsistencies between reported haul locations and Vessel Monitoring System (VMS) track-lines.[525] As of March 30, 2020, two Russian vessels were listed by the South Pacific Regional Fisheries Management Organization as fishing in waters under its jurisdiction without authorization, while four other vessels had previously been listed by RFMOs as engaging in IUU activities.[526] Further, Russia was classified as being at high risk of modern slavery by the Global Slavery Index on Fishing.[527]

IUU Fishing Activities

The current state of fishing activities in Russia can be traced to the collapse of the Soviet Union.[528] Previously, the Soviet government tightly controlled the behavior of the fishing fleet through the Sevryba, essentially a governing branch of the Ministry of Fishing Industry.[529] In the absence of strong government control after the collapse of the Soviet Union, the same forces that allowed the takeover of other market sectors by criminal elements and oligarchs applied to the Russian fishing industry.[530] However, this situation is reportedly improving due to increased law enforcement activity and monitoring of the fleet, as evidenced by the increasing number of Marine Stewardship Council (MSC) certifications for Russian fisheries.[531]

There is a history of IUU fishing activity occurring both by foreign-flagged vessels in Russian waters and Russian-flagged vessels in foreign waters. Russia does not permit foreign-flagged vessels to fish in its

[523] Additionally, Russian activity has been reported in other vulnerable regions, including the Eastern Central Atlantic, Southern Atlantic Ocean WWF, *Illegal Fishing*, October 2015, 22–23, 30, 32.
[524] NOAA Fisheries identified a Russian vessel as fishing in the U.S. EEZ without authorization, but the Russian government found the vessel not to be fishing in the U.S. EEZ, which resulted in a positive certification in 2019.
[525] NOAA Fisheries, *Improving International Fisheries Management*, 2019, 92.
[526] TMT, "Combined IUU Vessel List," accessed March 30, 2020.
[527] Minderoo Foundation, *Global Slavery Index 2018*, 2018.
[528] Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015.
[529] This was a complex system that rigidly dictated catch limits and landing procedures.
[530] USITC, hearing transcript, September 3, 2020, 61 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries); WWF, *Illegal Russian Crab*, October 2014; Stokke, "Trade Measures," March 2009; U.S. National Intelligence Council, *Global Implications*, September 19, 2016.
[531] USITC, hearing transcript, September 3, 2020, 81 (testimony of Todd Clark, Endeavor Seafood); Government of Russia, written submission to USITC, September 16, 2020, 1–2.

EEZ, though poaching has reportedly happened.[532] Concurrently, other nations, like Guinea-Bissau, have detained Russian nationals for illegal fishing in their own EEZs.[533] There are also reports of Russian vessels illegally fishing in U.S. waters.[534] Reportedly, Russian fishers will obtain an access agreement for one area, then use that proximity to fish in neighboring EEZs.[535] Russian vessels have also been identified by several RFMOs as engaging in IUU fishing. Four vessels were previously listed and two were marked as "currently listed" as of March 30, 2020. Both vessels, the *Nakhodka* and the *Vladivostok 2000*, were marked for fishing or being present without authorization, respectively, in waters under the jurisdiction of the South Pacific Regional Fisheries Management Organization, while the latter was also identified as supporting authorized Peruvian ships.[536]

A number of activities associated with IUU fishing, including illegal transshipment, occurred in Russia or were undertaken by Russian vessels in the recent past. As noted above, fishers often skipped the required landing of their catch in Russian ports, favoring foreign destinations.[537] This activity was reportedly done to circumvent quotas and reporting requirements.[538] For example, there was more exported Russian king crab entering the global supply chain based on importing countries' trade data than should exist according to the official Russian catch statistics. At its peak, a majority of Russian king crab catch was not included in the official data.[539] These practices were also in violation of international conservation and management measures that Russia is party to.[540] Presently, as a result of legal reforms and third-party certifications, less than 20 percent of Russian king crab is estimated to be IUU catch.[541]

The continuation of IUU fishing practices and associated activities reportedly stems from systemic problems that incubate such activity. The first is a lack of resources dedicated to rooting out the practice—inspectors are generally low paid (i.e., near subsistence) and there is a lack of sufficient patrolling.[542] Failure to pay port officials a sufficient wage has caused endemic bribery throughout the domestic supply chain, and officials are reluctant to take actions that would cause them to lose access to this income source.[543]

The high prevalence of IUU fishing-sourced seafood from Russia has reportedly caused financial harm to the fishing industries of other nations. Most commercial species harvested in the Russian EEZ are susceptible to IUU fishing, though some more than others, and some are sold in foreign markets where they compete with similar domestic products. By some estimates, about two-thirds of Russian crab —

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[532] It has been reported that Cambodian- and Sierra Leonian-flagged vessels have been caught in Russian waters. However, the Russian government reported no vessels using flags of convenience in either 2019 or the first half of 2020. Government of Russia, written submission to USITC, September 16, 2020, 3; Taylor, "Searching"; WWF, *Illegal Russian Crab*, October 2014.
[533] U.S. National Intelligence Council, "Global Implications."
[534] NOAA Fisheries, *Improving International Fisheries Management*, 2019.
[535] Industry representative, interview by USITC staff, May 11, 2020.
[536] TMT, "Combined IUU Vessel List," accessed March 30, 2020.
[537] Telesetsky, "U.S. Seafood Traceability," 2017.
[538] Industry representative, interview by USITC staff, March 18, 2020.
[539] WWF, *Illegal Russian Crab*, October 2014, 23.
[540] NOAA Fisheries, *Improving International Fisheries Management*, 2019.
[541] USITC IUU import estimates.
[542] Pramod et al., "Estimates," September 2014.
[543] Sobolevskaya and Divovich, "The Wall Street of Fisheries," 2015.

including king crab and snow crab— is illegally harvested and destined for export.[544] Russia is a leading global producer of salmon, which is also commonly subject to IUU harvesting.[545] Major IUU activities in the Russian salmon fishery include overfishing and poaching for roe. [546] Many U.S. fishers compete with major products under unfair conditions. IUU crab from Russia is estimated to depress prices for U.S. producers in the domestic market, and U.S. pollock and cod compete with Russian product in the global market.[547]Additionally, the large amount of Russian pollock that was reported to have moved through China, for example, has reportedly depressed prices for U.S.-caught pollock in Europe.[548]

There are examples of successes in Russia with regard to curbing IUU activity. While there is continued evidence of IUU activity, according to testimony from a representative of the Russian government there are currently no issues with illegal fishing or IUU products emanating from Russian waters.[549] Recently, Russia's Barents Sea Greenland Halibut and Opilio Trap snow crab fisheries achieved MSC certification, joining earlier certifications of 26 other fisheries.[550] As noted above, Russia has also been active in pursuing diplomatic agreements to combat IUU fishing. Although the presence of IUU crab is still a substantial problem in the supply chain, there has been some progress in reducing the overall catch volume.[551] Russia also has a history of engaging with U.S. law enforcement on IUU issues.[552]

Labor Issues in the Fishing Sector

There have been reports of human trafficking within the Russian fishing fleet, especially in the Barents Sea. For example, a 2012 reported noted that Ukrainian nationals had been found working on illegal crabbing boats operating in the Russian EEZ.[553] Conditions on these vessels include grueling working schedules, poor and unsafe conditions, and limited access to food.[554] As the victims of trafficking, workers had limited freedom or ability to leave the ship due to either a lack of documents and money or threats from the vessel's operators.[555] Other reports of labor violations have included the illegal movement of labor from other countries through brokers in contravention of those countries' laws. For example, a 2015 report notes that Burmese recruiters falsified documents and moved workers to

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[544] WWF, *Illegal Russian Crab*, October 2014, 1.
[545] McDowell Group, *Sockeye Market Analysis Fall 2015*, 2015.
[546] Pramod et al., "Estimates," September 2014.
[547] Industry representative, interview by USITC staff, March 17, 2020; Industry representative, interview by USITC staff, March 19, 2020.
[548] McDowell Group, *Wholesale Market Profiles for Alaska Groundfish and Crab Fisheries*, May 2016.
[549] For example, industry reports that there is still IUU crab taken from Russian waters entering the supply chain. Erling E. Jacobsen, written submission to USITC, October 4, 2020; USITC, hearing transcript, September 3, 2020, 25–26 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries).
[550] For complete information on Russian MSC certifications, see: MSC, "Home," accessed December 31, 2020. MSC, "Russia Sea of Okhotsk Pollock," September 24, 2013; MSC, "Russia's Remote Western Kamchatka Salmon," September 15, 2016; MSC, "Russian Red King Crab," February 23, 2018; MSC, "Two More Russian Fisheries," April 23, 2020; Government of Russia, written submission to USITC, September 16, 2020, 9–14.
[551] McDonald, *Commercially Important Crabs*, December 10, 2015.
[552] USITC, hearing transcript, September 3, 2020, 24, 29 (testimony of Vasily Sokolov, Russian Federal Agency of Fisheries).
[553] USITC, hearing transcript, September 3, 2020, 216 (testimony of Juno Fitzpatrick, Conservation International).
[554] IOM, *Trafficked at sea*, 2012, 19.
[555] IOM, *Trafficked at sea*, 2012, 20.

Russian vessels through multiple countries, without those workers even knowing what kind of work they were going to be performing at their destination.[556]

Multiple factors keep fishers working on Russian fishing vessels despite the conditions that violate labor protections. These fishers are often economically disadvantaged and typically pay brokers a recruitment fee or incur a debt to be placed on a vessel (i.e., debt bondage), creating an initial power imbalance that prevents workers from leaving exploitative conditions.[557] Workers are often men with children who are looking for work to support their family.[558] They are further controlled in some instances by the broker or other agent taking possession of their identifying documents.[559]

Estimates of IUU Imports

Both directly and indirectly, Russia is an important U.S. supplier of seafood, some of which is the product of IUU fishing. The Commission's supply chain analysis indicates that in 2019, most U.S. imports of marine-capture products from Russia originated in Russian EEZs, and that almost all of those imports were sourced by Russian vessels. Of these, a great majority of the U.S. imports of marine-capture products were crab products (92.1 percent), including king crab and snow crab, followed by sockeye salmon (2.6 percent), Pacific cod (1.5 percent), and Atlantic cod (1.3 percent). About 34.2 percent of the products sourced by Russian vessels in Russian EEZs are estimated to be imported into the United States via other countries, particularly from China. The Commission estimates that in 2019 about 16.5 percent, or an estimated $113.8 million, of the U.S. imports of marine-capture products from Russia were obtained via IUU fishing. Most of the estimated U.S. imports from Russia of IUU marine-capture seafood were of various types of crab, salmon, and cod.

Vietnam

The fishing and aquaculture industry is a major component of the Vietnamese economy and employs a substantial number of people in Vietnam.[560] Approximately four million people are directly employed within the sector, with 2.6 million employed in aquaculture production and over a million dedicated to farmed shrimp production.[561] It has been estimated that 10 percent of the population is either directly or indirectly employed in this industry.[562] Most Vietnamese fishers are small-scale operators. However, through government efforts for greater commercialization of marine fisheries, which began in the 1990s, the country has built up a larger industrial fleet.[563] Vietnam, like other countries in Southeast Asia, has high levels of domestic seafood consumption—over 35 kilograms per person per year—accounting for approximately 30 percent of all animal protein consumed.[564]

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[556] Lone and Barron, "Trawler Tragedy," April 7, 2015.
[557] IOM, *Trafficked at sea*, 2012, 18.
[558] Child labor on Russian vessels does not appear to be a common practice.
[559] IOM, *Trafficked at sea*, 2012, 19.
[560] Fisheries exports alone account for about $8–10 billion per year, compared to a total gross domestic product of circa $250 billion. Dao, "Vietnam Sets Goal," February 15, 2019.
[561] FAO, "Fishery and Aquaculture Country Profiles: The Socialist Republic of Viet Nam," 2019.
[562] FAO, "Fishery and Aquaculture Country Profiles: The Socialist Republic of Viet Nam," 2019.
[563] Ojamaa, "Research for PECH," October 2018, 13.
[564] FAO, "Fishery and Aquaculture Country Profiles: The Socialist Republic of Viet Nam," 2019.

Production

Vietnam is the fourth-largest producer of wild-capture and aquaculture products; it also produces fishmeal and fish oil. In 2018, Vietnam reported 7.5 million metric tons (mt) of wild-capture and aquaculture production (table 5.4).[565] By value, wild-capture production accounted for about 44.7 percent of the total production in Vietnam, reaching 3.4 mt in 2018. Wild-capture production in Vietnam has substantially expanded in recent years, growing 21.5 percent between 2014 and 2018.[566] Important species groups landed by the Vietnamese fleet include tuna and cephalopods (e.g., squid). The most valuable capture species from Vietnamese sources include skipjack, yellowfin, and bigeye tunas.[567] A substantial portion of the marine capture landings are destined for export.[568]

The aquaculture industry in Vietnam is also one of the world's largest. Over half of the Vietnamese seafood industry is dedicated to these operations.[569] These farms produce almost 3.5 million mt of shellfish, finfish, and other species groups (4.8 percent of world total aquaculture production) and the quantity has been consistently increasing over the past two decades.[570] About a quarter of agricultural exports from Vietnam are aquaculture products.[571] Major aquaculture products include shrimp and pangasius (a catfish-like species).[572]

Table 5.4 Vietnam: Total seafood production (wild capture and aquaculture), exports, and U.S. imports from Vietnam

Seafood production, 2018 (million mt)	Global ranking, 2018	Seafood exports, 2019 (billion $)	Value of U.S. imports of seafood, 2019 (billion $)	Share of U.S. seafood imports (%)	Ranking as U.S. supplier (2019)	Estimated value of U.S. imports obtained via IUU fishing (million $)
7.5	4	$20.4	$1.5	6.8	6	$106.1

Source: FAO, Global Production database, accessed May 19, 2020; IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.10, accessed September 22, 2020; USITC DataWeb/USDOC, HTS 03, 1604, 1605, 2301.10; accessed May 19, 2020; USITC IUU import estimates.

A substantial portion of the total wild-capture and aquaculture production in Vietnam are processed in the country and then exported. Seafood processing in Vietnam occurs in the coastal regions. For example, Cà Mau Province—the largest shrimp-farming region in Vietnam that supplies at least a quarter of production—has 30 facilities that process a combined 150,000 mt of shrimp per year.[573]

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565 Freshwater fishing, in contrast, is an important part of the domestic diet, and only encompasses 200,000 tons per annum catch. FAO, Global Production database, accessed May 19, 2020.
566 FAO, Global Production database, accessed May 19, 2020.
567 Ojamaa, "Research for PECH," October 2018, 20.
568 FAO, *The State of World Fisheries and Aquaculture*, 2020, 87.
569 FAO, *The State of World Fisheries and Aquaculture*, 2020, 7, 23.
570 FAO, Global Production database, accessed May 19, 2020; FAO, *The State of World Fisheries and Aquaculture*, 2020, 7, 33–34.
571 Vietnam includes seafood in its agricultural statistics. Accounting for about 2–3 percent of total export value based on total export composition of 8.5 percent agricultural products. Ojamaa, "Research for PECH," October 2018, 13.
572 FAO, *The State of World Fisheries and Aquaculture*, 2020, 86; Ojamaa, "Research for PECH," October 2018, 19.
573 Southern Shrimp Alliance, written submission to USITC, September 17, 2020, 2; EJF, *Caught in the Net*, November 11, 2019, 16.

Other processed products include a variety of tuna—with canned tuna accounting for about half of the exports.[574] The Vietnamese processing sector has been undergoing a transition, from primarily government-owned to private or joint stock enterprises; this has corresponded with industry consolidation and the beginnings of foreign investment.[575]

Vietnam is also an important producer and supplier of fishmeal and fish oil, particularly to China, which received 93.9 percent of the total Vietnamese exports of fishmeal and fish oil in 2019.[576] There are approximately 96 processors of fishmeal (and fish oil, which is a coproduct of fishmeal production) throughout Vietnam, producing almost half a billion mt of fishmeal per year.[577] The production of fishmeal is reportedly one of the primary drivers for overfishing within Vietnamese waters, and the fish captured for this purpose are highly vulnerable to IUU fishing practices.[578] Thus, while the shrimp and other species produced via aquaculture are not generally classifiable as obtained through IUU fishing, the meals used to feed them create an incentive for broader IUU fishing activity.[579]

Fleet

Vietnam has a sizable commercial fishing fleet with a large number of small vessels, although some larger vessels are active, especially in DWF. The total fishing fleet is reported to have about 96,609 vessels.[580] However, the majority—approximately 65,200—are small vessels under 15 meters in length, which are not as highly regulated as larger vessels.[581] Approximately 19,400 vessels range from 15–24 meters within the maritime fleet, and only 2,618 (2.7 percent) exceed 24 meters, which make up the bulk of the DWF fleet.[582] Overall, the large number of vessels and the intensity of fishing activity has substantially reduced fish stocks in the Vietnamese EEZ to near depletion, resulting in an increase in Vietnamese fishing activity in waters outside of its EEZ. Part of the expansion of the fishing fleet that depleted the Vietnamese EEZ was driven by government financial support for construction and retrofits of vessels, including vessels known as “blue boats.”[583]

[574] Pramod et al., “Estimates,” September 2014.
[575] World Fishing and Aquaculture, “Consolidation is the Key,” June 4, 2015.
[576] IHS Markit, Global Trade Atlas database, HS 2301.20, 1504.10, 1504.20, accessed December 3, 2020.
[577] Changing Markets Foundation, *Fishing for Catastrophe*, October 2019, 31.
[578] Nearly all caught species of fish— regardless of size—can be used to create aquaculture feed, which opens possibilities for IUU harvesting methods. Changing Markets Foundation, *Fishing for Catastrophe*, October 2019, 34–35.
[579] Southern Shrimp Alliance, written submission to USITC, September 17, 2020, 2.
[580] USITC, hearing transcript, September 3, 2020, 9–10 (testimony of Pham Quang Huy, Ministry of Agriculture and Rural Development of the Socialist Republic of Vietnam); Government of Vietnam, written submission to the USITC, September 2, 2020, 2.
[581] Ojamaa, “Research for PECH,” October 2018, 21; EJF, *Caught in the Net*, November 11, 2019, 7, 10; Government of Vietnam, written submission to the USITC, September 2, 2020, 2.
[582] USITC, hearing transcript, September 3, 2020, 9–10 (testimony of Pham Quang Huy, Ministry of Agriculture and Rural Development of the Socialist Republic of Vietnam); Government of Vietnam, written submission to the USITC, September 24, 2020, 2.
[583] The hulls of these small wooden vessels are often painted blue. While relatively small, blue boats have the capabilities to fish outside of the Vietnamese EEZ. Ojamaa, “Research for PECH,” October 2018, 21; Pew Charitable Trusts and RS Standards, *Addressing Illegal Fishing*, 2019, 5; de Rivaz et al., *Turning the Tide?*, November 29, 2019, 14.

Trade

Vietnam has been the world's third-largest exporter of fish and seafood products since 2014, following only China and Norway.[584] The United States is the second-largest market for Vietnamese fisheries products at 16.5 percent of the total; other major destinations include the EU (17.2 percent), Japan (15.4 percent), China (14.5 percent), and South Korea (9.2 percent).[585] The main seafood exports from Vietnam are shrimp, pangasius, and fishmeal, which accounted for 51.0 percent of the total exports of seafood from the country in 2019.[586] Exports to the EU, United States, Japan, and South Korea are concentrated in shrimp and tuna product; exports to China are mainly of fishmeal used in aquaculture production. Part of Vietnam's increasing exports have been driven by its growing processing industry—supplied in part by third-country imports—which produces products such as canned tuna.[587]

The Vietnamese seafood processing sector primarily produces product for export. Imports feed into this sector, with around $1.6 billion worth of fresh and frozen seafood imports being processed for export.[588] Imported products include tuna, crab, cephalopods, and other marine fish, and processed exports include canned tuna, canned crab, and frozen fish products.[589] The decrease in domestic fisheries stocks has led to an increased reliance on imported inputs—including from India, Japan, Hong Kong, and Taiwan— and the DWF fleet to meet export goals.[590] For example, tuna sourced from the high seas and other countries' EEZs (e.g., Indonesia) is likely contributing to Vietnam's canned tuna output.[591]

U.S. Imports from Vietnam

Vietnam is an important and increasing supplier of seafood products to the United States, ranking sixth in 2019 in terms of value.[592] U.S. imports of seafood products from Vietnam increased 3.0 percent on average annually since 2015. In 2019, the majority of U.S. imports of seafood imported from Vietnam were of shrimp, pangasius, and canned tuna products (table 5.5), three of the most consumed products in the United States (see chapter 6). Shrimp and pangasius imports are predominantly produced with inputs from Vietnam's aquaculture industry.[593]

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[584] FAO, *The State of World Fisheries and Aquaculture*, 2020, 8.
[585] EJF, *Caught in the Net*, November 11, 2019, 7.
[586] IHS Markit, Global Trade Atlas database, HS 0302, 0303, 0304, 0305, 0306, 0307, 0308, 1604, 1605, and 2301.20, accessed December 3, 2020.
[587] FAO, *The State of World Fisheries and Aquaculture*, 2020, 75.
[588] EJF, *Caught in the Net*, November 11, 2019, 8.
[589] Vietnam Association of Seafood Exporters and Producers, *Overview of Vietnam Fisheries Industry*, accessed September 21, 2020; Marsha, "Most of the Tuna," December 5, 2018; Food Source International, "Trinity Vietnam," accessed September 25, 2020; Food Safety News, "Texas Firm," February 28, 2019.
[590] USITC IUU import estimates.
[591] USITC IUU import estimates.
[592] USITC DataWeb/USDOC, accessed May 19, 2020.
[593] Shrimp is farmed in brackish water and pangasius in freshwater. Waycott, "Pangasius Farming," August 17, 2015; FAO, *National Aquaculture Sector Overview Viet Nam*, accessed September 21, 2020; USITC IUU import estimates.

Table 5.5 Vietnam: Top U.S. imports of seafood from Vietnam, 2019

Product group	Value ($)	Share of total U.S. seafood imports from Vietnam (%)
Warmwater shrimp	636	42
Pangasius	331	22
Yellowfin tuna	201	13
Albacore tuna	58	4
Swimming crab	30	2
All other	246	16
Total	1,502	100

Source: USITC staff calculations from USITC DataWeb/USDOC, accessed May 19, 2020.
Note: Imports may include products that originate in any fishing area and/or that are sourced by vessels from other countries.

Fisheries and Fleet Management

Overall fishing policy is set by Vietnam's national government, with enforcement responsibilities divided between the national government and provincial governments for offshore and coastal areas, respectively.[594] The relevant national Vietnamese oversight body is the Directorate of Fisheries within the Ministry of Agriculture and Rural Development.[595] The Directorate of Fisheries oversees the regulation of aquaculture, capture fisheries, inspection, conservation and development, and resource monitoring. This agency is ultimately responsible for certification and traceability of seafood, along with ensuring compliance with international standards. However, the implementation of these policies is the responsibility of individual provincial governments, making implementation inconsistent across the country.[596]

The main fisheries legislation in Vietnam is the Fisheries Law amended in 2017, which was adopted in response to the issuance of a yellow card by the EU.[597] Aspects of this law include requirements for large vessels (greater than 15 meters in length) to use monitoring systems; licensing requirements for small fishing vessels; new training on proper logbook, document handling, and traceability requirements; efforts to build-out vessel databases and increase port surveillance; monitoring at processing facilities; and the increase in the number of inspection offices and greater enforcement in the form of fines and the revocation of fishing licenses.[598] The Vietnamese government reports 1,764 fisheries sanctions were imposed by local authorities from October 2019 to June 2020.[599] However, it is unclear if these reforms have yet yielded measurable changes in IUU fishing behavior.

While Vietnam is not a member of a RFMO, it is a cooperating nonmember of the Western and Central Pacific Fisheries Commission (appendix H), and several other regional and international bodies for

[594] Government of Vietnam, written submission to the USITC, October 5, 2020, 11.
[595] Ojamaa, "Research for PECH," October 2018, 15–16.
[596] Ojamaa, "Research for PECH," October 2018, 15–16; Pew Charitable Trusts and RS Standards, *Addressing Illegal Fishing*, 2019, 7–9.
[597] Government of Vietnam, written submission to the USITC, October 5, 2020, 3–5; EJF, *Caught in the Net*, November 11, 2019, 13; Socialist Republic of Vietnam, Fisheries Law (Amended), Law No: 18/2017/QH14, (November 21, 2017).
[598] USITC, hearing transcript, September 3, 2020, 11–13 (testimony of Pham Quang Huy, Ministry of Agriculture and Rural Development of the Socialist Republic of Vietnam); Government of Vietnam, written submission to the USITC, October 5, 2020, 4; ASEAN Today, "Vietnam Has the Chance," November 13, 2019.
[599] Government of Vietnam, written submission to the USITC, October 5, 2020, 2.

fisheries management and conservation.[600] The country has also joined a number of international treaties on fishing and labor, including the United Nations Convention on the Law of the Sea and the Port State Measures Agreement (appendix H). However, there are concerns that the Fisheries Law amended in 2017 does not comply with the agreement.[601] Vietnam has also ratified various ILO conventions on forced and child labor, including the Forced Labor Convention and the Worst Forms of Child Labor Convention. However, it has not ratified the Protocol to the ILO convention on Forced Labor or the Work in Fishing Convention.

IUU Fishing Activities including Labor Issues

IUU fishing in Vietnamese waters and by Vietnamese vessels outside the country's EEZ has been widely documented. Part of the Vietnamese EEZ is situated in the Western Central Pacific, where extensive IUU fishing is common for a large number of species, resulting in the area being deemed a "high risk" region for illegal fishing by the WWF.[602] There is also evidence of RFMOs listing Vietnamese vessels as engaging in IUU fishing activity, including poaching and unauthorized fishing in foreign waters.[603] Further, in 2017 the EU issued a yellow card, which has not been removed as of December 2020.[604] Additionally, Vietnam has been identified by the USDOL as having fish produced with forced labor and shrimp produced with both forced and child labor.[605] Vietnam was also classified as being at medium risk of modern slavery by the Global Slavery Index on Fishing.[606]

IUU Fishing Activities

Documentation of IUU activities by the Vietnamese fleet are often the result of law enforcement actions by other nations.[607] In 2017, the EU issued a yellow card against Vietnam, citing problems with its fisheries regulations. The cited justifications included issues with unauthorized fishing and poaching in other nation's waters, failures to uphold responsibilities as a flag state under the United Nations Convention on the Law of the Sea, an insufficient legal framework and adequate enforcement, and an inability to adequately monitor and guarantee the traceability of fisheries products.[608] This notification entered into force in 2017, and Vietnam was initially given the opportunity to make progress over a six-month period before a red card citation would be issued that would have prevented all exports to the EU.[609]

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[600] These include the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention on Biological Diversity. FAO, "National Aquaculture Sector Overview Viet Nam," accessed September 21, 2020.
[601] de Rivaz et al., *Turning the Tide?*, November 29, 2019, 39.
[602] WWF, *Illegal Fishing*, October 2015, 32.
[603] TMT, "Combined IUU Vessel List," accessed March 30, 2020. See chapter 2 for more information on TMT.
[604] EC, "Commission Decision of 23 October 2017," October 27, 2017.
[605] USDOL, ILAB, *2018 List of Goods*, 2018, 10.
[606] Minderoo Foundation, *Global Slavery Index 2018*, 2018.
[607] Pew Charitable Trusts and RS Standards, *Addressing Illegal Fishing*, 2019, 5.
[608] See chapter 2 for a discussion of the responsibilities of flag states under United Nations Convention on the Law of the Sea. The law previous to the carding decision did not even require ships fly a flag. EJF, *Caught in the Net*, November 11, 2019, 17; EC, "Commission Decision of 23 October 2017," October 27, 2017.
[609] Pew Charitable Trusts, *The EU IUU Regulation Carding Process*, April 2016.

The Vietnamese government reports that efforts have been made to curtail IUU practices and join international fishing protocols, although problems are still ongoing.[610] While progress has been made in updating the country's legal framework and regulatory system, that is not necessarily reflected in implementation.[611] The rollout of new Vietnamese policy has not been deemed sufficient by the EU to rescind its yellow card. For example, it has been reported that fewer than half of fishing vessels actually turn on their tracking systems; this deficiency is compounded by the lack of satellite monitoring capabilities throughout the majority of the fleet.[612] Further, a 2019 Environmental Justice Foundation report noted that implementation of the new policy had been hampered by government officials' attitudes toward the issues, including complacency and open denial of IUU fishing activities. The report notes that in mid-2018 the Vietnamese Ministry of Agriculture and Rural Development reported no IUU fishing cases had been identified that year, while media reports from several countries pointed to a large number of cases. These attitudes, however, are reportedly changing, as the Vietnamese government has published statistics on incidents of IUU fishing by Vietnamese vessels.[613] Additionally, the report found that port authorities were not adequately monitoring landed catch, as port inspections are infrequent and cursory.[614]

Although Vietnam was initially given the opportunity to make progress over a six-month period before being issued a red card citation that would have prevented all exports to the EU, the EU has extended the original deadline following multiple inspections where progress was observed.[615] Overall, Vietnam has not been able to guarantee the traceability of its fisheries exports, and IUU fishing continues under the new law.[616] The EU has recognized improvements during its interim investigation on progress in Vietnam, but as of December 2020 had not rescinded the yellow card because of continuing issues.[617] The impact of the yellow card on Vietnamese exports to the EU have thus far been minimal; major shifts in Vietnamese exports to other markets as a consequence of EU actions have not yet been observed.[618]

The overriding cause of Vietnam's IUU activity is reportedly the general depletion of stocks in local waters, forcing fishers to engage in unauthorized extraterritorial activity to maintain catches.[619] This, combined with an expansion in the Vietnamese fleet, as mentioned above, has led to Vietnamese vessels fishing beyond the Vietnamese EEZ where they are often apprehended by foreign government authorities for engaging in IUU fishing. (There is also the intersection of other national priorities, such as

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[610] USITC, hearing transcript, September 3, 2020, 14 (testimony of Pham Quang Huy, Ministry of Agriculture and Rural Development of the Socialist Republic of Vietnam); Government of Vietnam, written submission to the USITC, October 5, 2020, 6–8.
[611] This has been described as "paper efforts" by some observers. Industry representative, interview by USITC staff, October 15, 2020.
[612] Ojamaa, "Research for PECH," October 2018**,** 21; ASEAN Today, "Vietnam Has the Chance," November 13, 2019.
[613] EJF, *Caught in the Net*, November 11, 2019, 14.
[614] EJF, *Caught in the Net*, November 11, 2019, 22.
[615] Government of Vietnam, written submission to the USITC, October 5, 2020, 7–8; Pew Charitable Trusts, *The EU IUU Regulation Carding Process*, April 2016.
[616] Ojamaa, "Research for PECH," October 2018**,** 31; Viet Nam News, "EC Recognises," December 27, 2019.
[617] Viet Nam News, "EC Recognises," December 27, 2019.
[618] USITC, hearing transcript, September 3, 2020, 13 (testimony of Pham Quang Huy, Ministry of Agriculture and Rural Development of the Socialist Republic of Vietnam); Government of Vietnam, written submission to the USITC, September 24, 2020, 6.
[619] Southern Shrimp Alliance, written submission to USITC, August 21, 2020, 34; EJF, *Caught in the Net*, November 11, 2019, 7.

the encouragement of a fishing militia in disputed areas to counterbalance moves by China.[620]) Vietnamese blue boats are suspected of making unauthorized incursions in foreign EEZs in the Pacific Ocean and the China Sea, and many of these vessels have been detained by neighboring governments for IUU fishing.[621] Thailand, Malaysia, Indonesia, and non-bordering Pacific states with Vietnam have all reported continuing violations.[622] These countries regularly arrest Vietnamese fishers and impound or sink their vessels. Malaysia has seized over 700 Vietnamese vessels and 7,000 crew since 2006. Indonesia has sunk over 300 Vietnamese vessels for illegal fishing since 2015, as part of its activities to curb IUU fishing in its EEZ, including 51 vessels in May 2019.[623] Such IUU activity in foreign EEZs was a primary reason for the EU's carding decision, and there is evidence that, even after the implementation of the amended Fisheries Law in 2017, IUU activity has continued.[624] However, the recent marine sustainability strategy produced by the Vietnamese Communist Party states that sustainable fishing development is a future priority.[625]

The depletion of local fisheries means most commercially relevant species are at some level of risk of IUU fishing. For example, previous estimates showed that about 35 percent of the tuna catch in Vietnam was unreported.[626] However, it is the endangered or otherwise controlled species that are at the highest risk.[627] Vietnamese boats often target these species selectively due their high value, and these vessels are often operating in foreign waters.[628] A very visible target are endangered or protected sea cucumbers, since one fishing voyage to obtain this product can net a profit of several million dollars. These species are considered a delicacy in the increasingly affluent Chinese market, which is the primary destination for this type of illegal catch.[629]

Labor Issues in the Fishing Sector

Both USDOL and USDOS have identified serious labor concerns in Vietnam's fishing industry, including the use of child labor and forced labor. USDOL notes the occurrence of child labor within the Vietnamese fishing sector.[630] The use of child labor is illegal: Vietnamese law bans minors from working in hazardous environments.[631] Reportedly, some underage fishers are working on their parents' vessels or are taking positions on others' boats to help support their families. Lack of on-board documentation

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[620] Ojamaa, "Research for PECH," October 2018**,** 21.
[621] de Rivaz et al., *Turning the Tide?*, November 29, 2019, 14, 29.
[622] EJF, *Caught in the Net*, November 11, 2019, 6; Ojamaa, "Research for PECH," October 2018**,** 29; Dao, "Illegal Fishing," May 14, 2019.
[623] See the Indonesia profile for more information. EJF, *Caught in the Net*, November 11, 2019, 9, 12; Unditu, "Sinking Captured Fishing Boats," May 2, 2019; Jakarta Post, "More than Half," May 12, 2019; de Rivaz et al., *Turning the Tide?*, November 29, 2019, 29.
[624] BenarNews, "Thailand: 36 Vietnamese," August 18, 2020; Faisal and Haryati, "Indonesian Navy," October 9, 2020.
[625] The Communist Party of Vietnam, *Resolution: The Eighth Party Conference the Central Executive Board Term XII*, October 22, 2018.
[626] Elvestad and Kvalvik, "Implementing the EU-IUU Regulation," August 7, 2015, 241–55.
[627] Miller et al., "The Historical Development," March 27, 2019.
[628] Ojamaa, "Research for PECH," October 2018**,** 31.
[629] EJF, *Caught in the Net*, November 11, 2019, 11.
[630] USDOL, ILAB, *2018 List of Goods*, 2018, 10.
[631] Government of Vietnam, written submission to the USITC, September 24, 2020, 5; EJF, *Caught in the Net*, November 11, 2019, 11.

and personnel records impede the general enforcement of labor laws in this area.[632] The USDOS has reported that Vietnamese nationals are often exploited in conditions of forced labor, particularly fishers on foreign vessels, including on vessels from Taiwan.[633] These conditions are partly due to a lack enforcement of the relevant laws resulting from poor administration.[634] There are other reports of forced labor in both Vietnam's domestic and distant waters occurring for these reasons.[635]

Workers on Vietnamese vessels are primarily Vietnamese nationals, and they are vulnerable to exploitation in several ways.[636] The general lack of written contracts and salary agreements in the industry can be used to deprive fishers of their compensation.[637] Instances of debt bondage have also been reported.[638] Part of the issue is the current law in Vietnam, which allows verbal contracts to be lawful in certain instances, allowing captains to bring workers on board without written contracts. Captains themselves are also often operating outside of the Fisheries Law, and many lack the required manifests and identification documents.[639] The general lack of legal oversight and protection has been observed to lead to poor working conditions while at sea.[640]

Estimates of IUU Imports

Vietnam supplies the United States with marine capture and farmed seafood, both of which contain some products generated by IUU fishing. The Commission's supply chain analysis indicates that in 2019, most U.S. imports of marine-capture products from Vietnam originated in the Vietnamese EEZ, followed by the high seas and the Japanese EEZ. Almost all the U.S. imports of marine-capture products from Vietnam originating in the Vietnamese EEZ were sourced by Vietnamese vessels. Of these, the vast majority of the U.S. imports of marine-capture products were estimated to be of tuna, shrimp, and crab products, at 51.7 percent, 11.6 percent, and 11.5 percent, respectively. About 4.8 percent of the products sourced by Vietnamese vessels in the Vietnamese EEZ are estimated to be imported into the United States via other countries. The Commission estimates that in 2019 about 19.4 percent, or an estimated $106.2 million, of the U.S. imports of marine-capture products from Vietnam were obtained via IUU fishing. Most of the estimated U.S. imports from Vietnam of IUU marine-capture seafood were of various types of tuna (particularly yellowfin tuna), crab, and shrimp. Farm-raised shrimp accounted for the majority of U.S. imports of aquaculture products from Vietnam. On a global basis, farm-raised shrimp were estimated to contain IUU product feed inputs equivalent to 6.6 percent of aquaculture production.

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[632] EJF, *Caught in the Net*, November 11, 2019, 22–23.
[633] Vietnam was ranked as a Tier 2 Watch List country in the 2019 TIP report. USDOS, *2019 Trafficking in Persons Report*, June 2019, 498.
[634] USDOS, *2019 Trafficking in Persons Report*, June 2019,498–501.
[635] EJF, *Caught in the Net*, November 11, 2019, 24.
[636] *Trafficking in Persons Report 2019*, June 2019, 498.
[637] EJF, *Caught in the Net*, November 11, 2019, 22–24.
[638] EJF, *Caught in the Net*, November 11, 2019, 25.
[639] EJF, *Caught in the Net*, November 11, 2019, 23.
[640] EJF, *Caught in the Net*, November 11, 2019, 24.

Indonesia

Similar to other Southeast Asian countries, fishing is important for the Indonesian economy and seafood is an important source of protein in the country. Indonesia is a vast archipelagic country, composed of over 17,000 thousand islands, a large number of fishing vessels of all sizes, and a substantial number of fishing ports in which fishers can land their catch.[641] In 2018, the fishing industry accounted for about 2.6 percent of Indonesia's gross domestic product, increasing slightly from 2.3 percent in 2014.[642] The fisheries sector was reported to employ about 2.7 million and 3.3 million workers in capture fishing and aquaculture, respectively,[643] or about 7 to 8 percent of the total working population.[644] The fish processing industry in Indonesia employs over 1 million workers.[645] Indonesia is also a large consumer of fish and fish products, with 55 percent of the country's production consumed fresh and only about 2 percent of Indonesia's catch being canned, with the remainder consumed as dried, smoked, or fermented fish.[646] Indonesians rely on fish and seafood for over 60 percent of their animal protein intake, three times higher than the global average of 17 percent.[647]

Production

Indonesia is a large global producer of capture and aquaculture products and its EEZ is an important and highly valuable fishing area for multiple fleets, particularly for tuna fishing. Overall seafood production in Indonesia has steadily increased from 2014 to 2018, expanding by 5.4 percent in the period.[648] In 2018, Indonesia produced 22.0 million metric tons (mt) of wild-capture and aquaculture products, ranking second in global seafood production (table 5.6). In 2018, Indonesia was the second-largest wild-capture producer in the world, by volume, with 7.3 million metric tons in reported landings, which accounted for about 7.5 percent of the total global catch.[649] Indonesia was also the second-largest producer of aquaculture globally—following China—reporting 14.8 million mt in 2018, or 12.9 percent of global production.[650]

Wild-capture production in Indonesia increased 11.2 percent, by volume, from 2014 to 2018, growing 7.0 percent in 2017–18.[651] Most Indonesian reported wild-capture production are from marine fisheries (93.4 percent in 2017), although landings from freshwater fisheries have steadily increased since 2014.[652] In 2018, the main type of marine-capture fish landed in Indonesia were miscellaneous pelagic fishes, including scad and mackerel, and miscellaneous coastal fishes, including snapper and grouper,

[641] FAO, "Fishery and Aquaculture Country Profiles: The Republic of Indonesia," July 2014.
[642] Hirschmann, "Contribution of fisheries to the gross domestic product," May 27, 2020.
[643] World Bank, *Indonesia Economic Quarterly: Oceans of Opportunity*, June 2019, 37.
[644] Barange et al., *Impacts of climate change on fisheries and aquaculture*, 2018, 283.
[645] CEA, *Trends in Marine Resources*, 2018, 12.
[646] FAO, "Fishery and Aquaculture Country Profiles: The Republic of Indonesia," July 2014.
[647] Barange et al., *Impacts of Climate Change on Fisheries and Aquaculture*, 2018, 43, 47.
[648] FAO, Global Production database, accessed May 19, 2020.
[649] FAO, Global Production database, accessed May 19, 2020.
[650] FAO, Global Production database, accessed May 19, 2020.
[651] Part of this increase is attributed to improvements in data collection and reporting by the Indonesian government. FAO, Global Production database, accessed May 19, 2020; FAO, *The State of World Fisheries and Aquaculture*, 2020, 10.
[652] Statistics Indonesia, "Fishery Production by Subsector (thousand tons), 1999-2018," accessed August 24, 2020.

followed by tuna, bonitos and billfishes, which combined accounted for about 56.8 percent of the total catch.[653] Generally, most of the fish caught in Indonesia is destined for human consumption.[654]

Table 5.6 Indonesia: Total seafood production (wild capture and aquaculture), exports, and U.S. imports

Seafood production, 2018 (million mt)	Global ranking, 2018	Seafood exports, 2019 (billion $)	Value of U.S. imports of seafood, 2019 (billion $)	Share of U.S. seafood imports (%)	Ranking as U.S. supplier (2019)	Estimated value of U.S. imports obtained via IUU fishing (million $)
23.0	2	$4.5	$1.9	8.5	5	$105.5

Source: FAO, Global Production database, accessed May 19, 2020; IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.10, accessed September 22, 2020; USITC DataWeb/USDOC, HTS 03, 1604, 1605, 2301.10; accessed May 19, 2020; USITC IUU import estimates.
Note: The estimated value of U.S. imports obtained via IUU fishing includes products from aquaculture production and marine capture. Estimates of IUU within aquaculture production are based on global production practices for various aquaculture inputs and species groups produced using aquaculture. Therefore, these values may understate or overstate the actual extent of IUU product within this country's aquaculture industries.

Aquaculture production in Indonesia increased 2.8 percent between 2014 and 2018 overall, although it dropped 8.4 percent between 2017 and 2018.[655] Aquaculture production accounted for 67.0 percent of total reported seafood production in 2018, continuing the growth started in the early 2000s (box 5.2).[656] Most Indonesian aquaculture production takes place in marine environments, which accounted for about 62.9 percent of the total aquaculture production in 2018, and is mostly composed of seaweed production.[657] Other than seaweed, in 2018 the main aquaculture products in Indonesia were pangasius (25.9 percent) and tilapia (22.5 percent), shrimps and prawns (16.8 percent), and miscellaneous diadromous fishes, particularly milkfish (16.1 percent).[658]

Box 5.2 Aquaculture Production in Southeast Asia

Although aquaculture production has been in practice in Asia for centuries, it developed as a major commercial activity in the late 1960s, especially in Southeast Asia, and has continued its expansion in recent years. In that period, technological innovations were driven by increased Japanese demand for jumbo tiger shrimp, which were primarily harvested in the Philippines and Indonesia. In turn, those innovations facilitated expansion of aquaculture production to other species, including grouper, seabass, and snapper.[a] Since then, multiple factors have contributed to the rapid expansion of aquaculture production, both geographically and in terms of species produced, coupled with economic and population growth in the region and globally.[b] By 2000, Asia contributed about 91 percent of the global aquaculture production—89 percent excluding aquatic plants.[c]

Between 2001 and 2012, aquaculture production in Southeast Asia grew at a faster rate than that of any other region, on average 14.9 percent annually. This growth was led by increased aquaculture production in Indonesia, followed by Vietnam and the Philippines. In 2014, Indonesia accounted for

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[653] Indonesia is reported to produce the largest tuna catch in the world, accounting for 17.9 percent of the global tuna production in 2016. FAO, Global Production database, accessed May 19, 2020; Hasnan, "Southeast Asia's Lucrative Tuna Industry," September 6, 2019; CEA, *Indonesia Fisheries*, 2016, 10.
[654] FAO, "Fishery and Aquaculture Country Profiles: The Republic of Indonesia," July 2014.
[655] FAO, Global Production database, accessed May 19, 2020.
[656] FAO, Global Production database, accessed May 19, 2020.
[657] FAO, Global Production database, accessed May 19, 2020.
[658] FAO, Global Production database, accessed May 19, 2020.

about 63 percent of the total aquaculture production in Southeast Asia, reaching 14.2 metric tons in that year.[d] In 2018, aquaculture production in Southeast Asia in general, and in Indonesia, in particular, accounted for the majority of the fisheries' production from the region, reaching 56.2 of the total fisheries production, by volume, in Southeast Asia and 67.0 percent of Indonesia's production.[e] While aquaculture production mostly used domestically produced fishmeal in the past, Indonesia's goals of increasing aquaculture production and exports, particularly of shrimp, has led to increased imports of fishmeal.[f] The United States is the largest supplier of fishmeal to Indonesia, by volume, accounting for about 30.9 percent of the total imports in 2019.[g] Aquaculture production in Indonesia is expected to continue to grow, with the government setting an ambitious goal of more than doubling exports by 2024, although many believe this will not be possible.[h]

[a] Hishamunda et al., "Analysis of Aquaculture Development in Southeast Asia," 2009, 4.
[b] FAO, "Aquaculture Development Trends in Asia" accessed September 23, 2020.
[c] Chinese aquaculture production, which was reported to have produced 79 percent of the total global production in 2002, drove the increase in aquaculture production in Asia until 2001 when production in Southeast Asia outpaced that of China. Sugiyama et al., *Status and Potential of Fisheries and Aquaculture in Asia*, 2004, 6.
[d] SEAFDEC, *Southeast Asian State of Fisheries and Aquaculture*, 2017.
[e] FAO, Global Production database, accessed May 19, 2020.
[f] Research and Markets, "Indonesia Aquaculture Market Report 2019–2023," May 22, 2019.
[g] IHS Markit, Global Trade Atlas database, HS 2301.20, accessed November 25, 2020.
[h] Dao, "Indonesia Unlikely to Realize Ambitious Shrimp-Sector Growth Target," October 15, 2020.

Fleet

Indonesia has a large commercial fishing fleet, primarily made up of smaller vessels in its artisanal fleet. In 2016, the Indonesian marine capture fleet included a total of 543,845 vessels, 68.4 percent of which were small, unmotorized, or out-motor vessels.[659] Overall, while the small-scale marine-capture fleet in Indonesia grew 14.5 percent from 2000 to 2014, it declined 7.7 percent between 2014 and 2016. Government efforts to provide vessels to fishers partly drove the increase in the number of vessels in the Indonesian fleet before 2014; however, a moratorium in the issuance of new licenses to fish in 2014 led to a reduction in the number of vessels from 2015 to 2016.[660] The industrial fleet grew 3.1 percent from 2010 to 2016 and experienced a 75.8 percent increase from 2000 levels.[661] Further, recent government policies have been aimed at expanding the domestic fleet by providing over 2,500 small vessels to fishers in the country.[662] In 2016, the majority of the reported number of vessels by type of

[659] About 35.1 percent of the fishing fleet was of nonpowered boats and 33.3 percent of outboard motorboats, which are considered small-scale vessels. Statistics Indonesia, "Number of Boats / Vessels by Province and Type of Boat," accessed November 24, 2020; FAO, *The State of World Fisheries and Aquaculture*, 2020.
[660] The small-scale fleet in Indonesia has shifted in composition in recent decades from nonpowered to outboard motor vessels while maintaining the share of the total fleet. Although nonpowered vessels increased 10.4 percent from 2010 to 2016, these represented 35.1 percent of the total fleet in 2016 compared to 51.4 in 2000. In contrast, while the outboard motorboat vessel fleet decreased 21.7 percent between 2010 and 2016, it represented 33.3 percent of the total in 2016, an increase from 26.9 percent in 2000. Statistics Indonesia, "Number of Boats/Vessels by Province and Type of Boat," accessed November 24, 2020; Ariansyach, "Fisheries Country Profile: Indonesia," 2017.
[661] Statistics Indonesia, "Number of Boats / Vessels by Province and Type of Boat," accessed November 24, 2020.
[662] The moratorium was in place between 2014 and 2015. Ikrami, "Indonesia's Reform of Its Fisheries Law and Policy & Cooperation with ASEAN in Combating IUU Fishing," 2017, 2; World Bank, *Indonesia Economic Quarterly: Oceans of Opportunity*, June 2019, 39.

gear were small purse seine vessels, followed by those using lift nets and large purse seines.[663] Most of the tuna fishing in Indonesia is achieved by traditional pole-and-line and handline fishing carried out by smaller vessels.[664]

Trade

Although most of the Indonesian wild-caught fish is consumed locally, Indonesia is a net exporter of fish and seafood products and these exports are important for the country's economy. Most Indonesian exports of seafood in 2019 were in the form of frozen seafood products, particularly frozen shrimp and prawns (28.1 percent) and squid (9.6 percent), as well as prepared or preserved tunas, skipjack, and bonito (9.1 percent), prepared or preserved shrimp and prawns (6.9 percent), and crab (6.8 percent) products.[665] In 2019, total seafood exports from Indonesia reached $4.5 billion; this was less than a 1 percent increase from the previous year, but 25.0 percent more than 2015. Indonesian exports of tuna, skipjack, and bonito have grown 39.4 percent since 2015, driving the increase in the value of imports from the country.[666] The United States is by far the main market for Indonesian seafood products, accounting for about 40.2 percent of its total exports. Other important markets for Indonesian seafood are Japan (14.2 percent), China (13.2 percent), and the EU (6.1 percent).[667] The United States and Japan are the top destinations for fresh tuna from Indonesia. [668]

U.S. imports from Indonesia

Indonesia is also one of the United States' top import suppliers. Indonesia was the fifth-largest supplier of fish and seafood products to the United States by value in 2019.[669] U.S. imports of seafood from Indonesia were mostly of warmwater shrimp products (60.8 percent), swimming crab products (13.9 percent), and yellowfin, skipjack, and bigeye tuna products (13.2 percent), which, combined, accounted for 87.9 percent of total U.S. imports from the country in 2019 (table 5.7). U.S. imports of fishery products from Indonesia reached $1.9 billion in 2019, a 4.1 percent decrease from 2018, but a 10.9 increase over 2015.[670]

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[663] Data on fishing gear are likely to be limited since vessels under 30 gross tons (small vessels) are under the authority of provincial governments and not required to report to the central Indonesian government. Ariansyach, "Fisheries Country Profile," 2017. For information about fishing gear types, including purse seines, see chapter 1.
[664] Pole-and-line and handline fishing are known as "one-by-one" fishing methods, in contrast with longline fishing, for example where multiple fish are caught at the same time. AP2HI, "A Global Leader of One-by-One Caught Tuna," accessed October 28, 2020.
[665] IHS Markit, Global Trade Atlas database, HS 0306.17, 0307.43, 1604.14, 1605.21, 1605.10, accessed September 22, 2020. The Indonesian fish processing industry, although an important part of the Indonesian seafood industry, faces a number of challenges, including poor quality infrastructure for cold storage and filleting technology, among others. Ariansyach, "Fisheries Country Profile: Indonesia," 2017.
[666] IHS Markit, Global Trade Atlas database, HS 1604.14, accessed September 22, 2020.
[667] IHS Markit, Global Trade Atlas database, HS 0306.17, 0307.43, 1604.14, 1605.21, 1605.10accessed September 22, 2020.
[668] FAO, "Fishery and Aquaculture Country Profiles: The Republic of Indonesia," July 2014.
[669] USITC DataWeb/USDOC, accessed May 19, 2020.
[670] USITC DataWeb/USDOC (HTS 03, 1604, 1605, 2301.20), accessed May 19, 2020.

Table 5.7 Indonesia: Top U.S. imports of seafood from Indonesia, 2019

Product group	Value ($)	Share of total U.S. seafood imports from Indonesia (%)
Warmwater shrimp	1,132	60.8
Swimming crab	260	13.9
Yellowfin, skipjack, and bigeye tuna	245	13.2
Tilapia	52	2.8
All other	173	9.3
Total	1,862	100

Source: USITC staff calculations from USITC DataWeb/USDOC, accessed May 19, 2020.
Note: Imports may include products that originate in any fishing area and/or that are sourced by vessels from other countries.

Fisheries and Fleet Management

The main regulatory agency responsible for the management of Indonesian fisheries is the Ministry of Marine Affairs and Fisheries (MMAF). The ministry includes the Directorate General of Capture Fisheries and the Directorate General of Aquaculture, which regulate capture fishing and aquaculture in the country, respectively.[671] MMAF and its subdivisions also cooperate with the Indonesian Marine Police and the Navy in carrying out enforcement operations.[672] The main fisheries legislation in Indonesia is the Fisheries Law of 2004 (Law No. 31 of 2004), as amended, which defines and stipulates provisions for fisheries management in the Indonesian EEZ and the open seas. This law authorizes MMAF to regulate fishing gear, total allowable catch, and licensing and registration requirements for fishing vessels and companies, excluding small-scale fishers. [673] The government of Indonesia has established fisheries management plans for tuna and small pelagic species through a series of ministerial decrees, including Ministerial Decree Number 107/KEPMEN–KP/2015.[674] Among other things, these management plans set total allowable catch limits for tuna and tuna-like species, the main fish species captured in the Indonesian EEZ.[675]

While historically fisheries management in Indonesia has been reported to be deficient, there are signs of improvement. In 2017, Indonesia was ranked 22nd of the largest 28 marine fishing nations for fishery management, evaluated as the “degree to which management objectives are achieved via research,

[671] MMAF also includes the Directorate General for Product Processing and Marketing, as well as the Directorate General for Coastal and Small Island Development, which is responsible for the conservation of fish stocks, among other functions. FAO, “Fishery and Aquaculture Country Profiles: The Republic of Indonesia,” July 2014.
[672] FAO, “Fishery and Aquaculture Country Profiles: The Republic of Indonesia,” July 2014.
[673] In 2009, the Republic of Indonesia adopted the Amendment to Law No. 31 Year 2004 Concerning Fishery (Law No. 45 Year 2009), which made changes covering the development, management and conservation of fisheries including: “management and conservation of fish resources; fishing gear and fishing methods; aquaculture; fishing vessels and fishing ports; provisions to favor minor fishers and minor fish cultivators; control and law enforcement in the handling of criminal acts in the fishery field; application of sanctions; etc.” Republic of Indonesia, Amendment to Law No. 31 Year 2004, Pub. L. No. Law No. 45/2009, October 29, 2009, 33. The Indonesian Law on Fisheries of 2004 amends Law Number 9 of 1985 on Fisheries, however, regulations from the 2985 law that were not explicitly amended by the 2004 law remained effective. Republic of Indonesia, Law of the Republic of Indonesia Number 31 of 2004 on Fisheries, Pub. L. No. Law 31/2004, State Gazette of the Republic of Indonesia of 2004 Number 118, October 6, 2004, 46.
[674] Ministerial Decrees 75–85 of 2016 establish management plans for Indonesian fisheries. Ariansyach, “Fisheries Country Profile: Indonesia,” 2017.
[675] Government of Indonesia, written submission to USITC, September 14, 2020, 4.

management systems, and enforcement."[676] The following year, in 2018, the Indonesian "PT Citraraja Ampat Canning, Sorong Pole and Line Skipjack and Yellowfin Tuna" fishery was certified by the Marine Stewardship Council (MSC) as a sustainable fishery, becoming the first fishery in the country to obtain this certification.[677] By 2020, the Indonesian "North Buru and Maluku Fair Trade Fishing Association" tuna fishery had also achieved MSC certification, and seven other fisheries were seeking MSC certification.[678]

In addition to domestic regulations on fisheries and fleet management, Indonesia is a member of three regional organizations that regulate fishing (appendix H).[679] While Indonesia is a cooperating nonmember of the International Commission for the Conservation of Atlantic Tunas (ICCAT), various Indonesian-flagged vessels have been identified as fishing without authorization in waters within its jurisdiction (see below for more details). Indonesia has also ratified various international treaties on fishing and labor, including the United Nations Convention on the Law of the Sea and the Port State Measures Agreement (appendix H), as well as International Labour Organization (ILO) conventions on forced and child labor, although it has not ratified the ILO Work in Fishing Convention and the ILO Protocol of 2014 to the Forced Labor Convention. Indonesia joined ministers from 27 countries issuing the Ministers' Declaration on Transnational Organized Crime in the Global Fishing Industry and is a member of the High-Level Panel for a Sustainable Ocean Economy.[680]

IUU Fishing Activities including Labor Issues

IUU fishing is considered a major threat to Indonesia's fish stocks and Indonesia has been linked to instances of IUU fishing and international labor violations. The government of Indonesia has highlighted IUU fishing and labor violations by foreign and domestic vessels as a persistent problem that it is aiming to combat and as a barrier to sustainability and growth in its industry.[681] The Indonesian EEZ is situated in the Eastern Indian Ocean and the Western Central Pacific, where there are a large number of species experiencing high levels of IUU fishing, resulting in the area being deemed a "high risk" region for illegal fishing by the WWF.[682] Additionally, Indonesian vessels have been linked to IUU fishing activities, including fishing without authorization in waters managed by regional fisheries management organizations (RFMO), in multiple instances throughout the years.[683] Indonesia has also been identified

[676] World Bank, *Indonesia Economic Quarterly: Oceans of Opportunity*, June 2019, 38.
[677] This fishery contributed 2,647 mt of skipjack tuna and 543 mt of yellowfin tuna in 2016. The fishery includes 35 fishing vessels and employs 750 local fishers. This is the second fishery in Southeast Asia to obtain this certification. To achieve the standard for certification, the fishery implemented an observer program to report tuna and baitfish catches as well as interaction with vulnerable species. MSC, *Indonesia's Sorong Pole and Line Tuna Fishery*, accessed September 23, 2020; Summers, "'One fish at a time,'" January 15, 2019.
[678] MSC, "FairTrade Tuna Fishery in Indonesia Achieves Certificate," May 12, 2020; AP2HI, "Eight Indonesian one-by-one tuna fisheries," December 24, 2019.
[679] Government of Indonesia, written submission to USITC, September 14, 2020, 4.
[680] Blue Justice, "Copenhagen Declaration," accessed December 3, 2020; High Level Panel for a Sustainable Ocean Economy, "Home," accessed December 3, 2020.
[681] IOM, *Report on Human Trafficking, Forced Labour*, 2016, 55, 104; Cabral et al., "Rapid and Lasting Gains," April 2018, 650.
[682] WWF, *Illegal Fishing: Which Fish Species Are at Highest Risk*, October 2015, 28, 32.
[683] TMT, "Combined IUU Vessel List," accessed March 30, 2020.

by the U.S. Department of Labor (USDOL) as having goods produced with forced and child labor[684] and was ranked as a Tier 2 country by the U.S. Department of State (USDOS) in its *2019 Trafficking in Persons Report*.[685] Indonesia was also classified as being at medium risk of modern slavery by the Global Slavery Index on Fishing.[686]

IUU Fishing Activities

The Indonesian EEZ, which has highly valuable tuna stocks, has historically been an important destination for a large number of foreign vessels engaging in IUU fishing and estimates show that IUU fishing costs Indonesia about $4 billion per year.[687] Between 2012 and 2014, over 90 percent of the foreign vessels fishing in the Indonesian EEZ were from China and Taiwan, generally of medium and large capacity.[688] Analyses of the Indonesian fishing sector have found that foreign fishing vessels have violated multiple regulations in the Indonesian EEZ, including not landing fish in port, fishing outside the fishing grounds, transporting goods without going through customs authorities, trafficking in persons and forced labor, among others.[689]

In an effort to combat these violations, in 2014, the Indonesian government implemented a moratorium that banned all foreign-built vessels from fishing in the Indonesian EEZ, sank vessels determined to be engaging in IUU fishing in its EEZ, and prohibited transshipment of fish at sea. These efforts resulted in a substantial reduction in overall fishing activity in Indonesia's waters.[690] In 2013, before the Indonesian government implemented the moratorium, the Indonesian EEZ was the 15th most fished area by foreign vessels. In 2016, the Indonesian EEZ ranked 86th in this measure.[691] Between 2014 and 2018, the government of Indonesia sank almost 500 vessels determined to be fishing in its EEZ without authorization. Most of the vessels sunk were identified as being from Vietnam (276 vessels), the Philippines (90 vessels), Thailand (50 vessels), and Malaysia (41 vessels).[692] However, a recent report points to the continued detention and sinking of foreign vessels in the Indonesian EEZ, including 51 vessels in the first half of 2019, as signs that Indonesia's policy has not achieved the intended deterrent effect.[693]

IUU fishing is not limited to foreign vessels, and the Indonesian government has implemented policies aimed at preventing the domestic fleet from engaging in IUU fishing, although these seem to have had

[684] Indonesia has been identified as having fish produced with child and forced labor. USDOL, ILAB, *2018 List of Goods*, 10, 42, accessed August 3, 2020.
[685] Tier 2 is defined as "countries whose governments do not fully meet the TVPA's minimum standards but are making significant efforts to bring themselves into compliance with those standards." USDOS, *2019 Trafficking in Persons Report*, June 2019, 48.
[686] Minderoo Foundation, *Global Slavery Index 2018*, 2018.
[687] Cabral et al., "Rapid and Lasting Gains," April 2018, 651.
[688] Bladen, "Sharp Decline in Foreign Fishing Boats," July 24, 2019.
[689] IOM, *Report on Human Trafficking, Forced Labour,* 2016, 15.
[690] By 2019, the Indonesian government had reported to have sunk over 500 vessels. The vessel-sinking policy was ended in 2019 as vessels are to be repurposed for domestic fishers. Cabral et al., "Rapid and Lasting Gains," April 2018, 651; Bladen, "Sharp Decline in foreign fishing boats," July 24, 2019; Jakarta Post, "Stop sinking ships," November 15, 2019.
[691] Cabral et al., "Rapid and Lasting Gains," April 2018, 653.
[692] de Rivaz et al., *Turning the Tide?*, November 29, 2019, 29.
[693] de Rivaz et al., *Turning the Tide?*, November 29, 2019, 29.

limited success.[694] Domestic IUU fishing mostly takes the form of unreported catches and the use of destructive gear, although other activities associated with IUU fishing have been identified.[695] To address this, the Indonesian government has expanded data collection and reporting. Vessels larger than 10 gross tons (gt) in capacity, which mostly contribute to the exportable supply, are required to report catches. However, unreported catches are still prevalent in the country. Further, while small vessels between 5 and 10 gt are now required to obtain a license and land their catches at official landing ports, some fishers still land their catches at nonofficial ports following their traditional relationships with middlemen and agents.[696]

Smaller (under 5 gt) vessels are exempted from data reporting requirements, contributing to a large amount of unreported catch.[697] However, a report by the Royal United Services Institute noted that corruption and fraud are present in Indonesia "at every level." This pattern includes the issuance of fishing licenses to vessel operators that are able to register large vessels as small, thus avoiding regulatory requirements and gaining benefits reserved for small vessels.[698] Unreported catch can also make its way into the aquaculture supply chain via the diversion of fish originally caught for human consumption into fishmeal production. Fish caught by small-scale fishers for the domestic market, for which reporting is not required, can be diverted to feed production, particularly as the product deteriorates and becomes unsuitable for consumption as fresh seafood.[699]

The use of destructive gear is also reportedly widespread, although the Indonesian government has attempted to ban the use of certain fishing instruments. Blast fishing, a practice that uses dynamite to catch fish, is estimated to have damaged about 65 percent of Indonesia's reefs.[700] In 2017 the Indonesian government prohibited the use of certain other fishing practices considered destructive, including the use of trawls and seine nets. However, an exemption was implemented until 2020 for the Pantura region—where most of the seine-fishing vessels are concentrated—due to resistance from domestic fishers, who were supposed to transition to environmentally friendly gear.[701] However, in 2020 MMAF announced plans to lift the ban, which would allow the use of various types of seine nets, used by vessels fishing for pelagic species, including tuna, as well as shrimp bottom-trawl nets.[702]

IUU fishing is also carried out by Indonesian vessels outside the country's waters. A total of 11 Indonesian vessels have been included in various RFMO lists of vessels engaging in IUU fishing since 2004, including 3 marked as "currently listed" as of March 30, 2020. Of these, 2 vessels had been identified as operating inside the International Commission for the Conservation of Atlantic Tuna (ICCAT)

[694] Cabral et al., "Rapid and Lasting Gains," April 2018, 655; CEA, *Trends in Marine Resources*, 2018, 10, 46; de Rivaz et al., *Turning the Tide?*, November 29, 2019, 32.
[695] Industry representative, email with USITC staff, October 12, 2020.
[696] Industry representative, interview by USITC staff, October 1, 2020.
[697] Jakub, "Indonesia's Small-Scale Fisheries," November 12, 2019.
[698] de Rivaz et al., *Turning the Tide?*, November 29, 2019,2019, 20, 22.
[699] Industry representative, interview by USITC staff, October 1, 2020.
[700] de Rivaz et al., *Turning the Tide?*, November 29, 2019,18.
[701] The prohibition of the use of all types of fishing trawl and seine nets was implemented by the Ministerial Regulation No. 2 of 2015, and originally scheduled to take effect in January 1, 2017. Reportedly, less than a third of the owners of the over 7,000 seine fishing vessels in Indonesia, which would qualify for financial aid to transition to environmentally friendly gear, received the subsidy. CEA, *Trends in Marine Resources*, 2018, 11; Gokkon, "Indonesia Buckles to Protests Against Seine Fishing Ban," January 25, 2018.
[702] Gokkon, "Indonesia to Allow Back Destructive seine," June 12, 2020.

area without authorization in 2004. Another vessel was listed in 2013 for operating in contravention of the Recommendation by ICCAT on a Program for Transshipment (Rec. 12-06) of 2012.[703] Additionally, about 7 percent of the vessels sunk by the government of Indonesia between 2014 and 2018 were Indonesian-flagged vessels determined by the Indonesian government to be fishing illegally.[704] The former Indonesian Minister of Agriculture and Fisheries, Susi Pudjuastuti, however, expressed the view that most, if not all of these vessels, were actually under Chinese control.[705] Indonesia, like many other countries, has domestically flagged, foreign-owned vessels in its fleet and has previously been identified as a flag of convenience country. Between 2013 and 2018, however, the number of foreign vessels carrying the Indonesian flag had decreased by 93 percent, from 27 vessels in 2013 to 2 vessels in 2018.[706] The moratorium described above aimed to reduce the number of foreign vessels fishing in the Indonesian EEZ by not issuing licenses to these.

To address some of these and other fisheries management issues, the Indonesian government has implemented policies that have been recognized as having the potential to reduce overall IUU fishing in its domestic fleet and improve overall management of its fisheries. Three programs Indonesia implemented include (1) a catch certificate system—the Indonesian Catch Certificate (known by its Indonesian acronym, SHTI)—launched in 2012, (2) an observer-on-board program for all vessels over 30 gt in 2013, and (3) a fishing logbook program that requires vessels over 5 gt to submit their logs of catches to the Port Authority in 2014.[707] Further, in 2017 Indonesia became the first country to publicly share vessel monitoring system data, with support from the nongovernmental organization Global Fishing Watch.[708] Recently, in 2019, the Indonesian government also implemented a regulation that mandates that imports of fishery products carry a catch certificate from their country of origin that must be validated by the country's embassy in Indonesia.[709] And, according to the government of Indonesia, the country has implemented guidelines for exporters to fill the Seafood Import Monitoring Program form in order to be able to export to the United States.[710] Nevertheless, given the historically high levels of IUU fishing in the Indonesian EEZ, reports of corruption, and the presence of organized transnational networks, it is not clear what the outcomes of these recent policies will be and whether Indonesia will be able to eliminate IUU fishing from its EEZ.[711]

Labor Issues in the Fishing Sector

In response to the multiple reports of labor violations in Indonesia, including human trafficking and forced labor, the Indonesian government has adopted various policies aimed to eliminate these from the fishing industry. USDOL classified the government's efforts to eliminate child labor as "Moderate

[703] TMT, "Combined IUU Vessel List," accessed March 30, 2020.
[704] Cabral et al., "Rapid and Lasting Gains," April 2018, 655.
[705] Bevins, "'I'm Nasty.' How an Indonesian Government Official," September 5, 2018.
[706] Petrossian et al., "Flags for sale," June 1, 2020, 4.
[707] Government of Indonesia, written submission to USITC, September 14, 2020, 4.
[708] CEA, *Trends in Marine Resources*, 2018; Cutlip, "Indonesia Makes its Fishing Fleet Visible," June 7, 2017.
[709] Government of Indonesia, written submission to USITC, September 14, 2020, 4.
[710] Government of Indonesia, written submission to USITC, September 14, 2020, 4.
[711] For instance, the Indonesian fisheries minister was arrested in November 2020 on charges of corruption related to a policy lifting a previous ban on exports of lobster larvae. de Rivaz et al., *Turning the Tide?*, November 29, 2019, 29; Dao, "Indonesian Fisheries Minister Arrested in Baby Lobster," December 2, 2020.

Advancement" in 2018.[712] These efforts include increased funding for inspections in the country and the development of a database to monitor human trafficking in Indonesia.[713] While the government has adopted policies aimed at governing the recruitment of seafarers in Indonesia and protecting Indonesian fishers abroad,[714] the involvement of various government agencies, all with jurisdiction and overlapping authority to regulate work in fishing, reportedly creates confusion among agencies.[715]

USDOL notes that although Indonesia has ratified all the key conventions on child labor, there are several gaps that still exist. These include lack of funding for programs against these forms of labor, as well as an insufficient number of inspectors in the country and limited inspection authority that excludes the informal sector.[716] Further, USDOL highlights that child labor occurs in Indonesian fishing vessels, processing facilities, and offshore platforms.[717] As a result, USDOL has included Indonesia's fish products on the list of goods for which the agency has "reason to believe are produced by forced labor or child labor in violation of international standards."[718]

Additionally, the U.S. Department of State's *Trafficking in Persons Report* in 2019 and 2020 listed Indonesia as a Tier 2 country and source of forced labor, noting that Indonesian nationals are exploited in fishing vessels throughout the Indian and Pacific Oceans.[719] The *Trafficking in Persons Report* in 2019 highlighted that over 7,000 Indonesian fishers per year face dire conditions while employed in vessels primarily owned by citizens of Taiwan, South Korea, and Japan. Indonesia is also a transit and destination country for human trafficking, and multiple violations of labor laws have been recorded involving Indonesian as well as migrant victims. The 2020 *Trafficking in Persons Report* underscored that protections for victims of forced labor in the fishing industry were lacking, partly due to poor coordination and clarity on the roles and responsibilities of the various government agencies with jurisdiction over cases. The report noted that crew on board vessels fishing in Indonesian waters force

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[712] USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Indonesia*, 2018.
[713] USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Indonesia*, 2018.
[714] Seafarers, as defined in the ILO Maritime Labor Convention, are "any person who is employed or engaged in any capacity on board a seagoing ship." IOM, *Report on Human Trafficking, Forced Labour,* 2016, iv, xv, 55.
[715] IOM, *Report on Human Trafficking, Forced Labour,* 2016.
[716] Although the Indonesian government increased labor inspectorate funding from $2.1 million in 2017 to $10.2 million in 2018, the number of inspectors is still low. According to USDOL's advised ratio of inspectors to workers for less developed countries, Indonesia would employ over 8,400 inspectors; however, the country reported having 1,619 inspectors in 2018, a decrease of over 350 inspectors compared to 2017. USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Indonesia*, 2018, 1–2, 4–5.
[717] Offshore fishing platforms, or *jermals*, are large fishing platforms made of wood that can stretch up to 70 meters. These are located in the open ocean, from five to 18 miles from the shore. Use of *jermals* primarily for anchovy fishing in Indonesia expanded from the 1970s until the early 2000s, when between 395 and 800 platforms were estimated to be active. About 8,000 workers, 75 percent of whom were estimated to be children, were employed in *jermal* fishing in Indonesia during this time. *Jermal* fishing declined due to the implementation of the National Action Plan against Child Labor, among other factors, and in 2010 about 12 *jermals* were estimated to remain active in Indonesia. USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Indonesia*, 2018, 1; Verite, *Research on Indicators of Forced Labor*, 2012, 12.
[718] USDOL, ILAB, *2020 List of Goods*, September 2020, 3, 9.
[719] Tier 2 is defined as "countries whose governments do not fully meet the Trafficking Victims Protection Act of 2000's (TVPA) minimum standards but are making significant efforts to bring themselves into compliance with those standards." USDOS, *2019 Trafficking in Persons Report*, June 2019, 36, 244; USDOS, *2020 Trafficking in Persons Report*, June 2020, 63.

fishers, from Indonesia and other Asian countries, "to engage in illegal fishing, poaching, smuggling, and illegal entry into national territories," which makes them vulnerable to criminalization.[720]

An International Organization for Migration analysis of the activities of foreign fishing vessels in Indonesia found that about 14.8 percent of the vessels analyzed were involved in human trafficking and forced labor. It also found violations of personal freedom and the right to live, including working without pay or with a salary below the minimum wage standard, child labor, health and safety violations, working 18–20 hour days, and physical and mental abuse, among others.[721] Further, various high-profile investigations have resulted in the repatriation of thousands of migrant fishers—mainly from Burma, Cambodia, Thailand, and Laos—rescued in Indonesia.[722]

Exploitation of Indonesian workers is also reported to occur in the country by domestic recruiters working for local captains, although evidence is limited. A recent analysis found an increasing number of Indonesian fishers being exploited domestically by local brokers. Known as *calo*, the brokers recruit Indonesians from different parts of the country and charge them high fees, and offer them cash advances, which then results in personal debt and exploitation of the fisher.[723] At least one of the workers interviewed in the analysis mentioned fishing for tuna in debt bondage conditions.[724]

Issues with local brokers are also reported to affect local fishers who are unable to navigate a complex and fragmented vessel licensing system. They hire agents who offer to acquire licenses for a fee, often resulting in exploitation of the fishers.[725] Additionally, experts on seafood supply chains in Southeast Asia noted that workers in the aquaculture sector, particularly in shrimp processing, often face working conditions similar to those reported in the Thai shrimp sector, which includes workers, among them women and children, working in forced labor conditions in shrimp peeling and cleaning facilities.[726] The Indonesian government has attempted to combat human rights violations in the fishing sector by introducing legislation that requires human rights certifications for companies that operate in

[720] The report also noted that although the Indonesian Task Force on Illegal Fishing brought charges for alleged forced labor against a recruitment agency, the case did not proceed, which has been attributed to the dissolution of the task force in 2019. The 2019 *Trafficking in Persons Report* noted that "dozens of recruitment agencies in Burma, Indonesia, and Thailand hire fishermen, assign them fake identity and labor permit documents, and force them to fish long hours in waters for low or unpaid salaries while incurring severe physical abuse" to work in the Indonesian fishing sector. USDOS, *2019 Trafficking in Persons Report*, June 2019, 266–67, 269.
[721] The analysis also found that crew members in foreign vessels fishing in the Indonesian EEZ were subjected to substandard and inhumane living conditions, homicide and sexual abuse, health and safety violations, withholding of identifying documents, and working with no working agreement. IOM, *Report on Human Trafficking, Forced Labour,* 2016, 19.
[722] Many of the fishers identified by these reports as victims of human trafficking in Indonesian waters were employed in Thai vessels fishing in the Indonesian EEZ and brought to the country under false or misguiding premises. IOM, *Report on Human Trafficking, Forced Labour,* 2016, 35–37.
[723] Jones, Visser, and Simic, "Fishing for Export," July 9, 2019, 7–9.
[724] Jones, Visser, and Simic, "Fishing for Export," July 9, 2019, 16.
[725] In Indonesia, licenses for vessels over 30 gt are issued by the central government, while licenses for vessels between 10–30 gt are issued by provincial governments and licenses for vessels between 5–10 gt are issued by district governments. de Rivaz et al., *Turning the Tide?*, November 29, 2019,2019, 32.
[726] For more information on the conditions reported in the Thai processing sector, see Thailand's country profile. Industry representative, interview by USITC staff, August 14, 2020.

Indonesian waters. However, a report notes that the government has released little guidance on how to implement the regulation, which has led to confusion and limited progress.[727]

Estimates of IUU Imports

Indonesia supplies the United States with marine capture and farmed seafood, both of which contain some products generated from IUU fishing. The Commission's supply chain analysis indicates that in 2019, the majority of U.S imports of marine-capture products from Indonesia originated in the Indonesian EEZs. Almost all U.S. imports of marine-capture products from Indonesia caught in the Indonesian EEZ were sourced by Indonesian vessels and were mostly of crab and tuna products, estimated at 43.0 percent and 37.2 percent, respectively. About 5.5 percent of the products sourced by Indonesian vessels in the Indonesian EEZs were estimated to be imported into the United States via other countries, including Thailand and China. The Commission estimates that in 2019 about 15.4 percent, or an estimated $105.5 million, of the U.S. imports of marine capture products from Indonesia were obtained via IUU fishing. Most of the estimated U.S. imports of IUU marine-capture seafood from Indonesia were of swimming crab, various types of tuna, and octopus. Farm-raised shrimp accounted for the vast majority of U.S. imports of aquaculture products from Indonesia. On a global basis, farm-raised shrimp were estimated to contain IUU product feed inputs equivalent to 6.6 percent of aquaculture production.

Thailand

Seafood production and processing are important economic activities in Thailand. The fisheries GDP is reported to contribute around $3.6 billion to the Thai economy.[728] According to the Thai government, about 2 million people work in the Thai fishing industry. Over 880,000 workers were employed in fishing, aquaculture, and seafood production activities in Thailand in 2019, more than 204,000 of which are identified as "foreigners."[729] Of these, the aquaculture sector employs over 571,000, and about a third of these are women. About 32,000 workers are employed in artisanal fishing vessels.[730] A large portion of the workers employed in shrimp processing, a labor-intensive activity, are migrant workers.[731]

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[727] The regulation was introduced in 2017. By the time the report was published in 2019, only two companies had been certified. de Rivaz et al., *Turning the Tide?*, November 29, 2019, 30.

[728] Government of Thailand, written submission to USITC, October 9, 2020, 9.

[729] According to government statistics, foreign workers are employed in commercial vessels (90,822 workers or 58.3 percent of the total for this category) and as "fisheries workers" (113,484 workers or 48.0 percent of the total for this category). DOF, "Thailand Fisheries Overview: Thailand Fisheries Supply Chain 2019," April 2, 2020. Government of Thailand, written submission to USITC, October 9, 2020, 9.

[730] Other estimates show that the number of workers employed in fish farms exceeds 650,000, of which 184,000 are employed in processing plants. Women are mostly employed in activities related to feed preparation, feeding, harvesting, processing, accounting, and marketing in this sector. DOF, "Thailand Fisheries Overview: Thailand Fisheries Supply Chain 2019," April 2, 2020; Yenpoeng, "Fisheries Country Profile," 2017.

[731] Industry representative, interview by USITC staff, August 14, 2020.

Seafood is the main protein in the Thai diet, with an estimated consumption rate of 31–39 kilograms per person per year, between 1.5 and 2.0 times higher than global per capita consumption.[732]

Production

Thailand is one of the world's largest producers of seafood products, both by wild-capture and aquaculture methods, and is one of the world's largest processors and exporters of fishery products. In 2018, Thailand reported a total 2.6 million metric tons (mt) in wild-capture and aquaculture production, ranking 15th in global production (table 5.8). In 2018, Thailand produced about 1.7 mt of marine-capture products, a 13.8 percent increase over 2017 levels.[733] This followed a decline in 2014–15 that was largely attributed to new government restrictions targeting IUU fishing and human trafficking.[734] In 2018, reported wild-capture production accounted for about 65.7 percent of Thailand's total production, by volume.[735] Overall wild-capture and aquaculture production in Thailand has been steady, increasing only 1.2 percent from 2014 to 2018.[736] Most reported Thai wild-capture production occurs within marine fisheries (88.3 percent in 2015), and freshwater fishing declined 12.5 percent since 2011.[737] In 2018, the main type of fish produced by marine capture in Thailand was miscellaneous marine fishes not identified (other than pelagic fish) (26.2 percent), pelagic fishes including various species of mackerel (19.5 percent), followed by herrings, sardines, and anchovies (14.6 percent). These three main groups accounted for a combined 60.3 percent of Thailand's marine-capture production in 2018.[738] Fish caught in the Thai EEZ are mostly destined for domestic consumption or for processing as fishmeal for use in the aquaculture sector, and a very small fraction is exported.[739]

Table 5.8 Thailand: Total seafood production (wild capture and aquaculture), exports, and U.S. imports from Thailand

Seafood production, 2018 (million mt)	Global ranking, 2018	Seafood exports, 2019 (billion $)	Value of U.S. imports of seafood, 2019 (billion $)	Share of U.S. seafood imports (%)	Ranking as U.S. supplier (2019)	Estimated value of U.S. imports obtained via IUU fishing (million $)
2.6	15	$5.7	$1.2	5.6	7	$94.3

Source: FAO, Global Production database, accessed May 19, 2020; IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.10, accessed September 22, 2020; USITC DataWeb/USDOC, HTS 03, 1604, 1605, 2301.10; accessed May 19, 2020; USITC IUU import estimates.

Thailand also produced about 891,000 mt of aquaculture products in 2018, a 3,000 mt decline over 2017 and 30.7 percent less compared to 2010. Thailand's reported aquaculture production has been

[732] Estimates of per capita seafood consumption vary depending on factors such as income and geographic location. DOF, "Thailand Fisheries Overview: Thailand Fisheries Supply Chain 2019," April 2, 2020; FAO, *The State of World Fisheries and Aquaculture*, 2020; FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020; Yenpoeng, "Fisheries Country Profile," 2017.
[733] FAO, Global Production database, accessed May 19, 2020.
[734] USDA, FAS, *Thailand: Seafood Report*, May 8, 2018, 4.
[735] FAO, Global Production database, accessed May 19, 2020.
[736] FAO, Global Production database, accessed May 19, 2020.
[737] Yenpoeng, "Fisheries Country Profile," 2017.
[738] FAO, Global Production database, accessed May 19, 2020.
[739] Industry representative, interview by USITC staff, August 14, 2020.

recovering after a large decline between 2012 and 2014, when the country's whiteleg shrimp population ––the main aquaculture product in Thailand–– was decimated by a disease.[740] Aquaculture production in Thailand is mostly concentrated in freshwater environments (46.3 percent of the total aquaculture production in 2018), followed by brackish water environments (43.3 percent), and marine aquaculture production (10.4 percent).[741] In 2018, the main aquaculture species produced in Thailand were whiteleg shrimp (39.0 percent), tilapia (23.7 percent), and pangasius (12.6 percent).[742] Whiteleg shrimp is produced in brackish water environments while tilapia and pangasius are produced in freshwater culture.[743]

Most of the Thai total seafood supply (about 81 percent in 2011–15) is destined for human consumption, with the remainder mostly used for fishmeal production.[744] For marine-caught seafood, about 78 percent of the total supply in Thailand was destined for human consumption, 24 percent of which was consumed fresh while the remainder was processed into chilled, frozen, canned, or transformed into other seafood products, including shrimp paste and fish sauce.[745] Aquaculture products are destined for human consumption.[746]

Seafood processing, particularly of tuna and shrimp, is an important and substantial component of the Thai seafood sector. There are a total of 345 fish processing factories in Thailand dedicated to canning (66 factories), fish sauce production (47 factories), fishmeal production (65 factories), and frozen seafood production, including shrimp processors (167 factories).[747] Some of the tuna canning and shrimp processing companies operating in Thailand are large multinationals that have business and retail presence in multiple countries around the world. Among these companies are the largest canned

[740] Whiteleg shrimp farms were heavily affected by the early mortality syndrome in 2011, a disease that decimated Thai shrimp supply and reduced Thailand's overall aquaculture production. Production declined substantially between 2012 and 2015 due to the wide spread of the early mortality syndrome but has been recovering since 2016. Production of whiteleg shrimp––the main aquaculture product in Thailand––increased to 347,000 mt in 2018. Early mortality syndrome, or acute hepatopancreatic necrosis disease, is a bacterial disease that first occurred in China in 2009 and spread through Southeast Asia, reaching Thailand in 2012 and resulting in massive economic losses. This disease causes mass mortality of shrimp––up to 100 percent of the population––within 30 to 35 days. Production peaked in 2011, reaching 603,000 mt. FAO, Global Production database, accessed May 19, 2020; FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020; Monterey Bay Aquarium, Seafood Watch, *Whiteleg Shrimp: Thailand Intensive Ponds*, July 6, 2020, 64.Monterey Bay Aquarium, Seafood Watch, *Whiteleg Shrimp: Thailand Intensive Ponds*, July 6, 2020, 6.
[741] FAO, Global Production database, accessed May 19, 2020.
[742] FAO, Global Production database, accessed May 19, 2020.
[743] FAO, Global Production database, accessed May 19, 2020.
[744] Data for 2011–15 are the most recent available. FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020; Yenpoeng, "Fisheries Country Profile," 2017.
[745] Yenpoeng, "Fisheries Country Profile," 2017.
[746] Yenpoeng, "Fisheries Country Profile," 2017.
[747] According to a 2006 FAO estimate, there were over 2,334 seafood processing plants in Thailand, 412 of which were large establishments. Of these, 47 plants were dedicated to canning, 96 to fishmeal production, and 177 to frozen seafood production. The remaining 2,334 plants were small establishments producing fish sauce or smoking and drying fish. DOF, "Thailand Fisheries Overview: Thailand Fisheries Supply Chain 2019," April 2, 2020; FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020.

tuna producer in the world, Thai Union Group, and agricultural conglomerate and largest global exporter of shrimp products, Charoen Pokphand Foods (CP Foods).[748]

Fleet

According to the FAO, Thailand's fishing fleet includes over 32,000 registered fishing vessels, 11,000 of which (34.0 percent) are considered commercial vessels, defined as measuring over 10 gt in capacity.[749] However, in 2019, the Thai government reported that there were about 5,726 active fishing vessels in total, most of which were vessels over 30 gt in capacity.[750] About 5,500 of the registered fishing vessels above 30 gt have installed mandatory vessel monitoring systems.[751] The Thai DWF fleet is small, relative to other large seafood-producing countries, as Thailand increasingly relies on imports of raw fish for processing.[752] However, the Thai DWF fleet fishes in foreign waters, particularly in the EEZs of Indonesia, Cambodia, and Burma.[753] A substantial portion of the Thai fleet contributes to the supply of forage fish used to produce fishmeal and fish oil, which are then used as inputs in the aquaculture sector.[754]

Trade

While Thailand is a large consumer of fishery products, the country is also the third-largest exporter of fish and seafood to the world, accounting for about $5.6 billion (2.4 percent) of global exports in 2019.[755] Exports of seafood products from Thailand are largely composed of processed seafood products, including canned tuna and frozen shrimp.[756] Thailand has an export-oriented processing industry which plays an important role in processing seafood products from other countries, particularly those from Asia and Oceania. The Thai processing industry has developed a wide range of products — from semi-processed products to higher-value products— and has invested in processing technology

[748] Both companies have subsidiaries in multiple countries, including in the United States. Thai Union Group distributes seafood products in the United States under its subsidiary Chicken of the Sea, as well as the seafood brand, Genova. Thai Union owns a canned tuna operation in California and operates Red Lobster restaurants. CP Foods, operating as Bellisio Foods Company, distributes products under the brands Captn's Pack and Authentic Asia, operates Boston Markets restaurants, and owns a farmed-shrimp operation in Florida. King, "Winning on the World's Largest Tuna Company and What It Means for the Oceans," July 11, 2017; Thai Union, "Our Brands," accessed October 28, 2020; C.P. Food Products, "Charoen Pokphand Foods (Thailand)," accessed October 28, 2020; Charoen Pokphand Foods, "Business Overview," accessed November 27, 2020; Government of Thailand, written submission to USITC, October 9, 2020, 2-3.
[749] The FAO reported in 2017 that the Thai fleet was estimated to have slightly over 25,000 vessels equipped with engines. DOF, "Thailand Fisheries Overview: Thailand Fisheries Supply Chain 2019," April 2, 2020; FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020.
[750] The Environmental Justice Foundation (EJF) proposed a series of recommendations to the Thai government starting in 2015, including to conduct an assessment of the Thai fleet and determine the number of vessels in the fleet, the fishing gear used, and their license status. According to EJF, Thai government agencies have made a sustained effort to survey all active vessels and void inactive licenses. EJF, *Implementation Status of EJF Recommendations*, 2019, 7; DOF, "Thailand Fisheries Statistic," January 4, 2020.
[751] EJF, *Implementation Status of EJF Recommendations*, 2019, 7.
[752] Industry representative, interview by USITC staff, August 14, 2020.
[753] Industry representative, interview by USITC staff, August 14, 2020.
[754] Industry representative, interview by USITC staff, August 14, 2020.
[755] IHS Markit, Global Trade Atlas database, HS 0302, 0304, 0305, 0306, 0307, 1604, 1605, accessed September 18, 2020.
[756] DOF, "Thailand Fisheries Overview: Thailand Fisheries Supply Chain 2019," April 2, 2020.

over the last several decades. These investments have led the Thai fish processing industry to account for about 20 percent of Thailand's total food product exports.[757]

Reduced domestic supply of fish and seafood due to overfishing has driven Thailand to become a net importer of raw materials for processing. These include tuna, sardines, and mackerel from multiple countries for canning; squid, cuttlefish, and salmon are used for further processing within the country and exported as finished products.[758] In 2019, the main suppliers of Thai imports of fish and seafood, by volume, were Burma (13.3 percent), China (9.5 percent), Taiwan (7.6 percent; see box 5.3), Japan (7.2 percent), and South Korea (5.6 percent).[759]

Box 5.3 Thai Tuna Supply Chain and IUU Fishing by Taiwan's Distant-water Fishing Fleet

The Commission estimates that almost a quarter of the U.S. tuna imports from Thailand, by value, are sourced by Taiwan's fleet in the Pacific Ocean, including in the EEZs of Pacific Islands such as Kiribati and Palau, as well as from Indonesia's EEZ. Taiwan's DWF fleet is the second-largest DWF fleet in the world (after China's) and is estimated to have reached over 400 vessels as of 2017. The Taiwan DWF fleet has been identified as engaging in IUU fishing in multiple EEZs, particularly in the Pacific, where small island states have fewer resources for regulatory enforcement. Vessels from Taiwan are also likely to engage in transshipments at sea, which are often illegal and have been linked to IUU fishing activity and violations to labor laws, with an estimated 15 percent of the transshipments analyzed in a recent study involving a Taiwan vessel. Further, Taiwan's DWF fleet has been linked to several violations of international labor laws, including holding crew members—mostly migrant workers from other Asian countries— in conditions of forced labor and debt bondage.[a]

While Taiwan has appeared to make progress in addressing IUU fishing by its DWF fleet, problems persist. These IUU fishing and related activities resulted in the issuance of a yellow card by the European Union (EU) in 2015 against Taiwan, which was lifted in 2019 after Taiwan implemented a series of reforms to address IUU fishing.[b] (For more information on the EU's carding system, see chapter 2.) However, in 2020 the U.S. Customs and Border Protection issued two "withhold release" orders, which prohibit the subject products from entering U.S. commerce, against two vessels from Taiwan for harvesting seafood, including tuna, with forced labor. One of the vessels, the *Da Wang*, was flagged to Vanuatu—an island country in the South Pacific—but owned by a Taiwan company.[c] Further, the U.S. Department of Labor included Taiwan in its 2020 report, *List of Goods Produced by Child Labor or Forced Labor*. USDOL listed Taiwan for having fish products harvested by forced labor, noting that numerous reports indicate that adults, mainly from other countries, are forced to work in Taiwan's DWF fleet.[d] Additionally, while the U.S. Department of State ranked Taiwan as Tier 1 for meeting the minimum standards for the elimination of trafficking in 2020, the *2020 Trafficking in Persons Report* noted that the Taiwan DWF fleet is "highly vulnerable" to employing forced labor among its crew and that insufficient

[757] USDA, FAS, *Thailand: Seafood Report*, May 8, 2018, 1; FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020.
[758] China, India, Taiwan, Vietnam, and the United States are the main suppliers of raw materials for further processing into Thailand. Combined, the five countries accounted for about 40 percent of the total imports of fishery products in 2017. USDA, FAS, *Thailand: Seafood Report*, May 8, 2018, 1; FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020; DOF, "Thailand Fisheries Statistic," January 4, 2020.
[759] Other important suppliers were Vietnam (5.6 percent), India (4.8 percent), and Malaysia (4.5percent). Includes live, fresh, and frozen seafood, as well as lightly processed product such as salted, dried, and smoked seafood. IHS Markit, Global Trade Atlas database, HS 03, accessed October 28, 2020.

staffing and inspection protocols impede efforts to combat these issues.[e] Thus, product sourced by vessels from Taiwan, including tuna, is at risk of being obtained via IUU fishing and in violation of labor laws. Its catch is a potential source for seafood obtained via IUU fishing to enter the Thai seafood processing supply chain.

[a] CEA, *Distant Water Fishing*, 2018, 20, 25.
[b] EC, "Illegal Fishing: EU lifts Taiwan's yellow card," June 27, 2019.
[c] USDHS, CBP "CBP Issues Detention Order on Seafood,", May 11, 2020; USDHS, CBP, "CBP Issues Detention Order on Seafood," August 18, 2020.
[d] USDOL, ILAB, *2020 List of Goods*, September 2020.
[e] Tier 1 is defined as "countries whose governments fully meet the Trafficking Victims Protection Act of 2000's (TVPA) minimum standards for the elimination of trafficking." USDOS, *2020 Trafficking in Persons Report*, June 2020.

In 2019, about 67.5 percent of total seafood exports from Thailand were of processed products, which included $2.2 billion (39.1 percent of total exports) in prepared or preserved tunas, skipjack, and bonito, followed by about $1.7 billion (29.9 percent) in exports of shrimp and prawn products.[760] The main Thai export markets are the United States and Japan, which accounted, respectively, for 21.5 percent and 20.7 percent of total exports of seafood from Thailand in 2019.[761] Total seafood exports from Thailand decreased about 3.7 percent in 2019 compared to the previous year. Before this, exports had increased for three years after a sharp fall (15.0 percent) in 2014–15 driven by lower shrimp and prawn exports due to an outbreak of Early Mortality Syndrome disease.[762]

U.S. Imports from Thailand

The United States is an important market for Thai seafood products and Thailand is a large supplier of seafood to the United States. Thailand was the 7th-largest supplier of seafood products to the United States, by value, in 2019.[763] In that year, U.S. imports of seafood products from Thailand were valued at $1.2 billion (table 5.6), a 9.1 percent decrease from 2015.[764] In 2019, Thailand was the largest supplier of prepared and preserved seafood products, representing 21.3 percent of total U.S. imports of these.[765] By value, the main U.S. imports from Thailand were of warmwater shrimp products, which accounted for 38.5 percent of the total U.S. imports from the country, and yellowfin, skipjack, and bigeye tuna products, which accounted for 34.2 percent of total seafood imports from the country, in 2019 (table 5.9).

[760] IHS Markit, Global Trade Atlas database, HS 1604, 1605, 1604.14; 1605.21, 1605.29, 0306.17, 0306.36, 0306.95, accessed September 18, 2020.
[761] Other important markets for Thai fishery products are China (6.3 percent in 2018), Australia (6.1 percent), and the EU (5.3 percent). IHS Markit, Global Trade Atlas database, HS 03, 1603, 1604, 1605, 2301, accessed September 18, 2020.
[762] Thai exports of shrimps and prawn products fell 20.7 percent in 2018 offsetting gains in exports of other seafood products, including a 9.4 percent increase in exports of prepared and preserved tuna products. IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.20, accessed September 18, 2020.
[763] USITC DataWeb/USDOC (HTS 03, 1604, 1605, 2301.20), accessed May 19, 2020.
[764] USITC DataWeb/USDOC (HTS 03, 1604, 1605, 2301.20), accessed May 19, 2020.
[765] USITC DataWeb/USDOC (HTS 1604, 1605), accessed May 19, 2020.

Table 5.9 Thailand: Top U.S. imports of seafood from Thailand, 2019

Product group	Value ($)	Share of total U.S. seafood imports from Thailand (%)
Warmwater shrimp	476	38.5
Yellowfin, skipjack, and bigeye tuna	423	34.2
Albacore	112	9.1
Pink salmon	47	3.8
All other	213	17.2
Total	1,237	100

Source: USITC staff calculations from USITC DataWeb/USDOC, accessed May 19, 2020.
Note: Imports may include products that originate in any fishing area and/or that are sourced by vessels from other countries.

Fisheries and Fleet Management

The main regulatory agency responsible for the management of Thai fisheries is the Ministry of Agriculture and Cooperatives, Department of Fisheries. The department and its subdivisions have jurisdiction over various aspects of fishing in Thai waters and by Thai vessels outside of the country's waters.[766] Specifically, the Fishing and Fleets Management Division is in charge of monitoring, surveilling, and analyzing the activity of Thai fishing vessels, as well as the operations of fishing ports and fish markets.[767]

In 2015, in response to the issuance of a yellow card by the EU, Thailand conducted a series of reforms of its laws and regulations governing seafood production and labor in the fisheries sector.[768] The main fisheries legislation in Thailand is the Royal Ordinance on Fisheries B.E. 2558 (2015), as amended. [769] This ordinance reorganized the legal framework governing fishing and aquaculture in Thailand and by Thai vessels outside of the Thai EEZ. For example, the new framework switched fisheries management in Thailand from "open access fisheries," which was a largely unregulated fishing system, to a controlled fishing system. The latter system issues fishing licenses based on maximum sustainable yield and catch allowance, combined with a reduction in fishing capacity.[770] This ordinance also sought to regulate working conditions throughout the fishing industry (e.g., on vessels and in processing plants). It also established the National Fisheries Committee, which is tasked with developing measures to prevent and deter IUU fishing and to safeguard and protect workers' rights, among other mandates.[771]

In addition to domestic regulations on fisheries and fleet management, Thailand has joined several international treaties on fishing and has also ratified various conventions to combat multiple forms of labor violations (appendix H). Thailand ratified the United Nations Convention on the Law of the Sea in 2011, although the Thai government noted that its legal framework was not able to fulfill its obligations under this convention before the 2015 reforms.[772] As part of the above-mentioned reforms in response to the EU yellow card, in 2016 Thailand acceded to the Port State Measures Agreement.[773] Thailand is

[766] DOF, "Department of Fisheries Structure," August 24, 2020.
[767] DOF, "Fishing and Fleets Management Division," March 18, 2020.
[768] DOF, "Thailand's Success in Combatting IUU Fishing," July 10, 2020.
[769] Royal Ordinance on Fisheries, B.E. 2558 (2015).
[770] Government of Thailand, written submission to USITC, October 9, 2020, 5.
[771] Royal Ordinance on Fisheries, B.E. 2558 (2015).
[772] Government of Thailand, written submission to USITC, October 9, 2020, 1.
[773] FAO Treaties Database, "Agreement on Port State Measures," accessed December 14, 2020.

also a member of two RFMOs that regulate fishing and several regional fisheries bodies (appendix H), including the Southeast Asian Fisheries Development Center.[774] Thailand has also joined all four core International Labour Organization (ILO) conventions on forced and child labor.

Widely published reports pointed to serious and systemic violations to labor laws in Thailand, which included cases of forced labor on board Thai fishing vessels and in shrimp-processing plants. In response to these and to the EU yellow card, Thailand reformed its national framework for regulating labor in the fishing sector.[775] In 2019, the Thai government adopted the Fishery Workers Protection Act, to implement the ILO Work in Fishing Convention (C188), which was ratified that same year.[776] However, 7 of the 11 implementing laws had not been adopted as of June 2020, making it uncertain whether the law can be fully enforced.[777] The Fishery Workers Protection Act was highlighted by the ILO as the "most extensive example of legal reform based on C188."[778] Notwithstanding ratification of C188 and other conventions on forced and child labor, reports note that issues still persist (see IUU Fishing Activities including Labor Issues section below).

IUU Fishing Activities including Labor Issues

IUU fishing and violations to labor laws in Thai waters and by Thai vessels outside the country's EEZ have been widely documented. These have been acknowledged by the Thai government as a persistent issue in its industry. The Thai government asserts that the regulatory reforms have led to a substantial reduction in IUU fishing and that progress in eliminating labor violations has also been made.[779] However, multiple reports note that issues still persist in certain areas, while some reforms are too recent to evaluate their effectiveness and sustainability. Part of the Thai EEZ is situated in the Eastern Indian Ocean, where large numbers of species experience high levels of IUU fishing, resulting in the area being deemed a "high risk" region for illegal fishing by the WWF.[780] Thailand is also a major fishing nation in the Western Central Pacific, which is also estimated to be at high risk of illegal fishing.[781] Further, the U.S. Department of Labor (USDOL) listed Thailand as having goods produced with forced and child labor.[782] The U.S. Department of State (USDOS) ranked Thailand as a Tier 2 country in its 2019

[774] FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020.
[775] The new regulations include measures to prosecute, protect, and prevent labor issues in the fishing sector by registering workers, increasing inspection and prosecution of violators, and allocating funds to anti-human-trafficking agencies, among others, although the Thai government recognizes there is still work to be done. Government of Thailand, written submission to USITC, October 9, 2020, 14–15. Industry representative, interview by USITC staff, December 10, 2020.
[776] For more information about ILO Work in Fishing Convention, see chapter 2.
[777] USDOS, *2020 Trafficking in Persons Report*, June 2020.
[778] ILO, *Fishers First—Good Practices to End Labour Exploitation*, 2016, 28.
[779] Government of Thailand, written submission to USITC, October 9, 2020, 4.
[780] WWF, *Illegal Fishing: Which Fish Species Are at Highest Risk*, October 2015, 28, 32.
[781] WWF, *Illegal Fishing: Which Fish Species Are at Highest Risk*, October 2015, 28, 32.
[782] Thailand has been identified as having fish caught produced with forced labor and shrimp processed with both forced and child labor. Thai shrimp processing has been identified as being produced with forced labor since the initial *List of Goods Produced by Child Labor or Forced Labor* report in 2009. The USDOL has funded various efforts to combat labor abuses in several countries, including Thailand, since the late 1990s, including 2010 a project to combat the worst forms of child labor in the Thai shrimp and seafood producing sectors. USDOL, ILAB, *2018 List of Goods*, 10, 42.

Trafficking in Persons Report.[783] Thailand was also classified by the Global Slavery Index on Fishing as being at high risk of modern slavery. The risks within the fishing industry are due to factors such as (1) the high proportion of catch taken outside Thailand's own waters, (2) poor governance (high levels of unreported catch) in the country, and (3) higher-than-average levels of harmful fishing subsidies. In addition, a high level of evidence points to modern slavery occurring within the country, including in the fishing sector.[784]

IUU Fishing Activities

Overfishing and overexploitation of Thai fish stocks has led to reduced catches in the Thai EEZ and an increase in the need to source raw materials for the processing and aquaculture sectors outside of Thai waters. This need to source product beyond the Thai EEZ has been linked to an increased risk of IUU fishing and labor violations on fishing vessels. Generally unregulated until 2015, the Thai EEZ had been subjected to overfishing for several decades. This led to an increased share of lower-value species caught in the EEZ, as higher-value species were depleted, and there was no oversight in place over endangered species. Thai EEZs have also seen IUU fishing as vessels harvested in restricted areas.[785] As a result of the 2015 ordinance on fisheries and increased enforcement actions, over 5,000 cases of IUU fishing have been filed for prosecution. Several of these cases resulted in the prosecution of Thai and foreign fishing vessels for IUU fishing.[786] In 2018, Thai authorities detained 22 Thai vessels and 67 foreign-flagged vessels in the Thai EEZ.[787] Further, Thai fishing vessels are reported to make incursions into neighboring EEZs, including the Indonesian EEZ, and many Thai vessels have been seized by Indonesian authorities for fishing without authorization.[788] For instance, multiple Thai vessels, including at least one in 2019, have been sunk by Indonesian authorities as part of an effort by the Indonesian government to reduce illegal fishing by foreign vessels in the Indonesian EEZ (described in the Indonesia country profile).[789] A substantial portion of the catch from Thai vessels fishing in foreign EEZs is used for processing as fishmeal for use in the Thai aquaculture sector.[790]

In 2015, the EU issued Thailand a yellow card for "not taking sufficient measures in the international fight against illegal fishing."[791] The country was delisted (i.e., the card was removed) in 2019 because the EU stated that Thailand "successfully addressed the shortcomings in its fisheries legal and administrative systems" by implementing the above-mentioned reforms. The EU also noted that Thailand had made

[783] USDOS, *2019 Trafficking in Persons Report*, June 2019, 48.
[784] Minderoo Foundation, *Global Slavery Index 2018*, 2018.
[785] Sullivan, "Ending Decades of Illegal Fishing in Thailand," June 20, 2019. Government of Thailand, written submission to the USITC, October 9, 2020, 2-3.
[786] Government of Thailand, written submission to USITC, October 9, 2020, 6.
[787] EJF, *Thailand's Progress in Combating IUU, Forced Labour*, 2019.
[788] Reportedly, Thai vessels' incursions into the Indonesian EEZ have decreased since Indonesia implemented its vessel-sinking policy in 2014. EJF, *Thailand's Seafood Slaves: Human Trafficking, Slavery and Murder*, 2015, 26–27; Gunawan, "Indonesia Sinks Three Foreign Vessels for Illegal Fishing," May 13, 2019; FAO, "Fishery and Aquaculture Country Profiles: The Kingdom of Thailand," accessed August 4, 2020.
[789] Gunawan, "Indonesia Sinks Three Foreign Vessels for Illegal Fishing," May 13, 2019.
[790] Industry representative, interview by USITC staff, August 14, 2020.
[791] EC, "EU acts on illegal fishing," April 21, 2015.

efforts to tackle human trafficking and improve working conditions in its fishing sector.[792] Thailand implemented a new legal framework, including the adoption of a new main fisheries law in the country to combat IUU fishing and improve the working conditions in its fishing industry. However, certain experts point out that these issues persist, and the new regulations have not been effective in curbing these problems.[793]

Thailand has been making efforts to prevent IUU fishing and activities that facilitate it with what appear to be mixed results. To reduce fishing capacity and eliminate vessels with invalid registration, the Thai government conducted a national survey of vessels, revoked vessel registrars of over 8,000 vessels without valid licenses, and implemented a vessel buy-back scheme.[794] The government established Port In–Port-Out (PIPO) Control Centers and Forward Inspection Points. Both have been set up in ports around the country for Thai fishing vessels to report to every time they depart from or arrive in port and they must be inspected by Thai officials.[795] The technologies and systems employed for these inspections are sophisticated and data-driven, increasing the efficiency and potential for effectively combating IUU fishing and labor violations. However, a 2019 a report by the Environmental Justice Foundation (EJF) noted that certain limitations persist for achieving effective inspection of vessels and the elimination of IUU fishing.[796] Particularly, it noted that, while improvements have been made, some PIPO centers lack resources for carrying out all the required inspections and that these inspections lack standardization and are inconsistent. It also noted that the requirements do not include inspection of landings or gear in the vessels, which could be indicative of IUU fishing activities. The EJF report also noted that officials continue to associate the identification of IUU fishing activities with a failure of the system, resulting in a disincentive to find violations.[797] Additional reports point to widespread corruption and the prevalence of transnational organized networks. These factors—widespread corruption and transnational organized networks—are pinpointed as some of the main enablers of IUU fishing and labor violations in Thailand, and a limiting factor for fully implementing the new regulations to combat these activities.[798] A Human Rights Watch report from 2018 also stated that corruption from

[792] EC, “Commission Lifts ‘Yellow Card’ from Thailand for Its Actions against Illegal Fishing,” January 8, 2019. Thailand also implemented an electronic traceability system designed for tracing catches from Thai-flagged vessels and imported fish from the processing plants to the EU market. Government of Thailand, written submission to the USITC, October 9, 2020, 9-10.
[793] Industry representative, interview by USITC staff, August 14, 2020; Industry representative, interview by USITC staff, April 30, 2020.
[794] Royal Thai Embassy, Washington D.C., “Thailand’s Fisheries Reform: Progress and Way Forward,” 2016.
[795] At PIPO centers and Forward Inspection Points (FIPs), Thai officers carry out physical inspections and documentation checks, and crosscheck with vessel monitoring system data to identify any suspicious activity. These centers enforce laws related to fishing, forced labor, child labor, and human trafficking. The Thai Maritime Enforcement Command Center (Thai-MECC) oversees PIPO and FIP operations. DOF, “Thailand’s Success in Combating IUU Fishing,” accessed October 29, 2020; USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Thailand*, 2018, 5; USDOS, *2020 Trafficking in Persons Report*, June 2020.
[796] de Rivaz et al., *Turning the Tide?*, November 29, 2019, 50; EJF, *Thailand’s Progress in Combating IUU, Forced Labour,* 2019.
[797] EJF, *Thailand’s Progress in Combating IUU, Forced Labour*, 2019. Industry representative, interview by USITC staff, December 10, 2020.
[798] de Rivaz et al., *Turning the Tide?*, November 29, 2019,19–22. Industry representative, interview by USITC staff, December 10, 2020.

Thai officials was prevalent, with cases of extortion of Thai and migrant fisheries workers by police officers being reported.[799]

Labor Issues in the Fishing Sector

Violations of labor laws in fishing vessels and seafood processing, including forced and child labor, in Thailand have been reported multiple times throughout various decades, although the government has made a series of efforts to combat these issues in its industry.[800] In 2014, media reports exposed that thousands of migrants, particularly from the Mekong region, were held in forced-labor conditions on board Thai vessels in Indonesian and Malaysian waters. The workers were used for fishing forage fish used as inputs in feed for farmed shrimp and prawns.[801] Since then, a large number of reports—including from media outlets as well as international governmental organizations and nongovernmental organizations have described the prevalence of networks that traffic migrants from countries such as Cambodia and Burma. The migrants are lured to fishing vessels in Thailand and other Southeast Asian countries by using deceptive tactics, coercion, and violence.[802]

While country nationals are also reported to be victims of forced labor and other violations, many human trafficking networks target migrant workers, often with no experience in fishing, from countries or regions with limited economic opportunities. These migrants are often excluded from protections under country laws and lack the language skills to communicate with authorities. Many of the victims of forced labor that have been rescued from fishing vessels report being held away from land for months or even years. In addition, they have been subjected to multiple forms of abuse from vessel operators, including physical abuse—with many reporting having witnessed the execution of a fellow crewmember— emotional abuse, and, in some cases, sexual abuse. In addition, living conditions on these vessels—which can be over 100 meters long and with capacity for over 100 fishers[803]—are crowded and unsanitary. Food is limited and many report working long hours with no time to rest. Many of these workers were children.[804]

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[799] Human Rights Watch, "Hidden Chains: Rights Abuses and Forced Labour," January 23, 2018; Bangkok Post, "Police Warned Against Extorting Migrants," July 3, 2017. A 2015 EJF report, which was published before the recent reforms took place, noted that extensive corruption had contributed to facilitating overfishing and the use of forced labor. EJF, *Thailand's Seafood Slaves. Human Trafficking, Slavery and Murder*, 2015, 4.

[800] For instance, a 2006 ILO report on human trafficking in the Mekong subregion found that 20 percent of the males interviewed, who were working on fishing boats in Thailand, were mostly between 15 and 17 years of age and said they were forced to work. Pearson et al., *The Mekong Challenge—Underpaid, Overworked and Overlooked*, vol. 1, xviii, January 1, 2006.

[801] Tickler et al., "Modern Slavery and the Race to Fish," November 7, 2018, 4643.

[802] EJF, *Thailand's Seafood Slaves. Human Trafficking, Slavery and Murder*, 2015; EJF, *Blood and Water: Human Rights Abuse*, May 6, 2019.

[803] U.N. Office on Drugs and Crime, *Transnational Organized Crime in the Fishing Industry*, 2011, 15.

[804] While most of the cases of forced labor onboard fishing vessels are men, women and young children have also been documented to be exploited for seafood-related activities. Reports also showed migrant women and children also being held in forced-labor conditions in shrimp processing facilities in Thailand. While Thai seafood processors have worked on addressing these issues since the 2014 reports, experts highlight that these still occur, and workers face similar conditions in shrimp processing facilities in other Southeast Asian countries. USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Thailand*, 2018 1; Tickler et al., "Modern Slavery and the Race to Fish," December 2018. Industry representative, interview by USITC staff, August 14, 2020.

In 2018, USDOL classified the government's efforts to eliminate child labor as "Moderate Advancement." These efforts include an increased budget for the Labor Inspectorate and training for volunteers on the worst forms of child labor. While the government has been actively addressing labor violations in the fishing sector, including the adoption of a new law and increased inspection, enforcement of labor laws remains a challenge. According to USDOL, this is particularly due to an insufficient number of inspectors in the country.[805] It also notes that, although Thailand has ratified all the key conventions on child labor, there are several gaps that still exist, including persistent violations of the minimum age requirements for employment.[806] Further, USDOL points to child labor that occurs on Thai fishing vessels, including as a result of human trafficking, and in the shrimp and seafood processing sector.[807] Specifically, USDOL notes that although incidents of child labor have decreased in Thailand, Thai and migrant children from the Greater Mekong region work in hazardous conditions. In shrimp and seafood processing plants, children work late hours cleaning and lifting heavy loads of seafood.[808] The shrimp processing sector, which was widely covered by the international press as having a high prevalence of migrants employed in conditions of forced and child labor, has taken steps to mitigate the risk of producing goods in contravention of labor laws.[809] For example, shrimp processors in Thailand have implemented a system to trace the fishmeal used as inputs in shrimp aquaculture farms and has insourced tasks that were previously completed before the product arrived at its facilities.[810] However, concerns persist on the conditions of these workers who are now within the shrimp-processing companies' control.[811]

Furthermore, the U.S. State Department's 2019 and 2020 *Trafficking in Persons Report* categorized Thailand as a Tier 2 country. The reports noted that Thai workers, as well as migrant workers from neighboring countries, were subjected to forced labor on Thai and foreign-owned fishing boats, and that corruption continues to undermine anti-trafficking efforts.[812] The 2020 report noted that many employers and brokers still make illegal paycheck deductions for the cost of bringing employees to Thailand. These costs may even be deducted from their electronic bank accounts after making the payment required by law. The *2020 Trafficking in Persons Report* mentioned that there is no requirement that working contracts be written in the migrant's language and that many of them do not

[805] USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Thailand*, 2018, 1.
[806] The Thai government increased labor inspectorate funding from $614,000 in 2017 to $921,000 in 2018, the number of inspectors is still low. According to USDOL's advised ratio of inspectors to workers for less developed countries, Thailand would employ over 2,500 inspectors, however, the country reported having 1,900 inspectors in 2018, an increase of about 400 inspectors compared to 2017. The Thai government, in its written submission to the USITC, noted that Thailand has reached the ILO recommended ration of inspectors to workers with 1,889 inspectors in 2019. USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Thailand*, 2018, 1, 5. Government of Thailand, written submission to the USITC, October 9, 2020, 16.
[807] USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Thailand*, 2018, 2.
[808] USDOL, ILAB, *2018 Findings on the Worst Forms of Child Labor: Thailand*, 2018, 2.
[809] Industry representative, interview by USITC staff, August 14, 2020; Hodal, Kelly, and Lawrence, "Revealed: Asian Slave Labour Producing Prawns," June 10, 2014.
[810] Industry representative, interview by USITC staff, August 14, 2020.
[811] Industry representative, interview by USITC staff, August 14, 2020; Industry representative, interview by USITC staff, December 10, 2020.
[812] The report highlights that some workers "are paid little or irregularly, incur debts from brokers and employers, work as much as 18 to 20 hours per day for seven days a week, and without adequate food, water or medical supplies" and that some boat captains subject fishers to physical violence, threats, and drugs to force them to work long hours. USDOS, *2019 Trafficking in Persons Report*, June 2019, 458.

have a copy of these contracts. Also, there was a lack of guidance on the work and rest hours requirements, which increases the risk of trafficking.[813] The report also highlighted the inconsistencies in PIPO inspection practices and that some inspection teams lacked translators to interview foreign workers. The report noted that only two labor violations had been identified of the over 60,000 inspections conducted between 2016–18.[814] Other reports also highlight the presence of forced labor and slave-like conditions in the Thai fishing industry. According to a report, about 60 percent of interviewed migrants from Cambodia who were trafficked into the Thai fishing industry reported witnessing the execution of a coworker by the ship's captain.[815]

Although the new regulations seek to reduce labor violations in Thailand by increasing monitoring and surveillance of the activities of the Thai fleet, forced labor is still prevalent in Thai vessels and seafood-processing facilities. While global estimates on the prevalence of forced labor in the Thai fishing sector are not available, a 2020 ILO report estimated that the prevalence of forced labor conditions among about 470 surveyed workers in fishing and seafood processing in Thailand to be about 10 percent.[816] This report noted that, of those surveyed, forced labor was found to be twice as prevalent among fishers on vessels (about 14 percent) than those working in seafood processing (about 7 percent).[817] By comparing the results of a similar survey in 2017, the report also found that slight but positive changes in recruitment, contracts, and wages had occurred since the new regulations were implemented.[818]

Moreover, a report by Human Rights Watch, which documented situations of forced labor between 2016 and 2018—after multiple regulatory reforms had been implemented—noted that gaps in Thai law prevent the appropriate identification of forced labor situations in the country. Specifically, the report noted that the law defines forced labor as being within the scope of human trafficking, so it does not consider victims of forced labor that are not trafficked.[819] The report also noted lack of both accountability and punishment against Thai nationals that employ forced labor.[820] Further, various organizations point out that the current legislation does not provide the necessary protections to workers and prevents migrant workers from participating in labor unions and organizing collectively. For instance, the Equal Justice Foundation recommended that the Thai government ratify and implement

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[813] USDOS, *2020 Trafficking in Persons Report*, June 2020, 495.
[814] USDOS, *2020 Trafficking in Persons Report*, June 2020, 495.
[815] U.S. National Intelligence Council, "Global Implications of Illegal, Unreported, and Unregulated (IUU) Fishing," 16, accessed October 28, 2020.
[816] The survey was conducted as part of the Ship to Shore Rights Project discussed in chapter 2. It covers 470 workers in fishing and seafood processing. These estimates were obtained by applying the ILO's framework for identifying forced labor based on indicators of involuntary work and coercion. The report notes that it was not possible to establish a representative sample of migrant workers and that the results of the study cannot be extrapolated to the entire fishing and seafood processing industry in Thailand. ILO, *Endline Research Findings*, March 10, 2020, VIII, 26–30.
[817] The report also found forced labor more prevalent among men (12 percent) than women (5 percent). While the report didn't find significant differences in estimated forced labor by migrant nationality, it noted that in a 2017 survey Cambodian migrants had higher reported levels of wage withholding, abusive working conditions, and deception, compared to Burmese migrants, which is likely a result from the higher concentration of Cambodian workers in Eastern Thai ports where labor practices were worse than in other regions. ILO, *Endline Research Findings*, March 10, 2020, 29.
[818] ILO, *Endline Research Findings*, March 10, 2020, IX.
[819] Human Rights Watch, "Hidden Chains: Rights Abuses and Forced Labour," January 23, 2018.
[820] Human Rights Watch, "Hidden Chains: Rights Abuses and Forced Labour," January 23, 2018.

the ILO Freedom of Association and Protection of the Right to Organize Convention of 1948 (C87) and the ILO Right to Organize and Collective Bargaining Convention of 1949 (C98). As of December 2020, Thailand had not ratified these conventions.[821]

Various other reports highlight limitations on the implementation of some of the main components of the legal framework as challenges in reducing violations of labor laws in Thailand. In addition to the above-mentioned limitations at PIPO centers, problems have been reported on how these inspections handle screening for labor violations.[822] Reports highlight that some inspections lack interpreters and fail to assess whether fishers in a vessel are working willingly or are subjected to violations of the law.[823]

The reforms adopted by the Thai government are deemed to have potential in combating IUU fishing including labor. However, factors including those mentioned above, as well as domestic pressures (box 5.4), do not clearly indicate what the outcomes of these recent policies will be for eliminating IUU fishing, including labor violations from the Thai fishing industry.

Box 5.4 Domestic Industry's Response to Thailand's Fisheries Reforms

The recent reforms in Thailand have not only faced some scrutiny and criticism from the international community, but also have resulted in increased pressure domestically. Thai fishers have expressed demands that include easing of the fishing restrictions implemented by the new framework, which includes the Royal Ordinance on Fisheries of 2015. These demands conflicts with the recommendations made by international organizations and nongovernmental organizations (NGOs). Thai fishers also request the government address issues of labor shortages and fishers' increasing debt problems, which could increase the risk of noncompliance and hence of IUU fishing including labor in the country.[a]

Moreover, the 2019 Fishery Workers Protection Act has met criticism from multiple fronts. For example, the law adopted a proposal by the National Fisheries Association of Thailand to allow children 16 years of age and older to serve as "interns" or "observers" on fishing vessels.[b] However, others claim that it would expose minors to hazardous work.[c] Further, one of the key components of the new regulatory framework is the registration of migrant workers—who are a substantial component of the Thai labor force due to limited availability of domestic fishers—by using one-stop service centers. This policy, however, reportedly had the unintended consequence of driving about 60,000 workers out of Thailand as it made them liable to fines and jail time if they did not register.[d]

[a] Dao, "Thailand Faces Massive Test in Its Efforts," December 23, 2019.
[b] Wongsamuth, "New Law to Protect Thai Fishermen," September 17, 2020.
[c] Blomberg, "Warnings Over New Law to Protect Workers," May 23, 2020.
[d] de Rivaz et al., *Turning the Tide?*, 2019, 31.

[821] EJF, *Implementation Status of EJF Recommendations*, 2019, 3–4; Human Rights Watch, "Hidden Chains: Rights Abuses and Forced Labour," January 23, 2018; ILO, *Endline Research Findings*, March 10, 2020.
[822] EJF, *Thailand's Seafood Slaves. Human Trafficking, Slavery and Murder*, 2015, 30.
[823] EJF, *Thailand's Seafood Slaves. Human Trafficking, Slavery and Murder*, 2015, 31; Human Rights Watch, "Hidden Chains: Rights Abuses and Forced Labour," January 23, 2018.

Estimates of IUU Imports

Thailand supplies marine capture seafood—most of which is caught outside its EEZs—and farmed seafood to the United States; products generated from IUU fishing are found in both supply chains. The Commission's supply chain analysis indicates that in 2019, only a fraction of U.S imports of marine-capture products from Thailand (9.0 percent) originated in the Thai EEZs. Thai vessels were estimated to be the source of all the U.S. imports of marine capture products originating in the Thai EEZs. The USITC estimate indicates that U.S. imports of marine capture products from Thailand were caught in Kiribati (21.1 percent), the high seas (14.6 percent), and Indonesia (10.7 percent). Thailand is not itself the largest source of its exports to the United States: of the total U.S. imports of marine capture products from Thailand, the main sources are vessels from Taiwan (20.5 percent) and South Korea (11.5 percent), followed by Thai vessels (11.2 percent). Vessels flagged to Pacific Island countries, such as Micronesia and Kiribati, supplied about 18.6 percent of the U.S. imports of marine-capture products from Thailand, while U.S. and Chinese vessels accounted for 7.5 and 6.1 percent.

Most of the U.S. imports of marine capture products from Thailand caught in the Thai EEZ and sourced by Thai vessels were of squid (19.7 percent), miscellaneous jack/pompano fishes (13.9 percent), and herring and sardine (9.5 percent) products. By contrast, U.S. imports of marine capture products from Thailand sourced by non-Thai vessels in all fishing areas were mostly of tuna products, which accounted for about 70.3 of the total U.S. imports from Thailand. About 14.2 percent of the products sourced by Thai vessels in the Thai EEZ are estimated to be imported into the United States via other countries, including India and China. The Commission estimates that in 2019 about 12.2 percent, or an estimated $92.9 million, of the U.S. imports of marine capture products from Thailand were obtained via IUU fishing. U.S. imports of IUU marine-capture seafood from Thailand include a wide range of species, including various species of tuna, swimming crab, and squid, mostly as processed fish products. Farm-raised shrimp accounted for the vast majority of U.S. imports of aquaculture products from Indonesia. On a global basis, farm-raised shrimp were estimated to contain IUU product feed inputs equivalent to 6.6 percent of aquaculture production.

Spain

Spain is a leading producer, importer, exporter, and consumer of seafood products. Its seafood production and processing sector is an important element of many coastal communities, especially in terms of employment in Galicia, Cantabria, and the Basque Country.[824] Spain has a highly developed processing industry and leads the EU in the production of frozen and canned fish products and is among the global leaders in canned fish production.[825] Spain's seafood processing industry consists of 607 companies (2017) with 6.1 billion euros ($6.8 billion) in sales (5 percent of all Spanish food manufacturing), and employs more than 20,000 people.[826] Spain regularly receives the greatest portion

[824] USDA, FAS, *Spain: Fish and Seafood Market Brief*, April 17, 2017.
[825] European Union information used to compile this section was generally pre-Brexit and thus included the United Kingdom unless otherwise specified. USDA, FAS, *Spain: Fish and Seafood Market Brief,* April 17, 2017.
[826] EUMOFA, "Country Profile: Spain," March 4, 2020, 5. Throughout this section, euros are converted to U.S. dollars using the appropriate year's annual exchange rate, Board of Governors of the Federal Reserve System (US), U.S. / Euro Foreign Exchange Rate [AEXUXEU], retrieved from FRED, Federal Reserve Bank of St Louis, https://fred.stlouisfed.org/series/AEXUSEU, accessed November 30, 2020.

of EU fisheries subsidies.[827] Spain is also a leading consumer of fishery products in the EU (42.5 kg per capita per year in 2017, second after Portugal) and globally in the top 20.[828]

Production

Spain is a leading producer, importer, exporter, and consumer of fisheries products. In 2018, Spain reported 1.3 million mt of wild-capture and aquaculture production, ranking 21st in global seafood production (table 5.10). The vast majority of this production—about 72.8 percent—is from wild-capture landings. Spain is among the top 20 countries for marine-capture fishing in the world and a leader among EU countries.[829] A very small amount of this production is from the growing aquaculture industry.

Table 5.10 Spain: Total seafood production (wild capture and aquaculture), exports, and U.S. imports from Spain

Seafood production, 2018 (million mt)	Global ranking, 2018	Seafood exports, 2019 (billion $)	Value of U.S. imports of seafood, 2019 (billion $)	Share of U.S. seafood imports (%)	Ranking as U.S. supplier (2019)	Estimated value of U.S. imports obtained via IUU fishing (million $)
1.3	21	$4.8	$177	0.8	17	$34.3

Source: FAO, Global Production database, accessed May 19, 2020; IHS Markit, Global Trade Atlas database, HS 03, 1604, 1605, 2301.10, accessed September 22, 2020; USITC DataWeb/USDOC, HTS 03, 1604, 1605, 2301.10; accessed May 19, 2020; USITC IUU import estimates.

Spain's total marine landings during 2014–18 accounted for 19.0 percent of the EU total including the United Kingdom (UK) and 28.4 percent of the EU total when the UK is excluded. Spanish landings totaled 843,159 mt valued at 1.9 billion euros ($2.3 billion) during 2018 (estimates suggest that the DWF fleet accounts for about 50 percent of landings).[830] The most recent peak catch was almost 1.1 million mt valued at nearly 2.7 billion euros ($3.6 billion) in 2014.[831] The leading species by volume during 2018 were skipjack tuna (22.8 percent), hake (11.6 percent), mackerel (9.2 percent), yellowfin tuna (7.4 percent), and anchovy (7.1 percent). The leading species by value were hake (14.9 percent), skipjack tuna (10.4 percent), yellowfin tuna (6.2 percent), swordfish (5.9 percent), and miscellaneous shrimp (5.8 percent).[832] These landings took place at 340 registered ports.[833]

Spain's aquaculture production has steadily increased from the most recent low of 282,000 mt in 2014 to 348,000 mt in 2018 (23.2 percent).[834] Aquaculture production was valued at 658 million euros

[827] Monterey Bay Aquarium, Seafood Watch, "Investigation: Taxpayers Pay Spain to Overfish," October 2, 2011; WWF, "In Schizophrenic Vote, European Parliament Reintroduces Subsidies," March 7, 2019.
[828] FAO, FAOSTAT, "New Food Balances," Food supply quantity (kg/capita/yr), http://www.fao.org/faostat/en/#data/FBS, accessed December 1, 2020.
[829] FAO, *The State of World Fisheries and Aquaculture*, 2020.
[830] EUMOFA, Yearly Ad-hoc query: Landings, Spain, Main commercial species by value and volume, 2015–2019, accessed January 14, 2021; Dentes de Carvalho, Keatinge M., and Guillen Garcia, Scientific, Technical and Economic Committee for Fisheries, 2019, 425.
[831] EUMOFA, Yearly Ad-hoc query: Landings, Spain, Main commercial species by value and volume, 2015–2019, accessed January 14, 2021.
[832] EUMOFA, Yearly Ad-hoc query: Landings, Spain, Main commercial species by value and volume, 2015–2019, accessed January 14, 2021.
[833] EUMOFA, "Country Profile: Spain," March 4, 2020, 2.
[834] FAO, Global Production database, accessed May 19, 2020.

($777 million) in 2018, 39.5 percent greater than in 2014.[835] The top three leading farmed species accounted for 58 percent of value. The leading farmed seafood includes European seabass (22.4 percent of value, 7.1 percent of volume), bluefin tuna (21.0 percent of value, 2.4 percent of volume), mussels (20.4 percent of value, 76.0 percent of volume), and gilthead seabream (10.5 percent of value, 4.3 percent of volume.[836]

Spain is also a large processing hub for seafood sourced by the Spanish fleet as well as imported from other countries. The main products processed in Spain are prepared and preserved tuna, skipjack, and Atlantic bonito. In 2018, the Spanish processing industry produced nearly 767,000 mt of fish products consisting of 307,000 mt of fresh and frozen products; 35,000 mt of dried, salted, brined, and smoked products; and 424,000 mt of prepared and preserved products.[837]

Some of the largest Spanish seafood companies are highly integrated, multinational firms that have invested in many levels of the fish and seafood supply chain and have fishing, processing, and sales operations throughout the world, including the United States. For example, Grupo Nueva Pescanova has subsidiary fishing operations totaling 60 vessels based in Uruguay, as well as in Argentina (16 vessels), Angola, Namibia, South Africa, and Mozambique (30 vessels) and has had a sales office in the United States offering salmon, shrimp, octopus, mahi-mahi, and Patagonian toothfish (also known as Chilean sea bass) since 1998.[838] The Pereira Group is another Spanish-owned multinational integrated seafood company offering seafood exports to the United States from fishing operations in South America, West Africa, and the North Atlantic.[839]

Fleet

Spain has the largest fishing fleet by capacity in the EU, the largest DWF fleet in the EU, and has the fifth-largest DWF fleet globally, representing about 10 percent of fishing effort. [840] The Spanish fleet consisted of 9,207 registered vessels in 2017, of which, 3,961 were active vessels in the small-scale coastal fleet, 4,136 were active vessels classified in the large-scale fleet, and 198 active vessels were classified as the DWF fleet.[841] Though the DWF fleet (198 vessels) represents less than 2.5 percent of the total Spanish fleet, its landings are more than 50 percent of total 2017 Spanish live-weight landings.[842] In addition, many Spanish-owned fishing companies are based and registered in countries outside Spain to gain access to third-country fisheries.[843] Spanish companies were involved in 220 joint-venture

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[835] EUMOFA, Yearly Ad-hoc query: Aquaculture, Spain, Main commercial species by value and volume, 2015–2019, accessed January 14, 2021.
[836] EUMOFA, Yearly Ad-hoc query: Aquaculture, Spain, Main commercial species by value and volume, 2015–2019, accessed January 14, 2021.
[837] ANFACO-CECOPESCA, *Cluster Mar-Alimentario: Datos 2019*, 2020; EUMOFA database, accessed October 5, 2020.
[838] Nueva Pescanova, "We Fish," accessed August 24, 2020.
[839] Grupo Pereira, "Bienvenidos al Grupo Pereira," accessed August 24, 2020.
[840] Yozell and Shaver, *Shining a Light*, November 1, 2019; Tickler et al., "Far from Home," August 2018.
[841] STECF, *The 2019 Annual Economic Report*, 2019.
[842] STECF, *The 2019 Annual Economic Report*, 2019, 427.
[843] Bates, "Ready for Fleet Renewal," March 17, 2017; Emmett, "Vigo's Falklands Fleet Faces a Sea of Trouble," March 28, 2020; Emmett, "A Long Way from Home," February 20, 2018.

enterprises operating 460 vessels, in about 30 countries.[844] Historically, Spain was the EU country most cited for IUU fishing, though in recent years Spain has implemented new regulations to reduce IUU fish in its supply chains.[845]

Trade

Spain exported about 1.24 million mt of seafood valued at more than 4.3 billion euros ($4.8 billion) in 2019, increasing from about 1.18 million mt and 3.6 billion euros ($4.0 billion) in 2015. The leading exports from the country consisted of all tuna—albacore, bigeye, bluefin, skipjack, yellowfin, and miscellaneous—valued at more than 1.1 billion euros ($1.3 billion); all shrimp—Crangon, coldwater, deep-water rose, warmwater, and miscellaneous—valued at 346 million euros ($387 billion); octopus valued at 351 million euros ($393 million); squid valued at 344 million euros ($385 million); and hake valued at 216 million euros ($241 million). The leading destinations for Spain's exports are Italy (28.4 percent), Portugal (17.2 percent), France (14.1 percent), and the United States (3.7 percent).[846]

Spain's seafood processing industry is also a substantial link in global fisheries supply chains. Imports are important for Spain in part as inputs for its large seafood processing industry. Spain imported an average of more than 1.7 million mt of fisheries products during 2014–18, a portion of which was destined for processing. In 2018, Spain imported 1.8 million mt of seafood valued at nearly 7.4 billion euros ($8.7 billion). Imports have steadily increased from 1.6 million mt (8.8 percent increase) and 5.3 billion euros ($6.3 billion, 38.4 percent increase) since 2014. The leading species imported by value included octopus valued at 670 million euros ($792 million), squid at 603 million euros ($713 million), miscellaneous shrimp at 537 million euros ($635 million), hake at 495 million euros ($585 million), and salmon at 465 million euros ($549 million). The leading sources for Spain's imports are Morocco (10 percent), Portugal (6 percent), Ecuador (6 percent), and China (6 percent).[847]

U.S. Imports from Spain

Spain is the 17th-largest supplier of seafood products to the United States. The main U.S. imports of Spanish seafood include octopus (48.8 percent), tuna (16.4 percent), squid (8.3 percent), other crustaceans (6.5 percent), and European sea bass (6.2 percent) (table 5.11). The total value of U.S. seafood imports from Spain increased from $89.1 million in 2015 to $177.7 million in 2019 (99.1 percent). Octopus imports more than doubled from $41.7 million to $86.6 million, while tuna (all species) imports increased by 57.9 percent ($18.4 million to $29.1 million).[848]

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844 CEPPT, or Cluster of Fishing Companies in Third Countries, is an association that acts as the spokesperson for companies with investments in non-EU Countries. FIS, "Companies Directory: CEPPT," accessed January 13, 2021; IUU Watch, "New Analysis of Spain's Implementation of the EU IUU Reg," June 13, 2017.
845 Clover, "Spain's Fishing Fleet Is Endangering the Life," December 10, 2019.
846 EUMOFA, Yearly Ad-hoc query: Import-Export, Spain, Imports and exports by main commercial species and partner country, 2015–2019, accessed January 14, 2021.
847 EUMOFA, Yearly Ad-hoc query: Import-Export, Spain, Imports and exports by main commercial species and partner country, 2015–2019, accessed January 14, 2021.
848 USITC staff calculations from USITC DataWeb/USDOC, accessed May 19, 2020.

Table 5.11 Spain: Top U.S. imports of seafood from Spain, 2019

Product group	Value ($)	Share of total U.S. seafood imports from Spain (%)
Octopus	86.6	48.8
All tuna	29.1	16.4
Squid (loligo and other)	14.7	8.3
Other crustaceans	11.5	6.5
Sea bass	11.1	6.2
All other	24.5	13.8
Total	177.5	100.0

Source: USITC staff calculations from USITC DataWeb/USDOC, accessed May 19, 2020.
Note: Imports may include products that originate in any fishing area and/or that are sourced by vessels from other countries.

Fisheries and Fleet Management

Spanish fisheries industries are subject to both EU and Spanish regulation. All EU member states are governed by the Common Fisheries Policy (CFP). The CFP is the set of rules for managing European fishing fleets and for conserving fish stocks. The CFP was first introduced in the 1970s with the latest update taking place in 2013, Regulation (EU) No 1380/2013.[849] The CFP rules and regulations are generally enforced by the individual member states subject to (1) the Corrigendum to Commission Implementing Regulation (EU) No 404/2011, (2) Commission Implementing Regulation (EU) No 404/2011, and (3) Council Regulation (EC) No 1224/2009.[850] Spanish Law No. 3/2001, the State Maritime Fishing Law, sets up the basic regulations for the management of the fishing sector, including the regime of infractions and sanctions in matters of maritime fishing in external waters and basic regulations for the management of the fishing sector and marketing of fishing products.[851]

While EU regulations are considered among the most stringent globally, EU and Spanish fisheries are among the most over-exploited in the world.[852] Moreover, the Spanish fisheries industry has been identified with practices that have been linked to and are known to facilitate IUU fishing. These practices include (1) capacity-enhancing subsidization (Spain has historically been the largest beneficiary of EU fisheries-related subsidies),[853] (2) large DWF fleets,[854] and (3) offshore ownership of fishing companies and registration of vessels to facilitate fishing in third-country waters.[855]

In addition to domestic and EU regulations on fisheries and fleet management, Spain is a member of 12 RFMOs that regulate fishing in waters under their jurisdiction, 10 of which are through EU membership (appendix H). Spain has also ratified most international treaties on fishing and labor, including the United Nations Convention on the Law of the Sea and the Port State Measures Agreement, which was

[849] EC, “The Common Fisheries Policy (CFP),” accessed November 30, 2020.
[850] EC, “Infringements and Sanctions,” accessed September 16, 2016.
[851] Government of Spain, Ley de pesca marítima del Estado (state maritime fishing law) (2001, Ley No. 3).
[852] Oceana, “EU Still Far from Phasing Out Overfishing by 2020,” June 11, 2018; Oceana, “EU to Fail at Recovering Overexploited Fish,” April 11, 2019.
[853] Sumaila et al., “Updated Estimates and Analysis of Global Fisheries Subsidies,” November 2019.
[854] STECF, *The 2019 Annual Economic Report*, 2019.
[855] FIS, “Companies Directory: CEPPT,” accessed January 13, 2021.

ratified by the EU in 2011 (appendix H). Spain is also a party to all four core ILO conventions on forced and child labor, but it has not ratified the Work in Fishing Convention.

IUU Fishing Activities and Labor Issues

Spain has the largest DWF fleet in the EU, and it is among the largest in the world, including companies that operate subsidiaries in West African and South American Atlantic fisheries. The country has a large domestic processing industry that requires a large amount of imports to operate efficiently, thus increasing the risk that IUU fish, shellfish, and mollusks enter the Spanish supply chain. Spain is a major fishing nation in the East Central Atlantic (the high seas and EEZ coastal areas off West Africa), where the WWF has identified 41 stocks or species with high levels of IUU fishing; the Mediterranean and Black Sea (with 29 stocks or species with high levels of IUU fishing); and the Southwest Atlantic (high seas and EEZ coastal areas off of Eastern South America, with 26 stocks or species with high levels of IUU fishing). Moreover, the Global Slavery Index rated Spain as being at high risk for slavery based on catch outside its EEZ, distant-water fishing, and subsidies.[856]

IUU Fishing Activities

Spain's domestic fishing industry is generally well managed being subject to both EU and Spanish regulations; nonetheless, Spain's seafood supply chains have been identified as being at risk for IUU fishing and labor violations. Spain's domestic consumption and large seafood processing industry, including processing for export, rely on inputs from the Spanish DWF fleet, imports from foreign-based subsidiaries, and imports from less well-managed foreign sources.

DWF fleets have been associated with IUU fishing because they typically lack transparency and monitoring.[857] Spain has, historically, been a major DWF nation,[858] and Spanish flagged vessels represent a large majority of the EU's DWF fleet as well as one of the largest DWF fleets in the world.[859] As noted, Spanish marine capture landings by live weight are from the DWF fleet are large (about half as of 2017) and growing.[860] Moreover, DWF fleet landings increased by 40 percent during 2010–19.[861] IUU fishing has been identified in the Spanish DWF fleet. For example, Vidal Armadores S.A., a Spanish-owned company, has been listed as having previously owned vessels on the IUU lists of various RFMOs and has been fined by the Spanish government for IUU fishing activities.[862]

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[856] Minderoo Foundation, *Global Slavery Index 2018*, 2018.
[857] CEA, *Distant Water Fishing: Overview of Research Efforts and Current Knowledge*, October 2018.
[858] The Spanish DWF fleet fished, on average, 1,500 km from Spain during the 1950s increasing to more than 3,000 km from Spain by 2014. Countries with similar increases in DWF fleet distance include China, South Korea, and Taiwan; Tickler et al., "Far from Home," August 2018.
[859] CFFA, "Fishing Outside EU waters," accessed August 24, 2020; EC, "Fishing Outside the EU," September 16, 2016; Yozell and Shaver, *Shining a Light*, November 1, 2019.
[860] Gaspar Dentes de Carvalho, Keatinge, and Guillen Garcia, *Scientific, Technical and Economic Committee for Fisheries*, 2019, 427.
[861] CFFA, "Fishing Outside EU waters," accessed August 24, 2020.
[862] CCAMLR, "Non-Contracting Party IUU Vessel List," accessed December 2, 2020; Stop Illegal Fishing, "Vidal Armadores—Banned, Fined and Awaiting Trial," June 29, 2016.

Despite Spanish regulations to fight IUU fishing,[863] Spanish fishing companies continue to be accused of violating regulations such as overfishing tuna quotas, illegal smuggling of bluefin tuna, and employing vessels identified as being involved in IUU fishing. The Spanish fleet has been accused of overfishing its 2018 Seychelles tuna quota by more than 13,000 mt (30 percent).[864] In October of 2018, Spanish officials arrested 79 people (including some from one of Spain's largest seafood farming companies) and seized 80 mt of bluefin tuna of illicit origin; the group is accused of smuggling bluefin tuna valued at 12.5 million euros ($14.8 million) annually.[865] In 2016, Spanish officials imposed fines totaling more than 17 million euros ($19.8 million) on nine companies and seven individuals for their involvement with vessels involved in illegal fishing.[866]

Labor Issues in the Fishing Sector

The Global Slavery Index indicates that Spain's supply chains are at high risk of forced labor because they rely on fish sourced from DWF, foreign-based joint ventures, and direct imports from less-regulated sources.[867] Spain's large domestic processing industry relies on unprocessed and semi-processed inputs from foreign-based joint ventures and third-country export sources. These inputs from joint-venture and third-country sources are not directly subject to EU and Spanish labor laws. Moreover, the Spanish seafood industry is among the leading users (second after France) of third-country labor in the EU. A 2013 European Commission study found that nearly 2,800 nonlocal workers were involved in the Spanish seafood industry, more than 2,100 of whom were employed on fishing vessels, mostly offshore and DWF vessels.[868] Most of these nonlocal workers were from Africa (primarily Senegal) and South America (Peru), though more recently Spanish vessel owners have increased the number of Indonesians that they employ.[869]

Estimates of IUU Imports

Spain supplies marine capture seafood, both directly and indirectly, to the United States; over one-fifth of the total is estimated to be the product of IUU fishing. The estimates indicate that in 2019, almost 30 percent of the total U.S. imports of marine-capture products from Spain were caught in EU-27 EEZs, including about 17.8 percent in Spanish EEZs. U.S. imports of marine-capture products from Spain also originated in Moroccan EEZs (22.5 percent) and the Mauritanian EEZ (17.4 percent). The vast majority of the U.S. imports of marine-capture products from Spain caught in Spanish EEZs were sourced by Spanish vessels. These were also the source of over two thirds of the U.S. imports from Spain of marine-capture products originating in EU-27 EEZs. Most of the U.S. imports of marine-capture products from Spain caught in Spanish EEZs and sourced by Spanish vessels were of octopus (45.3 percent), tuna (30.2 percent), and anchovy (11.9 percent) products.[870] About 23.4 percent of the products sourced by Spanish vessels in Spanish EEZs are estimated to be imported into the United States via other countries,

[863] Wright, "Spain Law to Fight IUU Fishing Draws NGO Praise," January 16, 2015.
[864] Blue Marine Foundation, "Inquisition by Scientists Reveals Massive Over-catch ," accessed October 29, 2020.
[865] White, "Illegal Bluefin Tuna Smuggling Ring Busted in Europe," October 18, 2018.
[866] Stop Illegal Fishing, "Vidal Armadores – Banned, Fined and Awaiting Trial," June 29, 2016.
[867] Minderoo Foundation, *Global Slavery Index 2018, Chapter 4 Spotlight on Sectors*, 2018.
[868] EC, "Study on the Employment of Non-local Labor," June 2016.
[869] Emmett, "A Long Way from Home," February 20, 2018.
[870] Similarly, the majority of the U.S. imports of marine capture products from Spain caught in the EU-27 EEZs and sourced by Spanish vessels are of tuna, octopus, and anchovy products.

particularly from other EU-27 countries, including Portugal and Italy. The Commission estimates that in 2019 about 22.4 percent, or about $34.3 million, of the U.S. imports of marine capture products from Spain were obtained via IUU fishing. Most of the estimated U.S. imports of IUU marine-capture seafood from Spain were of octopus, squid, and anchovies.

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Chapter 6
U.S. Commercial Fishing Industry

Introduction

The United States has coasts on three major bodies of water and is home to hundreds of seafood species.[871] The two primary types of fishing in U.S. waters are commercial and recreational.[872] U.S. marine capture commercial fishing is highly concentrated on a small number of species, particularly in terms of landings measured by quantity. During 2018–19, just 10 species accounted for over three-quarters of total U.S. landings by volume and three-fifths by value.[873] U.S. landings levels were relatively stable during 2015–19.[874] This was in part due to the state and federal systems for managing U.S. fisheries, which control harvest levels for a wide range of finfish and shellfish species.[875]

U.S. consumption is also highly concentrated in a few species, with the top 10 accounting for the vast majority (about 90 percent) of consumption.[876] Despite an extensive coastline and sizable domestic fishing industry, the U.S. market is highly dependent on imports to meet demand—including for some of the most popular species, such as shrimp and salmon. The United States tends to import higher-value seafood products and to export lower-value seafood products. This reflects U.S. consumer demand for certain higher-value seafood products, including lobster, crab, and shrimp. U.S. finfish, which are exported in large volume, have lower average values. Some U.S. seafood, including a number of groundfish species from Alaska and the Pacific Northwest, are shipped abroad for processing (especially to China). [877] A share of this production is then imported into the United States as fillets or other higher-

[871] NOAA Fisheries, Landings database: Commercial, accessed multiple dates.
[872] Commercial fishing covers operations focused on selling their catch for profit and excludes recreational fishing (as well as for-hire services aimed at recreational fishers) and subsistence fishing. NOAA Fisheries, *Fisheries of the United States 2018*, February 2020; NOAA Fisheries, *Fisheries Economics 2016*, December 2018, vi. There is a limited amount of subsistence fishing in the United States and its territories. The primary U.S. subsistence fishers are Pacific Islanders and Native American tribe members from Alaska and the Pacific Northwest. NOAA Fisheries, "Resources for Fishing: Subsistence Fishing," accessed April 21, 2020.
[873] See "Production" below for a list of the most landed species by volume and value. These include finfish such as Alaska pollock, menhaden, Pacific hake, and Pacific cod, as well as shellfish/crustaceans such as American lobster and blue crab and mollusks such as sea scallops and Eastern oysters. Landed catch volume and value are based on the sum of landings in 2018 and 2019 in order to account for the significant annual fluctuations in catch of certain species such as pink salmon. For example, during 2015–19, pink salmon landings ranged in value from a low of $40 million in 2016 to a high of $164 million in 2017. NOAA Fisheries, Landings Database: Commercial, accessed December 4, 2020.
[874] NOAA Fisheries, Landings Database: Commercial, accessed December 4, 2020.
[875] See "Overview of Regulatory Framework" and "U.S. Fisheries Management" sections below.
[876] See "Consumption" section below for information on the top 10 most consumed species in the United States, which include shrimp (a shellfish), salmon, and canned tuna (both finfish). NFI, "Top 10 List for Seafood Consumption," accessed August 10, 2020.
[877] See, e.g., AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Haddon and Newman, "Fish Caught in America," August 9, 2018; Yeong, "NW Salmon Sent to China," July 16, 2005.

value processed products. U.S. marine fisheries products face competition in the U.S. market from both legal imports and imports harvested through IUU fishing.

Overview of Regulatory Framework and U.S. Fisheries Management

The federal government and states jointly manage U.S. marine fisheries.[878] Individual state governments and Marine Fisheries Commissions (MFCs) are generally responsible for fishery management from the U.S. coastline out to three nautical miles, within the requirements of federal law.[879] The federal government, through Regional Fishery Management Councils (RFMCs) and the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service, or NOAA Fisheries, is responsible for fisheries management within the U.S. exclusive economic zone (EEZ) extending from 3 to 200 nautical miles off the coast. Federal legislation, such as the Magnuson-Stevens Act, authorizes state and federal fishery management authorities to establish fishery management plans within their jurisdiction.[880]

Magnuson-Stevens Act

As stated in chapter 2, U.S. fisheries management is guided by several federal laws, foremost of which is the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (Box 6.1). It established the U.S. EEZ, which comprises federal waters, and eight RFMCs with representation from the coastal states and regional fisheries stakeholders. In 2007, the act was reauthorized and included a variety of new provisions that (1) authorized RFMCs to develop annual catch limits for each of their managed fisheries that may not exceed the fishing level recommendations of their scientific and statistical committees or peer review processes, (2) promoted market-based management strategies, including limited access privilege programs such as catch shares, (3) strengthened the role of science through peer review, scientific and statistical committees, and the Marine Recreational Information Program, and (4) enhanced international cooperation by addressing IUU fishing and bycatch.[881]

Box 6.1 Protection of Marine Mammals and Other Sea Life in Commercial Fisheries

In addition to laws aimed at managing fish stocks and preventing overfishing, other laws aimed at protecting marine mammals and other sea life also impact the U.S. commercial fishing industry, and non-compliance with these laws can result in IUU fishing. One such law is the federal Marine Mammal Protection Act (MMPA) of 1972. Under the MMPA, three federal entities work to protect and manage marine mammal populations and maintain their place within their ecosystems.[a] The Marine Mammal Commission, an independent agency, "provides science-based oversight of domestic and international policies and actions of federal agencies addressing human impacts on marine mammals and their ecosystems."[b] Protected marine mammals are managed either by NOAA Fisheries (e.g., dolphins and

[878] The terms "fishery" and "fisheries" are used throughout this section to refer to marine fisheries.
[879] NOAA Fisheries, "Understanding Fisheries Management in the United States," accessed September 25, 2020.
[880] NOAA Fisheries, "Understanding Fisheries Management in the United States," accessed September 25, 2020.
[881] 109th Congress, Pub. L. No. 109-479, § 120 Stat. 3575, 3579-3581 (2007); NOAA Fisheries, "Magnuson-Stevens Act," accessed September 16, 2020.

seals) or by the U.S. Fish and Wildlife Service (e.g., polar bears and manatees).[c] Similar to species managed under the Magnuson-Stevens Act, stock assessments are done for marine mammals to assess their levels. Based on these assessments, management actions are taken to try to ensure sufficient population levels in a given ecosystem.[d] While aimed at protecting marine mammals, these actions can impact other industries including the U.S. commercial fishing industry. For example, under the MMPA limits can be imposed the type of gear a commercial fishery may use or fisheries may be closed for periods of time to reduce bycatch of protected mammals. In some fisheries, commercial fishers may be required to obtain permits for “incidental take” of marine mammals captured while fishing for other species to help minimize marine mammal bycatch.[e] Regional fisheries management organizations (RFMOs) also have in place measures to protect marine mammals and other sea life in the fisheries they manage.[f] For example, the IATTC requires observers on board large purse seine vessels to ensure compliance with RFMO rules aimed at protecting dolphins in the tuna fishery.[g] The Western and Central Pacific Fisheries Commission (WPCFC) prohibits vessels from targeting or intentionally setting nets on manta rays and requires vessels to release rays unintentionally entangled in fishing gear.[h] Fishing not done in compliance with requirements under the MMPA, or other federal law or RFMO rules concerning protection of marine mammals and other sea life during commercial fishing activities, may be deemed IUU fishing.

[a] The MMPA has been amended since 1972, including substantially in 1994. NOAA Fisheries, “Law & Policy: Marine Mammal Protection Act,” accessed January 26, 2021.
[b] Marine Mammal Commission, “Our Mission,” accessed January 26, 2021.
[c] NOAA Fisheries, “Law & Policy: Marine Mammal Protection Act,” accessed January 26, 2021.
[d] NOAA Fisheries, “Marine Mammal Protection: Overview,” accessed January 26, 2021.
[e] NOAA Fisheries, “Marine Mammal Protection: Conservation & Management,” accessed January 26, 2021; Pub. L. No. 105-42, 11 Stat. 1122 (August 15, 1997).
[f] For more information on RFMOs see Chapter 2.
[g] See e.g., IATTC, “Quarterly Report: July-September 2014,” 5: ISSF, “IATTC 94th Meeting,” June 4, 1019, 6.
[h] WPCFC also requires for example vessels to disentangle, and where necessary, resuscitate, sea turtles caught in commercial fishing nets. See e.g., WPCFC, " Conservation and Management Measure on Mobulid Rays,” December 2019; WPCFC, “Conservation and Management Measure of Sea Turtles,” December 14, 2018.

Fishery Management Authorities in the United States

Major fishery management authorities in the United States include RFMCs, NOAA Fisheries MFCs, and state governments and their respective fishery management authorities. RFMCs and NOAA Fisheries are generally responsible for fisheries management in U.S. federal waters (i.e., the EEZs), while MFCs and state governments are responsible for fisheries management from the U.S. coastline out to three nautical miles. While fishery management authority is generally determined based on where a species is predominant, certain fisheries are cooperatively managed by different authorities.

Regional Fishery Management Councils

There are eight regional fishery management councils (RFMCs) in the United States: New England, Mid-Atlantic, South Atlantic, Gulf of Mexico, Caribbean, Pacific, North Pacific, and Western Pacific (see table 6.11).[882] The regional councils develop and recommend fisheries management plans for fisheries in federal waters within their jurisdiction. The management plans and specific management measures,

[882] NOAA Fisheries, “Magnuson-Stevens Act,” accessed September 16, 2020.

such as fishing seasons, quotas, and closed areas, are developed by the regional councils based on scientific advice from their respective scientific and statistical committees. NOAA Fisheries then implements the management plans and measures adopted by the regional councils.[883] Some regional councils, such as the New England and Mid-Atlantic Councils, develop joint fishery management plans (FMPs) for specific fisheries (e.g., monkfish and spiny dogfish).

Table 6.1 Fisheries managed by U.S. regional fishery management councils (RFMCs)

RFMCs	States and territories under the jurisdiction	Managed fisheries
New England	Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut	Northeast multispecies (groundfish including Atlantic cod); Atlantic sea scallop; monkfish[a]; Atlantic herring; skate; small-mesh multispecies (whiting/hake); deep-sea red crab; spiny dogfish[a]; Atlantic salmon
Mid-Atlantic	New York, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina	Summer flounder, scup, and black sea bass; Atlantic mackerel, squid (longfin and illex), and butterfish; surf clams and ocean quahogs; bluefish; golden tilefish
South Atlantic	North Carolina, South Carolina, Georgia, Florida	Coastal migratory pelagics (mackerels); mahi-mahi (dolphinfish)/Wahoo; golden crab; shrimp; snapper/grouper; spiny lobster
Gulf of Mexico	Florida, Alabama, Mississippi, Louisiana, Texas	Reef fish; shrimp; spiny lobster; migratory pelagics; red drum (redfish)
Caribbean	Puerto Rico, U.S. Virgin Islands	Reef fish; queen conch; spiny lobster
Pacific	California, Oregon, Washington, Idaho	Salmon (Chinook, coho, and pink); groundfish; coastal pelagic species (sardines, anchovies, and mackerel); highly migratory species (tunas, sharks, and swordfish)
North Pacific	Alaska	Bering Sea/Aleutian Islands and Gulf of Alaska groundfish; Bering Sea/Aleutian Islands crab fishery management plan (FMP); Scallop FMP; Salmon FMP
Western Pacific	Guam, Commonwealth of the Northern Mariana Islands, Wake Island, Midway Atoll, Johnston Islands, Hawaiian Islands, Palmyra Atoll and Kingman Reef, Jarvis Island, Baker and Howland Islands, American Samoa	American Samoa Fishery Ecosystem Plan (FEP); Hawaii FEP; Marianas FEP; Pacific Remote Island Area (PRIA) FEP; Pelagic FEP

Source: U.S. Regional Fishery Management Council websites, accessed September 15, 2020.
Note: Certain highly migratory species, like tuna and various species of salmon, are jointly managed by international regional fisheries management organization (RFMOs) and NOAA Fisheries. A fishery ecosystem plan (FEP) is a geographic-based management plan that incorporates ecosystem considerations. Fisheries that come under a FEP are managed in the context of the state of the ecosystems, and a fishery's performance is interpreted in this light. The Western Pacific Council manages thousands of species under these five FEPs, which are considered "managed fisheries."
[a] Jointly managed by the New England Council (also known as the NEFMC) and the Mid-Atlantic Council.

Marine Fisheries Commissions

Marine Fisheries Commissions (MFCs) are interstate agencies that collect data and manage shared coastal fishery resources (up to three nautical miles off the coast), with representation from member

[883] RFMCs, "Home," accessed September 15, 2020.

states' governments. There are three MFCs in the United States: the Atlantic States Marine Fisheries Commission, the Gulf States Marine Fisheries Commission, and the Pacific States Marine Fisheries Commission.[884] If a fishery falls within both state and federal waters, primary management authority is generally determined based on where the species is predominant. For example, 80 percent of the American lobster fishery is harvested in state waters (under three nautical miles), so the Atlantic States Marine Fisheries Commission manages this species and provides recommendations to NOAA Fisheries and the New England Council (also known as the NEFMC) to implement complementary measures in federal waters. However, other fisheries, such as the Atlantic herring fishery, are cooperatively managed by the Atlantic States Marine Fisheries Commission, NOAA Fisheries, and the East Coast RFMCs.[885]

Federal and International Management

U.S. marine fisheries that are not managed by RFMCs, MFCs, or state governments are generally managed at the federal level by NOAA Fisheries, or jointly managed by NOAA Fisheries and other fishery management authorities. For example, NOAA Fisheries manages certain highly migratory species present in U.S. federal waters in the Atlantic Ocean, Gulf of Mexico, and Caribbean that require complex management plans and international cooperation.[886] As previously described in chapter 2, regional fishery management organizations (RFMOs) make conservation and management recommendations to their member states for the fisheries they manage. For example, the International Commission for the Conservation of Atlantic Tunas (ICCAT) makes recommendations for the management of bluefin tuna and other highly migratory species within the fishery.

As an ICCAT member state, the United States, through NOAA Fisheries, generally sets regulations (e.g., annual total allowable catch limits, time/area closures, etc.) for the U.S. bluefin tuna fishery in the U.S. Atlantic, Gulf, and Caribbean waters based on conservation and management measures recommended by ICCAT (see chapter 7).[887] Other species, such as Pacific salmon, have a broad geographic range and migration route from inland tributaries to waters offshore Alaska and Canada. NOAA Fisheries cooperates with U.S. federal, state, tribal, and Canadian officials to manage these species through a

[884] NOAA Fisheries, "Partners: State Agencies," accessed September 17, 2020.
[885] ASMFC, "Management 101," accessed September 23, 2020.
[886] NOAA Fisheries, "Atlantic Highly Migratory Species," accessed October 26, 2020; NOAA Fisheries, "Atlantic Bigeye Tuna," accessed October 22, 2020.
[887] NOAA Fisheries, "Atlantic Bigeye Tuna," accessed October 22, 2020. The bluefin tuna fishery is managed principally through a quota. NOAA Fisheries implements and codifies the ICCAT-recommended U.S. quota through rulemaking, annually or biannually depending on the length of the relevant ICCAT recommendation. 79 Fed. Reg. 71509, December 2, 2014.

variety of forums, including the Pacific Salmon Commission (a RFMO) and the Pacific and North Pacific Council.[888]

Fishery Management Plans

U.S. fisheries are managed using a variety of methods described in the following section; however, stock assessments form the basis of all fishery management plans. Stock assessments estimate one or more biological characteristics of the stock, such as abundance (number of fish) or biomass (weight). Most plans use two biological indicators—stock biomass and rate of fishing—to determine the status of a fishery.[889] In order to conduct stock assessments, scientific and statistical committees of RFMCs and other fishery management authorities collect data and information to determine what harvest levels can maximize catch while preventing overfishing, and if necessary, how to rebuild depleting stocks. The results of these studies are further scrutinized through quantitative analysis and peer review in order to provide the best available data to the relevant fishery management authorities so they can develop and implement fishery management plans.[890]

Annual Catch Limits

Annual catch limits, also known as total allowable catch, are restrictions established on the number of fish or shellfish that can be harvested in a fishery. For each species, RFMCs and other management authorities first determine the stock's overfishing limit, or the catch level that corresponds to the stock's maximum sustainable yield. A scientific and statistical committee will then use this information to recommend the stock's acceptable biological catch (ABC), which is adjusted downward to account for scientific uncertainty. Using this information, a fishery management authority will set an annual catch limit. The limit set cannot exceed the ABC and is often set at the same level as the ABC. RFMCs may also set an annual catch target, which is generally set below the annual catch limit to account for management uncertainty. After the annual catch limit and/or target is set, the fishery management authority will develop and implement regulations such as gear restrictions, fish length limits, bag limits, and fishing seasons in order to meet the established annual catch limit and/or target.[891]

[888] The Pacific Salmon Commission, which was established by the 1985 Pacific Salmon Treaty between the United States and Canada, provides regulatory recommendations for Pacific salmon species to U.S. and Canadian fishery management authorities for final approval and implementation. The Pacific FMC sets and manages annual fisheries for Chinook, coho, and pink salmon in federal waters off the coasts of Washington, Oregon, and California, while the North Pacific FMC manages salmon fisheries in federal waters off the coast of Alaska. The North Pacific FMP delegates management of the commercial troll fishery in Southeast Alaska to the State of Alaska and the Pacific Salmon Commission. NOAA Fisheries, "Salmon and Steelhead Fisheries on the West Coast," accessed October 22, 2020; NOAA Fisheries, "Pacific Salmon and Steelhead: Alaska Fisheries," accessed October 22, 2020.
[889] A stock biomass indicator compares a current estimate of the stock biomass to a reference biomass value, defined as enough to produce young fish during the next spawning cycle. The goal of this measure is to maintain biomass above the reference level in order to promote sustainability of the stock. A rate of fishing indicator is used to determine whether overfishing is occurring. If fishing mortality is below a reference level, overfishing is not occurring. ASMFC, *Guide to Fisheries Science and Stock Assessments*, June 2009, 1.
[890] NOAA Fisheries, "Fish Stocks," accessed September 16, 2020.
[891] NOAA Fisheries, "Setting an Annual Catch Limit," accessed September 16, 2020.

Catch Shares

Catch shares generally refer to fishery management strategies that allocate a certain share of the total allowable catch to licensed fishers, cooperatives, fishing communities, or other entities for their exclusive use through the use of permits.[892] The term also includes more specific programs defined in statutes, such as limited access privilege programs and individual fishing quotas. Recipients of catch share programs are required to stop fishing when they meet their specific share of the annual quota; however, they are permitted to buy, sell, or lease shares to other parties on an annual basis. There are 17 active catch share programs across the United States in all regional council management areas, excluding areas in U.S. territories managed by the Caribbean and Western Pacific councils (see table 6.12).[893]

Table 6.2 Current catch share programs, by U.S. regional fisheries management council (RFMCs)

RFMCs	Current catch share programs	Year implemented
New England	Atlantic sea scallops individual fishing quotas[a]	2010
	Multispecies sectors	2010
	Georges Bank cod—hook gear	2004
	Georges Bank cod—fixed gear	2007
Mid-Atlantic	Surf clam and ocean quahog	1990
	Golden tilefish	2009
South Atlantic	Wreckfish	1991
Gulf of Mexico	Red snapper	2007
	Grouper and tilefish	2010
Pacific	Pacific sablefish permit stacking	2001
	Pacific Coast Groundfish Trawl Rationalization	2011
North Pacific	Halibut and sablefish	1995
	Western Alaska community development quota[b]	1992
	Bering Sea AFA Pollock Cooperative	1999
	Groundfish (non-pollock) cooperatives	2008
	Aleutian Islands pollock	2005
	Bering Sea king and tanner crab	2005
	Central Gulf of Alaska rockfish	2011
Atlantic highly migratory species	Atlantic bluefin tuna individual bluefin quota[c]	2015

Source: NOAA Fisheries, "Catch Share Programs by Council Region," accessed September 16, 2020.
[a] Individual fishing quotas are federal permits issued to harvest a specific quantity of fish or shellfish, expressed by a unit or units representing the total allowable catch of a fishery.
[b] The Western Alaska community development quota is a program used to allocate Bering Sea and Aleutian Islands quotas for groundfish, prohibited species, halibut, and crab to eligible communities in Western Alaska.
[c] The bluefin tuna individual bluefin quota is a catch share program for bluefin tuna in the pelagic longline fishery in the Atlantic Ocean and Gulf of Mexico.

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[892] In certain catch share programs, a vessel's crew may receive a percentage of the revenue generated by the catch. USITC, *Frozen Warmwater Shrimp,* May 2017, 23 and I-23.
[893] NOAA Fisheries, "Catch Shares," accessed September 16, 2020; NOAA Fisheries, "Glossary: Catch Shares," accessed September 23, 2020.

Limited Entry Programs

Limited access privilege management programs (i.e., limited-entry programs) are federal permits issued to license holders that grant the holder harvesting (or processing) rights to a percentage of the annual total allowable catch in a fishery. These programs limit the risk of overfishing by controlling the capacity of the commercial fishing fleet operating in the fishery.[894] While these programs generally issue quota shares to licensed vessel owners and/or captains, they are also used to allocate quota shares to seafood processors through processor quota shares (see crab species profile later in this chapter).[895] Other limited-entry programs—such as the program found in the Pacific Coast commercial groundfish fishery—regulate capacity by placing limitations on the number of harvesting vessels that can operate in the fishery, the number of vessels using a specified gear type (e.g., travel, trap/pot, longline), and the length of commercial fishing vessels.[896]

Overview of the U.S. Commercial Seafood Industry and Market

U.S. Industry

Production

In 2018, the United States was the fifth-largest producer of marine capture seafood, accounting for about 6 percent of global production.[897] U.S. commercial fishing and seafood production was relatively flat during 2015–19, although production was generally higher than the previous five years (table 6.1).[898] On average, U.S. commercial landings increased 1.9 percent by volume and 3.0 percent by value between 2010–14 and 2015–19.[899] In 2019, U.S. commercial fishers landed 4.3 million metric tons (mt) of fish and seafood worth about $5.5 billion.[900] A substantial majority (88 percent in 2018) of commercial landings by volume are of finfish, but shellfish account for over half (55 percent) of landed

[894] NOAA Fisheries, "Glossary: Catch Shares," accessed September 23, 2020.
[895] NOAA Fisheries, "Glossary: Catch Shares," accessed September 23, 2020; North Pacific Council, "Crab Rationalization," accessed September 17, 2020.
[896] NOAA Fisheries, "Groundfish Limited Entry Change of Ownership/Vessel Registration," accessed September 25, 2020.
[897] According to the Food and Agriculture Organization of the United Nations (FAO), in 2018 the top four global producers of marine capture products were China (who accounted for 15 percent of global production), Peru (8 percent), Indonesia (8 percent), and the Russian Federation (6 percent). As of December 2020, 2018 is the most recent year for which FAO capture data are available. FAO, *The State of World Fisheries,* 2020, 13.
[898] The data on U.S. commercial landings presented in this chapter do not include IUU landings estimates. The United States is a low-risk IUU fishing country; however, as in all countries, some IUU fishing occurs. See chapter 3 and appendix F.
[899] In commercial fishing, landings are the portion of the catch harvested to be sold. NOAA Fisheries, *NOAA Fisheries Glossary*, June 2006; NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, x; NOAA Fisheries, "Landings Database: Commercial." accessed July 9, 2020.
[900] NOAA Fisheries, Landings database: Commercial, accessed April 20, 2020.

value.[901] Catch and landings are influenced by a number of factors, including natural fluctuations in supply, catch limits, and other measures to prevent overfishing, and over the long term by changes in consumer preferences.[902]

Table 6.3 U.S. Commercial fisheries landings, volume and value, 2010–14 average and 2015–19

	2010–14 avg.	2015	2016	2017	2018	2019
Million $	5,314	5,218	5,564	5,455	5,610	5,529
1000 mt	4,285	4,418	4,374	4,516	4,274	4,254

Source: NOAA Fisheries, Landings database: Commercial, accessed November 30, 2020.

There are over 800 aquatic species commercially produced in the United States. The substantial variation in prices by species affects rankings of the largest commercial species, regions, or states.[903] Finfish often have high-volume production and correspondingly low prices, although they can yield multiple commercially viable products that have very different values.[904] Shellfish often have a much higher value than finfish, but a more limited quantity of landings. The highest-value U.S. species, American lobster and sea scallops, accounted for 2.1 percent of the total volume of U.S. landings but 21.2 percent of value during 2018–19.[905] Therefore, it is important to assess production levels (and trade, below) by both volume and value.

The majority of landings are highly concentrated in a few species, particularly when measured by catch quantity.[906] The top three commercially landed species by volume—Alaska pollock (also known as walleye pollock[907]), menhaden, and Pacific hake—accounted for 59.0 percent of the total volume of U.S. landings in 2018–19, and the top 10 species accounted for 77.4 percent of landings (table 6.2). Measured by value, U.S. commercial landings are less concentrated. The top three species—American lobster, sea scallops, and sockeye salmon—accounted for 28.5 percent, while the top 10 accounted for 55.9 percent.

[901] As of December 2020, the most recent Fisheries of the United States reports covers the period through 2018. NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, viii.
[902] Catch limits, which are mandated by the Magnuson-Stevens Fishery Conservation and Management Act, are explained above in “Overview of Regulatory Framework and US Fisheries Management.” NOAA Fisheries, “Ending Overfishing through Annual Catch Limits,” December 30, 2019; Munshi, “Lobster Industry Squeezed by Oversupply,” August 7, 2013; EPA, “Climate Action Benefits,” May 11, 2015.
[903] NOAA Fisheries, Landings database: Commercial, accessed November 30, 2020.
[904] For example, three of the products derived from Alaska pollock– fillets, surimi and roe–have wide range of values. AFSC and McDowell Group, *Wholesale Market Profiles,* May 2016, 10. See also the profile on Alaska Pollock in Chapter 7.
[905] Landed volume and value are the sum of landings in 2018 and 2019 to account for the significant annual fluctuations in catch in certain species. NOAA Fisheries, Landings database: Commercial, accessed November 30, 2020.
[906] NOAA Fisheries, Landings database: Commercial, accessed November 30, 2020.
[907] Alaska pollock is another name for walleye pollock that has been caught in Alaskan waters. It is the same species of walleye pollock that is harvested in Russian waters. In 2015, a U.S. law designated that only pollock caught in U.S.-controlled waters—up to 200 miles offshore in both federal and state waters—may be called Alaska pollock. Intrafish, “New Spending Law Includes GMO, Pollock Provisions,” December 21, 2015.

Table 6.4 Top 10 species of U.S. commercial landings, by volume and value, 2018–19

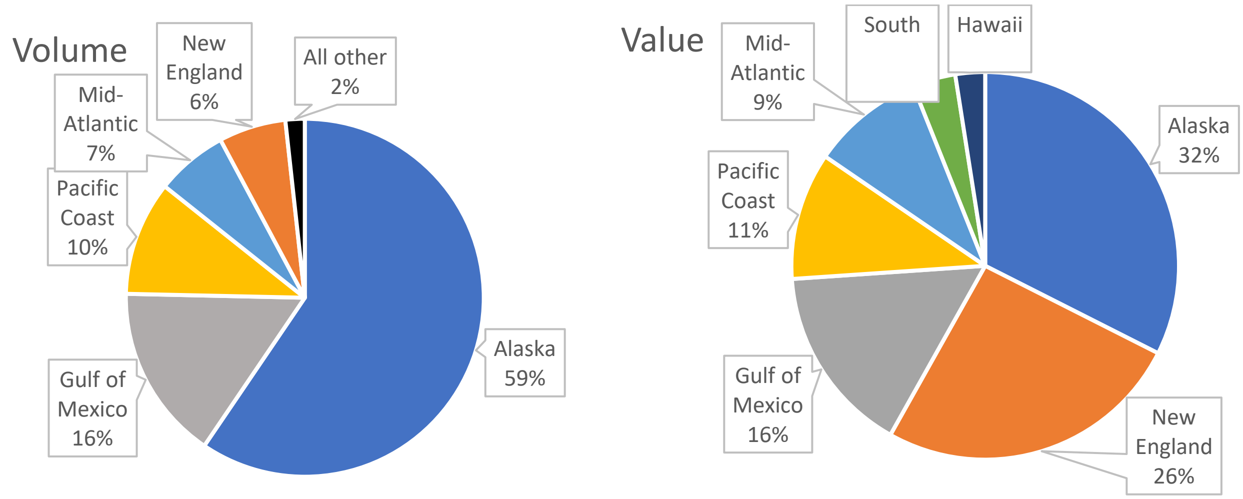
Landings by volume		Landings by value	
Species	**Thousand mt**	**Species**	**Million $**
Alaska pollock	3,047	American lobster	1,262
Menhaden	1,401	Sea scallop	1,103
Pacific hake	583	Sockeye salmon	807
Pacific cod	443	Alaska pollock	878
Yellowfin sole	252	Northern white shrimp	443
Sockeye salmon	249	Blue crab	402
Pink salmon	241	Dungeness crab	441
Blue crab	130	Eastern oyster	392
Atka mackerel	129	Menhaden	308
American lobster	124	Bigeye tuna	194
All other	1,931	All other	4,910
Total	8,529	Total	11,139

Source: NOAA Fisheries, Landings database: Commercial, accessed November 30, 2020.
Notes: Landed volume and value are the sum of landings in 2018 and 2019 to account for the significant annual fluctuations in catch in certain species such as pink salmon. Only specified species were included in this table: it excludes data associated with the "withheld for confidentiality" group, which was the ninth-largest grouping by landings value.

U.S. commercial landings are highly concentrated geographically. During 2015–19, Alaska accounted for the majority of the volume of landings (figure 6.1).[908] Together, Alaska, the Gulf of Mexico, and the Pacific Coast accounted for 85.7 percent of landings by volume. Four regions accounted for about the same amount of production (84.3 percent) on a value basis: Alaska, New England, the Gulf of Mexico, and the Pacific Coast. The Mid-Atlantic is also an important commercial producing region, accounting for about 6.1 percent of landings by volume and 9.4 percent by value during 2015–19.

[908] NOAA groups states into regions in different publications and databases, although these groupings can vary by source. For example, Alaska is sometimes included in the Pacific Region and sometimes treated as its own region. For purposes of this report, Pacific Coast excludes Alaska; two states—Alaska and Hawaii—are treated as two separate regions. NOAA Fisheries, *Fisheries of the United States 2016*, August 2017, 12; RFMCs, "Home," accessed April 20, 2020; NOAA Fisheries, Landings database: Commercial, accessed November 30, 2020.

Figure 6.1 United States: Regional share of commercial landings, by volume and value, 2015–19



Source: NOAA Fisheries, Landings database: Commercial, accessed December 1, 2020.
Notes: For volume, "other" is composed of the South Atlantic, Hawaii, and the Great Lakes regions. The Great Lakes was excluded from the value figure because it accounted for less than one-half of 1 percent of the value of commercial landings during 2015–19. Corresponds to appendix table J.2 and appendix table J.3.

During 2018–19, Alaska was by far the largest producing state, accounting for 58.7 percent of total U.S. landings by volume, followed by Louisiana (10.2 percent) and processed-at-sea (4.1 percent), which are almost exclusively of Pacific hake (also known as whiting) (table 6.3).[909] In that period, Alaska also had the highest landed value, although since the majority of its production is of lower-value finfish (e.g., Alaska pollock and Pacific cod), it only accounted for just under one-third of the value of U.S. landings. Massachusetts and Maine had the second-highest landed values (just under 12 percent each).[910] A significant share of the catch in these states, which are part of the New England fishing region, is of high-value species, including sea scallops and American lobster.

[909] NOAA Fisheries, Landings Database: Commercial, accessed December 1–2, 2020.
[910] Massachusetts and Maine each accounted for less than 3 percent of the total volume of U.S. landed values in 2017–18.

Table 6.5 U.S. Commercial fishing profiles, largest producing states and processed at sea, 2018–19

State/area	Landings			Top 3 species	Employment
	1,000 mt	**Million $**	**By volume (share of landings)**	**By value (share of landings)**	**Jobs (number)**
Alaska	5,006	3,601	Alaska pollock (60.9%); Pacific cod (8.8%); yellowfin sole (5.0%)	Alaska pollock (24.4%); sockeye salmon (22.4%); Pacific cod (9.8%)	Commercial fishers (38,272); processing & dealers (11,935); wholesalers & distributors (355)
Louisiana	873	680	Menhaden (83.0%); Northern white shrimp (5.8%); blue crab (4.0%)	Northern white shrimp (26.1%); menhaden (22.2%); Eastern oysters (17.9%)	Commercial fishers (12,395); processing & dealers (1,770); wholesalers & distributors (831)
Massachusetts	216	1,328	Sea scallop (17.3%); Atlantic herring (7.8%); American lobster (7.3%)	Sea scallop (58.1%); American lobster (13.8%); Eastern oysters (4.4%)	Commercial fishers (12,487); processing & dealers (1,710); wholesalers & distributors (1,082)
Maine[a]	196	1,319	American lobster (51.4%); Atlantic herring (17.5%); rockweed seaweed (5.4%)	American lobster (74.3%); soft clam (2.4%); Atlantic herring (1.7%)	Commercial fishers (15,027); processing & dealers (2,291); wholesalers & distributors (892)
Processed at sea	354	67 [b]	Pacific hake (whiting) (99.0%)	Pacific hake (whiting)[c]	([c])

Sources: NOAA Fisheries, Landings database: Commercial, accessed December 1-2, 2020; NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 73–74; NOAA Fisheries, Fisheries Economics of the United States 2017: Interactive Tool, accessed September 16, 2020; NOAA Fisheries, "Pacific Whiting," accessed October 26, 2020.

Notes: The volume and value of landings are based on the total of 2018 and 2019 year to account for annual fluctuations in supply and catch limits. Employment is based on reported jobs "without imports" (i.e., jobs tied to U.S. harvested seafood) for 2017, the most recent year available. "Processed at sea" covers fish that are caught in U.S. waters that are then processed on vessels at sea.

[a] In Maine, "withheld for confidentiality " is the third-largest category of landings by volume (15.6 percent) and second-largest by value (15.1 percent). This category was not included in the table and was replaced with the next-largest named species.

[b] Processed at sea landings value based on Pacific hake: value data are not available for other species processed at sea.

[c] Not available.

Employment

The U.S. commercial seafood industry directly employs people at multiple stages of the supply chain beginning with fishers.[911] As of 2017, there were close to 169,000 commercial fishers in the United States (table 6.4). This was a 2.9 percent increase from 2015, but a decline of 15.1 percent from 2013. Employment levels are heavily influenced by stocks and how they are managed. For some species, policies aimed at maintaining heathy stock levels ultimately control the number of active vessels and

[911] Commercial fishers are also referred to as commercial harvesters. Other direct and indirect employment in the supply chain occurs in processing, wholesale, importing, retail, and transportation. See, e.g., McDowell Group, *The Economic Value of Alaska's Seafood Industry*, January 2020, 26; NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 73–74; NOAA Fisheries, *Fisheries Economics 2016,* August 2017.

thus employment.[912] The Bureau of Labor Statistics (BLS) anticipates that employment will fall over the next decade in view of the possibility that new catch limits may be established, which reduce employment demand.[913] In addition, BLS noted that commercial fishing's seasonal nature and often hazardous working conditions contribute to high employee turnover. Industry representatives from both New England and Alaska have noted problems attracting younger people to their fishing industries.[914] One representative attributed this to competition from both IUU and legal imports.[915]

The industry also directly employs processors and dealers, who are often the first to take possession of the catch, as well as wholesalers and distributors. For the sector as a whole, processing and dealer employment directly related to domestic catch is roughly a third that of commercial fishers.[916] Wholesaler and distributor employment is just under half the level of processors and dealers. Following the trend of commercial fishers, both processing and wholesale employment dropped sharply between 2013 and 2015 but, despite annual fluctuations, was relatively flat through 2017.[917]

Table 6.6 U.S. Employment related to U.S. commercial fishing, 2013–17, number of jobs

Sector	2013	2014	2015	2016	2017
Commercial fishers	198,647	185,263	164,047	166,952	168,746
Seafood processors & dealers	63,017	62,346	52,972	54,238	53,765
Seafood wholesalers & distributors	29,150	28,503	24,666	25,204	24,932
Total	290,814	276,112	241,685	246,394	247,443

Sources: NOAA Fisheries, Fisheries Economics of the United States 2017: Interactive Tool, accessed September 16, 2020; NOAA Fisheries, *Fisheries Economics of the United States 2016*, December 2018, 18; NOAA Fisheries, *Fisheries Economics of the United States 2015*, May 2017, 16; NOAA Fisheries, *Fisheries Economics of the United States 2014*, May 2016, 14; NOAA Fisheries, *Fisheries Economics of the United States 201*3, October 2015, 14.
Note: 2017 is the year for which most recent commercial fishing employment data were available as of December 2020. Employment is based on reported jobs without imports (i.e., jobs related directly related to domestic catch); retail employment is not included. Fishers are referred to as harvesters in these reports.

The nature of employment for commercial fishers varies by region and species, and involves self-employed fishers and businesses of varying sizes. In addition, the type of vessel is an important determinant of crew needs. Smaller crews are common throughout many of the fisheries in the United

[912] For example, in 2015 there were 415 active U.S. vessels fishing red snapper in U.S. waters in the Gulf of Mexico, 11 fishing golden tilefish in the mid-Atlantic, and 874 fishing Alaskan halibut. NOAA Fisheries, *Fisheries Economics of the United States 2016*, December 2018, 5.
[913] USDOL, BLS, "*Fishing and Hunting Workers*, Job Outlook," accessed April 27, 2020.
[914] Jacobsen, written submission to USITC, October 4, 2020, 2; industry representative, virtual roundtable, September 29, 2020, 69.
[915] Industry representative, virtual roundtable, September 29, 2020, 69.
[916] NOAA breaks out employment with imports and without imports for all fisheries-related employment. This breakout has no impact on U.S. commercial fishers data; however, if imported seafood is included, seafood processors and dealers employment is substantially higher than employment directly related to U.S. catch. For example, in 2016 seafood processors and dealers employment was over three times higher with imports (about 200,500 vs. about 54,000 jobs). NOAA Fisheries, *Fisheries Economics of the United States 2016*, December 2018, 18.
[917] There has been a long-term (over two decades) decline in U.S. seafood processing in favor of processing in third countries, especially China, largely because of high labor costs and labor shortages in the United States. See, e.g., Yeong, "NW Salmon Sent to China," July 16, 2005; Haddon, Newman, and Simard, "Fish Caught in America," August 9, 2018; NOAA Fisheries, *Fisheries Economics of the United States 2008*, April 2010, 10.

States. By one estimate, as of 2013 in New England, average crew size per vessel ranged from a low of 3.4 persons in New Hampshire to a high of 7.8 persons in Connecticut.[918] In a number of fisheries, including warmwater shrimp in the Gulf of Mexico, certain groundfish in the Northwest, and scallops in New England, smaller vessels with a three-person crew are common.[919] However, even within a fishery there is variation, often driven by vessel type. For example, in the Atlantic sea scallops fishery, while limited access general category (LAGC) vessels averaged about three crew members per trip, full-time small dredge vessels averaged about five crew members, and the larger full-time dredge vessels have long averaged about seven crew members.[920]

In some parts of the country, including New England, small owner-operator businesses are common; often these business are inherited from a relative.[921] This includes the lobster industry, where most operations are individual owner-operated vessels with, on average, one other crew member operating close to shore.[922] However, there are some offshore lobster vessels, including some owned by companies with multiple boats, which tend to operate with somewhat larger crews (four to five on average).[923] Of note, total employment in some fisheries is restricted by limited-entry programs which restrict the number of vessels allowed to fish (see “Limited Entry” section below).

The average crew size for most “other states” (primarily those outside New England) was estimated at 45.3 (as of 2013), likely influenced by states like Alaska with larger fleets and vessels.[924] Alaska is home to some of the larger employers of fishers; there are a number of companies which have fleets harvesting Alaskan groundfish or crab.[925] Fleet sizes vary: for example, the Alaska Seafood Cooperative has five member companies, all headquartered in Washington, that each have two to five vessels operating in Alaska.[926] Companies hire fishers and other employees to staff their vessels. The type of

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[918] New England states, New Jersey, and New York were excluded from “other states.” As of 2013, average crew size per vessels was 15.3 in New Jersey and 6.6 in New York. Measuring the Effects of Catch Shares, “Have Economic and Social Effects on Local Communities Changed?,” July 2013.

[919] NOAA Fisheries, “B-Roll: Scalloping,” “B-Roll: Groundfish Trawl,” “B-Roll: Shrimping,” all accessed September 24, 2020; New England Council, “Amendment 19,” June 16, 2016, 97.

[920] Averages for LAGC vessels and full-time small dredge vessels based on data from 2003–14; for full-time dredge vessels, based on data from 1994–2014. New England Council, “Amendment 19,” June 16, 2016, 94–97.

[921] Industry representative, virtual roundtable, September 29, 2020, 69, 77.

[922] USITC, Lobster hearing transcript, October 1, 2020**,** 34 (testimony of Annie Tselikis, Maine Lobster Dealers' Association), 59, 60–61 (Beth Casoni, Massachusetts Lobstermen's Association).

[923] An estimated 80 percent of lobster are caught in state waters, and 20 percent are caught in offshore federal waters (3 to 200 miles offshore). Offshore trips normally range from 4 to 10 days: in states waters, fishers return to shore every day. Some offshore fleets have multiple vessels, including one based in New Hampshire with 15 vessels. Atlantic Offshore Lobstermen’s Association, “Lobster Management Regulations,” October 19, 2020; USITC, Lobster hearing transcript, October 1, 2020, 61–62 (testimony of Beth Casoni, Massachusetts Lobstermen's Association).

[924] In this estimate, “other states” excludes New England states, New Jersey, and New York. Measuring the Effects of Catch Shares, “Have Economic and Social Effects on Local Communities Changed?,” July 2013.

[925] See, e.g., Alaska Seafood Cooperative, Member Companies, http://alaskaseafoodcooperative.org/aksc-members-and-vessels/; Aleutian Spray Fisheries, Inc., http://www.starboats.com/; O’Hara Corporation, https://www.oharacorporation.com/; North Star Fishing Co., http://www.northstarfishing.com/; Bering Sea Versus Me.com Fishing Companies—Seattle, http://www.beringseaversus.me/fishing-companies-seattle-list/, all accessed September 17, 2020.

[926] Alaska Seafood Cooperative, Member Companies, http://alaskaseafoodcooperative.org/aksc-members-and-vessels/, accessed September 17, 2020.

vessel dictates crew needs and can vary widely: smaller vessels employ between about 10 and 35 people, while larger ones can employ well over 100.[927] Some vessels are catcher-processor vessels, which employ both fishers and processors.[928] These vessels can be equipped for specific species (e.g., crab), while others are outfitted to harvest multiple species (e.g., Alaska pollock and Pacific cod). The species a vessel targets determines the season(s) in which it operates, and this seasonality impacts the vessel's employment needs. While the majority of fishers working in Alaska live within the state (56 percent in 2017–18), the industry is dependent on out-of-state staff for a substantial minority of its vessels.[929]

Supply Chains

The vast majority of U.S. seafood catch ends up either in retail outlets (e.g., grocery stores) or in restaurants and foodservice, although some—such as menhaden—is destined for other uses, like fishmeal or fish oil.[930] However, there is variance throughout the middle of the supply chain, including how much processing occurs. Seafood can be sold live, fresh, or frozen, or it may be destined for additional processing, including value-added products such as breaded or canned seafood. In the United States, most seafood is sold processed to some degree and frozen, although some is sold fresh.[931] The first ex-vessel sale (i.e., at the point of landing) is usually to a processor or distributor. For example, Alaskan groundfish is normally transferred straight to primary processors, but most wild-caught warmwater shrimp is sold to distributors.[932] Wholesalers and foodservice distributors also play a major role in purchasing fresh, frozen, and further-processed products for retail, restaurant, and foodservice customers.[933]

[927] See, e.g., Arctic Storm Management Group, LLC, Vessels, https://www.arcticstorm.com/about-us/vessels/; clipper Seafoods, Vessels, https://www.clipperseafoods.com/new-page-1; North Star Fishing Co., Vessels, http://www.northstarfishing.com/vessels/our-fleet/, all accessed September 17, 2020.
[928] See, e.g.,, Aleutian Spray Fisheries, Inc., http://www.starboats.com/; O'Hara Corporation, https://www.oharacorporation.com/; North Star Fishing Co., http://www.northstarfishing.com/; Bearing Sea Versus Me, Fishing Companies- Seattle, http://www.beringseaversus.me/fishing-companies-seattle-list/, all accessed September 17, 2020.
[929] McDowell Group, *The Economic Value of Alaska's Seafood Industry*, January 2020, 27.
[930] Menhaden, one of the largest three fishery products from Louisiana, go to industrial uses including bait and supplement production. In addition to those entities mentioned, other parties involved in seafood supply chains include trading companies, wholesalers, dealers, and transporters. AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Seafood Health Facts, "Overview of the Seafood Industry," accessed September 21, 2020; Future of Fish and the Nature Conservancy, *Making Sense of Wild Seafood Supply Chains*, 2015; Shamshak et al., "U.S. Seafood Consumption," August 2019, 716; NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, xii; NOAA Fisheries, "Atlantic Menhaden," accessed October 23, 2020.
[931] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, xvi; Chidmi, Hanson, and Nguyen, "Substitutions between Fish and Seafood Products," December 2012, 359–70; Seafood Health Facts, "Overview of the Seafood Industry" accessed September 21, 2020; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Future of Fish and the Nature Conservancy, *Making Sense of Wild Seafood Supply Chains*, 2015, 5; 21CFR101.95 (revised April 1, 2019). Live sales of high-value seafood are not uncommon some parts of the world, including Singapore, China, and Hong Kong. See, e.g., FAO, "Live Fish and Shellfish Transport," accessed October 26, 2020; Fong and Zheng, *Synopsis of the Hong Kong Seafood Market*, August 8, 2016, 36–38; Medina Pizzali, *Low-cost Fish Retailing Equipment*, 2001 (Singapore case study).
[932] USITC, *Frozen Warmwater Shrimp*, May 2017, II–1.
[933] Seafood Health Facts, "Overview of the Seafood Industry," accessed September 21, 2020.

Primary processing covers a range of activities—such as gutting, cleaning, and segmenting the seafood in some way (e.g., deheading, gutting, and cutting into fillets, steaks, or wheels for finfish)—depending on the type of seafood.[934] Primary processing can also include cooking, curing, or smoking fish and seafood. Primary processing for large crab species (e.g., king and snow) usually involves segregating leg clusters and cooking and/or freezing, while for shrimp it may involve peeling, deveining, or cooking.[935] Some finfish and other seafood are sold into the fresh market, including to restaurants, after basic gutting and/or cleaning.[936] Fish not sold fresh are generally cut and frozen during the primary processing stage. For example, certain finfish are filleted and sold as once-frozen fillets, although some are sold as headed and gutted (H&G) fish.[937] Other, further processed products may be generated from some finfish by primary processors. Examples include surimi (a processed minced-meat product primarily made from pollock and, to a lesser extent, cod[938]) and roe.[939] Fillets may be sold at retail or food outlets or used by secondary processors to create further processed products.[940]

Primary processing can be done at sea or at a processing facility on or near shore, depending on the species. For example, in New England scallops are shelled shortly after catch and bagged for the first point of sale on the vessel where they were caught.[941] A number of pelagic species are gilled and gutted as soon as they are caught—swordfish and some tuna are also headed—and then iced.[942] Pacific hake (whiting), Pacific cod, and Alaska pollock are processed on catcher-processor vessels, floating processors (called motherships), or by shoreside processors.[943]

[934] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Future of Fish and the Nature Conservancy, *Making Sense of Wild Seafood Supply Chains*, 2015; Seafood Health Facts, "Overview of the Seafood Industry," accessed September 21, 2020; Knapp, Guettabi, and Goldsmith, *The Economic Importance of the Bristol Bay Salmon Industry*, April 2013, 3–4; NOAA Fisheries, "B-Roll: Scalloping," accessed September 24, 2020; Sea Port, "Products: Swordfish," accessed September 24, 2020; Boston Sword & Tuna, "Buyer's Guide: Swordfish," September 24, 2020.
[935] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 111–12, 122–23; American Shrimp Processors Association, "Shrimp Academy," accessed October 19, 2020; Kuhar, Lin, and Matthia, *Feasibility Study for a Shrimp Processing Line*, August 2016; Casani, Leth, and Knöchel, "Water Reuse in a Shrimp Processing Line," July 1, 2006, 541–42.
[936] See, e.g., NOAA Fisheries, "Ties That Bind," April 9, 2018; industry representative, virtual roundtable, 37, September 29, 2020.
[937] As its name implies, once-frozen fillets are frozen once (after filleting) before being sold or used in secondary processing. Twice-frozen fillets are fillets that have been frozen once as a headed and gutted (H&G) fish and a second time after filleting.
[938] FAO, "Reduced Cod Supplies," September 10, 2017.
[939] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Future of Fish and the Nature Conservancy, *Making Sense of Wild Seafood Supply Chains*, 2015.
[940] Bumble Bee Foods, Trace My Catch: Sockeye Salmon, accessed September 23, 2020; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 14–16, 47–49.
[941] NOAA Fisheries, "B-Roll: Scalloping," accessed September 24, 2020.
[942] Sea Port, "Products: Swordfish," accessed September 24, 2020; Hawaiian Fresh Seafood, "Life on a Hawaii Longline Fishing Boat," November 22, 2016; Hawaiian Fresh Seafood, "Tuna Fishing in Hawaii," November 22, 2016; ATUNA, "Tuna Products," accessed November 3, 2020.
[943] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 15, 31; NOAA Fisheries, "Pacific Whiting," accessed September 24, 2020; American Seafoods, Wild Pacific Cod, accessed September 25, 2020.

Secondary processing is common, particularly for certain finfish, including Alaskan groundfish, salmon, and tuna.[944] Primary processors sell H&G fish to secondary processors, who then fillet them into twice-frozen fillets. Other secondary producers will manufacture further processed products such as canned products (e.g., tuna or salmon) or breaded fish or fish sticks from once- or twice-frozen fillets.[945] Surimi is manufactured into a range of products, such as fish cakes and imitation crab meat. Some secondary processing occurs in the United States, but most is done in third-country markets, including China, Japan, and European countries. There are a number of reasons for this, including high U.S. processing costs, especially labor costs and labor shortages; the geographic proximity of certain Asian processors to Alaska, which incentivizes processing in China; and demand in foreign markets for species with limited U.S. consumption.[946]

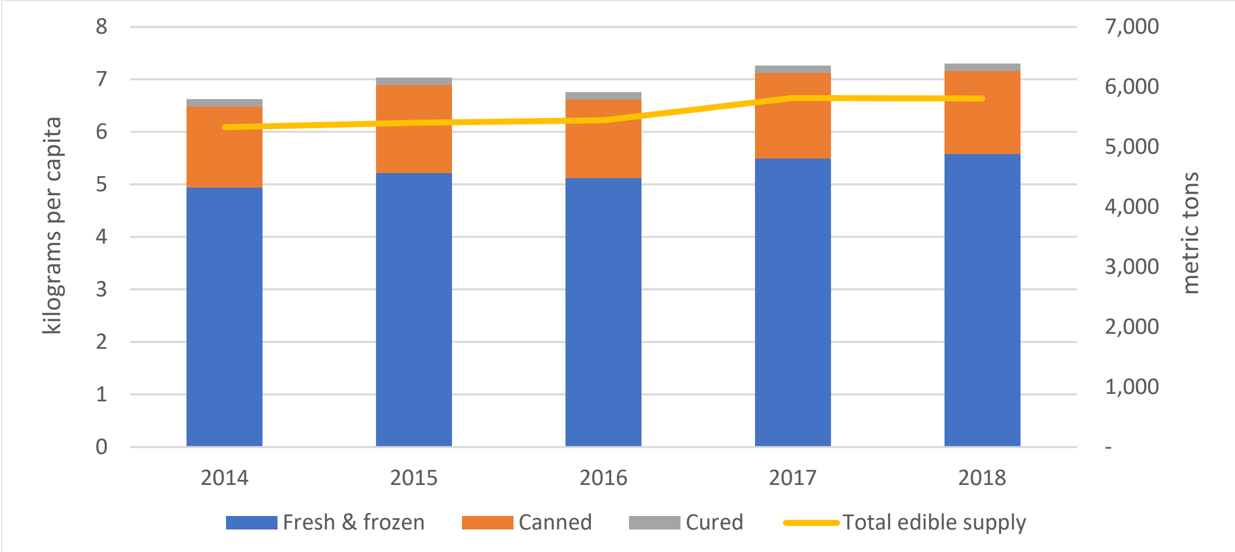
U.S. Market

Consumption

While there are annual fluctuations in overall U.S. seafood consumption, it has been relatively stable for the past decade. The vast majority of the U.S. commercial supply of fishery products is edible—about 95 percent annually during 2014–18.[947] In the decade since 2009, total edible U.S. consumption (as measured by supply) fluctuated between 5.3 and 5.8 thousand mt. However, consumption declined between 2010 and 2013 before growing 12.8 percent between 2014 and 2018 to return 2010 levels (figure 6.2). On a per capita basis, consumption has showed similar trends, fluctuating between about 6.6 and 7.5 kilograms (kg) per capita in the three decades since 1990, as measured by NOAA Fisheries.[948] U.S. per capita consumption of fish and shellfish is just above the global average, although consumption varies widely between countries.[949]

[944] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Hamilton, Lewis, and McCoy, "Market and Industry Dynamics in the Global Tuna Supply Chain," June 2011; Knapp, Guettabi, and Goldsmith, *The Economic Importance of the Bristol Bay Salmon Industry*, April 2013.
[945] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Future of Fish and the Nature Conservancy, *Making Sense of Wild Seafood Supply Chains*, 2015, 5; Seafood Health Facts, "Overview of the Seafood Industry," accessed September 21, 2020; Knapp, Guettabi, and Goldsmith, *The Economic Importance of the Bristol Bay Salmon Industry*, April 2013, 3–4; Hamilton, Lewis, and McCoy, "Market and Industry Dynamics in the Global Tuna Supply Chain," June 2011; Hamilton, McCoy, and Lewis, *Market and Industry Dynamics: Tuna Purse Seine Fishery*, August 2019; Bumble Bee Foods, Trace My Catch: Albacore and Sockeye Salmon, accessed September 23, 2020.
[946] Shamshak et al., "U.S. Seafood Consumption," August 2019, 716; Haddon, Newman, and Simard, "Fish Caught in America," August 9, 2018; Yeong, "NW Salmon Sent to China," July 16, 2005.
[947] As of December 2020, data for 2018 are the most recent data available. NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 104.
[948] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 117.
[949] Based on per capita human consumption of fish and shellfish as estimated on a live-weight basis by the FAO using a disappearance model (which differs from NOAA's disappearance model). The global average fish and shellfish consumption is 19.6 kg per capita. U.S. consumption is 22.0 kg per capita. NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 116, 120–21.

Figure 6.2 U.S. consumption: Per capita consumption of commercial fish and shellfish by product grouping and supply of edible commercial fishery products, 2014–18



Source: NOAA, *Fisheries of the United States 2018*, February 2020, 104, 117.
Notes: NOAA bases its calculation of consumption on a "disappearance" model. NOAA calculates supply as domestic commercial landings plus imports minus exports. Corresponds to appendix table J.4.

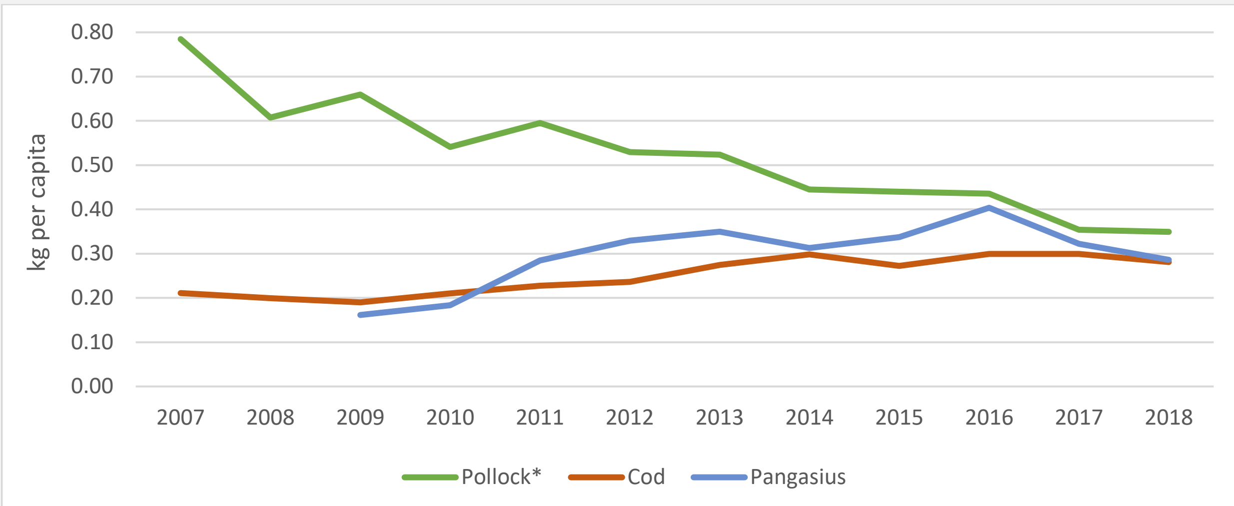
Three-quarters of fishery products consumed are fresh or frozen; canned products account for most of the balance of consumption.[950] In the United States, the most commonly consumed fishery products are fish fillets and steaks (accounting for 38 percent of consumption during 2014–18), followed by all forms of shrimp (about 27 percent).[951] Research has shown that, by weight, most seafood consumption occurs at home (61 percent) and there is a relatively strong preference for certain products for home use (e.g., tilapia, canned tuna, and salmon).[952] However, away from home (e.g., at a restaurant) seafood expenditures are higher (spending away from home equals 65 percent of seafood expenditures).[953]

U.S. seafood consumption is highly and consistently concentrated in a small number of species, although there have been long-term shifts among these species. The top 10 most-consumed species made up roughly 90 percent of per capita consumption during 2007–18.[954] Three species—shrimp, salmon, and canned tuna—accounted for over half of U.S. consumption (about 57 percent on average) during that

[950] A small share of cured fish is also consumed. Globally live, fresh, or chilled fish accounted for 44 percent of fish utilized for human consumption in 2018: 35 percent were frozen, 11 percent "prepared or preserved," and 10 percent cured. NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 117; FAO, *The State of World Fisheries*, 2020, 61.
[951] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 119.
[952] Love et al., "Food Sources and Expenditures for Seafood," June 17, 2020, 1810; Fiorillo, "One of the Most Perplexing Questions in Seafood," August 18, 2020.
[953] There were preferences for crab, shrimp, and cod in away-from-home purchases, although these were not as strong as the home use preferences. For example, 45 percent (by weight of seafood consumed) of shrimp was consumed at home and 55 percent away from home, but for salmon 79 percent of consumption was at home. Love et al., "Food Sources and Expenditures for Seafood," June 17, 2020, 5.
[954] As of December 2020, consumption data for 2018 are the most recent data available. The top 10 species vary annually, but 9 species were in the top 10 every year during 2007–18: shrimp, salmon, canned tuna, pollock, tilapia, catfish, crab, cod, and clams. NFI, "Top 10 List for Seafood Consumption," accessed August 10, 2020.

period.[955] Among these three, consumption rates have changed, and salmon overtook canned tuna as the second-most consumed species in 2013. Tilapia (a major aquaculture species) has been the fourth most consumed species since 2010.[956] For high-volume buyers, such as retailers and foodservice buyers, farmed species have a competitive advantage because of their consistency in quality and reliable delivery.[957] Consumption of catfish, crab, and clams—ranked the 8th-, 9th-, and 10th-most consumed species, respectively, since 2013—also stabilized around 2011 after declines early in the period. Despite the overall consistency in consumption, there have been some notable shifts in U.S. consumption over time for 3 of the top 10 most consumed species: pollock, pangasius, and cod (figure 6.3).

Figure 6.3 U.S. consumption: Select species, kilograms per capita, 2007–18



Source: NFI, "Top 10 List for Seafood Consumption," accessed August 10, 2020.
Note: Corresponds to appendix table J.5.

During 2007–09, pollock was the fourth most consumed species, but it has ranked fifth in most years since.[958] As of 2016, the United States was the second-largest market for pollock fillets globally.[959] Most pollock consumption occurs in restaurants or foodservice outlets in the form of generic breaded and fried fillets, although branding of the fish name is reported to be increasing.[960] Pollock consumption showed a long-term decline throughout the period, with per capita consumption during the last two years of the period about half the level of the first two years. Increased consumption of different competing white-fleshed species, including cod and pangasius, likely contributed to this decline. However, according to calculations by the Genuine Alaska Pollock Producers (GAPP), U.S. pollock consumption grew 38 percent in 2019, reversing the declines seen over the past decade.[961] Moreover,

[955] NFI, "Top 10 List for Seafood Consumption," accessed August 10, 2020.
[956] FAO, *The State of World Fisheries*, 2020, 30.
[957] Shamshak et al., "U.S. Seafood Consumption," August 2019, 716.
[958] In 2011, pollock was the fourth most consumed species. NFI, "Top 10 List for Seafood Consumption," accessed August 10, 2020.
[959] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 20.
[960] Frozen fish stocks made of pollock are also a common retail product. Fish sticks may be made from fillets or surimi.
[961] Based on GAPP's unofficial calculations. GAPP, "GAPP Reports Significant Increase in U.S. Consumption of Wild Alaska Pollock," March 2, 2020; IntraFish, "GAPP," March 2, 2020.

GAPP estimates that a record 59 percent of pollock consumption was from U.S.-caught fish (i.e., Alaska pollock) and attributes these gains to its brand awareness campaign.[962] Industry identifies pollock as a versatile product, and any increase in consumption may also be supported by new pollock-based products available in the market.[963] For further information on the U.S. pollock industry see chapter 7.

Pangasius became the sixth most consumed U.S. seafood in 2011 and has held that position ever since.[964] U.S. consumption of this fish grew rapidly, increasing 150 percent between 2009—when pangasius entered the top 10 species list—and its peak consumption in 2016. Most pangasius, which is primarily a farm-raised species, is imported, and Vietnam is the largest supplier.[965] The foodservice industry has been a major buyer of pangasius.[966] At the retail level, it has also been attractive to lower-income consumers, especially in the South.[967] Pangasius has benefited from low retail prices, driven, in part, by Vietnam's lower production cost compared to U.S. channel catfish (with which it competes) and retailers driving prices down during some years.[968] However, consumption fell after 2016 as restaurant chains cut purchases and imports fell—in part, because of higher antidumping duties on imports from Vietnam.[969] Beginning in August 2017, mandatory inspection of all imports of pangasius from Vietnam by the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) also caused a temporary decline in these imports, as there was a brief adjustment period for Vietnamese producers.[970] During this time, there were increased purchases of competing species (e.g., catfish from China).[971]

Cod has been the seventh most consumed species since 2013.[972] Its consumption rose notably starting in 2010 and was about 41 percent higher in 2017–18 than in 2007–08. Cod is becoming more widely

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962 Based on records starting in 2006. IntraFish, "GAPP," March 2, 2020.
963 Nelson, "Demand for Cod and Pollock Soars," June 6, 2020.
964 Pangasius is a freshwater fish primarily originating from Vietnam, which is a large producer and exporter (but it is also found in other Asian countries). Pangasius is also known as striped pangasius, swai, sutchi, and tra (in Vietnam). When it first entered the U.S. market pangasius was sometimes called catfish, but it is now legally prohibited to be labeled as catfish. See e.g., Sea Port, "Striped Pangasius," August 11, 2020; Greenberg, "A Catfish by Any Other Name," October 9, 2008; Seafood Health Facts, "Pangasius," accessed August 11, 2020; 9 CFR 541.7 (80 Fed. Reg. 75616) (December 2, 2015).
965 FAO, *The State of World Fisheries*, 2020, 75; FAO, "Viet Nam Pangasius Farmers," June 24, 2019.
966 Greenberg, "A Catfish by Any Other Name," October 9, 2008; Thi, "COVID-19," July 14, 2020; Urch, "How Pricing 'War' May Be Killing the Pangasius Industry," October 13, 2015.
967 Greenberg, "A Catfish by Any Other Name," October 9, 2008.
968 Specifically, this competitive advantage is driven by factors including the ability to raise Vietnamese pangasius in higher density, a tropical environment that leads to a faster growth cycle, and cheaper labor costs for aquaculture production. Greenberg, "A Catfish by Any Other Name," October 9, 2008; Urch, "How Pricing 'War' May Be Killing the Pangasius Industry," October 13, 2015. Vietnamese pangasius have been subject to antidumping duties since 2003. See, e.g., 68 Fed. Reg. 47909 (August 12, 2003); USITC, *Frozen Fish Fillets from Vietnam: Staff Report,* October 9, 2020.
969 83 Fed. Reg. 47528 (September 19, 2018); USITC, *Frozen Fish Fillets from Vietnam: Staff Report,* October 9, 2020; White, "Future of Pangasius in US Uncertain," January 24, 2018; Chau, "US Reduces Anti-Dumping Duties on Vietnamese Pangasius," accessed September 22, 2020; IntraFish, "US Pangasius Imports Continue to Plummet," January 15, 2018.
970 USITC DataWeb/USDOC, accessed September 29, 2020; USDA, FSIS, "Eligible Categories and Products: Vietnam," April 9, 2020.
971 IntraFish, "US Pangasius Imports Continue to Plummet," January 15, 2018.
972 Cod can be found in both the Pacific and Atlantic Oceans. Fish from the two oceans are substitutes for one another. NOAA Fisheries, "Atlantic Cod," accessed June 26, 2020; NOAA Fisheries, "Pacific Cod," accessed August 18, 2020.

used in restaurants, including fine-dining establishments, and has benefited from retail marketing to promote it.[973] Cod also became more available in the 2010s compared to the 20 years prior. While cod had been widely consumed for centuries in Europe and North America, cod stocks collapsed in the Northwest Atlantic in the 1990s after decades of overfishing that reduced supply.[974] Supply was also limited by subsequent moratoriums and restrictions on harvesting Atlantic cod by the United States, Canada, and others.[975] While measures to rebuild Atlantic stocks remain in place, overall cod catch began to increase in the late 2000s. Between 2007 and 2014, landings rose every year (increasing 64 percent over the period) to their highest level since 2000 (1.9 million mt).[976] However, landings then declined 11.8 percent through 2018. While there are expectations of strong demand for cod, supply-side constraints due to ongoing efforts to maintain and rebuild stocks in the Atlantic, and more recently in the Pacific, are likely to continue.[977]

Substitutability

The substitutability of a seafood species is determined by a number of factors, including how many other sources of the species or similar species exist, its end uses, supply, price, flavor, texture, and consumer preferences.[978] The same or related species produced in different areas are often highly substitutable (e.g., Atlantic and Pacific cod). High-volume wild-caught groundfish such as cod and pollock are seen as substitutable with each other, especially for further processed applications. Fish of this type also compete with other mild white-fleshed fish species, both wild-caught and farm-raised.[979] Less widely produced species arguably have lower rates of substitution. For example, certain lower-volume species, including Pacific halibut and sablefish, can be seen as having more defined niche markets.[980] However, to a certain extent all seafood is interchangeable, and substitutions are also viewed as choices among or between flavor profiles and color, with certain products favored by certain

[973] Chase, "Experts Predict Cod Market Will Remain Strong in 2020," January 30, 2020.
[974] Gammon, "Fish Success Story," October 15, 2015; Shapiro, "Cod Comeback," May 28, 2015; Thomson, and Ahluwalia, "Remembering the Mighty Cod Fishery," June 29, 2012.
[975] Cod stock collapsed in the Irish Sea and off the west coast of Scotland in the early 2010s. Shapiro, "Cod Comeback," May 28, 2015; Gammon, "Fish Success Story," October 15, 2015; Thomson and Ahluwalia, "Remembering the Mighty Cod Fishery," June 29, 2012; Roberts, *Northeast Multispecies Fishery Management Plan Resource Guide*, January 2018; New England Council, "Management Plans: Northeast Multispecies (Groundfish)," September 25, 2020; FAO, "Alaska Pollock and Cod Prices on the Way Up," January 14, 2019.
[976] Based on the sum of Pacific and Atlantic cod. FAO, Global Capture Production, "Atlantic and Pacific Cod," accessed December 31, 2020.
[977] in 2019 the Gulf of Alaska cod fishery was closed for the 2020 season due to concerns about stock levels, which had been declining for several years. Earl, "Stock Decline Leads to Historic Shutdown," December 11, 2019; NOAA Fisheries, "NMFS Announces Closing Offshore," January 22, 2020; Nelson, "Demand for Cod and Pollock Soars," June 6, 2020; Chase, "Experts Predict Cod Market Will Remain Strong in 2020," January 30, 2020.
[978] This discussion focuses on substitutability between seafood. Seafood is also substitutable with other foods, particularly other proteins including meat products.
[979] However, while current cod production is historically low, cod has "center-of-the-plate" applications and retail applications for its filets which pollock does not, making the latter less substitutable in those applications. AFSC and McDowell Group, *Wholesale Market Profiles,* May 2016, 1, 3, 7, 18, 29, 41, 47, 54–55; SeafoodSource, "Pollock, Alaska," January 23, 2014; Chase, "Experts Predict Cod Market Will Remain Strong in 2020," January 30, 2020; industry representative, virtual roundtable, September 29, 2020, 63–64.
[980] AFSC and McDowell Group, *Wholesale Market Profiles,* May 2016, 3, 81–96.

consumers or markets.[981] There are indications, however, that finfish and shellfish are seen by consumers as less substitutable for each other.[982] Other factors that can influence consumer decisions include familiarity with a species, nutritional or safety differences (whether real or perceived), and environmental concerns.[983]

Price plays an important role in purchasing and substitution decisions, as does reliability of supply. Many industry representatives and others have noted the importance of price in purchasing decisions throughout the supply chain.[984] Research also suggests that seafood consumption in the United States is more price elastic than in other countries.[985] However, there may be some variation in price sensitivity by species. One journal article found that U.S. retail consumers appear more sensitive to price changes in some seafood, including catfish and salmon, than in others, specifically shrimp and tilapia. This means that if prices rise, they are more likely to make substitutions for products in the former group than those in the latter when making purchasing decisions.[986] Adequate supply is also an important consideration for certain retail and other large buyers. One industry representative recounted his decision, when serving as a large retail buyer, to swap fresh U.S. yellowtail flounder for a frozen product of a different species of another origin after processors told him that there would be a shortfall in supply due in part to regulatory changes.[987] And in the shrimp industry, an advantage of farm-raised shrimp over wild-caught is its consistent availability in large volumes.[988]

Fraudulent Substitutions

In the seafood industry, many substitutions are transparent; however, driven by economic incentives, fraudulent substitutions are not uncommon, sometimes within species groups (table 6.5). Such fraud occurs in all distribution channels: retail, restaurant, and foodservice. An investigation by the New York Attorney General's office found that, on average, over one-quarter of barcoded retail purchases in the state were mislabeled and that mislabeling rates exceeded 40 percent in some areas (e.g., New York City and Long Island).[989] According to one industry representative, there are a number of controls in the retail industry to try to stop seafood fraud, while in restaurants and foodservice there are few to none.[990] Fraudulent substitutions can involve legal or IUU product. As shown in this report, it is not

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[981] Taylor, "Fish Flavors and Substitutions," September 17, 2010; Office of the New York State Attorney General, *Fishy Business*, December 2018, 2; Nguyen, Hanson, and Jolly, "A Demand Analysis for Crustaceans at the U.S. Retail Store Level," July 3, 2013, 212–27.
[982] Chidmi, Hanson, and Nguyen, "Substitutions between Fish and Seafood Products," December 2012.
[983] Office of the New York State Attorney General, *Fishy Business*, December 2018, 2–3; Seafood Watch Program, Monterey Bay Aquarium, "Seafood Recommendations," accessed October 2, 2020.
[984] Industry representatives, virtual roundtable, September 29, 2020, 25–26, 36, 78–79; USITC, hearing transcript, 58 (testimony of Nathaniel Rickard, Louisiana Shrimp Association), 166–67 (testimony of Katherine Alvarez, General Counsel with Alfa International Seafood, Incorporated). See also USITC, *Frozen Warmwater Shrimp*, May 2017, 31; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 3, 77; Nguyen, Hanson, and Jolly, "A Demand Analysis for Crustaceans," July 3, 2013.
[985] Gallet, "The Demand for Fish," August 26, 2009, 235–45.
[986] Chidmi, Hanson, and Nguyen, "Substitutions between Fish and Seafood Products," December 2012.
[987] Industry representative, virtual roundtable, September 29, 2020,79–80.
[988] USITC, *Frozen Warmwater Shrimp*, May 2017, 21.
[989] Office of the New York State Attorney General, *Fishy Business*, December 2018, 1.
[990] Industry representative, phone interview by USITC staff, October 2,2020.

uncommon for IUU seafood to be incorporated into a supply chain and passed off as legally caught seafood.[991]

Table 6.7 Select commercial seafood species: Examples of fraudulent substitutes

Species or species group	IUU fishing	Covered by SIMP	Examples of fraudulent substitutes
Abalone	✓	✓	Topshell
Pacific salmon	✓		Farmed Atlantic salmon and lower-priced Pacific salmon species for higher-priced salmon (e.g., chum salmon sold as pink salmon).
Cod (Pacific and Atlantic)	✓	✓	Haddock and other whitefish
Grouper	✓	✓	Escolar
King crab (red)	✓	✓	Blue and golden king crab
Mahi-mahi (dolphinfish)	✓	✓	Yellowtail flounder
Red snapper	✓	✓	Other types of snapper (e.g., lane or crimson), as well as rockfish, porgy, and tilapia
Shrimp	✓	✓	Other shrimp species (e.g., farmed whiteleg shrimp sold as “Gulf”’ shrimp)
Swordfish	✓	✓	Mako shark
Tuna (albacore, bigeye, skipjack, yellowfin, and bluefin)	✓	✓	Other tuna species (e.g., Pacific bluefin sold as yellowfin tuna) and, for albacore, escolar.

Sources: chapter 3, this report; AFSC and McDowell Group, *Wholesale Market Profiles,* May 2016, xii, 3, 77; NOAA, U.S. Seafood Import Monitoring Program, accessed April 9, 2020; 80 Fed. Reg. 66867 (October 30, 2015); Warner et al., *Deceptive Dishes,* 2016; Rasmussen and Morrissey, “Application of DNA-Based Methods to Identify Fish,” 2009, 118, 123–24; MRAG, “Towards the Quantification of IUU Fishing in the Pacific Islands Region,” 2016; Office of the New York State Attorney General, *Fishy Business*, December 2018, 1, 13–16; Oceana, *Shrimp*, October 2014.
Note: SIMP = the U.S. Seafood Import Monitoring Program (see chapter 2). List of fraudulent substitution examples may not be exhaustive. For further information on the U.S. shrimp, king crab, and tuna industries, see chapter 7.

Common types of fraudulent substitutions include swapping species and misrepresenting the origin of a species.[992] The first type of fraudulent substitution occurs when a species (usually a low-value one) is swapped in for another species (normally with a higher value) without the buyer’s knowledge. Once seafood has been processed and is in a fillet form, it can be difficult to be sure of the species without DNA testing.[993] For example, a 2016 Oceana report identified low-cost pangasius as the most common species used fraudulently to substitute for other products: it was mislabeled as 18 different types of

[991] Warner et al., *Deceptive Dishes*, September 2016, 1, 3.
[992] 80 Fed. Reg. 66867 (October 30, 2015); AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 3; GAO, *Seafood Fraud*, February 19, 2009, 2; Guy, “You’re Probably Eating Asian Catfish without Knowing It,” accessed September 23, 2020; Warner et al., *Deceptive Dishes*, September 2016; Oceana, “The Global Reach of Seafood Fraud,” July 18, 2014; Office of the New York State Attorney General, *Fishy Business*, December 2018, 1; Picard Kentz & Rowe, written submission to the USITC, August 21, 2020, 63–71, Exhibits 34-37; Oceana, *Oceana Study Reveals Seafood Fraud Nationwide*, February 2013.
[993] NOAA, FishWatch, “Seafood Fraud,” September 25, 2020; Rasmussen and Morrissey, “Application of DNA-Based Methods to Identify Fish,” April 2009, 118–54.

species, including, most commonly, perch, grouper, and halibut.[994] As a further processed product (e.g., crab cakes), many types of swimming crab (common in Southeast Asia) are passed off as blue crab.[995]

The second type of fraudulent substitution occurs when the same or similar species from another source is substituted without the buyer's consent or knowledge. For example, farmed Atlantic salmon has been found to be mislabeled as higher-value wild-caught Pacific salmon.[996] Other types of mislabeling include misrepresenting country of origin and incorporating IUU seafood into the supply chain and passing it off as legally caught.[997] A high level of transshipment of product increases opportunities for species substitution and the introduction of IUU catch.[998] In an attempt to stop mislabeled and IUU harvested product from entering the U.S. market, the U.S. government established the Seafood Import Monitoring Program (SIMP).[999] This program targets a select group of species known to have high rates of IUU fishing and/or seafood fraud (see chapter 2 for more information on SIMP).

Price

Commercial seafood prices can be impacted by a number of supply and demand factors, including species-specific supply (which are influenced by stocks and catch limits); how substitutable a species is and the supply of any substitutes; consumer preferences; and, for internationally traded products, tariff and nontariff measures, as well as exchange rates.[1000] For example, Alaska pollock, cod, and flatfish make up a small share of the global "whitefish" market and are more likely to be exported than most other wild-caught fish. As a result, producer prices of these species are impacted by landings of foreign suppliers of the same species and of competing species, and U.S. producers are normally positioned as price takers (i.e., they must accept the prices set by the market). However, prices for other species such as Pacific halibut and rockfish are often a function of local factors, including Alaskan harvest volumes, because these species are less substituted and have more niche markets for which Alaska is a major global supplier.[1001] Other factors may also impact prices for some species, including the season, the size or weight of an animal, how many times a product has been frozen, where it is processed (at sea or

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[994] Warner et al., *Deceptive Dishes*, September 2016, 7.
[995] Blue crabs are found in the Atlantic Ocean and Gulf of Mexico, with the most valuable fishery located in the Mid-Atlantic's Chesapeake Bay. 80 Fed. Reg. 66867 (October 30, 2015); Warner et al., *Oceana Reveals Mislabeling of Iconic Chesapeake Blue Crab*, April 2015; NOAA Fisheries, "Blue Crab," accessed October 23, 2020.
[996] Leschin-Hoar, "That Salmon on the Menu Might Be a Fraud," accessed September 24, 2020; Warner et al., *Oceana Reveals Mislabeling of America's Favorite Fish: Salmon*, October 2015; Office of the New York State Attorney General, *Fishy Business*, December 2018, 1, 13–16.
[997] Warner et al., *Deceptive Dishes*, September 2016, 1, 3; NOAA Fisheries, "Seafood Fraud," September 25, 2020; industry representative, telephone interview by USITC staff, October 2, 2020.
[998] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; 80 Fed. Reg. 66867 (October 30, 2015).
[999] U.S. Executive Office of the President, "U.S. Seafood Import Monitoring Program," accessed April 9, 2020; 80 Fed. Reg. 66867 (October 30, 2015).
[1000] See, e.g., Crona et al., "Masked, Diluted, and Drowned Out," December 2016, 1175–82; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 11–16, 25, 46–49, 82, 87; Rappaport, "Elver Price Plummets," May 12, 2020; Huffman, "US Lobster Harvesters Worry about Further Price Dip as Volume Climbs," July 7, 2020; Whittle, "Lobster Prices Falling as Industry Deals with Effects," June 27, 2020; industry representative, virtual roundtable, September 29, 2020, 13–14.
[1001] Pacific halibut is *Hippoglossus stenolepis*. AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 3, 90–93.

inshore), its origin, and how it is caught.[1002] In addition, environmental certification (e.g., Marine Stewardship Council certification) or other tools for marketing and differentiating product may lead to higher prices, especially for shipments to certain markets (e.g., the European Union) and if competing suppliers are not certified.[1003]

Supply

U.S. commercial marine harvest competes with imports (both wild-caught and farmed) and, to a much smaller extent, domestic aquaculture production; price is a key factor for most consumers in selecting among sources.[1004] During 2014–18, the United States imported about two-thirds more edible fishery products than it produced domestically.[1005] For example, imports make up a large and increasing share of U.S. edible commercial shellfish supply: imports were about three times as large as domestic landings in 2014, but were about four times as large by 2018.[1006] The high rate of consumption of frozen and further processed seafood products, as opposed to live or fresh seafood, increases the ability of imported product to compete with domestic product.[1007]

Certain popular species, including shrimp and salmon, are supplied in part by domestic commercial fisheries and to a much lesser extent the small aquaculture industry. However, the United States also imports in large quantities from foreign aquaculture suppliers. For example, India, Indonesia, Vietnam, and Ecuador all have large shrimp aquaculture industries.[1008] Norway, Chile, and Canada are all suppliers of farmed salmon.[1009] Tilapia and pangasius are farmed species almost entirely supplied by imports, including from China and Vietnam.[1010] Most farmed species are imported; U.S. aquaculture production is relatively small.[1011] The FAO estimates that only about 9 percent of total U.S. seafood production is from aquaculture production.[1012] As one report concluded, “Aquaculture production is not significant in the

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1002 AFIN, APEX Reporting System: Groundfish Economic SAFE: Groundfish ex-vessel and Groundfish Wholesale, accessed August 18, 2020; Alaska Fisheries Science Center, 11–16, 25, 46–49, 111, 122; industry representatives, virtual roundtable, September 29, 2020, 21–22,42–43, 62; USITC, hearing transcript, 194 (testimony of Nathaniel Rickard, Louisiana Shrimp Association).

1003 Berry and Weaver, “Exporting Ecolabels,” July 2018.

1004 See, e.g., AFSC and McDowell Group, *Wholesale Market Profiles,* May 2016, xi; Chidmi, Hanson, and Nguyen, “Substitutions between Fish and Seafood Products,” December 2012, 360; industry representatives, virtual roundtable, September 29, 2020, 36, 78–80.

1005 Data for 2018 are the most recent available as of December 2020. NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 103.

1006 NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 104; NOAA Fisheries, *Fisheries of the United States 2016*, August 2017, 105; NOAA Fisheries, *NOAA Fisheries of the United States 2015*, September 2016, 94.

1007 NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 18, 27.

1008 See chapter 3 in this report; Anderson, Valderrama, Jory, “GOAL 2019,” November 4, 2019.

1009 See, e.g., chapter 3 in this report; USITC DataWeb/USDOC, accessed September 29, 2020; FAO, Global Aquaculture Production: Atlantic Salmon, accessed November 4, 2020; FAO, *The State of World Fisheries*, 2020, 75, 80, 84–85.

1010 See, e.g., chapter 3 in this report; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 3; FAO, “Trade War between China and the United States,” November 4, 2019; FAO, Globefish, “Global Tilapia Sector Set for Reshuffle,” February 12, 2019; Shamshak et al., “U.S. Seafood Consumption,” August 2019, 716.

1011 See, e.g., Shamshak et al., “U.S. Seafood Consumption,” August 2019, 716, 719; FAO, *The State of World Fisheries*, 2020, 23–36.

1012 FAO, *The State of World Fisheries*, 2020, 23–25.

United States and landings of wild fish are stable and unlikely to increase; thus, any increase in seafood consumption in the United States has to be based on imports."[1013]

U.S. Trade

Imports

As noted above, the United States depends on imports to help fill consumer demand for seafood. U.S. imports (including imports of U.S.-caught seafood processed in other countries) provide over 90 percent of the seafood consumed in the United States and are a major source of the most commonly eaten species.[1014] Overall, the average unit value (AUV) of U.S. seafood imports from all sources was $7,922 per mt during 2015–19. However, in 2019 a group of researchers estimated that, excluding imports of U.S.-caught seafood processed in other countries, imports provide about 62 to 64 percent of U.S. seafood consumed.[1015] As shown in chapter 3, among the top 10 imported species (by volume) in 2019 were 8 of the most-consumed species in the United States: shrimp, Atlantic salmon, crab, tuna (including canned tuna), tilapia, cod, catfish, and pangasius.[1016] Of these, shrimp, Atlantic salmon, tilapia, and pangasius are primarily supplied by foreign aquaculture producers. Many of these popular seafood imports enter the United States free of duty, including Atlantic salmon, tilapia, cod, and king crab.[1017]

Imports are relatively concentrated, although the top suppliers varied by value and volume (tables 6.6. and 6.7). By value, the top 10 trading partners supplied about 77.7 percent of all imports during 2015–19; by volume, they supplied 80.8 percent. In 2019, Canada, India, and Chile were the largest suppliers by value (together accounting for 36.8 percent of imports) while China, India, and Canada were the largest suppliers by volume (together accounting for 37.9 percent of imports).[1018]

U.S. imports were relatively flat the last three years of the period, averaging $21.9 billion annually during 2017–19. By value, U.S. imports from the largest suppliers are concentrated in shellfish and farmed seafood products. The largest imports from Canada were mostly higher-value products like snow crab (18.6 percent of imports by value from Canada in 2019), certain farmed Atlantic salmon products (16.1 percent), certain processed lobsters meat (16.0 percent), and live lobsters (11.6 percent).[1019] Imports from India were dominated by frozen shrimp and prawns.[1020] Peeled frozen shrimp accounted for 59.1 percent of all imports by value from India in 2019, while shell-on frozen shrimp accounted for

[1013] Shamshak et al., "U.S. Seafood Consumption," August 2019, 719.
[1014] NOAA Fisheries, *NOAA Fisheries of the United States 2015*, September 2016; NOAA Fisheries, *Fisheries of the United States 2018*, February 2020; Shamshak et al., "U.S. Seafood Consumption," August 2019; industry representative, virtual roundtable, September 29, 2020, 48.
[1015] Gephart, Froehlich, and Branch, "Opinion," May 7, 2019, 9142–46.
[1016] The other top two species are lobster and squid. See chapter 3 in this report.
[1017] Certain frozen shrimp, as well as pangasius, are also MFN duty free, although some imports of these products are subject to antidumping duties. USITC, U.S. Harmonized Tariff Schedule (2020, Revision 26); USITC DataWeb/USDOC, accessed September 29, 2020; USITC, *Frozen Fish Fillets from Vietnam: Staff Report,* October 9, 2020; 70 Fed. Reg. 5147 (February 1, 2005); 85 Fed. Reg. 13131 (March 6, 2020).
[1018] Trade data include both marine capture and farmed seafood products. Unless otherwise mentioned, all data discussed in this section are from USITC DataWeb/USDOC, accessed September 29, 2020.
[1019] Based on HTS provisions 0306.14.4020, 0302.14.0003, 0306.12.0070, and 0306.32.0010.
[1020] As previously noted, India has built a large shrimp aquaculture industry. FAO, *The State of World Fisheries 2020*, 2020, 75–76.

25.9 percent.[1021] Imports from Chile were highly concentrated (80.8 percent in 2019) in farmed Atlantic salmon fillets.[1022]

U.S. imports by volume grew for most of the period, increasing 3.0 percent annually on average from 2015–18, but declined somewhat (2.4 percent) in 2019, largely driven by lower imports from China. This was primarily because of additional tariffs placed on fish imports from China and the impact on the processing sector of the Chinese government's efforts to reduce fishing capacity.[1023] Tilapia fillets accounted for over one-fifth (21.5 percent) of U.S. imports from China in 2019.[1024] Other imports from China were much less concentrated. A number of these products were processed finfish items, including those made from imported fish such as frozen salmon fillets (which accounted for 9.3 percent of U.S. imports from China in 2019), other cod fish fillets or other fish meat (8.5 percent), and frozen fillets of Alaska pollock (4.9 percent).[1025] Overall, imports from China were of lower-value products. During 2015–19, the AUV of seafood imports from China was the lowest of any of the top 10 suppliers.[1026] As explained in further detail in chapter 4, China has a large fish processing industry and is a large processor of certain U.S. finfish, including Alaska groundfish.[1027]

[1021] Based on HTS provisions 0306.17.0040 (peeled frozen shrimp) and 0306.17 (which covers shell-on frozen shrimp of all counts). Shrimp imports from India have been subject to an antidumping duty order since 2005. See, e.g., 70 Fed. Reg. 5147 (February 1, 2005); 85 Fed. Reg. 13131 (March 6, 2020).

[1022] In 2019, 62.6 percent of total U.S. imports from Chile were of fresh or chilled farmed Atlantic salmon fillets (HTS provision 0304.41.0010), while 18.2 percent were frozen (HTS provision 0304.81.5010).

[1023] FAO, *The State of World Fisheries*, 2020, 75, 86; USITC, *2018 Trade Shifts*, December 2019. See chapter 4 for more information on China.

[1024] Tilapia fillets and certain other tilapia products (based on HTS provisions 0303.23.0000 and 0304.61.0000) accounted for over one-quarter (27.2 percent) of U.S. seafood imports from China.

[1025] Based on HTS provisions 0304.81.50 (of these, 97.4 percent were of 0304.81.5090, which covers salmon except Atlantic salmon), 0304.71.50, and 0304.75.50. Haddon and Newman, "Fish Caught in America," August 9, 2018.

[1026] The AUV of seafood imports from China was $4,680 per mt. The next lowest AUV was for imports from Vietnam, which averaged $6,170 per mt. Overall, the average unit value (AUV) of U.S. seafood imports from all sources was $7,922 per mt during 2015–19. USITC DataWeb/USDOC, accessed September 29, 2020.

[1027] Between 2010 and 2014 about one-third of all Alaskan groundfish were processed in China. According to a report prepared by the McDowell Group, more than half of Alaskan-caught seafood processed in China is then re-exported to the United States. AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, xi; Future of Fish and the Nature Conservancy, *Making Sense of Wild Seafood Supply Chains*, 2015, 10; Morris, "A Tale of a Fish from Two Countries," February 17, 2017; Haddon and Newman, "Fish Caught in America," August 9, 2018.

Table 6.8 U.S. seafood imports, by value, 2015–19 (million dollars)

Trading partner	2015	2016	2017	2018	2019
Canada	2,954	3,184	3,240	3,234	3,373
India	1,349	1,582	2,288	2,362	2,551
Chile	1,367	1,550	1,850	2,052	2,129
China	2,579	2,493	2,685	2,896	1,905
Indonesia	1,681	1,650	1,852	1,944	1,864
Vietnam	1,336	1,415	1,395	1,573	1,452
Thailand	1,361	1,367	1,423	1,235	1,236
Norway	456	584	747	839	851
Ecuador	894	797	801	810	808
Russia	317	411	473	581	696
All other	4,269	4,284	4,651	4,842	5,044
Total	18,564	19,317	21,405	22,367	21,909

Source: USITC DataWeb/USDOC, accessed September 29, 2020.
Note: Imports include cover all fisheries products both capture and farmed, including processed products of all kinds.

Table 6.9 U.S. seafood imports, by volume, 2015–19 (thousand metric tons)

Trading partner	2015	2016	2017	2018	2019
China	552	550	559	582	431
India	149	168	232	268	306
Canada	299	310	294	270	270
Vietnam	227	255	228	236	219
Chile	162	159	167	190	202
Indonesia	173	176	178	193	202
Thailand	204	204	199	183	191
Ecuador	128	111	111	120	127
Mexico	67	70	77	84	85
Norway	60	66	80	86	84
All other	474	484	500	513	542
Total	2,495	2,553	2,624	2,725	2,659

Source: USITC DataWeb/USDOC, accessed September 29, 2020.
Note: Imports cover all fisheries products both capture and farmed, including processed products of all kinds.

Exports

U.S. seafood exports are highly concentrated, on both a value and volume basis, in lower-valued products.[1028] While there are notable exceptions, the United States has long exported more lower-value seafood products than it imports.[1029] During 2015–19 the AUV of U.S. seafood exports was $4,083 per mt, with just under half that of imports.[1030] Of the U.S. exports of the top 10 exported seafood products by quantity, 9 were finfish products.[1031] During 2015–19 these nine finfish products accounted for 65.7 percent of the volume of exports but only 43.5 percent of the value. In that period, the top 8 product groups had average AUVs ranging from $1,451/mt to $3,310/mt; only the 9th product, frozen

[1028] Shamshak et al., "U.S. Seafood Consumption," August 2019, 719.
[1029] Researchers have found that over the past 40 years the value of U.S. imports are consistently much higher than the value of U.S. exports. Shamshak et al., "U.S. Seafood Consumption," August 2019, 719–20.
[1030] Based on all seafood exports.
[1031] As grouped at the 6-digit level of the international Harmonized System (HS) of tariff codes.

sockeye salmon (0303.11), had a higher AUV ($6,765/mt). An examination of U.S. seafood exports under the HS chapter 3 also illustrates the concentration of exports in lower-valued finfish (table 6.8). However, as this table also illustrates, the U.S. does export some higher-value seafood products, especially shellfish. Based on total seafood exports, the largest exports of higher-value seafood products include lobster, certain salmon products (which have a relatively high value for finfish), and frozen crabs.[1032]

Table 6.10 U.S. exports by species category, 2015–19

Species category (Schedule B HS 4-digit provisions)	2015	2016	2017	2018	2019
			Average Unit Value ($ per mt)		
Finfish (HS4: 0301– 0305)	3,035	3,089	3,157	3,337	3,317
Shellfish (HS4: 0306)	12,550	12,848	12,930	13,223	14,121
Molluscs and other invertebrates (HS4: 0307–0308)	4,904	6,238	5,865	5,820	6,004
Total	3,828	3,987	3,899	4,140	4,068
			Share of quantity (percent)		
Finfish (HS4: 0301–0305)	85.6	86.1	87.4	86.9	88.8
Shellfish (HS4: 0306)	6.8	7.0	5.7	6.4	5.6
Molluscs and other invertebrates (HS4: 0307–0308)	7.5	6.9	6.9	6.6	5.6
			Share of value (percent)		
Finfish (HS4: 0301–0305)	67.9	66.7	70.8	70.1	72.4
Shellfish (HS4: 0306)	22.4	22.5	18.8	20.6	19.3
Molluscs and other invertebrates (HS4: 0307–0308)	9.7	10.8	10.4	9.3	8.3

Source: USITC DataWeb/USDOC, accessed September 14, 2020.
Notes: Species categories are grouped based on exports under HS Chapter 3 provisions.

Both by value and by volume, over 80 percent of exports went to five trading partners—Canada, China, the EU-27, Japan, and South Korea—during 2015–19 (tables 6.9 and 6.10). However, as with imports, Canada was the largest trading partner by value while China was the largest by volume.

Exports to Canada were relatively stable, averaging about $1.2 billion annually during 2015–19, and were concentrated in higher-value seafood products. The top exports, by value, to Canada were lobster and salmon products (i.e., Pacific salmon, canned salmon, and Atlantic salmon) which accounted for

[1032] During 2015–19, certain lobster products (HTS 0306.22 and 0306.32) were the largest shellfish exports by value. These two lobster products were the fifth- and sixth-largest U.S. seafood exports by value: they had AUVs of $12,292/mt and $13,391/mt, respectively. Frozen crab products (0306.14) were the second most exported shellfish product group. Overall, frozen crab products were the 11th-largest U.S. export by value but had the highest AUV—$14,308/mt—of any of the top 15 exports. Among the top 10 largest U.S. exports by value in that period, 3 salmon product groups (HTS 0303.11, 1604.11, and 0303.91) had the highest AUVs after lobsters. These were 8th- through 10th-largest U.S. seafood exports by value, with AUVs ranging between $5,485/mt and $7,991/mt.

almost half (49.2 percent) of all exports in 2019.[1033] Some of the lobster is exported to Canada to be processed and re-imported as a higher-value processed good.[1034]

The quantity of U.S. exports to China fluctuated between 2015 and 2017 and fell 27.3 percent between 2017 and 2019. This was due to a mix of factors, including declining Chinese processing capacity and additional tariffs placed on U.S. fisheries products in 2018.[1035] Exports were concentrated in lower-value finfish, with some higher-value finfish also sent to China for processing. Among the top five species exported in 2019, by quantity, were yellowfin sole (14.9 percent), pink salmon (12.5 percent), cod (8.6 percent), and Alaska pollock (7.5 percent).[1036] China has a large seafood-processing sector, and is a major processer of certain U.S.-caught products.[1037] For certain species including yellowfin sole, cod, and Alaska pollock, most of the fish processed in China is then exported to other trading partners, including the United States, Canada, and the EU.[1038]

Table 6.11 U.S. seafood exports, by value, 2015–19 (million dollars)

Trading partner	2015	2016	2017	2018	2019
Canada	1,151	1,221	1,148	1,195	1,180
EU-27	1,058	1,029	998	974	978
China	1,044	973	1,240	1,071	865
Japan	840	683	861	858	685
South Korea	477	496	451	495	512
All other	1,022	1,015	1,065	1,043	1,031
Total	5,592	5,417	5,762	5,634	5,252

Source: USITC DataWeb/USDOC, accessed September 14, 2020.
Note: Exports include cover all fisheries products, both captured and farmed, including processed products of all kinds. The EU-27 covers the 27 members of the European Union as of February 1, 2020; it excludes the United Kingdom.

[1033] USITC DataWeb/USDOC, accessed September 14, 2020.
[1034] USITC, Lobster hearing transcript, 16 (testimony of Nadia Bourély, Minister-Counsellor responsible for Economic and Trade Policy at the Canadian Embassy to the United States), 48–46 (testimony of Mr. Geoff Irvine, Director of the Lobster Council of Canada), 64 (testimony of Annie Tselikis, Maine Lobster Dealers' Association).
[1035] See, e.g., Godfrey, “New Report: China’s Seafood Processing Sector in Decline,” April 11, 2019; Chase, “Experts Predict Cod Market Will Remain Strong,” January 30, 2020; USITC, “Section 232 and 301 Trade Actions in 2018,” 2019; Government of China, Ministry of Finance, “Taxation Committee Announcement [2018] No. 5,” June 16, 2018; Sandler Travis, China 301 List 1, accessed July 9, 2019.
[1036] Based on 10-digit HS provisions 0303.39.0130, 0303.12.0032, 0303.63.0000, and 0303.67.0000. USITC DataWeb/USDOC, accessed September 14, 2020.
[1037] See chapter 4 in this report; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016; Future of Fish and the Nature Conservancy, *Making Sense of Wild Seafood Supply Chains*, 2015, 10.
[1038] See chapter 4 in this report; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 15–21, 30–31, 47–51,63, 79, 83–87.

Table 6.12 U.S. seafood exports, by volume, 2015–19 (thousand mt)

Trading partner	2015	2016	2017	2018	2019
China	389	336	410	330	298
EU-27	275	279	266	254	250
Japan	218	179	212	200	173
South Korea	148	158	148	151	158
Canada	163	177	165	164	142
All other	225	195	244	230	235
Total	1418	1324	1447	1329	1256

Source: USITC DataWeb/USDOC, accessed September 14, 2020.
Note: Exports include all fisheries products both capture and farmed, including processed products of all kinds. The EU-27 covers the 27 members of the European Union as of February 1, 2020; it excludes the United Kingdom.

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Chapter 7
Economic Effects of Illegal, Unreported, and Unregulated Imports on U.S. Commercial Fishing

Introduction

This chapter quantifies the economic effects of IUU imports on U.S. commercial fishers and U.S. commercial fishing prices, production, and trade. Economic effects are modeled for species facing significant competition from IUU seafood products using industry-specific partial equilibrium models of the U.S. commercial fishing industry. Each model is calibrated to a baseline with IUU imports, and a new set of prices, production, and trade outcomes are generated after removing the IUU imports from the U.S. market. The models take into account industry-specific features like closely related products, domestic processing, and catch limits when applicable. The models also quantify employment effects for selected species where data are available.

The species included in this chapter were chosen based on a set of selection criteria including the IUU share of total imports, value of IUU imports, size of the market, and other factors. Using 15 different models, a total of 32 species are modeled (table 7.1), covering roughly 83 percent of the total value of IUU imports estimated in chapter 3.

Table 7.1 Species modeled in chapter 7

Group	Species[a]
Crustaceans	King crab, snow crab, blue crab, American lobster, spiny lobster, warmwater shrimp, coldwater shrimp
Groundfish	Pollock, cod, red snapper, grouper
Small pelagic forage species	Sardine, herring, anchovy, mackerel species
Highly migratory pelagic species	Mahi-mahi, swordfish, albacore, yellowfin tuna, bluefin tuna, bigeye tuna, skipjack tuna, bonito, NEI tuna[b]
Salmon species	Chinook, chum, coho, pink, sockeye, Atlantic
Cephalopods	Octopus, squid

[a] Some organizations use different names for the same species (e.g., Alaska vs walleye pollock, mahi-mahi vs dolphinfish). The U.S. species names in this report match the NOAA species names in their species directory, unless species have been aggregated for this analysis. Other commonly used names are described in each species section below.
[b] Not elsewhere included (NEI) tuna refers to tuna species not otherwise listed in this group.

The first section of this chapter describes the direction of economic effects of removing IUU imports from the domestic market. The second section gives a brief nontechnical description of the industry-specific model. The third section describes model inputs used to calibrate the baseline. The last section presents model estimates for each species under consideration. For three of these species—Alaska pollock, king crab, and warmwater shrimp—additional profiles of the U.S. industry are provided to help contextualize model results. Employment effects for select species where data was available are presented at the end of this chapter. Technical details of the model and sensitivity analyses under alternate parameter assumptions are included in appendix I.

Summary of Economic Effects

The removal of IUU imports from the U.S. market has a positive effect on U.S. commercial fishers, who receive a higher price for their landings. The model first removes IUU products from U.S. imports. This leads to a decline in total imports by an amount less than the IUU import estimate because there is some replacement with non-IUU import sources. Lower import supply leads to higher import prices and a positive demand shift towards U.S.-sourced seafood products as imports become relatively less competitive. U.S. fishers respond to higher demand for their catch with an increase in landings where supply constraints are not binding. For species where domestic fishers are supply constrained (e.g., by nearing or reaching their U.S. catch limits, facing overfishing restrictions, or needing to consider a threatened or endangered species designation), the removal of IUU products primarily increases U.S. prices, not production levels (landings). These species are red snapper, Atlantic cod, chinook salmon, chum salmon, coho salmon, Atlantic bigeye tuna, Pacific bluefin tuna, Pacific sardines, northern shrimp, and Atlantic mackerel. For species that are not catch constrained, IUU fishing increases U.S. prices and U.S. landings. A summary of supply constraints by species are listed in table I.1 in the technical appendix (appendix I).

The removal of IUU imports also results in increased prices of U.S. processed products for species where processing is a significant aspect of the market. Changes in the volume of U.S. processed production have mixed effects by species. First, the removal of processed IUU imports leads to an increase in demand for U.S. processors as consumers shift sourcing and imports become less competitive. At the same time, for many of the species with significant processing, the increase in price of the landed unprocessed fish, as described above, flows directly into the price of the processed product. For some species, the effects of greater demand for domestic processing outweighs the higher cost of landed fish inputs, so production increases. For other species, like tuna, the higher input costs outweigh the increased demand, and U.S. processing production declines.

In addition to prices and production, the model estimates change in operating income for both U.S. commercial fishers and U.S. processors after IUU products are removed from the market. All operating income derived from unprocessed products increases, and all operating income from non-tuna processed products increases as well. Effects on operating income from producing/handling processed tuna are mixed; some species show increases in operating income, and some show declines. Those that show declines are those for which the increase in input costs outweighs the increase in domestic demand. Prices of imports increase for both unprocessed and processed products. When IUU imports are removed, non-IUU imports increase—but not enough to fully replace the IUU imports, so total imports decline.

The magnitude of these effects, presented in the next section, depends on several factors. Reliance on imports in the U.S. market is a major determinant. The effects of IUU imports on pollock fishers, for example, is small because nearly all pollock consumed in the United States comes from Alaskan fishers. The size of IUU imports relative to total imports is also an important driver of effects. The effect of IUU imports on grouper, for example, is large because the estimated share of IUU imports in total imports is large. Other determinants are overfishing status, closeness of landings to U.S. catch limits, availability of substitutable species, and estimated substitution elasticities. Price effects are largest for red snapper, octopus, mahi-mahi, and bluefin tuna, and smallest for cod, pollock, some salmon species, and shrimp. Landings effects are largest for king crab, octopus, grouper, mahi-mahi, anchovies, skipjack tuna, bluefin tuna, swimming crab, and spiny lobster, and smallest for cod, pollock, and salmon species.

Description of the Economic Model

This analysis uses customized partial equilibrium models to estimate the effects of removing IUU imports from the U.S. market. Models were constructed at the species level, with substitution across species for related products. U.S. consumers of each species choose between U.S. commercial fishing catch and imports. Consumers cannot distinguish between legal and illegal imports, as they cross the border at the same price. U.S. domestic aquaculture production is an additional source of supply for some species.[1039] U.S. commercial fishing production is constrained by regional catch limits that may reduce the supply response of U.S. producers. U.S. commercial fishing production is also limited by low supply elasticities where catch limits are not established but other factors limit the ability to scale up landings. The model also includes processed products for species with significant imports of seafood from IUU sources. For many species, the price of the domestic processed product is a constant markup over the unprocessed product price.[1040] Species-specific model details can be found in table I.1 of appendix I.

Model Inputs

The inputs of each model include data on 2018 U.S. landings from commercial fishing by species, data on 2018 U.S. imports and exports by species, and the species-level IUU estimates described in chapter 3.[1041] U.S. domestic aquaculture data are used for species that have domestic aquaculture as a substitute for wild-caught fish. The models that include processed seafood use 2018 U.S. processing production data and U.S. processed seafood trade data. The models enforce U.S. Regional Fishery Management Councils (RFMCs) catch limits, and this constrains the domestic supply response for species that are nearing their

[1039] Foreign aquaculture products are included in foreign imports sources.

[1040] If processing is included in the model, the model assumes that U.S. domestic processing uses U.S.-caught landings. The price of the processed product is a constant mark-up over the price of the landed fish. This assumption works well for species like cod and pollock, where processing occurs on the boats or at plants located near fishing ports. For species where U.S. processing plants primarily use imports as their inputs, processing is still modeled, but the link between prices is removed. Species-specific mark-ups are calculated using 2018 calibration data as the domestic processed price divided by the domestic unprocessed price.

[1041] Note that this analysis only includes imported products considered substitutable with domestic products, so the import data presented in this chapter are different than the U.S. import totals presented in chapter 3. The level of imports is also different because this figure is based on 2018 imports rather than 2019 imports, although they use the same percentage estimates of IUU products for individual species groups and partners.

regional catch limits.[1042] Model inputs are as of 2018, the latest year for which domestic landings data are available.

The model also includes several parameter values that reflect the interchangeability of products from different sources, as well as the supply responses of domestic fishers to changes in prices. Replacement rates in the model describe the supply response of legal imports when IUU imports are removed from the market. These rates depend on a wide variety of factors, including the policy implemented to remove IUU imports from the U.S. market and the ability of foreign suppliers of fish products to divert trade to and from other countries. The replacement rates are chosen assuming that the policy to remove IUU imports from the United States is analogous to a U.S. border policy and not a policy at the point of harvest, and that the border policy is fully effective at stopping all IUU products from crossing the border. Foreign suppliers of IUU products may respond by diverting their trade to countries without a border policy and diverting legal trade to the United States. The extent to which foreign suppliers can divert trade is analyzed for each species. Additional detailed information on data inputs, elasticities, replacement rates, and catch limits can be found in appendix I.

The model is calibrated to 2018 data inputs, with estimated IUU imports included in the baseline. A new equilibrium set of prices, production, and trade is calculated after removing estimated IUU imports from the model. The economic effects are calculated as the difference between the baseline with estimated IUU imports and the new equilibrium with estimated IUU imports removed. All estimated IUU imports for all species, including unprocessed and processed products, are removed from the models concurrently.

Model Estimates

Average domestic landings and price impacts are reported in table 7.2. Total effects in table 7.2 are aggregated from the 15 species-level models used to generate economic effects in the sections below.[1043] Percent changes are calculated as a production-weighted average of the species-level effects, using 2018 landings values for weights. Dollar-value changes and landings volume changes are summed across species. The overall landings and price impacts are heavily influenced by the species-level results for Alaska pollock, as that species comprises about 59 percent of the total U.S. seafood market modeled. Because of this, the average effects are also presented in table 7.2 excluding Alaska pollock. As shown in table 7.2, the average price that U.S. fishers receive for their landings increases by about 1 percent when Alaska pollock is excluded. The average price effect, which includes both domestic prices and import

[1042] The Magnuson-Stevens Act requires that acceptable biological catch and annual catch limits must be set for federally managed stocks that have fishery management plans (MSA 303(a)(15). There are exceptions to this requirement for stocks subject to management under another international agreement, and for species with a lifespan of less than one year (longfin squid). For species like tuna that are managed under a regional fishery management organization (RFMO) and do not have a U.S.-specified catch limit, we use the recommended catch limit from the relevant RFMO. For species where there are no U.S. annual catch limits, and no RFMO recommendation, and the species is considered overfished, we use a low supply elasticity to lower the supply response of U.S. commercial fishers. See chapter 6 for more discussion on federal fishery management rules. Refer to the technical appendix (appendix I) for more discussion on supply elasticities. NOAA Fisheries, *Magnuson-Stevens Fishery Conservation and Management Act*, May 2007.
[1043] There may be cross-species effects not already modeled that have minor impacts to the average effects reported in table 7.2 (for example, substitution between cod and tuna).

prices, is slightly higher because import price increases are larger than domestic price increases. The model estimates an increase of about 70.5 million kg in landings for the U.S. fishing industry, and of $60.8 million in operating income for that industry, after the hypothetical removal of IUU imports.

Table 7.2 Average effects of removing IUU imports from the U.S. market for species modeled

Factor	Overall effects	Effects without Alaska pollock
Landings effect, % change	2.7	5.5
(total change in volume)	(70.5 million kg)	(59.0 million kg)
Domestic-caught price effect, % change[a]	0.7	1.5
Average price effect, % change[a]	2.2	5.0
Operating income effect, change in million $	$60.8	$58.8

Source: USITC estimates.
Note: This table reports the weighted-average change in domestic prices and landings, and the total change in domestic operating income, for species modeled in this chapter. Weights were calculated using 2018 production volumes. Estimates of price and quantity changes by species were determined using customized partial equilibrium models and are presented in the sections below.
[a] The average domestic-caught price is the average price received by U.S. fishers for their catch. The average price includes both domestic landings prices and import prices.

Profiles of Selected Species and Associated Model Results

Below are profiles of four species from a variety of fishing regions that face competition from IUU-caught imports. They cover three species that have a high volume of sales, reflecting their popularity with U.S. consumers: Alaska pollock, shrimp, and tuna. They also cover one specialty product that often commands higher prices: king crab. After each profile, species-specific model results are presented.

Alaska Pollock

Pollock (also known as walleye pollock) is an important fish in the United States both in terms of commercial fishing and U.S. consumption. It was also the second most harvested finfish globally, accounting for 5 percent of total marine capture production in 2018.[1044] A wild-caught groundfish species, pollock is a member of the cod family.[1045] It is a mild-flavored white fish that can be processed into a wide range of products.

Alaska is the second-largest pollock producer in the world, accounting for about 44.1 percent of the volume of global pollock production on average during 2014–18.[1046] Alaska trails only Russia, which is the world's largest producer of pollock, accounting for 48.9 percent of production during 2014–18.[1047] Pollock caught in Alaska is termed Alaska pollock, although it is the same species that is caught elsewhere in the northern Pacific. Alaska pollock is considered highly substitutable with foreign-caught (Russian) pollock and moderately substitutable with cod. In certain applications, it may also be

[1044] Anchoveta was the most produced species, accounting for 10 percent of global production in 2018. FAO, *The State of World Fisheries*, 2020, 14.
[1045] SeaFood Source, "Pollock, Alaska," January 23, 2014; NOAA Fisheries, "Alaska Pollock," accessed July 7, 2020; AFSC and McDowell Group, *Wholesale Market Profiles for Alaska Groundfish*, May 2016, 3.
[1046] FAO, Global Capture Production, Pollack (sic), accessed August 17, 2020.
[1047] Russia has accounted for about half of all production since 2016. The third-largest producer is Japan, although its share of production has been declining: Japan's share was 6.0 percent in 2016, but it averaged 3.8 percent during 2016–19. FAO, Global Capture Production, Pollack (sic), accessed August 17, 2020.

substitutable with other white-fleshed fish species, including haddock, flatfish, tilapia, and pangasius. For surimi (a processed minced product used to make further processed fish products, including imitation crab meat), substitutions include cod, Pacific hake (whiting), and certain tropical fish such as threadfin bream.[1048]

Fisheries Management

Commercial fishing is managed by the North Pacific Fisheries Management Council, which establishes seasons and catch limits (see chapter 6).[1049] The majority of fishing occurs in the Bering Sea and Aleutian Islands (collectively known as BSAI), although there is also some in the Gulf of Alaska.[1050] Total aggregate catch limit was set at 2.8 million metric tons (mt) in 2018**,** with 93.8 percent of this catch (2.6 million mt) allocated in the BSAI.[1051] In 2020, the aggregate catch limit was reduced to 2.0 million mt for the BSAI.[1052] By law (the American Fisheries Act of 1978), all pollock fishing in the BSAI is conducted through cooperatives in order to rationalize fishing in those fisheries.[1053] The Marine Stewardship Council (MSC) has certified Alaska pollock caught using midwater trawls in these areas since 2005.[1054]

Supply Chain

Once caught, most Alaska pollock is processed—at least twice for most products—before it reaches the end consumer.[1055] According to a McDowell Group/AFSC report, the Alaska pollock supply chain is one of the most complex for a groundfish.[1056] Primary processing can occur inshore (processing plants on shore or floating near shore), on a mothership (ships that process fish and seafood from catcher vessels), or at sea on a catcher-processor vessel.[1057] The two largest pollock products in terms of value and volume are fillets (including skinless/boneless, deep-skinned, or bone in) and surimi (see table 7.3). Roe, the highest-value pollock product, and headed and gutted (H&G) fish are also important pollock

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[1048] NOAA Fisheries, “Alaska Pollock,” accessed July 7, 2020; SeaFood Source, “Pollock, Alaska,” January 23, 2014; McDowell Group, *The Economic Value of Alaska’s Seafood Industry*, January 2020, 3, 7, 29; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016 2; Pittman Seafoods, “Surimi Explained,” August 2, 2016; Sonu, *Surimi Supply, Demand, and Market of Japan*, October 2015, 18.

[1049] The Bering Sea and Aleutian Islands (BSAI) pollock total allowable catch (TAC) allocates 10 percent of the catch to Community Development Quota groups. The remainder of the TAC is allocated among vessels delivering to inshore (50 percent), offshore catcher/processors (40 percent), and catcher vessels delivering to motherships (10 percent). NOAA Fisheries, “Alaska Pollock: Management,” accessed July 7, 2020; North Pacific Council, “GOA Pollock,” accessed August 13, 2020.

[1050] AKFIN, Groundfish Economic SAFE: Groundfish Wholesale, accessed August 18, 2020; NOAA Fisheries, “Alaska Pollock: Management,” accessed July 7, 2020; North Pacific Council, “GOA Pollock,” accessed August 13, 2020.

[1051] Appendix I: 83 Fed. Reg. 8768 (March 1, 2018); 83 Fed. Reg. 8365 (February 27, 2018).

[1052] 85 FR 13553 (March 9, 2020).

[1053] American Fisheries Act of 1978, Pub. L. No. 105-277 (1998), section 210; North Pacific Council, “AFA Pollock Cooperatives,” accessed October 28, 2020.

[1054] MSC, “Alaska Pollock—Gulf of Alaska” and “Alaska Pollock—Bering Sea and Aleutian Islands,” both accessed August 13, 2020; Alaska Seafood Institute, “Alaska Pollock Fact Sheet,” 2017.

[1055] Alaska Seafood Institute, “Alaska Pollock Fact Sheet,” 2017; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016 2, 10.

[1056] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016 14.

[1057] 85 Fed. Reg. 19 (January 2, 2020); North Pacific Council, *2001 Shore Plant Profiles*, 2001; NOAA Fisheries, “Alaska Pollock: Management,” accessed July 7, 2020; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016 15.

products.[1058] Processor decisions on what product mix to produce each year are heavily influenced by wholesale prices.[1059] Once processed, most products are frozen for sale, often in bulk blocks, although fillets may also be individually frozen.[1060]

After primary processing in the United States, products are usually sold to foreign secondary processors, although there is a small U.S. secondary production industry.[1061] The majority of once-frozen fillets are sold to European secondary processors. H&G pollock, which consistently generates the lowest wholesale prices, is usually exported for further processing to China.[1062] Chinese secondary processors produce twice-frozen fillets, which are primarily exported to other processors. These other processors are mostly located abroad, including in Europe and Brazil. During 2015–19, about 22 percent of U.S. pollock exports by volume were to China.[1063] Other export destinations included processors in Japan and South Korea (likely used for surimi production).[1064] Once-frozen and twice-frozen fillets compete against each other in the wholesale market, although the once-frozen product commands a price premium.

Table 7.3 Alaska pollock: Bering Sea and Aleutian Islands Fisheries, major products' share of volume of wholesale production and prices, 2014–18

Products	2014	2015	2016	2017	2018
			Share of volume of wholesale production (%)		
Surimi	32.1	35.4	34.5	35.9	35.5
Other fillets	24.6	23.2	21.3	18.9	20.7
Deep-skin fillets	7.0	7.9	7.3	10.4	9.1
Headed and gutted	9.5	6.5	7.4	7.6	6.4
Roe	4.0	3.7	2.5	3.4	3.9
			Prices (USD/mt)		
Surimi	2,436	2,518	2,631	2,935	2,803
Other fillets	2,868	2,830	2,910	2,566	2,872
Deep-skin fillets	3,516	3,432	3,613	3,293	3,283
Headed and gutted	1,420	1,402	1,709	1,199	1,283
Roe	6,427	5,049	6,270	6,345	6,366

Source: AFIN, APEX Reporting System: Groundfish Economic SAFE: GFSAFE009, accessed August 18,2020.
Notes: This table shows major products and does not sum to 100 percent of production. Prices are for all gear (trawl and fixed) and all sectors (at-sea processors and shoreside processors) and have been converted to a price per metric ton.

Pollock fillets are a commodity product used by secondary processors to produce processed fillet fish products, including fish sticks, patties, and battered or breaded fillets.[1065] These products are sold to retail and foodservice buyers as well as to distributors. Deep-skinned fillets (which are fillets with the fat

[1058] Ancillary products like meal and oil are also derived from pollock. Roe has the highest price and profit margin of any pollock product, but its consumption is highly concentrated in Japan and South Korea. AFSC and McDowell Group, "Wholesale Market Profiles for Alaska Groundfish," May 2016 10, 30; NOAA Fisheries, *NOAA Fisheries Glossary*, June 2006, 52.
[1059] Fissel et al., *SAFE Report Alaska Groundfish Fisheries*, November 22, 2019, 3.
[1060] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 13–14.
[1061] The McDowell Group estimated that in 2014 only 15.8 percent of Alaska pollock wholesale sales were domestic. AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 5–41.
[1062] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 35–36.
[1063] USITC DataWeb/USDOC, accessed August 17, 2020.
[1064] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 35–36.
[1065] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 13–15; Berry and Weaver, *Exporting Ecolabels*, July 2018, 20.

line removed), which are normally used for products destined for fast food and other chain restaurants (e.g., McDonald's Filet-O-Fish sandwich), command higher prices for primary processors than other fillets.[1066] Regular skinned fillets are generally used in breaded retail products and product for fish and chips-type restaurants.[1067] Further processing usually occurs in the European market and to a lesser degree in the United States.[1068] On average, 54 percent of direct U.S. pollock exports went to the European Union (EU) during 2015–19.[1069] Pollock is considered an affordable substitute for cod in Europe.[1070] In addition, industry participants have stated that they believe MSC certification has been an important factor in gaining and retaining access to markets in Europe.[1071]

Frozen surimi blocks are sold to domestic and foreign surimi processors, including those located in Japan, South Korea, and Europe.[1072] These enterprises process surimi into a wide range of products, including fishcakes and imitation crab meat. Processed surimi products are then sold to retailers and distributors. Many of these processed surimi products, as well as fillet, are then exported to buyers in third-country markets for final consumption.[1073]

Prices

Alaska pollock producers are generally positioned as price takers (that is, they accept prevailing prices) because of the high level of substitutability of pollock and the fact that Russia is the largest producer of pollock.[1074] Prices are influenced by a number of factors, including quota levels, stock levels of frozen product, and trade patterns (for example, changes related to the additional tariff China placed on Alaska pollock in 2018).[1075] Prices can also be influenced by shortfalls in landings of other substitutable fish, such as Pacific hake, or by trends in the production of particular types of pollock products. For example, between 2016 and 2018 surimi prices rose because of a decline in global surimi production, with a large part of the decrease coming from lower surimi production from tropical fish species.[1076]

[1066] AFIN, APEX Reporting System: Groundfish Economic SAFE: GFSAFE009, accessed August 18, 2020. AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 13–14; McDonald's Corporation, "What is actually in the Filet-O-Fish?" accessed October 28, 2020.
[1067] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 14.
[1068] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 14–17.
[1069] Data are for the EU-27, which covers the 27 members of the European Union as of February 1, 2020; it excludes the United Kingdom. USITC DataWeb/USDOC, accessed August 17, 2020; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 15.
[1070] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 18.
[1071] MSC certified a Russian pollock fishery, the Sea of Okhotsk, in 2013 increasing competition in the European market, and lowering prices, for Alaska pollock. Berry and Weaver, "Exporting Ecolabels," 15–16, 20–21; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 20.
[1072] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 24–29.
[1073] Berry and Weaver, "Exporting Ecolabels," July 2018, 20–21; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 28.
[1074] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, May 2016 3.
[1075] FAO, *Alaska Pollock and Cod Prices,* January 14, 2019; Seaman, "Pollock Block Prices Set to Stabilize," December 23, 2019; FAO, "Bleak Outlook for Pacific Cod and Alaska Pollock," November 4, 2019; Wilsterman, "How the Trade War With China," accessed October 30, 2020. Government of China, Ministry of Finance, "Taxation Committee Announcement [2018] No. 5," June 16, 2018; Sandler Travis, China 301 List 1, accessed July 9, 2019.
[1076]AFIN, APEX Reporting System: Groundfish Economic SAFE: GFSAFE009, accessed August 18,2020; FAO, "Bleak Outlook for Pacific Cod and Alaska Pollock," November 4, 2019.

Cod and Pollock Species Model Estimates

Cod and pollock species include Alaska (or walleye) pollock, Atlantic pollock, Pacific cod, and Atlantic cod groundfish species. As noted above, in 2018, Alaska pollock was the number one-ranked species caught by volume of landings in the United States (1,525,855 mt). Pacific cod was ranked sixth at 232,578 mt. Economic effects of IUU fishing are different for the Atlantic and Pacific region because of a greater reliance on imports in the Atlantic, and because catch limit constraints are only binding in the Atlantic.[1077]

The model includes both landings and processed products, where changes in the price of the landed fish impact the price of the processed product. Cod and pollock are linked in the model to capture demand relationships and substitution across products. One example of a demand link across cod and pollock species is in fillet processing. If the price of pollock landings increases, fillet producers may substitute more cod into production. As described above, it is common for a portion of landings to be exported for processing and re-imported back to the U.S. market as a processed product. These exported products are removed in the model's calculation of apparent consumption of unprocessed products and are reflected in the processed imports varieties.

As described above, catch limits are enforced in the model to appropriately constrain increases in U.S. landings after removing IUU imports. Of the species included, Atlantic cod is designated as overfished, according to recent stock assessments, in both the Gulf of Maine and Georges Bank regions.[1078] Landings of Atlantic cod are slightly constrained in the model by domestic catch limits, capturing the inability to significantly increase catch. Pacific cod is not designated as overfished, but is nearing 2018 catch limits in the model baseline (with 2018 landings at 96 percent of the Pacific cod annual catch limit). Because of this, Atlantic and Pacific cod species face some supply constraints in the policy scenario. Alaska pollock and Atlantic pollock catch limits are also included in the model but do not bind in the policy scenario.

The statistics in columns 2 and 3 of table 7.4 present 2018 market shares and are useful to understand the magnitude of economic effects; the higher the IUU and import percentages, the bigger the economic effect of removing IUU on the U.S. industry. Unprocessed cod and pollock imports make up a small fraction of the U.S. market (4.4 percent and 0.2 percent respectively), as a majority of products are sourced from Alaskan waters. As a result, the economic effect of removing IUU imports from the unprocessed cod and pollock markets will be small. A larger share of processed cod and pollock products are imported, so effects on U.S. processing will be relatively larger.

It is estimated that removing IUU from the U.S. market for cod and pollock species has a positive effect on production and prices (table 7.4).[1079] Economic effects on price and landings are relatively small (increases of less than 1 percent) for unprocessed products because imports are a small share of the U.S. market, with a high number of unprocessed products sourced domestically from the Pacific. Increases for Atlantic cod and pollock species are slightly larger than those for Pacific species in percent terms,

[1077] Pacific and Atlantic domestic varieties compete with all imports. U.S. Pacific wild-caught cod, for example, is substitutable with both Pacific and Atlantic cod imports. The model structure was chosen because both Pacific and Atlantic import varieties are routed through the same countries before arriving in the U.S.
[1078] NOAA Fisheries, "Atlantic Cod Species," accessed June 26, 2020.
[1079] Note that IUU products for all cod and pollock products, unprocessed and processed, are removed simultaneously in the model.

because imports make up a larger share of the domestic market in the Atlantic. Price and landings changes are largest for processed products, where a relatively higher share of the market comes from imports. Operating profits increase, with the largest increase for processed pollock products because of the volume of the products shifting to domestic processing.[1080]

Table 7.4 Estimated economic effects on domestic prices and production of removing IUU imports from the U.S. market for cod and pollock

	2018 market shares		Change in domestic industry				
Product	**IUU share of imports (%)**	**Imports share of market (%)**	**Domestic price, Pacific (% change)**	**Domestic price, Atlantic (% change)**	**Domestic production, Pacific (% change)**	**Domestic production, Atlantic (% change)**	**Operating profits,[a] dollar-value change (1,000 $)**
Unprocessed pollock	8.8	0.2	0.2	0.2	0.8	1.1	84.9
Unprocessed cod	6.1	4.4	0.2	0.2	0.8	0.8	34.4
Processed pollock[b]	14.2	44.7	0.2	0.2	3.6	9.8	1,912.8
Processed cod	7.1	74.6	0.2	0.2	4.7	4.7	723.1

Source: USITC estimates.

Notes: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.

[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. The calculation does not include a measure of fixed costs of production, and without this information it is not possible to calculate a percent change in operating profits. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.

[b] A majority of the processed cod and pollock products in the model are fish fillets.

The hypothetical removal of estimated IUU products from imports has a small positive impact on unprocessed import prices (around 1 percent for both cod and pollock species) and slightly larger price impact for processed imports (table 7.5). The volume of total trade declines by an amount slightly less than the volume of trade that is estimated to be IUU products because there is moderate replacement with non-IUU sourced imports.

Table 7.5 Estimated economic effects on trade of removing IUU imports from the U.S. market for cod and pollock

Products	**% change in import price**	**% change in import quantity**
Unprocessed pollock	0.7	-6.2
Unprocessed cod	1.1	-4.3
Processed pollock	2.0	-9.9
Processed cod	2.5	-5.0

Source: USITC estimates.

Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model.

[a] A majority of the processed cod and pollock products in the model are fish fillets.

[1080] The operating profits calculation is described in the technical appendix to this chapter.

King Crab

King crab, especially red king crab, is a valuable U.S. commercial fishery product.[1081] In the United States, there are three commercial types of king crabs: red, which has been the most important type in recent decades; golden, and, to a much lesser extent, blue.[1082] While blue king crab is traditionally considered commercially important, in most years since 1999 its fisheries have been closed because of low stocks, resulting in little to no U.S. production.[1083] Since the late 1990s, red king crab has comprised over half of the wholesale value and processed production of Alaskan king crab. However, in 2019, for the first time in almost 35 years, red king crab production accounted for less than half of all Alaskan king crab production (40.6 percent by volume and 49.8 percent by value).[1084] Before that, red king crab processed production fell for six consecutive years, declining 60.3 percent between 2014 and 2019. However, red king crab remains the most valuable type of king crab: its average unit value was about 40 percent higher than that of golden king crab during 2014–19.

Through its Alaskan fisheries, the United States is the second-largest producer of king crab, although its share of global production fell from 24.0 percent in 2014 to 11.3 in 2018 because of both declining U.S. production and rising Russian production.[1085] As with pollock, Russia is the world's largest producer of king crab and the only producer with steadily increasing production. In 2018, Russia accounted for 83.5 percent of global production. It landed 37.4 thousand mt of king crab, a 65.5 percent increase from 2014. Norway is also a small but steady supplier of red king crab, accounting for about 5.7 percent of production on average during 2014–18.

U.S. production of king crab was estimated to supply less than one-fifth of U.S. consumption: most U.S. demand is filled by imports, especially those from Russia and to a lesser extent Argentina.[1086] Russia supplies red, golden and blue king crab to export markets.[1087] Domestic and foreign-caught king crab, including southern king crab caught in South America, are direct or close substitutes, depending on the

[1081] In 2019, king crab was the 34th most valuable base on unit value (for reported species with a calculable unit value). However, of the top 50 most valuable landed U.S. species, king crab was the third-largest species on both a volume and value basis for 2018–19. NOAA Fisheries, Landings Database: Commercial, accessed Oct 14, 2020; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 120.

[1082] Golden king crab is also known as brown king crab. King crabs are named for the color of their shells. Monterey Bay Aquarium, *Blue King Crab, Golden King Crab, Red King Crab: Alaska*, December 3, 2015, 9, 13–17; Garber-Yonts and Lee, *SAFE Report for the King and Tanner Crab Fisheries 2019*, January 21, 2020; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 120–30; Alaska Department of Fish and Game, Commercial Fishing Reporting, accessed October 14, 2020.

[1083] In 2009–12 and again in 2014, some blue king crab fishing was allowed and there were small volumes of the species landed (less than 11 percent of total king crab landings each year). Unless otherwise mentioned, all data in this paragraph are from Alaska Department of Fish and Game, Commercial Fishing Reporting, accessed October 14, 2020.

[1084] Production of the less valuable golden king crab also fell through most of that period although at a slower rate (5.1 percent between 2014 and 2019) and, in 2019, processed production increased 10.1 percent from the year before.

[1085] All calculations in this paragraph are based on data from FAO, Global Capture Production, King Crab (red, blue and golden), accessed October 15, 2012 and NOAA Fisheries, Landings Database: Commercial: King crab, accessed October 14, 2020.

[1086] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 126–27.

[1087] FAO, Global Capture Production, King Crab (red, blue and golden), accessed October 15, 2020.

type of crab.[1088] Red king crab is covered by U.S. SIMP because of issues with seafood fraud—mostly centered around misrepresentation of product origin, although there is also some species substitution (including substituting less valuable blue and golden king crab for red king crab)—and related problems with IUU fishing.[1089]

Fisheries Management

Commercial king crab harvest is managed jointly by the North Pacific Fisheries Management Council (NPFMC) and the state of Alaska. The two coordinate to establish seasons and annual total allowable catch limits and issue quotas and other management tools.[1090] A substantial majority of U.S. king crab come from BSAI fisheries.[1091] The Bristol Bay red king crab fishery (BBR) is the largest source of red king crab, while the Aleutian Islands are the major source of golden king crab. The framework for managing the BSAI fisheries was established in the 2005 Crab Rationalization program which, according to the NPFMC, established a limited access privilege management program.[1092] The total allowable catch is divided into harvest quota shares which are issued to vessel owners and captains; 10 percent of the quota is given to the Community Development Quota Program.[1093] The crab rationalization program also established processor quota shares allocated to processors. The total allowable catch for the BBR fell for five seasons through 2019/20, reaching 1,724 mt (3.8 million lb.), its lowest level since the fishery was temporarily closed in 1995/96.[1094] Conversely, the catch limits in the Aleutian Islands fisheries for golden king crab have seen increases in recent years. While the largest king crab fisheries remain open, a number of Alaskan king crab fisheries have been closed to rebuild stocks, including some long-term closures. For example, the red king crab fisheries of the Western Aleutian Islands and the Pribilof Islands have been closed since 2003/04 and 1999 respectively.[1095]

[1088] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 129.
[1089] 80 Fed. Reg. 66867 (October 30, 2015); NOC Committee, “U.S. Seafood Import Monitoring Program,” accessed September 25, 2020. See chapter 2 for more information on SIMP.
[1090] Alaska Bering Sea Crabbers, “Regional Policy,” accessed October 15, 2020; Alaska Department of Fish and Game, “Information by Fishery: Commercial Shellfish Fisheries,” accessed October 15, 2020; Garber-Yonts and Lee, *SAFE Report for the King and Tanner Crab Fisheries 2019*, January 21, 2020; North Pacific Council, “BSAI Crab Plan Team,” accessed October 15, 2020; FishWatch, “Red King Crab,” October 14, 2020; Jacobsen, written submission to the USITC, October 4, 2020, 2.
[1091] A 2016 report estimated that BSAI normally accounts for 90 percent of total Alaskan king crab harvest volume. A 2020 estimate put harvest of King and snow crab from this area as constituting about 95 percent of total Alaskan harvest. AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 121. Jacobsen, written submission to the USITC, October 4, 2020, 1.
[1092] North Pacific Council, “Crab Rationalization,” accessed October 16, 2020.
[1093] According to NPFMC, the Community Development Quota Program was established to help eligible western Alaskan villages by, among other things, giving them a chance to participate in this capital-intensive industry and support economic development in the region. North Pacific Council, “Crab Rationalization,” accessed October 16, 2020; North Pacific Council, “Community Development Quota Program,” accessed October 16, 2020.
[1094] Garber-Yonts and Lee, *SAFE Report for the King and Tanner Crab Fisheries 2019*, January 21, 2020, 30–31.
[1095] The Pribilof Islands Blue king crab fishery has also been closed since 1999. Garber-Yonts and Lee, *SAFE Report for the King and Tanner Crab Fisheries 2019*, January 21, 2020, 3–4.

Supply Chain

The Alaskan king crab industry includes crabbers and processors. Crabbers use steel cages called pots, which are baited and set on the ocean floor (between 90 and 300 feet deep) to catch king crab.[1096] Vessels retrieve their pots by lines tied to buoys. Members of one large cooperative, the Inter-cooperative Exchange, account for about 70 percent of all BSAI harvest.[1097] The vast majority of king crab is sold processed and frozen, although a small share is sold live or fresh to high-end markets.[1098] Most king crabs are kept alive on catcher vessels before being taking to floating or shoreside processors.[1099] However, 2 out of the 101 vessels in the BSAI fleet (as of 2018) are catcher-processors.[1100] Certain types of harvest quota shares require the catch to be taken to processors who hold processing quotas: other quota shares allow catch to be sold to any processors.[1101] Primary processors butcher and then cook and/or freeze leg and claw clusters, which are sorted and sold by size.[1102] This product is sold to retail or foodservice outlets as well as to secondary processors. Secondary processing, which mostly occurs in the United States for domestic consumption, includes cracking or splitting crab legs and producing specialty products.[1103]

Processors are concentrated in Alaska where, by law, king crab must be landed.[1104] According to an industry expert, while a number of facilities process king crab, ownership of these facilities is concentrated among four firms, three of which are owned by Japanese parent companies.[1105] One report estimated that as of 2014 there were 20 shoreside processors and 6 floating vessel-based processors.[1106] However, NOAA Fisheries data indicate that processing capacity has been declining in the region and that there may have been as few as 8 processing facilities in the BSAI region for king and tanner crabs as of 2018.[1107]

Domestic and export distributors purchase primary and secondary processed product in the wholesale market. The largest markets for Alaskan king crab are the United States (accounting for an estimated

[1096] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 120.
[1097] Jacobsen, written testimony to the USITC, August 26, 2020, 1.
[1098] In a 2020 submission, an industry representative estimated that about 5 percent of U.S. crab (king and snow) is sold live or cooked and chilled: 70 to 80 percent is sold butchered, cooked, and frozen. An industry report estimated that live sales totaled $3.5 million while fresh sales total $1.3 million in 2014. That year total wholesale king crab sales were valued at $116.7. Jacobsen, written submission to the USITC, October 4, 2020, 1; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 122.
[1099] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 122–23; Garber-Yonts and Lee, *SAFE Report for the King and Tanner Crab Fisheries 2019*, January 21, 2020, 7.
[1100] FishWatch, “Red King Crab,” October 14, 2020; Garber-Yonts and Lee, *SAFE Report for the King and Tanner Crab Fisheries 2019*, January 21, 2020, 1.
[1101] North Pacific Council, “Crab Rationalization,” accessed October 16, 2020.
[1102] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 122–23; FishChoice, “Red King Crab,” April 18, 2013; Jacobsen, written submission to the USITC, October 4, 2020, 1.
[1103] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 122–23.
[1104] Jacobsen, written submission to the USITC, October 4, 2020, 1.
[1105] In addition, the City of Adak also owns a processor which is reported to be non-operational as of October 2020 because of “financial issues related to tariff.” Jacobsen, written submission to the USITC, October 4, 2020, 1.
[1106] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 123. An industry representative noted that Alaskan crab processing facilities are primarily staffed with employees from foreign countries. Jacobsen, written submission to the USITC, October 4, 2020, 2.
[1107] Garber-Yonts and Lee, *SAFE Report for the King and Tanner Crab Fisheries 2019*, January 21, 2020, 7, 117.

44 percent of sales during 2010–14), which is the largest buyer of golden king crab, and Japan (34 percent), the largest buyer of red king crab. The primary customer outlets for king crab vary by type. An estimated 70 percent of red king crab was sold at restaurants and foodservice outlets, with the remaining going to retail. However, sales of the less expensive golden king crab were estimated to be equally divided between foodservice, retail, and the U.S. military.[1108]

Prices

U.S. king crab prices are set through negotiations at the ex-vessel (point of landing) and wholesale level. According to a representative of the Inter-cooperative Exchange, ex-vessel prices are set through negotiations which utilize a formula based on the historic division of revenue (from prior to the 2005 Crab Rationalization program) between catchers and processing quota holders.[1109] Wholesale prices are set by processing companies negotiations with large U.S. buyers and buyers from Japan, the largest export market for Alaskan red king crab. Major price determinants are crab supply (both domestic and imported), size category, and the Japanese exchange rates.[1110] King crabs are sold by number of legs in a 10 lb. box with larger legs (i.e., fewer legs per box) commanding a higher price (figure 6.6).[1111] While other factors influence U.S. prices, including the supply of imports, being of U.S./Alaskan origin increases the value of crab: for example, U.S. red king crab products generally command roughly a 10 percent price premium.[1112]

King Crab Modeling Estimate

The first of the crustacean species presented here, king crab, is caught in U.S. commercial fisheries in the Bering Sea and Aleutian Islands and along the Gulf of Alaska. King crab data inputs are an aggregate of red, golden, and blue king crab.[1113] A majority of king crab caught in Alaska is not designated as overfished, except for the blue king crab population in the Pribilof Islands fishery, which is designated as overfished by a 2018 stock assessment.[1114] Further, because king crab fishing is considered a dangerous activity, a lower supply elasticity is used in the model to capture the potential difficulty of scaling up catch after a positive demand shock.[1115]

[1108] AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 122–23, 126.
[1109] Jacobsen, written submission to the USITC, October 4, 2020, 1–2.
[1110] Jacobsen, written submission to the USITC, October 4, 2020, 1–2.
[1111] Urner Barry, Comtell: Data builder: King Crab: yearly 01/01/2014–12/31/2019, accessed October 15 and November 5, 2020; AFSC and McDowell Group, *Wholesale Market Profiles*, May 2016, 122.
[1112] One industry expert estimates that this is the typical price premium for U.S.-origin king crab. Pricing data for red king crab support this. For example, during 2015-18, 6- to 9-count ex-warehouse Alaskan red king crab legs commanded a 9.3 percent price premium on average over equivalent Russian product; 9- to 12-count, a 9.8 percent price premium; and 12- to 14-count, a 13.9 percent premium. Alaskan golden king also generally commanded a pricing premium over equivalent Russian ex-wholesale product, although it was smaller than that of red king crab and fluctuated significantly in the two years of data available (2018 and 2019). Urner Barry, Comtell: Data builder: King Crab: yearly 01/01/2014–12/31/2019, accessed October 15, 2020; Jacobsen, written submission to the USITC, October 4, 2020, 1.
[1113] While there are differences in flavor profile between red, golden, and blue king crab, in the U.S. the golden and blue king crab species are frequently substituted for red. Bering Sea Crabbers, written submission to the USITC, October 5, 2020, 2.
[1114] NOAA Fisheries, *2018 Alaska Crab Stock Assessment*, January 29, 2020.
[1115] Welch, “Fish Factor,” May 9, 2018.

The estimate of IUU-sourced seafood in king crab imports has lowered over time and is now estimated at 16.0 percent due to recent advancements in IUU monitoring (see chapter 3 for more detail). However, a majority of king crab consumed in the U.S. is sourced from imports, at nearly 75 percent of the U.S. market, so changes in imports will have a stronger impact on domestic prices (table 7.6). Both domestic prices and landings are estimated to increase as a result of removing IUU seafood imports from the market. The landings increase, though muted by lower supply elasticities, is possible because most king crab commercial fishing regions were not nearing their quota in the baseline. Operating profits received by U.S. commercial fishers are estimated to increase by almost $1.1 million, due largely to the high volume of the product shifting to domestic sourcing.

Table 7.6 Estimated economic effects of removing IUU imports from the U.S. market for king crab

	2018 market share		Change in domestic industry			Change in trade	
Products	IUU share of imports (%)	Imports share of market (%)	Domestic price (% change)	Domestic production (% change)	Operating profits,[a] dollar-value change (1,000 $)	Import price (% change)	Import quantity (% change)
King crab	16.0	74.8	6.4	11.5	1,062.3	9.1	-11.2

Source: USITC estimates.
Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model.
[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for king crab products are received by U.S. commercial fishers.

Shrimp (Warmwater)

The U.S. commercial shrimp fishery is one the most economically important fisheries in the United States. As reflected in the model results below, shrimp is found in both warmwater and coldwater environments and can be wild-caught or farm raised. Warmwater shrimp species are landed in the Gulf Coast and South Atlantic regions of the United States, while “coldwater” species of shrimp are caught in other regions of the United States (the Pacific Northwest and New England).[1116] The U.S. Gulf region (Texas, Louisiana, Mississippi, Alabama, and Florida’s Gulf Coast) is the principal region for commercial shrimp landings in the United States. During 2017–18, this region accounted for approximately 79 percent of total U.S. commercial landings of shrimp, by value (see table 7.7).[1117]

Table 7.7 U.S. commercial landings of all shrimp, by region, 2017–18

Region	Quantity (mt)	Value (million $)	Share of quantity (%)	Share of value (%)
Gulf	201,610	831.9	73.3	79.0
Pacific Coast	39,937	78.8	14.5	7.5
South Atlantic	31,864	134.3	11.6	12.8
Alaska	1,702	6.8	0.6%	0.6
All other	61	0.7	<0.5	<0.5
Total	275,174	1,052.5	100	100

Source: NOAA, NOAA Fisheries Database: Commercial Landings, accessed November 4, 2020.

[1116] Shrimp harvested off the Pacific and Northern Atlantic coasts is coldwater shrimp and account for a minority of U.S. landings. USITC, *Frozen Warmwater Shrimp*, May 2017, I-22.
[1117] Texas accounted for 31 percent of U.S. commercial landings, while Louisiana accounted for 24 percent in 2019. Based on total landings for all shrimp species in 2019. NOAA Fisheries, “NOAA Fisheries Database: Commercial Landings,” accessed October 28, 2020.

Note: "All other" category includes Middle Atlantic, New England, and Hawaii regions. Commercial landings of both warmwater and coldwater shrimp are presented above. Shares may not sum to 100 due to rounding.

U.S. consumption of shrimp products has risen in recent years. In 2018, U.S. per capita consumption of shrimp products reached 4.6 pounds, the highest level ever reported.[1118] This rising demand has largely been met by an increase in imports. During 2014–18, U.S. imports of shrimp products rose 25 percent, by quantity, while U.S. commercial landings declined by 1 percent. U.S. commercial landings as a share of total U.S. supply declined from 11 percent in 2015 to 8 percent in 2018, while imports as a share of total supply remained relatively stable (see table 7.8).

Table 7.8 Shrimp: U.S. landings, trade, and apparent consumption, 2014–18

Supply indicators	2014	2015	2016	2017	2018
Commercial landings, mt[a]	81,758	90,481	75,760	79,835	81,075
Imports, mt[a]	729,856	755,029	771,561	865,462	912,718
Exports, mt[a]	25,412	30,549	22,071	14,046	16,480
Apparent consumption, mt[a]	786,202	814,961	825,250	931,251	977,314
Commercial landings, share of apparent consumption, %	10.4	11.1	9.2	8.6	8.3
Imports, share of apparent consumption, %	92.8	92.6	93.5	92.9	93.4

Source: NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 112.
[a]Head-off weight.

Warmwater shrimp are the focus of this species profile because they make up the majority of U. S. shrimp production (which is primarily from marine capture) and imports (which are a combination of marine capture and aquaculture production). Warmwater shrimp are crustaceans that usually inhabit salt waters in coastal regions in the tropics and subtropics; however, there are also freshwater species of shrimp. Warmwater shrimp are generally classified in the Penaeidae family and comprise shrimp of several genera and species.[1119] Common warmwater shrimp species caught in U.S. waters include brown shrimp, pink shrimp, and white shrimp.[1120]

Fishery Management

Warmwater shrimp fisheries in the United States are managed through the use of permits and quotas.[1121] The Shrimp Fishery Management Plan for the South Atlantic Region requires that fishers obtain permits to harvest shrimp in federal waters, that they submit trip reports for each fishing trip, and that observers be stationed aboard selected vessels to collect data on the catch, bycatch, fishing effort (i.e., the amount of fishing), and fishing gear.[1122] Unlike other species, where catch limits are

[1118] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 116.
[1119] USITC, *Frozen Warmwater Shrimp*, May 2017, I-21.
[1120] Commercial fishing for another species of shrimp—Atlantic northern shrimp—is prohibited due to its "extremely depleted state." NOAA Fisheries, "Species Directory," accessed October 23, 2020.
[1121] Shrimp fisheries in federal waters off the South Atlantic and Gulf Coast states are managed by the South Atlantic and Gulf of Mexico Fishery Management Councils, respectively, while state resource management agencies are responsible for management in state waters (i.e., less than three nautical miles off the coast).
[1122] NOAA Fisheries, "White Shrimp," accessed October 23, 2020.

based on population levels, catch limits for shrimp in the South Atlantic region are based on historic harvest amounts and fishing rates, and are heavily influenced by environmental factors.[1123]

Gulf of Mexico shrimp fisheries are managed under the Gulf of Mexico Shrimp Fishery Management Plan, which also requires federal permits to harvest shrimp in federal waters. At present, no new permits are being issued in order to prevent an increase in the number of vessels fishing in the region.[1124] The Gulf Shrimp Fishery Management plan also requires fishers to install electronic logbooks, as well as observers aboard selected vessels to collect data on the catch, bycatch, fishing effort, and fishing gear. In addition, all shrimping in federal waters off the coast of Texas is closed from mid-May to mid-July.[1125] NOAA Fisheries classifies each of these shrimp fisheries as sustainably managed and responsibly harvested under federal regulations.[1126]

Supply Chain for U.S. Wild-caught Shrimp

U.S. shrimp fishing in the Gulf and South Atlantic region is conducted by thousands of vessels spread across about two dozen port communities. There are two categories of commercial shrimpers: inshore shrimpers and offshore shrimpers. Inshore shrimpers operate small boats typically manned by one person on daylong trips in bays, estuaries, and shallow near-shore waters. Offshore shrimpers operate large vessels typically manned by a crew of three in deeper waters extending to the U.S. exclusive economic zone limit. However, there are some offshore vessels that can freeze their catch and thus make trips lasting several weeks. Most vessels are individually owned and operated, often by the skipper. While horizontal and vertical integration is limited, some shrimpers also process shrimp and/or own multiple vessels.[1127]

Shrimp vessels are often equipped with sophisticated electronic gear for navigating, communicating, and locating shrimp. Vessels catch shrimp by towing one or more large, funnel-shaped net. The U.S. fleet, particularly in the Gulf, is relatively mobile and migrates with the seasonal warmwater shrimp populations, or away from areas of poor fishing. Therefore, vessels may land shrimp at different ports in different states. Some shrimp vessels are equipped to perform simple primary processing steps (e.g., heading, washing, grading, icing, or freezing) while at sea.[1128] Shrimp may be placed in mesh bags before freezing. Thus, warmwater shrimp can be landed either whole or headed (heads-off) and either fresh or frozen—shrimp in different forms can be landed from the same trip. Upon unloading, shrimp are

[1123] For white shrimp, federal waters close to commercial fishing if cold weather reduces the overwintering shrimp population by 80 percent or more, or if water temperatures fall below a certain level. NOAA Fisheries, “White Shrimp,” accessed October 23, 2020; NOAA Fisheries, “Pink Shrimp,” accessed October 23, 2020; South Atlantic Council, “Shrimp,” accessed November 2, 2020.
[1124] NOAA Fisheries, “White Shrimp,” accessed October 23, 2020; USITC, hearing transcript, 52 (testimony of John Williams, Southern Shrimp Alliance).
[1125] NOAA Fisheries, “Brown Shrimp,” accessed October 23, 2020.
[1126] NOAA Fisheries, “Brown Shrimp,” accessed October 23, 2020; NOAA Fisheries, “White Shrimp,” accessed October 23, 2020; NOAA Fisheries, “Pink Shrimp,” accessed October 23, 2020.
[1127] USITC, *Frozen Warmwater Shrimp,* May 2017, I-22 to I-23.
[1128] USITC, *Certain Frozen or Canned Warmwater Shrimp and Prawns*, January 2005, I-7.

generally sold at dockside to dealers or processors. Most U.S. wild-caught warmwater shrimp are sold to distributors.[1129]

The U.S. onshore processing industry consists of various operators that produce a variety of shrimp products. While some processors own their own boats, most have buying arrangements with several shrimp vessels. After unloading, shrimp are transferred to processing facilities, which are often located dockside. Processors must first separate shrimp from ice, and weigh, wash, size, and grade them. At this stage, shrimp may either be frozen in whole form (i.e., head-on, shell-on) or may undergo further steps such as heading, peeling, deveining, and cooking, resulting in a variety of forms (e.g., head-on, shell-on; headless, shell-on; raw, peeled; and cooked, peeled). Regardless of their specific processed form, shrimp then are often frozen, with the exception that cooked, peeled shrimp may be canned rather than frozen. Many processing steps (e.g., washing, grading, peeling, deveining, and cooking) may be performed manually or mechanically using purpose-built machinery.[1130]

Processing of warmwater shrimp is conducted by a variety of types of operations. Dealers (i.e., shrimp houses or fish houses) and packing houses perform minimal processing steps (e.g., weighing, washing, sorting, and packing) for other processors or distributors. Other processors, variously known as freezers, peelers, and breaders, produce the variety of processed forms of shrimp noted previously and perform additional steps such as breading, cutting, and preparing specialty items.[1131]

The U.S. foodservice industry purchases most U.S. wild-caught warmwater shrimp. Larger shrimp are generally used as a "center-of-the-plate" item in restaurants.[1132]

Aquaculture

A small share of U.S. domestic production of warmwater shrimp is produced by aquaculture (i.e., is farm raised). U.S. production of aquaculture shrimp peaked in 2014 at 2,209 metric tons, or $10.3 million. The most recent available data from NOAA Fisheries indicate that U.S. production declined to 1,633 mt, or $10.1 million, in 2017.[1133] The decline in shrimp farming in recent years has reportedly been because of price pressure, high feed costs, and environmental regulations.[1134] While outdoor shrimp aquaculture is the dominant model in the United States, shrimp are occasionally grown in indoor aquaculture facilities, and the number of these facilities seems to have increased in recent years. However, this type of production (which faces a somewhat different cost structure from outdoor aquaculture) still accounts for a small share of even the minor total U.S. shrimp aquaculture production.[1135]

[1129] Because of the differing feeding habits, migration patterns, and habitats of the different species, Gulf and South Atlantic shrimp vessels usually land one species at a time. Likewise, harvesting activities and hence landings in the U.S. Gulf and South Atlantic exhibit seasonal patterns that are influenced by the natural patterns of development of the different species of warmwater shrimp. USITC, *Frozen Warmwater Shrimp,* May 2017, 23 and I-23.
[1130] USITC, *Frozen Warmwater Shrimp,* May 2017, I-23.
[1131] USITC, *Frozen Warmwater Shrimp,* May 2017, I-24.
[1132] USITC, *Frozen Warmwater Shrimp,* May 2017, II-13 to II-14.
[1133] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 27.
[1134] USITC, *Frozen Warmwater Shrimp,* May 2017, I-24; Treece, *The Rise and Decline in US Shrimp Farming*, 2017.
[1135] USITC, *Frozen Warmwater Shrimp,* May 2017, I-24.

Prices

U.S. and global prices for shrimp fluctuated throughout 2010–19, peaking in 2014 and remaining relatively stable from 2016 to 2019.[1136] In 2014, shrimp prices reached a 14-year high due to a disease that reduced aquaculture shrimp populations throughout Asia.[1137] U.S. commercial shrimp fishing representatives note that U.S. prices for shrimp have declined in recent years due to rising import volumes, including of wild-caught shrimp obtained by IUU fishing and aquaculture shrimp produced with IUU inputs.[1138] U.S. imports of shrimp, regardless of whether the product is IUU or non-IUU, play a significant role in establishing both ex-vessel and wholesale prices for shrimp sold in the U.S. market.[1139] U.S. industry representatives note that while there has been a consistent premium for U.S.-caught warmwater shrimp since antidumping duty orders were first imposed in 2005, prices for domestic-caught shrimp generally follow prices for imported shrimp. As a result, a fall in import prices leads to a decline in the price for domestic-caught shrimp.[1140]

Shrimp Species Model Estimates

Shrimp is one of the highest-value species landed in the United States, valued in 2018 at $496 million.[1141] The species included in this model are wild-caught warmwater shrimp, wild-caught coldwater shrimp, and U.S. shrimp aquaculture.[1142] Coldwater species are primarily caught in New England and Pacific regions.[1143] Warmwater species are found in the South Atlantic and the Gulf of Mexico and constitute more than 80 percent of the domestic shrimp landings caught in the United States. Species are linked in the model to capture demand relationships across species, with U.S. shrimp aquaculture included in the warmwater nesting structure.[1144] As described above, federal management of warmwater shrimp includes the use of quotas to manage population sizes. But not all warmwater and coldwater species and subpopulations have federal catch limits, so there is no aggregate catch limit in

[1136] Urner Barry, Comtell: Data builder: Shrimp, accessed October 28, 2020; Federal Reserve Bank of St. Louis, "Global Price of Shrimp," accessed October 28, 2020.
[1137] Reed and Royales, “Shrimp Disease in Asia,” June 2014; Patton, “Shrimp-Price Surge,” April 15, 2014.
[1138] USITC, hearing transcript, 60–62 (testimony of Acy Cooper, Louisiana Shrimp Association).
[1139] USITC, hearing transcript, 193 (testimony of Nathaniel Rickard, counsel to Southern Shrimp Alliance).
[1140] USITC, hearing transcript, 195 (testimony of Nathaniel Rickard, counsel to Southern Shrimp Alliance). The United States currently has active antidumping orders on imports of frozen warmwater shrimp from China, India, Thailand, and Vietnam. See e.g., USITC, *Certain Frozen or Canned Warmwater Shrimp and Prawns*, January 2005; USITC, *Frozen Warmwater Shrimp*, May 2017. Previous antidumping orders on imports of frozen warmwater shrimp from Brazil were revoked on April 29, 2016. 82 FR 25242 (June 1, 2017).
[1141] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020.
[1142] U.S. shrimp aquaculture production is small compared to wild-caught varieties, with an estimated value in 2017 of $10 million. Refer to the shrimp species profile for more detail.
[1143] Coldwater shrimp, also called Atlantic northern shrimp in the Atlantic, is found in New England through the Canadian coast, Greenland, Iceland, and Norway. In the Pacific, they are found in the Okhotsk Sea, Bering Strait, and Alaskan waters.
[1144] As described in the technical appendix, there are two demand nests for shrimp species. The warmwater shrimp nest includes U.S. wild-caught warmwater shrimp, warmwater shrimp imports from all sources, and U.S. aquaculture shrimp. The coldwater shrimp nest includes U.S. wild-caught coldwater shrimp and coldwater shrimp imports from all sources. The elasticity of substitution within each nest is estimated using the trade cost method described in the technical appendix. The elasticity of substitution across the two nests is chosen based on available industry information.

this model. Instead, low supply elasticities are used for species that are considered overfished, where scaling up landings may be difficult. There is one coldwater shrimp stock in the Gulf of Maine that is considered overfished, according to a 2018 stock assessment, so a low supply elasticity is used for that coldwater shrimp variety.[1145]

The estimated economic effects of removing IUU imports are positive for both warmwater and coldwater domestic prices and landings (table 7.9). The effects for warmwater shrimp are larger than for the coldwater species because the estimated IUU incidence is higher and a larger fraction of the warmwater shrimp market is sourced from imports. Also, because some coldwater shrimp regions are considered overfished, the coldwater landings are slightly constrained in the model. Operating profits are also significantly larger for warmwater shrimp species (up nearly $4.4 million) because of the size of warmwater sourcing compared to the coldwater species.

Estimated effects on U.S. processed shrimp prices and production are also positive. As with unprocessed warmwater shrimp, processed shrimp operating income is estimated to significantly increase (up $8.6 million) because of the volume of processed products that shift from imported to domestically produced sourcing. Though not reported in table 7.9, U.S. shrimp aquaculture prices and production are also estimated to increase. U.S. aquaculture prices are estimated to increase by 2.1 percent and production volume by 10.4 percent as U.S. consumers substitute away from lost imports and consume more U.S. shrimp products from all sources.

The effects of estimated IUU imports on the U.S. warmwater shrimp industry can be separated into two categories—effects from estimated IUU imports of marine capture shrimp, and effects from estimated IUU imports of shrimp aquaculture—using a layered approach. Of the total estimated 2.1 percent increase in the domestic price, 0.7 percent is due to the removal of marine capture IUU products and 1.4 percent is due to the removal of aquaculture IUU products. Of the total estimated 10.3 percent increase in landings, 3.4 percent is due to the removal of marine capture IUU products and 6.8 percent from aquaculture IUU products. The estimated effects of IUU imports from aquaculture-sourced shrimp are roughly two times higher than the effects from marine capture shrimp imports. Despite the higher IUU percentage for marine capture shrimp, the volume of imports from aquaculture is much larger and has a stronger impact on the domestic industry.

Table 7.9 Estimated economic effects of removing IUU imports from the U.S. market for warmwater and coldwater shrimp

	2018 market shares		Change in domestic industry			Change in trade	
Products	**IUU share of imports (%)**	**Imports share of market (%)**	**Domestic price (% change)**	**Domestic production (% change)**	**Operating profits,[a] dollar-value change (1,000 $)**	**Import price (% change)**	**Import quantity (% change)**
Unprocessed warmwater	8.6	69.0	2.1	10.3	4,354.2	3.4	-6.0
Unprocessed coldwater	3.6	6.9	1.4	2.7	167.9	1.8	-1.8
Processed shrimp	7.7	77.4	1.8	9.2	8,627.3	2.9	-5.4

Source: USITC estimates.

1145 ASMFC, *Assessment Report for Gulf of Maine Northern Shrimp*, November 2018.

Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.
[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.

Tuna and Tuna-like Species

Tuna—one of the most consumed finfish in the United States—is harvested in both Pacific and Atlantic fisheries, though the Pacific is the much larger source. There are five major commercial types of tuna: bluefin, bigeye, yellowfin, skipjack, and albacore. A tuna's species and the method of harvest play a role in determining which of two major end markets they are sent to: the fresh/frozen market or the canned market. Bluefin and bigeye primarily serve the fresh/frozen market, while skipjack almost exclusively supplies the canned market. Albacore is important in the canned market, but also has fresh/frozen applications. Yellowfin is widely used in both markets, though U.S. landings of this species are mostly used in canning. Different types of vessels and fishing gear are commonly used to catch these different species of tuna. The two major categories of tuna vessel types are line vessels, which catch tuna on lines using a variety of different types of gear, and seiners (mostly purse seiners), which catch tuna in nets. Tuna line vessels include longliners, trollers, and pole-and-line vessels, and their landings may go to either the fresh/frozen or the canned market; seiners landings are normally destined for canning.

Major sources of U.S. tuna landings include the following fisheries: skipjack in the South Pacific, skipjack and yellowfin in the Eastern Pacific, albacore in the North and South Pacific, yellowfin and bigeye in Hawaii, and bluefin in the Atlantic. In part because tuna are highly migratory, the vast majority (about 93 percent during 2016–18) of all tuna landed by U.S. fishers is caught on the high seas or off foreign shores.[1146] After being caught mostly outside the U.S. EEZ, the U.S. tuna catch is also mostly landed in foreign ports. In 2018, U.S. fishers landed 23,444 mt of tuna in the 50 states, valued at $149 million and mostly sold locally in the fresh market, as described below.[1147] However, U.S. fishers landed a much greater volume of tuna at foreign ports and in U.S. territories such as American Samoa; these landings totaled about 200,000 mt annually and were mostly sold into the canning market.[1148] Skipjack accounts for a large majority of U.S. landings, followed by yellowfin (table 7.10).

[1146] Bluefin is the major exception and is caught almost exclusively in the U.S. EEZ. Data include landings of U.S flag vessels landing outside the 50 states and as such will not match U.S. commercial landings. Data for 2018 are the most recent data available. NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 17; NOAA Fisheries, *Fisheries of the United States 2016*, August 2017, 18; NOAA Fisheries, *Fisheries of the United States 2017*, September 2018, 17.
[1147] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, xxiii.
[1148] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 21.

Table 7.10 Tuna landings by U.S. fishers, metric tons, 2014–18

Type of tuna	2014	2015	2016	2017	2018
Total	318,593	274,076	215,226	215,456	223,522
Skipjack	266,570	226,201	171,140	159,647	174,637
Yellowfin	27,098	22,496	20,574	34,369	28,618
Bigeye	10,562	11,715	10,784	11,864	10,841
Albacore	13,071	12,460	11,179	7,899	8,245
Bluefin	971	856	1,210	1,311	958
Other	321	348	339	366	223

Sources: NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 17; NOAA Fisheries, *Fisheries of the United States 2017*, September 2018, 17; NOAA Fisheries, *Fisheries of the United States 2016*, August 2017, 18; NOAA Fisheries, *Fisheries of the United States 2015*, September 2016, 14; NOAA Fisheries, *Fisheries of the United States 2014*, September 2015, 14.

Fisheries Management

Tuna is a highly migratory species which traverses the waters of many countries and the high seas, making management complicated. International coordination is necessary for effective fisheries management.[1149] Regional fishery management organizations (RFMOs) have historically been particularly important in tuna fishing due to the large share of tuna caught on the high seas. RFMOs often impose quotas and other management measures to limit the catch of tuna species they regulate within the waters they manage. These quotas are often divided among the RFMO's member countries authorized to fish for the tuna, and the countries may set additional rules that govern how their quota allocation is managed. Because tuna fishing is highly international, its management structure often includes not only RFMOs and domestic authorities, but also bilateral and multilateral agreements. For the U.S. fleet, this includes, most significantly, the South Pacific Tuna Treaty. This treaty gives U.S. tuna vessels access to the EEZs of 16 Pacific island countries; most of these vessels are purse seiners targeting yellowfin and skipjack.[1150]

One example of this complexity is the albacore tuna. Depending on where in the Pacific they are caught, albacore tuna targeted by the U.S. fleet may fall under the regulatory authority of one of two different RFMOs. These RFMOs' management measures are implemented for the U.S. fleet through coordination between NOAA Fisheries, U.S. regional fishery management councils, and the U.S. Department of State. U.S. authorities, such as NOAA Fisheries, may add additional management measures, such as the mandatory use of vessel monitoring systems for albacore longline vessels in the Western Pacific.[1151] Adding another layer of complexity, some albacore fishing by U.S. vessels occurs either in the Canadian EEZ, access to which is governed by an agreement with Canada (for the North Pacific albacore fishery), or in the South Pacific Tuna Treaty zone (for albacore troll and longline vessels fishing in the South Pacific). The situation for albacore, with overlapping roles for RFMOs, domestic authorities, and bilateral or multilateral forums, is similar for other tuna fisheries the U.S. fleet participates in, as shown in table

[1149] NOAA Fisheries, "Pacific Yellowfin Tuna," accessed July 14, 2020; NOAA Fisheries, "Atlantic Yellowfin Tuna," accessed September 17, 2020; NOAA Fisheries, "Atlantic Bigeye Tuna," accessed October 22, 2020; NOAA Fisheries, "Pacific Bigeye Tuna," accessed September 1, 2020; NOAA Fisheries, "Pacific Bluefin Tuna," accessed August 3, 2020; Western Pacific Council, *Fishery Ecosystem Plan*, September 24, 2009, 57–72.
[1150] NOAA Fisheries, "South Pacific Tuna Treaty," March 22, 2019.
[1151] NOAA Fisheries, "Pacific Albacore Tuna: Management," accessed December 18, 2020.

7.11. For each key U.S. fishing area, the table shows the major authorities and management measures governing the area's major tuna species.

Table 7.11 Tuna management measures, by U.S. fishing area, for select species

Area	U.S. regional regulators	RFMO	Species-specific management measures	Major management measures for all tuna species
Western and central Pacific (Pacific island EEZs and high seas)	Western Pacific Regional Fishery Management Council	Western and Central Pacific Fisheries Commission (WCPFC)	For bigeye tuna, catch limits (per WCPFC)	Limited entry program; gear restrictions; vessel permits; area restrictions; observers on vessels (upon request per NOAA fisheries)
Eastern Pacific	Pacific Fishery Management Council	Inter-American Tropical Tuna Commission (IATTC)	For bluefin tuna, catch limits (per IATTC); trip catch limits for purse seine vessels (per NOAA Fisheries)	Observers on all large purse seine vessels; permitting; gear restrictions
Atlantic (including the Gulf of Mexico and Caribbean)	NOAA Fisheries Atlantic Highly Migratory Species Management Division	International Commission for the Conservation of Atlantic Tunas (ICCAT)	For bluefin tuna, catch limits and mandatory observer program (per ICCAT)	Minimum catch size; permitting; gear restrictions; time and area closures

Sources: IATTC, "IATTC Resolution C-18-01," August 2018; ICCAT, "Recommendation by ICCAT on A Multi-Annual Conservation and Management Programme for Tropical Tunas," 2019; ICCAT, "Recommendation by ICCAT to Replace Recommendation 16-01," 2019; NOAA Fisheries, "Pacific Bigeye Tuna," accessed September 1, 2020; NOAA Fisheries, "Pacific Islands Annual Catch Limits," updated September 14, 2020; NOAA Fisheries, "Longline Bigeye Tuna Catch Limits in the Pacific," updated August 13, 2019; NOAA Fisheries, "Atlantic Highly Migratory Species," accessed October 20, 2020; Western Pacific Council, "Bigeye Tuna Fact Sheet," 2014; Western Pacific Council, *Fishery Ecosystem Plan*, September 24, 2009.

Supply Chain

As noted above, tuna supply chains for the fresh/frozen market and the canned market are largely different. Species is an important factor in determining the end market for a tuna. Bluefin tuna are primarily sold in the fresh market and used in sashimi or tuna steak cuts. Due in part to bluefin tuna's rich taste, and in part to its scarcity, this species is highly prized and sold at a high price globally. Bigeye tuna is also typically sold in fresh markets for sashimi and tuna steaks. In contrast, skipjack tuna landings are sold primarily to canning facilities. Skipjack populations are considered abundant and have a less desirable texture and smell when processed than other species. Albacore and yellowfin tuna species are used in canning and also sold fresh, though a large majority of both U.S. yellowfin and albacore tuna landings are sent to canning facilities.[1152] Because the U.S. fleet catches all five of the major tuna species, U.S. tuna landings enter both of these supply chains. But since skipjack tuna caught in the Pacific accounts for the majority of landings, the majority of U.S. catch is sold for canning.

[1152] Note that the fraction of yellowfin and albacore sold in the fresh market and sold to processors in the U.S. is different than the split globally.

Fresh/Frozen Market

For the minority of tuna caught by the U.S. fleet and landed in the 50 states, which mostly enters the fresh/frozen market, Hawaii is the source of the majority of landings. On average, Hawaii accounted for 71.9 percent of U.S. commercial landings by volume and 75.2 percent by value during 2014–18.[1153] Both bigeye and yellowfin tuna are landed there. Hawaiian longline fishers are the largest producers of bigeye tuna in the United States.[1154] A substantial majority (about 80 percent) of Hawaii's catch is consumed locally, with most of the rest being shipped to the U.S. mainland, although a small share is exported.[1155] California and Massachusetts are the next largest sources of tuna landed in the United States, with California landing mostly bigeye and yellowfin, and Massachusetts landing mostly bluefin tuna caught in artisanal fisheries.[1156]

The majority of U.S. fresh tuna consumption is filled by U.S. landings; the U.S. landings share was between 57 and 68 percent annually during 2014–18.[1157] Nonetheless, imports are important for meeting U.S. demand. Imports were equal to about 28 percent of bigeye consumption during 2014–18, the lowest level of any of the three fresh market tunas.[1158] Imports were more important for meeting U.S. demand for yellowfin (equal to about 43 percent of consumption during 2014–18) and bluefin (about 76 percent). However, U.S. bluefin exports were equal to over half (about 54 percent) of total bluefin commercial landings in the five-year period: close to three-quarters of these exports were to Japan, almost all of which was fresh, not frozen, product. The three fresh market tunas are covered by SIMP because of the risk of IUU fishing—some fisheries have a history of violations—and, for yellowfin and bigeye, problems with seafood fraud, primarily passing off lower-value tunas as these two types.[1159] Bluefin has not historically been subject to such fraudulent substitutions because of its unique color and texture.

Canned Market

U.S. tuna catch for the canned market may enter a long or a relatively short supply chain. Tuna canning is a global industry that operates on thin margins, and labor costs and duty rates affect where processing steps are carried out. As an example of a short supply chain, some tuna that is landed in American Samoa is processed there. American Samoa is home to several large plants that can tuna using relatively labor-intensive methods. This tuna enters the United States duty free, since it is produced in a

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1153 NOAA Fisheries, Landings Database: Commercial, accessed January 8, 2020.
1154 Western Pacific Council, "Bigeye Tuna Fact Sheet," 2014.
1155 Western Management Council, "Hawaii Longline Fishery Fact Sheet," accessed October 23, 2020.
1156 California Department of Fish and Wildlife, *Final California Commercial Landings for 2019*, 2020, 5; Cape Cod Commercial Fishermen's Alliance, "Bluefin Tuna," accessed December 18, 2020.
1157 Consumption is based on calculated apparent consumption. Unless otherwise noted, all data in this paragraph are from NOAA Fisheries, Landings Database: Commercial and Foreign Trade database, accessed November 2, 2020.
1158 NOAA Fisheries, Landings Database: Commercial and Foreign Trade database, accessed November 2, 2020; NOAA Fisheries, *Fisheries of the United States 2018*, February 2020, 17; NOAA Fisheries, *Fisheries of the United States 2017*, September 2018, 17; NOAA Fisheries, *Fisheries of the United States 2016*, August 2017, 18; NOAA Fisheries, *Fisheries of the United States 2015*, September 2016, 14; NOAA Fisheries, *Fisheries of the United States 2014*, September 2015, 14.
1159 Albacore and skipjack are also covered by SIMP. 80 Fed. Reg. 66867 (October 30, 2015); NOC Committee, "U.S. Seafood Import Monitoring Program," accessed September 25, 2020.

U.S. territory. Other U.S. catch may be sent for processing in major tuna canning hubs around the world, such as Thailand and Ecuador. Some canned tuna is imported as a finished product from these countries, but other tuna is processed into a product known as tuna loins (which are cooked tuna ready for canning) and imported into the United States for packing in a small number of U.S. facilities. These include two plants in Georgia and California that use loins to produce canned tuna. These plants are highly automated and use little labor.[1160] There are also smaller, specialty tuna canneries in the United States, mostly in the Pacific Northwest.[1161]

Prices

For fresh market tuna, the majority of tuna ex-vessel prices are set at auction.[1162] Most fish are sold individually, and prices are influenced by quality, size, and market conditions, including supply of and demand for tuna.[1163] The availability, or lack of availability, of less expensive imports impacts the prices of locally landed fish.[1164] By contrast, tuna for canning—including yellowfin and skipjack destined for canneries—is a commodity product, with prices set on global exchanges, including those in Thailand (Bangkok) and Ecuador.[1165]

Tuna and Tuna-like Species Model Estimates

Tuna and tuna-like species are modeled together and have a customized nesting structure in the model to capture the complex demand relationships across species. The species included in this model are albacore tuna, bigeye tuna, bluefin tuna, skipjack tuna, yellowfin tuna, other not elsewhere included (NEI) tuna like little tunny and blackfin, and bonito.[1166] Because of the differences in end uses described above, the model separates tuna species primarily sold in fresh markets from tuna species primarily used in canning. Bigeye and bluefin tuna varieties are substitutable with each other from a consumer perspective, since they are typically sold in the fresh market, but are not substitutable with the canned species nest (albacore, yellowfin, skipjack, other NEI tuna, and bonito).[1167]

Imported tuna products are included in the data inputs if they are substitutable with the domestic product. Tuna loins, a highly processed product used in U.S. canning production, were included in

[1160] USITC, *The Economic Effects of Significant U.S. Import Restraints*, September 2017, 60.
[1161] Industry representative, telephone interview with USITC staff, October 26, 2020.
[1162] Fishers are paid same day, but after all the fish have been auctioned, for their landings. Industry representative, virtual roundtable, October 13, 2020, 16-17; NOAA Fisheries, Ties That Bind, April 9, 2018, April 9, 2018; Hawaii Seafood, “Honolulu Fish Auction,” accessed November 2, 2020.
[1163] Industry representative, virtual roundtable, October 13, 2020, 17-19; Hawaii Seafood, “Honolulu Fish Auction,” accessed November 2, 2020.
[1164] Industry representatives, virtual roundtable, October 13, 2020, 16-18.
[1165] Industry representative, virtual roundtable, October 13, 2020, 20.
[1166] The “other NEI tuna” category is included in the model with a high replacement rate but omitted from results for brevity. Bonito is not a tuna species but is included in the model because it is often used as a cheaper substitute for skipjack tuna for canning purposes. These species are included because they are considered substitutable with the tuna varieties used in canning.
[1167] Information from industry sources was used to understand tuna species end uses. In the Western and Central Pacific, longline vessel landings in the Western Pacific are primarily sold directly to the Honolulu fresh fish auction, and landings caught by purse seiners are almost exclusively set to processing facilities. This assumption, along with catch data by species and vessel type, was used to calculate the split in end uses for yellowfin and albacore tuna species. Industry representative, virtual roundtable, October 13, 2020, 50.

unprocessed tuna imports for skipjack, yellowfin, and albacore products because they compete with domestic landings in canned production.

Both unprocessed and processed tuna markets are modeled. The price of U.S. processed tuna production is modeled as a constant markup over the price of the unprocessed price index for that species. This means that an increase in the price of the tuna landings or unprocessed imports, from the removal of IUU products in imports, will directly affect U.S. processing prices. Higher input costs shift the supply curve for the U.S. processed tuna varieties, resulting in higher prices and lower production, all else being equal. At the same time, the removal of IUU processed imports leads to increased demand for U.S. processed products. These two opposing effects may lead to an increase or decrease in production volume, depending on the magnitudes.

There are some tuna species subpopulations that are considered overfished. Atlantic bigeye tuna is overfished, according to a 2018 stock assessment.[1168] Because this species is managed under the International Commission for the Conservation of Atlantic Tunas (ICCAT) and not via a U.S. fishery management plan, the RFMO-recommended catch limit is used in the model. Catch limits were also obtained for the Pacific bigeye tuna stock.[1169] The Pacific bluefin tuna is overfished as well, according to a 2018 stock assessment.[1170] Domestic catch limits for Pacific bluefin tuna that were established by the Inter-American Tropical Tuna Commission (IATTC) are used in the model.[1171] Though not considered overfished, catch limits were also obtained for the Atlantic bluefin tuna stock.[1172] The inclusion of these catch limits addresses supply constraints with the declining population of these high-value tuna species.

The estimated effects of removing IUU seafood products on the U.S. market for bluefin tuna are large, because the IUU estimate for bluefin tuna is large and because a large share of the U.S. market is sourced from imports (table 7.12). It is important to note that while the estimated effects on bluefin tuna landings are also large, they are still relatively smaller, because catch limits constrain landings. This is also true of the percent changes for bigeye tuna landings. Unprocessed skipjack and bonito species also experience large landings impacts, in part because they are relatively unconstrained by domestic catch limits. There is also slight substitution across species as consumers shift to buying less-constrained U.S. tuna species.

The estimated effects on U.S. processed tuna products are mixed. U.S. processing of bigeye and bluefin tuna products increases after the removal of IUU products, whereas processed albacore, skipjack, and yellowfin canning production declines. As described above, this is because the increase in input costs of processing outweighs the positive shift in demand after the removal of estimated processed IUU imports. Estimated operating income effects are largely positive, with the exception of those for the processed bluefin tuna variety. Operating income for processed bluefin tuna is estimated to decline after the removal of IUU imports because of the relatively high decline in production volume.

[1168] NOAA Fisheries, *SAFE Report for Atlantic Highly Migratory Species*, April 2019.
[1169] eCFR, “Electronic Code of Federal Regulations: Longline Fishing Restrictions,” accessed October 27, 2020.
[1170] ISC, “Stock Assessment of Pacific Bluefin Tuna,” July 2018.
[1171] NOAA Fisheries, “Pacific Bluefin Tuna Commercial Harvest Status,” September 14, 2020.
[1172] NOAA Fisheries, “Atlantic Bluefin Tuna and Northern Albacore Quotas,” September 27, 2018.

Table 7.12 Estimated economic effects of removing IUU imports from the U.S. market for tuna and tuna-like species

	2018 market shares		Change in domestic industry			Change in trade	
Products	IUU share of imports (%)	Imports share of market (%)	Domestic price (% change)	Domestic production (% change)	Operating profits,[a] dollar-value change (1,000 $)	Import price (% change)	Import quantity (% change)
Unprocessed albacore	14.7	86.6	0.2	0.8	121.1	6.2	-7.6
Unprocessed bigeye	15.4	48.1	4.8	8.4	3,931.1	13.1	-10.8
Unprocessed bluefin	47.6	85.0	10.2	17.5	445.9	27.9	-42.9
Unprocessed skipjack	9.1	97.4	2.1	10.5	30.4	4.9	-4.5
Unprocessed yellowfin	12.7	62.5	1.0	4.9	704.3	6.9	-9.5
Unprocessed bonito	24.9	9.0	1.9	9.3	7.4	5.3	-17.4
Processed albacore	14.2	35.2	5.7	-5.3	187.2	6.7	-7.1
Processed bigeye	17.1	83.7	8.2	1.0	1,419.7	14.1	-12.0
Processed bluefin	26.2	22.0	25.5	-35.0	-631.3	22.2	-23.6
Processed skipjack	10.4	56.7	4.8	-1.0	1,409.8	5.4	-5.2
Processed yellowfin	13.4	74.1	4.6	-2.1	856.4	7.4	-9.4

Source: USITC estimates.
Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.
[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.

Model Estimates of Additional Species

Sardine, Herring, Anchovy, and Mackerel Species

Sardine, herring, anchovy, and mackerel species are linked in the model to capture demand relationships across similar products. The mackerel variety is an aggregate of jack, Atlantic, chub, king, Spanish, and atka mackerel. The model includes both landings and processed products, where changes in the price of the landed fish impacts the price of the processed product.

Some of the species and regions included in this model are overfished. The northern subpopulation of Pacific sardines (Baja California, Mexico to British Columbia, Canada) is overfished and the fishery is closed, according to a recent 2018 stock assessment.[1173] There are also some Pacific herring subpopulations that are considered overfished. Because of the Pacific sardine and herring overfishing statuses, a low supply elasticity is used in the model to limit landings' responses. In addition, Atlantic mackerel species in the Gulf of Maine and Cape Hatteras are overfished, according to a 2016 stock assessment.[1174] Because this subpopulation is only a small fraction of total mackerel, the species is not catch constrained at the aggregate level.

The removal of estimated IUU seafood imports on sardine, anchovy, herring, and mackerel species is estimated to have positive effects on domestic prices and production (table 7.13). The species with the greatest reliance on imports, like sardine and mackerel, experience the largest percentage changes.

[1173] Pacific Fishery Management Council, *Status of the Pacific Coast Coastal Pelagic Species Fishery*, April 2019.
[1174] Mid-Atlantic Council, "Mackerel Closure Framework (Framework 12)," accessed October 1, 2020.

Also, there is slight substitution across species as consumers shift from buying sardines to buying less-constrained herring, anchovy, and mackerel species. U.S. processing for all forage species is estimated to increase because of the positive demand shift after removing processed IUU imports. The operating profit changes for both unprocessed and processed sardines are estimated to be small, despite the fact that they have larger estimated IUU shares and import shares (columns 2 and 3). This is because the Pacific sardine fishery is closed due to overfishing, so U.S. sardine fishers cannot easily scale up production. Further, the estimated small positive impact on domestic landings of sardine is met with a low unit price for the product, so estimated changes in operating income profits are not large. There is estimated to be a large operating income change ($2.0 million) because the volume of processed mackerel changing from import-sourced to domestic-sourced is large, at a relatively high unit price.

Table 7.13 Estimated economic effects of removing IUU imports from the U.S. market for sardine, anchovy, herring, and mackerel species

	2018 market shares		Change in domestic industry			Change in trade	
Products	IUU share of imports (%)	Imports share of market (%)	Domestic price (% change)	Domestic production (% change)	Operating profits,[a] dollar-value change (1,000 $)	Import price (% change)	Import quantity (% change)
Unprocessed sardine	19.6	94.0	4.9	4.8	6.4	8.1	-13.7
Unprocessed herring	7.2	5.9	1.7	3.4	161.5	2.8	-3.6
Unprocessed anchovy	14.2	16.1	2.1	10.0	20.7	5.0	-7.1
Unprocessed mackerel	12.4	85.8	1.3	6.1	72.8	5.7	-8.7
Processed sardine	21.0	99.9	4.9	8.9	1.0	8.9	-14.7
Processed herring	6.9	80.5	1.7	15.9	76.9	4.2	-3.5
Processed anchovy	16.3	43.7	2.1	12.2	86.1	6.0	-8.2
Processed mackerel	16.3	33.8	1.3	11.7	2,039.5	4.3	-11.4

Source: USITC estimates.

Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.

[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.

Salmon Species

Salmon plays an important role in U.S. consumers' diets, as it is the second most consumed species after shrimp.[1175] All salmon species are linked in the model to capture demand relationships across species. The species included in this model are wild-caught Chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, and Atlantic salmon aquaculture.[1176] The model includes both landings and processed products, where changes in the price of the landed fish impacts the price of the processed product.

Pacific salmon species are not managed with U.S. annual catch limits (ACLs). Salmon fisheries are managed by establishing escapement goals by stock and river system.[1177] An escapement goal is the number of salmon in a particular stock that the manager has determined should be allowed to escape

[1175] Mutter, "Here Are America's Most-Consumed Seafood Species," February 24, 2020.

[1176] U.S. aquaculture production of Atlantic salmon is valued at $61 million in 2017, a relatively small value compared to chum and sockeye varieties.

[1177] Alaska Department of Fish and Game, "Escapement Goals, Alaska Fisheries Sonar," accessed October 1, 2020.

the fishery to spawn to achieve the maximum sustainable yield. As it is not feasible to include this type of constraint in the economic model, the salmon model instead uses information about species endangerment to constrain U.S. catch with lower supply elasticities. Some of the Pacific salmon stocks are designated as endangered or threatened under the Endangered Species Act (ESA). Two stocks of Chinook salmon and one stock of coho salmon are listed as endangered under the ESA. In addition, one stock of sockeye salmon and two stocks of chum salmon are listed as threatened under the ESA. Atlantic salmon commercial fishing is prohibited in the United States because of the Atlantic salmon's ESA status and low population levels. All Atlantic salmon in the model are farmed aquaculture products.

The model estimates small positive effects on domestic prices and landings (table 7.14). Due to the ESA status for most salmon species, U.S. commercial fishers of wild-caught salmon species cannot easily increase catch levels, so domestic landings percentage changes are estimated to be relatively small. The Atlantic (farmed) salmon species is estimated to have the largest landings percentage change (9.6 percent) because it is not subject to the same ESA regulation as the wild-caught species. Estimated unprocessed salmon operating profits increase, though the magnitude of the increase varies by species. Sockeye salmon has the largest estimated operating income increases ($2.7 million unprocessed) because it has the highest volume of landings in the baseline (120 thousand mt, compared to the next highest of 63 thousand mt for chum) and therefore has a large increase in volume after the policy change. The processed products are estimated to have modest to moderate increases in production and domestic prices. Chinook shows the largest estimated increase in processing production because of the size of the IUU estimate and greater reliance on imports in the United States.

Table 7.14 Estimated economic effects of removing IUU imports from the U.S. market for Atlantic, chinook, chum, coho, pink, and sockeye salmon species

	2018 market shares		Change in domestic industry			Change in trade	
Products	IUU share of imports (%)	Imports share of market (%)	Domestic price (% change)	Domestic production (% change)	Operating profits,[a] dollar-value change (1,000 $)	Import price (% change)	Import quantity (% change)
Atlantic (farmed)	11.9	92.7	1.9	9.6	1,671,0	6.9	-8.3
Unprocessed Chinook	8.2	98.8	0.9	1.8	21.2	6.1	-5.7
Unprocessed chum	4.1	5.2	1.6	3.2	694.5	4.2	-2.9
Unprocessed coho	4.0	33.0	2.1	4.1	66.3	4.7	-2.8
Unprocessed pink	14.6	64.0	0.4	2.0	59.9	7.6	-10.2
Unprocessed sockeye	13.2	10.1	1.9	3.7	2,652.9	6.3	-9.3
Processed Chinook[b]	9.5	73.2	0.9	9.9	290.4	6.5	-6.6
Processed chum[b]	1.9	76.5	1.6	7.5	971.3	5.1	-1.4
Processed coho[b]	7.4	67.4	2.1	7.5	617.0	6.4	-5.2
Processed pink[b]	4.6	83.9	0.4	3.3	825.8	5.8	-3.2
Processed sockeye[b]	18.5	72.7	1.9	3.6	3,961.4	8.8	-12.9

Source: USITC estimates.

Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.

[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.

[b] Processed products include both canned salmon and salmon fillets.

Lobster Species

American and spiny lobster are the two lobster species caught in U.S. commercial fisheries. American lobsters are caught in the northwest Atlantic Ocean and are considered one of the most valuable species in the United States, with 2018 landings valued at $624.2 million.[1178] U.S.-caught American lobsters are substitutable with other sources of coldwater lobster, such as the American lobster from Canada (which is the same species as U.S. production) and *Homarus gammarus* lobsters from Europe.[1179] Spiny lobsters are caught in the South Atlantic, Gulf of Mexico, and Caribbean, with landings valued at $60.1 million in 2018.[1180] Spiny lobsters can be easily distinguished from their coldwater counterpart because of their long thick antennae and absence of claws. To clearly delineate between the two types of lobster, the American lobster and related import varieties are referred to as the coldwater species, and the spiny lobster and related import varieties as the warmwater species. Coldwater and warmwater lobster species are linked in the model to capture demand relationships across species. The model includes slight cross-species demand substitutability between these varieties.[1181]

Spiny lobster stocks are managed with ACLs in each fishing region and are not considered overfished. American lobster species, however, are not managed with quotas. Fishery managers instead use trap caps and other management techniques to control fishing effort. There is one stock of American lobster, the Southern New England Stock, that is considered overfished, according to a 2015 stock assessment.[1182] Because a majority of American lobster landings come from regions further north (the Gulf of Maine and Georges Bank), the landings in the model are not constrained.

The effects of removing estimated IUU imports from U.S. lobster markets are presented in table 7.15. Domestic prices and production are estimated to increase, with the largest effects for unprocessed warmwater lobster. This is in part because warmwater lobster has a higher estimated share of IUU imports. The larger effect is also due to warmwater species having a higher estimated elasticity of substitution among import varieties (see appendix I for elasticity estimates used in the model). The higher elasticity indicates that consumers are more willing to switch sources of supply as the relative price of the product changes. Despite larger percent changes for warmwater species, the estimated dollar change in operating profits is higher for coldwater lobster species because the American lobster market is larger, so the increase in volume of coldwater domestic production is larger.

1178 NOAA Fisheries, *Fisheries of the United States 2018*, February 2020.

1179 Another coldwater lobster species, the Norway lobster, is not included in the analysis because it is most closely related to crawfish species. Also, while *Homarus gammarus* lobsters are included in coldwater imports, the American lobster is the dominant imported variety.

1180 NOAA Fisheries, *Fisheries of the United States 2018*, February 2020.

1181 As described in the technical appendix, there is a warmwater nest and a coldwater nest. The warmwater nest includes U.S. wild-caught spiny lobster and rock lobster imports from all sources. The coldwater nest includes U.S. wild-caught American lobster and other coldwater lobster imports from all sources. The elasticity of substitution within each nest is estimated using the trade cost method described in the technical appendix. The elasticity of substitution across the two nests is chosen based on available industry information. The analysis uses a low value to reflect limited substitution across species.

1182 ASMFC, *American Lobster Benchmark Stock Assessment*, August 2015.

Table 7.15 Estimated economic effects of removing IUU imports from the U.S. market for warmwater and coldwater lobster

	2018 market shares		Change in domestic industry			Change in trade	
Products	**IUU share of imports (%)**	**Imports share of market (%)**	**Domestic price (% change)**	**Domestic production (% change)**	**Operating profits,[a] dollar-value change (1,000 $)**	**Import price (% change)**	**Import quantity (% change)**
Unprocessed warmwater lobster[b]	21.8	69.4	5.5	17.7	891.9	7.7	-15.3
Unprocessed coldwater lobster	3.9	71.4	0.2	1.1	2,397.4	2.6	-2.7
Processed warmwater lobster	11.8	8.5	0.3	1.7	33.0	1.0	-8.2
Processed coldwater lobster	3.9	67.8	0.2	1.2	793.1	1.6	-2.7

Source: USITC estimates.

Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.

[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.

[b] As described in the paragraph above, warmwater lobster species refers to spiny lobster and related rock import varieties. Coldwater lobster refers to the American lobster and related import varieties, such as the *Homarus gammarus* from Europe.

Snow Crab and Blue Crab

Snow crab, grouped with the tanner crab species in this section, is another Pacific crab species with significant IUU imports. Alaskan snow crab is not considered overfished, according to a 2018 stock assessment, with 2018 landings only filling about 26 percent of the total available catch limit in the region.[1183] The model includes both landings and processed products, where changes in the price of landed crab impacts the price of the processed product. As shown in table 7.16, the share of IUU imports in total imports of snow crab is estimated in chapter 3 as 5.9 percent for unprocessed imports and 14.4 percent for processed products. The IUU estimates may seem modest, but reliance on imports for both unprocessed and processed snow crab products is high, as imports supply over 80 percent of the market.

Domestic prices and landings of snow crab are estimated to increase in both unprocessed and processed consumer markets (table 7.16). While the estimated price increase of the landed snow crab flows directly to the domestic processors, the increase in price is offset by the positive demand shock from the removal of processed IUU imports, so domestic processing increases. Although operating income for both products rises in this scenario, increases for unprocessed products are more significant. This is because the relative size of the unprocessed market is larger than the processed market, so the dollar value change in operating income is bigger. Total imports are estimated to decline by 3 and 10 percent for unprocessed and processed imports at a rate slightly lower than the share of IUU imports, because there is moderate replacement with legally sourced imports.

[1183] NOAA Fisheries, *2018 Alaska Crab Stock Assessment*, January 29, 2020.

Table 7.16 Estimated economic effects of removing IUU imports from the U.S. market for snow crab

	2018 market shares		Change in domestic industry			Change in trade	
Products	**IUU share of imports (%)**	**Imports share of market (%)**	**Domestic price (% change)**	**Domestic production (% change)**	**Operating profits,[a] dollar-value change (1,000 $)**	**Import price (% change)**	**Import quantity (% change)**
Unprocessed snow crab	5.9	84.1	1.8	9.0	677.0	3.4	-4.1
Processed snow crab[b]	14.4	98.5	1.8	83.5[c]	55.4	10.3	-10.1

Source: USITC estimates.
Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.
[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.
[b] Processed snow crab is primarily prepared crabmeat.
[c] This percent change in quantity of domestic processed snow crab is large, but from a small base.

Blue crab, which belongs to the family of species known as swimming crab, is an Atlantic crab species with significant competition from IUU imports.[1184] The species is caught by U.S. commercial fishers along the Atlantic Coast and Gulf of Mexico, and is considered the most valuable fishery in the Chesapeake Bay.[1185] This species does not have commercial catch limits and is primarily managed through size limits, pot limits, gear restrictions, and seasonal closures. A recent 2018 stock assessment by the Chesapeake Bay Stock Assessment Committee lists the species as not overfished, so constraints on catch are not binding in the model.[1186] The model includes both landings and processed products, where changes in the price of the landed crab impacts the price of the processed product.

The estimated share of IUU imports in total imports of swimming crab, presented in table 7.17, is 25.7 percent for unprocessed products and 26.8 percent for processed products. Significantly more imported swimming crab products enter the United States as a processed product than an unprocessed product, so estimated effects are higher for the processed product. Domestic prices and landings of U.S. blue crab are estimated to increase after the removal of IUU seafood imports (table 7.17). Comparing estimated operating income effects with results from snow and king crab, processed blue crab has the largest operating profits increase because of the volume of blue crab seafood shifting from imported to domestically produced sourcing.

[1184] Note that the blue crab is the major type of swimming crab caught commercially in the United States. The domestic species in the model is blue crab, and it competes with all swimming crab imports, which include blue crab imports. The terms “blue crab” and “swimming crab” are used interchangeably in this section.
[1185] NOAA Fisheries, “Blue Crab,” accessed October 23, 2020.
[1186] CBSAC, *2018 Chesapeake Bay Blue Crab Advisory Report*, June 7, 2018.

Table 7.17 Estimated economic effects of removing IUU imports from the U.S. market for blue crab

	2018 market shares		Change in domestic industry			Change in trade	
Products	IUU share of imports (%)	Imports share of market (%)	Domestic price (% change)	Domestic production (% change)	Operating profits,[a] dollar-value change (1,000 $)	Import price (% change)	Import quantity (% change)
Unprocessed blue crab	25.7	12.1	4.6	21.5	704.7	6.3	-18.0
Processed blue crab[b]	26.9	92.1	4.6	109.2[c]	4,925.3	12.4	-18.8

Source: USITC estimates.
Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.
[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.
[b] Processed blue crab is mostly prepared crabmeat.
[c] This percent change in quantity of domestic processed blue crab is large, but from a small base.

Other Species

This section reports economic effects for species not presented in the sections above, including red snapper, octopus, grouper, mahi-mahi, swordfish, and squid. Mahi-mahi, swordfish, and squid all have significant IUU imports of processed products, so processing is modeled for those species. Only the unprocessed products are modeled for red snapper, octopus, and grouper species. Squid is an aggregate of loligo longfin squid and illex shortfin squid.

Some of the species in this section are nearing their catch limits or considered overfished by stock assessments. The red snapper South Atlantic stock is overfished according to a 2016 stock assessment.[1187] The red grouper South Atlantic stock is also overfished, based on a 2017 stock assessment.[1188] Octopus does not have a commercial fishery in the continental United States and is caught in small numbers in the U.S. territories. Because of the difficulty for U.S. commercial fishers to scale up production, a low supply elasticity is used in the model for domestic octopus supply. Additional information about supply elasticities and catch limits by species can be found in Appendix I.

The estimated effects of removing IUU imports on red snapper occur primarily through higher domestic prices (table 7.18). Because red snapper fishing regions are constrained, U.S. commercial fishers are not able to easily scale up landings. The story for grouper is different; landings are below catch limits for a majority of the grouper fishing regions, so estimated effects of removing IUU imports are seen in both domestic prices and landings. The estimated percent change in octopus landings is large (40.0 percent), but from a small base. Grouper shows the largest estimated operating income changes in table 7.18 because of the size of the increase in landings, and because of a relatively higher estimated markup for grouper products.

[1187] SEDAR, *South Atlantic Red Snapper Stock Assessment Report*, April 2016.
[1188] SEDAR, *South Atlantic Red Grouper Stock Assessment Report*, February 2017.

Table 7.18 Estimated economic effects of removing IUU imports from the U.S. market for red snapper, grouper, and octopus products

	2018 market shares		Change in domestic industry			Change in trade	
Products	**IUU share of imports (%)**	**Imports share of market (%)**	**Domestic price (% change)**	**Domestic production (% change)**	**Operating profits,[a] dollar-value change (1,000 $)**	**Import price (% change)**	**Import quantity (% change)**
Red snapper	39.0	58.8	15.5	2.4	1,147.7	27.2	-35.1
Grouper	47.6	75.9	5.7	25.0	2,561.8	31.0	-33.3
Octopus	37.5	99.9	22.1	40.0	9.8	35.5	-26.2

Source: USITC estimates.
Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. These species did not have significant processed IUU products, so only the unprocessed market was modeled. Domestic production refers to domestic landings.
[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income are received by U.S. commercial fishers. Operating income changes are presented in thousands of U.S. dollars.

Table 7.19 reports estimated effects of removing IUU imports for mahi-mahi, swordfish, and squid. Of the species in this table, estimated percent changes are largest for mahi-mahi. Estimated landings of unprocessed mahi-mahi increase by 38.8 percent in the policy scenario, in part because catch is not constrained by quotas in the baseline and because the estimated IUU percent of imports and reliance on imports in the market is large.

Table 7.19 Estimated economic effects of removing IUU imports from the U.S. market for mahi-mahi, swordfish, and squid products

	2018 market shares		Change in domestic industry			Change in trade	
Products	**IUU share of imports (%)**	**Imports share of market (%)**	**Domestic price (% change)**	**Domestic production (% change)**	**Operating profits,[a] dollar-value change (1,000 $)**	**Import price (% change)**	**Import quantity (% change)**
Unprocessed mahi-mahi	33.4	90.5	8.1	38.8	626.1	23.0	-23.4
Processed mahi-mahi	21.1	92.9	5.0	27.4	1,120.6	14.5	-14.7
Unprocessed swordfish	11.8	77.8	0.9	4.2	368.7	7.7	-8.3
Processed swordfish	15.9	62.8	0.6	2.8	470.0	8.3	-11.1
Unprocessed squid	29.1	85.5[b]	2.0	9.7	2,542.3	21.6	-20.3
Processed squid	23.6	22.2	0.7	3.4	1,575.4	6.1	-16.5

Source: USITC estimates.
Note: Estimates of price and quantity changes are determined using a customized partial equilibrium model. Domestic production refers to commercial landings for unprocessed products and domestic processing production for processed products.
[a] With the assumption of constant markups, initial profits are estimated as revenue divided by the elasticity of substitution of the product. Changes in operating income for unprocessed products are received by U.S. fishers, and processed product operating income changes are split by U.S. fishers and U.S. processors. Operating income changes are presented in thousands of U.S. dollars.
[b] Most squid caught by U.S. fishers is exported (about 80%). Imports supply a majority of U.S. consumption of squid products.

Employment Effects for Selected Species

Estimated employment effects are presented in this section for select species where fishers' employment data by species were available (table 7.20).[1189] Changes in employment are assumed to be proportional to estimated changes in domestic production. Removing IUU imports from the U.S. market is estimated to have a positive impact on U.S. fishers' employment for each of the species and regions considered in this section. Regions that are not constrained by catch limits show larger employment increases than regions where landings reach their ACLs or are considered overfished.

Table 7.20 Estimated employment effects of IUU removal by species and region

Species	Region and/or fleet	Estimated number of fishers, pre-policy change	Estimated percent increase in employment after IUU removal	Estimated increase in number of fishers, post-policy change
King crab	Aleutian Islands and Bristol Bay	402	2.4	9
Snow and tanner crab	Bering Sea	647	9.0	58
Bigeye, yellowfin, swordfish	Hawaii Longline[a]	870	6.5[b]	56
Bigeye, yellowfin, swordfish	American Samoa Longline	54	6.5	3
American lobster	Maine and Massachusetts	11,000	1.1	122

Source: USITC estimates.
Note: This table reports employment effects for select species and regions where employment data were available. Estimates of landings changes are determined using a customized partial equilibrium model.
[a] There are 164 longline vessel permits in Hawaii, and 145 active vessels. The employment estimate is limited by the number of permits available and assumes that the number of permits remains fixed. A representative from the Hawaii longline fleet stated in a roundtable discussion that an increase in landings and crew size is likely in the case where it is economically feasible to ramp up production. Note that after removing IUU seafood from the market, the estimated increase in employment does not cause the number of vessel permits to bind. Helpful information for this section was received from the WPRFMC roundtable discussion on October 13, 2020.
b The percent increase in landings is a weighted average of the individual species percent changes from the subsections above.

[1189] There is no central location for fishers' employment data by species. There are multiple reasons for this. First, fisheries data are collected and maintained at the regional level and reporting differs by council. Second, it is often the case that fishers catch multiple species at a time, or change targeted species depending on the season. For these reasons, employment data were collected and estimated to the extent possible.

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Appendix A
Request Letter

Congress of the United States

U.S. House of Representatives

COMMITTEE ON WAYS AND MEANS

1102 LONGWORTH HOUSE OFFICE BUILDING
(202) 225–3625

Washington, DC 20515–0348

http://waysandmeans.house.gov

December 19, 2019

DOCKET NUMBER
3427
Office of the Secretary
Int'l Trade Commission

The Honorable David Johanson
Chairman
U.S. International Trade Commission
500 E Street, SW
Washington, DC 20436

Dear Chairman Johanson:

We are writing today to request that the U.S. International Trade Commission (USITC) conduct an investigation of the potential economic effects on U.S. fishermen of competition with illegal, unreported, and unregulated (IUU) seafood imports. IUU seafood includes products obtained in contravention of fisheries management regulations or in violation of labor laws. Trade in IUU seafood products includes not only IUU catch that is sent directly to end markets, but also IUU raw material inputs that are further processed into aquaculture feed or seafood products for human consumption.

Up to 31 percent of the global catch of fish reportedly comes from IUU fishing, at an estimated value of more than $23 billion per year. IUU fishing contributes to the overexploitation of fish stocks, threatens the livelihoods of coastal communities, jeopardizes food security, and harms marine ecosystems. IUU fishing also creates unfair competition for U.S. fishermen as imports account for 90 percent of U.S. seafood consumption. China plays an enormous role in the global production and trade of seafood and is the largest seafood trade partner of the United States. China also has been ranked as worst among 152 coastal countries based on the prevalence of IUU fishing and the country's response to it.

To better understand the size, scope, supply chains, pricing pressures, and potential economic effects of this problem, we request that the USITC conduct an investigation, and prepare a report, pursuant to section 332(g) of the Tariff Act of 1930. Based on available information, we request that the Commission's report provide, to the extent practicable:

- A review of the existing data and literature on the prevalence of IUU products in the U.S. import market, and an overview of international mechanisms for monitoring and enforcement to address IUU fishing;
- A description of the size and structure of the U.S. commercial fishing industry;
- A description of major global producers of IUU products, including but not limited to China, and country practices related to IUU production and exports.
- An analysis of the extent to which IUU product is imported into the United States, as well

as major U.S. import sources and global supply chains of such products; and

- A quantitative analysis of the economic impact of IUU imports on U.S. commercial fishermen and U.S. commercial fishing production, trade, and prices.

We request that the Commission deliver the report by 12 months from the date of this letter. As we intend to make the report available to the public, we request that confidential business information not be included in the report. Your assistance in this matter is greatly appreciated.

Sincerely,

Richard E. Neal
Chairman

Earl Blumenauer
Chairman, Trade Subcommittee

Appendix B
Federal Register Notice

government employees and contract personnel, solely for cybersecurity purposes. All contract personnel will sign appropriate nondisclosure agreements. All nonconfidential written submissions will be available for public inspection at the Office of the Secretary and on EDIS.

This action is taken under the authority of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), and in Part 210 of the Commission's Rules of Practice and Procedure (19 CFR part 210).

By order of the Commission.

Issued: May 27, 2020.

Lisa Barton,

Secretary to the Commission.

[FR Doc. 2020–11790 Filed 6–1–20; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–575]

Seafood Obtained via Illegal, Unreported, and Unregulated Fishing: U.S. Imports and Economic Impact on U.S. Commercial Fisheries; Notice of New Dates for Public Hearing and Transmittal of the Commission's Report

AGENCY: United States International Trade Commission.

ACTION: Notice of new dates for public hearing and transmittal of the Commission's report.

SUMMARY: The Commission has changed the date of its public hearing for Investigation No. 332–575: *Seafood Obtained via Illegal, Unreported, and Unregulated Fishing: U.S. Imports and Economic Impact on U.S. Commercial Fisheries* from May 12, 2020 to September 3, 2020; and the date has changed for transmittal of its report to the U.S. House of Representatives Committee on Ways and Means (Committee) in this investigation from December 19, 2020 to February 18, 2021 due to COVID–19.

DATES:

August 12, 2020: Deadline for filing requests to appear at the public hearing.

August 21, 2020: Deadline for filing pre-hearing briefs and statements.

September 3, 2020: Public hearing.

September 17, 2020: Deadline for filing post-hearing briefs and statements.

October 9, 2020: Deadline for filing all other written submissions.

February 18, 2021: Transmittal of Commission report to the Committee.

ADDRESSES: All Commission offices, including the Commission's hearing rooms, are located in the United States International Trade Commission Building, 500 E Street SW, Washington, DC. All written submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street SW, Washington, DC 20436. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS), *https://edis.usitc.gov.*

FOR FURTHER INFORMATION CONTACT: Project Leader Renee Berry (202–205–3498 or *renee.berry@usitc.gov*) or Deputy Project Leader Daniel Matthews (202–205–5991 or *daniel.matthews@usitc.gov*) for information specific to this investigation. For information on the legal aspects of these investigations, contact William Gearhart of the Commission's Office of the General Counsel (202–205–3091 or *william.gearhart@usitc.gov*). The media should contact Margaret O'Laughlin, Office of External Relations (202–205–1819 or *margaret.olaughlin@usitc.gov*). Hearing-impaired individuals may obtain information on this matter by contacting the Commission's TDD terminal at 202–205–1810. General information concerning the Commission may also be obtained by accessing its internet server (*https://www.usitc.gov*). Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000.

SUPPLEMENTARY INFORMATION: The Commission published notice of institution of the investigation in the **Federal Register** on January 31, 2020 (85 FR 5704, January 31, 2020). In that notice, the Commission announced it would hold a public hearing on May 12, 2020, and it also set dates by which requests to appear at the hearing, briefs, and other written submissions should be filed. However, due to COVID–19, the Commission postponed the hearing to a date to be determined (85 FR 21460, April 17, 2020). The Commission has rescheduled the public hearing as well as deadlines for requests to appear at the hearing, briefs, and other written submissions to the following dates. Please note the Secretary's Office will accept only electronic filings at this time. Filings must be made through the Commission's Electronic Document Information System (EDIS, *https://edis.usitc.gov*). No in-person paper-based filings or paper copies of any electronic filings will be accepted until further notice. The scope of the investigation remains the same as published in the **Federal Register** on January 31, 2020.

Public Hearing: A public hearing in connection with this investigation will be held beginning at 9:30 a.m. on September 3, 2020. This hearing may occur at the U.S. International Trade Commission Building, 500 E Street SW, Washington, DC, or via an online videoconferencing platform. Information about the place and form of the hearing, including about how to participate in or view the hearing, will be posted on the Commission's website at (*https://usitc.gov/research_and_analysis/what_we_are_working_on.htm*). Once on that web page, scroll down to the entry for investigation No. 332–575, *Seafood Obtained via Illegal, Unreported, and Unregulated Fishing: U.S. Imports and Economic Impact on U.S. Commercial Fisheries,* and click on the link to ''hearing instructions.''

Requests to appear at the public hearing should be filed with the Secretary, no later than 5:15 p.m., August 12, 2020 in accordance with the requirements in the ''Submissions'' section below. All pre-hearing briefs and statements should be filed no later than 5:15 p.m., August 21, 2020; and all post-hearing briefs and statements should be filed not later than 5:15 p.m., September 17, 2020. In the event that, as of the close of business on August 12, 2020, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or nonparticipant should contact the Office of the Secretary at 202–205–2000 after August 12, 2020, for information concerning whether the hearing will be held.

Written Submissions: In lieu of or in addition to participating in the hearing, interested parties are invited to file written submissions concerning this investigation. All written submissions should be addressed to the Secretary, and should be received not later than 5:15 p.m., October 9, 2020. All written submissions must conform to the provisions of section 201.8 of the Commission's Rules of Practice and Procedure (19 CFR 201.8), as temporarily amended by 85 FR 15798 (March 19, 2020). Under that rule waiver, the Office of the Secretary will accept only electronic filings at this time. Filings must be made through the Commission's Electronic Document Information System (EDIS, *https://edis.usitc.gov*). No in-person paper-based filings or paper copies of any electronic filings will be accepted until further notice. Persons with questions regarding electronic filing should contact the Office of the Secretary, Docket Services Division (202–205–1802), or consult the Commission's Handbook on Filing Procedures.

Confidential Business Information. Any submissions that contain confidential business information must also conform to the requirements of section 201.6 of the Commission's Rules of Practice and Procedure (19 CFR 201.6). Section 201.6 of the rules requires that the cover of the document and the individual pages be clearly marked as to whether they are the ''confidential'' or ''non-confidential'' version, and that the confidential business information is clearly identified by means of brackets. All written submissions, except for confidential business information, will be made available for inspection by interested parties.

As requested by the Committee, the Commission will not include any confidential business information in the report that it sends to the Committee or makes available to the public. However, all information, including confidential business information, submitted in this investigation may be disclosed to and used: (i) By the Commission, its employees and Offices, and contract personnel (a) for developing or maintaining the records of this or a related proceeding, or (b) in internal investigations, audits, reviews, and evaluations relating to the programs, personnel, and operations of the Commission including under 5 U.S.C. Appendix 3; or (ii) by U.S. government employees and contract personnel for cybersecurity purposes. The Commission will not otherwise disclose any confidential business information in a manner that would reveal the operations of the firm supplying the information.

Summaries of Written Submissions: The Commission intends to publish summaries of the positions of interested persons in an appendix to the report. Persons wishing to have a summary of their position included in the report should include a summary with their written submission. The summary may not exceed 500 words, should be in a format that can be easily converted to MS Word, and should not include any confidential business information. The summary will be published as provided if it meets these requirements and is germane to the subject matter of the investigation. The Commission will identify the name of the organization furnishing the summary and will include a link to the Commission's Electronic Document Information System (EDIS) where the full written submission can be found.

By order of the Commission.

Issued: May 27, 2020.

Lisa Barton,

Secretary to the Commission.

[FR Doc. 2020–11760 Filed 6–1–20; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation Nos. 701–TA–648 and 731–TA–1521–1522 (Preliminary)]

Walk-Behind Lawn Mowers From China and Vietnam; Institution of Anti-Dumping and Countervailing Duty Investigations and Scheduling of Preliminary Phase Investigations

AGENCY: United States International Trade Commission.

ACTION: Notice.

SUMMARY: The Commission hereby gives notice of the institution of investigations and commencement of preliminary phase antidumping and countervailing duty investigation Nos. 701–TA–648 and 731–TA–1521–1522 (Preliminary) pursuant to the Tariff Act of 1930 (''the Act'') to determine whether there is a reasonable indication that an industry in the United States is materially injured or threatened with material injury, or the establishment of an industry in the United States is materially retarded, by reason of imports of walk-behind lawn mowers from China and Vietnam, provided for in subheading 8433.11.00 of the Harmonized Tariff Schedule of the United States, that are alleged to be sold in the United States at less than fair value and alleged to be subsidized by the Government of China. Unless the Department of Commerce (''Commerce'') extends the time for initiation, the Commission must reach a preliminary determination in antidumping and countervailing duty investigations in 45 days, or in this case by July 10, 2020. The Commission's views must be transmitted to Commerce within five business days thereafter, or by July 17, 2020.

DATES: May 26, 2020.

FOR FURTHER INFORMATION CONTACT: Nitin Joshi (202) 708–1669), Office of Investigations, U.S. International Trade Commission, 500 E Street SW, Washington, DC 20436. Hearing-impaired persons can obtain information on this matter by contacting the Commission's TDD terminal on 202–205–1810. Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000. General information concerning the Commission may also be obtained by accessing its internet server (*https://www.usitc.gov*). The public record for these investigations may be viewed on the Commission's electronic docket (EDIS) at *https://edis.usitc.gov.*

SUPPLEMENTARY INFORMATION:

Background.—These investigations are being instituted, pursuant to sections 703(a) and 733(a) of the Tariff Act of 1930 (19 U.S.C. 1671b(a) and 1673b(a)), in response to a petition filed on May 26, 2020, by MTD Products Inc., Valley City, Ohio.

For further information concerning the conduct of these investigations and rules of general application, consult the Commission's Rules of Practice and Procedure, part 201, subparts A and B (19 CFR part 201), and part 207, subparts A and B (19 CFR part 207).

Participation in the investigations and public service list.—Persons (other than petitioners) wishing to participate in the investigations as parties must file an entry of appearance with the Secretary to the Commission, as provided in sections 201.11 and 207.10 of the Commission's rules, not later than seven days after publication of this notice in the **Federal Register**. Industrial users and (if the merchandise under investigation is sold at the retail level) representative consumer organizations have the right to appear as parties in Commission antidumping duty and countervailing duty investigations. The Secretary will prepare a public service list containing the names and addresses of all persons, or their representatives, who are parties to these investigations upon the expiration of the period for filing entries of appearance.

Limited disclosure of business proprietary information (BPI) under an administrative protective order (APO) and BPI service list.—Pursuant to section 207.7(a) of the Commission's rules, the Secretary will make BPI gathered in these investigations available to authorized applicants representing interested parties (as defined in 19 U.S.C. 1677(9)) who are parties to the investigations under the APO issued in the investigations, provided that the application is made not later than seven days after the publication of this notice in the **Federal Register**. A separate service list will be maintained by the Secretary for those parties authorized to receive BPI under the APO.

Conference.—In light of the restrictions on access to the Commission building due to the COVID–19 pandemic, the Commission is

Appendix C
Calendar of Hearing Witnesses

CALENDAR OF PUBLIC HEARING

Those listed below appeared as witnesses at the United States International Trade Commission's hearing via videoconference:

Subject:	Seafood Obtained via Illegal, Unreported, and Unregulated Fishing: U.S. Imports and Economic Impact on U.S. Commercial Fisheries
Inv. No.:	332-575
Date & Time:	September 3, 2020 – 9:30 a.m.

EMBASSY, GOVERNMENT AND GOVERNMENT-AFFILIATED ORGANIZATIONS:

Embassy of Vietnam
The Ministry of Agriculture and Rural Development of S.R. Vietnam ("MARD")
Hanoi, Vietnam

Mr. Pham Quang Huy, Deputy Head of Division, International Cooperation Department, MARD

Embassy of the Russian Federation
Russian Federal Agency of Fisheries, International Cooperation Department
Moscow, Russia

Mr. Vasily Sokolov, Deputy Head of Russian Fisheries and Head of the U.S.-Russian Intergovernmental Committee on Fisheries

Mr. Oleg Rykov, Interpreter for Mr. Sokolov

China Chamber of Commerce of Import & Export of Foodstuffs, Native Produce and Animal By-Products ("CFNA")

Ms. Yu Lu, Vice President

PANEL 1: Processors/Importers, U.S. Producers & Trade Associations

ORGANIZATION AND WITNESSES:

Picard Kentz & Rowe LLP
Washington, DC
on behalf of

Southern Shrimp Alliance

John Williams, Executive Director, Southern Shrimp Alliance

Nathaniel Rickard) – OF COUNSEL

Louisiana Shrimp Association
Venice, LA

Acy J. Cooper, Jr., President

Ronald Anderson, Vice President

Thomas Olander, Chairman

Inter-Cooperative Exchange
Lind, WA

Erling E. Jacobsen, Executive Director

National Fisheries Institute
McLean, VA

Robert DeHaan, Vice President, Government Affairs

Alfa International Seafood, Inc
Miami, FL

Katherine L. Alvarez, General Counsel

Endeavor Seafood
Newport, RI

Todd Clark, Vice President and Partner

Maritime Products International
Newport News, VA

Matthew Fass, President

Panel 2: Academia and Environmental Groups

ORGANIZATION AND WITNESSES:

Conservation International
Arlington, VA

Juno Fitzpatrick, Program Manager, Social Responsibility, Global Fisheries and Aquaculture Program

Seafood Slavery Risk Tool, Inc. and Monterey Bay Aquarium Seafood Watch
Wilmington, DE

Sara L. McDonald, Project Manager

The University of British Columbia
Institute for the Oceans and Fisheries
Vancouver BC, Canada

Professor Rashid Sumaila, Institute for the Oceans and Fisheries & School of Public Policy and Global Affairs

Global Fishing Watch
GlobalFishingWatch.org

David Kroodsma, Director of Research and Innovation

Yoichiro Kimura, Middlebury Institute of International Studies
Monterey, CA

Yoichiro Kimura, Master of Arts Candidate, International Trade and Economic Diplomacy

-END-

Appendix D
Summary of Views of Interested Parties

Interested parties had the opportunity to file written submissions to the Commission in the course of this investigation and to provide summaries of the positions expressed in the submissions for inclusion in this report. This appendix contains these written summaries, provided that they meet certain requirements set out in the notice of investigation. The Commission has not edited these summaries. A copy of all written submissions is available in the Commission's Electronic Docket Information System (EDIS), https://www.edis.usitc.gov. The Commission also held a public hearing in connection with this investigation on September 3, 2020, on a virtual platform. The full text of the transcript of the Commission's hearing is also available on EDIS.

Department of Fisheries, Royal Thai Government

1. Thailand is the world's third largest exporter of fishery and seafood products, accounted for around 8% of total world exports, and is ranked as the seventh largest exporter of fishery products to the US. On average, Thailand exports 224,757.21 tons of fishery products to the US annually, amounted 1.536 billion USD, and imports 121,220.28 tons of fishery products from the US annually, amounted 493.17 million USD. Some 94.64 percent of imports from the US are fishery products, i.e., salmon and Alaska pollock.

2. Thailand's investments in food and fishery industry in the US are worth over 1.080 million USD. Thai companies in the US market, such as C.P. Food Products, Inc., Bellisio Foods Company, and Thai Union North America, Inc., have helped generate employments of more than 61,400 local workers.

3. In terms of combatting IUU fishing, Thailand's work with the EU has been successful, resulting in the lifting of the yellow card on Thailand on January 8th, 2019. Furthermore, the Environmental Justice Foundation (EJF) and other countries have praised Thailand's undertakings in the fight against IUU fishing, citing the country as a role model for flag state, coastal state and port state in the region.

4. Thailand has reformed its national fishery policy, laws and regulations to be in line with international standards as well as developed new tools and mechanisms to manage fisheries and marine resources, such as vessel e-registration, fishing licensing, a robust monitoring, control and surveillance systems, stringent law enforcement, a comprehensive traceability system covering the whole supply chain, and close cooperation on information sharing with relevant states.

5. Thailand has effectively implemented the PSMA (Port State Measure Agreement) since 2016 and, as a result, has been able to prevent 3,492 tons of IUU fishery products from entering into the domestic supply chain. Under Thailand's IUU-Free Policy, the Department of Fisheries has also carried out rigorous monitoring and investigation to ensure that IUU products are not exported.

6. Thailand has played a proactive role internationally through information exchange and cooperation with neighboring countries, particularly the ASEAN Network for Combating IUU fishing (AN-IUU) aiming to fight against IUU fishing in the ASEAN region. Thailand is currently serving as the Network's center.

7. Thailand has made utmost efforts with regards to combatting human trafficking. At present, 100% of the migrant workers employed in the fishing and seafood sectors (114,558 persons in 2019) have

entered Thailand through legal channels. Thailand has recently ratified the ILO C188 and ILO P29 as well as issued the new Labor Protection in Fishing Act, 2019, which is in compliance with the C188/

8. The IUU Fishing Index for assessing the risks of IUU fishing in exporting countries should be carefully and reasonably taken into consideration. These criteria and indicators should be regularly updated to reflex the most recent situations.

9. Any laws or measures used to restrict trade in relation to IUU fishery products should be in compliance with WTO rules.

European Commission, Directorate-General for Maritime Affairs and Fisheries

In the EU, we have since 2010, implemented the EU IUU regulation which has two main tools to combat IUU fishing and prevent illegally caught products from entering its market. One is a catch certification scheme covering most marine fisheries products imported into the EU; the other is a multiple-step procedure for dealing with non-EU countries considered uncooperative in the fight against IUU fishing. In the link is a short overview of the EU IUU policy and its main pillars: https://ec.europa.eu/fisheries/sites/fisheries/files/docs/publications/2019-tackling-iuu- fishing_en.pdf

Under the catch certification scheme every consignment of the majority of fishery products entering the EU must be accompanied by a catch certificate validated by the flag State of the catching vessel. This certificate is submitted by the EU importer to the competent authorities in the importing EU Member State. 92 non-EU flag States have notified their competent public authorities in charge of validation. EU Member States verify the content of the catch certificates and if they have doubts about the validity of or the information in the certificate, they request the validating authorities to provide a clear answer before making the final decision about allowing the fish into the EU market.

In addition, the EU has a dialogue system in place where the cooperation of flag, port, coastal and/or processing States is assessed on the basis of their compliance and fulfilment of international obligations in the fight against IUU fishing.

The purpose of the dialogues is to rectify existing shortcomings through appropriate support to the non-EU countries concerned. If third countries fail to put in place the required reforms in a timely manner, sanctions (red card), including trade bans on their fisheries products, can be imposed. If successful, these dialogues often lead to having new and committed partners cooperating in the fight against IUU fishing. The EU's carding system has proven especially effective in increasing transparency in coastal and flag States, by holding them accountable to their international obligations. As a result, the EU carding scheme has successfully contributed to increased international cooperation in the global fight against IUU fishing.

Within this framework, the European Commission has entered into informal dialogues with more than 60 non-EU countries. The countries involved are flag, port, coastal and processing States and cover most of the world from southern and eastern Asia over the western and central Pacific to the Caribbean and further to West Africa and the Indian Ocean.

A total of 26 countries have been given a yellow card (up to September 2020). However, 27 yellow cards have been issued as Panama received a yellow card for the second time in December 2019 (our first case of recidivism). Currently, eight countries have a yellow card, and three countries have a red card (see attached list or https://ec.europa.eu/fisheries/sites/fisheries/files/illegal-fishing-overview-of-existing-procedures-third-countries_en.pdf). The countries who no longer hold a yellow or a red card have rectified the shortcomings identified and thereby become another global partner in the fight against IUU fishing.

Taiwan Fisheries Agency

1. The reformation of Taiwanese fisheries management and protection of foreign crews on vessels flying the Taiwan flag

The Government of Taiwan continues making rolling adjustments on its policies, laws and regulations in order to strengthen its capacity to combat IUU fishing and enhance the protection of rights and benefits of foreign crews on vessels flying the Taiwan flag.

To combat IUU fishing, the Government has focused on four main aspects to enhance its fisheries management, which are "legal framework", "MCS measures", "traceability" and "international fisheries cooperation". The monitoring of high sea fishing operation (including transshipment) and control over nationals have been remarkably strengthened.

As for the protection of rights and benefits of foreign crews, special legislation has been stipulated to regulate minimum monthly wage & rest time, mandatory life insurance, labor standards and other matters relating to rights protection for foreign crews on the vessels. The permission and evaluation system of the employment agents, random interview with foreign crews as well as appeal mechanisms for foreign crew have been built since 2017. In addition, work to incorporate the ILO C188 Convention into domestic law is underway.

The reformations consistently bring about fruitful outcomes and are definitely worth being considered and valued by the international community.

2. Concern for the application of AIS data

In principle, the requirement for vessels to carry AIS onboard is for the purpose of navigation safety rather than monitoring of fishing activities. Generally, AIS is not regarded as a management tool in fisheries sector either on national or regional level. Furthermore, the features of AIS data, including the unreliability and the vulnerability to manipulation, have been widely discussed in many spheres. The utilization of AIS data for fisheries monitoring shall be reconsidered discreetly.

3. Appeal for holding reservations for some imprudent speeches made by NGOs

Several NGOs were invited as witnesses and expressed their opinions towards IUU fishing as well as forced labor issue. Taiwan appreciated their great enthusiasm and efforts seeking the resolution of IUU-related problems; however, it questions their hasty speeches which might misguide the participants of the hearing and provide them with deficient information. For example, during the discussion on Panel 2, the representative from the Global Fishing Watch stated that IUU fishing would occurred in certain major fleets operating in the high seas for those fleets are ''just so dominant". Are large-scale or "dominant" fleets absolutely in connection with IUU fishing activities? Or, is it just a prejudice against major fishing nations? We believe such statement or any similar speeches delivered in the said hearing lack empirical grounding and shall not be considered while ITC prepares its analysis report.

Southern Shrimp Alliance

Illegal, unreported, and unregulated ("IUU") fishing, including the use of slave and child labor, substantially impacts global trade of both wild-caught and farm-raised shrimp.

With respect to wild-caught shrimp, academic investigations of IUU fishing have concluded that significant volumes of shrimp are landed through illegal and unreported ("IU") fishing. These shrimp are, in turn, internationally traded. Academic researchers have estimated that between twenty-five to forty percent of wild-caught shrimp landed in Mexico is through IU fishing and that wild-caught shrimp comprise thirty-four percent of total Mexican shrimp production. These researchers also estimated that between twenty-five and thirty-five percent of wild-caught shrimp landed in Ecuador is through IU fishing and that wild-caught shrimp comprise ten percent of total Ecuadorian shrimp production. Given the large volumes of shrimp exported from Mexico and Ecuador to the United States, these estimates imply that tens of millions of dollars in IUU wild-caught shrimp is imported into the United States every year from these two countries alone.

Farmed shrimp are also a significant conduit of IUU seafood into the U.S. market. Although a product of aquaculture, farmed shrimp is raised in foreign nations with feed produced from fish and other marine species harvested through IUU fishing. Shrimp aquaculture is reported to consume nearly one-third (thirty-one percent) of the fishmeal used in aquaculture around the world. Estimates of the shrimp farming industry's consumption of fishmeal indicate that shrimp aquaculture would have consumed one and a half million tons of fishmeal in 2018. Investigations of the industries producing aquaculture feed have established that IUU seafood is a significant part of this production process. Demand for aquatic feed produced through IUU seafood is driven by demand for farmed shrimp in major seafood importing markets, including the United States.

The prevalence of shrimp produced through IUU fishing in the U.S. market, whether farmed or wild-caught, demonstrates why traceability requirements for imported seafood are essential. The Southern Shrimp Alliance strongly supports NOAA Fisheries' Seafood Import Monitoring Program ("SIMP"). A review of import data for seafood species covered by SIMP establishes that a traceability requirement, on its own, has already had a significant impact on the U.S. seafood market. Dramatic changes in import patterns for certain seafood products following the imposition of SIMP's traceability requirements indicate that substantial volumes of these products, worth tens of millions of dollars, were likely to have been imported every year despite an inability by suppliers to show that such products were legitimately harvested.

Although U.S. seafood importers continue to strongly object to SIMP, the U.S. seafood market has repeatedly and consistently demonstrated that it is not self-regulating. In the absence of government regulation and meaningful enforcement of the law, the Southern Shrimp Alliance's experience with regard to imported shrimp contaminated with banned and harmful antibiotics, as well as its work to counteract massive shrimp trade fraud, teaches that seafood importers in the United States will pursue the lowest cost sources of supply, with little regard for the integrity of their supply chains.

Appendix E
Existing Literature on the Production and Importation of IUU Seafood

This literature review briefly summarizes techniques used within a broad range of studies that have identified and measured specific and global IUU marine capture landings. It then presents the findings of recent studies that examine the extent of IUU fishing worldwide. This includes a description of a 2014 study that, like this report, focused specifically on estimating or characterizing IUU seafood imported into the United States.

Techniques Used to Measure the Extent of IUU Fishing

Many studies have attempted to measure the extent of IUU fishing, either globally or, more frequently, in specific regions and fisheries. Therefore, this review is not meant to be exhaustive, but instead is designed to indicate some of the main methods that have been used to estimate IUU fishing, along with their advantages and disadvantages.[1190] And while a wide variety of techniques have been used to measure the extent of IUU fishing, they can be broadly divided into two categories: “bottom-up” and “top-down.” The four “bottom-up” techniques this analysis has identified are observation, information gathering through surveys and interviews, identification of IUU fishing risk factors, and remote sensing (e.g., as used in locating vessels). There are also several “top-down” techniques that use existing data to estimate IUU fishing levels. Researchers often use more than one of these techniques when developing IUU fishing estimates.

A technique commonly used to estimate IUU fishing in a given area is observation. It involves using known or suspected instances of IUU fishing as a direct basis for measuring landings, using these practices to estimate IUU practices occurring in a specific fishing area. As described in chapter 2, fishing areas may include individual high seas areas governed by regional fishery management organizations (RFMOs), or exclusive economic zones (EEZs) managed by countries. Such observations may include violations discovered through the monitoring, control, and surveillance (MCS) systems of various countries or RFMOs. It can also include patrol sightings of known IUU fishing vessels within EEZs or high seas areas.

The extent of IUU fishing based on these observations can be derived from the amount of fishing effort that such vessels were likely to be engaged in or, when known, the seafood landings of these vessels. For example, as described in chapter 2, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has measured IUU fishing in the high seas areas under its jurisdiction by measuring verified reports of IUU vessel sightings in these areas and extrapolating catches based on estimated catch and effort data from licensed vessels.[1191] Measuring IUU fishing through official and/or direct observations and known violations can be useful in detecting the existence and types of IUU practices that exist in certain areas. However, the approach has limitations. Observational information is generally

[1190] Identification of specific studies and the analytical frameworks used by those studies was assisted by literature reviews produced in other studies, particularly Macfadyen, Caillart, and Agnew, *Review of Studies*, 2016; Agnew, “Estimating the Extent of IUU Fishing,” 2015.

[1191] CCAMLR Secretariat, *Estimation of IUU Catches of Toothfish*, October 4, 2010. Expanding on this methodology to capture both seen and unseen instances of IUU fishing, a study by Agnew and Kirkwood simulated the level of total IUU activity in a subarea under CCAMLR jurisdiction by approximating the likelihood that such vessels would be seen by patrolling fisheries protection vessels. Agnew and Kirkwood, “A Statistical Method for Estimating the Level,” 2005.

not available for most EEZs or high seas areas. In addition, it is difficult to use this information to estimate the prevalence of IUU for a specific fleet or region due to the targeted approaches that MCS systems frequently use to investigate and discover such violations.[1192]

A primary source-driven approach to estimating IUU fishing includes the use of anonymous surveys and interviews to approximate the extent and type of IUU practices occurring in specific fisheries. Information is gathered from a wide range of stakeholders, including professionals within MCS systems, fishers, port community members, government officials, and other experts. However, using this type of information-gathering approach to produce quantitative IUU estimates is often subject to criticism due to the lack of a statistical basis for the estimates it produces. Criticisms also focus on the lack of transparency surrounding sources, which are frequently anonymous.[1193] Despite these weaknesses, individual market participants are often willing to describe their first-hand knowledge of IUU fishing, particularly when they can do so anonymously, in ways that official sources generally are not.[1194] Many sources of IUU estimates or IUU risk information use confidential discussions to inform or confirm quantitative estimates. Examples include major studies of global fishing or U.S. imports of marine capture products by Agnew et al., Pauly and Zeller (which describes the Sea Around Us Catch Reconstruction methodology), and Pramod et al.[1195]

Another bottom-up method for estimating IUU fishing involves the identification and characterization of IUU risk factors for specific production operations. Measures of IUU risk are identified and then linked with estimated IUU production that is associated with those risks through an assumed quantifiable relationship. Observation of these risk measures within marine capture production is considered to indicate certain levels of IUU production. These production estimates may be aggregated across detailed production observations or extrapolated to reach broader conclusions about the level of IUU occurring within a region. Recent examples of this methodology include two studies by MRAG (a fisheries analytics company) with broad geographic focus: a 2015 study on IUU fishing in various Asian countries and a 2016 study on IUU fishing in the Western and Central Pacific. These studies used somewhat different techniques, but both involved the combination of existing quantitative IUU estimates with systematic

[1192] Macfadyen, Caillart, and Agnew, *Review of Studies*, 2016; Agnew, "Estimating the Extent of IUU Fishing," February 2015, 38–39.
[1193] Agnew, "Estimating the Extent of IUU Fishing," 2015, 39.
[1194] For example, a critique by Hilborn et al. of a 2019 study by Pramod, Pitcher, and Mantha on products imported by Japan argued that the study's reliance on confidential informants was subject to potential errors and analytical weaknesses. These critics referred to the low likelihood that any individual informant would understand the extent of IUU production within supply chains and the challenges posed to authors, article referees, and readers in establishing credible conclusions based on such statements, particularly when the original statements or qualifications of the confidential informants were not reported. In a following defense of their approach, Pramod and Pitcher noted that given the sensitive nature of illegal and unreported catches, researchers must rely on nonpublic information in estimating illegality within supply chains. They asserted that they relied on interviewees with relevant background in seafood supply chains who were involved in management and monitoring of fisheries. Hilborn et al., "Pramod et al. Methods to Estimate IUU," 2019; Pramod and Pitcher, "In Defence of Seafood Import Analysis," 2019; Pramod, Pitcher, and Mantha, "Estimates of Illegal and Unreported Seafood Imports to Japan," 2019.
[1195] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009, 5; Pauly and Zeller, "Catch Reconstruction," 2015, 4, 8; Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014, 104.

consideration of more broadly available qualitative risk information to produce detailed IUU production estimates for these regions.[1196]

Several other studies have used a variety of quantitative and qualitative sources in order to measure risk factors associated with IUU fishing without estimating the extent of IUU production itself. For instance, studies have developed measurements of risk by port state,[1197] by species,[1198] for various types of labor violations at sea,[1199] and for IUU in general across different market participants.[1200] Several resources provide databases of reports that include risk factors by specific fishery; examples include Marine Stewardship Council (MSC) assessment reports, Monterey Bay Aquarium Seafood Watch reports, and reports from FishSource.org.[1201] Frequently, these studies develop country-, species-, or fishery-specific measures of risk based on consideration or aggregation of data from various sources that are weighted and averaged within an index or score. These studies do not themselves provide estimates of IUU fishing.[1202] However, when such risk metrics are applied systematically, using common sources, they can be employed by governments, industries, and others to compare the IUU-preventative performance of various fisheries and identify where key vulnerabilities to IUU exist within the supply chain.[1203] Several of these studies and their data sources were used extensively in the estimation approach described in chapter 3, and are discussed in greater detail there.

As described in chapter 2, an emerging field of research uses remote sensing techniques to detect vessels engaged in possible IUU fishing activity. Remote sensing techniques cover a range of activities, such as at-sea sightings of other vessels by on-ship observers, overflight sightings by aircraft, and use of information from satellites and from automatic identification system (AIS) transponders to identify vessels engaged in activities consistent with IUU fishing. The advantage of remote sensing is its ability to generate both detailed and broad information on potential fishing activities, although identification of the type of fishing occurring—and whether it is IUU fishing specifically—is challenging without direct interactions with these vessels.[1204]

Recent advances in improving detection of IUU fishing using remote sensing have included a variety of research initiatives pursued by Global Fishing Watch (GFW) and its research partners. GFW uses AIS and

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[1196] MRAG, *Review of Impacts of Illegal, Unreported and Unregulated Fishing*, November 2015; MRAG Asia Pacific, *Towards the Quantification of IUU Fishing*, February 2016.
[1197] Hosch et al., "Any Port in a Storm," 2019.
[1198] Petrossian and Clarke, "Explaining and Controlling Illegal Commercial Fishing," 2014; WWF, "Illegal Fishing: Which Fish Species Are at Highest Risk," 2015.
[1199] Tickler et al., "Modern Slavery and the Race to Fish," November 7, 2018; USITC, hearing transcript, September 3, 2020, 221-25 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc. and Seafood Watch) describing the Seafood Slavery Risk Tool.
[1200] Macfadyen et al., *The IUU Fishing Index*, 2019.
[1201] MSC, Track a Fishery database, accessed October 15, 2020; Seafood Watch, Recommendations database, accessed October 15, 2020; SFP, FishSource database, accessed October 15, 2020.
[1202] For example, the authors of the 2019 IUU Fishing Index stated that IUU fishing country scores within their study "cannot, and should not, be used with any algorithm to generate estimated volumes and values of IUU fish catch for different countries" because such scores are not proxies for volumes and values of IUU fish catch. Rather, these scores represented standardized measures of vulnerability, prevalence, and response across different state responsibilities. Macfadyen et al., *The IUU Fishing Index*, 2019, 17–18.
[1203] Macfadyen et al., *The IUU Fishing Index*, 2019, 17–18.
[1204] Agnew, "Estimating the Extent of IUU Fishing," 2015, 39.

other technology on large fishing vessels to collect information on global apparent fishing effort as well as more specific activities, such as at-sea transshipment; information gathered in this way is broken out by detailed geographic area, precise time, and vessel.[1205] In particular, these data, used together with satellite imagery, have been effective at identifying fleets operating where they are not permitted to do so and can be used to estimate quantities of landings by such vessels. A 2020 study by Park et al. used these methods to estimate that in 2018, Chinese fishing vessels operating illegally in North Korean waters captured approximately 164,000 mt of Japanese flying squid (*Todarodes pacificus*).[1206]

Several top-down data techniques have been used to approximate unreported landings. One approach involves comparing reported landings from a specific fleet or country with international trade data.[1207] For example, a study by Clarke, McAllister, and Kirkpatrick estimated that Russian sockeye salmon caught in the Russian Far East between 2003 and 2005 were traded to East Asia at levels that surpassed reported landings from that region by 60 to 90 percent.[1208] Other studies have used stock assessments to approximate total catch (including both reported and unreported catch) based on changes in stocks over time.[1209] These estimation techniques do not identify the type of practices that were used to produce unreported seafood landings, and in some cases the practices included within these estimates may not fit within traditional IUU definitions.[1210]

Many of these techniques have been combined in various ways by researchers seeking to produce broader estimates using a technique known as the "anchor points and influence" approach. This approach is the most common method for analyzing IUU fishing over a time series. Under this approach, "anchor points" (IUU fishing estimates at various points of time) are adjusted over a time series of production data based on "influence factors." Influence factors are frequently qualitative information indicative of changes over time, such as shifts in fisheries management regimes.

The IUU fishing estimates produced in the anchor points and influence studies are frequently derived from a combination of original research and information from other studies. Original research often involves using information-gathering techniques such as surveys of fishers and anonymous sources. It is also common to use top-down estimates based on remote sensing techniques, direct observation, and comparisons of reported landings with other indicators suggesting missing catch. The anchor points and

[1205] GFW, "First Global View of Transshipment at Sea," 2020.
[1206] Park et al., "Illuminating Dark Fishing Fleets in North Korea," July 1, 2020.
[1207] Macfadyen, Caillart, and Agnew, *Review of Studies*, 2016, 14.
[1208] Clarke, McAllister, and Kirkpatrick, "Estimating Legal and Illegal Catches of Russian Sockeye," April 1, 2009, 532–45.
[1209] Stock assessments are estimations of the quantity of fish of a certain species in a certain region. As an example of how these are used to estimate IUU fishing, a study by Payne, Agnew, and Brandão used a stock assessment comparison to estimate that 5,000 mt of unreported Patagonian toothfish were captured in Falkland Island waters between 1994 and 1996. Payne, Agnew, and Brandão, "Preliminary Assessment of the Falklands Patagonian Toothfish Population," December 2005, 344–58.
[1210] Macfadyen, Caillart, and Agnew, *Review of Studies*, 2016, 14.

influence approach has been used and refined across multiple studies, including most of those that provide estimates with broad geographic focus (described below).[1211]

Despite being used in many studies, the anchor points and influence approach is also subject to two major types of criticisms related to the types of sources used to establish these estimates. First, these studies are frequently criticized for the limitations of their underlying data sources, particularly when underlying data necessary for establishing “anchor points” are based on non-scientific or non-specific information. The second major criticism is that different anchor points may have used different definitions of IUU fishing, suggesting that the data therefore may not be consistent. Different studies producing broad IUU fishing estimates often use different definitions of IUU production from underlying data sources. For example, some sources focus predominantly on unreported landings without identifying whether such unreported fishing is actually IUU production, while others focus only on specific aspects of illegality.[1212]

Studies on the Global Extent of IUU Fishing

Relatively few studies have presented global estimates of IUU fishing. Two studies in 2002 and 2005 presented global IUU production estimates considered highly uncertain by the authors themselves within analyses that were otherwise focused on different or broader topics. In a 2002 article by Pauly et al., the authors presented global IUU estimates over time based on a consideration of the incentives for IUU fishing within major fisheries and fishing activities by gear type. Estimated IUU landings for the last year of the time series, 1999, were about 30 million metric tons (mt).[1213] In a 2005 study by MRAG, authors used bottom-up derived estimates of IUU fishing for 10 countries to extrapolate a regional estimate of IUU prevalence within sub-Saharan Africa based on an observed relationship between IUU fishing and national governance. This study estimated that 19 percent of the value of landed seafood in sub-Saharan Africa was derived from IUU fishing. When this percentage was applied globally, about $9.5 billion in global landings could be considered IUU product.[1214]

A 2009 study by Agnew et al. estimated illegal and unreported (IU) fishing on a global basis, and the estimates generated in this study have been frequently referenced and used in later analyses.[1215] This study estimated that between 11 billion and 26 billion mt of IU marine capture seafood, worth between $10 billion and $23.5 billion, was produced annually during the 2000–2003 period. This would equate to

[1211] See, e.g., Pitcher et al., “Estimating Illegal and Unreported Catches from Marine Ecosystems,” 2002; Ainsworth and Pitcher, “Estimating Illegal, Unreported and Unregulated Catch,” 2005; Agnew et al., “Estimating the Worldwide Extent of Illegal Fishing,” 2009; Pramod et al., “Estimates of Illegal and Unreported Fish in Seafood Imports to the USA,” 2014; Pauly and Zeller, “Catch Reconstruction,” 2015; MRAG, *Review of Impacts of Illegal, Unreported and Unregulated Fishing*, November 2015; MRAG Asia Pacific, “Towards the Quantification of IUU Fishing,” 2016.

[1212] Macfadyen, Caillart, and Agnew, *Review of Studies*, 2016; Hilborn et al., “Pramod et al. Methods to Estimate IUU,” October 2019; USITC, hearing transcript, September 3, 2020, 73-74 (testimony of Robert DeHaan, National Fisheries Institute).

[1213] Pauly et al., “Towards Sustainability in World Fisheries,” September 1, 2002.

[1214] MRAG, *Review of Impacts of IUU Fishing on Developing Countries*, July 2005.

[1215] See, e.g., WWF, *An Analysis of the Impact of IUU Imports*, June 16, 2016; WWF, *Illegal Fishing: Which Fish Species Are at Highest Risk*, October 2015; MRAG Asia Pacific, “Towards the Quantification of IUU Fishing,” February 2016; Cutlip, “IUU: Illegal, Unreported, Unregulated Fishing,” October 18, 2016.

between 13.2 and 30.9 percent of reported global catch. It analyzed 292 case study fisheries that comprised 46 percent of reported global marine catch and used estimates of IU for these fisheries, based on published scientific literature and specialist studies, to extrapolate its global estimates. This study determined that there were substantial differences in IU fishing by region and seafood products, as well as mixed trends in the intensity of IU production over time across regions. In addition, it identified a relationship between indices of governance and levels of illegal and unreported fishing, consistent with the 2005 MRAG study's findings.[1216]

A 2020 study by Sumaila et al. used data on unreported landings to estimate the extent of illicit trade in the global fishing sector.[1217] This study used data from the Sea Around Us Reconstructed Catch database to approximate proportions of unreported landings that were likely to be engaged in illicit trade.[1218] It found that between 7.7 million and 14.0 million mt of unreported catches worth about $8.9 billion to $17.2 billion were potentially traded illicitly each year. In addition, it estimated that the potential economic impact from the redirection of fisheries catches away from legitimate trade and from economic activity supporting that trade equated to $25.5 billion to $49.5 billion in annual losses. It further estimated that income losses to seafood workers were between $6.8 billion and $13.3 billion and that lost government tax revenues were between $2.2 billion and $4.3 billion annually.[1219]

A 2014 journal article by Pramod et al. is the only study that has previously attempted to estimate the extent of IU seafood imported into the United States. (Like Agnew et al., Pramod et al. estimated IU rather than IUU fishing.) This study estimated that between 20 to 32 percent of the weight of imported seafood obtained through marine capture methods in 2011 were from IU catches. This seafood had an estimated value of between $1.3 billion and $2.1 billion.[1220] These estimates were derived from more granular estimations of IU practices associated with 30 seafood products produced by 10 U.S. import partners.[1221] To develop these estimates, the researchers used information from a broad variety of primary and secondary sources, including other studies, government data sources, trade data, stock assessments, personal interviews, press reports, and expert opinion.[1222] Using these estimates, a later

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[1216] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
[1217] The study used a definition of illicit trade from the Global Agenda Council of the World Economic Forum, which defined illicit trade as trade that "involves money, goods or value gained from illegal and generally unethical activity. It encompasses a wide variety of illegal trading activities, including human trafficking, environmental crime, illegal trade in natural resources, various types of intellectual property infringements, trade in certain substances that cause health or safety risks, smuggling of excisable goods and trade in illegal drugs , as well as a variety of illicit financial flows." Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020, 1.
[1218] The Sea Around Us Reconstructed Catch's global estimates of unreported landings, which were used extensively in this report, are described in greater detail within the appendix F discussion of Step 1 of the USITC IUU Import Estimate methodology.
[1219] Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020.
[1220] Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014, 105.
[1221] Pramod et al., "Estimates of Illegal and Unreported Fish in Seafood Imports to the USA," 2014, 103–4. Specifically, these granular IU estimations were conducted for 30 country/species combinations accounting for 45 percent of U.S. marine capture seafood imports, and the total IU estimation for all of this product was applied to total U.S. marine capture imports.
[1222] Pramod et al., "Estimates of Illegal and Unreported Fish," 2014, 104. This work built on primary data sources and IU estimates developed in the 2009 study by Agnew et al., which included similar authors. Pramod et al., "Sources of Information Supporting Estimates," 2008.

(2016) study by the World Wildlife Fund found that U.S. fishers could be losing $1 billion, or 19 percent of total revenues from their catch, per year in revenue as a result of these imports.[1223]

[1223] WWF, *An Analysis of the Impact of IUU Imports*, 2016.

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Appendix F
Additional Detail on the IUU Imports Estimation Approach

This section provides additional detail about the Commission's IUU estimation approach, as described in chapter 3. As discussed in that chapter, the Commission adopted a multi-step approach to generating estimates of the extent to which IUU product is imported into the United States. In step 1 of this approach, the Commission combined data from existing sources to produce a detailed database covering marine capture landings and aquaculture production worldwide. In step 2, the Commission estimated the amount of global marine capture landings that are from IUU fishing. These estimates were based on the consideration of landings data along with qualitative risk criteria associated with the likelihood of IUU fishing, IUU fishing estimates from literature, and evidence of labor violations. This resulted in an adjustment of the database for IUU marine capture landings. Step 3 involved the estimation of the extent of IUU product used as feed inputs in global aquaculture production for various species. Step 4 used information on marine capture and aquaculture IUU production to estimate the extent to which U.S. imports contained the products of IUU fishing practices based on a supply chain mapping analysis.

Step 1: Capture and Aquaculture Database Creation

Data Sources

As described in chapter 3, the Commission first created a commercial capture and aquaculture production database that formed the foundation for establishing IUU estimates for each fishery. Commercial landings data from the Sea Around Us Reconstructed Catch database were used to measure marine capture landings, while the Global Production database of the Food and Agriculture Organization of the United Nations (FAO) was used to measure freshwater capture landings as well as all marine and freshwater aquaculture production.

Sea Around Us Reconstructed Catch Data[1224]

Sea Around Us is a research initiative at the University of British Columbia (see chapter 2). The Sea Around Us Reconstructed Catch database contains national-level estimates of reported and unreported landings, broken out by fishing country, fishing area, taxonomic product category (usually at the species level), fishing sector, and other parameters. Sea Around Us uses data from the FAO, other international organizations, and national governments to build a database of reported landings. Sea Around Us then combines local knowledge, academic literature, original research, and information from governments and international research organizations to (1) assign parameters (such as fishing sector and species) to the landings data where otherwise unavailable, and (2) construct estimates of unreported landings over a time series.[1225] In addition, Sea Around Us maps places where fishing is likely to have occurred, based on information related to specific exclusive economic zones (EEZs), a fisheries access agreement

[1224] Pauly, Zeller, and Palomares, "Sea Around Us Concepts, Design and Data," 2020.
[1225] Pauly and Zeller, "Catch Reconstruction," 2015, 2–14.

database, the reported FAO statistical area within the landings data, and information about where various species are concentrated.[1226]

Sea Around Us Reconstructed Catch data (for all EEZs) were extracted from seaaroundus.org on September 7, 2020.[1227] The Reconstructed Catch data used in the Commission's analysis covers the quantity of marine capture landings, by EEZ, year, fishing sector (type of fisher), species, fishing country, and reporting status (reported vs. unreported).[1228] Within the Commission's analysis, only the artisanal and industrial fishing sectors were included—recreational and subsistence fishers were not included.

FAO Global Production database[1229]

The FAO Global Production database provides data on reported national-level capture fisheries and aquaculture production of seafood products. The FAO gathers this information from national authorities, which in turn generally collect data using census-based methods, sample-based methods, or a combination of both. FAO supplements these data using assumptions when data collection methods in certain countries are incomplete, harmonizes data from various sources to the extent possible, and presents these data annually in the *FAO Yearbook of Fishery and Aquaculture Statistics*.[1230]

FAO Global Production Statistics data were extracted from FishStatJ (the FAO app used for extracting large-scale fisheries statistics) on May 19, 2020. Only freshwater capture and freshwater and marine aquaculture were included within the capture and aquaculture database in order to supplement the Reconstructed Catch data.[1231]

Products and Parameters Included within the Capture and Aquaculture Database

The Commission created its initial capture and aquaculture database by combining the Sea Around Us Reconstructed Catch data covering all global marine capture production with the FAO production data

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[1226] Such information regarding the concentration of species includes the latitudinal (north-south) range of species, published distribution ranges of species, and information related to the depth range, habitat preference, and equatorial submergence (preference of various species for certain depth ranges at certain latitudes). This information is used to estimate the concentration of species at detailed (half-degree) latitude and longitude cells, which is then assigned to individual EEZs. Pauly and Zeller, "Catch Reconstruction," 2015, 17–42.
[1227] Data for high seas regions were provided by Sea Around Us in a bulk database on June 4, 2020. These data were not available on the Sea Around Us website when the updated 2016 data were pulled for all EEZs on September 7, 2020. Therefore, high seas marine capture landings are based on 2014 data.
[1228] Other parameters are also available in the Reconstructed Catch database, such as whether the catch type was discards or landings (only landings were included in the Commission's analysis); the type of gear used and end use of products (these were aggregated in the Commission's analysis); broader functional and commercial product groups (which were not considered in the Commission's analysis); and the estimated value of production as well as levels of uncertainty regarding the estimates (also not incorporated in the Commission's analysis).
[1229] FAO, Capture and Aquaculture Production database, accessed May 19, 2020.
[1230] FAO, "Methodology for Data Collection," accessed October 7, 2020.
[1231] The only products included were those quantified in metric tons on a live-weight basis. Products not measured in metric tons were measured in terms of the number of individual animals landed. These products were crocodiles and alligators; sperm whales and pilot whales; blue whales and fin whales; and eared seals, hair seals, and walruses. None of these products were included within the scope of the U.S. import estimate.

covering the quantity of all global aquaculture and freshwater capture production for the year 2016.[1232] The initial capture and aquaculture database contained the following parameters:

- **Source:** This is the fishing or aquaculture-producing country or territory that would normally report landings or aquaculture production.
- **Fishing area:** This is the area where fishing or aquaculture production occurs. For FAO data (aquaculture and freshwater capture), "fishing area" was considered to be within the national inland and marine areas of the source country. For example, all freshwater capture landings reported by Canada were considered to be within the fishing area "Canada (Freshwater Capture)." Each marine capture EEZ was allocated to a specific **coastal country** and **FAO major fishing area**.[1233] For example, the EEZ "Canada (East Coast)" was allocated to the coastal country of Canada and FAO major fishing area 21 (Northwest Atlantic).[1234] In instances where an EEZ crossed multiple FAO major fishing areas, a single FAO major fishing area was assigned based on assumptions about where most fishing occurred in that country.[1235]
- **Species group:** Both data sources used within the capture and aquaculture database listed scientific species names along with broader aggregated or undefined basket categories of species, which were reassigned into Commission-defined species groups (see "species groups" section below).
- **Reporting status:** The marine capture data, derived from the Reconstructed Catch data, had breakouts based on reported vs. unreported landings. These data were important in the ultimate IUU estimation approach, so this parameter was preserved within the Commission's initial capture and aquaculture database. For aquaculture and freshwater capture production, all production was allocated a reporting status of "reported" for purposes of establishing this database.
- **Type:** Referred to the type of capture or aquaculture, including:
    - the **zone** of harvest (whether products were harvested in freshwater or marine areas);[1236]

[1232] 2014 data were used for high seas marine capture production based on a previous version of the Sea Around Us Reconstructed Catch data, as described above.
[1233] FAO divides the world's waters into 27 major fishing areas. FAO, "Fishing Areas for Statistical Purposes," accessed November 30, 2020.
[1234] Sea Around Us allocates all global catches, other than high seas catches, to EEZs that they associate with specific claimants to those EEZs or to countries that could claim EEZs under the United Nations Convention on the Law of the Sea (UNCLOS). These delineations are provided by the Flanders' Marine Institute. When certain zones are disputed (claimed by multiple countries), the same zone is treated as being "owned" by each claimant with respect to their own fisheries catches within that area. Pauly and Zeller, "Catch Reconstruction," 2015, 2; Flanders Marine Institute, "Flanders Marine Institute," accessed December 15, 2020.
[1235] These assignments were Australia's EEZ (FAO major fishing area 57); Angola (47); Gabon and Republic of Congo (34); Costa Rica (Pacific) (77); Greenland (21); India (57); U.S. West Coast (67); Spain (Mainland, Mediterranean and Gulf of Cadiz) (37).
[1236] Marine areas included estuarine or brackish water production.

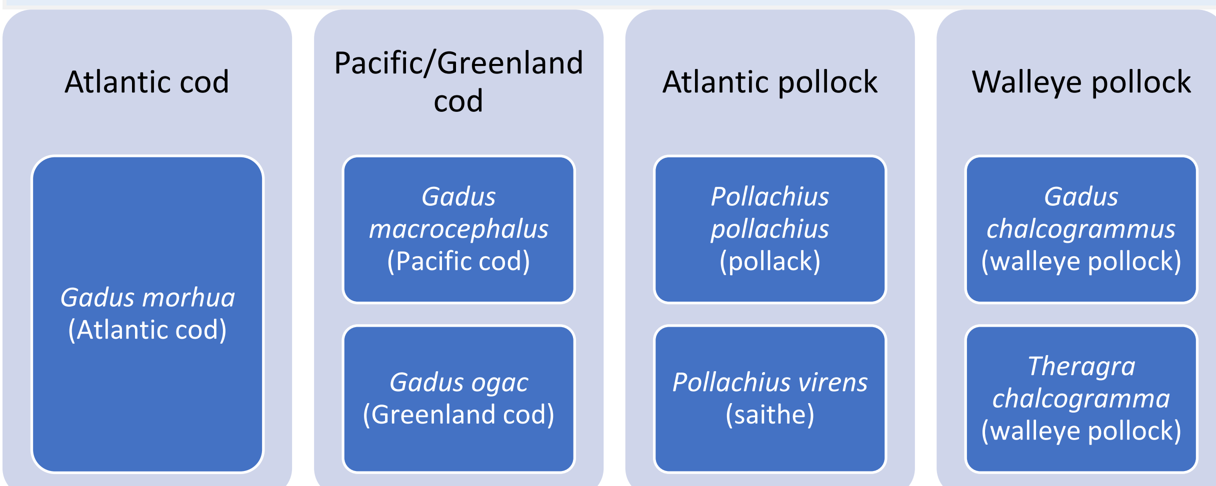
- the **method** of harvest (whether the harvest was through capture production or aquaculture); and
- the **fishing sector** (whether capture was artisanal (small-scale commercial fishing), industrial (large-scale commercial fishing), or undefined (applied to aquaculture and freshwater production)).

- **Quantity:** Quantity of landings or production in metric tons on a live-weight basis.

Species Groups in the Capture and Aquaculture Database

It was necessary to concord the scientific names across the data sources to build the Commission's initial capture and aquaculture database and, for step 4, across international trade data. Each of the four primary data sources used in the IUU import estimation methodology—the Sea Around Us Reconstructed Catch database, the FAO Global production database, U.S. official import statistics, and global import data—included variables that broke out products based on the scientific nomenclature of aquatic animal species that were captured, produced through aquaculture, and traded as seafood. However, these data sources used different scientific names and nomenclature aggregations. Mapping these product breakouts across these data sources required concordance of product breakouts. Product breakouts in each database were assigned to one of 151 "species groups." These species group are detailed commercial groupings of various species that were developed for this report (see example species groups in figure F.1).[1237]

Figure F.1 Examples of species groups (cods and pollocks) and underlying species



Source: Compiled by USITC staff.

[1237] Allocation of individual species, or broader groups of species, into species groups involved multiple resources, including (1) the common names of species included within these data sources and the Harmonized Tariff Schedule and (2) several global species databases, including FishBase, SeaLifeBase, and the World Register of Marine Species (WoRMS). FishBase, FishBase database, December 2019; SeaLifeBase, SeaLifeBase database, July 2020; WoRMS Editorial Board, WoRMS database, 2020.

Species groups were defined with the objective of capturing as much detail as possible in scientific nomenclature descriptions within the trade databases, which were generally less detailed than those in the capture and aquaculture databases.[1238] Because most capture and aquaculture source data had product breakouts based on species-level scientific nomenclature, most observations within the capture and aquaculture database were aggregated into species groups that were broader, including multiple species. In other cases, U.S. and global import data referred to individual species, and in these cases, there was a straightforward assignment of all capture and aquaculture data to detailed species groups that matched those individual species.[1239]

Within the source data, there were also a substantial number of observations that involved more broadly defined products than any species group. These broader categories were frequently at the next taxonomic level higher: for example, landings of brachyura, the name of an infraorder which refers to all crab and would cover multiple underlying species groups. Such broad product categorization often occurred due to a reporting source country not providing detailed information about capture and aquaculture in specific areas.[1240] In order to map these data to more detailed species groups, a series of steps were taken to separate quantities associated with these product categories into multiple observations.

- Broad product categories were mapped to (concorded with) underlying species groups based on the taxonomic relationship between these products. For example, *Lutjanus*, a genus of marine snappers, was mapped to underlying species groups covering red snapper (i.e., *Lutjanus campechanus*) and "other snapper" (including, e.g., *Lutjanus synagris* (lane snapper) and *Lutjanus griseus* (grey snapper)).
- When observations within the source data were defined under broader groups of species, these quantities were separated and allocated to underlying species groups. Quantities were divided between species groups proportionally based on known quantities by species group within a given fishing area and type. For example, Indonesia's industrial marine capture landings of *Lutjanus* within the Indonesian Eastern EEZ were allocated to the two underlying snapper species groups based on all species group-specific industrial marine capture landings (from all fleets) of these species groups within that region.
- In some cases, there were limited (less than 1,000 mt) or no known quantities on the species group level for a given fishing area and type. In these cases, landings for broader product categories were broken out into species groups based on global proportions by type of harvest (a term that combines method and zone of harvest and fishing sector, as described above). In

[1238] For example, within the U.S. import database, the Harmonized Tariff Schedule of the United States (HTS) 10-digit code—HTS 0302.51.0020—refers to fresh or chilled cod other than Atlantic cod (therefore including Pacific and Greenland cod). Within the production databases, production data are available for the three different cod species. Therefore, one species group is referred to as "Atlantic cod," and another species group is referred to as "Pacific/Greenland cod" (Greenland cod is likely a far smaller volume of U.S. imports than Pacific cod based on the location of partner countries and the extent of global capture, and therefore references to this product within chapter 3 and elsewhere in the report are to "Pacific cod").
[1239] For example, haddock is an individual species with observations in both the FAO and Sea Around Us data. Fresh and chilled haddock is covered by a 6-digit international Harmonized System (HS) tariff schedule code (HS 0302.52) and, in the Harmonized Tariff Schedule of the United States has a 10-digit code (HTS 0302.52.00.00).
[1240] For example, a substantial quantity of global landings were reported as "marine fishes not identified."

cases where there were no known quantities on the species group level for a type, global proportions for any type were used. For example, marine capture landings of snapper by Indian industrial vessels in the Indian EEZ were only available for an aggregate snapper category, and there were no species group-specific marine capture industrial landings of snappers in the Indian EEZ. As a result, global marine capture industrial landings of snappers were used to determine the extent to which these were red snapper or other snappers. In this case, the vast majority of Indian landings of snapper were allocated to other snappers, which comprise virtually all global industrial landings of snapper.

Step 2: IUU Marine Capture Estimation

As described in chapter 3, the Commission developed estimates of IUU fishing within marine capture landings on a global basis. Unreported landings from the Sea Around Us were used as initial IUU marine capture estimates for each fishery.[1241] For each marine capture estimate, the Commission characterized marine capture landings as fitting within one of 12 possible "risk profiles" that qualitatively described the likelihood of IUU fishing within that production according to underlying risk criteria. Each possible risk profile was matched with a range of "benchmark" IUU estimates drawn from a study by Agnew et al. The initial IUU marine capture estimates for each fishery were then adjusted to fit within this range of possible IUU estimates based on the risk profile of that fishery. IUU marine capture estimates were further adjusted based on evidence of forced labor, child labor, or human trafficking violations within source country fleets in order to account for the existence of such labor violations that occur in otherwise non-IUU fishing operations.

Resources Used for Assigning Fisheries Risk

Fisheries risk, along with "fundamental risk," form the risk profile that is used as the primary qualitative characterization of the likelihood of IUU fishing for marine capture landings. Fisheries risk is based on ad hoc research into individual fisheries, which are defined in this analysis as landings for a combination of source country, fishing area, fishing sector, and species group.[1242] Low fisheries risk will generally be accompanied by a lower IUU marine capture estimate for associated landings. Moderate fisheries risk is frequently accompanied by a mid-range IUU estimate, and high fisheries risk will generally be accompanied by a high IUU estimate (see discussion below regarding "Assignment of Risk Profiles to Ranges of Possible IUU Estimates"). Fisheries risk was determined only for a portion of global production (over 3,500 fisheries); however, U.S. imports from these fisheries accounted for approximately 75 percent of U.S. imports of marine capture products. This section describes the main sources considered within these analyses.

[1241] The term "fishery" has been used in the IUU estimation approach to refer to combinations of source country, fishing area, fishing sector, and species group within marine capture landings.

[1242] Although fishing sector was included as a parameter within fisheries risk characterizations, the same fisheries risk was used for both industrial and artisanal marine capture landings for virtually all source fishing for individual species groups in specific fishing areas. There was one exception: Peruvian fisheries for anchoveta, menhaden, and other forage fish (which are practically all anchoveta). Peru's industrial marine capture landings of anchoveta in the Peru EEZ were considered to have low fisheries risk, whereas artisanal landings were considered to have high fisheries risk. The basis for these two divergent risk profiles is described in box 3.2 of chapter 3.

Overall Framework for Determining Fisheries Risk

Fisheries risk characterizations were based on consideration of one or more resources that provided information on individual fisheries. These characterizations were generally not assigned in the same way as the fundamental risk assignments made at the country and fishing-area levels (described in chapter 3 and below), which were based on a systematic, hierarchical analysis of a consistent set of criteria. Such information was not available for the diverse group of major fisheries supplying U.S. import supply chains. Instead, fisheries risk was determined on a case-by-case basis by weighing analyses from available resources. The three levels of fisheries risk included:

- **High fisheries risk:** Assignment of high fisheries risk was generally based on the following information: (1) quantitative estimates or qualitative analyses from other studies indicated that IUU fishing was prevalent; (2) a fishery had clear weaknesses with regard to government enforcement of and fishers' compliance with fisheries management regulations and laws; or (3) a fishery's management system was weak overall, suggesting that any regulations or laws applicable to that fishery were not well enforced or complied with.
- **Moderate fisheries risk:** Assignment of moderate fisheries risk was generally based on the following information: (1) there was mixed evidence regarding the extent of IUU fishing in the fishery; (2) there was some apparent IUU fishing, but it was not prevalent; or (3) the fishery was in a state of flux, particularly when a fishery with a history of IUU fishing was experiencing significant improvements in its ability to address these problems.
- **Low fisheries risk:** Assignment of low fisheries risk was generally based on the following information, often in combination: (1) robust and/or longstanding government enforcement systems were in place; (2) strict, clearly understood, and utilized penalties for non-compliance were in regular use; (3) fishers routinely complied with regulations, either due to strict penalties routinely enforced, a known industry culture of compliance, economic incentives, or a combination of these; or (4) quantitative estimates or qualitative analyses from other studies indicated that IUU fishing was very low.

Marine Stewardship Council (MSC) Certifications

The existence or prevalence of Marine Stewardship Council (MSC) certifications within a fishery was the most commonly used basis for characterizing fisheries risk as "low."[1243] MSC certifications were used because they are the most common global seafood sustainability certification system and provide information at a level of detail that allows characterization of IUU fishing—or lack thereof—at the fishery level. MSC certification follows a process of assessment by independent certification bodies and allows seafood products from certified fisheries to carry blue MSC labels on consumer-facing products to indicate the sustainability of these products.[1244] MSC certifications, once granted, are generally followed by annual "surveillance" reports conducted by independent bodies, which may result in withdrawal of certifications if any of multiple possible requirements are not met.

[1243] MSC certifications can be searched using this organization's online portal: see MSC, Track a Fishery database, accessed October 15, 2020. MSC certifications were reviewed case by case, and therefore not all MSC certifications were considered in this report.
[1244] MSC, "Fisheries," accessed December 20, 2020.

Of particular importance to analysis of IUU fishing, MSC certifications require that certified fisheries' "monitoring, control and surveillance (MCS) mechanisms ensure the management measures in the fishery are enforced and complied with" (performance indicator 3.2.3). The criteria used to determine whether this standard is met consider the effectiveness and extent of MCS systems, the application of sanctions to deal with fishers' noncompliance, and the extent of noncompliance in the fishery.[1245]

MSC certifications usually define "fisheries" using a different scope from those considered in this report. The scope of MSC-certified fisheries varies by certification, and in some cases includes multiple species in a specific geographic area, use of a specific gear type(s), and discrete groupings of fishers (e.g., an association of fishers, a few companies, or a specific group of vessels).[1246] In some cases, MSC certifications cover only a narrow scope of all fishing occurring within the broader operations considered in this report. Nonetheless, even where MSC certifications covered only a portion of total fishing within a source/fishing area/species group combination, assessment reports frequently referenced characteristics of enforcement and compliance with broader applicability across a source and fishing area. In addition, it was considered more likely that MSC-certified product would be representative of U.S. imports from these sources, as U.S. retailers frequently require that their products be certified under various third-party certification schemes. Most major grocery chains have sourcing policies that dictate that either all the fish they buy or a high (and rising over time) percentage of it come from fisheries that are either MSC certified or in a Fisheries Improvement Project (FIP) working towards certification.[1247]

Therefore, the information within an MSC certification report, as well as the MSC certification itself, supported characterizations of specific fisheries as having low fisheries risk.[1248] Frequently, this information was determinative even when conflicting information existed in other sources. The reliance on MSC certifications in these circumstances was due to the fact that (1) MSC assessments and annual surveillance reports were frequently more up to date than other sources; and (2) other sources themselves—particularly Monterey Bay Aquarium Seafood Watch (Seafood Watch), described below—

[1245] Within a certification report, each performance indicator receives a score backed up by qualitative and, occasionally, quantitative analysis indicating how adequately the fishery meets the standard. At the minimum level (SG60) for performance indicator 3.2.3, the certification process ascertains whether (1) MSC "mechanisms exist, and are implemented in the fishery and there is a reasonable expectation that they are effective"; (2) "sanctions to deal with non-compliance exist and there is some evidence that they are applied"; and (3) "fishers are generally thought to comply with the management system under assessment, including when required providing information of importance to the effective management of the fishery." Higher scores within this performance indicator (SG80 and SG100) incorporate higher standards. MSC, *MSC Fisheries Standard Version 2.01*, August 31, 2018, 75.
[1246] MSC, "Fisheries," accessed December 20, 2020.
[1247] Berry and Weaver, "Exporting Ecolabels," July 2018, 13–14.
[1248] According to industry sources, MSC certifications generally indicated that IUU fishing was likely limited in currently MSC-certified fisheries, although there was more variation in fisheries working toward MSC certifications through FIPs. Industry representative, virtual roundtable, September 29, 2020, 51–52; industry representative, virtual roundtable, October 13, 2020, 33–34; industry representative, interview by USITC staff, October 9, 2020.

consider MSC certifications to be representative of highly effective fisheries enforcement.[1249] However, where conflicting information existed from other resources and where MSC reports provided mixed findings, such as in MSC certification reports related to Pacific salmon captured in the Russian Far East, such information was generally used to support moderate risk findings (see chapter 3). MSC certification information was not generally used as a basis for assigning high fisheries risk, as the absence, suspension, or withdrawal of such certifications did not provide direct evidence of IUU fishing in these fisheries.

Seafood Watch Recommendations

Seafood Watch is a sustainable seafood ratings program that uses a "stoplight" system—including purchasing recommendations of "Best Choice," "Good Alternative," and "Avoid"—to rate the environmental sustainability of various seafood products.[1250] Multiple criteria are considered within these recommendations, but those most relevant to IUU fishing are within the "management effectiveness" criteria of these recommendations, particularly factor 3.4 ("enforcement of and compliance with management regulations").[1251] Therefore, the Commission reviewed Seafood Watch reports within most of its fisheries risk analyses, and took into account the overall findings for factor 3.4 and for "management effectiveness" as well as underlying information presented within these reports in support of these findings. This information, including the time period in which this information was developed, were weighed along with other available sources of information in order to reach fisheries risk findings of low, moderate, or high.

FishSource.org Profiles

FishSource.org is an online database created by the Sustainable Fisheries Partnership to provide major seafood buyers with information on the sustainability of fisheries, as well as the improvements the

[1249] Seafood Watch has considered its own criteria within its seafood recommendations compared to the minimum criteria required for fisheries to obtain MSC certifications. Overall, Seafood Watch considers MSC-certified products to meet at least a Seafood Watch "Good Alternative" recommendation, which is below their highest "Best Choice" recommendation. However, Seafood Watch considers MSC certification's minimum requirements with respect to enforcement of fisheries management measures (performance indicator 3.2.3) to be equivalent to their own maximum "highly effective" rating for enforcement. Frequently, Seafood Watch does not produce recommendations on MSC-certified fisheries, instead recommending these products as equivalent to at least Good Alternatives. Seafood Watch, *Benchmarking Equivalency Draft Results Assessed Against the Seafood Watch Fisheries Criteria*, January 2013; USITC, hearing transcript, September 3, 2020, 220-21 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc., and Monterey Bay Aquarium Seafood Watch); Seafood Watch, "Eco-Certified Seafood," accessed December 20, 2020.
[1250] USITC, hearing transcript, September 3, 2020, 220-21 (testimony of Sara McDonald, Seafood Slavery Risk Tool, Inc., and Monterey Bay Aquarium Seafood Watch). Recommendations and associated reports are provided in an online database. Seafood Watch, Recommendations, accessed October 15, 2020.
[1251] Factor 3.4 includes underlying criteria related to the degree of regular enforcement and verification of fisheries management regulations and the government's capacity to control, ensure and report compliance within the fishery. Factor 3.4 can be found to be "highly effective," "moderately effective," or "ineffective." In addition, if IUU fishing is over 25 percent within a fishery, overall "management effectiveness" is considered to be "critical." In certain reports, including those with critical ratings, no finding was made for factor 3.4, in which case the overall "management effectiveness" findings were considered. Seafood Watch, *Seafood Watch Standard for Fisheries*, April 2020, 34–35.

fisheries need to make to become more sustainable.[1252] This resource contains profiles on individual fisheries around the world, including brief descriptions of enforcement and compliance issues as well as "fishers' compliance" scores, which deal with whether fishers comply with the rules and policies set by fisheries management bodies.[1253] Because FishSource profiles frequently offer less underlying information than the reports associated with MSC certifications and Seafood Watch recommendations, they were not considered in some cases when more comprehensive information was available. Nonetheless, this resource had considerable breadth in terms of global coverage of many individual fisheries and was therefore used extensively in fisheries risk characterizations.

Other Fishery-Specific Resources

A variety of other resources were used to analyze fisheries risk. Where source countries had known major IUU fishing problems, particular attention was paid to recent research. For example, studies published in 2020 indicated that China's squid fishing relied substantially on IUU fishing both in distant-water fishing and closer to the Chinese EEZ, indicating high fisheries risk for all Chinese-captured squid.[1254] Particular attention was also paid to various fisheries in the Russian Far East, which has historically been a substantial source of U.S. imports of IUU products. For fisheries risk characterizations of these products in this study, more recent research and statements from industry witnesses at the Commission's hearing indicated that the levels of IUU fishing in this region had declined. This is discussed in greater detail in the chapter 3 species group profiles. In some cases, other studies that produced quantitative IUU fishing estimates were used as a basis for assigning fisheries risk. For example, a 2016 study by MRAG which produced IUU estimates for much of the Western and Central Pacific Fisheries Commission area was used as a basis for fisheries risk characterizations for tuna and swordfish captured by many of the small Pacific island countries and other fleets operating in this area.[1255]

Fundamental Risk Criteria

"Fundamental risk" is a component of risk profiles used in this report to adjust IUU marine capture estimates, with findings of "high," "moderate," or "low" risk assigned to all global marine capture landings based on the source country and fishing area parameters. Fundamental risk was determined based on underlying risk findings for "IUU prevalence," "IUU vulnerability," and "national governance risk," which were themselves determined based on whether specific criteria met certain thresholds. This section provides detail on the individual risk criteria within IUU prevalence, IUU vulnerability, and national governance risk.

[1252] SFP, "About FishSource," accessed December 20, 2020; SFP, FishSource database, accessed October 15, 2020.
[1253] Frequently, fishers' compliance is based on whether fishers catch fish over the quota set by managers. Cannon, "FishSource Scores: How They're Calculated," accessed December 20, 2020, 12–14.
[1254] Park et al., "Illuminating Dark Fishing Fleets in North Korea," July 1, 2020; Oceana, "Oceana Finds 300 Chinese Vessels Pillaging the Galapagos for Squid," September 2020.
[1255] MRAG Asia Pacific, *Towards the Quantification of IUU Fishing*, February 2016. For a list of additional resources used to assign fisheries risk, other than those cited in appendix F and in chapter 3, see the bibliography section below ("Additional Resources Used to Assign Fisheries Risk").

Overall Framework for Determining Fundamental Risk

Fundamental risk assignments were based on a hierarchical system of criteria which were drawn from globally focused resources in order to reach conclusions about the likely extent of IUU fishing for each source country's fishing within each global fishing area. Such criteria contributed to successively higher risk findings based on a threshold approach. Specifically:

- **High fundamental risk:** If there was information indicating that IUU fishing within a given source country/fishing area combination was likely extensive according to any underlying set of criteria, then fundamental risk for those landings was considered "high," notwithstanding the absence of supportive evidence when looking at other criteria. For this reason, if a source country/fishing area combination had high risk of IUU prevalence, IUU vulnerability, or national governance risk, then fundamental risk was also high.

- **Moderate fundamental risk:** A moderate assignment of fundamental risk was based on there being some evidence of IUU prevalence, IUU vulnerability, or national governance risk, but no evidence of high fundamental risk based on any of these underlying criteria.[1256] Most global marine capture landings likely have some level of IUU risk, and global seafood supply chains are frequently complex and nontransparent.

- **Low fundamental risk:** If a source country's marine capture landings within a fishing area were not linked with IUU prevalence or vulnerability, and both the source country and coastal country had strong national governance indicators (i.e., low national governance risk), fundamental risk was considered low.

The Commission's use of a qualitative threshold approach for determining fundamental risk differed from prior studies that combined criteria into aggregated linear indexes of overall risk.[1257] The threshold approach used in this report was intended to avoid problems associated with selection bias and false negatives when characterizing the extent of IUU fishing. For any given criterion, evidence suggesting the existence of IUU fishing may be enough to indicate a more systemic likelihood of IUU fishing for a given country, but lack of evidence of IUU fishing would not itself indicate that IUU fishing was unlikely.

For some criteria, sources of information may focus predominantly on countries or fishing areas that are relevant to a specific type of IUU fishing or are of greater economic significance. For example, Mexico is one of several countries that are regularly listed in NOAA Fisheries biennial reports that focus on fishing violations in U.S. waters (which Mexico neighbors) and in areas administered by regional fisheries management organizations (RFMOs), while Vietnam (a distant, primarily regional fishing country) has not been listed in these biennial reports. On the other hand, Vietnam—the seventh-largest source of European Union (EU) seafood imports—is one of the relatively few countries with an EU yellow card, while Mexico, the 34th-largest source of EU seafood imports, has not received an EU card. The two

[1256] In the rare instances where there is a total absence of information about prevalence, vulnerability, or governance for a given source country and fishing area, moderate fundamental risk was assumed.

[1257] See, e.g., Hosch et al., "Any Port in a Storm," June 3, 2019; Macfadyen et al., *The IUU Fishing Index*, 2019. These studies also characterized indicators within specific "threshold bands" or "threshold values," but in many cases treated zero or low values for specific IUU-related indicators (e.g., relatively few NOAA identifications) as being consistent with an absence of IUU fishing practices, which had the practical effect of weighting overall country-specific IUU risk index scores downward.

criteria together suggest that IUU fishing is prevalent in both countries (contributing to high fundamental risk findings for both) despite the absence of risk information for each country in one criterion.

IUU Prevalence Risk Criteria

Certain official governmental or intergovernmental resources explicitly list specific source countries or vessel flags associated with IUU marine capture landings, providing direct affirmative evidence that source countries' vessels are engaging (or have recently engaged) in IUU fishing. The resources relied upon in this report, which are described in greater detail in chapter 2, included RFMO/Interpol IUU vessel lists, NOAA Fisheries biennial reports, and the EU carding system.[1258] These resources focus on different components of IUU fishing but are considered indicative of broader systemic IUU fishing issues within source country marine capture fisheries. None of these resources explicitly cover labor violations in the fishing sector; however, the IUU fishing practices identified in these resources have been linked with forced labor and human trafficking, including in some instances by the resources themselves.[1259]

All marine capture landings of a source country were considered to have "high IUU prevalence" if any one of these three criteria were considered "high risk." Source countries were considered high risk if they were repeatedly or comprehensively referred to in at least one of these criteria's reference materials. All marine capture landings of a source country were considered to have "moderate IUU prevalence" if any of these three criteria were considered "moderate risk." Moderate risk was assigned when source countries were less frequently referred to in the underlying reference materials, but these references nonetheless suggested the existence of IUU fishing within that country's fleets.

RFMO and Interpol Lists

RFMO and Interpol vessel lists provided an indication of which countries' fleets have engaged in IUU fishing in the recent past. Information about IUU fishing vessels on these lists were drawn from the Combined IUU Vessel List produced by Trygg Mat Tracking (TMT).[1260] If a country's flagged vessels were listed multiple times (twice or more), it indicated that a country's enforcement of regulations covering its industrial fishing fleet was likely broadly inadequate to prevent IUU fishing. If this threshold was met, high and moderate risk for this criterion was determined based on the following:

[1258] These resources were also used to establish evidence of IUU risk in other studies. See, e.g., Macfadyen et al., *The IUU Fishing Index*, 2019; Hosch et al., "Any Port in a Storm," June 3, 2019.

[1259] In its 2019 biennial report, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) described the linkages between IUU fishing, forced labor, and human trafficking. NOAA Fisheries, *2019 Report to Congress*, 2019, 77–78. One industry witness indicated that labor reforms in the Thai fishing sector stemmed at least indirectly from consultations that occurred as a result of EU yellow card placed on Thailand, and the European Commission (EC) indicated in its press release removing this yellow card that these reforms had occurred. Industry representative, interview by USITC staff, December 10, 2020; EC, "Commission Lifts 'Yellow Card' from Thailand," January 8, 2019. In a 2019 study, Oceana used data from Global Fishing Watch to track the fishing and port visit behavior of individual vessels that appeared on vessel lists and also engaged in forced labor and human trafficking violations. Oceana, "Illegal Fishing and Human Rights Abuses at Sea," June 2019.

[1260] TMT, "IUU Vessel List," accessed December 10, 2020. Listed vessels include (1) those currently on the Combined IUU Vessel List as of December 10, 2020; or (2) those that were added in 2015 or after but were later removed.

- **High risk**: A source country's flagged vessels accounted for a higher share of all flag-identified vessels on the Combined IUU Vessel List than that country's share of global reported industrial marine capture landings, indicating that the source country's appearance on these lists is disproportionally high relative to that country's industrial fishing activity.[1261]
- **Moderate risk**: A source country's flagged vessels accounted for a lower share of all flag-identified vessels on the Combined IUU Vessel List than that country's share of global reported industrial marine capture landings, indicating that the source country appears on these lists multiple times, but not disproportionally relative to that country's industrial fishing activity.
- **No risk factor assigned**: If a source country's flagged vessels appeared on the Combined IUU Vessel List only once (or not at all), this information was insufficient for determining any degree of IUU prevalence.

NOAA Fisheries' Biennial Reports

NOAA Fisheries' biennial reports contain in-depth analysis supporting the identification of IUU marine capture practices within source countries' fishing fleets, and therefore support findings of IUU prevalence within these countries.[1262] Nonetheless, these identifications do not fully encompass all IUU fishing by source countries. The IUU definition used by NOAA Fisheries, which primarily covers RFMO violations and unauthorized foreign fishing in U.S. waters, does not cover IUU fishing either in fishing countries' own EEZs or in the EEZs of third countries.[1263] In addition, NOAA Fisheries frequently certifies that IUU allegations from a prior report have been appropriately addressed.[1264] Therefore, NOAA Fisheries' listing of a source country may not by itself indicate that that country's IUU production is common outside of high seas or U.S.-proximate fishing activities. Therefore, the characterization of IUU prevalence risk in this report considers whether countries appear in NOAA Fisheries reports multiple times, as repeated identifications over multiple biennial reports indicate that a source country's IUU fishing likely is a more pervasive problem that extends beyond the specific violation or violations identified by NOAA Fisheries.[1265]

[1261] Reported industrial marine capture landings were gathered using Sea Around Us Reconstructed Catch data as compiled within the Capture and Aquaculture Database (see step 1). Industrial landings were used based on the expectation that only industrial fishers would appear on IUU vessel lists due to the high seas nature of RFMO governance. Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020.
[1262] NOAA Fisheries, *Improving International Fisheries Management*, 2019, 11. NOAA Fisheries may report that a nation is "of interest" rather than being formally identified if, for example, it determines, based on consultations with the nations involved, that there is sufficient information that either refutes allegations or shows appropriate corrective actions have been taken. NOAA Fisheries, *2017 Report to Congress*, 2017, 18.
[1263] Specifically, the definition used by NOAA Fisheries to identify fishing nations as engaged in IUU fishing includes (1) fishing in violation of international measures required of a party under an international fishery management agreement to which the United States is also a party; (2) undermining RFMO conservation and management measures by both parties and non-parties in RFMOs in which the United States is also a party; (3) destructive fishing practices in vulnerable marine environments beyond national jurisdiction and not otherwise governed by international agreements; and (4) foreign fishing in U.S. waters. NOAA Fisheries, *2019 Report to Congress*, 2019, 19–22.
[1264] NOAA Fisheries, *2019 Report to Congress*, 2019, 18, 31.
[1265] These reports are available on the NOAA Fisheries website. NOAA, "Identification of IUU Fishing Activities," accessed December 16, 2020.

- **High risk**: If a country was formally identified in three or more of the five biennial reports produced over the past decade (2011–19), this indicated that IUU fishing has been pervasive within a country's fleet in a way that is has not been systemically addressed, even if the country took steps to resolve specific problems identified in prior reports necessary for certification.
- **Moderate risk**: If a country was formally identified or considered "of interest" two times, or at least once in the more recent (2017 or 2019) reports, the repeated or recent evidence of IUU activity was sufficient to consider the country's fishing fleet to have moderate IUU prevalence.
- **No risk factor assigned:** If a country was identified or considered "of interest" only once in a report before 2017, this suggested that the issues considered by NOAA Fisheries were either somewhat isolated or had been resolved more systemically since that time. Therefore, a single reference in an older NOAA Fisheries report was not considered evidence of IUU prevalence in recent marine capture.

European Union Carding System

The European Commission (EC) maintains a process for notifying, identifying, and listing non-cooperating third countries that fail to uphold their responsibilities to combat IUU fishing, which is frequently referred to as the EU carding system. EU "yellow cards" and "red cards" on countries generally are issued following years of informal consultations between the EC and these countries. Due to the potentially severe consequences of countries being listed, these identifications are only considered a measure of last resort when countries fail to cooperate on implementing policies to address IUU fishing.[1266] Therefore, if a country had a yellow or red card currently or recently, it indicated that IUU fishing likely existed within that source country's marine capture operations.[1267]

- **High risk**: If a country was subject to a yellow or red card, then IUU fishing was likely extensive in those source countries' marine capture operations.
- **Moderate risk**: If a country had been subject to a yellow or red card but had been delisted or removed from pre-identification in 2015 or later (i.e., had the card removed), it indicated that the country had taken regulatory and legal steps to improve its efforts to combat IUU fishing.

[1266] Before publicly identifying a country under this system, the EC will informally engage in dialogue to address the EC's position as well as discuss evidence that the country is not upholding duties under international law as a flag, port, coastal, or market state. If the situation does not improve, the EC will publicly notify a country that they may be identified as non-cooperating. This status is frequently referred to as "pre-identification" or as a "yellow card," and involves formal dialogue between the EC and the third country to resolve the identified issues within an appropriate time frame. If no action is taken, the Council of the European Union may identify and list the country as a non-cooperating third country, which will prevent that country from trading seafood with European Union members among other consequences. This status is frequently referred to as a "red card." A country can have its pre-identification (yellow card) or listing (red card) removed with continued improvements and dialogue with the EU. EC, *Handbook on the Practical Application of Council Regulation (EC) No. 1005/2008*, October 2009, 82; EC, "Tackling IUU Fishing," October 2019; Macfadyen et al., *The IUU Fishing Index*, 2019, Methodology Indicator 30; EC, "Questions and Answers: IUU Fishing in General and in Thailand," January 2019.

[1267] Card status was determined based on a listing of carded countries on the EC website as of September 17, 2020. EC, "Overview of Existing Procedures as Regards Third Countries," accessed September 17, 2020.

However, such regulatory improvements did not necessarily mean that full implementation of those new procedures on the ground or changes in practices by fishers had occurred.[1268]

- **No risk factor assigned:** If a country had been subject to a yellow or red card, but was not subject to that card in 2015 or later, then no risk finding was assigned for this criterion.

IUU Prevalence Summary

In 2019, the United States imported an estimated $1.9 billion of seafood sourced from marine capture landings considered to have high IUU prevalence. Major source countries included within this grouping were China and India (based on the frequency by which these countries' flagged vessels appeared on RFMO/Interpol lists); Mexico (based on its frequent identification in NOAA Fisheries biennial reports); Vietnam (based on its current EU yellow card); and Ecuador (based on both NOAA Fisheries biennial reports and its current yellow card) (see table F.1).

In addition, the United States imported about $2.8 billion of seafood sourced from marine capture landings estimated to have moderate IUU prevalence. Major source countries and territories with moderate IUU prevalence included Russia and Indonesia (based on occasional vessels appearing on RFMO/Interpol lists and references in NOAA biennial reports) and Taiwan, South Korea, and Thailand (based on references in NOAA Fisheries biennial reports and recent delistings or removals from the EU carding system) (see table F.2).

[1268] For example, the EC gave Panama a yellow card for a second time in December 2019 after it revoked the prior yellow card in October 2014. The EC has noted that "Panama did not ensure adequate implementation of the system that had been set up to fight against IUU fishing upon the lifting of the first yellow card." EC, "IUU Fishing and Issues at Stake in Panama," December 2019.

Table F.1 IUU prevalence criteria for top 10 high IUU prevalence source countries/territories, by estimated U.S. marine capture import value, 2019

Source	Value of U.S. imports from source (million $)	RFMO/Interpol vessel lists		References in NOAA biennial reports			Current EU card status	Basis for identification as high IUU prevalence source
		Number of listed vessels	High share of vessels?	Identified	"Of interest"	Referenced in '17 or '19		
China	615.6	26	Yes	0	0	No	None	Vessel lists
Mexico	439.3	0	([a])	4	0	Yes	None	NOAA reports
Vietnam	383.3	0	([a])	0	0	No	Yellow	EU card
India	284.6	10	Yes	0	0	No	None	Vessel lists
Ecuador	102.7	0	([a])	5	0	Yes	Yellow	NOAA reports and EU card
Panama	69.2	1	No	1	1	Yes	Yellow	EU card
Kiribati	22.5	0	([a])	0	0	No	Yellow	EU card
Trinidad and Tobago	15.4	0	([a])	0	0	No	Yellow	EU card
Colombia	8.0	0	([a])	3	0	No	None	NOAA reports
St. Vincent	3.4	2	Yes		0	No	Red	Vessel lists and EU card

Source: USITC IUU import estimate; TMT, "IUU Vessel List," accessed December 10, 2020; NOAA Fisheries, "Identification of IUU Fishing Activities," accessed December 16, 2020; EC, "Overview of Existing Procedures as Regards Third Countries," accessed September 17, 2020.

Note: "Number of listed vessels" refers to flag-identified vessels on the Combined IUU vessel list, including those added in 2015 or after but later removed. A country was considered to have a "high share of vessels" if that country's vessels accounted for a higher share of total flag-identified vessels on the Combined IUU vessel list than that country's share of global reported marine capture industrial landings. U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

[a] Not applicable.

Table F.2 IUU prevalence criteria for top 10 moderate IUU prevalence source countries/territories, by estimated U.S. marine capture import value, 2019

Source	Value of U.S. imports from source (million $)	RFMO/Interpol vessel lists		References in NOAA biennial reports			Recent EU card delisting?	Basis for identification as moderate IUU prevalence source
		Number of listed vessels	High share of vessels?	Identified	"Of interest"	Referenced in '17 or '19		
Russia	1,114.3	2	No	1	1	No	No	Vessel lists and NOAA reports
Indonesia	674.4	3	No	0	0	No	No	Vessel lists and EU card
Taiwan	280.9	0	([a])	0	2	No	Yes	NOAA reports and EU card
South Korea	196.8	1	No	2	0	Yes	Yes	NOAA reports and EU card
Thailand	99.1	0	([a])	0	0	No	Yes	NOAA reports and EU card
Philippines	97.6	0	([a])	0	1	No	Yes	NOAA reports
Venezuela	87.6	0	([a])	2	0	No	No	NOAA reports and EU card
Spain	59.8	0	([a])	1	2	No	No	NOAA reports
Papua New Guinea	52.4	0	([a])	0	0	No	Yes	EU card
South Africa	35.4	0	([a])	0	2	No	No	NOAA reports

Source: USITC IUU import estimate; TMT, "IUU Vessel List," accessed December 10, 2020; NOAA Fisheries, "Identification of IUU Fishing Activities," accessed December 16, 2020; EC, "Overview of Existing Procedures as Regards Third Countries," accessed September 17, 2020.

Note: "Number of listed vessels" refers to flag-identified vessels on the Combined IUU vessel list, including those added in 2015 or after but later removed. A country was considered to have a "high share of vessels" if that country's vessels accounted for a higher share of total flag-identified vessels on the Combined IUU vessel list than that country's share of global reported marine capture industrial landings. U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

[a] Not applicable.

IUU Vulnerability Criteria

The IUU vulnerability criteria were used to identify source countries and/or fishing areas where supply chain transparency was reduced by practices that obscured the origin of seafood products, or where fishers were frequently engaged in practices often associated with IUU fishing. These risk factors are associated not only with IUU fishing as defined by FAO but are also frequently linked with labor violations.[1269] Criteria used to assess source country–fishing area IUU vulnerability include:

- **Flag of convenience risk**: Whether other countries' vessels frequently use the source country's flag;
- **Port obscurity risk**: The extent to which the source country has a major port often used by third-country vessels;
- **Transshipment risk**: Whether a fishing area is in a region with major open-water transshipment activity between fleets of different countries;
- **Distant-water fishing (DWF) risk (source)**: The extent to which the source's landings or fishing effort occur in other countries' EEZs;
- **DWF risk (fishing area)**: The extent to which a fishing area has foreign landings or fishing effort.

Unlike IUU prevalence criteria, IUU vulnerability criteria did not provide direct evidence of IUU fishing occurring. For this reason, marine capture landings of a source country operating in a specific fishing area were considered to have "high IUU vulnerability" if multiple (two or more) underlying risk criteria reached a "high risk" threshold. If only one underlying risk criteria reached a "high risk" threshold, or if one or more underlying risk criteria only reached "moderate risk" thresholds, then those landings were considered to have "moderate" IUU vulnerability.

Flag of Convenience Risk

Certain countries operate open registries that allow foreign vessels to use their flag or otherwise license specific vessels under their flag. In order to avoid costs associated with legal fishing or risks of potential penalties, IUU fishing vessels frequently use flags of convenience when flag countries with open registries exert minimal regulatory oversight, enforcement activity, or penalizing of illegal behavior, or do not comply with specific international agreements. In addition, flags of convenience allow fishing vessels and carrier vessels to obfuscate the original source of fish landings as well as the owners who benefit financially from them.[1270] This report assigned IUU vulnerability to source countries' landings based on evidence that countries frequently allowed foreign vessels to use their flags, which signaled potential ambiguity as to the actual source of reported landings and, more importantly, greater likelihood that a country's overall enforcement of all flagged vessels was weak (see table F.3).

[1269] See, e.g., Oceana, "Illegal Fishing and Human Rights Abuses at Sea," June 2019; EJF, *Blood and Water*, May 6, 2019; USITC, hearing transcript, September 3, 2020, 212–15 (testimony of Juno Fitzpatrick, Conservation International), 307 (Sara McDonald, Seafood Slavery Risk Tool, Inc., and Monterey Bay Aquarium Seafood Watch); industry representative, interview by USITC staff, December 10, 2020.
[1270] EJF, *Lowering the Flag*, 2009, 7, 10–12; Petrossian et al., "Flags for Sale," June 2020, 3–7.

- **High risk**: 50 percent or more of the vessels under a source country's flag were foreign-owned.[1271]
- **Moderate risk**: 25 percent or more of the vessels under a source country's flag were foreign-owned.
- **No risk factor assigned:** If less than 25 percent of vessels under a source country's flag were foreign-owned, no risk characterization was assigned.

Table F.3 Source countries and territories with high and moderate flag of convenience risk, by estimated U.S. marine capture import value, 2019

Flag of convenience risk	Source	Value U.S. imports from source country (million $)	Share of source country's flagged vessels that are foreign-owned
High	Panama	69.2	62.0
High	Micronesia	60.5	71.1
Moderate	Papua New Guinea	52.4	44.3
Moderate	Suriname	43.2	30.0
Moderate	Mauritania	33.7	25.6
High	Falkland Islands	24.0	55.0
High	Kiribati	22.5	84.6
High	Belize	16.9	88.2
High	Marshall Islands	13.3	50.0
Moderate	Solomon Islands	8.2	47.1

Source: USITC IUU import estimate; Petrossian et al., "Flags for Sale," June 2020.
Note: U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

Port Obscurity Risk

Although many global ports are primarily visited by domestic fishing vessels, there are certain global ports with substantial foreign vessel traffic. Foreign fishing vessels and carrier vessels may use these ports to transship from one vessel to another or to offload seafood for further distribution and processing.[1272] Source countries' port authorities often lack the capacity and coordination with other governments to adequately monitor whether the foreign-captured fish landed in busy ports were harvested using legal methods. For these reasons, vessels engaged in IUU fishing frequently offload their catch in ports with substantial foreign vessel traffic in order to enter their product into global supply chains.[1273]

[1271] These shares were based on data from a 2020 study by Petrossian et al. that focused on the characteristics that make flags of convenience more desirable for fishing vessels to use. These authors developed data showing foreign-owned vessels as a share of total fishing vessels for each flag state for 2013 and 2018. In this report, only 2018 data were used for establishing flag of convenience risk. Petrossian et al., "Flags for Sale," June 2020.
[1272] Hosch et al., "Any Port in a Storm," 2019.
[1273] Hosch et al., "Any Port in a Storm," 2019; industry representatives, interview by USITC staff, May 11, 2020; industry representative, interview by USITC staff, August 6, 2020; industry representative, interview by USITC staff, October 15, 2020; industry representative, interview by USITC staff, December 10, 2020. As described in chapter 2, the Port State Measures Agreement (PSMA) is a major international effort to prevent IUU fishing by denying port access to vessels known to be engaged in these activities. However, this is a relatively new agreement, and there is likely significant variation in port countries' abilities to identify and prevent landings of IUU-captured products.

This report measured port obscurity risk by calculating ratios that compared measures of foreign vessel traffic in source country ports with the source country's reported marine capture landings. Each source country's quantity of reported marine capture landings was aggregated.[1274] Then, within each source country, three measures of foreign vessel traffic were aggregated across all major ports in that country: (1) number of foreign fishing vessel visits; (2) summed hold sizes of all visiting foreign fishing vessels; and (3) summed hold sizes of all foreign carrier vessels.[1275] Reported landings were then divided by each of these aggregate measures of foreign traffic. Based on these measures, if a source country had relatively low ratios of reported domestic landings to measures of foreign traffic, then the actual source of seafood from these countries within global supply chains was considered to have greater obscurity. If a source country had relatively high ratios of reported landings to foreign traffic, then the source country was considered more likely to be the actual source of these products within global supply chains.[1276]

- **High risk**: For any of the three ratios calculated, if a source country had among the lowest 15 ratios among all source countries, then port obscurity risk was considered high.
- **Moderate risk**: For any of the three ratios calculated, if a source country had among the lowest 30 ratios among all source countries, but not among the lowest 15 ratios, then port obscurity risk was considered moderate.[1277]
- **No risk factor assigned**: If a source country did not have among the lowest 30 ratios among all source countries for any of the three ratios calculated, or if a source country did not have a port

[1274] Source countries' reported landings were based on FAO Global Production database for 2017. FAO data were used to measure reported marine capture landings within IUU vulnerability criteria unless more specific estimates were needed, in which case estimates from the Sea Around Us Reconstructed Catch database were used. This decision was based on the need to match reported landings with specific time periods that were unavailable in the Sea Around Us Reconstructed Catch database (e.g., 2017, for port obscurity risk). FAO, Capture and Aquaculture Production database, accessed May 19, 2020.
[1275] Measures of foreign fishing vessel and carrier vessel traffic were derived from a 2019 study by Hosch et al., which developed indexes to measure the risk of IUU product entering global ports. Among the data used to measure such risk, these authors used AIS data to estimate the number of port visits that occurred as well as the aggregate hull sizes of the vessels that visited. These figures included foreign fishing and carrier vessel visits (i.e., visits from vessels that were not from the port country) for 2017. The Hosch et al. data include only the top 100 ports by foreign fishing vessel visits, by foreign fishing vessel aggregate hold size, and by foreign carrier vessel aggregate hold size. Therefore, use of these data for countrywide estimates of port visits or aggregate hold sizes may overstate the ranking of countries with small numbers of large ports relative to countries with greater numbers of smaller ports, as the latter group may not be fully accounted for in the lists of the top 100 ports. Hosch et al., "Any Port in a Storm," 2019. "Hold size" refers to storage space for catch in a fishing vessel and is the most widely used output-based measure of a vessel's fishing capacity. Gréboval, "Managing Fishing Capacity," 1999.
[1276] Within the Commission's supply chain mapping, the trading partner for U.S. imports is known, but the source country (or countries) supplying those imports is inferred based on supply chain analysis.
[1277] Singapore is ranked lowest in terms of all three of these ratios because it has relatively few landings and high amounts of foreign fishing vessel and carrier vessel traffic. By contrast, Canada has high amounts of fishing and does not have one of the 100 busiest ports in terms of foreign fishing traffic, and therefore does not even register in terms of these ratios. Norway is an example of a country that had relatively substantial foreign traffic in certain ports, but also had high reported landings, and therefore does not rank within the lowest 30 source countries across any of these ratios.

within the top 100 busiest global ports in terms of any of the measures of foreign traffic, then no port obscurity risk characterization was made.

See table F.4 for the top source countries and territories, by U.S. marine capture import value, with high and moderate port obscurity risk.

Table F.4 Source countries and territories with high and moderate port obscurity risk, by estimated U.S. marine capture import value, 2019

Port obscurity risk	Source	Value U.S. imports from source country (million $)	Key ports
Moderate	Taiwan	280.9	Kaohsiung is the fifth-largest global port in terms of foreign carrier vessel aggregate hold size, and is an offload port for South Korean and Chinese fleets operating in the Western and Central Pacific.
Moderate	South Korea	198.6	Busan is the largest global port in terms of number of foreign fishing vessel visits and foreign carrier vessel hold size, and is the fourth-largest port in terms of foreign fishing vessel hold size. The vast majority of foreign visits are from Russian-, Chinese-, and Panamanian-flagged vessels.
High	Ecuador	102.7	Manta, a large global tuna port, is the second-largest global port in terms of number of foreign vessel visits. Other major ports include Posorja, Puerto Bolívar, and Guayaquil.
High	Fiji	80.0	Suva, a mid-ocean port that accommodates in-port transshipment and unloading of purse seine tuna catches in the Western Pacific, is the fifth-largest global port in terms of the number of foreign fishing vessel visits.
High	Panama	69.2	Cristobal and Panama City are major transit hubs for fishing and carrier vessels traversing the Panama Canal.
High	Micronesia	60.5	Pohnpei is a top 10 destination for both foreign fishing and carrier vessels, likely reflecting its role as a transshipment hub for tuna harvested in the Pacific Ocean.
Moderate	Spain	59.8	Spain has several ports with substantial foreign vessel traffic, with Las Palmas in the Canary Islands being the second-largest global port in terms of foreign carrier vessel hold size.
High	Senegal	58.7	Dakar is the third-largest global port in terms of foreign fishing vessel hold size.
Moderate	Papua New Guinea	52.4	Rabaul is the eighth-largest global port in terms of foreign carrier vessel hold size, and is also a large destination for foreign fishing vessels.
Moderate	South Africa	35.4	Cape Town is the 11th-largest global port in terms of foreign fishing vessel hold size.

Source: USITC IUU import estimate; Hosch et al., “Any Port in a Storm,” 2019.
Note: U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

Transshipment Risk

It is common for fishing vessels operating far offshore to transship products to refrigerated carrier vessels, which then transport catch to ports. Although transshipment may improve the efficiency of fishing activities on the high seas or in remote areas, it has frequently been linked with IUU fishing. This is particularly the case where transshipment is itself illegal, where transshipment mixes seafood harvested through IUU methods with non-IUU seafood, and/or where transshipment occurs between vessels of different nationalities.[1278] Using data published by Global Fishing Watch (GFW),[1279] the Commission mapped the aggregate number of hours between 2016 and 2018 associated with potential transshipment events to FAO major fishing areas and then compared those to the 2016-18 aggregated reported landings of all source countries that occurred within those areas (see table F.5).[1280]

As a threshold consideration in this risk analysis, moderate and high transshipment risk characterizations required that over 50 percent of transshipment hours within a given FAO major fishing area were between vessels of different flag states.[1281] Where transshipment was predominantly between vessels of the same nationality, no transshipment risk characterization was made, as such activities were unlikely to obfuscate the supply chains of seafood products and frequently took place in regions with known reliance on transshipment due to the highly remote nature of fishing in those regions.[1282] If most

[1278] Boerder, Miller, and Worm, “Global Hot Spots of Transshipment of Fish Catch at Sea,” July 25, 2018.
[1279] GFW and SkyTruth have produced data on potential transshipment behavior on a highly granular basis, where such data are available by vessel, location, and time. GFW used AIS data and machine learning techniques to approximate the number of hours that fishing vessels and carrier vessels were engaged in potential transshipment events at sea based on whether apparent encounters between vessels exhibited transshipment behavior patterns. GFW, “First Global View of Transshipment at Sea,” accessed September 25, 2020; SkyTruth and GFW, “The Global View of Transshipment: Revised Preliminary Findings,” August 2017. In a revision of their original report, the authors noted that their original report referred to “potential transshipments” and “likely transshipments,” but that they changed these labels to “potential rendezvous” and “likely rendezvous” to accommodate readers who believed using “transshipment” was too definitive. For purposes of this report, such events are characterized simply as “transshipments” while recognizing the degree of uncertainty surrounding them.
[1280] This study considered transshipment data across the geographically broad FAO major fishing areas as opposed to the narrower EEZ designation. This is because a relatively large number of transshipment events occur on the high seas, which are not linked to specific EEZs. Frequently, fishing vessels engage in fishing activity within EEZs and then transfer their catch to carrier vessels operating in high seas areas. Boerder, Miller, and Worm, “Global Hot Spots of Transshipment of Fish Catch,” July 25, 2018, 2–3; USITC, hearing transcript, September 3, 2020, 277–78 (testimony of Rashid Sumaila, University of British Columbia Institute for the Oceans and Fisheries and Sea Around Us). Reported marine capture landings were based on the FAO Global Production database. FAO, Capture and Aquaculture Production database, accessed May 19, 2020.
[1281] Also included were transshipment hours between vessels of the same nationality where that country was considered “high risk” in terms of flag of convenience risk. For example, carrier and fishing vessels that both used the flag of Panama, a source country with a high flag of convenience risk, were frequently engaged in transshipment events within this database. A large share of global transshipment events involved vessels flying flags of convenience. Miller et al., “Identifying Global Patterns of Transshipment Behavior,” 2018.
[1282] For example, transshipment between Russian vessels within the Russian Far East were the most common global transshipment events within EEZs. These transshipments likely reflect a necessary mode of operation due to the vast distances between fishing grounds and the primary ports of Vladivostok and Murmansk. Miller et al., “Identifying Global Patterns of Transshipment Behavior,” 2018. A similar pattern exists for U.S. fishing and transshipment within the Alaskan EEZs.

regional transshipment took place between vessels of different nationalities, high and moderate risk was determined based on the following:

- **High risk**: Where there was high transshipment activity relative to the amount of fish reportedly landed in the region (i.e., less than 1,500 mt was landed in the FAO major fishing area for every hour of potential transshipment), transshipment risk for all fishing areas within the FAO major fishing area was considered to be high.
- **Moderate risk**: Where there was more moderate transshipment activity relative to the amount of fish reportedly landed in the region (i.e., less than 10,000 mt was landed in the FAO major fishing area for every hour of potential transshipment), transshipment risk for all fishing areas within the FAO major fishing area was considered to be moderate.
- **No risk factor assigned**: If there was low transshipment activity relative to the amount of fish reportedly landed in the region (i.e., more than 10,000 mt was landed in the FAO major fishing area for every hour of potential transshipment), no transshipment risk characterization was made for that fishing area.

Where transshipment risk was assigned, it was assigned to all landings within the capture and aquaculture database for EEZs within FAO major fishing areas. Many potential transshipment events within the GFW transshipment database involved vessels flagged to source countries based outside of FAO major fishing areas. However, assignment of transshipment risk on a regional basis (including to the landings of countries that did not appear within transshipment databases) reflected two considerations.

First, a concentration of potential transshipment events within specific regions indicated that MCS systems within those regions may need to be improved. For example, concentrated transshipment activity within the Southeast Atlantic major fishing area, where transshipment is banned on the high seas under the convention area of the South East Atlantic Fisheries Organization, or within West African countries' EEZs, indicate that coastal countries faced enforcement challenges within these areas.[1283] Second, the potential transshipment events within the GFW database only covered events where both the carrier and fishing vessels used automatic identification system (AIS) transponders. While AIS usage is common among large industrial vessels operating over long distances, it is less common among fishing vessels that operate primarily within EEZs themselves.[1284] Therefore, while the GFW potential transshipment data captured transshipment activity between distant water vessels, the lack of apparent transshipment events with local, non-AIS vessels did not itself indicate the lack of local participation in transshipment events. For example, small and mid-size boats in West Africa reportedly engage in transshipment with foreign vessels operating in or just outside of West African EEZs.[1285]

[1283] Boerder, Miller, and Worm, "Global Hot Spots of Transshipment of Fish Catch," July 25, 2018, 7; SkyTruth and GFW, "The Global View of Transshipment: Revised Preliminary Findings," August 2017, 11.
[1284] Boerder, Miller, and Worm, "Global Hot Spots of Transshipment of Fish Catch at Sea," July 25, 2018, 8.
[1285] USITC, hearing transcript, September 3, 2020, 277–78 (testimony of Rashid Sumaila, University of British Columbia Institute for the Oceans and Fisheries and Sea Around Us).

Table F.5 FAO major fishing areas with high and moderate transshipment risk, by estimated U.S. marine capture import value, 2019

Transshipment risk	FAO major fishing area	Value U.S. imports from FAO major fishing area (million $)	Regional quantity of reported landings per hour of transshipment (mt)
High	Southwest Atlantic (41)	526.1	1,268
High	Eastern Central Pacific (77)	456.4	761
Moderate	Southeast Pacific (87)	324.9	6,456
Moderate	Eastern Central Atlantic (34)	273.8	4,917
Moderate	Western Indian Ocean (51)	65.5	6,587
Moderate	Southwest Pacific (81)	58.2	1,649
Moderate	Southeast Atlantic (47)	41.6	7,251

Source: USITC IUU import estimate; GFW, Transshipment Data and Report, 2020; FAO, Capture and Aquaculture Production database, accessed May 19, 2020.
Note: Regional quantity of reported landings per hour of transshipment is based on landings and transshipment hours from 2016 to 2018. U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

Distant-Water Fishing Risk

DWF fleets, or fleets of industrial vessels operating outside of countries' home EEZs, are likely responsible for a large amount of global IUU fishing. Vessels operating far from home ports are often those that are listed within RFMO/Interpol vessel lists and cited within U.S. and EU documentation of IUU activities in foreign countries. These vessels also often engage in the types of activities that are associated with IUU fishing and are used in this study to assess IUU vulnerability: open water transshipment, use of flags of convenience, and visitation in foreign ports. Due to their frequently large size and greater engine power, DWF vessels are capable of operating far offshore in areas where MCS capabilities are weaker and are also capable of engaging in intensive fishing effort.[1286] DWF vessels frequently operate in foreign waters under fishing access agreements that may be nontransparent, informally arranged, and/or poorly enforced, and IUU fishing may still be common even in EEZs where DWF is permitted.[1287] In some cases, DWF vessels will operate in foreign waters without permission, including by using access in neighboring EEZs or nearby high seas as bases for illicit incursions.[1288] A 2018 study by Cabral et al. identified substantial reductions in IUU activity when bans on DWF in Indonesia and The Gambia were actively enforced.[1289]

GFW has tracked and measured DWF and local fishing effort using AIS transponder data and publishes these data on its website. The Commission mapped GFW fishing effort data for all global fishing in 2018 to marine areas by merging latitude and longitude parameters in the GFW database with a database of

[1286] CEA, *Distant Water Fishing*, October 2018, 48–49.
[1287] CEA, *Distant Water Fishing*, October 2018, 43–47. Fishing access agreements may include formal arrangements between governments, as is common between European fleets and other countries. They may also include informal arrangements between key officials of coastal countries and fishing companies. In certain cases, a small number of vessels will be granted a license to fish in a country's EEZ but many more vessels will actually engage in fishing. Industry representatives, interview by USITC staff, May 11, 2020.
[1288] Industry representatives, interview by USITC staff, May 11, 2020.
[1289] Cabral et al., "Rapid and Lasting Gains from Solving Illegal Fishing," April 2018.

maritime boundaries published by the Flanders Marine Institute.[1290] Fishing effort data for the largest DWF fleets and the fishing areas with the most substantial DWF presence are presented in tables F.6 and F.7.

Table F.6 Top 10 source countries and territories that engage DWF, by DWF effort in total hours, 2018

Source	DWF effort (hours)	Total fishing effort (hours)	DWF as share of total effort (%)
China	5,445,229	17,546,661	31.0
European Union	3,745,298	10,819,919	34.6
Taiwan	2,648,707	3,199,943	82.8
Japan	1,444,302	1,663,965	86.8
South Korea	890,695	1,831,984	48.6
United States	469,044	1,635,843	28.7
Russia	465,090	1,746,594	26.6
Norway	392,804	1,113,326	35.3
Vanuatu	238,544	242,749	98.3
Iceland	141,576	607,701	23.3

Source: GFW, Fishing Effort: Datasets and Code, 2020, accessed July 14, 2020.
Note: DWF refers to (1) fishing in EEZs other than those claimed by the fishing vessel's flag country and (2) high seas fishing, and does not include EU fishing vessels operating within the European EEZs of other EU countries. Fishing effort data track only vessels that activate AIS transponders and do not include artisanal and industrial vessels that do not use AIS.

Table F.7 Top 10 fishing areas with substantial DWF, by DWF effort in total hours, 2018

Fishing areas (EEZs)	DWF effort (hours)	Total fishing effort (hours)	DWF as share of total effort (%)
Japan (all EEZs)	449,452	669,115	67.2
Brazil (mainland EEZ)	368,005	531,332	69.3
Solomon Islands	306,484	306,702	99.9
Norway (mainland EEZ)	276,493	997,015	27.7
Micronesia	226,068	249,657	90.6
Argentina	221,364	733,275	30.2
Svalbard (Norway)	181,484	181,484	100.0
Papua New Guinea	159,611	172,467	92.5
Mauritius	155,898	186,471	83.6
European Union EEZs	151,123	7,225,744	2.1

Source: GFW, Fishing Effort: Datasets and Code, 2020, accessed July 14, 2020.
Note: DWF refers to (1) fishing in EEZs other than those claimed by the fishing vessel's flag country and (2) high seas fishing, and does not include EU fishing vessels operating within the European EEZs of other EU countries. Fishing effort data track only vessels that activate AIS transponders and do not include artisanal and industrial vessels that do not use AIS.

Distant Water Fishing Risk (Source Country)

This report considered a source country's fleet to have a moderate or high DWF risk based on a consideration of both (1) the extent of the source country's DWF and (2) its overall national governance

[1290] GFW, Fishing Effort: Datasets and Code, 2020; Kroodsma et al., "Tracking the Global Footprint of Fisheries," February 23, 2018, 904–8; Flanders Marine Institute, Maritime Boundaries Geodatabase, 2019. The Commission did not include EU source country fishing effort within other EU countries' European EEZs in overall totals of DWF fishing effort. The United Kingdom (including Guernsey and Jersey for these purposes), which was an EU member during the years covered by all databases used here, was considered an EU member for purposes of this analysis. In addition, if a source country's vessels were operating in marine areas that were claimed by that country, this fishing effort was also not considered DWF fishing effort.

(see ”National Governance Risk Criteria” below) (see table F.8). The consideration of both DWF activity and governance criteria reflected an assumption that countries with lower governance scores would be less likely to adequately ensure that their DWF vessels were following domestic, foreign, and international obligations in fishing. The first threshold for establishing moderate or high DWF risk was based on the extent of a source country’s DWF fleet as measured by its marine capture landings and fishing effort.[1291] If most of a source country’s reported landings (over 50 percent) were from its DWF fleet, or if the large majority of a source country’s fishing effort (over 75 percent) was by DWF vessels, then this first threshold for establishing DWF risk was met.[1292] If a source country met this threshold, then its average ranking according to four national governance criteria was also taken into account to determine the degree of risk for this criterion:

- **High risk**: If a source country also had a low average ranking across the four national governance criteria (in the bottom 25th percentile), then its global fishing was considered high risk.[1293]
- **Moderate risk**: If a source country also had a moderate average ranking across the four national governance criteria (below the top 25th percentile), then its global fishing was considered moderate risk.
- **No risk factor assigned:** If a source country had a high average ranking across the four national governance criteria (in the top 25th percentile), then no DWF risk ranking was assigned on this basis.

[1291] Marine capture landings were based on the reported landings data collected within the capture and aquaculture database (see step 1), based primarily on Sea Around Us Reconstructed Catch data from 2016 (see above). Fishing effort was measured based on fishing effort data published by GFW. Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020, accessed September 7, 2020; GFW, Fishing Effort: Datasets and Code, 2020, accessed July 14, 2020.
[1292] The higher threshold applied for fishing effort is related to the use of AIS transponder data to produce these data. AIS data are generally used on larger industrial fishing vessels, including most DWF vessels. Many midsize and smaller craft, which comprise large proportions of domestic fishing operations, do not use AIS transponders. USITC, hearing transcript, September 3, 2020, 195, 199–200 (testimony of David Kroodsma, Global Fishing Watch). Therefore, the GFW fishing effort data likely overstate the proportion of DWF vessels relative to domestic fishing in any given source country or EEZ.
[1293] Attributing high or moderate DWF risk to all of a source country’s landings, even those that were not DWF landings, reflects the lack of certainty surrounding the accuracy of information indicating source country fishing areas within both reported and unreported landings data. For example, a 2013 study by Pauly et al. indicated that China substantially overreports domestic landings and underreports DWF landings. Pauly et al., “China’s Distant-Water Fisheries in the 21st Century,” 2014.

Table F.8 Source countries with high and moderate DWF risk, by estimated U.S. marine capture import value, 2019

DWF risk (source)	Source country	Value U.S. imports from source country (million $)	DWF as a share of total fishing	
			Based on reported landings (%)	Based on fishing effort (%)
Moderate	Vietnam	383.3	0.3	77.1
Moderate	Philippines	97.6	7.2	100.0
High	Nicaragua	75.7	24.8	84.9
Moderate	Panama	69.2	26.7	100.0
Moderate	Micronesia	60.5	90.9	62.1
Moderate	Honduras	52.8	0.0	100.0
High	Papua New Guinea	52.4	80.2	62.0
High	Burma	52.4	0.0	100.0
Moderate	Guyana	38.4	0.5	100.0
Moderate	Poland	28.4	72.3	23.4

Source: USITC IUU Import Estimate; Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020, accessed September 7, 2020; GFW, Fishing Effort: Datasets and Code, 2020, accessed July 14, 2020.
Note: DWF refers to (1) fishing in EEZs other than those claimed by the fishing vessel's flag country and (2) high seas fishing, and does not include EU fishing vessels operating within the European EEZs of other EU countries. Fishing effort data track only vessels that activate AIS transponders and do not capture artisanal and industrial vessels that do not use AIS. Reported landings and fishing effort data were collected for 2018. U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

Distant-Water Fishing Risk (Fishing Area)

As a separate DWF risk criterion, this report also considered landings within a fishing area to have moderate or high DWF risk based on a consideration of the extent of foreign activity within the fishing area, as well as of the coastal country's national governance (see table F.9). Where DWF was high within a fishing area and where a coastal country's national governance ranking was low, it was considered more likely that the coastal country was unable to effectively apply MCS systems to reduce IUU fishing activity within its claimed waters. The first threshold for establishing moderate or high DWF risk for fishing areas was based on the extent of DWF occurring in a fishing area, as measured by marine capture landings and fishing effort within that area. If most of the fishing area's reported landings were from DWF fleets, or if the majority of the fishing effort occurring within the fishing area (over 75 percent) was by DWF vessels, then this first threshold for establishing DWF risk for fishing areas was met. If a fishing area met this threshold, then its coastal country's average ranking according to four national governance criteria was also taken into account to determine the degree of risk for this criterion:

- **High risk**: If a fishing area's coastal country also had a low average ranking across the four national governance criteria (in the bottom 25th percentile), then all fishing within this area was considered high risk.[1294]

[1294] Attributing high or moderate DWF risk to all of a fishing area's landings, including those of local vessels fishing in home waters, reflects uncertainty surrounding the true origin of landings in waters with substantial DWF activity. For example, Mauritania's EEZ is among the most productive globally in terms of landings, and its industrial fleet is dominated by foreign vessels operating under FAAs or using the Mauritanian flag. Belhabib et al., "Preliminary Estimation of Realistic Fisheries Removals from Mauritania," 2012.

- **Moderate risk**: If a fishing area's coastal country also had a moderate average ranking across the four national governance criteria (below the top 25th percentile), then all fishing within this area was considered moderate risk.
- **No risk factor assigned**: If a fishing area's coastal country had a high average ranking across the four national governance criteria (in the top 25th percentile), then no DWF risk ranking was assigned on this basis.

Table F.9 Fishing areas with high and moderate DWF risk, by estimated U.S. marine capture import value, 2019

DWF risk (area)	Fishing area	Value U.S. imports from fishing area (million $)	DWF as a share of total fishing	
			Based on reported landings (%)	Based on fishing effort (%)
Moderate	Vietnam	388.7	0.7	98.9
Moderate	Kiribati (Gilbert Islands)	120.2	85.8	95.2
Moderate	Kiribati (Phoenix Islands)	57.1	88.3	95.2
Moderate	Bahamas	54.2	7.4	100.0
High	Burma	53.8	3.1	100.0
Moderate	Honduras (Caribbean)	52.0	0.7	100.0
Moderate	Philippines	51.0	3.7	99.8
Moderate	Suriname	49.4	3.7	100.0
High	Mauritania	44.7	35.6	92.6
High	Papua New Guinea	38.2	80.3	92.5

Source: USITC IUU Import Estimate; Pauly, Zeller, Palomares, Sea Around Us Concepts, Design and Data, 2020, accessed September 7, 2020; GFW, "Fishing Effort: Datasets and Code," 2020, accessed July 14, 2020.
Note: DWF refers to (1) fishing in EEZs other than those claimed by the fishing vessel's flag country and (2) high seas fishing, and does not include EU fishing vessels operating within the European EEZs of other EU countries. Fishing effort data track only vessels that activate AIS transponders and do not capture artisanal and industrial vessels that do not use AIS. Reported landings and fishing effort data were collected for 2018.

IUU Vulnerability Summary

In 2019, the United States imported an estimated $330.0 million of seafood sourced from marine capture landings considered to have high IUU vulnerability. Major source countries in this grouping were Panama, Burma, Senegal, and island countries and territories such as Micronesia, Papua New Guinea, the Falkland Islands, and Kiribati (see tables F.10 and F.11). These countries and territories were considered to have high IUU vulnerability due to multiple criteria reaching high risk thresholds. For example, Panama frequently let other countries' vessels use its flags, operated major ports with substantial foreign traffic, and was within FAO major fishing area 77, which had high levels of open-water transshipment. Burma and Papua New Guinea had substantial DWF activity within home EEZs, but at the same time had disproportionate numbers of flagged vessels operating in other countries' EEZs or in high seas areas.

In addition, the United States imported about $3.1 billion of seafood sourced from marine capture landings considered to have moderate IUU vulnerability. Many large source countries and territories had moderate IUU vulnerability landings accounting for large quantities of their total output, including

Vietnam, Argentina, Mexico, Taiwan, and South Korea.[1295] The vast majority of moderate IUU vulnerability landings were also considered to have at least moderate risk in terms of IUU prevalence and/or national governance risk. Therefore, moderate IUU vulnerability did not by itself determine overall fundamental risk for most sources of U.S. imports.[1296]

U.S. imports of seafood products that are more likely to be subject to obscure or extended supply chains associated with remote fishing operations were the most frequently associated with high IUU vulnerability. Tuna species groups accounted for more than half of the value of U.S. imports from high IUU vulnerability sources, while snapper, crab, toothfish, and mahi-mahi were also obtained from source countries or in fishing areas with high IUU vulnerability. In addition, the tuna species groups accounted for a large share of the value of U.S. imports from moderate IUU vulnerability sources, along with warmwater shrimp, rock lobster, mahi-mahi, octopus, and squid.

[1295] Although much of China's DFW fishing was considered to have moderate IUU vulnerability, the areas showing the largest Chinese landings within the database—China's EEZ, the Russian Far East, the Japan Main Islands EEZ, and the high seas—did not have either moderate or high IUU vulnerability.
[1296] Exceptions included the home EEZ fishing of source countries Chile and New Zealand. These countries had low national governance risk for home-water fishing and no apparent IUU prevalence, but were characterized as having moderate IUU vulnerability due to their geographic location in FAO major fishing areas with moderate levels of transshipment.

Table F.10 IUU vulnerability criteria for top 10 high IUU vulnerability source/fishing area combinations, by estimated U.S. marine capture import value, 2019

Source	Fishing area	Value of U.S. imports (million $)	Flag of convenience risk	Port obscurity risk	Transshipment risk	DWF risk	
						Source country	Fishing area
Burma	Burma	52.4	([a])	([a])	([a])	High	High
Panama	Panama (Pacific)	34.2	High	High	High	Moderate	Moderate
Panama	High Seas	26.4	High	High	([a])	Moderate	([a])
Falkland Islands	Falkland Islands	24.0	High	([a])	High	([a])	([a])
Micronesia	Kiribati (Gilbert Islands)	17.0	High	High	([a])	Moderate	Moderate
Papua New Guinea	Papua New Guinea	15.1	Moderate	Moderate	([a])	High	High
Nicaragua	Nicaragua (Pacific)	12.7	([a])	([a])	High	High	([a])
Costa Rica	Costa Rica (Pacific)	10.9	([a])	High	High	Moderate	Moderate
Micronesia	Kiribati (Phoenix Islands)	10.2	High	High	High	Moderate	Moderate
Kiribati	Kiribati (Gilbert Islands)	9.8	High	High	([a])	Moderate	Moderate

Source: USITC IUU Import Estimate; Petrossian et al., "Flags for Sale," June 2020; Hosch et al., "Any Port in a Storm," 2019; GFW, Transshipment Data and Report, 2020, accessed September 25, 2020; FAO, Capture and Aquaculture Production database, accessed May 19, 2020; Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020, accessed September 7, 2020; GFW, Fishing effort: Datasets and Code, 2020, accessed July 14, 2020.

Note: If multiple criteria indicated that a source/fishing area combination was "high risk," those criteria were considered to support a high IUU vulnerability characterization.

[a] No risk finding was made for this criterion.

Table F.11 IUU vulnerability criteria for top 10 moderate IUU vulnerability source/fishing area combinations, by estimated U.S. marine capture import value, 2019

Source	Fishing area	Value of U.S. imports (million $)	Flag of convenience risk	Port obscurity risk	Transshipment risk	DWF risk	
						Source country	Fishing area
Vietnam	Vietnam	376.9	([a])	([a])	([a])	Moderate	Moderate
Argentina	Argentina	299.7	([a])	([a])	High	([a])	([a])
Mexico	Mexico (Pacific)	286.6	([a])	([a])	High	([a])	([a])
Peru	Peru	147.2	([a])	([a])	Moderate	([a])	([a])
Brazil	Brazil (mainland)	146.6	([a])	([a])	High	([a])	([a])
Chile	Chile (mainland)	69.3	([a])	([a])	Moderate	([a])	([a])
Taiwan	High seas	66.9	([a])	Moderate	([a])	([a])	([a])
South Korea	High seas	60.9	([a])	Moderate	([a])	([a])	([a])
Taiwan	Kiribati (Gilbert Islands)	59.9	([a])	Moderate	([a])	([a])	Moderate
Nicaragua	Nicaragua (Caribbean)	58.2	([a])	([a])	([a])	High	([a])

Source: USITC IUU Import Estimate; Petrossian et al., “Flags for Sale,” June 2020; Hosch et al., “Any Port in a Storm,” 2019; GFW, Transshipment Data and Report, 2020, accessed September 25, 2020; FAO, Capture and Aquaculture Production database, accessed May 19, 2020; Pauly, Zeller, and Palomares, Sea Around Us Concepts, Design and Data, 2020, accessed September 7, 2020; GFW, Fishing effort: Datasets and Code, 2020, accessed July 14, 2020.

Note: If only one criterion indicated that a source/fishing area combination was “high risk” or if one or more criteria indicated that a source/fishing area combination was “moderate risk,” those criteria were considered to support a moderate IUU vulnerability characterization.

[a] No risk finding was made for this criterion.

National Governance Risk Criteria

Indexes created by global organizations to measure national-level governance and corruption were used as a third component of fundamental risk. Several studies have detected strong linkages between governance indicators and IUU fishing. In a 2009 global estimation of IUU fishing conducted by Agnew et al., the authors found significant relationships between their estimates of fishing countries' illegal and unreported (IU) catches and governance indicators, including those of the Worldwide Governance Indicators (WGI) project and Transparency International's Corruption Perceptions Index.[1297] A 2005 study by MRAG also found a strong relationship between WGI governance measures and developing coastal countries' vulnerability to IUU fishing activity. This finding was attributed to an observation that good governance was associated with strong MCS systems and procedures, the political will to enforce regulations, and cooperation with neighbors on surveillance, among other factors.[1298] Other studies, such as the IUU Fishing Index, include risk metrics based on governance indicators to assess countries' general IUU vulnerability.[1299]

Because these are national-level, not fisheries-specific indicators, use of these indexes assumes that general levels of corruption and governance strength apply as much to the fisheries sectors as to other sectors.[1300] In support of this assumption, recent research has established that IUU fishing activities frequently connect to broader illegal activity that extends beyond the fisheries sector, including use of vessels and revenues generated to facilitate illegal drug trafficking, human trafficking and slavery, tax fraud, and money laundering.[1301]

In this report, national governance risk is determined based on a country's average ranking in terms of the four WGI governance measures considered by the 2005 MRAG study and the 2009 Agnew et al. study: Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption.[1302] Unlike IUU prevalence and IUU vulnerability, the other aggregated risk groupings used in this study to assess overall fundamental risk of IUU fishing activities, national governance risk data are available for most of the world's countries. These data are also unique among fundamental risk criteria in that they provide

[1297] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009, 4.
[1298] MRAG, *Review of Impacts of IUU Fishing on Developing Countries*, July 2005, 7, 13.
[1299] Macfadyen et al., *The IUU Fishing Index*, January 2019, 10.
[1300] Macfadyen et al., *The IUU Fishing Index*, January 2019, methodology page 32.
[1301] Belhabib, Le Billon, and Wrathall, "Narco-Fish," June 26, 2020; Brush, *Strings Attached*, 2019; Sumaila et al., "Illicit Trade in Marine Fish Catch," February 2020.
[1302] Kaufmann and Kraay, "Worldwide Governance Indicators," accessed September 22, 2020. Based on the WGI methodology, "government effectiveness" captures perceptions of the quality of public services; the quality of the civil service and the degree of its independence from political pressures; the quality of policy formulation and implementation; and the credibility of the government's commitment to such policies. "Regulatory quality" captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. "Rule of law" captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. "Control of corruption" captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Kaufmann, Kraay, and Mastruzzi, "WGI: Methodology and Analytical Issues," September 2010. Rankings for the year 2018, based on the 2019 update to these data, were used.

evidence of strong governance and therefore lower susceptibility to IUU fishing for certain countries, allowing for the establishment of low fundamental risk characterizations.

- **High risk**: For all of a source country's landings within a fishing area, where both the source country and the coastal country were in the bottom 25th percentile in terms of their average ranking across the four WGI criteria, fishing was characterized as having high national governance risk.
- **Moderate risk**: For all of a source country's landings within a fishing area, where both the source country and the coastal country were between the top and bottom 25th percentile in terms of their average ranking across the four WGI criteria, fishing was characterized as having moderate national governance risk.
- **Low risk:** For all of a source country's landings within a fishing area, where both the source country and the coastal country were in the top 25th percentile in terms of their average ranking across the four WGI criteria, fishing was characterized as having low national governance risk.

In 2019, the United States imported an estimated $3.9 billion of marine capture products from source countries operating in fishing areas, where both the coastal country and the source country (which were frequently the same) had strong national governance (i.e., low national governance risk). This included most U.S. imports that were originally sourced in Canada, the United States, Japan, Australia, New Zealand, and most of Europe. By contrast, the United States imported an estimated $259.1 million from source countries operating in fishing areas with high national governance risk, with the largest source countries in this group being Nicaragua, Venezuela, Burma, Mauritania, and Papua New Guinea. The United States imported an estimated $6.0 billion of marine capture imports derived from fishing that fell within the broader grouping of moderate national governance risk that characterized the majority of global landings, including from sources like Russia, Indonesia, China, Mexico, and Vietnam.

Assignment of Risk Profiles to Ranges of Possible IUU Estimates

As described in chapter 3, risk profiles that combine fisheries and fundamental risk were assembled for each global marine capture fishery. For any given fishery, there were 12 possible risk profiles based on a combination of (1) low, moderate, high, or unknown fisheries risk; and (2) low, moderate, or high fundamental risk. Risk profiles were used to guide the development of a range of possible IUU estimates derived from a 2009 study by Agnew et al.[1303] The Commission used this study's illegal and unreported (IU) estimates (referred to here as "benchmark estimates") as reference points for cross-checking and, if necessary, adjusting IUU landings for each fishery. Benchmark estimates were expressed in terms of reported landings, as that is the basis that was available in the Agnew et al. study and that was used to adjust IUU marine capture estimates within the capture and aquaculture database. This section describes the detailed justification for linking these benchmark estimates with each of the 12 possible risk profiles.

[1303] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.

Global Minimum and Maximum Estimates

All estimates within this study were bounded by a global minimum and a global maximum estimate.

Global minimum estimate: The lowest possible level of IUU fishing within any given fishery was considered to be 1.2 percent of reported landings, which was the Agnew et al. study's low-end estimate for FAO major fishing area 81 (Southwestern Pacific Ocean) and the lowest estimate within that study. This estimate was used as a lower bound for all ranges of possible IUU estimates for fisheries with low fisheries risk, which was based on an assumption that all fisheries (even those with high fundamental risk indicating greater systemic issues in source countries and/or fishing areas) with more specific evidence of strong enforcement and fishers' compliance could have extremely low levels of IUU fishing.

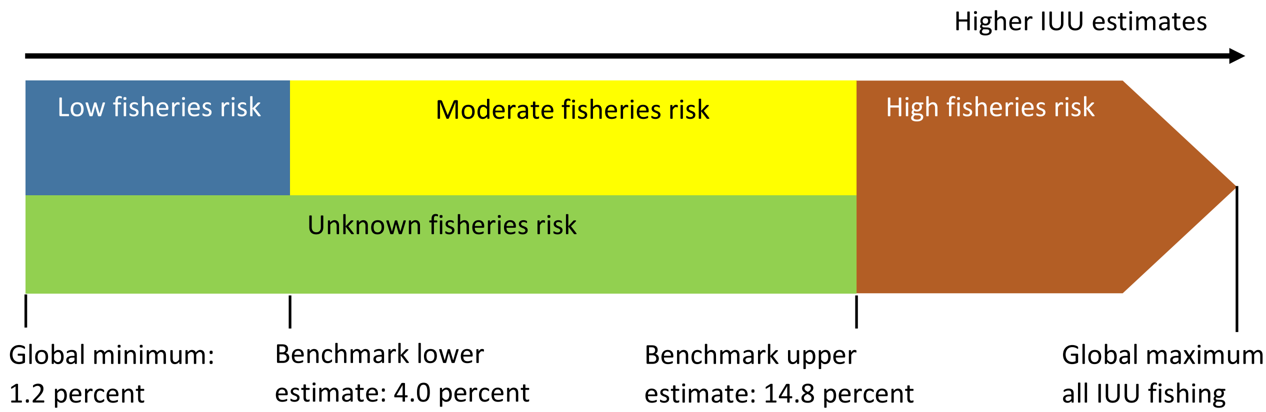
Global maximum estimate: The highest possible level of IUU fishing within any given fishery was considered to be all IUU fishing (which equates to an infinite share of reported landings in cases where no landings are reported). For example, certain marine capture landings reflect source countries operating without licenses in specific fishing areas, in which case all landings would be IUU fishing. The global maximum was used as an upper bound for all ranges of possible IUU estimates for fisheries with high fisheries risk. In these instances, if a fishery had an initial marine capture estimate consisting only of IUU fishing (i.e., if all of that fishery's landings were "unreported" based on data from the Sea Around Us Reconstructed Catch database), unreported landings were used directly as a proxy for IUU fishing within the final IUU marine capture estimates.

Ranges of Possible IUU Estimates for Low, Moderate, and High Fundamental Risk Profiles

For all global fisheries, ranges of possible IUU estimates were established using a combined consideration of minimum and maximum global bounds as well as additional ranges of benchmark estimates for FAO major fishing areas representative of low, moderate, or high fundamental risk. Fisheries with low fisheries risk were assigned ranges of possible IUU estimates between the global minimum and the lower bound estimate for the representative FAO major fishing area. Fisheries with moderate fisheries risk were assigned ranges of possible IUU estimates between the lower and upper bound estimates for that representative area. Fisheries with high fisheries risk were assigned ranges of possible IUU estimates between the upper bound estimates for that representative area and the global maximum. Fisheries with unknown fisheries risk were assigned broader ranges of possible IUU estimates on a case by case basis. These assignments are described in greater detail below for low, moderate, and high fundamental risk profiles.

Low fundamental risk: Fishing with low fundamental risk was likely to have low levels of IUU fishing consistent with strong national governance (for both the source countries and the coastal countries) and no systemic evidence of IUU fishing prevalence or vulnerability to IUU fishing. Ranges of possible IUU marine capture estimates for these risk profiles were derived from the benchmark estimates for FAO major fishing area 21 (Northwest Atlantic Ocean), which was primarily U.S. and Canadian fishing in home EEZs. The benchmark estimates for FAO major fishing area 21 ranged from 4.0 percent to 14.8 percent of reported landings (see figure F.2). This major fishing area was chosen to represent low fundamental risk because (1) these estimates were lower than most other global regions, but were relatively consistent with estimates for a group of FAO major fishing areas with similarly low IU estimates;[1304] (2) underlying research used in the Agnew et al. study indicated that these fishing areas had relatively low levels of IUU fishing;[1305] and (3) most fisheries within this FAO major fishing area were predominantly low fundamental risk based on the risk analysis of this report.

Figure F.2 Ranges of possible IUU estimates for fisheries with low fundamental risk



Source: Compiled by USITC staff; Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
Note: Figure is not drawn to scale. Percentages are expressed in terms of reported landings. Global minimum estimate is based on the lower-bound estimates from Agnew et al. for FAO major fishing area 81. Benchmark lower and upper estimates were based on the lower- and upper-bound estimates from Agnew et al. for FAO major fishing area 21.

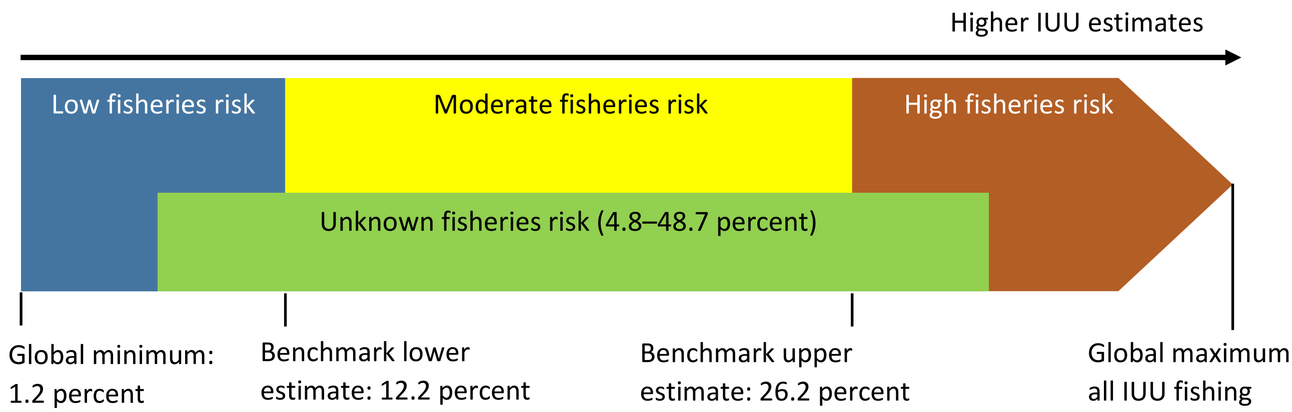
For fishing with low fundamental risk and moderate fisheries risk, the Commission used a range of possible IUU estimates that was bounded by the lower and upper benchmark estimates for FAO major fishing area 21, which represented average levels of IUU fishing across a broad region that were estimated with high levels of uncertainty. The lower benchmark end estimate of 4.0 percent was used as the upper bound of the range of possible IUU estimates for fishing with low fundamental risk and low fisheries risk. This reflected an assumption that these relatively well-governed fisheries were on the lower end of the benchmark range or even lower than those averages for the region. For these fisheries, the global minimum estimate was used as the lower bound. Similarly, the upper benchmark estimate of 14.8 percent was used as the lower bound of the range of possible IUU estimates for fishing with low fundamental risk and high fisheries risk, as these fisheries were considered to have IUU fishing that exceeded the norms for those source countries and fishing areas. For these fisheries, the global maximum estimate was used as the upper bound. When fisheries risk was unknown and fundamental risk was low, the range of possible IUU estimates was considered to be bounded by the global minimum and the upper benchmark estimate (14.8 percent).

Moderate fundamental risk: Fishing with moderate fundamental risk was likely to include some IUU fishing based on a combination of information from IUU prevalence, IUU vulnerability, and national governance risk analysis. Ranges of possible IUU marine capture estimates for these risk profiles were derived from the benchmark estimates for FAO major fishing area 87 (Southeastern Pacific Ocean), which included most of the Pacific South American coast. The benchmark estimates for FAO major

[1304] Benchmark estimate ranges for FAO major fishing areas 21, 27, 31, 47, 67, and 81 were all between 1.2 percent and 15.0 percent of reported landings. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
[1305] Pramod et al., "Sources of Information Supporting Estimates," 2008.

fishing area 87 ranged from 12.2 percent to 26.2 percent of reported landings (see figure F.3). This major fishing area was chosen to represent moderate fundamental risk because (1) these estimates were within the mid-range of global regions;[1306] (2) underlying research used in the Agnew et al. study as well as in the study itself indicated that these fishing areas had longstanding issues with IUU fishing that were nonetheless more moderate than those in other regions;[1307] and (3) fisheries within this FAO major fishing area represented a mix of risk profiles based on the risk analysis of this report.

Figure F.3 Ranges of possible IUU estimates for fisheries with moderate fundamental risk



Source: Compiled by USITC staff; Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
Note: Figure is not drawn to scale. Percentages are expressed in terms of reported landings. Global minimum estimate is based on the lower bound estimates from Agnew et al. for FAO major fishing area 81. Benchmark lower and upper estimates were based on the lower and upper bound estimates from Agnew et al. for FAO major fishing area 87.

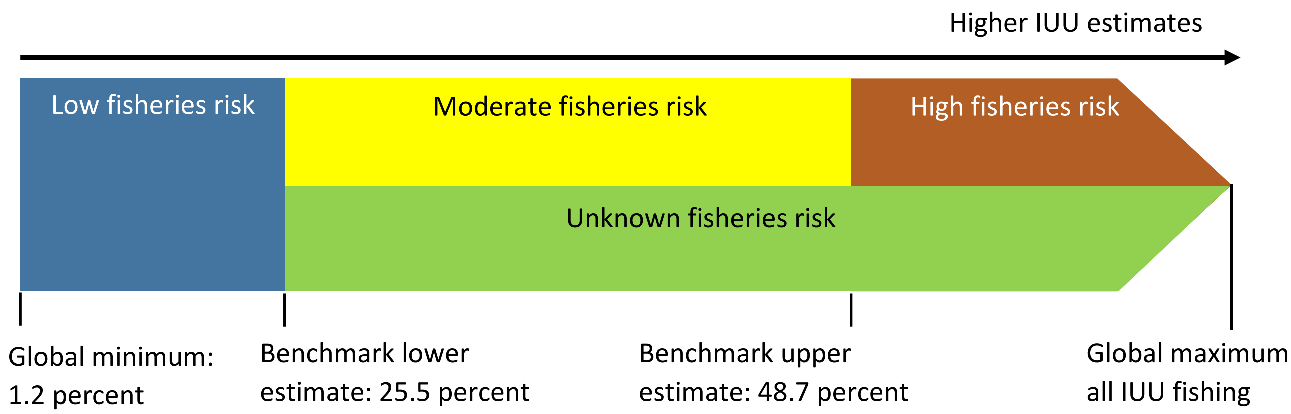
Based on the same logic as that described above for low fundamental risk profiles, fishing with moderate fundamental risk and moderate fisheries risk were considered likely to be within a range of possible IUU estimates that was coextensive with the benchmark range for FAO major fishing area 87 (12.2 percent to 26.2 percent). The extent of IUU fishing with moderate fundamental risk and low fisheries risk was considered likely to be between the global minimum IUU estimate (1.2 percent) and the lower benchmark estimate (12.2 percent), while the extent of IUU fishing with moderate fundamental risk and high fisheries risk was considered likely to be greater than or equal to the upper benchmark estimate of 26.2 percent. When fisheries risk was unknown and fundamental risk was moderate, risk analysis was considered to be subject to substantial uncertainty as a basis for estimating the extent of IUU fishing. In these cases, the lower-bound estimate for FAO major fishing area 21 (4.0 percent, as described above) and the upper-bound estimate for FAO major fishing area 34 (48.7 percent, as described below) were used.

High fundamental risk: Fishing with high fundamental risk was likely to include more extensive IUU fishing. Ranges of possible IUU marine capture estimates for these risk profiles were derived from the benchmark estimates for FAO major fishing area 34 (Eastern Central Atlantic Ocean), which included

[1306] Benchmark estimate ranges for FAO major fishing areas 51, 77, and 87 were all between 9.4 percent and 26.2 percent of reported landings. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
[1307] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009; Pramod et al., "Sources of Information Supporting Estimates," 2008.

most of the West African coast. The benchmark estimates for FAO major fishing area 34 ranged from 25.5 percent to 48.7 percent of reported landings (see figure F.4). This major fishing area was chosen to represent high fundamental risk because (1) these estimates were high relative to those of other global regions, although the high estimates were within a grouping of regions with similarly high IUU fishing;[1308] (2) underlying research used in the Agnew et al. study as well as in the study itself indicated that these fishing areas had major issues with IUU fishing due to a combination of low fisher compliance, illegal incursions of foreign DWF fleets into fishing areas, and weak MCS systems;[1309] and (3) fishing within this FAO major fishing area often was considered to have high fundamental risk based on the risk analysis of this report.

Figure F.4 Ranges of possible IUU estimates for fisheries with high fundamental risk



Source: Compiled by USITC staff; Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
Note: Figure is not drawn to scale. Percentages are expressed in terms of reported landings. Global minimum estimate is based on the lower-bound estimates from Agnew et al. for FAO major fishing area 81. Benchmark lower and upper estimates were based on the lower- and upper-bound estimates from Agnew et al. for FAO major fishing area 34.

Based on the same logic as that described above, for low and moderate fundamental risk profiles, fishing with high fundamental risk and moderate fisheries risk were considered likely to be within a range of possible IUU estimates that was coextensive with the benchmark range for FAO major fishing area 34 (25.5 percent to 48.7 percent). The extent of IUU fishing with high fundamental risk and low fisheries risk was considered likely to be between the global minimum IUU estimate (1.2 percent) and the lower benchmark estimate (25.5 percent), while the extent of IUU fishing with high fundamental risk and high fisheries risk was considered likely to be greater than or equal to the upper benchmark estimate of 48.7 percent. When fisheries risk was unknown and fundamental risk was high, the range of possible IUU estimates was considered to be lower bound by the lower benchmark estimate (25.5 percent).

[1308] Benchmark estimate ranges for FAO major fishing areas 34, 41 57, 61, and 71 were all between 16.2 percent and 48.7 percent of reported landings. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009.
[1309] Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," 2009; Pramod et al., "Sources of Information Supporting Estimates," 2008.

Adjustment of IUU Marine Capture Estimates Based on Evidence of Labor Violations

As described in chapter 3, the Commission used qualitative evidence of forced labor, child labor, and human trafficking (“FL/CL/HT risk”) as a basis for accounting for labor violations that occur within otherwise legal fishing within the IUU marine capture estimates. Then, the Commission used standard approximations to increase IUU marine capture estimates based on FL/CL/HT risk on a source country-wide basis. This section describes how the FL/CL/HT risk criterion was developed. In addition, this section includes a sensitivity analysis that demonstrates how changes in the standard approximations used impact overall IUU marine capture estimates (overall, and from specific sources).

Forced Labor, Child Labor, and Human Trafficking Risk (“FL/CL/HT Risk")

As described in greater detail throughout the main report, forced labor, child labor, and human trafficking are major labor violations that occur within certain source countries’ fishing fleets. Although certain source and coastal countries or territories, such as China, Thailand, Taiwan, and Indonesia (described in chapters 4 and 5), are frequently referenced as having extensive labor violations in fishing operations, many fleets and fishing areas with similar practices are frequently overlooked because attention tends to center on specific countries.[1310]

In order to incorporate a broader consideration of global labor violations to develop FL/CL/HT risk, the Commission used references to fishing sector violations within two U.S. government reports focused on many countries. One of these reports is the 2019 Department of State’s Trafficking in Persons (TIP) report. Using information from a broad array of resources, the TIP report places countries into one of four tiers that reflect the extensiveness of government efforts to address human trafficking problems within their economies and includes country reports that identify where outstanding problems continue to exist.

The Commission compiled references to specific countries’ labor violations within this report as well as the tier ranking of that country as one resource within this risk assessment. Tiers 1 and 2 indicate that countries are taking actions to meet minimum standards for the elimination of human trafficking or have met those minimum standards. However, assignment of countries to these lower tiers does not mean that a country has no human trafficking problem or that it is doing enough to address the problem.[1311] Tier 2 Watch List refers to countries where governments are making progress to bring themselves into compliance with minimum standards, but where the absolute number of victims is very significant or increasing and no evidence has been provided that the government is doing enough to

[1310] Industry representative, interview by USITC staff, May 28, 2020; industry representative, interview by USITC staff, May 28, 2020; industry representative, interview by USITC staff, August 14, 2020.
[1311] This report defines minimum standards based on section 108 of the Trafficking Victims Protection Act, which include requirements that governments make efforts to prohibit, punish, and eliminate various severe forms of human trafficking. U.S. Department of State, “2019 Trafficking in Persons Report,” 2019, 36–40.

address these problems. Tier 3 refers to countries where governments are not making significant efforts to meet minimum standards.[1312]

A second report used to develop FL/CL/HT risk is the U.S. Department of Labor Bureau of International Labor Affairs' List of Goods Produced by Child Labor and Forced Labor (ILAB CL/FL report). The ILAB CL/FL report identifies goods from countries that ILAB believes are produced by forced labor and child labor that enter global supply chains. This list is comprehensive and updated annually, and it covers over 154 countries. However, this report does not include a characterization of the extent of these issues along with these identifications.[1313]

- **High risk**: High risk was assigned to all source country landings if (1) that country was identified as Tier 2 Watch List or Tier 3 within the 2019 TIP report and the description of that country within the report referred to fishing sector violations; or (2) that country was identified within any tier and the description of that country within the report referred to fishing sector violations, and seafood goods from that country were also identified in the ILAB CL/FL report.
- **Moderate risk**: Moderate risk was assigned to all source country landings if (1) that country was identified as Tier 1 or Tier 2 within the 2019 TIP report and the description of that country within the report referred to fishing sector violations; or (2) seafood goods from that country were identified in the ILAB CL/FL report.
- **No risk factor assigned:** If a country's fishing sector labor violations were not addressed in either report, no FL/CL/HT risk characterization was made and the IUU marine capture estimate was not increased for that country.

In 2019, the United States imported $2.5 billion of marine capture seafood from source countries with high FL/CL/HT risk (see table F.12). Almost all of these imports came from major sources in Asia, including Indonesia, China, Vietnam, Taiwan, Thailand, and the Philippines. The United States also imported $1.1 billion of marine capture seafood from source countries with moderate FL/CL/HT risk (see table F.13). These source countries were more geographically dispersed, and included India, South Korea, Brazil, Peru, and Ecuador.

[1312] USDOS, *2019 Trafficking in Persons Report*" 2019, 36–37.
[1313] USDOL, ILAB, *2020 List of Goods*, September 2020.

Table F.12 FL/CL/HT risk criteria for top 10 high FL/CL/HT source countries and territories, by estimated U.S. marine capture import value, 2019

Source	Value of U.S. imports from source (million $)	TIP report tier	ILAB report listing (fishing sector)		Basis for identification as high FL/CL/HT risk source
			Child labor	Forced labor	
Indonesia	674.4	Tier 2	Yes	Yes	Combination of ILAB listings and moderate TIP tier
China	615.6	Tier 3	No	Yes	High TIP tier with ILAB listings
Vietnam	383.3	Tier 2 Watch List	Yes	No	High TIP tier with ILAB listings
Taiwan	280.9	Tier 1 Mention	No	Yes	Combination of ILAB listings and moderate TIP tier
Thailand	99.1	Tier 2	Yes	Yes	Combination of ILAB listings and moderate TIP tier
Philippines	97.6	Tier 1 Mention	Yes	No	Combination of ILAB listings and moderate TIP tier
Fiji	80.0	Tier 2 Watch List	No	No	High TIP tier only
Honduras	52.8	Tier 2	Yes	No	Combination of ILAB listings and moderate TIP tier
Papua New Guinea	52.4	Tier 3	No	No	High TIP tier only
Burma	52.4	Tier 3	No	Yes	High TIP tier with ILAB listings

Source: USITC IUU Import Estimate; USDOS, *2019 Trafficking in Persons Report*, June 2019; USDOL, ILAB, *2020 List of Goods*, September 2020.
Note: U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

Table F.13 FL/CL/HT risk criteria for top 10 moderate FL/CL/HT source countries and territories, by estimated U.S. marine capture import value, 2019

Source	Value of U.S. imports from source (million $)	TIP report tier	ILAB Report Listing (fishing sector)		Basis for identification as moderate FL/CL/HT risk source
			Child labor	Forced labor	
India	284.6	Tier 2	No	No	Moderate TIP tier
South Korea	196.8	Tier 1 Mention	No	No	Moderate TIP tier
Brazil	148.2	None	Yes	No	ILAB listing
Peru	147.2	None	Yes	No	ILAB listing
Ecuador	102.7	Tier 2	No	No	Moderate TIP tier
New Zealand	64.3	Tier 1 Mention	No	No	Moderate TIP tier
Micronesia	60.5	Tier 2	No	No	Moderate TIP tier
Suriname	43.2	Tier 2	No	No	Moderate TIP tier
Solomon Islands	8.2	Tier 2	No	No	Moderate TIP tier
Uruguay	8.0	Tier 2	No	No	Moderate TIP tier

Source: USITC IUU Import Estimate; USDOS, *2019 Trafficking in Persons Report*, June 2019; USDOL, ILAB, *2020 List of Goods*, September 2020.
Note: U.S. import values in this table do not include imports based on source country fishing in unknown areas, which may slightly reduce import values compared to those seen in chapter 3.

Sensitivity Analysis for Adjustment of IUU Marine Capture Estimates Based on Evidence of Labor Violations

This section considers the impact on the final IUU marine capture estimates based on different standard approximations associated with FL/CL/HT risk. Within the estimation approach described in chapter 3, IUU marine capture estimates (as a share of reported landings) for a fishery were increased by 5 percent when source countries had moderate FL/CL/HT risk, and were increased by 10 percent when source countries had high FL/CL/HT risk. These additions were standardized because of a lack of information about the extent of labor violations in global marine capture landings.

Upward adjustments of IUU marine capture estimates were set at relatively small levels because these additions were intended to capture only labor violations that occur in marine capture production that is not also committing other IUU fishing violations. (The reason for this is that landings from sources with other IUU fishing violations would have already been included within the steps described above.) The choice of 5 and 10 percent was made due to assumptions that labor violations in otherwise legal fishing were (1) relatively uncommon but greater than zero (justifying small, but positive additions); and (2) higher in source countries with greater amounts of IUU fishing (justifying proportional additions to IUU estimates expressed as a share of reported landings).

Estimating additional IUU fishing in this manner has clear limitations. First, standard additional estimates were selected because they were considered adequately representative of the assumptions described above, but without direct evidence supporting these specific levels. Second, use of the same standard additions across different types of violations increases uncertainty (e.g., estimates for New Zealand and Peru both received a 5 percent increase due to identified forced labor and child labor, respectively). Similarly, even when standard additions are based on the same types of labor violations, there are frequently many other factors that influence the prevalence and distribution of labor violations in fisheries around the world, meaning that use of the same additional increases across different countries is also subject to uncertainty. In certain countries, FL/CL/HT risk factors may indicate the existence of labor practices that may not actually be defined as labor violations by the identified countries based on local laws or international obligations.

To analyze how these standard additions impacted the IUU marine capture estimates, different estimates were generated in order to test the baseline assumptions underpinning the 5 percent and 10 percent increases in these estimates. In order to test the effects of this first assumption—that labor violations in otherwise legal fishing are likely small—the Commission also estimated the extent of IUU fishing in U.S. imports based on higher additional increases. In this analysis (described as alternative 1), IUU marine capture estimates as a share of reported landings for each detailed fishery were increased by 10 percent when source countries had moderate FL/CL/HT risk, and were increased by 20 percent when source countries had high FL/CL/HT risk. The effects of these additional labor violations within final IUU marine capture estimates resulted in relatively modest increases in U.S. imports of marine capture and aquaculture IUU products (see table F.14). Effects are greater for IUU marine capture estimates from specific source countries with high FL/CL/HT risk and relatively high levels of IUU fishing in general, such as China, Vietnam, and Thailand (see table F.15).

As an additional alternative (alternative 2), IUU marine capture estimates were also increased based on an assumption that IUU fishing (as estimated in the previous steps) and labor violations are mutually exclusive activities. This alternative assumption represents the conceptual opposite of our baseline assumption that labor violations and other types of IUU fishing often occur simultaneously, a conclusion that is supported by the commonality of conditions and incentives driving these practices and by the observed incidence of overlap between them (as described in chapter 3). Without these assumed linkages, IUU fishing would likely be more extensive than the estimates presented in the report. Under alternative 2, total IUU marine capture estimates as a share of reported landings for each detailed fishery were increased by 7.5 percentage points when source countries had moderate FL/CL/HT risk, and were increased by 15.0 percentage points when source countries had high FL/CL/HT risk.[1314] Alternative 2 differed from the baseline analysis and alternative 1 methodologically: in those other scenarios, the additional quantity of IUU marine capture landings was based on an increase in the existing estimates of IUU fishing (based on previous steps), whereas in alternative 2, the quantity of additional landings with labor violations was estimated based on the total quantity of reported marine capture landings. Under this illustrative scenario, IUU marine capture estimates substantially increased for certain source countries with high risk; however, overall marine capture and aquaculture IUU estimates increased more moderately.

Table F.14 Estimated U.S. IUU imports under three different scenarios, 2019

Method	IUU (with labor violations) share of total value of U.S. imports (%)		
	Baseline (relatively few additional labor violations)	**Alternative 1 (higher additional labor violations)**	**Alternative 2 (no overlap between labor violations and other IUU fishing)**
Marine capture	13.3	13.9	16.5
Aquaculture	8.6	9.0	11.3
Total	**10.7**	**11.1**	**13.6**

Source: USITC IUU Import Estimate.

Note: In the baseline analysis (used in chapter 3), IUU marine capture estimates as a share of reported landings were increased by 5 percent and 10 percent if FL/CL/HT risk was moderate or high, respectively, for the source country. In alternative 1, IUU marine capture estimates as a share of reported landings were increased by 10 percent and 20 percent if FL/CL/HT risk was moderate or high, respectively. In alternative 2, IUU marine capture estimates as a share of reported landings were increased by 7.5 percentage points and 15.0 percentage points if FL/CL/HT risk was moderate or high, respectively. For example, prior to any FL/CL/HT risk-based adjustment, Thailand's industrial IUU marine capture landings of primary swimming crab in the Thai Gulf of Thailand EEZ were equivalent to 26.2 percent of reported landings in that fishery. Thailand has high FL/CL/HT risk. Therefore, under the baseline approach, this estimate was increased to 28.8 percent of reported landings (0.262 multiplied by 1.1). Under alternative 1, this estimate was increased to 31.4 percent of reported landings (0.262 multiplied by 1.2). Under alternative 2, this estimate was increased to 41.2 percent of reported landings (0.262 plus 0.15).

[1314] An increase by 15 percentage points for high FL/CL/HT risk was a round-number estimate based on survey findings by an ILO study, which found that 14 percent of surveyed workers in fishing in Thailand experienced forced labor conditions in 2019. ILO, *Endline Research Findings*, March 10, 2020.

Table F.15 Estimated U.S. IUU marine capture imports from top source countries and territories with moderate or high FL/CL/HT risk under three alternative scenarios, 2019

Source	IUU (with labor violations) share of total value of U.S. imports (%)		
	Baseline (relatively few additional labor violations)	Alternative 1 (higher additional labor violations)	Alternative 2 (no overlap between labor violations and other IUU fishing)
Indonesia	15.8	17.3	27.2
China	29.3	31.6	37.9
Vietnam	23.8	26.0	33.4
India	22.3	23.4	27.1
Taiwan	14.9	16.3	26.5
South Korea	9.5	9.9	15.8
Peru	14.6	15.3	20.1
Brazil	19.9	20.8	25.0
Thailand	25.4	26.3	34.8
Ecuador	22.8	23.8	27.6
Philippines	47.2	48.6	53.9
Fiji	11.9	13.0	24.2
New Zealand	8.2	8.6	14.8
Micronesia	1.6	1.6	8.9
Burma	22.4	24.4	32.0
All others	**10.0**	**10.1**	**10.6**
Total	**13.3**	**13.9**	**16.5**

Source: USITC IUU Import Estimate.

Note: In the baseline analysis (used in chapter 3), IUU marine capture estimates as a share of reported landings were increased by 5 percent and 10 percent if FL/CL/HT risk was moderate or high, respectively, for the source country. In alternative 1, IUU marine capture estimates as a share of reported landings were increased by 10 percent and 20 percent if FL/CL/HT risk was moderate or high, respectively. In alternative 2, IUU marine capture estimates as a share of reported landings were increased by 7.5 percentage points and 15.0 percentage points if FL/CL/HT risk was moderate or high, respectively. For example, prior to any FL/CL/HT risk-based adjustment, Thailand's industrial IUU marine capture landings of primary swimming crab in the Thai Gulf of Thailand EEZ were equivalent to 26.2 percent of reported landings in that fishery. Thailand has high FL/CL/HT risk. Therefore, under the baseline approach, this estimate was increased to 28.8 percent of reported landings (0.262 multiplied by 1.1). Under alternative 1, this estimate was increased to 31.4 percent of reported landings (0.262 multiplied by 1.2). Under alternative 2, this estimate was increased to 41.2 percent of reported landings (0.262 plus 0.15).

Recalculation of Total Marine Capture Landings

As described above and in chapter 3, IUU estimates expressed as shares of reported landings were used for purposes of comparing the benchmark estimates (and associated ranges of possible IUU estimates) with initial IUU marine capture estimates. On this basis, the IUU marine capture estimates within this report were first adjusted using risk profiles, and then further adjusted into final IUU estimates based on additional labor violations.

However, to make final IUU marine capture estimates usable within the subsequent steps of the IUU estimation approach, including for aquaculture IUU estimation and supply chain analysis, it was necessary that these estimates be expressed as a share of total landings. For each fishery, total landings were recalculated by adding reported landings (which did not change as a result of these adjustments) and adjusted IUU marine capture landings quantities. For purposes of this addition, the labor adjustments described above were not incorporated within IUU marine capture landings quantities, as a greater or lesser quantity of landings based on labor violations in otherwise non-IUU fishing was not considered likely to affect the overall quantity of landings in a fishery. However, the first set of adjustments was considered likely to substantially change the estimated quantity of total landings, as many IUU marine capture landings (and likely the vast majority in certain fisheries) are unreported.

Therefore, adjusted IUU marine capture landings used within revised total landings calculations were equivalent to (1) IUU marine capture estimates as a share of reported landings (as adjusted using risk profiles) multiplied by reported landings for each fishery; or (2) unreported landings, if there were no reported landings and the risk profile included “all IUU fishing” as an upper bound. The Agnew et al. study did not present total landings, and it is unclear whether reported and IU estimates within that study are mutually exclusive; if not, given this report’s adjustments using benchmark estimates from the Agnew et al. study, this report’s expression of IUU landings as a share of total landings may understate the extent of IUU fishing that is not also unreported.

Step 3: Estimation of IUU Feed Inputs for Aquaculture

This section provides additional detail for various calculations used within the aquaculture IUU estimation (step 3). The extent of IUU product within aquaculture supply chains varies by aquaculture-raised species group, based on (1) the types of fish inputs used within fishmeal and fish oil; (2) the amount of fishmeal and fish oil used in feed; and (3) the amount of feed needed to produce harvested aquaculture products.[1315] These are components within modified “Fish In: Fish Out” (FIFO) ratios used in this report to determine the amount of whole fish—specifically, those fish captured using IUU fishing—used to produce aquaculture-raised species groups. These calculations resulted in estimates of the extent of IUU marine capture product within aquaculture production by species group on a global basis. For each aquaculture species group, the proportion of IUU marine capture product inputs as a share of total aquaculture output was used directly to determine the share of U.S. imports of aquaculture products that consisted of IUU product.

In addition to these calculations for most aquaculture-raised products, the extent of IUU products within aquaculture-raised tuna production was estimated using a separate set of calculations. This section concludes with a description of these tuna-specific calculations. Aquaculture IUU estimates were not developed for certain filter-feeding bivalves, including mussels, scallops, oysters, and clams. Such estimates were also not developed for small quantities of global aquaculture production of cockles/ark shells, sea cucumbers, jellyfish, sea urchins, abalones, octopus, and other miscellaneous invertebrates and mollusks for which aquaculture feed use data were unavailable or not relevant.

Previous Approaches to Fish In: Fish Out Ratios

In a 2008 study by Tacon and Metian, the authors calculated the entire amount of whole forage “fish in” needed to produce a given quantity of “fish out” aquaculture output. Processing of forage fish into fishmeal and fish oil generates both products. Therefore, Tacon and Metian determined that the total quantity of whole forage fish required in aquaculture production of any given species was equivalent to the greater of (1) the fish needed to produce the fishmeal required; or (2) the fish needed to produce

[1315] These factors also vary within species groups based on the feed producers, countries, and industries involved, but these levels of granularity were not comprehensively available or incorporated within this report.

the fish oil required. Extra fishmeal or fish oil not required in aquaculture production was not counted within this analysis.[1316] However, a 2009 study by Jackson demonstrated that in aquaculture feed production, leftover fishmeal or fish oil is likely repurposed in other industries, including other aquaculture industries. Therefore, the Jackson study concluded that the sum of all "fish in" needed for producing multiple aquaculture-raised species groups, based on the Tacon and Metian methodology, likely far exceeded the actual amount of whole-fish inputs used within those multiple industries. Jackson developed a method to reduce the extent of multiple counting of whole fish used in aquaculture feed production across different industries.[1317]

Because this report includes aggregate findings with respect to U.S. aquaculture IUU imports and presents these on a global basis, the Commission produced FIFO ratios based on the Jackson study's technique. However, the Commission's FIFO calculations were modified in several ways. Rather than simply measure the quantity of fish inputs used to produce aquaculture products, the Commission measured separately the quantities of IUU and non-IUU marine capture landings that entered aquaculture industries based on estimates of the content of IUU marine capture products in fish oil and fishmeal. Another distinction between the Commission's FIFO method and the Jackson method involves the incorporation of fish used to produce byproduct trimmings. The Jackson method does not include byproduct-derived fish oil and fishmeal within the "fish in" calculations used.[1318] Use of byproducts to produce fish oil and fishmeal is considered a sustainable practice, as captured fish processed for human consumption are more fully utilized rather than wasted.[1319] However, when fish oil and fishmeal byproducts are generated from fish produced using IUU methods, these products are appropriately characterized as IUU marine capture products that enter aquaculture supply chains and were relevant to the scope of this report.[1320]

Aquaculture Input Groups and the Extent of IUU Marine Capture Product in Fishmeal and Fish Oil

The Commission estimated the use of specific "aquaculture input groups" (aggregated groups of species) used in coldwater and warmwater feeds using data from Cargill's 2019 Aqua Nutrition Sustainability Report (Cargill Report) as a guide for determining which types of marine capture products were used in the aquaculture supply chain.[1321] The Cargill Report contained the species composition of breakouts of

[1316] Tacon and Metian, "Global Overview on the Use of Fish Meal and Fish Oil," December 7, 2008.
[1317] Jackson, "FIFO Ratios Explained," January 2009; see also IFFO, "FIFO Ratios," October 2017.
[1318] Jackson, "FIFO Ratios Explained," January 2009.
[1319] IFFO, "FIFO Ratios," October 2017.
[1320] The inclusion of byproducts within "fish in" calculations may contribute to some double-counting of IUU product entering U.S. import supply chains, particularly when the same countries that process and export large quantities of marine capture IUU products are also major sources of byproduct trimmings in feed ingredient supply. For example, if the United States imports cans of skipjack tuna from Ecuador that were originally captured using IUU fishing, and also imports warmwater shrimp produced in any country from inputs derived from byproducts of those same tuna, such IUU product would be double-counted within total U.S. imports of IUU products. However, it is unlikely that the United States would be the destination for both products from the same fish.
[1321] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020. The Cargill Report detailed its efforts to use aquaculture inputs from sustainable sources, including from specific fisheries with IFFO RS and MSC certifications,

byproduct trimmings and forage fish used in warmwater and coldwater feeds.[1322] Because marine capture data and associated IUU fishing estimates were organized by species group based on steps 1 and 2, the Commission's aquaculture input groups were broader categories than the individual species included within the Cargill Report (where those were available). The Cargill Report also indicated the different extent to which byproduct trimmings and forage fish were used within fishmeal and fish oil that in turn were used in warmwater and coldwater feeds.[1323] Based on this information and using its own product groups, the Commission calculated the proportions of each aquaculture input group (both byproduct trimmings and forage fish) for fishmeal and fish oil used in warmwater and coldwater feeds.

The proportional use of each aquaculture input group within fishmeal and fish oil used in warmwater and coldwater feeds is presented in tables F.16 and F.17.

Table F.16 Estimates of shares of major aquaculture input groups within warmwater feed ingredients

Aquaculture input group	Use in fishmeal (%)	Use in fish oil (%)	IUU as a share of global landings (%)
Forage fish	37.3	38.1	14.8
Anchoveta, menhaden, and other forage fish	22.3	22.8	10.1
Mixed fish from Thailand and Vietnam	10.0	10.2	22.0
Sardine	2.3	2.3	22.6
Other clupeid herringlike products	0.9	0.9	18.0
Squid	0.8	0.8	25.7
All other species	1.0	1.1	19.9
Byproduct trimmings	62.6	61.8	10.6
Skipjack	18.4	18.2	8.5
Yellowfin tuna	12.7	12.5	8.5
Mixed fish from Thailand and Vietnam	6.1	6.1	12.1
Anchoveta, menhaden, and other forage fish	5.1	5.0	10.1
Squid	4.4	4.3	25.7
Catfish	4.3	4.3	0.0
Atlantic salmon	3.7	3.7	0.0
Sardine	3.2	3.2	22.6
Other clupeid herringlike products	1.4	1.4	18.0
All other species	3.3	3.2	19.9

Source: USITC IUU Import Estimate; Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.
Note: Only capture landings were included in forage fish calculations, whereas aquaculture products were also included within byproduct trimmings. "Squid" included loligo squid, other squid, and cuttlefish. "Mixed fish from Thailand and Vietnam" included all products where Thailand and Vietnam were the source countries. "All other species" included global marine capture landings other than for those species groups included in other aquaculture input groups.

and also listed the countries where species of fish were sourced. With the exception of certain mixed groups of species from major forage fish- and byproduct-producing regions, these identifications of forage fish and byproduct trimming origins were not used within the Commission's analysis of global aquaculture supply chains. Instead, the Cargill Report was used solely as a basis for approximating the proportions of various aquaculture input groups used within warmwater and coldwater feed. The aquaculture input species referred to in the Cargill Report are broadly consistent with those listed by IFFO, an international trade organization that represents the marine ingredients industry, as being commonly used within fish oil and fishmeal. IFFO, "Forage Fish and Whole Fish," accessed December 8, 2020.
[1322] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020, 31, 34.
[1323] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020, 31.

Table F.17 Estimates of shares of major aquaculture input groups within coldwater feed ingredients

Aquaculture input group	Use in fishmeal (%)	Use in fish oil (%)	IUU as a share of global landings (%)
Forage fish	59.0	71.8	10.9
Anchoveta, menhaden, and other forage fish	25.5	31.1	10.1
Blue whiting	17.0	20.6	4.0
Sardine	9.6	11.7	22.6
Herring	3.3	4.0	8.5
All other species	3.7	4.5	19.9
Byproduct trimmings	40.5	27.8	8.5
Herring	19.2	13.2	8.5
Various North Atlantic groundfish	9.9	6.8	1.3
Mackerel	3.0	2.1	13.2
Hake/Whiting	1.6	1.1	18.0
Jack/Horse mackerel	1.6	1.1	23.4
Walleye pollock	1.6	1.1	9.7
Capelin	1.3	0.9	3.9
All other species	2.1	1.5	19.9

Source: USITC IUU Import Estimate; Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.
Note: Only capture landings were included in forage fish calculations, whereas aquaculture products were also included within byproduct trimmings. "Various North Atlantic groundfish" included cod species, haddock, other codlike fish, flatfish other than halibuts, and pollock sourced by Denmark, Iceland, Ireland, Norway, and the United Kingdom. "All other species" included global marine capture landings other than for those species groups included in other aquaculture input groups.

IUU marine capture estimates for individual aquaculture input groups were then weighted proportionally to determine the extent of IUU product within fishmeal and fish oil. On a global basis, IUU marine capture products were estimated to comprise 9.9 percent of fishmeal and 10.2 percent of fish oil used to produce coldwater feeds, and 12.2 percent of fishmeal and fish oil used to produce warmwater feeds (see table F.18 below, which summarizes the results of the calculations described here).

IUU marine capture estimates for warmwater feeds were used within calculations of aquaculture IUU estimates for warmwater shrimp and tilapia, as these products were associated with warmwater feed within the Cargill Report.[1324] In addition, warmwater feed estimates were used in calculations of aquaculture IUU production for eels, carp, catfish, farm-raised swimming crabs, other crustaceans such as crayfish, and most fish species groups that naturally occur in freshwater environments. These associations were driven by the assumption that these predominantly Asian and freshwater products would use types and concentrations of aquaculture inputs within feed ingredients that were similar to those predominant within warmwater feeds for shrimp and tilapia. IUU marine capture estimates for coldwater feeds were used within calculations of aquaculture IUU estimates for salmon due to an association within the Cargill Report between coldwater feed and salmon production.[1325] Because Atlantic salmon is a carnivorous fish primarily raised in marine pens, coldwater feed estimates were also used in calculations of aquaculture IUU production for other marine fish (except tuna) and trout.

The extent of IUU product within fishmeal can be defined as IUU_{meal}. The extent of IUU product within fish oil can be defined as IUU_{oil}.

[1324] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.
[1325] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.

Fishmeal and Fish Oil Included in Feed

The extent of IUU product within aquaculture depended to a large extent on the inclusion of fishmeal and fish oil as a share of all ingredients within feeds, which varies considerably by aquaculture-raised product. The greater the extent of fishmeal and fish oil within feed, the greater the extent of IUU product used to produce aquaculture-raised seafood.

Estimates of fishmeal and fish oil inclusion in feed were derived from several sources (see table F.18). For all aquaculture-raised products considered likely to use coldwater feeds, including salmon, trout, and most carnivorous marine fish (except tuna), the Commission used the Cargill Report estimate for inclusion of fishmeal (14.5 percent) and fish oil (10.4 percent) within coldwater feed.[1326] For aquaculture-raised products considered likely to use warmwater feeds, a greater variety of fishmeal and fish oil inclusion rates were used in the analysis. For warmwater shrimp, swimming crabs, and other crustaceans, the Commission used the Cargill Report estimate for inclusion of fishmeal (8.7 percent) and fish oil (1.2 percent) within warmwater feed.[1327] For carp, tilapia, catfish, eel, and most other freshwater fish, the Commission used more specific estimates from a 2008 study by Tacon and Metian.[1328] For each of these fish types, the global inclusion rates provided by these authors for 2006 (the current rates at that time) and the projected inclusion rates for 2020 were averaged to reflect progressive reduction in fishmeal and fish oil within feeds over time.

The inclusion rate of fishmeal within feed for each aquaculture-raised product can be defined as use_{meal}. The inclusion rate of fish oil within feed for each aquaculture-raised product can be defined as use_{oil}.

Feed Fish Inclusion Factors (FFIFs)

By combining use_{meal} and use_{oil} along with standard fishmeal and fish oil conversion ratios, it was possible to calculate the amount of whole marine capture fish required to produce a given quantity of feed for each aquaculture-raised species group. These are referred to as "feed fish inclusion factors," and they are usually estimated based on the extent of forage fish within aquaculture feed. As described above, the Commission also included byproduct trimmings within its calculations, including FFIFs.

For any given aquaculture-raised species group, $FFIF = (use_{meal} + use_{oil})/(yield_{meal} + yield_{oil})$, where yield factors for fishmeal and fish oil refer to the amount of fishmeal and fish oil produced as a share of live fish inputs. Standard yield figures were used for fishmeal (22.5 percent) and fish oil (4.8 percent).[1329]

In this report, the proportion of live-weight IUU marine capture products required to produce a given quantity of feed was determined using a further modification of FFIFs. Using IUU_{meal} and IUU_{oil} along with the other components of FFIFs, an IUU feed fish conversion factor ($FFIF_{IUU}$) was determined for

[1326] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.
[1327] Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020.
[1328] Tacon and Metian, "Global Overview on the Use of Fish Meal and Fish Oil," December 7, 2008.
[1329] IFFO, "FIFO Ratios," October 2017. For a description of how fishmeal and fish oil are derived from whole fish or byproduct trimmings, see also Tahergorabi, "The Application of Seafood Processing By-products," August 16, 2016.

each species using the following formula: $FFIF_{IUU} = ((IUU_{meal} \times use_{meal}) + (IUU_{oil} \times use_{oil}))/(yield_{meal} + yield_{oil})$.

Economic Feed Conversion Ratios (eFCRs)

Another important consideration in determining the extent of IUU product within aquaculture was the quantity of feed required for aquaculture harvest, which also varied by aquaculture species group. If aquaculture products require more feed to reach harvestable weight, they will use more of the fishmeal and fish oil products within that feed, and by extension, require more marine capture products (including IUU products). eFCRs are calculated by dividing the total weight of feed used in aquaculture by the total harvest of aquaculture-raised product. The Commission used eFCRs from a 2015 study by Tacon and Metian.[1330]

Fish In: Fish Out Ratios

As a final step for determining the ratio of IUU marine capture product inputs to the total output of aquaculture-raised products, "fish in: fish out" ratios were calculated by multiplying the eFCR and the $FFIF_{IUU}$ of each aquaculture-raised species group: $FIFO_{IUU} = FFIF_{IUU} \times eFCR$. This is the quantity of live IUU marine capture product inputs relative to the total output of each aquaculture-raised species, which is also the aquaculture IUU estimate.

Table F.18 Estimates of proportional use of major aquaculture input groups within coldwater feeds

Aquaculture-raised product	IUU in meal (%)	IUU in oil (%)	Feed use of meal (%)	Feed use of oil (%)	FFIF (IUU) (ratio)	eFCR (ratio)	Aquaculture IUU estimate (%)
Salmon, trout	9.9	10.2	14.5	10.4	0.1	1.3	11.9
Marine fish	9.9	10.2	14.5	10.4	0.1	1.5	13.7
Carp	12.2	12.2	3.0	0.0	0.0	1.6	2.1
Tilapia	12.2	12.2	3.5	0.3	0.0	1.6	2.7
Catfish	12.2	12.2	6.0	1.4	0.0	1.3	4.3
Eel	12.2	12.2	40.0	3.5	0.2	1.5	29.0
Warmwater shrimp	12.2	12.2	8.7	1.2	0.0	1.5	6.6
Swimming crab and other crustaceans	12.2	12.2	8.7	1.2	0.0	1.7	7.5
Other freshwater fish	12.2	12.2	27.5	3.5	0.1	1.7	23.5

Source: USITC IUU Import Estimate; Cargill, "Cargill Aqua Nutrition Sustainability Report, 2019," 2020; IFFO, "FIFO Ratios," October 2017; Tacon and Metian, "Global Overview on the Use of Fish Meal and Fish oil," December 7, 2008; Tacon and Metian, "Feed Matters," February 2015; Jackson, "FIFO Ratios Explained," January 2009.
Note: "FFIF (IUU)" refers to the proportion of live-weight IUU marine capture products required to produce a given quantity of feed. "eFCR" refers to the total weight of feed used in aquaculture divided by the total harvest of aquaculture-raised product.

Aquaculture-raised Tuna

Unlike other aquaculture-raised species groups, aquaculture-raised tuna serving U.S. markets is primarily fed marine capture forage fish directly using locally harvested forage fish.[1331] Therefore, tuna

[1330] Tacon and Metian, "Feed Matters," February 2015.
[1331] Seafood Watch, "Pacific Bluefin Tuna: Mexico," December 5, 2020; Seafood Watch, "Pacific Bluefin Tuna: Japan," December 5, 2016.

species groups were the only aquaculture-raised products in this report that were directly linked with source countries' own marine capture fishing. IUU estimates for the marine capture inputs used for tuna were based on source countries' marine capture landings of mackerels; sardines; squid; other clupeid herringlikes; and anchoveta, menhaden, and other forage fish.[1332] These estimates can be expressed as IUU_{source}.

Because tuna are directly fed forage fish, the Commission did not use the same calculations described above for tuna regarding the conversion of fish into feed ingredients (fishmeal and fish oil) and the inclusion of feed ingredients within feeds. Instead, the extent of IUU marine capture product within tuna farming is simply the percentage of IUU product within all forage fish inputs multiplied by the eFCR for tuna: $FIFO_{IUU} = IUU_{source} \times eFCR$. The eFCR for tuna is 12:1, as it takes about 12–15 mt of wild fish to produce a single mt of farmed bluefin tuna.[1333] Based on this high eFCR, the extent of IUU marine capture product within aquaculture-raised tuna is over 100 percent for all major source countries that supply U.S. imports, other than Japan (14.2 percent).[1334]

Step 4: Supply Chain Mapping

The proportional weight of IUU and non-IUU landings within all underlying species groups, partner countries, source countries, fishing areas, and fishing sectors were used as a basis for estimating the extent of IUU product within U.S. imports. The underlying sources of partner countries' exportable supply were used as the basis for determining the extent of IUU products within U.S. imports. Trading partners' aquaculture products were included within partners' exportable supply, but their imports of aquaculture products from other countries were usually not included. These general assumptions and examples of how these supply chain mechanisms work are described in greater detail in chapter 3.

This appendix section provides detailed exceptions to these broader supply-chain mapping rules. These exceptions and underlying assumptions were based on information received over the course of this investigation from industry sources through interviews, hearing participation, and two industry roundtables. Additional research and knowledge of fisheries were also used to inform these assumptions.

Artisanal Marine and Freshwater Capture Landings

Artisanal marine capture landings and freshwater capture landings, both of which consisted predominantly of fishing activities by small-scale fishers, were weighted downward within exportable supply calculations. Most artisanal fishing is far less likely to enter global trade channels than industrial

[1332] These aquaculture input groups for tuna were based on Monterey Bay Aquarium Seafood Watch reports on tuna farming in Australia, Japan, and Mexico. Seafood Watch, "Pacific Bluefin Tuna: Mexico," December 5, 2020; Seafood Watch, "Pacific Bluefin Tuna: Japan," December 5, 2016; Seafood Watch, "Southern Bluefin Tuna: Australia," December 5, 2016.
[1333] Seafood Watch, "Pacific Bluefin Tuna: Mexico," December 5, 2020; Seafood Watch, "Pacific Bluefin Tuna: Japan," December 5, 2016; Seafood Watch, "Southern Bluefin Tuna: Australia," December 5, 2016.
[1334] When IUU marine capture product within aquaculture-raised tuna was calculated as being over 100 percent, aquaculture IUU estimates were capped at 100 percent of total production.

marine capture landings, for several reasons.[1335] Artisanal commercial fishing frequently overlaps with subsistence fishing activities in which excess catch is sold to local markets, and such catch can be an important source of seafood in local communities.[1336] Industrial fishers, which often have the ability to fish far offshore using large vessels with onboard processing and freezing facilities, are better equipped to enter global supply chains for otherwise perishable seafood products. Artisanal marine capture fishing is inherently less capital intensive than industrial fishing, relying to a greater extent on smaller vessels or shore fishing. Exporting also frequently relies on standardization of production and establishment of institutional support needed to meet the quality and safety standards of major importing countries, which can preclude access to global export opportunities for small fishers or fishing communities without these systems in place, particularly in lower-income countries.[1337]

The Commission therefore reduced quantities of artisanal marine capture and freshwater capture landings by 90 percent within partner countries' own landings as well as in their imports from source countries. This re-weighting had the practical effect of accentuating the characteristics (including the extent of IUU fishing) of industrial marine capture landings and aquaculture production relative to the landings of these smaller-scale fishers within global supply chain analysis. However, when artisanal marine capture fisheries were subject to the same risk profiles as industrial marine capture fisheries (as was almost always the case for combinations of source countries, fishing areas, and species groups), IUU marine capture estimates were frequently similar regardless of these assumptions. In addition, such re-weighting had little to no effect on the supply chain characteristics of imports from certain partners whose exportable supply for specific species groups overwhelmingly consisted of landings by artisanal and/or freshwater fishers.[1338] Artisanal and freshwater capture landings were not weighted downward for certain high-value species groups (including tunas, octopus, lobsters, shrimps, abalones, and eels), as small-scale fishers' participation in these global supply chains was considered likely to be more common based on statements by industry representatives.[1339]

Snappers

There is a broad variety of snappers captured globally, but the United States is predominantly a red snapper (*Lutjanus campechanus*) market. Most U.S. imports of snapper enter under 10-digit codes 0302.89.50.58 and 0303.89.00.67 of the Harmonized Tariff Schedule of the United States (HTS). These codes specify snapper products at the genus level, a grouping that includes many snappers that are likely less commonly consumed in the United States but are consumed widely on a global basis. In order

[1335] Most sources indicate that the primary markets for artisanal landings are local or domestic sales. The Fish Project, "Artisanal Fisheries," 2015; FAO, "FAO Term Portal: Artisanal Fisheries," accessed December 8, 2020.
[1336] Bhagooli and Kaullysing, "Seas of Mauritius," 2019; Pauly and Zeller, "Catch Reconstruction," 2015; FAO, "FAO Term Portal: Artisanal Fisheries," accessed December 8, 2020.
[1337] UNCTAD, *Fishery Exports and the Economic Development of Least Developed Countries*, 2017.
[1338] For example, Peru's exportable supply of "other squid" (squid other than cuttlefish and loligo squid) is harvested entirely by Peruvian artisanal vessels, based on Peru's import data and data on its capture landings and aquaculture production. Re-weighting Peruvian artisanal capture landings of other squid downward had no impact on the share of Peru's exportable supply from such sources, and therefore U.S. imports of other squid from Peru were entirely attributed to these artisanal sources.
[1339] USITC, hearing transcript, September 3, 2020, 277–79 (testimony of Rashid Sumaila, University of British Columbia Institute for the Oceans and Fisheries and Sea Around Us); industry representatives, interviews by USITC staff, May 18, 2020 and August 6, 2020.

to ensure that the IUU estimates reflected the high share of red snapper within U.S. imports of snapper products, other types of snapper (the “other snapper” species group) was weighted downward in U.S. partner countries’ exportable supply by 90 percent.

Warmwater Shrimp

The vast majority of U.S. imports of warmwater shrimp from major Asian aquaculture producing countries is likely to be from aquaculture production, notwithstanding substantial marine capture landings of warmwater shrimp in many of these countries. An industry representative with knowledge of the U.S. import supply chain for warmwater shrimp indicated that the largest suppliers and importers predominantly focus on farm-raised shrimp, with marine capture shrimp rarely entering discussions between supply chain participants.[1340] U.S. imports of marine capture warmwater shrimp from Thailand, Indonesia, India, Vietnam, China, Malaysia, and the Philippines were reduced within U.S. partner countries’ exportable supply by 90 percent, which had the effect of accentuating the characteristics of these countries’ aquaculture-raised warmwater shrimp within U.S. imports.

Swimming Crabs

Although several species of swimming crabs are produced in large volumes globally, only a few appear to be marketed in the United States in commercial volumes. In addition to being produced in large volumes in the United States, *Callinectes* species are produced in Mexico, Central America, and South America and exported to the United States.[1341] In Asia, the predominant species that are exported to the United States are blue swimming crab (*Portunus pelagicus*) from multiple countries and red swimming crab (*Portunus haani*) primarily from China.[1342] Other major commercial species, including gazami crab (*Portunus trituberculatus*), mud/swamp crabs of the genus *Scylla*, and crabs of the genus *Charybdis*, appear to be predominantly marketed in Asia.[1343] In order to allocate weighting of U.S. imports of swimming crabs toward the primary *Portunus* and *Callinectes* species, and away from these other species with substantial global capture and consumption, partner countries’ exportable supply of “other swimming crab” (consisting of these other species) were weighted downward by 90 percent. Descriptions of swimming crab imports in chapter 3 combine these two groupings.

Pacific Salmon

Other than fresh and frozen salmon products (under HTS 0302 and 0303) and certain processed products (under HTS 1604), most U.S. imports of Pacific salmon do not distinguish the type of Pacific salmon involved. Virtually all U.S. imports of Pacific salmon from Russia (as a trading partner) were frozen sockeye salmon (HTS 0303.11.00.00). Based on this, all frozen fillets of Pacific salmon that were

[1340] Industry representative, interview by USITC staff, August 27, 2020.
[1341] Seafood Watch, Recommendations database, accessed December 4, 2020; Twin Tails Seafood Corporation, “Twin Tails Crab Education,” accessed December 18, 2020.
[1342] Monterey Bay Aquarium Seafood Watch, “Recommendations,” accessed December 4, 2020; Twin Tails Seafood Corporation, “Twin Tails Crab Education,” accessed December 18, 2020; industry representative, interview by USITC staff, August 27, 2020.
[1343] Li, Ai, and Liu, “Mud Crab,” 2018; Roy’s Farm, “Gazami Crab,” August 20, 2017; FAO, “*Portunus trituberculatus*,” accessed December 18, 2020; FAO, “*Scylla serrata*,” accessed December 18, 2020.

originally sourced in Russia (including those that passed through other countries) were also considered likely to be sockeye salmon. For U.S. imports of frozen fillets of Pacific salmon that did not explicitly identify the species (all within HTS code 0304) from all countries, the weight of all Pacific salmon produced by Russia was reduced to zero if it was not sockeye salmon. As a result of this decision, most U.S. imports of Pacific salmon fillets were still originally sourced in Russia, but they were all considered sockeye.

U.S. imports of non-canned salmon not in oil (HTS 1604.11.40.50) is one of the largest product categories under which U.S. imports of salmon enter, and this product category could include either Atlantic or Pacific salmon. Canned salmon not in oil includes breakouts into chum, pink, sockeye, and other salmon (HTS 1604.11.40.10, 1604.11.40.20, 1604.11.40.30, and 1604.11.40.40), and of these imports of similar products, the large majority of them enter the pink salmon product code (HTS code 1604.11.40.20). For this reason, the weight of all salmon products entering under 1604.11.40.50 was reduced by 75 percent unless those products were pink salmon.

U.S. Exports of Certain Products

Most U.S. exports of unprocessed and semi-processed products to trading partners were included within those partners' exportable supply calculations, as the United States likely exports large quantities of certain products to partners for further processing before re-importing those products (see chapter 3 and chapter 6). However, certain products were reportedly less likely to enter these processing supply chains for purposes of re-importation back to the United States, including sockeye salmon, Chinook salmon, and halibut.[1344] In addition, U.S. exports of primary swimming crab were considered less likely to return to the United States. These U.S. exports were reduced by 90 percent within partners' exportable supply calculations.

[1344] Industry representative, interview by USITC staff, May 20, 2020.

Bibliography

This bibliography is divided into two sections. The first section includes entries that correspond to cited materials within appendix F. The second section includes resources used to assign fisheries risk that were not otherwise cited in chapter 3 or in appendix F.

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Appendix G
Country Profile Selection Criteria

Background

The U.S. House of Representatives Committee on Ways and Means (Committee), in its December 19, 2019, letter, requested the U.S. International Trade Commission (Commission or USITC) to conduct a factfinding study of the potential economic effects on U.S. fishers of competition with illegal, unreported, and unregulated (IUU) seafood imports. The Committee requested that the Commission's report provide a description of major global producers of IUU products, including but not limited to China, and country practices related to IUU production and exports.

To establish selection criteria for identifying countries as major global producers as requested in the letter, the Commission consulted the available literature and interviewed experts in the field, including government, academic, and industry representatives; environmental organizations; and nongovernmental organizations focusing on labor violations in the fishing industry. The Commission reviewed a number of sources that gave a systematic view of the global situation of IUU fishing activities and labor violations in the fishing sector. These sources also evaluated the risk of IUU fishing and certain labor violations in a global context.

The Commission combined these sources in a methodology to evaluate a large number of countries and to avoid profiling only countries with highly publicized instances of IUU fishing and violations of labor laws in the fishing industry. This methodology also ensured the Commission evaluated a wide range of IUU fishing activities in its analysis. These sources are discussed in detail below.

Country Selection Methodology

After the initial review of the sources described above, the Commission combined the information to develop criteria used to select the countries that would be identified as major global producers of seafood obtained via IUU fishing. From each source, the Commission selected the countries that were identified as engaging in the relevant activities by applying source-specific criteria (described below) or were estimated to be at high risk of engaging in these. The Commission then selected the countries with the highest number of occurrences in the sources. Specifically, the Commission evaluated the number of instances in which a country met the source-specific criteria and generally selected the countries with the highest number, as illustrated in table G.1.

Table G.1 Illustrative example of how the country selection scoring system was applied

Country	Meets criteria in source 1	Meets criteria in source 2	Meets criteria in source 3	Meets criteria in source 4	Meets criteria in source 5	Number of occurrences in which country met source-specific criteria
Country A	X	X		X		3
Country B		X	X			2

Source: Illustrative example by USITC staff.

The first step resulted in over 50 countries being evaluated for appearing in at least one of these sources. The Commission then further analyzed nine countries that met the highest number of source-specific criteria: Cambodia, Ghana, Indonesia, Panama, Russia, South Korea, Tanzania, Thailand, and Vietnam. Indonesia met five source-specific criteria and the other countries met four. In addition to the sources analyzed using the method described above, the Commission considered countries' value of marine-capture production, geographic location, and seafood industry structure when making country selections. In adjusting the list based on value of seafood production, Peru and Spain were added to the list of nine countries because these were the largest producers in South America and Europe, respectively; they also met the highest number of source-specific criteria for their respective regions. Cambodia, Tanzania, and Panama were dropped from the list because the value of production from these countries is relatively low.

Upon further research into IUU activities in specific countries on the initial list, Ghana and Peru were found to not merit individual country profiles because the problems identified were largely linked with China's distant-water fishing (DWF) fleet and not their own country fleets. Instead, a description of these activities was included in chapter 4, which features descriptions of China's DWF fleet around the globe. Issues in the Peruvian anchovy fishery (the largest fishery in the world) were included as part of the Commission's analysis of aquaculture inputs described in chapter 3, since production from that fishery is typically incorporated into global aquaculture production and is rarely exported directly to the United States. Of note, Mexico, India, and the Philippines—all of which are among the top U.S. suppliers of seafood obtained via IUU fishing (shown in chapter 3) and are large global producers of seafood—were not included in the profiles as these countries met fewer selection criteria than the countries that were selected.

Sources

As described above and illustrated in table G.1, the Commission identified seven sources that applied a global systematic analysis of multiple countries. Specifically, the Commission identified three sources evaluating IUU fishing activities and two sources evaluating violations to labor laws in the fishing sector. Further, a source evaluating risk of IUU fishing and a source evaluating risk of labor violations in the fishing sector were incorporated in the analysis.

Sources Evaluating IUU Fishing Activities

1. U.S. National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) biennial reports to Congress:

   NOAA Fisheries submits biennial reports to Congress on international fisheries management under the Magnuson-Stevens Act.[1345] In the three-year process established under the law, NOAA first identifies countries for IUU fishing and/or bycatch of protected marine resources or shark catch on the high seas. These countries are included in the biennial report submitted to Congress. Following identification, NOAA enters a two-year consultation process encouraging the country to take measures to address the identified issue(s). After the consultation period ends, NOAA Fisheries determines the certification status of the country. The certification status can be positive—if the country provides evidence of actions implemented to address identified issue(s)—or negative, which "may result in denial of U.S. port access for fishing vessels of that nation and potential import restrictions on fish or fish products." The certification status is

[1345] NOAA Fisheries, "Identification of IUU Fishing Activities," June 23, 2020.

included in the following biennial report.[1346] In order to select the countries for review, NOAA uses multiple sources including regional fisheries management organization (RFMO) materials, reports from U.S. Coast Guard, foreign governments, the media, nongovernmental organizations, responses to a *Federal Register* notice requesting public input, and other public sources. This information does not capture labor violations.

The Commission analyzed countries that had been included in NOAA Fisheries' biennial reports from 2009 to 2019. If a country had been identified by NOAA Fisheries as engaging in IUU fishing activities in any of the reports, it was determined to meet source-specific criteria.

While comprehensive, NOAA Fisheries biennial reports cover only countries with which the United States has an international fishery management agreement, countries that fish in the U.S. EEZ, or countries have shared fish in stocks with the United States that are not subject to an international management agreement.

2. European Union's Carding Decisions:

   In 2010, the European Council (EC) Regulation No 1005/2008 entered into force, establishing a "Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing."[1347] The regulation established a catch certificate scheme that requires countries exporting seafood products to the European Union (EU) to certify the origin and legality of marine catches being exported, as described in chapter 2. If a country is unable to certify the legality of the products, the regulation allows the EU to issue a warning to the country in order to begin a dialogue with the country "to help improve their legal framework and practices." The warnings are commonly referred to as "cards": the first identification is known as a yellow card and gives the country an opportunity to improve their measures to combat IUU fishing. After a "yellow card" is issued, countries are given a set timeframe to implement reforms. A failure to do so results in a "red card," while implementing the required reforms results in a "green card." Countries issued red cards can be sanctioned, including by banning imports of their fisheries' products into the EU.

   The Commission analyzed countries that had been carded by the EU since 2010. If a country had an active yellow or red card as of March 2020, it was determined to meet source-specific criteria.

   While broad in scope, the EU carding decisions only cover countries that export seafood to the EU or that lend their flags to vessels that export into the EU market. According to IUU Watch, "(carded) countries are usually chosen based on their relevance to the EU seafood sector as flag, coastal, port or market State."

3. Trygg Mat Tracking's Combined IUU Vessel List:

[1346] Countries can also be deemed "of interest" by NOAA Fisheries if they are flagged for certain violations but do not meet the threshold for being identified (e.g., the threshold for including a country for having vessels engaging in IUU fishing is two vessels). NOAA Fisheries, *Improving International Fisheries Management*, 2019.
[1347] IUU Watch, "Background to the Regulation," accessed October 12, 2020.

Twelve regional fisheries management organizations maintain or share lists of vessels that have been identified as engaging in or supporting IUU fishing activities.[1348] The Norwegian nongovernmental organization, Trygg Mat Tracking (TMT), combines these lists with a list of fishing vessels that have been subject to an Interpol Purple Notice and makes it available to the public.[1349]

The Commission used the version of TMT's dataset available on March 31, 2020, and determined a country to meet source-specific criteria if, as of that date, it had vessels marked as "currently listed" by one or more RFMOs.

While the combined IUU vessel list gives information on vessels that have been listed as engaging in IUU fishing activities, it does not include vessels engaging in IUU fishing that have not been listed by RFMOs. RFMOs have variable practices for listing countries as engaging in IUU fishing and, in some cases, flag countries can prevent a vessel from being listed, which would not be captured by the data. Additionally, as vessels change ownership and flag, they are delisted, which does not mean the vessel would not continue to engage in IUU fishing. Further, vessels not flying a country flag or flying multiple flags are marked as "stateless" in the data.[1350] As a result, the vessel data is helpful in the selection method, but best when combined with the other sources shown here.

4. U.S. Department of State 2019 *Trafficking in Persons Report*[1351]:

   The U.S. Department of State publishes the *Trafficking in Persons Report* annually, as mandated by the Victims of Trafficking and Violence Protection Act of 2000 (TVPRA). The report is a comprehensive resource used as a diplomatic tool to engage foreign governments on issues related to human trafficking. It includes country profiles, which contain a detailed discussion of the actions country governments take to combat human trafficking. Based on the requirements set forth under the TVPRA and the actions taken by country governments, the report assigns each country to a tier, which are defined in appendix F.

   The Commission compiled a list of the countries for which the report mentioned evidence of human trafficking in their domestic fishing sector or by vessels fishing in their waters. A country was designated as meeting source-specific criteria if the report mentioned human trafficking activities domestically or abroad by country nationals. While the Commission focused on

[1348] The RFMOs that maintain or share lists of vessels identified as engaging in IUU fishing are: the Commission for the Conservation of Antarctic Marine Living Resources, the Inter-American Tropical Tuna Commission , the International Commission for the Conservation of Atlantic Tunas, the Indian Ocean Tuna Commission, the Northwest Atlantic Fisheries Organization, the North East Atlantic Fisheries Commission, South East Atlantic Fisheries Organization, the Western and Central Pacific Fisheries Commission, the South Pacific Regional Fisheries Management Organization, the General Fisheries Commission for the Mediterranean, the North Pacific Fisheries Commission, and the Southern Indian Ocean Fisheries Agreement. TMT, "Combined IUU Vessel List," accessed March 30, 2020.
[1349] For more information about Interpol Purple Notices, see chapter 2.
[1350] Industry representative, interview by USITC staff, May 28, 2020.
[1351] When developing the methodology for selecting countries to profile in this study, the 2020 *Trafficking in Persons Report* had not been published, thus the Commission used information included in the 2019 *Trafficking in Persons Report*.

countries with assigned tier rankings of Tier 2 and above, it also determined Tier 1 countries to meet source-specific criteria if the report noted persistent issues in its fishing sector.[1352]

While the report analyzes human trafficking activities in every country, it only mentions broadly that there are known instances of these activities in a number of countries and does not include information on the prevalence of these issues, especially in specific sectors.

5. U.S. Department of Labor's *2018 List of Goods Produced by Child Labor or Forced Labor*[1353]:

   The U.S. Department of Labor (USDOL), International Labor Affairs Bureau, publishes the List of Goods Produced by Child Labor or Forced Labor and their source countries, as required under the Trafficking Victims Protection Reauthorization Act (TVPRA).[1354] The goods and countries are identified based on available public information—including media reports, interviews, and in-depth on the ground research— grouped by type of product, and presented on an annual list by country and whether forced or child labor has been identified.[1355]

   The USDOL's definition of child labor is based on the two International Labor Organization (ILO) treaties on child labor.[1356] Those treaties establish the minimum required standards regarding children's labor rights for member states, though states can establish higher standards if they choose.[1357] The USDOL distinguishes child labor as a subset of "working children," and excludes certain permitted labor for children from its definition.[1358] Child labor is further distinguished from "the worst forms of child labor," a subset of child labor which includes slavery, debt-bondage, work involving illicit activities, and hazardous work as defined by individual member states.[1359]

[1352] This is the case of the Philippines and Taiwan, which in the 2019 *Trafficking in Persons Report* were ranked as Tier 1 countries, however country narratives identified Taiwan- and Philippines-flagged vessels as engaging in human trafficking and holding fishers in forced labor and debt-bondage conditions, among other violations. USDOS, 2019 Trafficking in Persons Report, June 2019.
[1353] When developing the methodology for selecting countries to profile in this study, the *2020 List of Goods Produced by Child Labor or Forced Labor* had not been published, thus the Commission used information included in the *2018 List of Goods Produced by Child Labor or Forced Labor*.
[1354] USDOL, ILAB, *2018 List of Goods Produced by Child Labor or Forced Labor*, September 2018.
[1355] Industry representative, interview by USITC staff, April 30, 2020.
[1356] Definitions related to child labor are guided by ILO Minimum Age Convention and ILO Worst Forms of Child Labor Convention. ILO's Resolution Concerning Statistics of Child Labor, developed during the 18th International Conference of Labor Statisticians (ICLS), and amendments made during the 20th ICLS provide the international framework for measuring children's work. USDOL, ILAB, *2020 List of Goods Produced by Child Labor or Forced Labor,* September 2020, 56.
[1357] 2020 List of Goods produced by Child Labor and Forced Labor, Appendix 2. For a general overview of the function and obligations of the two treaties and their subsequent resolutions and amendments, *see generally* Rombouts, "The International Diffusion of Fundamental Labour Standards," 2019, 98.
[1358] The USDOL defines child labor as "work below the minimum age for work, as established in national legislation that conforms to international standards." The definition includes the worst forms of child labor but also expressly "excludes children who work only a few hours a week in permitted light work and those who are above the minimum age who engage in work not classified as a worst form of child labor. USDOL, ILAB, *2020 List of Goods Produced by Child Labor or Forced Labor,* September 2020, 56.
[1359] For the full list of the worst forms of child labor, *see* ILO C. 182, Worst Forms of Child Labor, 1999, Art. 3.

The Commission obtained the 2018 List of Goods Produced by Child Labor or Forced Labor and determined a country to meet source-specific criteria if it was listed as having fish or fish products —namely dried fish, shrimp, fish, shellfish, tilapia, lobsters, and Nile perch—produced with child or forced labor.

While DOL analyzes labor practices in a large number of countries, the *List of Goods Produced by Child Labor or Forced Labor* relies on publicly available information provided by private sources and only captures what these sources investigate. The list does not provide detailed information of the issues identified in most countries or on the prevalence of these issues.[1360]

Sources Evaluating Risk of IUU Fishing or Labor Violations

In addition to the sources described above, which document specific instances of fishing and labor violations in source countries, the Commission considered two additional sources that examine risk factors that have been shown to be associated with fishing and labor violations. While the evidence presented in these sources is less direct than that contained in the sources above, the sources were considered to be valuable additional indicators of countries that should be prioritized for profiles in chapter 5.

1. *World Wildlife Fund, Illegal Fishing: Which Fish Species Are at Highest Risk from Illegal and Unreported Fishing?* (2015 report)

   In 2015, this World Wildlife Fund (WWF) report combined two sources to estimate the risk of IUU fishing for marine species. The estimates presented in Agnew et al, “Estimating the Worldwide Extent of Illegal Fishing,” 2009 covered the prevalence of IUU fishing for groups of fish species and ocean basins, while a 2011 FAO report provided a stock assessment.[1361] The WWF report presented these estimates by FAO fishing area and included a list of the main countries fishing in each area.

   The Commission determined a country to meet source-specific criteria if it was listed as one of the main fishing countries in fishing areas deemed at high or moderate risk of IUU fishing.

   Although the Commission analysis provides comprehensive estimates for all the global fishing areas, the risk profiles are derived from estimates on risk of illegal fishing that are over 10 years old. Additionally, other factors that could increase or mitigate the risk of IUU fishing are not considered in this report.

2. *The Minderoo Foundation’s Global Slavery Index 2018*

   The Global Slavery Index (GSI) developed estimates on the level of risk of modern slavery for the top 20 fishing nations, indicating where “undetected modern slavery issues may exist.”[1362] Countries are presented as having high, moderate, or low risk of modern slavery in their fishing industries. The fishing GSI combines results from the main GSI on the prevalence of modern

[1360] Industry representative, interview by USITC staff, April 30, 2020.
[1361] WWF, “Illegal Fishing,” October 2015.
[1362] The Minderoo Foundation, Global Slavery Index 2018, 2018.

slavery, media and NGO reports, and fisheries information from the Sea Around Us project. These further inform the risk of a country having modern slavery in its fishing sector by incorporating factors such as dependence on distant water fishing, levels of vessel and fuel subsidization, and the scale of unreported fish by a country's fleet.

The Commission determined a country to meet source-specific criteria if it was listed as having high or moderate risk of modern slavery in their fishing industry.

Although the index estimates the risk of modern slavery in the fishing sectors of largest 20 fishing countries, which account for about 80 percent of the total global marine catch, it is not indicative of actual incidence of modern slavery. Further, the index applies estimates on modern slavery for the country as a whole to estimate the risk in the fishing sector.

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Appendix H
Ratification of International Treaties on Fishing and Labor

Throughout the years, many of the countries profiled in Chapters 4 and 5 have joined several treaties covering fishing activities and workers' rights (table H.1). When a country becomes party to a treaty, it consents to be bound by it. A country can become party to a treaty by means of ratification, acceptance, or accession, or can become a signatory before fully joining the treaty. Depending on the treaty and respective legal system of the countries involved, implementing legislation might also be necessary to give effect to the treaty obligations. The definitions of these terms are provided below:[1363]

1. **Ratify/ratification:** "the international act whereby a state indicates its consent to be bound to a treaty if the parties intended to show their consent by such an act."[1364]
2. **Acceptance/approval:** "the instruments of 'acceptance' or 'approval' of a treaty have the same legal effect as ratification and consequently express the consent of a state to be bound by a treaty. In the practice of certain states acceptance and approval have been used instead of ratification when, at a national level, constitutional law does not require the treaty to be ratified by the head of state."[1365]
3. **Accession/acceded:** "the act whereby a state accepts the offer or the opportunity to become a party to a treaty already negotiated and signed by other states. It has the same legal effect as ratification. Accession usually occurs after the treaty has entered into force."[1366]
4. **Signed/signature:** when a treaty is subject to ratification by its own terms, "signature does not establish the consent to be bound. However, it is a means of authentication and expresses the willingness of the signatory state to continue the treaty-making process. The signature qualifies the signatory state to proceed to ratification, acceptance or approval. It also creates an obligation to refrain, in good faith, from acts that would defeat the object and the purpose of the treaty." In treaties where ratification is not required, however, signature can establish a country's intent to be bound ("Definitive Signature").[1367]

Table H.1 Ratification status of international treaties on fishing and labor (year)

International treaties	China	Indonesia	Thailand	Vietnam	Russia	Spain
UN Treaties						
UN Convention on the Law of the Seas	Ratified (1996)	Ratified (1986)	Ratified (2011)	Ratified (1994)	Ratified (1997)	Ratified (1997)
UN Fish Stocks Agreement	Not ratified (signed in 1996)	Ratified (2009)	Acceded (2017)	Acceded (2018)	Ratified (1997)	Ratified (2003)

[1363] When a country has not ratified, accepted, acceded, or signed a treaty, it is considered a non-party. United Nations Treaty Collection, "Law of Treaties," May 23, 1969.
[1364] United Nations Treaty Collection, Glossary, citing Vienna Convention on the Law of Treaties 1969, Arts. 2 (1) (b), 14 (1) and 16.
[1365] United Nations Treaty Collection, Glossary, citing Vienna Convention on the Law of Treaties 1969, Arts. 2 (1) (b) and 14 (2).
[1366] United Nations Treaty Collection, Glossary, citing Vienna Convention on the Law of Treaties 1969, Arts. 2 (1) (b) and 15.
[1367] United Nations Treaty Collection, Glossary, citing Vienna Convention on the Law of Treaties 1969, Arts. 10 and 18.

International treaties	China	Indonesia	Thailand	Vietnam	Russia	Spain
UN Port State Measures Agreement	Non-party	Ratified (2016)	Acceded (2016)	Acceded (2019)	Not ratified (signed in 2010)	Ratified by EU (2011)
UN Palermo Protocol on Trafficking in Persons	Acceded (2010)	Ratified (2009)	Ratified (2013)	Acceded (2012)	Ratified (2004)	Ratified (2002)
UN Convention on the Rights of the Child	Ratified (1992)	Ratified (1990)	Acceded (1992)	Ratified (1990)	Ratified (1990)	Ratified (1990)
ILO Conventions						
Forced Labor Convention (C29)	Not ratified	Ratified (1950)	Ratified (1969)	Ratified (2007)	Ratified (1956)	Ratified (1932)
Protocol to the Forced Labor Convention (P29)	Not ratified	Not ratified	Ratified (2018)	Not ratified	Ratified (2019)	Ratified (2017)
Freedom of Association and Protection of the Right to Organise Convention (C87)	Not ratified	Ratified (1998)	Not ratified	Not ratified	Ratified (1956)	Ratified (1977)
Right to Organise and Collective Bargaining Convention (C98)	Not ratified	Ratified (1957)	Not ratified	Ratified (2019)	Ratified (1956)	Ratified (1977)
Equal Remuneration Convention (C100)	Ratified (1999)	Ratified (1958)	Ratified (1999)	Ratified (1997)	Ratified (1956)	Ratified (1967)
Abolition of Forced Labor (C105)	Not ratified	Ratified (1999)	Ratified (1969)	Ratified (2020)[(a)]	Ratified (1998)	Ratified (1967)
Discrimination (Employment and Occupation) Convention (C111)	Ratified (2006)	Ratified (1999)	Ratified (2017)	Ratified (1997)	Ratified (1961)	Ratified (1967)
Minimum Age (C138)	Ratified (1999)	Ratified (1999)	Ratified (2004)	Ratified (2003)	Ratified (1979)	Ratified (1977)
Worst Forms of Child Labor (C182)	Ratified (2002)	Ratified (2000)	Ratified (2001)	Ratified (2000)	(Ratified (2003)	Ratified (2001)
Maritime Labor (C186)	Ratified (2015)	Ratified (2017)	Ratified (2016)	Ratified (2013)	Ratified (2012)	Ratified (2010)
Work in Fishing (C188)	Not ratified	Not ratified	Ratified (2019)	Not ratified	Not ratified	Not ratified

Source: UNTC, "United Nations Convention on the Law of the Sea," December 14, 2020; UNTC, "Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks," December 14, 2020; FAO Treaties Database, "Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal Unreported and Unregulated Fishing (PSMA)," accessed December 14, 2020; UNTC, "Protocol to Prevent, Suppress and Punish Trafficking in Persons, Especially Women and Children, supplementing the United Nations Convention against Transnational Organized Crime," December 14, 2020; UNTC, "Convention on the Rights of the Child," December 14, 2020; ILO, "Ratifications of C029 - Forced Labour Convention, 1930 (No. 29)," accessed December 14, 2020; ILO, "Ratifications of P029 - Protocol of 2014 to the Forced Labour Convention, 1930," accessed December 14, 2020; ILO, "Ratifications of C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)," accessed February 11, 2021; ILO, "Ratifications of C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98)," accessed February 11, 2021; ILO, "Ratifications of C100 - Equal Remuneration Convention, 1951 (No. 100)," accessed February 11, 2021; ILO, "Ratifications of C105 - Abolition of Forced Labour Convention, 1957 (No. 105)," accessed December 14, 2020; ILO, "Ratifications of C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111)," accessed February 11, 2021; ILO, "Ratifications of C138 - Minimum Age Convention, 1973 (No. 138)," accessed December 14, 2020; ILO, "Ratifications of C182 - Worst Forms of Child Labour Convention, 1999 (No. 182)," accessed December 14, 2020; ILO, "Ratifications of MLC, 2006 - Maritime Labour Convention, 2006 (MLC, 2006)," accessed December 14, 2020; ILO, "Ratifications of C188 - Work in Fishing Convention, 2007 (No. 188)," accessed December 14, 2020.

[a] Enters into force in 2021.

In addition to international treaties, most of the countries profiled in Chapters 4 and 5 are also members of various regional fisheries management organizations (RFMOs). These memberships are shown on table H.2.

Table H.2 Membership to regional fisheries management organizations (RFMOs)

RFMO	Acronym	China	Indonesia	Thailand	Vietnam	Russia	Spain
Convention for the Conservation of Antarctic Marine Living Resources	CCAMLR	✓				✓	✓
Commission for the Conservation of Southern Bluefin Tuna	CCSBT		✓				✓ [a]
General Fisheries Commission of the Mediterranean	GFCM						✓
Inter-American Tropical Tuna Commission	IATTC	✓	[b]				✓ [a]
International Commission for the Conservation of Atlantic Tunas	ICCAT	✓				✓	✓ [a]
Indian Ocean Tuna Commission	IOTC	✓	✓	✓			✓ [a]
Northwest Atlantic Fisheries Organization	NAFO					✓	✓ [a]
North East Atlantic Fisheries Commission	NEAFC					✓	✓ [a]
North Pacific Fisheries Commission	NPFC	✓				✓	
South East Atlantic Fisheries Organization	SEAFO						✓ [a]
Southern Indian Ocean Fisheries Agreement	SIOFA	✓		✓			✓[a]
South Pacific Regional Fisheries Management Organization	SPRFMO	✓				✓	✓ [a]
Western and Central Pacific Fisheries Commission	WCPFC	✓	✓	[b]	[b]		✓ [a]

Source: CCAMLR, “Members,” (accessed November 27, 2020); CCSBT, “Origins of the Convention,” (accessed November 27, 2020); FAO, “General Fisheries Commission for the Mediterranean - GFCM: Membership,” (accessed November 27, 2020); ICCAT, “Contracting Parties,” (accessed November 27, 2020); FAO, “Indian Ocean Tuna Commission: Structure of the Commission,” (accessed November 27, 2020); NAFO, “Overview of NAFO,” (accessed November 27, 2020); NEAFC, “Home,” (accessed November 27, 2020); NPFC, “The North Pacific Fisheries Commission (NPFC),” (accessed November 27, 2020); SEAFO, “Contracting Parties,” (accessed November 27, 2020); SIOFA, “Southern Indian Ocean Fisheries Agreement (SIOFA),” accessed November 27, 2020; SPRFMO, “Home,” (accessed November 27, 2020); WCPFC, “About WCPFC,” February 11, 2020.

[a] The European Union is a member to the RFMO.

[b] Cooperating non-member.

Appendix I
Technical Details of the Economic Models and Sensitivity Analyses

This appendix provides a technical description of the economic models, additional information about model inputs, and select sensitivity analyses of results presented in chapter 7. The first section describes the models' structural features. The second section describes the data and parameter inputs, including the approach used to econometrically estimate the within-species elasticity of substitution parameters. The third section describes the limitations of the models. The last section of this appendix reports a set of additional model runs under alternative assumptions to illustrate the sensitivity of estimated economic effects to these assumptions.

Technical Description of the Models

The report uses species-level partial equilibrium models to estimate the effects of removing IUU imports from the U.S. commercial fishing industry. The U.S. industry for each species is assumed to operate under monopolistic competition with a large number of fishers that compete with one another. Products in the model are differentiated by source of supply, which may be at the country level or at the regional level depending on the species under consideration.[1368,1369] Consumers substitute across differentiated products based on a constant elasticity of substitution (CES) that is econometrically estimated for each species using the trade cost method described later in this appendix. A nesting structure is used to add inter-species demand links to the model, so that changes in the price of one species will affect related species (figure I.1). In the baseline consumers cannot distinguish between IUU and non-IUU imports, and both types of imports cross the border at the same import price. Table I.1 provides a detailed description of the demand nesting structure, supply constraints, and processing for each model and set of species in the analysis.

U.S. fisheries regional catch limits are used to appropriately limit domestic supply responses. Catch limits that are binding, or close to binding, will determine the level of domestic supply in the model absent IUU imports. Domestic catch limits are represented as vertical asymptotes to domestic supply functions for each species. The models also include fish processing for species where a significant portion of IUU imports crosses the U.S. border as a processed product. For most models, the price of the processed product is a constant markup over the price of the unprocessed product. The unprocessed product and processed product outcomes for all linked species are solved for simultaneously in the model. Markups are calibrated to 2018 market data that reflect an initial equilibrium and remain fixed in the analysis.

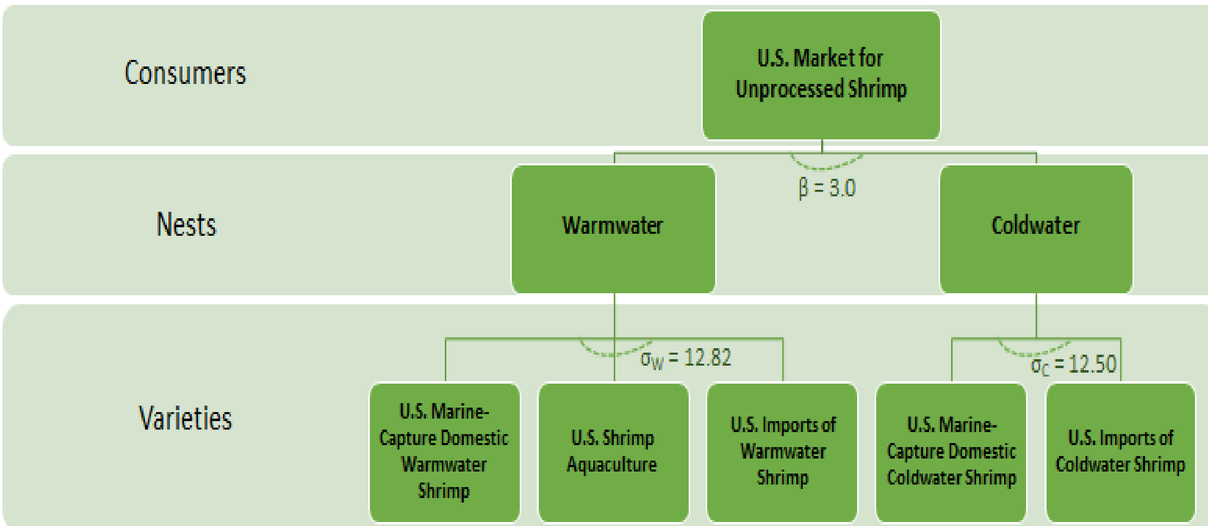
The models are calibrated to observed 2018 data on landings, processing, and trade, and assumed to be in a state of initial equilibrium. The models then exogenously reduce imports by the IUU estimate (as reported in chapter 3) and impose replacement rates for other imports for each product type. The models then solve for a new set of equilibrium prices and quantities in the market absent the IUU import estimates. The IUU imports are removed for all related species and all products simultaneously.

Operating income changes are calculated using the monopolistic competition assumption that the species-level operating margin is equal to the inverse of the elasticity of substitution.[1370] Operating income changes are calculated and reported for both unprocessed and processed products. It can be

[1368] For example, cod and pollock species are separated by Atlantic and Pacific regions.
[1369] Armington, "A Theory of Demand for Products Distinguished by Place of Production," 1969, 159–78.
[1370] USITC, *Caribbean Basin Economic Recovery Act*, September 2019.

assumed that operating income changes for unprocessed products are received by U.S. fishers, and processed product operating income changes are split between U.S. fishers and U.S. processors.[1371]

Figure I.1 Example nesting structure for unprocessed shrimp



Source: Example by USITC staff.
Note: The parameters σ and β are the within- and across-species elasticities of substitution. They are described in the parameters sections below.

Table I.1 Detailed description of models

Model and species	U.S. demand nesting structure	U.S. supply constraints	U.S. processing
Groundfish: Atlantic cod, Pacific cod, Atlantic pollock, Alaska pollock	Nest 1: U.S. marine-capture Atlantic cod, U.S. marine-capture Pacific cod, U.S. imports of cod (σ = 4.71) Nest 2: U.S. marine-capture Atlantic pollock, U.S. marine-capture Alaska pollock, U.S. imports of pollock (σ = 11.62) Across-nest elasticity of substitution = 5.0	All species have catch limits; Atlantic cod designated as overfished in all Atlantic regions	Processing included in model; price of the processed product a constant markup over the price of the domestic landings
Salmon: chinook, chum, coho, pink, sockeye, Atlantic (farmed)	Nest 1: U.S. marine-capture Chinook, U.S. imports of Chinook (σ = 4.02) Nest 2: U.S. marine-capture chum, U.S. imports of chum (σ = 4.02) Nest 3: U.S. marine-capture coho, U.S. imports of coho (σ = 4.02) Nest 4: U.S. marine-capture pink, U.S. imports of pink (σ = 4.02) Nest 5: U.S. marine-capture sockeye, U.S. imports of sockeye (σ = 4.02) Nest 6: U.S. farmed Atlantic, U.S. imports of Atlantic (σ = 5.14) Across-nest elasticity of substitution = 3.0	No catch limits exist; low supply elasticities for Chinook, coho, chum, and sockeye species because of their Endangered Species Act (ESA) status	Processing included in model; price of the processed product a constant markup over the price of the domestic landings

[1371] The model would require additional assumptions about upstream and downstream competitiveness to calculate that split.

Model and species	U.S. demand nesting structure	U.S. supply constraints	U.S. processing
Pelagic forage species: sardine, herring, anchovy, mackerel aggregate	Nest 1: U.S. marine-capture sardine, U.S. imports of sardine (σ = 6.57) Nest 2: U.S. marine-capture herring, U.S. imports of herring (σ = 7.79) Nest 3: U.S. marine-capture anchovy, U.S. imports of anchovy (σ = 5.86) Nest 4: U.S. marine-capture mackerel, U.S. imports of mackerel (σ = 7.79) Across-nest elasticity of substitution = 3.0	All species have catch limits except herring; low supply elasticities for sardine and herring species because of overfishing status	Processing included in model; price of the processed product a constant markup over the price of the domestic landings
Tuna and tuna-like: albacore, yellowfin, bluefin, bigeye, skipjack, bonito, NEI tuna	Species used primarily in canning (skipjack, albacore, yellowfin, bonito, and NEI tuna) are linked. Species sold primarily to fresh markets and used in fillets and sushi (bigeye, bluefin) are linked. There is no link across canning and fresh nests. Nest 1: U.S. marine-capture albacore, U.S. imports of albacore (σ = 2.01) Nest 2: U.S. marine-capture yellowfin, U.S. imports of yellowfin (σ = 2.87) Nest 3: U.S. marine-capture skipjack, U.S. imports of skipjack (σ = 8.45) Nest 4: U.S. marine-capture NEI tuna, U.S. imports of NEI tuna (σ = 2.01) Nest 5: U.S. marine-capture bonito, U.S. imports of bonito (σ = 8.45) Across-species elasticity of substitution for species used in canning = 3.0 Nest 6: U.S. marine-capture bigeye, U.S. imports of bigeye (σ = 2.58) Nest 7: U.S. marine-capture bluefin, U.S. imports of bluefin (σ = 6.04) Bigeye-bluefin elasticity of substitution = 3.0	Bigeye and bluefin have recommended RFMO catch limits; low supply elasticities used for bigeye and bluefin because of overfishing status	Processing included in model; price of the processed product a constant markup over the unprocessed price index
Shrimp: warmwater shrimp, coldwater shrimp, aquaculture	Nest 1: U.S. marine-capture warmwater shrimp, U.S. shrimp aquaculture, U.S. imports of warmwater shrimp (σ = 12.82) Nest 2: U.S. marine-capture coldwater shrimp, U.S. imports of coldwater shrimp (σ = 12.50) Across-nest elasticity of substitution = 3.0	No catch limits; low supply elasticity for coldwater shrimp due to overfishing status	Processed shrimp segment modeled separately; no price links to the unprocessed segment
Lobster: American lobster, spiny lobster	Nest 1: U.S. marine-capture coldwater lobster, U.S. imports of coldwater lobster (σ = 3.05) Nest 2: U.S. marine-capture warmwater lobster, U.S. imports of warmwater lobster (σ = 16.65) Across-nest elasticity of substitution = 1.5 (unprocessed) and 3.0 (processed)	Spiny lobster has a catch limit; American lobster not managed with catch limits and unconstrained	Processed lobster segment modeled separately; no price links to the unprocessed segment

Model and species	U.S. demand nesting structure	U.S. supply constraints	U.S. processing
Octopus (standalone)	Nest 1: U.S. marine-capture octopus, U.S. imports of octopus (σ = 6.15)	No catch limits exist; low supply elasticity because no federally managed fishery in mainland U.S.	No processing
Squid (standalone)	Nest 1: U.S. marine-capture squid, U.S. imports of squid (σ = 4.11)	Catch limits	Processed squid segment modeled separately; no price links to the unprocessed segment
King crab (standalone)	Nest 1: U.S. marine-capture king crab, U.S. imports of king crab (σ = 10.73)	Catch limits; low supply elasticity used because fishing activity considered difficult to scale up	No processing
Snow crab (standalone)	Nest 1: U.S. marine-capture snow crab, U.S. imports of snow crab (σ = 8.99)	Catch limits	Processing included in model; price of the processed product a constant markup over the price of the domestic landings
Blue crab (standalone)	Nest 1: U.S. marine-capture blue crab, U.S. imports of swimming crab (σ = 13.30)	No catch limits exist, unconstrained	Processing included in model; price of the processed product a constant markup over the price of the domestic landings
Red snapper (standalone)	Nest 1: U.S. marine-capture red snapper, U.S. imports of red snapper (σ = 4.71)	Catch limits	No processing
Grouper (standalone)	Nest 1: U.S. marine-capture grouper, U.S. imports of grouper (σ = 2.94)	Catch limits	No processing
Mahi-mahi (standalone)	Nest 1: U.S. marine-capture mahi-mahi, U.S. imports of mahi-mahi (σ = 4.61)	No catch limits exist, unconstrained	Processed mahi-mahi segment modeled separately; no price links to the unprocessed segment
Swordfish (standalone)	Nest 1: U.S. marine-capture swordfish, U.S. imports of swordfish (σ = 1.97)	Catch limits	Processed swordfish segment modeled separately; no price links to the unprocessed segment

Note 1: The symbol σ represents the within-species elasticity of substitution. This parameter value is estimated using the trade cost method in Riker (2020) and is explained further in the technical appendix.
Note 2: Models do not include processing if the IUU share of imports for processed products is small.
Note 3: Species groupings and nesting decisions were made based on species-specific research and conversations with industry experts. All demand and supply equations will be included in a post-report model release.

Detailed Description of Model Inputs

Domestic landings data are obtained from the *Fisheries of the United States 2018* report published by U.S. Department of Commerce's National Oceanic Atmospheric Administration National Marine

Fisheries Service (known as NOAA Fisheries).[1372] Landings data are reported on a round (live) weight basis. Data include landings by U.S.-flag vessels at ports within the 50 states plus U.S. territories. The dollar value of landings used in the model are ex-vessel as paid to the fisher at the time of first sale. Only U.S. commercial landings were included in domestic production; U.S. recreational fishing was not included in the models.[1373] The landings data also do not include U.S. aquaculture production. If a species has domestic aquaculture as a viable substitute, it is included as an additional differentiated variety in the models. Since aquaculture data were not available for 2018 at the time of preparing this report, a five-year average value from 2013 to 2017 was used for the 2018 aquaculture variety in the baseline.

Processed product production data were obtained from the NOAA Fisheries processed products database.[1374] These data were originally collected by NOAA Fisheries through a survey of seafood processors across the United States. The model data inputs include only products that are directly substitutable with the processed fish imports for that species. The models do not include processing of fish meal, offal, or oils, or processed products not for human consumption.

U.S. import data by species were used to establish imported substitutable varieties for U.S. landings and U.S. processing. The model also crucially requires the flow of U.S. imports of each species that are sourced from IUU activities, as estimated in chapter 3. This data flow includes seafood obtained via IUU fishing activities in both marine capture and aquaculture products. For a detailed description of the U.S. import data used, and details about how the IUU import estimate was calculated, refer to chapter 3 and appendix F. U.S. export data were obtained from NOAA Fisheries' trade database.[1375]

Parameter inputs not described in the sub sections below are reported in table I.2. The elasticities listed below were chosen based on species-specific research and discussions with the industry.

Table I.2 Select parameter inputs

Parameter	Value
Across-species elasticity of substitution[a]	3.0
Industry price elasticity of demand, all species	-1.0
Price elasticity of supply, all species unless otherwise mentioned below	5.0
Price elasticity of supply, species considered overfished	2.0
Price elasticity of supply, octopus	2.0
Price elasticity of supply, salmon species with ESA status	2.0

Source: USITC estimates.
[a] The across-species elasticity of substitution parameter is only used for models that involve multiple species: cod and pollock, tuna, salmon, shrimp, lobster, and pelagic forage fish (sardines, anchovies, herring, and mackerel).

Replacement Rates

Replacement rates describe the supply response of non-IUU imports when IUU imports are (hypothetically) removed from the U.S. market in the simulations. These rates depend on a wide variety

[1372] NOAA Fisheries, *Fisheries of the United States 2018*, February 2020.
[1373] Recreational fishing landings are not seen as a substitutable product with commercial fishing for this analysis because catch from recreational fishing is typically harvested for personal consumption or released.
Florida Fish and Wildlife Conservation Commission, "Recreational Fisheries FAQ," accessed October 21, 2020.
[1374] NOAA Fisheries, NOAA Fisheries Processed Products database, accessed September 1, 2020.
[1375] NOAA Fisheries, "NOAA US Trade in Fishery Products," accessed September 1, 2020.

of factors, including the policy implemented to remove IUU imports from the U.S. market and the ability of foreign seafood suppliers to divert their trade from other countries. The replacement rates in the model reflect an assumption that the policy implemented is a border policy and not a policy at the point of harvest. The model assumes that the border policy is fully effective at stopping IUU products from crossing the border. After the policy is implemented, suppliers of IUU products may divert their trade to countries without a border policy and divert non-IUU trade to the United States. The extent to which this trade diversion is likely to occur is captured in the replacement rate.[1376]

The assumption about the policy implemented is important. If the policy is implemented at the point of harvest, such as via more policing in international waters, then the hypothetical scenario where IUU is removed from the market stops IUU seafood products from being generated. There would be no trade diversion in this case, indicating 0 percent replacement of IUU imports. If the policy is a border policy, such as the Seafood Import Monitoring Program (SIMP), the IUU activities are still occurring.[1377] The border policy stops the IUU products from entering the United States. Trade diversion occurs between countries, where fish suppliers divert their IUU trade to countries with lax border policies and divert non-IUU trade to the U.S. after the border policy is implemented. This leads to a non-zero replacement of IUU imports.

Trade diversion of IUU product depends on a variety of factors, including the size of U.S. imports relative to global imports for that species, the number of suppliers of the product, and the estimated amount of IUU product imported into the country. If the flow of IUU product in imports is large, then there are more products to replace and trade diversion is less likely. If the U.S. imports a significant share of global product or if there are few suppliers of the product, then there are less sources to draw from and trade diversion is also less likely.

The magnitude of the replacement rate is pinned down using evidence from historical antidumping orders on freshwater crawfish tail meat and frozen warmwater shrimp. Freshwater crawfish tail meat from China had antidumping duties imposed starting in 1997.[1378] U.S. crawfish imports at the time were almost entirely sourced from China. After the antidumping duties were imposed, the quantity of crawfish imports from China decreased by roughly 228 mt from 1996 to 1997. Of this reduction, non-subject countries replaced roughly 73 mt, or 32 percent of the product.

Frozen warmwater shrimp is the second antidumping case analyzed.[1379] The antidumping duties were levied on Brazil, China, India, Thailand, and Vietnam and entered into force in 2005.[1380] After antidumping duties were imposed, the quantity of frozen warmwater shrimp imports from the subject

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[1376] This approach assumes that foreign IUU production is not affected by the U.S. border policy and does not consider any supply-side changes at the point of harvest.
[1377] See chapters 2 and 3 for further information on SIMP.
[1378]The antidumping duties for freshwater crawfish tail meat covered Harmonized Tariff Schedule of the United States (HTS) codes 0306.19.00.10 and 0306.29.00.00. Note that the antidumping duties on these crawfish products ended in May of 2019. 62 Fed. Reg. 48218 (September 15, 1997).
[1379] The antidumping duties for frozen warmwater shrimp covered HTS codes 0306.17.00, 1605.21.10.30, and 1605.29.10.10.
[1380] The antidumping duties on frozen warmwater shrimp are still in place. 69 Fed. Reg. 70997 (December 8, 2004). https://www.federalregister.gov/documents/2004/12/08/04-26976/notice-of-final-determination-of-sales-at-less-than-fair-value-certain-frozen-and-canned-warmwater.

countries decreased by about 23,410 mt. Of this decrease, non-subject countries replaced roughly 8,133 mt of product, equivalent to a 35 percent replacement rate in the data.

The case studies described above act as a benchmark for the replacement rate determination, and then species-specific data are used to adjust the rate up or down depending on the assessed likelihood of trade diversion. Nearly all U.S. crawfish imports at that time were sourced from China, and the level of imports from China was large. However, there were several other large import markets for crawfish. A low number of suppliers, with other large import markets, led to a 32 percent replacement of product. In the shrimp case, the U.S. was one of the largest importers of shrimp, but there were a large number of shrimp suppliers available to replace the product, which led to a 35 percent replacement of product. Using this evidence, the moderate replacement rate is set at 30 percent. The low and high replacement rates are set at 10 and 50 percent, respectively. For species with significant IUU product in imports, few suppliers, and if the U.S. imports a large share of global imports, the low replacement rate is used in the model. For the opposite, the high replacement rate is used. For all other species, the moderate replacement rate is used in the model.

Within-Species Elasticity of Substitution Estimation

The within-species elasticity of substitution parameters were estimated using the trade cost method described in Riker (2020).[1381] The method uses variation in international trade costs to identify the elasticity of substitution across sources of imports for each species. Panel import data from 2012 to 2019 were obtained from the U.S. International Trade Commission's DataWeb and were disaggregated by product, source country, customs district of import entry, and year. The measure for international trade costs is the ratio between the landed duty-paid value of imports and the customs value, and includes international freight costs, tariffs, and other import charges. The estimation used country-year and district-year fixed effects to control for variation in prices and other demand factors, including the price index, producer prices, and total expenditures.

Table I.3 reports elasticity estimates for each species modeled. For species where sufficient data were not available for the estimation, a related species' estimate was used as a proxy. These species include red snapper, mackerel, bonito and other tuna species. Not enough data were available about Pacific salmon species (Chinook, chum, coho, pink, and sockeye) to estimate an elasticity of substitution for each species, so an aggregate Pacific salmon elasticity was estimated instead.[1382]

[1381] Riker, "A Trade Cost Approach to Estimating the Elasticity of Substitution," July 2020.

[1382] For example, chum salmon was imported from only three countries in the years used in the panel.

Table I.3 Within-species elasticity of substitution estimates from a 2012–19 panel of U.S. imports data

Species group	Estimate
Albacore tuna	2.01
Anchovy	5.86
Atlantic salmon	5.14
Bigeye tuna	2.58
Bluefin tuna	6.04
Cod	4.71
Coldwater lobster	3.05
Coldwater shrimp	12.50
Grouper	2.94
Herring	7.79
King crab	10.73
Mahi-mahi	4.61
Octopus	6.15
Pacific salmon	4.02
Pollock	11.62
Sardine	6.57
Skipjack tuna	8.45
Snow crab	8.99
Squid	4.11
Swimming crab	13.30
Swordfish	1.97
Warmwater lobster	16.65
Warmwater shrimp	12.82
Yellowfin tuna	2.87

Source: USITC estimates.
Note: These estimates were produced using the trade cost method described in Riker (2020).

Catch Limits

As described in the model inputs above, catch limits are used to limit the supply responses of commercial fishers in the model. Catch limits are an important driver of the magnitude of supply changes in the model. The removal of IUU products from imports implies greater demand for U.S.-caught products, leading to increases in either price, landings, or both. For the species that are nearing their U.S. total allowable catch limit, the effect on U.S. commercial fishers of removing IUU products from imports will be primarily through the price of their catch. Though not modeled explicitly, catch limits also serve to limit long-term changes to stock populations. If there are large increases in domestic landings for a particular species in the policy scenario, there could be adverse effects to stock populations in the next period if catch limits are not enforced in the model.

The Magnuson-Stevens Act requires that acceptable biological catch (ABCs) and annual catch limits (ACLs) be set for federally managed stocks that have fishery management plans.[1383] There are exceptions to this rule for species that are managed under an international agreement and species with a lifespan less than one year. Tuna and other highly migratory species are typically managed through international RFMO agreements that provide recommended catch limits for participating member

[1383] NOAA Fisheries, *Magnuson-Stevens Fishery Conservation and Management Act*, May 2007.

countries. The longfin squid is another species that is excepted from the rule because the species has a lifespan less than one year. See chapter 6 for more discussion on fishery management rules.

The 2018 aggregated species-level ACL is used for the catch limit in the model where it exists. ACL data are collected for each commercial fishing region from U.S. Regional Fishery Management Councils (RFMC) sources and aggregated up to the species level used in the model. For some species, like cod and pollock, the ACLs are aggregated up to the Pacific and Atlantic oceans. For other species, ACLs are aggregated to the national level. For bigeye and bluefin tuna species, recommended and adopted catch limits are used in the model. For species that do not have ACLs or recommended catch limits, this analysis uses information about overfishing or Endangered Species Act status to appropriately limit supply responses. Table I.4 contains aggregate catch limits used in the model.

Table I.4 Select aggregate catch limits used in the species-specific models

Species group	Region	Aggregate catch limit	2018 overfishing status
Alaska pollock[a]	Gulf of Alaska and East Bering Sea	2,762,265 mt	None
Atlantic bigeye tuna[b]	Atlantic Ocean (HMS)[c]	1,575 mt	Overfished
Atlantic bluefin tuna[d]	Atlantic Ocean (HMS)	1,248 mt	None
Atlantic cod[e]	Georges Bank and Gulf of Maine	2,185 mt	Overfished in Georges Bank and Gulf of Maine
Atlantic pollock[f]	Atlantic Ocean	38,204 mt	None
Grouper[g]	South Atlantic and Gulf of Mexico	5,591 mt	Red grouper overfished in South Atlantic
Illex shortfin squid[h]	Atlantic Ocean	22,915 mt	None
Blue king crab[i]	Pribilof Islands and St. Matthew Island	31 mt	Overfished in Pribilof Islands
Golden king crab[j]	Aleutian and Pribilof Islands	4,210 mt	None
Red king crab[k]	Bristol Bay, Pribilof Islands, Norton Sound, and Western Aleutian Islands	4,800 mt	None
Loligo longfin squid[l]	Atlantic Ocean	22,932 mt	None
North Atlantic albacore tuna[m]	Atlantic Ocean (HMS)	791 mt	None
North Atlantic swordfish[n]	Atlantic Ocean (HMS)	3,378 mt	None
Northern anchovy[o]	Northern and Central subpopulation	34,750 mt	None
Pacific bigeye tuna[pqr]	Western, Central, and Eastern Pacific, U.S. territories	10,304 mt	None
Pacific bluefin tuna[s]	Pacific Ocean	630 mt	Overfished
Pacific cod[t]	Eastern Bering Sea, Gulf of Alaska, Aleutian Islands, West Coast	242,721 mt	None
California market squid[u]	California	118,000 mt	None
Red snapper[v w]	Gulf of Mexico and South Atlantic	3,235 mt	Overfished in South Atlantic
South Atlantic swordfish[x]	South Atlantic (HMS)	75 mt	None

Species group	Region	Aggregate catch limit	2018 overfishing status
Spiny lobster[y z]	Gulf of Mexico, South Atlantic, Puerto Rico, and U.S. Virgin Islands	4,403 mt	None
Snow and Tanner Crab[α]	Alaska	40,500 mt	None

[a] NOAA Fisheries, "Alaska Groundfish Harvest Specifications," accessed November 19, 2020.
[b] ICCAT, "Tropical Tuna Fishery Development," November 2018.
[c] HMS refers to highly migratory species.
[d] NOAA Fisheries, "Atlantic Bluefin Tuna and Northern Albacore Quotas," September 27, 2018.
[e] NOAA Fisheries, "Northeast Multispecies (Groundfish)" April 30, 2018.
[f] NOAA Fisheries, "Northeast Multispecies (Groundfish)" April 30, 2018.
[g] NOAA Fisheries, "Southeast Region ACL Monitoring," August 27, 2020.
[h] 82 Fed. Reg. 58583 (December 13, 2017).
[i] North Pacific Council, *SAFE Report for the King and Tanner Crab Fisheries*, September 2018.
[j] North Pacific Council, *SAFE Report for the King and Tanner Crab Fisheries*, September 2018.
[k] North Pacific Council, *SAFE Report for the King and Tanner Crab Fisheries*, September 2018.
[l] 82 Fed. Reg. 58583 (December 13, 2017).
[m] NOAA Fisheries, "Atlantic Bluefin Tuna and Northern Albacore Quotas," September 27, 2018.
[n] NOAA Fisheries, "NOAA Fisheries Adjusts the 2018 North and South Atlantic Swordfish Quotas," July 30, 2018.
[o] Pacific Fishery Management Council, "Annual Season Management," accessed November 19, 2020.
[p] Electronic Code of Federal Regulations (eCFR), "Electronic Code of Federal Regulations: Longline Fishing Restrictions," accessed October 27, 2020.
[q] 83 Fed. Reg. 53399 (October 23, 2018).
[r] NOAA Fisheries, "Longline Bigeye Tuna Catch Limits in the Pacific," August 13, 2019.
[s] NOAA Fisheries, "National Marine Fisheries Service Pacific Bluefin Stakeholder Meeting," June 2020.
[t] NOAA Fisheries, "Alaska Groundfish Harvest Specifications," accessed November 19, 2020.
[u] California Department of Fish and Wildlife, "Market Squid Fishery Management Plan," accessed November 19, 2020.
[v] NOAA Fisheries, "Final Rule to Adjust Gulf of Mexico Red Snapper Sector Annual Catch Limits," June 6, 2017.
[w] NOAA Fisheries, "Commercial Reopening for Red Snapper," November 30, 2018.
[x] NOAA Fisheries, "NOAA Fisheries Adjusts the 2018 North and South Atlantic Swordfish Quotas," July 30, 2018.
[y] 83 Fed. Reg. 29044 (June 22, 2018).
[z] 50 CFR § 622.12: LII / Legal Information Institute, "Annual catch limits (ACLs) and accountability measures (AMs) for Caribbean island management areas/Caribbean EEZ," accessed November 19, 2020.
[α] North Pacific Council, *SAFE Report for the King and Tanner Crab Fisheries*, September 2018.

Limitations of the Modeling Approach

There are several limitations to the modeling approach. First, the partial equilibrium framework does not endogenously model the supply responses of non-U.S. legal fishers after hypothetically eliminating IUU imports. In principle, trade diversion of legal imports could be estimated using a complete multi-country model of the fishing industry, but that is not practical for the extensive modeling in this investigation. The models instead include species-level replacement rate ranges based on a set of common selection criteria. These criteria are practical rules of thumb for calculating replacement rates based on readily available information. This approach also holds fixed the mix of non-U.S. IUU and non-IUU global production of fish and does not consider any supply-side changes at the point of harvest. The assumption is that the IUU fishing violations will continue to occur, but the mix of products entering the U.S. adjusts in response to the hypothetical policy change.

Second, the models rely on conversion factors obtained from both the Food and Agriculture Organization of the United Nations (FAO) and NOAA Fisheries to convert net to live weight products in the model. These conversion factors are commonly used in the industry to convert product weights but are only estimates.

Third, the models use a simple rule to link processed and unprocessed products from the same species. The models assume that processed product prices are a constant markup over unprocessed products prices. The approach does not model changes in non-fish processing costs or changes in the share of processing costs attributed to the fish input.

Fourth, U.S. catch limit model inputs are an aggregation of regional catch limits. For some species, regional catch limits are aggregated in the Pacific and Atlantic separately, and for other species they are aggregated at the national level. The models do not constrain domestic supply by region and assume that increases in demand for U.S. products can be filled where catch limits are not binding.

Sensitivity Analyses

This section presents sensitivity analyses to show the responsiveness of model outcomes to alternate parameter assumptions. First, model outcomes are re-estimated using a 90 percent confidence interval for the within-species elasticity of substitution estimates. These estimates were described in the model inputs section above and presented in table I.3. There are a few species where the lower bound of the confidence interval is below 1.0. For these species, a low value of 1.5 is used.[1384] Average effects using the upper and lower bounds of the confidence intervals are presented in table I.5. The landings and domestic-caught price impacts increase with higher elasticities of substitution; the higher the elasticity, the more willing consumers are to shift product sourcing, leading to higher landings impacts. The price index impact decreases with increases in the elasticity of substitution. This is because the import price increases are smaller as the elasticity of substitution increases, and a greater share of seafood markets are sourced from imports, so the average price index lowers. Operating income changes are smaller for higher values of the elasticity of substitution. The operating margin for each product is calculated as the inverse of the elasticity of substitution, so the higher the elasticity, the smaller the margin received for U.S. seafood products.

Table I.5 Average effects of removing IUU imports from the U.S. market for species modeled, using a 90 percent confidence interval on within-species elasticity of substitution estimates

Factors	Lower bound	Benchmark effect	Upper bound
Landings effect, % change	2.0	2.7	3.2
Domestic-caught price effect, % change [a]	0.5	0.7	0.8
Average price effect, % change	2.4	2.2	2.1
Operating income effect, change in million $	71.3	60.8	50.7

Source: USITC estimates.
Note: This table reports the weighted-average change in domestic prices and landings, and the total change in domestic operating income, for species modeled in this chapter. Weights were calculated using 2018 production volumes. Estimates of price and quantity changes by species were determined using customized partial equilibrium models and are presented in chapter 7. Upper and lower bounds refer to 90 percent confidence intervals on within-species elasticity of substitution estimates used in the species-level models.
[a] The average domestic-caught price is the average price received by U.S. fishers for their catch. The average price index includes both domestic landings prices and import prices.

In the second sensitivity analysis, across-species substitutability is removed, so price impacts for one species does not impact the outcomes of another related species. For example, if the price of bluefin tuna increases, it no longer impacts the model outcomes for bigeye tuna. Average effects under the assumption of no across-species substitutability are presented in table I.6. Landings, domestic-caught

[1384] The species with a lower bound below 1.0 are grouper, coldwater lobster, octopus, swordfish, and albacore tuna.

price impacts, and operating income are lower when there is no across-species substitution. There are a few opposing effects that lead to these lower outcomes. First, consumers of constrained species are no longer substituting towards less-constrained seafood options. One example is with the pelagic forage fish model, where consumers of sardines cannot shift consumption to mackerel or anchovy following the positive demand shift from the removal of IUU products. Consumers instead buy sardines at a higher price. On the other hand, this leads to lower price changes for related unconstrained species that are not receiving the additional demand from across-species substitution. The direction of average price effects depends on which effect is bigger in aggregate. Operating income increases are lower with no across-species substitution because price and landings impacts are generally smaller.

Table I.6 Average effects of removing IUU imports from the U.S. market for species modeled, with no across-species substitutability between similar products

Factors	Benchmark Effect	No Across-Species Substitution
Landings effect, % change	2.7	2.2
Domestic-caught price effect, % change[a]	0.7	0.5
Price effect, % change[a]	2.2	2.4
Operating income effect, change in million $	60.8	53.1

Source: USITC estimates.

Note: This table reports the weighted-average change in domestic prices and landings, and the total change in domestic operating income, for species modeled in this chapter. Weights were calculated using 2018 production volumes. Estimates of price and quantity changes by species were determined using customized partial equilibrium models and are presented in chapter 7. Across-species substitution is removed from the species-level models for similar products.

[a] The average domestic-caught price is the average price received by U.S. fishers for their catch. The average price index includes both domestic landings prices and import prices.

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Appendix J
Additional Tables Corresponding to Figures in the Report

Data Table for Chapter 3 Figure

Table J.1 shows the data for figure 3.5, "Estimated U.S. marine capture imports from top 10 trading partners, share of products from partner's domestic and foreign-sourced IUU and non-IUU sources, 2019."

Table J.1 Data for figure 3.5

Partner	Share of U.S. marine capture imports from partner's domestic IUU landings (%)	Share of U.S. marine capture imports from partner's domestic non-IUU landings (%)	Share of U.S. marine capture imports from partner's foreign-sourced IUU landings (%)	Share of U.S. marine capture imports from partner's foreign-sourced non-IUU landings (%)
Canada	2.3	79.9	1.1	16.7
China	11.9	27.6	5.1	55.4
Thailand	2.9	8.3	9.3	79.5
Russia	16.4	83.2	0.0	0.3
Indonesia	14.8	78.3	0.6	6.4
Vietnam	15.9	50.6	3.4	30.0
Mexico	24.5	71.6	0.6	3.3
India	20.5	67.5	3.5	8.5
Argentina	15.9	80.4	0.5	3.2
Ecuador	9.1	29.8	7.7	53.4
All others	11.6	66.8	3.3	18.3
Global	10.4	61.9	3.0	24.8

Source: USITC IUU import estimate.
Note: "Partner's domestic" landings refer to partner's exports to the United States estimated to consist of partner's own marine capture landings, whereas "Foreign-sourced" landings refer to partner's exports to the United States estimated to be derived from partner's own imports of marine capture products from other countries. Corresponds to figure 3.5.

Data Tables for Chapter 6 Figures

Tables J.2 and J.3 show the data for figure 6.1, "United States: Regional share of commercial landings, by volume and value, 2015–19." This figure contains two pie charts.

Table J.2 Data for figure 6.1 volume pie chart

Region	Share of the volume of commercial landings during 2015–19
Alaska	59.5%
Gulf of Mexico	15.9%
Pacific Coast	10.3%
Mid-Atlantic	6.5%
New England	6.1%
All other	1.7%

Source: NOAA Fisheries, Landings Database (accessed December 1, 2020).
Notes: For volume, "other" is composed of the South Atlantic, Hawaii, and the Great Lakes regions. Corresponds to figure 6.1 volume pie chart.

Table J.3 Data for figure 6.1 value pie chart

Region	Share of the value of commercial landings during 2015–19
Alaska	32.4%
New England	25.6%
Gulf of Mexico	15.7%
Pacific Coast	10.6%
Mid-Atlantic	9.4%
South Atlantic	3.6%
Hawaii	2.5%

Source: NOAA Fisheries, Landings Database (accessed December 1, 2020).
Notes: The Great Lakes was excluded from the value figure because it accounted for less than one-half of on-percent of the value of commercial landings during 2015–19. Corresponds to figure 6.1 value pie chart.

Table J.4 shows the data for figure 6.2, "U.S. consumption: Per capita consumption of commercial fish and shellfish by product grouping and supply of edible commercial fishery products, 2014–18."

Table J.4 Data for figure 6.2

Factor	2014	2015	2016	2017	2018
Total edible supply (mt)	5,329	5,403	5,446	5,816	5,808
Per capita consumption (kg per capita)					
Fresh & frozen	4.9	5.2	5.1	5.5	5.6
Canned	1.5	1.7	1.5	1.6	1.6
Cured	0.1	0.1	0.1	0.1	0.1
Total	6.6	7.0	6.8	7.3	7.3

Source: NOAA, Fisheries of the United States 2018, February 2020, 104, 117.
Notes: NOAA bases its calculation of commercial consumption is based on a "disappearance" model. NOAA calculates supply as domestic commercial landings plus imports minus exports. Corresponds to figure 6.2.

Table J.5 shows the data for figure 6.3, "U.S. consumption: Select species, kilograms per capita, 2007–18."

Table J.5 Data for figure 6.3

Species	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Pollock	0.78	0.61	0.66	0.54	0.60	0.53	0.52	0.44	0.44	0.44	0.35	0.35
Cod	0.21	0.20	0.19	0.21	0.23	0.24	0.27	0.30	0.27	0.30	0.30	0.28
Pangasius			0.16	0.18	0.28	0.33	0.35	0.31	0.34	0.40	0.32	0.29

Source: NFI, "Top 10 List for Seafood Consumption," accessed August 10, 2020.
Note: Corresponds to figure 6.3.