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Alaska Seafood

OVERVIEW OF THE GLOBAL SUPPLY CHAIN



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Executive Summary

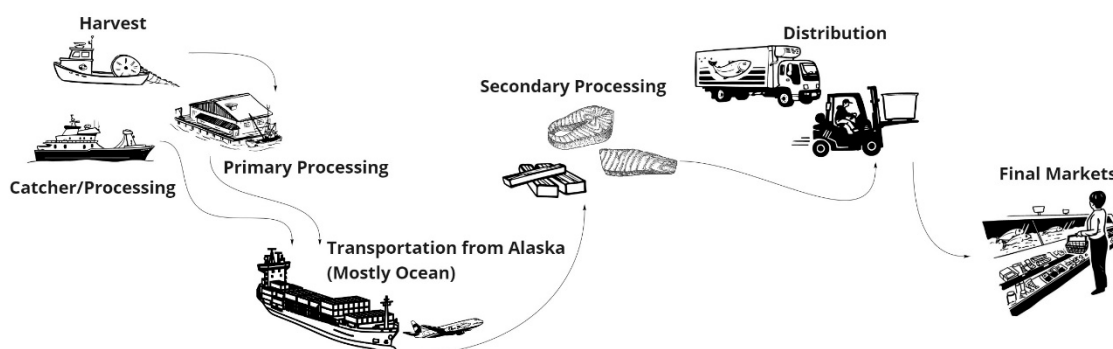
Alaska's commercial fisheries are the most productive in the United States. Harvests of about \$2 billion worth of seafood in 2021 resulted in \$4.7 billion worth of processing products. By value, about one-third of seafood products went into the U.S. market while two-thirds were exported to roughly 100 countries around the globe.

Alaska produces dozens, if not hundreds, of seafood products that are both exported and consumed domestically. Additionally, each processor, seller, exporter, and shipper of seafood uses specific trade partners and logistical methods that are essentially proprietary business methods. This report focuses on representative routes taken by common Alaska seafood products over the last five to 10 years, as revealed in trade data and key informant interviews. Recent changes to policy or regulation and notable supply chain challenges are also described to provide context.

Seafood Supply Chain Steps

The supply chain pathways of Alaska seafood to U.S. and foreign markets are as varied as the species and products produced. Although supply chain pathways are not strictly linear, this study lays out typical steps for the main fish and shellfish products starting in Alaska and ending at the consumer. Between start and end points is transformation and packaging at processors, transportation on ships, planes, rail, and trucks, and distribution through refrigerated warehouses, chilled transportation, and networked suppliers. Each node in typical handling and transportation for Alaska seafood is summarized, including snapshots of key product forms and their supply chain pathways.

Figure ES-1. Illustration of the Main Phases of the Alaska Seafood Supply Chain



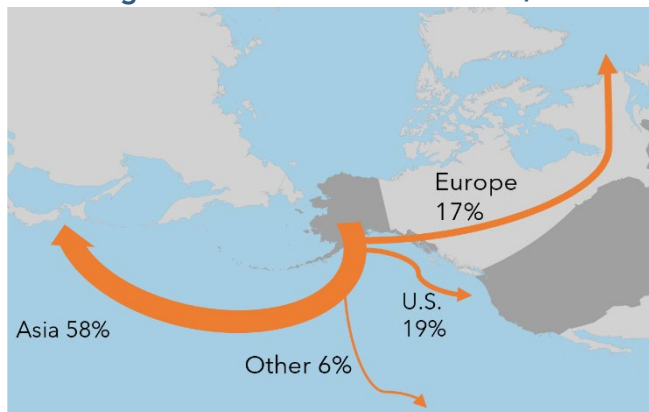
Source: ASMI and Shutterstock images.

Key Locations in the Alaska Seafood Supply Chain

Consumers in the U.S., Europe, and Japan eat of most Alaska's seafood.¹ But before it reaches final markets, much of the harvest has to be transformed from unrefined forms such as frozen headed-and-gutted fish – the main seafood product produced within Alaska – into more consumer-ready products, such as fillets, surimi, breaded fish, and smoked fish. This process is known as reprocessing or secondary processing.

When it leaves Alaska, most Alaska seafood first goes to Asia, which is both a final market (particularly Japan) and a reprocessing market (particularly China, Thailand, and Vietnam).² Much of the Alaska seafood processed in China and Southeast Asia is eventually shipped back to the U.S. or to other major markets.

Figure ES-2. Alaska Seafood Exports and Estimated Domestic Shipments as a Percentage of Total Production Volume, 2017-2021



Source: McKinley Research Group estimates and graphic.

Note: Initial movement of seafood is based on export data and production minus exports in the case of shipments to the contiguous United States.

The Role of China

China developed into the largest export market for Alaska seafood in the early 2000s as the country (in particular the northern ports of Dalian and Qingdao) became a major center for Alaska seafood reprocessing. China grew as a reprocessing hub because of the availability of processing infrastructure, low-cost labor, and low-cost international shipping.

Alaska seafood exports to China declined between 2017 and 2020 and were largely flat between 2020 and 2022. Factors contributing to the decline and stagnation of exports to China include rising labor costs in China, the U.S.-China trade conflict that began in 2017, the rise in ocean

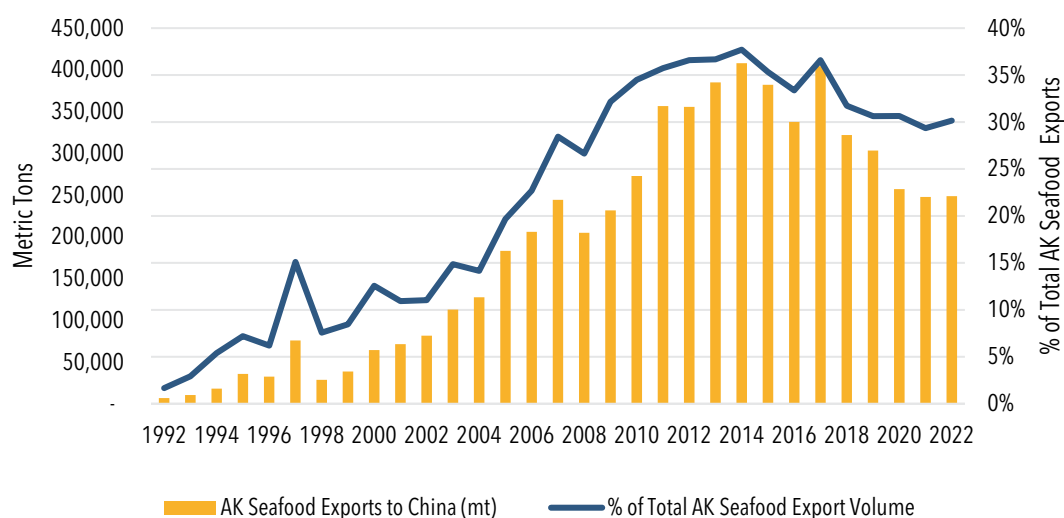
¹ By a conservative estimate, about 60% of Alaska's seafood eventually goes to these three markets.

² South Korea, another key export market in Asia, is both a consumption market and shipping and cold storage hub. Alaska seafood exported to South Korea often pauses there on route to another country (primarily Japan and China).

freight costs during the COVID-19 pandemic, and restrictive Chinese import inspection and labor policies during the pandemic.³

Although the importance of China in the Alaska seafood supply chain has declined since 2017, in 2022 China remained the world's largest export market for Alaska seafood by volume (Japan was the largest by value).

Figure ES3. Alaska Seafood Exports to China (Metric Tons and Percentage of Total Export Volume), 1992-2022



Source: NMFS, compiled by McKinley Research Group.

Market Case Studies

This report gives special attention to three regions of the world that are of relevance to the Alaska seafood industry due to recent industry trends and events: Southeast Asia, the United Kingdom, and the United States. These three global regions process and consume Alaska seafood and are markets where consumption of Alaska seafood will likely grow. Additional detail on why these three global markets were chosen for an in-depth review is described below.

SOUTHEAST ASIA

This region is seen as a potential growth export market for Alaska seafood, particularly as an alternative to China for Alaska seafood reprocessing. While China is still the dominant Asian reprocessing market, Southeast Asia is gaining ground quickly.

³These zero COVID policies in China were generally ended in late 2022.

Southeast Asia countries have many of the elements needed to increase reprocessing of Alaska seafood: container shipping ports, cold storage infrastructure, existing processing plants, and inexpensive and skilled labor. Some SE Asia countries have good government-to-government trade relationships with the U.S. and predictable regulations with respect to tariffs, customs requirements, and health inspections.

Exports to Southeast Asia from Alaska doubled between 2016 and 2020, but with significant year-to-year fluctuations. Despite the rapid growth, this region is still a small market for Alaska seafood, importing less than 3% of total Alaska production.

About two-thirds of Alaska seafood exports to Southeast Asia go to Thailand where frozen headed-and-gutted pink salmon is the dominant product. Thailand has a large tuna-canning sector that also cans Alaska salmon, much of it for the U.S. and Japanese markets.

In addition to salmon, other Alaska seafood products frequently exported to Thailand and the larger Southeast Asia region include pollock (surimi and other forms), flatfish, and snow crab. Most of these products are reprocessed in Southeast Asia, not consumed in the region.

UNITED KINGDOM

The United Kingdom is an important consumer market for Alaska seafood products, particularly battered whitefish and canned salmon. The UK case study of this report outlines the typical routes of these and other Alaska seafood products to the UK in the context of a changing trade landscape influenced by Brexit, COVID-19, and other factors.

The UK is a significant consumer of Alaska products, including canned salmon, flatfish, Pacific cod, and pollock. The latter two are sometimes used for fish and chips, a popular convenience takeout food that is traditionally made with Atlantic cod or haddock. Canned salmon is the top seafood product by value and volume directly exported to the UK from Alaska, clocking in at \$46.2 million in 2020. It is a shelf-stable protein that saw a resurgence of sales during the COVID-19 pandemic.

With the separation of the UK from the European Union (also called Brexit), U.S. exporters must now manage the UK and EU as separate trade partners. In general, the UK and EU regulatory frameworks remain aligned, but the likelihood they will diverge in the future creates uncertainty for businesses.

With the implementation of Brexit, seafood products entering EU customs prior to entering the UK are likely to decrease or become nonexistent, while direct export to UK or through a customs-free transit zone will likely be maintained or increase. In the short-term, a shortage of truck drivers and Brexit-related border inspections slowed trucking for all seafood and perishable goods moving from the EU into the UK.

Brexit has also pushed UK harvesters to shift their landings to EU ports. This decrease in domestic landings has diminished UK seafood processing volumes, which could be an opportunity for greater reprocessing of Alaska seafood in the UK going forward.

UNITED STATES

The U.S. is among the world's strongest economies with a large middle-class population able to buy Alaska seafood and processed seafood products. U.S. consumers are increasingly demanding healthy, sustainable, and domestically produced products, which is a fit with Alaska seafood.

The supply chain for Alaska seafood consumed in the U.S. moves either directly from Alaska to the contiguous United States market or first goes through a reprocessing nation (usually China).

An estimated 19% of the volume of Alaska seafood products was shipped **directly** to the contiguous United States from Alaska in recent years. These seafood products often undergo secondary processing, such as filleting and breading, in the United States. Secondary processing of Alaska seafood within the U.S. is concentrated in two main regions, Puget Sound (in Washington state) and Massachusetts.

The percentage of Alaska-origin production shipped to the U.S. **indirectly** after reprocessing in China can conservatively be estimated to be 5%. China is particularly important for processing Alaska-origin salmon, flatfish, and Pacific cod.

The total U.S. market share, including direct and indirect shipments, is therefore estimated to be about 25% of Alaska seafood production, larger than any other consumer market.

Alaska Seafood Supply Chain Challenges

The routes of Alaska seafood to global markets are as varied as Alaska fish species, which is to say hundreds exist. As a focal point, this report describes the typical global trade routes for the high-volume Alaska species, particularly pollock, salmon, cod, flatfish, halibut, and crab. Occasionally noted are also examples of lower volume products that have distinctive pathways to market – such as fresh and live seafood going out by airplane.

The incredible variety of seafood species and products, as compared to other forms of protein, such as beef or chicken, has shaped the distribution pathways now well established in major consumer markets. In the U.S., selling and distributing seafood is mostly handled by specialty distributors that focus only on seafood. Such specialization illustrates the industry knowledge needed to handle the sheer volume and variety of seafood products available from around the world, and the complexity of receiving and redistributing perishable seafood products.

Alaska seafood products enter a massive global seafood marketplace from an isolated corner of the world. Abundance as well as remoteness defines most commercial fisheries in Alaska. In a state of fewer than 1 million people, many of Alaska's harvesting and processing areas are not connected to the contiguous U.S. or Canada by road or rail. These defining factors shape how, when, and in what form products leave Alaska.

- Alaska is **remote** – accessible primarily by water, not road or rail – and most seafood products leave the state by ocean shipping.
- Most Alaska commercial fisheries are **high volume**, for example an exporter of flatfish is typically looking for a buyer that can receive on the order of 30 containers of fish.
- In some fisheries – such as salmon – the high volume of product arrives in a massive pulse – the Bristol Bay sockeye salmon fishery is harvested in a six-week window. As a result of this and other factors, **limited value-added processing** occurs in Alaska.
- Most seafood leaves Alaska in **frozen form** after heading and gutting by a vessel- or shore-based processor.
- **Packaging serves a critical role** in the supply chain by protecting and preserving seafood, facilitating the freezing process, and standardizing the product's shape, size, and weight for transportation and subsequent processing.

In addition to these Alaskan attributes, U.S. and global seafood policies impact Alaska differently. Supply chain issues that have been problematic over the past decade have recently been magnified by global supply chain disruptions, shortages, and COVID-19 pandemic impacts. The following policies have an outsized impact on the Alaska's seafood supply chain:

- **Jones Act:** This U.S. law allows only U.S.-flagged vessels to carry cargo between U.S. ports. This severely limits the ocean shipping options available to seafood coming out of Alaska ports and going to other U.S. ports. One container shipping company, one break-bulk cargo shipping company, and two tug-and-barge companies are the primary means of moving frozen seafood directly to the U.S. market from Alaska.
- **Trade with China:** Alaska seafood exporters, particularly for flatfish, desire more reprocessing options in addition to China, and the need to diversify has been heightened by recent trade disputes and COVID-19 customs and labor restrictions. Pushed by all these factors, Alaska's seafood exporters are increasingly looking to Southeast Asia, Eastern Europe, and South America for alternative reprocessing sectors.
- **Sanctions on Russia:** Alaska and the Russian Far East both harvest seafood species from the Bering Sea, and therefore compete in many global markets. Key markets, including the EU, UK, and Japan, are now either banning or increasing tariffs on direct imports of Russian seafood in response to the 2022 Russian invasion of Ukraine. This may create beneficial trade conditions for certain Alaska products, although indirect importation of Russian-origin seafood is not necessarily subject to these bans and tariffs. The global conversation on seafood traceability and country of origin labeling may be pushed by the implementation of these trade sanctions.

Glossary of Terms

Box truck – A commercial vehicle with an enclosed cargo area.

Break bulk cargo – Goods that are stowed on board a ship in distinct units, such as boxes and cartons often secured to a pallet, but not containerized.

Broadline – A distributor selling a wide array of products to both wholesalers and other distributors.

Chassis – A trailer or undercarriage used to transport ocean containers over the road.

Coastwise – A vessel route that is within 20 nautical miles of the shoreline.

Containerized cargo – Goods that are contained in a 20 or 40-foot metal container that is standardized for use in the global intermodal freight shipping network.

Drayage – Short-distance movement of cargo as part of a longer overall move, usually in or around a port area between ship and train/truck/warehouse.

Glazed – A protective coating of frozen water or sugar water on seafood that prevents dehydration and discoloration during storage and transit.

Mothership – Processing vessel in the Bering Sea pollock fishery. Motherships are not capable of conducting fishing activities.

Oceangoing – Designed and equipped for travel on the rough waters of the open sea.

Refreshed – Fish that is frozen and thawed prior to sale. Often refreshed seafood refers to product that was frozen as H&G, thawed, filleted, and sold at a retail fish counter.

Round – Fish with the head, viscera, and tail intact.

Shatter pack – A carton of frozen fillets packed in layers separated by sheets of plastic allowing for individual fillets to be removed without thawing the entire box.

Tender – A vessel that receives fish from harvesters and moves fish to processors, typically used in salmon fisheries in Alaska.

Tramper – A foreign-flagged break bulk cargo vessel. Also called a break bulk cargo vessel.

Transshipment – Moving product from one vessel to another vessel, whether at sea or on land.

Unit load device – A container used to load aircraft cargo.

Abbreviations and Acronyms

AMHS - Alaska Marine Highway System

H&G - Headed and gutted fish

HTS - Harmonized Tariff Schedule

IQF - Individually quick frozen

IUU - Illegal, unreported, and unregulated fishing

NMFS - U.S. National Marine Fisheries Service, also called NOAA Fisheries

NSPF - Not Specifically Provided For, commodity description used when no other code closely matches the commodity

ULD - Unit Load Devices, non-refrigerated metal containers that fit into the hold of a cargo plane

Introduction

Alaska Seafood Marketing Institute (ASMI) contracted with McKinley Research Group to research Alaska's seafood supply chain and produce a report that increases understanding of this complex topic.

This study describes the typical seafood trade routes and logistics for live, fresh, frozen, and canned seafood. Each step in the supply chain is described, from ocean harvest to the first processing, from export to value-added processing, and from storage and distribution to final sale. Each species and product will take a slightly different route from Alaska to its final markets. Rather than an exhaustive review of each of these supply chains, the report focuses on key topics and selected products to provide both a broad picture as well as specific examples.

This report gives special attention to three markets for Alaska seafood that are of particular relevance to the Alaska seafood industry because of recent industry trends and events: Southeast Asia (a growing alternative reprocessing market), the UK (where trade patterns are in flux due to Brexit), the U.S. (a key growth market for Alaska seafood).

Methodology

The project team used data from Alaska Department of Fish & Game, National Oceanic and Atmospheric Administration, Alaska Commercial Fisheries and Entry Commission, U.S. Department of Agriculture, Bureau of Transportation Statistics, U.S. Customs and Border Protection, United Nations, and Trade Data Monitor. Data are from the most recent available year except in the case of some seafood statistics where multi-year averages were used to minimize the effect of year-to-year variation. A special note on trade data is included below.

Research was complimented by interviews with subject matter experts in harvesting, processing, vessel shipping, air cargo, distribution, cold storage, labeling, quality control, export, import, reprocessing, distribution, retail, and foodservice industries. Approximately 50 interviews were conducted for this report.

Photos are courtesy of ASMI, McKinley Research Group, or a non-copyrighted web source unless otherwise specified.

The McKinley Research Group calculation of domestic consumption of Alaska seafood is based on a "disappearance" model. Export and Alaska production volumes are converted to fillet equivalents and the volume not exported is assigned to the domestic market. The model does

not account for any export of value-added products produced in the U.S. and the approach also includes the simplification that products are consumed in the year they are produced.

Harmonized Tariff Schedule

Commodities traded between countries are classified under a Harmonized Tariff Schedule (HTS or HS) code system. The first six digits of an HTS code are standardized by the World Customs Organization,⁴ which customs authorities recognize around the globe. For example, 0304.71 is frozen cod fillets and 0306.14 is cooked in shell, frozen crab.

In addition to the six-digit HTS codes shared globally, importing countries can add an additional four digits to further categorize the commodity.

HTS codes are used to classify internationally traded products and apply a tariff. The HTS system does not contain information about harvest area or licenses, product origin country, transshipment, processing location, original product form prior to processing, or mass balancing. Those data may be collected by customs or other agencies in addition to HTS codes, but those data are not typically shared with the public. HTS codes alone do not provide enough information to track seafood supplies globally as they are processed, mixed, transformed, and re-exported. For this study, HTS codes contributed a general picture of seafood supply chain pathways when coupled with additional information from subject matter experts and industry participants.

⁴ [World Customs Organization](#).

Seafood Supply Chain Steps

The global supply chain for seafood is among the most complicated of any commodity. In the Alaska-origin seafood supply chain, the initial steps of harvesting, transporting, processing, and packaging are relatively straightforward compared to subsequent steps. After seafood leaves Alaska, it will either stay in the domestic market or be exported and enter the global marketplace – sometimes eventually returning to the U.S. end market.

The section below describes key steps in the seafood supply chain from Alaska waters to end consumers – the full journey from ‘bait to plate.’

Harvest in Alaska

The first step in the global seafood supply chain is the commercial harvesting of fish and shellfish from marine and fresh water by net, hook, trap, or jig. In Alaska, most commercial harvest takes place on the ocean, although some salmon is commercially harvested from the coastline or in rivers.

Some harvesters, such as salmon trollers, have a low enough volume that each fish undergoes initial processing on board the harvesting vessel. Catcher-processor vessels, which conduct more extensive processing on board fishing vessels, are described below.

Transport to the First Buyer within Alaska

Boats that catch wild fish from the ocean must either transport that fish to a processor, process it on board the vessel, or deliver the fish to another vessel. Factors that influence this decision include the seafood type, harvest volume, season and trip length, processing capability of the harvester vessel, and distance from shoreside processors.

In many salmon fisheries, fish are primarily delivered to tender vessels stationed on the fishing grounds. Processor-hired tender vessels aggregate fish from multiple harvesters and deliver to a shore-based or floating processor. Tenders are commonly used in Alaska’s summertime salmon fisheries. The use of tender vessels helps keep salmon harvester vessels on the fishing grounds, increasing their efficiency during the short, high-volume fishing season.

Harvesters of halibut, sablefish, crab, cod, flatfish, and pollock generally deliver to a shore-based processing plant or process the catch on board. Some Bering Sea pollock and cod catcher vessels transfer fish at sea to one of three large processing vessels, termed motherships. Motherships are fish aggregators and processors that do not have the capability to catch fish.

Commercial fishing ports are spread across coastal Alaska; the main ports and fishing regions are noted in the map below. Anchorage is also noted on the map because of the role it plays in consolidation, processing, shipping, and air transportation.

Figure 1. Map of Major Alaska Fishing Ports and Regions



Source: McKinley Research Group graphic.

Primary Processing in Alaska

Seafood processing is the top manufacturing activity in the State of Alaska, comprising 70% of the state's manufacturing employment in 2019. Alaska's seafood processing sector consists of roughly 160 shore-based plants, 52 catcher-processor vessels, approximately 30 floating processors, and other assets. Primary processing transforms fish into a product form that is stable enough to be transported to secondary processors, distributors, and other markets.

Quickly processing huge volumes of fish is the quintessential challenge of Alaska's processing sector. Due to short harvesting windows, high volumes, and a high operating cost structure, about 40% of Alaska's commercially harvested seafood (by volume) leaves the state as headed and gutted (H&G) product. Other seafood receives additional processing, such as canning, filleting, cooking, or surimi production. H&G fish and other partially processed fish products such as fillet and surimi blocks are transported out of Alaska to other domestic or foreign locations for secondary processing (see section on Secondary Processing).

Shore-based Processing in Alaska

A little more than half of the primary processing in Alaska occurs on land at the state's 160 shore-based processing facilities (54% for the most recent 5-year average). Shore-based processing is concentrated in the major fishing regions of Southeast Alaska, Prince William Sound, Cook Inlet,

Kodiak Island, Aleutian Islands, and Bristol Bay. Species for which shore-based processing accounts for more 90% of processing, by volume, include salmon, halibut, and all main species of crab. By regulation, 50% of Alaska's pollock harvest is processed at on shore plants.

Shore-side processing is less space- and labor-constrained and a wider variety of processing lines and approaches are therefore used compared to at-sea processing. Canning, which in Alaska exclusively happens at facilities on land, has historically been a primary method for quickly preserving a large quantity of salmon in a shelf-stable form. While down from historical levels, in recent years roughly a quarter of the Alaska salmon harvest volume was canned.

Vessel-based Processing in Alaska

Certain fisheries, primarily in the groundfish sector, are processed exclusively or in large part by catcher processors. Examples include pollock and flatfish trawlers as well as freezer longline vessels targeting Pacific cod and other species.

On freezer-longliners and flatfish trawlers, catch is brought on board and funneled below deck for processing including grading by species and size, heading and gutting (tails are also removed for most flatfish) by machine or hand, and freezing in pans. Frozen H&G blocks are glazed with a water or water/sugar mixture, put into woven paper bags with polyethylene liners, sealed with tape, and frozen. The blocks of fish are typically hand stacked in the freezer hold until off-load by crane at sea to a tramper vessel or to shore-side cold storage or shipping container. It may take 15 workers around 20 hours to off-load a larger catcher processor by hand. On other vessels, blocks are stacked onto pallets that can then be moved mechanically, reducing the work to about 4 hours.

Pollock trawl catcher-processors bring pollock on board and below deck where the fish is filleted, skinned, and deboned for processing into fillet blocks or into surimi. For fillet blocks, freezing pans are lined with plastic-coated cartons, and after freezing these cartons of frozen pollock are placed in a master cardboard carton and put in the freezer hold. Most, but not all, at-sea pollock processors have fish meal and fish oil plants on board, processing fish heads, frames, and other trimmings to produce these value-added, shelf-stable products. All shore-side processors that specialize in pollock have fish meal and oil plants.

Pollock catcher-processors typically deliver their processed products to Dutch Harbor where goods are loaded onto container ships for export to Asia and Europe or on other vessels for delivery to North American markets.

Packaging

Packaging serves a critical role in the supply chain by protecting and preserving seafood, facilitating the freezing process, and standardizing the shape, size, and weight of product for transportation and subsequent processing.



Materials used by processors include plastic bags, plastic liners, containers, trays, canning supplies, labels, salt, paper bags, fasteners, plastic tubs and lids, gel ice, Styrofoam, cardboard boxes, pallets, packing bands, tape, glue, ancillary products, and plastic sheeting for shrink/stretch wrap.

According to interview sources, top packaging materials used in Alaska are:

- Corrugated cardboard boxes with polypropylene (poly) liners
- Paper bags lined inside with woven polypropylene for H&G groundfish blocks
- Plastic film for retail-ready fillets or portions
- Waxed paper cartons that line the freezing pan and hold fillet blocks (picture above)

Plastic or polypropylene (poly) bags, liners, and plastic lined cartons are used to protect fish from oxidization, which can discolor and dehydrate fish flesh. Bagged seafood is typically further protected by packing into cardboard totes or larger boxes that are stacked and secured to pallets with packing bands or shrink-wrap plastic.

Prior to shipping to Alaska plants, packaging materials are consolidated by companies that specialize in serving the Alaska seafood industry. These companies are typically headquartered in Washington State with the largest shippers being Frontier Packaging, Seattle-Tacoma Box Company, and Rena International.

These companies provide materials forecasting, bulk purchasing, consolidation, warehousing, and logistics functions. Packaging consolidation companies source materials from hundreds of vendors in the U.S. and globally. Materials are sourced, stored, assembled to order, and shipped to Alaska by container. The lead time for ordering and gathering packaging materials has increased due to the COVID-19 pandemic, according to interviews with subject matter experts. For example, the lead time for a packaging consolidator to order and receive boxes was two weeks pre-COVID and now can be one to two months.

Depending on the fishery and region of Alaska, some processors order all packaging materials prior to the start of a processing season, while others order materials throughout the season.

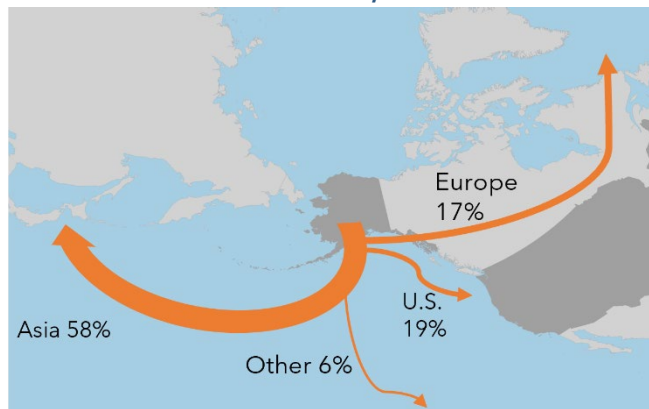
Processors in Southeast Alaska can often order packaging supplies regularly via weekly barge delivery from Seattle. Remote processors, such as those in Bristol Bay and the Alaska Peninsula, typically rely on one main shipment of packaging materials to cover the whole processing season. Remote processors can predict material need for the season based on historical catch data and harvest forecasts for the upcoming season. Processors focused on the nearly year-round BSAI groundfish season, benefit from regular shipments of packing materials to Dutch Harbor throughout the year.

Shipping Out of Alaska

Alaska's most productive fishing ports are distributed across the state and most have no road access. Seafood leaving Alaska offers important backhaul freight for both air cargo and shipping vessels that bring consumer goods into Alaska and might otherwise leave the state nearly empty. Alaska's seafood industry ships an estimated half a billion pounds of seafood product south by sea to Seattle/Tacoma each year, allowing for more competitive rates on northbound freight.

Roughly three-quarters of Alaska seafood is exported to the international market with the remainder going to the U.S. domestic market. Asian countries (especially China, Japan, and South Korea) have been the destination for more than half of Alaska's seafood production in recent years. In the case of China, much of this export is for reprocessing rather than final consumption.

Figure 2. Alaska Seafood Exports and Estimated Domestic Shipments as a Percentage of Total Production Volume, 2017-2021



Source: McKinley Research Group estimates and graphic.

Note: Initial movement of seafood is based on export data and production minus exports in the case of shipments to the contiguous United States.

Seafood transportation by sea, by air, and by land are described below. Alaska does not have a rail connection to other states or regions.

By Sea

Three main types of ocean freight vessels serve Alaska coastal communities: container ships, break bulk carriers, and barges. Available shipping services vary by port depending upon port infrastructure, region, and volume of product typically moved. Another important consideration is the product destination due to the Jones Act requirement that only U.S.-flagged vessels transport goods directly between two U.S. ports. Foreign seafood exports can be moved on foreign-flagged vessels, which are lower cost to construct and operate than U.S.-flagged vessels.

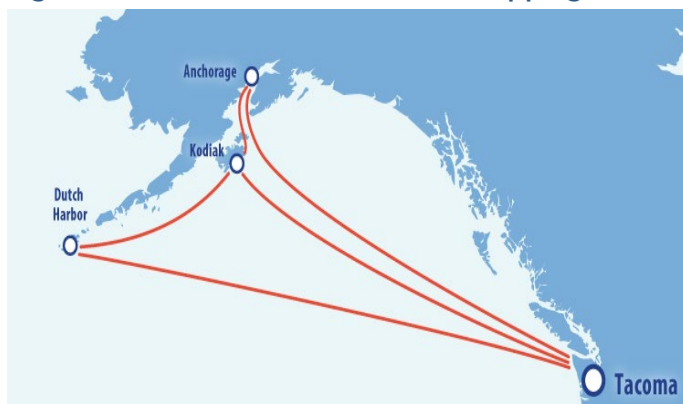
Container Ships

Container ships are ocean-capable vessels that carry large quantities of cargo in intermodal containers. These containers are typically 40 feet long and stackable. Container ships require deep-water ports and usually require cranes for loading and unloading. Alaska ports that can efficiently receive and load/unload container ships with purpose-built container cranes are limited to Anchorage, Dutch Harbor, and Kodiak. Other ports, such as Valdez, Seward, and Homer, can side tie a container ship and use a traditional crane but cannot efficiently load and unload containers.

Dutch Harbor has international container ship service not available to other fishing communities due to its location in the central Pacific Ocean and the magnitude of Bering Sea and Gulf of Alaska groundfish fisheries production. Major international shipping companies that serve Dutch Harbor include Matson, Maersk, CMA CGM and subsidiary American President Lines (APL). Of these, only Matson offers container shipping from Dutch Harbor to Tacoma, Washington using Jones Act compliant vessels.

Kodiak's most frequent ocean freight link to Puget Sound is Matson, which provides twice-

Figure 3. Matson Alaska Container Shipping Routes



Source: [Matson Navigation Company, Inc.](https://www.matson.com)

weekly sailings on an itinerary that includes Tacoma (a major Seattle-area port), Anchorage, Kodiak, and on some sailings Dutch Harbor (Unalaska). The southbound service can be as short as three days on itineraries that do not include Dutch Harbor, and six days on itineraries that include Dutch Harbor. Matson also operates international service between Kodiak, Unalaska, and ports in Asia.

Container ships can travel at speeds of up to 24 knots in open water and can travel twice as fast as a break bulk carrier. This makes container ships well suited to long-distance transportation across the Pacific from Alaska to Asian ports.

Other container ships operate in Alaska including the following:

- TOTE Maritime Alaska is a cargo ship company with U.S.-flagged roll-on/roll-off (RORO) capacity.
- Alaska Reefer Management LLC, a subsidiary of American Seafoods, is a foreign-flagged cargo company that moves refrigerated containers long distances, such as from the North Pacific to the Atlantic Ocean.
- Trident Seafoods has two U.S.-flagged freight vessels that support Trident operations by moving materials and containers between Alaska ports and Puget Sound.

Cargo ships that transport containers – ROROs, reefers, and tankers – travel on the Great Circle Route from North America to Asia via the Aleutian Islands along a line of latitude. A line of latitude is the shortest distance between two points when traveling on a sphere, and therefore cargo ships and planes use these routes for long-distance global travel.

Refrigerated containers moved by barge are described in the Tug and Barge section below.

Break Bulk Carrier

Break bulk carrier vessels move cargo that is not containerized. Most break bulk cargo is loaded into a watertight hold below deck, though non-perishable freight such as machinery or vehicles can be stored on deck.

Coastal Transportation is a U.S.-flagged freight company that can deliver non-containerized goods and freight between U.S. ports. Coastal Transportation moves freight on pallets stored below deck in refrigerated holds, and serves small ports on the Alaska Peninsula, Aleutian Islands, and Pribilof Islands by connecting them to Dutch Harbor and Seattle. Coastal Transportation serves Dutch Harbor weekly during pollock seasons (January-March and August-October) and every-other-week in the off seasons. Non-containerized frozen seafood on pallets may be transferred to containers in Dutch Harbor or Seattle for further transport on container ships.

Trampers are a type of break bulk carrier about 500 feet in length that carry break bulk cargo (often palletized) below deck. Trampers got their name from traveling from port to port picking up and delivering cargo without a set schedule. However, trampers that transport Alaska seafood have approximate sailing schedules. When a trumper is filled with seafood, it starts on the journey to a foreign port, usually in Asia. Transit time for trampers is usually longer than for container ships, which deliver on a more rigid schedule.

Trampers and container ships have complex operating structures: they are foreign flagged by one nation (e.g., Panama), owned by a company headquartered in another nation (e.g., South Korea), and crew on board may be of several nationalities. Like other large vessels, trampers operating in Alaska coastal waters are required to have an Alaska marine pilot on board to ensure safe navigation.

Catcher-processors are the fishing vessels most likely to use trampers to move seafood from Alaska to global markets. Catcher-processors harvest, process, and freeze fish into blocks on board. When its freezer holds are full, a catcher-processor travels into port to off-load product or schedules a transshipment to a tramper. Transshipment at sea, also called 'off-loading on the hook' (or on anchor), takes place in areas designated by Customs and Border Protection. Moving frozen blocks of seafood or pallets from one vessel to another is done with a combination of conveyors, cranes, and/or by hand.

Tug & Barge

Barges are non-motorized, flat-bottom vessels that are pushed or pulled by powerful tugboats. Tug and barge operations are not suited for rough open seas and travel more slowly than container ships. However, barges are well suited to shallow approaches, beach landings, coastal communities with no dock, and river travel, making the tug-and-barge industry a crucial one in Alaska for transfer of seafood as well as other important commodities.

For moving seafood from remote Alaska to major processing and shipping nodes, barge shipping is key. Seafood from Bristol Bay, the Alaska Peninsula and as far away as Prince William Sound is moved by barge to Dutch Harbor and Kodiak where it can be transferred to container ships. Barge service is especially important along the protected waters that connect Southeast Alaska and Puget Sound as well as in Prince William Sound, where no direct container ship service is available. Barges also serve Western Alaska and are an essential resource for coastal communities that cannot be served by cargo ships.

Alaska Marine Lines (AML) and Samson Tug and Barge are key barge service providers throughout the state and for the seafood industry. Like container ships, barges carry cargo in refrigerated shipping containers (sometimes called reefers). Shipping companies charge a premium for less than full container loads.

AML provides regular scheduled service to ports throughout Southeast Alaska, Central Alaska (including Anchorage, Cordova, Homer, Kenai, Seward, Valdez and Whittier), and Western Alaska (including Bethel, Dillingham, Dutch Harbor, Naknek, and Nome).

AML does not have scheduled service to Kodiak but makes stops there, especially on southbound trips of its every-other-week Western Alaska run during the summer fishing season. AML

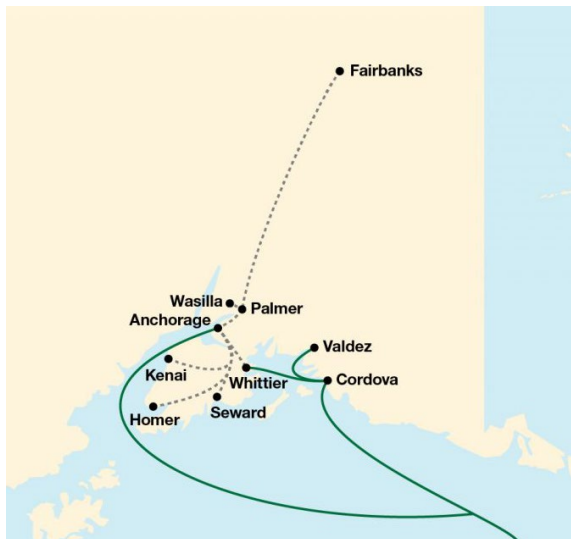
Figure 4. Alaska Marine Lines Twice Weekly Barge Service in Southeast Alaska



Source: [Alaska Marine Lines](#).

mainline Prince William Sound service is through the Port of Whittier, with service to Valdez and Cordova via a smaller barge that ferries across Prince William Sound once a week. Another freight service through Whittier is the Canadian National Railway Company's "Aquatrain" barge, which travels between Whittier and Prince Rupert, British Columbia two to three times a month, year-round.

Figure 5. Alaska Marine Lines Weekly Barge Service to Central Alaska



Source: [Alaska Marine Lines](https://www.alaskamarinelines.com/).

Due to geographic proximity, southern Southeast Alaska enjoys the fastest and lowest-cost barge service to Puget Sound from Alaska. AML provides twice-weekly service from Ketchikan to Seattle, a trip that takes approximately three travel days. Craig, on the west coast of Prince of Wales Island, accesses this Ketchikan-Seattle service, but shipping takes longer and costs more. AML moves freight from Craig by truck to Thorne Bay and loads it onto a small barge operating weekly for transport to Ketchikan and transfer to the mainline barge.

Bristol Bay is serviced by AML and Alaska Logistics, LLC, both offering sailings between Dillingham, Naknek, Anchorage, and Seattle.

Containers arrive in the spring and summer and

return with seafood. Salmon is also barged from Naknek, Dillingham, and other locations to Dutch Harbor where it is temporarily stored and loaded onto container ships that sail to Asia and Europe. AML also services Bristol Bay communities of Big Creek, Egegik, Ekuk, and Togiak, as well as villages in western Alaska, Norton Sound, Kotzebue Sound, and the Arctic.

Samson Tug & Barge provides every-other-week service to Kodiak, and direct service to Seattle from Valdez and Cordova every other week (less often in winter). Samson Tug & Barge serves Southeast Alaska through a vessel-sharing agreement with AML.

Ferry

The Alaska Marine Highway System (AMHS) is a state-run ferry system serving Southeast and Southcentral Alaska. Ferries carry passengers, vehicles, and roll-on/roll-off cargo. Companies that move small amounts of seafood to road-connected ports use the ferry to move product to market. For example, a single container load or less could be moved from a non-roaded Southeast Alaska port to Skagway, Whittier, or Bellingham, which are connected to the North American road system.

Commercial cargo vehicles carried on the ferry cannot be longer than 48 feet. The ferry provides a limited number of 440-volt plug-ins available on a first-come-first-served basis that can be used to keep refrigerated cargo cold. Generators are not permitted to run on the ferry. Non-drivable units, such as a trailer without a vehicle, can be transported on the ferry but AMHS does not provide drayage services. Drayage is available from private companies in some ports.

Table 1. Shipping Services Serving Alaska’s Seafood Industry

Vessel Type	Jones Act Compliant (U.S.-Flagged)*	Cargo Type
Container Ships		
CMA CGM/APL		Container
Matson	X	Container
Maersk		Container
TOTE Marine	X	Container on chassis
Alaska Reefer Management (private)		Container
Trident freight (private)	X	Container
Break Bulk Carriers		
Coastal Transportation	X	Break bulk
Trampers		Break bulk
Other		
Tug & Barge service	X	Container
Charter	X	Depends on vessel type
State Ferry	X	Van or container on chassis

*U.S.-flagged vessels may deliver goods between U.S. ports, foreign-flagged vessels may not.

Catcher-processors

Most large pollock and other catcher processors that operate in Alaska waters are homeported outside the state, typically in the Puget Sound region. On each season’s last fishing trip in Alaska, the vessel will typically fill its freezer holds and return to Puget Sound for offloading. Many of the vessels in this scenario will offload at Pier 91 in Seattle via conveyors and cranes either into a cold storage operating on the pier or into refrigerated shipping containers.

By Air

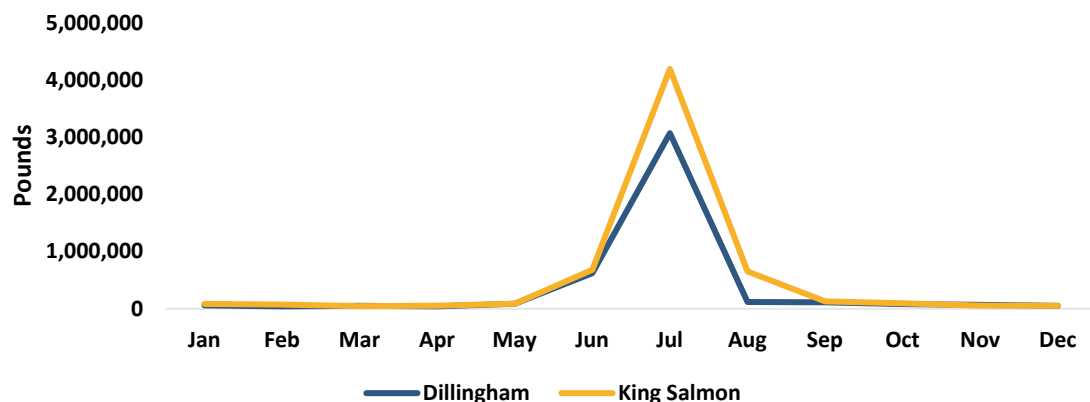
Transporting seafood by air – via air cargo or passenger plane – is the fastest and most expensive way to move fish within and out of Alaska. Air shipment is used primarily for the highest value products (e.g., fresh king salmon, fresh halibut, and live shellfish), which must be moved to the consumer market within days. A short supply chain is especially important for shellfish products that are shipped live such as Dungeness crab, oysters, and geoduck.

Air transport is also used to move fresh fish from remote areas of Alaska such as Bristol Bay into Anchorage for consolidation or processing. This is done by major commercial carrier Alaska Airlines or air cargo companies with smaller planes, on regularly scheduled or chartered flights.

Because timeliness is less critical for frozen seafood products, air transportation is generally not worth the expense for transporting frozen seafood. The exception is small volumes of frozen seafood, such as a custom order from a direct marketer to consumer. Such orders may be shipped by air freight companies such as FedEx and United Parcel Service (UPS). A custom order may weigh between 5 and 100 pounds and will be packaged to remain chilled for 72 hours without refrigeration (although refrigeration is usually available at air cargo warehouses). At the destination airport, FedEx and UPS offer truck transportation for delivery to the purchaser. As sales of custom seafood orders increase, the business model for some companies has shifted from shipping out of Alaska to shipping out of a distribution facility in the contiguous U.S. nearer to major population centers.

Fresh seafood - primarily salmon and halibut - is flown out of Bristol Bay, Southeast Alaska (Ketchikan, Wrangell, Petersburg, Juneau, Sitka, and Yakutat), and Prince William Sound (Cordova) to major cities in the contiguous states. Federal Bureau of Transportation Statistics, for example, show an order-of-magnitude jump in outgoing air freight between June and July from two major ports in Bristol Bay. This bump in outgoing air freight coincides with the peak Bristol Bay salmon harvest and processing season and can be attributed to transportation of fresh salmon to Anchorage.

Figure 6. Bristol Bay Monthly Air Freight (pounds), 2020 - 2021 Average



Source: U.S. Department of Transportation Bureau of Transportation Statistics.

Anchorage has direct flights to U.S. and international hub cities offered primarily by Alaska Airlines, Delta Airlines, and FedEx. According to an air cargo expert, seafood moving out of Alaska is about evenly split between dedicated cargo planes and passenger planes carrying extra cargo. An Alaska Airlines cargo plane can move up to 40,000 pounds, and passenger

planes also have cargo capacity.⁵ Cargo planes typically are loaded via metal Unit Load Devices (ULDs), non-refrigerated containers that fit in the hold of a cargo plane. Four pallets can fit inside a ULD.

Most air cargo locations in Alaska provide freezer and cooler storage for frozen and fresh products. Alaska Air cargo requirements specify that seafood must

- stay cool for 48 hours without refrigerated storage
- not leak
- not exceed 100 pounds per box.

Alaska Air cargo does not offer drayage or home delivery; freight must be retrieved by the buyer or distributor from the air cargo facility at the destination airport.

Air cargo carriers FedEx Freight and UPS operate in Alaska but serve fewer locations than Alaska Airlines. FedEx air freight serves Anchorage, Juneau, Kodiak, and Fairbanks. UPS flies air freight out of Anchorage. Additional locations in Alaska are served by these two companies when shipping non-cargo packages, such as a single box of perishable seafood to a domestic home address.

Air cargo is not commonly used for international shipping of seafood, as the expense is too high. An exception is high-value seafood products shipped in small batches to specialty foreign markets, such as live geoducks shipped from Southeast Alaska to China.

The U.S. Postal Service (USPS) does not offer air freight services but does offer home delivery of packages weighing less than 70 pounds. The USPS is not commonly used for shipping packages of perishable seafood because size and weight limits are restrictive, refrigeration is not offered, and the fastest delivery option may take 3 to 5 days from Alaska to the contiguous U.S., which is not fast enough for perishable products. USPS is used for direct market sales and delivery of nonperishable products such as canned or pouched salmon.

FedEx and UPS offer home delivery of parcels weighing less than 150 pounds in most contiguous U.S. locations. This service lends itself to niche online sales of Alaska seafood to domestic consumers. Few direct marketers ship seafood internationally, including to Canada, because the cost is too high to meet the consumer's desired price point.

By Road

Alaska is connected to Canada and the contiguous U.S. by road, yet only a handful of Alaska port cities are linked to this road system. Anchorage serves as both a trucking and air cargo hub

⁵ [Alaska Airlines, Air Cargo.](#)

in Southcentral Alaska. Several fishing communities are linked to Anchorage by road including Homer, Kenai, Soldotna, and Seward. Whittier, although not a major commercial fishing community, receives seafood by ship or ferry from Cordova, and Whittier is connected to Anchorage by rail and highway.

From Anchorage, fresh seafood is trucked through Glenallen to Tok before entering Canada's Yukon Territory. The main route through the Yukon Territory and British Columbia is the 1,500-mile Alaska Highway (Alcan Highway), which requires 2 to 3 days of driving to reach a U.S. west coast market and longer to reach a central or east coast market. Shipments originating from the communities of Valdez, Haines, and Skagway connect with this highway system without moving through Anchorage first.

While trucking adds a couple days of transit time compared to air shipments, the much lower price point keeps it as an option that is regularly utilized, although air is the primary mode of transportation for fresh seafood. Frozen seafood is rarely, if ever moved by truck: trucks can move only one or two containers, while each container ship or barge can move hundreds of containers.

Secondary Processing Outside of Alaska

Most seafood harvested in Alaska undergoes additional processing to create a final product for consumption. Most products are partially processed in Alaska (e.g., headed, gutted and frozen) before being transported out of state for additional manufacturing, known as secondary processing. Case studies in this report discuss secondary processing in Thailand, Vietnam, the UK, and the U.S.

Secondary processing, sometimes called reprocessing or value-added processing, refers to the handling, cutting, and packaging of seafood after initial handling. Reprocessing specifically refers to secondary processing in a foreign country with the intent to re-export the product. Reprocessing countries typically receive large volumes of frozen fish from Alaska by container ship or tramper, thaw that fish (sometimes it is kept frozen for cutting), process it into a product specified by the buyer, re-freeze, package, label, and export the product to the destination country.

Reprocessing locations typically have an inexpensive, abundant, and skilled processing labor force and facilities that handle large volumes of fish year-round. Alaska seafood is reprocessed in China (salmon, Pacific cod, flatfish), Thailand (salmon), Poland (fillet blocks), and Indonesia (crab). Most of the filleting happening in these countries is done by hand and is not economical to do by machine with current technology.

Products that receive value-added processing in the U.S., UK, and Germany tend to be consumed in those markets and are not re-exported beyond nearby countries. The U.S. case study in this document offers more detail about the main domestic locations where value-added processing occurs.

A major reason behind the lack of value-added processing in Alaska is the short timeframe in which many summer fisheries occur. For example, the 50 million or so sockeye harvested in Bristol Bay each summer must be processed within a six-week window in June and July. It is difficult to mobilize sufficient resources for such a brief high-volume manufacturing pulse in a remote location. Processing capacity is limited by factors such as labor, housing, processing equipment, storage space, and outbound shipping capacity. The infrastructure, human capacity, and time required for additional value-added processing is therefore limited. A major benefit of reprocessing Alaska seafood in a secondary location is more time, a larger workforce, and availability of processing technologies to add value, increase yield, and use byproducts to a greater degree than currently done in Alaska.

Alaska Exports

In 2021, 845 metric tons or \$2.8 billion worth of Alaska seafood was exported to 100 countries. The export market typically accounts for two-thirds of sales value and four-fifths by volume of Alaska seafood.

Table 2. Alaska Seafood Exports, by Partner Country, 2021

Country	Volume (MT)	Value (\$millions)
China	247,289	\$557.5
Japan	161,101	\$638.5
South Korea	138,467	\$372.8
Netherlands	65,366	\$230.3
Canada	61,874	\$363.4
Germany	31,416	\$149.5
France	25,659	\$89.3
Thailand	23,011	\$71.2
Vietnam	11,769	\$46.5
Ukraine	10,867	\$47.1

Source: NMFS, compiled by McKinley Research Group.

Cold Chain & Cold Storage

At every step of the seafood supply chain, products must be kept cold or frozen to maintain product quality and extend shelf-life. Freezing, thawing, and re-freezing seafood degrades its quality and texture, and should be avoided except under the controlled conditions of a processing facility.

Seafood products must be stored, transported, and handled at the appropriate temperature. Within a shipping container, whether that container is moved by boat, truck, or rail, the internal temperature is continuously maintained and regularly recorded. A time-temperature indicator can be placed in a container or select packages of a shipment to continuously monitor

temperature. According to interviews conducted for this report, Alaska seafood shipments do not typically contain temperature monitoring devices because the frozen cold chain for seafood is well developed between Alaska and the first outside port. For later transportation legs, such as shipment out of Seattle by train or truck, temperature monitoring is more common but is not universally conducted.

Fresh product must be kept below 38° Fahrenheit. Reduced contact with oxygen also helps slow spoilage. Fresh product must travel quickly to destination markets. Alaska seafood products in general are not well suited to the fresh seafood market because of the distance to market, short harvest season (particularly for salmon), or high volume. Most Alaska seafood is best preserved by freezing or canning. For example, cod is caught from frigid Arctic waters, minimally processed, and immediately blast-frozen into a block, which is then glazed with ice and bagged to seal in moisture and prevent oxidization. From that point onwards, frozen cod must be kept at temperatures below -20°F.⁶ This low temperature arrests bacterial deterioration, extending the shelf-life up to 18 months on average.

During transport, seafood may undergo short periods when the ambient temperature is not at the required level. This occurs when fish is loaded or unloaded between modes of transportation, cold storage facilities, or during value-added processing. These ‘in between’ periods carry risk to fresh and frozen seafood products and could reduce product quality or shelf-life. Temperature continuity during transportation, cold storage, and distribution of perishable foods such as seafood is critical for ensuring product value and safety.

Cold storage offers an important service. Cold storage facilities are typically located at or near ports, airports, railways, and major highways. Alaska Airlines and private consolidators have cold storage capabilities at many airports in Alaska, but Alaska’s total cold storage capacity is low compared to other states.⁷ According to the U.S. Department of Agriculture’s 2021 Summary of Refrigerated Warehouse Capacity, Alaska had no public cold storage warehouses and six private or semi-private warehouses. Five states – California, Washington, Wisconsin, Texas and Florida – each had more than 200 public and private refrigerated warehouses. Alaska seafood products are often stored in Washington State cold storage facilities after transport from Alaska. In Alaska, much of the cold storage need in remote areas is fulfilled with individual refrigerated shipping containers rather than cold storage warehouses.

⁶ FAO. 2001. [Cold Storage of Frozen Fish](#).

⁷ A project at Ted Stevens Anchorage International Airport, Alaska Cargo and Cold Storage, LLC, is expected to add 700,000 square feet of climate-controlled storage. McKinley Research Group’s parent company McKinley Management is a partner in the joint venture.

Distribution

Food distributors buy, gather, store, and transport food to retailers and wholesale buyers such as foodservice suppliers, restaurants, hotels, and institutions. Distribution networks, primarily consisting of cold storage warehouses and trucking services, are set up by distributors in each country for the timely movement of perishable foods. In most countries refrigerated seafood is moved by truck from cold storage warehouses to retailers and foodservice operators.

Distribution sites for seafood (cold storage warehouses) are typically privately owned facilities in or near major metropolitan areas. In the U.S., seafood distribution warehouses are typically located near dense urban areas such as Boston, Atlanta, New York, Phoenix, and Chicago and along major trucking routes such as Interstate-5 along the west coast.

Broadline distributors sell a variety of foods and non-food products – such as cutlery, stemware, and to-go boxes – to foodservice buyers, including institutions and restaurants. The largest broadline distributor in the U.S. is Sysco, which sold an estimated \$2.6 billion worth of seafood in 2021 to foodservice operations.⁸ Globally, Sysco has over 325 distribution centers in 90 countries including an estimated 169 in the U.S. Sysco operates regional companies that specialize in meat and seafood in Florida, Maryland, California, New Jersey, Texas, Ohio, Illinois, North Carolina, and Georgia.

Specialty seafood distributors, also called wholesalers, focus on seafood, although some might also sell other animal proteins. Specialty seafood distributors sell to retail stores and foodservice buyers. Most major cities have one or two specialty seafood distributors that dominate that market and multiple additional niche distributors. Specialty distributors often thaw and cut (refresh) seafood to customer specifications or re-label seafood. An example of a large specialty seafood importer/processor/distributor in the U.S. is Pacific Seafoods LLC, with distribution facilities in Washington, Oregon, California, Nevada, Arizona, Texas, and Florida.⁹ For more information on U.S. distributors, see the U.S. Case Study below.

Niche distribution channels exist to serve markets that demand high quality, certified, region specific, or value-added seafood products. Niche markets include specialty grocers or chains, community-supported fisheries programs, local fish markets, or community co-ops or natural food stores.

⁸ Statista. 2022. [Annual sales of Sysco Corporation from 2014 to 2021 by segment](#).

⁹ Pacific Seafood. 2021. [CSR Report](#).

Final Sale into Retail or Foodservice

Distributors move seafood by truck from warehouse to a retail store or foodservice entity. Retail includes all consumer facing outlets such as grocery stores, convenience stores, fish mongers, or markets. Foodservice includes any entity that prepares food outside of the home for immediate consumption, such as a fast food and full-service restaurants, school and hospital cafeterias, and catered events.

Retail stores and foodservice operations typically receive seafood from different distributors. Large or chain retail stores typically source seafood from large specialty distributors, while foodservice operators source seafood and many other products from broadline distributors.

Eating Out Vs. Eating at Home

In 2020, U.S. consumers spent \$1.69 trillion on food, according to the U.S. Department of Agriculture's Economic Research Service. Due to the COVID-19 pandemic and resulting disruption in food consumption patterns, people ate out less in 2020 than in 2019. Prior to the pandemic, U.S. consumers spent more than 55% of their food budget eating out and the remainder at retail.

A pre-pandemic study of seafood spending patterns in the U.S. found that, 65% of U.S. consumer spending on seafood was at restaurants and other "away from home" sources.

Source: Love et.al. 2020. Food Sources and Expenditures for Seafood in the United States.

End Products

Main supply chain channels vary widely depending on species and product type. Below are brief summaries of the supply chain pathway for a representative set of product types made from Alaska seafood.

Live Seafood

- Main species: crab, geoduck, oysters
- Main markets: Asia

Live animals are moved out of Alaska by airplane because shipment to market is time sensitive. The main Alaska seafood species shipped live are king crab, Dungeness crab, sea cucumber, geoduck, and oysters. Live species are primarily shipped from Southeast Alaska.

Most species that are shipped live can survive out of water for a period of time and can be flown in boxes or plastic totes without sea water or minimal sea water. Some live products, particularly king crab and geoduck, require oxygen refreshment at the interim air transportation node. Seattle has refresh capabilities for live products, but Anchorage does not. After a refresh in Seattle, geoducks are put on international flights to Asia and king crab are typically moved to local processing facilities and the processed product remains in the U.S. market.

Sea cucumber is typically exported to Canada and re-exported to final market in Hong Kong or China. Oysters typically serve the domestic market and can live for days during shipping if packed appropriately for temperature control.

Fresh Seafood

- Main Species: halibut, sockeye salmon, king salmon, coho salmon, Pacific cod, rockfish
- Main markets: U.S.

Fresh halibut and salmon are high-value products that must be moved quickly from harvest to market to ensure product freshness and safety. Anchorage and cities in Southeast Alaska (Yakutat, Cordova, Sitka, Juneau, and Ketchikan) have daily commercial flights to locations in the contiguous United States. Typically, fresh product is flown out of Alaska on commercial air cargo planes to domestic restaurant and retail markets. Fresh seafood shipments are flown via Alaska Airlines or Delta Airlines. Airports that handle significant volumes of fresh commercial seafood

include Anchorage, Yakutat, Cordova, Juneau, and Ketchikan. Small quantities of fresh product, such as salmon, is also moved out of Alaska by truck.

Bulk shipments of fresh seafood via Anchorage are typically coordinated by consolidators that sort, re-package, and re-ice fish. When an estimated volume of fish is incoming, the consolidator books cargo space on airplane routes as specified by the buyer. Seafood is packed for air transit to standards acceptable to the Transportation Security Administration, usually in insulated, wet lock boxes with dry ice or gel packs. Fresh product is then moved to the airport by truck and held in cold storage until it is loaded on a cargo or passenger plane. At the destination airport, the buyer arranges for pick up by truck and the product enters local distribution to retail or foodservice.

Refresh Products

- Main species: halibut, sockeye salmon, king salmon, coho salmon, Pacific cod, rockfish
- Main markets: U.S. and Europe



Refreshed seafood is frozen seafood that is thawed for sale at retail (example in picture below). Refreshed seafood is typically high value seafood, such as whitefish or salmon fillets. The refresh market effectively extends the fresh seafood market from seasonal to year-round and has a growing importance in the U.S. because the quality of once-frozen refreshed seafood is comparable to fresh.

The supply chain pathway for refreshed seafood begins with fish caught, headed, gutted, and frozen in Alaska. Specialty seafood distributors operating near final markets (or sometimes retailers themselves) thaw, fillet, skin, and package the fillet or portion for retail sale. The product is moved from the distributor warehouse or secondary processing location to retail market by refrigerated truck.

Pet Food

- Main species: salmon, cod, pollock
- Main markets: U.S. and Europe

Certain dog and cat foods contain nutrients, protein, oils, and flavor from fish. Pet food and treat manufacturers use fish and bone meal, fish oil, and frozen byproducts and trimmings. Salmon and whitefish are two fish categories that are advertised as



having beneficial fatty acids and being recommended for pets with allergies. Some pet food brands tout sourcing fish from certified sustainable fisheries.

Fish meal for pet food is made from ground-up and frozen fish heads, frames, skin, and bones. Containers of frozen fish meal are shipped by Alaska seafood processors to pet food manufacturers, including in central and northwest U.S.

Pet food and treats are not generally manufactured in Alaska; however, AlaSkins is an exception with their line of specialty pet treats made from fish skins.

Byproduct is generated from processing Alaska seafood in reprocessing countries, such as Thailand and China. Yield targets must be met by reprocessing plants, and the trim pieces become the property of the reprocessing plant for use or disposal. Bone and skin are ground and made into fish meal for animal feed and pet food, while any usable parts are sold into the local market, or to nearby farms or factories. Byproducts from canning salmon in Thailand are known to be used in canned wet cat food production.

Canned and Ambient Products

- Main species: pink salmon
- Main markets: U.S. and UK

Salmon is canned in both Alaska and in reprocessing countries. In Alaska sockeye and pink salmon are canned at shoreside processing facilities in Bristol Bay, Prince William Sound, and Southeast Alaska. Alaska canners generally produce talls (14.75 ounce cans), halves (7.5 ounces), and some quarters (3.25 ounces) – with no canning of smaller cans or pouches.

Cans are then shipped to Washington State for labeling and quality control checks. Cans are moved by container ship from Seattle/Tacoma ports to Europe through the Panama Canal, which takes about seven weeks. Cans may also be moved by rail across Canada or the U.S. and shipped across the Atlantic to Europe, which takes about four weeks. Cans that stay in the U.S. market are stored in distribution warehouses. Inventory is held in the Seattle area and near the end market in the U.S., UK, Netherlands, Ireland, Australia, and Scandinavia.

For pink salmon canned outside the state, headed and gutted pink salmon is frozen, container shipped to Asia, thawed, skinned, canned, and exported to end markets. Thailand has canneries for tuna and capacity for canning other fish species. The quality of salmon canned from a frozen product is thought to be lower yet canning in a reprocessing country has other advantages. Manufacturers in Thailand can operate year-round



and invest in processing equipment to serve emerging market preferences for smaller cans (eg., 80 grams cans increasingly sold in combination with crackers, salad packs, etc.) and pouches that appeal to younger, convenience-driven consumers. See the Southeast Asia Case Study below for more information on salmon canning in Thailand.

Canned pink salmon inventory can be held safely for up to 5+ years, though most seafood processors prefer to sell down inventory after each season. Major buyers purchase pink salmon in sufficient quantities to carry them through even years when pink salmon harvests are typically substantially lower.

Roe

- Main species: salmon, pollock, cod, herring
- Main markets: Asia, Eastern Europe

Pollock roe is harvested primarily in the BSAI trawl fishery's "A season" that runs between January and March. Pollock roe was worth \$114 million in wholesale value to the Alaska seafood industry in 2020. Roe skeins are frozen, graded, and shipped by vessel to Seattle, Washington or Busan, South Korea where the raw product is auctioned or sold directly to contract buyers. Secondary processing in Japan, South Korea, China, or Thailand involves defrosting and brining the roe skein in salt or spices. High quality pollock roe is packaged in an ornate fashion and given as holiday gifts in Japan. Lower grades of pollock roe are used as a condiment ingredient in soups, rice balls, rice dishes, and pasta sauces. The primary end market is Japan, followed by South Korea.



Salmon roe or ikura caviar is a significant part of Alaska's salmon market, generating on average about \$220 million a year in wholesale value. Roe is harvested from all five salmon species, with the bulk of production and value coming from pink and keta salmon. Salmon roe is stripped from salmon harvested in summer months as fish near their natal rivers to spawn. The timing of salmon egg harvest is important to ensure the end product has the right structure. Salmon caviar should have a crisp pop when the consumer is biting down.

Roe is typically processed either as frozen uncured "green roe" or as cured (ikura) roe, which is brined and seasoned in a stirring vat that breaks the eggs out of the skein. Cured roe is graded by size, color, maturity, and other factors, packaged into shallow plastic 500 gram or 1kg trays, and frozen. Roe handling and processing at Alaska seafood processors is typically handled by specialized processing workers in dedicated roe facilities or rooms within a processing plant.

Prior to the 2014 Russian ban on U.S. seafood imports, Russia was a major importer of Alaska salmon caviar. Today the main end markets are Japan, Poland, and Ukraine, among others.

Frozen Meals

- Main species: salmon, pollock
- Main markets: North America, Europe

Frozen food sales jumped during the COVID-19 pandemic due to the product convenience for cooking at home and long shelf-life which reduced the number of trips to market. Frozen meals that can be microwaved or heated in the oven are convenient and can cater to specific diets, such as low-carb. Younger consumers (ages 18 to 34) have a more positive view of frozen food, including seafood, than older consumers (over age 55).¹⁰ Examples of frozen meal entrees that contain seafood include breaded or battered whitefish fillets with rice or pasta, seafood with sauce, carbohydrates, and vegetables, and fish pies. Other ready-to-cook frozen food containing seafood includes breaded fish sticks, battered fish fillets, potstickers, dumplings, frozen meal kits, frozen skillet meals, protein meal starters in herbs or sauce, and seafood cakes or burgers.



The pathway for Alaska seafood to frozen meals and frozen ready-to-cook foods follows a typical global route. Fish caught in Alaska is headed and gutted, frozen, and shipped to manufacturing plants that produce frozen meals. Specialized staff at these businesses conduct extensive quality and sensory testing to ensure product received meets their specifications.

Manufacturing plants are located in the continental U.S., Asia, and Europe. For example, Swiss-owned Nestle Global (which markets the frozen meal brands Lean Cuisine and Stouffer's) has manufacturing plants in South Carolina and Arkansas. Conagra markets the brands Banquet, Healthy Choice, and Marie Callender's and has manufacturing plants in Arkansas, Ohio, Iowa, and Missouri. Manufacturing plants package and label the food as specified by the buyer or end market requirements. Distributors hold the product in frozen cold storage until it is stocked in a store or ordered by foodservice operators.

Frozen Portions

- Main species: crab, flatfish including yellowfin sole, pink, keta, and sockeye salmon, Pacific cod

¹⁰ Deloitte. 2021. Fresh vs. Frozen. *Insights*.

- Main markets: North America, Europe



Individually frozen portions of Alaska seafood are sold to both retail and foodservice. Individually quick-frozen (IQF) fillets, crab legs, or other skinless, boneless portions are convenient products that do not require consumers or cooks to thaw large volumes or cut portions. At retail, 2 to 5 pound packages are sold containing 4 or more frozen fish portions which may be individually wrapped. Foodservice shatter packs of individually frozen fillets or portions weigh 10 to 15 pounds.

Fish caught in Alaska is filleted, frozen, and boxed or bagged in Alaska, or it is headed, gutted and frozen in Alaska and exported to be filleted, frozen, and bagged in a reprocessing country. Fillets that are produced in a reprocessing country are twice frozen – frozen first in Alaska for export and again after filleting for re-export. Single frozen products are higher quality, and command a higher price, than twice frozen, though there can be overlap between the two markets.

Retailers sell frozen portions under store brands, such as Great Value sold at Wal-mart, Simply Balanced and Good & Gather both sold at Target, Fremont Fish Market sold at Aldi U.S., and Fisherman's Reserve sold at Kroger. Retailers also sell name brand frozen fish fillet portions, such as Orca Bay and Trident Seafoods. Broadline distributor brands carry boneless, skinless fish portions, such as Portico Seafood by Sysco and Harbor Banks Seafood by U.S. Foods.

Smoked and Cured Products

- Main species: salmon, black cod, Pacific cod
- Main markets: U.S., Europe

Cold smoked salmon (also called lox, gravlox, or nova) is a high-end food item served as an appetizer or on a breakfast or holiday platter in Europe, the U.S., and other countries. In the U.S., lox is often paired with bagels and cream cheese as a high-end brunch item. Alaska sockeye and coho salmon are used in lox production, although the lox industry is dominated by farmed Atlantic salmon.



Salmon from Alaska that is cold smoked is usually troll (hook and line) caught, individually gilled, gutted, bled and iced on board the boat; headed at a shoreside plant; individually blast frozen,

glazed with a water/sugar mixture, bagged, and boxed; and shipped by container to a smoking facility. Key locations for smoking include France, Poland, the UK, and the U.S east coast.

One smoker might buy 5 to 100 containers of H&G salmon, hold it in cold storage for up to 16 months near the processing plant, removing fish for processing over time. Quality cold smoked salmon cannot be produced from twice-frozen salmon. After lox is produced and packaged it is frozen and shipped to distributors in the final market country.

While it used to be common for lox to be served as a whole fillet in high-end restaurants, most smoked salmon lox today is sold at retail, pre-sliced, in shallow tray packaging holding 4 to 6 ounces.

Southeast Asia Case Study

Introduction

Alaska's seafood exports to Southeast (SE) Asia have shifted markedly in the last decade. The region is gaining prominence as an export destination, as seafood companies seek more favorable trade and business environments for the reprocessing of Alaska seafood. Trade conflicts between the U.S. and China and the COVID-19 pandemic have made reprocessing in China more difficult, resulting in increased use of SE Asian countries for seafood reprocessing. Domestic consumption of Alaska seafood (in SE Asia) has increased during this time, as well.

While China is still the dominant Asian reprocessing market, SE Asia is gaining ground quickly. A decade ago, Alaska exports to China outpaced SE Asia by 20-to-1. By 2020 this differential had fallen to 5-to-1.

Expanding the number of reprocessing countries to which Alaska seafood is exported provides seafood exporters with more options and lowers risk. The COVID-19 pandemic revealed the importance of diversifying buyers of headed and gutted (H&G) fish when China refused entry to frozen food products¹¹ and significantly increased customs inspections and testing of imported frozen seafood, which dramatically slowed the supply chain for seafood.¹²

Thailand, Vietnam and other SE Asia countries have many of the elements needed to grow the reprocessing of Alaska seafood: container shipping ports, cold storage infrastructure, existing processing plants, and inexpensive and skilled labor. Some SE Asia countries have good government-to-government trade relationships with the U.S. and predictable regulations with respect to tariffs, customs requirements, and health inspections.

Currently, several SE Asia countries receive Alaska fish and crab, primarily for secondary processing and re-export. Both the re-export trade pathway and the domestic consumption pathway are examined in detail below for select SE Asia trade partners of Alaska seafood, as well as the amount and value of raw seafood material that is exported directly from Alaska to SE Asia.

¹¹ Reuters. November 13, 2020. [China's sweeping COVID controls put frozen food importers on ice.](#)

¹² Undercurrent News. November 3, 2021. [China customs ramps up COVID crackdown on imported seafood.](#)

Southeast Asia Overview

SE Asia is a massive producer of tuna, shrimp, tilapia and pangasius (also called catfish or basa). After China, Asia is the next major fish producing region in the world, generating 34% of global production in 2018.¹³ The production of fish and shellfish in the SE Asia region has doubled in the past 20 years and continues to grow.¹⁴ Aquaculture accounts for 55% of the seafood production in the region while wild capture accounts for 38%.¹⁵ Indonesia, Thailand and Vietnam are among the top ten fish-producing countries in the world.

The high level of production – 44 million metric tons in 2015¹⁶ – has resulted in SE Asia being a net exporter of seafood products. Vietnam, Thailand and Indonesia are the region's highest exporters of seafood products. The main recipients of seafood exported from SE Asia are U.S., Japan, Associated Southeast Asian Nations (ASEAN), EU, and China. These countries receive seafood products that are either in final form or need only minimal final processing, such as breeding.

High SE Asian expertise and labor capacity in seafood processing makes this region an area of focus for increased reprocessing of Alaska seafood. Several SE Asia countries are receiving salmon, pollock, and crab for reprocessing and export, and certain domestic markets within SE Asia have increasing potential for consumption of Alaska-origin products.

Consumers in SE Asian countries are gaining access to Alaska seafood available through e-commerce, at high-end restaurants, and in tourist and expatriate areas. Expatriate populations are driving up domestic consumption of Alaska-origin seafood. Fine dining, Japanese restaurants, and international dishes use high-quality Alaska species, which in turn set trends and tastes for the sophisticated diner more broadly. Convenience foods are also growing in popularity in SE Asia, including surimi products sold in retail and Western style battered fish sold in quick service restaurants.

SE Asian countries have a history of fishing and fish farming, and locally harvested seafood is a major source of protein for the general population. Per capita seafood consumption of seafood in SE Asia – 33.4 kg/person/year¹⁷ – is far higher than the global average (20.5 kg/person/year in 2018).

¹³ FAO. 2020. [*The State of the World Fisheries and Aquaculture 2020*](#).

¹⁴ Ibid.

¹⁵ Southeast Asian Fisheries Development Center (SEAFDEC). 2015. [*Fish Stats*](#).

¹⁶ Ibid.

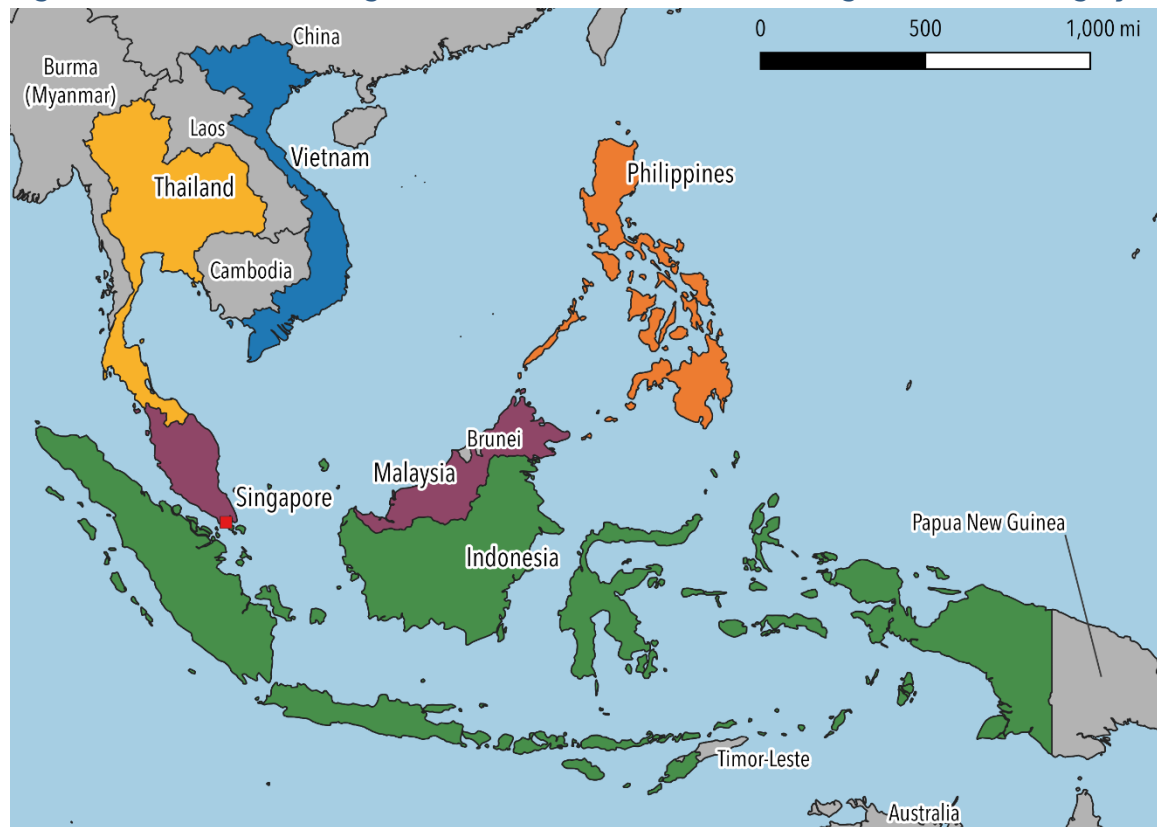
¹⁷ International Food Policy Research Institute. 2017. [*Fish to 2050 in the ASEAN Region*](#). Pg 12

Seafood Exports from Alaska to SE Asia

The Alaska Seafood Marketing Institute created a SE Asia program area in 2019. The program area countries are Thailand, Vietnam, Indonesia, Singapore, Malaysia, and the Philippines.

The program area does not include the geographic SE Asian nations of Laos, Cambodia, Myanmar, Brunei, East Timor, or Papua New Guinea, none of which have directly imported Alaska seafood products in the past five years, according to National Marine Fisheries Service data.

Figure 7. ASMI SE Asia Program Countries (color) and Other Regional Countries (gray)



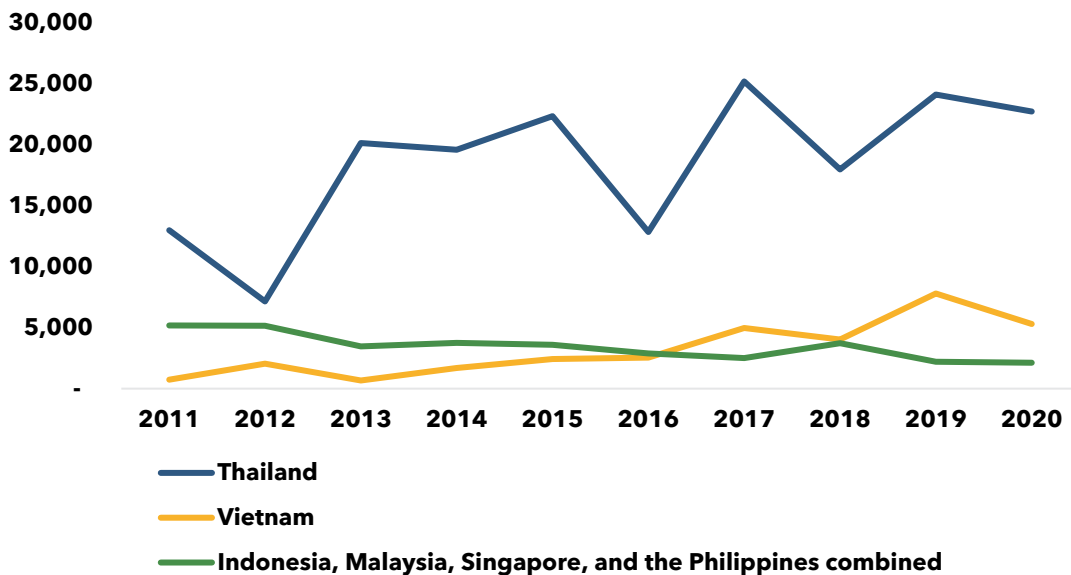
Source: UN World Food Program (country polygons). McKinley Research Group graphic.

Alaska seafood product exports to SE Asia (by value) have nearly doubled in the five-year period between 2016 and 2020, although a great deal of year-to-year fluctuation exists.

- Thailand is the largest importer of Alaska seafood products in SE Asia. Alaska seafood exports to Thailand have doubled by volume over the past decade.
- Vietnam's Alaska seafood imports have increased rapidly over the last 10 years, but volumes are about one-quarter of Thailand's Alaska seafood imports as of 2020.

- Thailand, Vietnam, and Indonesia have significant seafood processing sectors for domestically produced seafood, and that processing capacity has been used to re-process Alaska-origin seafood.
- Thailand and Vietnam are the main countries in SE Asia that import raw seafood products from Alaska for reprocessing. Other SE Asia countries combined represented 7% of Alaska's seafood exports by volume in 2020.

Figure 8. Alaska Seafood Exports to Select SE Asia Countries by Volume (mt), 2011-2020



Source: NMFS, compiled by McKinley Research Group.

In the year 2020, SE Asia was one of the only parts of the world with a year-over-year increase of Alaska seafood imports by value. Globally, Alaska seafood exports were down 16% by value between 2019 and 2020 due to COVID-19 impacts and biological factors. By contrast, Alaska exports to SE Asia were up 6% by value in 2020, though they dropped 13% by volume.

Vietnam as well as Indonesia are proportionally larger importers of Alaska seafood products by value than by volume. This is because these two nations import significant volumes of high value snow crab from Alaska, while other SE Asian nations do not.

Table 3. Alaska Seafood Exports to SE Asia, By Country, 2018-2020 Average

	Volume (mt)	Value (\$millions)
Thailand	21,621	\$70.9
Vietnam	5,713	\$22.7
Malaysia	1,230	\$3.6
Indonesia	1,023	\$10.1
Singapore	218	\$2.6
Philippines	217	\$0.8
Total Alaska Exports to SE Asia	30,023	\$110.8

Source: NMFS, compiled by McKinley Research Group.

Note: Columns may not sum due to rounding.

Country Analysis

Thailand

Thailand is one of the world's largest producers and exporters of seafood. Major export products are canned tuna, processed shrimp, squid, and canned sardines. Canned seafood is the principal exported seafood commodity out of Thailand.¹⁸ Thailand is the largest exporter of tuna to the U.S., valued at \$679 million in 2020. Thailand is the fifth largest exporter of shrimp to the U.S., valued at \$464 million in 2020.

THAILAND SEAFOOD MARKET (2020)

Population: 69.8 million

GDP per capita: \$7,817

Direct imports of Alaska seafood products: \$78.0 million

Total seafood imports: \$3.6 billion

Thailand, like most SE Asia nations, has an extensive coastline and a history of artisanal fishing and fish farming. Thailand's narrow Malay Peninsula faces the Andaman Sea and Indian Ocean to the west and the Gulf of Thailand to the east. Thai seafood production includes small-scale nearshore fishing, coastal and freshwater aquaculture, and off-shore pelagic fishing. Thailand is grappling with overfishing, excess capacity and unregistered boats, illegal fishing and labor, and climate change. These issues have impacted local seafood product production. For example, surimi produced in Thailand from tropical species has decreased significantly.¹⁹

Thailand has a robust seafood processing sector built up around cleaning fish, peeling shrimp, and canning tuna. In addition to processing locally produced raw seafood products, Thailand

¹⁸ SEAFDEC. 2019. [Fish Trade Profile: Thailand](#).

¹⁹ FAO. 2021. [GLOBEFISH - Information and Analysis on World Trade](#).

imports raw squid, surimi, tuna, catfish, shrimp and other fish from Myanmar, China, India, Vietnam, Taiwan, the U.S., Japan, and South Korea.²⁰

Thailand's top export markets for seafood products are Japan, U.S., EU, and Australia. Other export markets are other ASEAN countries, China, Canada, and Middle Eastern countries.

In 2016, the seafood consumption rate in Thailand was 33.7 kg/person/year, and was higher than pork, beef and chicken.²¹ A growing Thai middle-class with greater buying power is increasing the demand for seafood, including high-quality, imported seafood products that align well with Japanese cuisine, such as salmon and sablefish. Tourism in Thailand fuels flourishing restaurant chains and fast-food franchises that serve American or Japanese style food, although seafood is not a major menu focus.²² At home, seafood is a major part of the Thai diet and cuisine. A typical home-prepared seafood dish is a gutted, head-on whole roasted or fried fish (barramundi, mackerel, catfish, etc.) which is eaten by tearing pieces off and dipping into sauces.

Alaska exports pink and sockeye salmon, pollock surimi and fillet, snow crab, and sablefish to Thailand. Interviews indicate that over 90% of Alaska's exports to Thailand are re-processed and re-exported, and very little stays in the domestic market or is consumed locally. This may be due to the availability of low-cost seafood and the familiarity of cultural cuisine developed around locally harvested fish and shellfish.

SEAFOOD PROCESSING AND REPROCESSING SECTOR

Frozen raw seafood from foreign sources arrives in Thailand via eight ports that can handle container ships and offload refrigerated containers of seafood, which are included in a total of 25 ports that allow entry to foreign vessels.²³

The product is then moved from port to processor. Bangkok port is about an hour drive from the main seafood processing area of Thailand, in Samut Sakhon province, a suburban area of the Bangkok Metropolitan Region. Laem Chabang port, also near Bangkok, is within trucking distance to Samut Sakhon and other seafood processing factories in greater Bangkok. The southern Thailand port and city of Songkhla on the Gulf of Thailand has seafood processing plants that receive both harvested and imported seafood products for reprocessing, including surimi.

Much of Thai reprocessing is done by hand, such as cleaning fish, peeling shrimp, hand-picking crab meat, and packing seafood for shipping. Large processing factories have greater

²⁰ SEAFDEC. 2019. [Fish Trade Profile: Thailand](#).

²¹ SEAFDEC. 2017. [Fisheries Country Profile: Thailand](#).

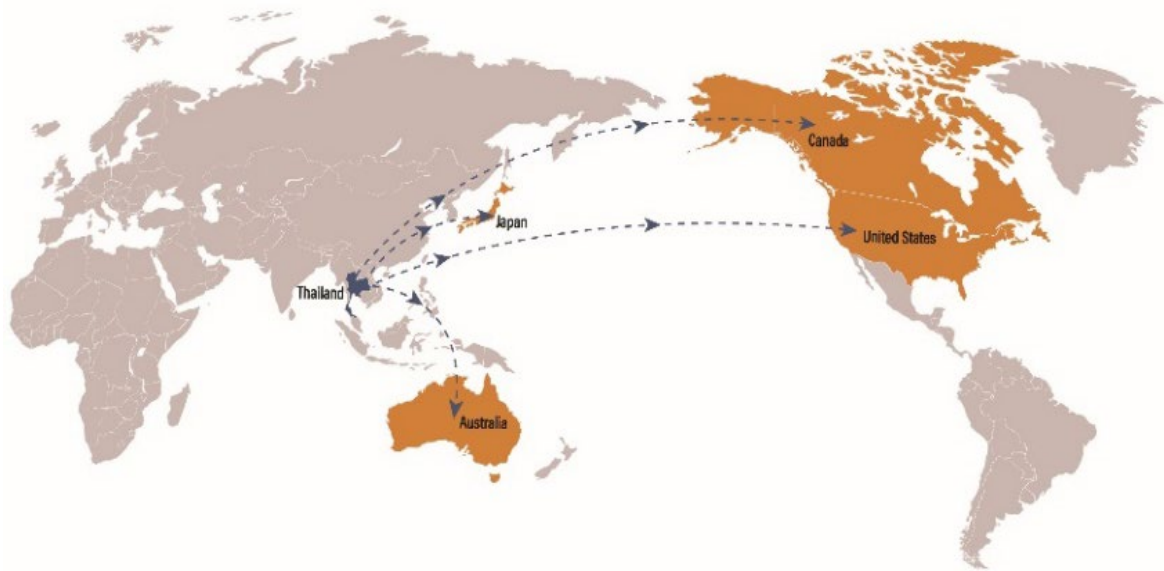
²² USDA Foreign Agricultural Service. 2018. [Thailand Seafood Report](#).

²³ SEAFDEC. 2019. [Country Fisheries Trade: Thailand](#).

automation, but much of the processing work is done by hand. An estimated 300,000 laborers work in the Thai seafood processing sector,²⁴ the majority of whom are migrant workers from Myanmar. About two-thirds of Thailand's seafood processing workers are women.²⁵

Re-processors thaw H&G product or frozen salmon, process it into fillets, portions, or cans, and package/label it for end markets per buyer specifications. A small amount of product may only be repackaged, but most products receive some added value, such as filleting, picking of crab meat, or canning. In most cases, Thailand-based processors are crafting seafood products that are ready for sale by retail and catering in Japan, Canada, U.S. and Australia, other ASEAN countries, and China. There are some products, such as whitefish, that are cut in Thailand or other SE Asia countries and breaded or battered in or near the end market country. By-products are converted to fish oil, fish meal, and canned pet food.

Figure 9. Thailand's Top Seafood Export Partners for Alaska-origin Seafood Products



IMPORTS OF ALASKA PRODUCTS

As described above, 90% or more of Alaska's seafood exports to Thailand (by volume) are estimated to go into the reprocessing sector. The top Alaska products exported to the country are frozen H&G pink salmon (57% of the 2020 total value), followed by H&G sockeye salmon (13% of the 2020 total value) and pollock surimi (13% of the 2020 total value).

²⁴ Tang, Tsz Ki K., et al., 2017. *Community Partnerships for the Prevention of the Worst Forms of Child Labor among Migrant Children in Samut Sakhon, Thailand*. The Journal of Sociology & Social Welfare: Vol. 44 : Iss. 1 , Article 6; pg. 70

²⁵ International Labour Organization. 2020. *Endline research findings on fishers and seafood workers in Thailand*.

Of the SE Asia countries, Thailand is the third largest importer of snow crab from Alaska, after Vietnam and Indonesia. Thailand imported \$4.4 million of Alaska snow crab in 2020, most of which was exported back to the U.S., to Japan, or to the EU after picked from the shell, vacuum packed, re-frozen, and boxed for shipping to end markets.

Thailand was once a much larger producer of surimi, but since 2012 that production has fallen by two-thirds to about 50,000 mt, due to lower tropical fish input to surimi production. Thailand imports Alaska-origin pollock surimi to re-process into surimi products, but it is a relatively small percentage (less than 10%) of all surimi imported by Thailand. Surimi processing occurs around Bangkok, Songkhla, and a few other locations. Surimi products are primarily consumed in Thailand (~72%) and the remainder exported to Japan, Russia, China, and Korea.

Table 4. Alaska Seafood Exports by Volume and Value to Thailand, 2018-2020 Average

Import Product Type	Volume (mt)	Value (\$millions)
Salmon (mostly frozen pink H&G)	13,432	\$45.3
Pollock surimi	4,946	\$12.8
Other pollock (mostly frozen fillet)	1,904	\$5.1
NSPF* groundfish meat	523	\$1.4
Frozen flatfish (mostly yellowfin sole)	421	\$0.8
Frozen snow crab	186	\$3.4
Frozen sablefish	45	\$0.6
Other products	163	\$1.6
Total Alaska Seafood Exports to Thailand	21,621	\$70.9

Source: NMFS, compiled by McKinley Research Group.

*Not Specifically Provided For

Note: Columns may not sum due to rounding.

THAILAND SALMON REPROCESSING ANALYSIS

Salmon is the main Alaska species processed in Thailand. Most of this salmon (by volume) is processed into cans and other shelf stable product forms such as retort pouches. About half of these shelf stable salmon products from Thailand are exported to the U.S.

Salmon Imports into Thailand

Thailand imports large volumes of frozen H&G salmon from both Alaska and Russia, most of it is pink salmon.

In addition to frozen salmon, Thailand imports large volumes of chilled farmed Atlantic and coho salmon (mostly from Norway, the world's largest salmon-producing nation), most of which is consumed domestically.

Salmon Exports from Thailand

Canned salmon is the largest category of salmon products exported from Thailand by both volume and value. About half of Thailand's shelf stable salmon products has been exported to the U.S. in recent years.

Thailand also exports significant volumes of frozen salmon fillets, almost all of which go to Japan.

Most fresh/chilled salmon that is imported into Thailand is consumed domestically, although a small amount is exported to the neighboring country of Cambodia.

Table 5. Salmon Exports from Thailand by Product Form and Destination Country, 2019

	2019 Volume (mt)	2019 Value (\$millions)
Shelf stable salmon	14,997	\$120.3
United States	7,622	\$56.0
Japan	3,187	\$33.9
All other nations	4,188	\$30.4
Frozen fillets	4,415	\$58.6
Japan	4,212	\$55.3
All other nations	203	\$3.3
Fresh, chilled, smoked, H&G, and other salmon products	182	\$1.7
Total salmon exports out of Thailand	19,594	\$180.6

Source: Trade Data Monitor.

Note: Columns may not sum due to rounding.

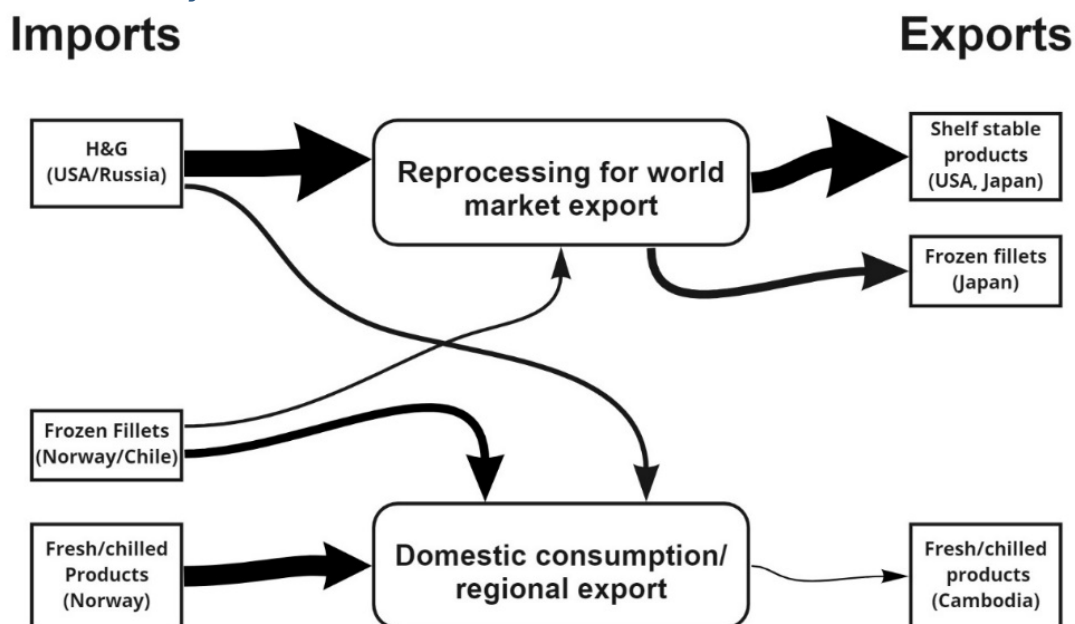
Thailand Salmon Product Streams

The analysis of Thailand's salmon reprocessing sector is complicated by import/export Harmonized System (HS) codes that do not always differentiate between (largely Alaska origin) Pacific salmon and farmed Atlantic salmon.

However, as the diagram below illustrates, Thailand's salmon production can be generalized into two main product streams: 1) an export reprocessing product stream that transforms frozen H&G salmon into shelf stable products and frozen fillets. 2) a domestic production product stream that processes chilled H&G salmon and frozen fillets for sale in Thailand and neighboring Southeast Asian nations.

Most frozen H&G product is wild from Alaska or Russia and goes into the export reprocessing stream, while most domestic consumption salmon is primarily farmed salmon from Norway or Chile. There is relatively little crossover between the domestic consumption and world market reprocessing product streams.

Figure 10. Primary Salmon Product Flows in Thailand



Source: Trade Data Monitor data. McKinley Research Group graphic.
Line thickness indicates relative trade product volume.

Importance of U.S. to Thailand Reprocessing

The U.S. is both an important source of raw product and a final market for the salmon reprocessing sector in Thailand. As seen in the table below, the prominence of the U.S. as a trading partner for salmon products is especially pronounced when considering frozen and shelf stable product categories.

Table 6. Thailand Frozen Salmon Reprocessing Analysis Summary, 2019

	Volume (mt)	Value (\$millions)	Value/mt
Salmon Imports into Thailand	28,278	\$117.4	\$4,153
From U.S. (AK) to Thailand	15,775	\$44.1	\$2,798
To Thailand from other nations	12,503	\$73.23	\$5,862
% imported from U.S.	56%	38%	
Salmon Exports out of Thailand	19,412	\$180.01	\$9,277
To U.S. from Thailand	7,652	\$56.23	\$7,355
From Thailand to other nations	11,760	\$123.8	\$10,528
% exported to U.S.	39%	31%	

Source: NMFS, compiled by McKinley Research Group; Trada Data Monitor.

Vietnam

A coastal nation, Vietnam is the seventh largest wild seafood harvesting nation in the world by volume, producing more than Japan but less than the U.S. in recent years. The Mekong River delta supports an abundant wild harvest of tuna, shrimp, squid, bream, snapper, and grouper in the southern part of the country, where most of the wild capture and related shore-based processing

occurs. One third of the marine harvest goes into fishmeal and fish oil, which supports aquaculture in Vietnam, other ASEAN countries, China, Norway, and Chile.²⁶

VIETNAM SEAFOOD MARKET (2020)

Population: 67.8 million

GDP per capita: \$2,715

Direct imports of Alaska seafood products: \$25.7 million

Total seafood imports: \$1.7 billion

Vietnam is a large producer and exporter of farmed shrimp and pangasius. Vietnam was the fourth largest exporter of farmed shrimp to the U.S. (valued at \$696 million in 2020), after India, Indonesia, and Ecuador. Aquaculture accounts for just over half the seafood production by Vietnam, and the Vietnamese government has a goal of increasing that to 70% by 2030. Aquaculture products are processed in Vietnam in the same locations as wild capture harvest, in the southern part of the country. Vietnam is the second largest exporter of tuna to the U.S. after Thailand (valued at \$230 million in 2020).

Vietnam's top export markets for seafood products are U.S., EU, Japan, and China.

IMPORTS OF ALASKA SPECIES

Vietnam imports from the U.S. include: frozen snow crab; frozen H&G Chinook, keta, pink, and sockeye salmon; herring roe; frozen pollock fillet and H&G; pollock surimi; frozen cod H&G; sablefish; rockfish; sole; not specified frozen H&G; and fish oil. Shellfish (other than crab), pollock roe, and salmon are either not exported to Vietnam, or the volumes are very low.

The highest value items in 2020 were frozen snow crab (\$12 million); frozen H&G keta salmon (\$3 million); frozen H&G sockeye salmon (\$2 million); frozen H&G pink salmon (\$1.7 million); frozen H&G Pacific cod (\$1.5 million); and sablefish (\$1million). Additionally, combined by-products and not specified (or uncategorized) products totaled \$1million in 2020.

Vietnam is the largest SE Asia country importer of snow crab from Alaska (in addition to Indonesia and Thailand). Vietnam imported \$12.2 million of Alaska snow crab in 2020, most of which was exported back to the U.S., to Japan, or to the EU after being picked from the shell, vacuum packed, re-frozen, and boxed for shipment to end markets. The U.S. imported \$4.9

²⁶ International Fishmeal and Fish Oil (IFFO). July 2021. [Vietnam Webinar's Takeaways](#).

million worth of snow crab products from Vietnam in 2020.²⁷ These are likely re-imports of Alaska-origin snow crab.

Table 7. Alaska Seafood Exports by Volume and Value to Vietnam, 2018-2020 Average

	Volume (mt)	Value (\$millions)
Salmon (mostly frozen keta and pink H&G)	2,009	\$8.1
Frozen flatfish (mostly yellowfin sole and rock sole)	970	\$1.5
Frozen pollock (including surimi and roe)	886	\$1.6
Frozen cod	611	\$1.8
Frozen snow crab	486	\$7.2
Fish oil	236	\$0.3
Frozen Pacific Ocean perch	119	\$0.4
Frozen herring	109	\$0.1
Frozen sablefish	54	\$0.7
Other products	287	\$1.8
Total Alaska Seafood Exports to Vietnam	5,713	\$22.7

Source: NMFS, compiled by McKinley Research Group.

Note: Columns may not sum due to rounding.

PROCESSING AND REPROCESSING

Vietnam's seafood processing primarily takes place around Ho Chi Minh City in southern Vietnam, and to the south on the Cà Mau Peninsula. Ho Chi Minh has sophisticated port facilities for loading and unloading the container ships that bring frozen, raw seafood for reprocessing.

Vietnam Association of Seafood Processors and Exporters is the main association of seafood processors and exporters in Vietnam and is a politically powerful group. There are nearly 800 processing companies licensed in Vietnam. Of those, 600 have freezing capability and 17 have canning capability.²⁸ The volume of processed fish products was over 2 million tons in 2019.

DOMESTIC CONSUMPTION

Most products exported from the U.S. which are dominantly originating from Alaska and imported by Vietnam do not stay in Vietnam for domestic consumption, with perhaps the exception of sablefish. Sablefish, also called black cod, is a popular fish served in Japanese-style and sushi restaurants.

²⁷ NOAA Fisheries. 2021. [US Trade in Fishery Products](#).

²⁸ USAID Oceans. 2020. [Technical Guidance on the Design and Implementation of Electronic Catch Documentation and Traceability in Vietnam, 2020 - 2023](#).

EXPORT OF ALASKA SPECIES

Vietnam is the largest SE Asian importer of snow crab from Alaska (\$12.2 million in 2020). Snow crab is re-processed in Vietnam and re-exported, not consumed in Vietnam. The reprocessing of snow crab consists of hand or machine picking of the meat from the shell, vacuum packing the meat, and re-freezing the product. The U.S. imported \$4.9 million worth of snow crab products from Vietnam in 2020,²⁹ and these are likely re-imports of Alaska-origin snow crab.

²⁹ NMFS. 2021. [US Trade in Fishery Products](#).

United Kingdom Case Study

The UK has been a long-time seafood consumer market for Alaska seafood. UK consumers have a taste for breaded and battered whitefish, canned salmon, and smoked salmon. UK retailers have a sustained commitment to sourcing certified sustainable seafood, which places Alaska seafood in a favorable position to supply the UK demand and capture value for those products.

UK SEAFOOD MARKET (2020)

Population: 67.8 million

GDP per capita: \$42,354

Direct imports of Alaska seafood products: \$68.4 million

Total seafood imports: \$4.1 billion

The trade policy landscape in the UK has rapidly shifted in recent years due to multiple factors. As a result of its departure from the European Union (EU), the UK has had to negotiate new bilateral free trade deals with dozens of trade partners and is navigating additional customs and border health checks. It is also currently negotiating wild harvest quotas with EU countries.³⁰ At the same time, the COVID-19 pandemic impacted manufacturing and distribution logistics, worker safety, prices, and consumer dining and cooking habits.

Alaska seafood arrives in the UK market either directly or after passing through other countries. Alaska seafood entering the UK will typically undergo additional reprocessing or repackaging either in the UK or just prior to arrival. Some UK-bound seafood passes through customs-free trade zone in the EU or Asia because of global shipping routes and long-established patterns of moving seafood around the world by container ship. These trade pathways and reprocessing into the final product form make Alaska-origin seafood difficult to track to the end market. This case study describes direct seafood trade from Alaska to the UK and the common triangular trade pathways for major and minor Alaska seafood products to the UK market.

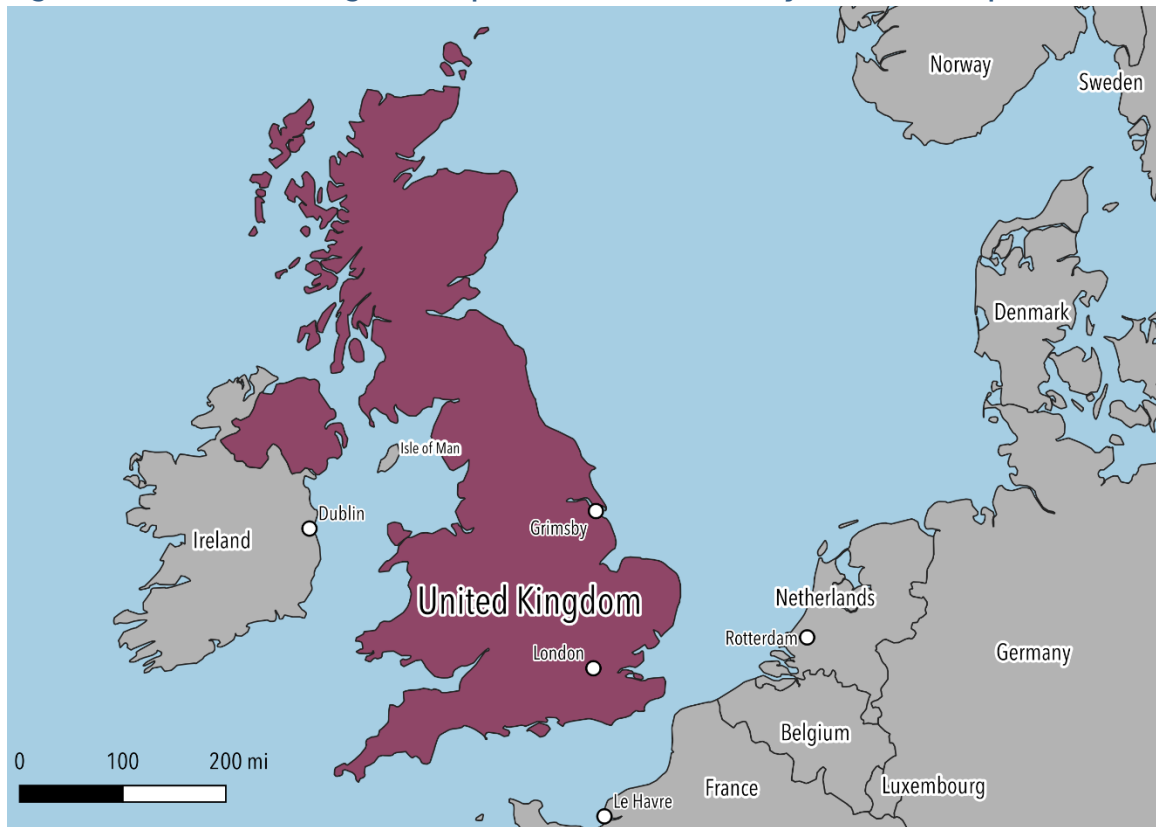
³⁰ Bloomberg News. October 2021. [U.K. Slams France's Threats Over Fishing as Tensions Rise.](#)

UK Seafood Market Overview

The UK³¹ is the U.S.'s seventh largest two-way trading partner in terms of goods in 2019; the US exported \$69.1B and imported from UK \$63.2B.³² The UK is a net importer of fish, despite their own vessels harvesting 621,900 tons in 2019 from both UK and foreign waters.³³

UK exports 60% to 80% of its catch, most of it to the EU. The UK left the European Union (a process called Brexit) on January 31, 2020. Brexit has recently caused hurdles to the UK to EU seafood export channel, described further below.

Figure 11. The United Kingdom, Republic of Ireland and Key Western Europe Ports



Source: UN World Food Program (country polygons), McKinley Research Group graphic.

Domestic harvest and farming in the UK are anticipated to increase in the near future. The UK catch share within UK waters is expected to increase between 2021 and 2026, after which the

³¹ The UK is comprised of the Isle of Great Britain, Northern Ireland, and the British Isles. The Isle of Great Britain contains England, Scotland, and Wales.

³² Office of the US Trade Representative. 2019. [United Kingdom](#).

³³ USDA, Foreign Agricultural Service. March 2021. [United Kingdom - Fish and Seafood Market Update 2021](#).

UK can completely exclude EU harvester vessels.³⁴ Although aquaculture is one-tenth the size of UK's wild capture fisheries landings and has not grown in the past decade, that industry aspires to grow and possibly branch into warm-water species such as tilapia and shrimp.³⁵ Aquaculture production of Atlantic salmon and shellfish occurs primarily in Scotland. Atlantic salmon accounts for over 80% of UK aquaculture production.

The seafood reprocessing center of UK is in Grimsby, on the east coast of the Isle of Great Britain. Some reprocessing occurs in Grimsby, such as the breeding, battering, and packaging of whitefish for retail and catering. Grimsby is also a primary processing center for domestically caught or farmed seafood. However, the use of the UK as a processing center for EU-destined products is now reduced due to Brexit. In 2018, there were 353 fish processing sites in the UK.³⁶

Fish consumption in the UK in 2019 was at 14.2 kg/person/year, which is lower than the 2018 global average of 20.5 kg/person/year.³⁷ Among the most commonly consumed seafood in the UK is fish and chips, a ubiquitous and convenient takeaway food item. Within this popular national fast-food dish, battered and fried whitefish is primarily Atlantic cod or haddock. Pollock is a substitute whitefish, but the British report they prefer Atlantic cod³⁸ likely due to traditional consumption patterns from North Sea harvests. With climate change and overfishing pressure on traditional Atlantic cod, alternative sources of whitefish may increase by necessity.³⁹

The UK is a major retail market for Alaska-origin canned salmon. Although the UK produces farmed Atlantic salmon, it is not typically canned. The UK imported over \$46 million worth of canned Alaska salmon in 2020, making it the second largest market for direct export of Alaska canned salmon after Canada. An older, yet loyal, demographic of UK consumer prefers canned salmon although there is some concern that this consumer base is declining due to aging. Some canned salmon retailers are seeing demand by a younger demographic for individual canned portions for salmon (e.g., 80 gram can size), as is available for tuna. Regardless of the canned or pouched product form or can size, shelf-stable protein saw a jump in sales in UK retailers during pandemic lockdowns in 2020 and 2021 as consumers stocked their pantry shelves.

Industry sources indicate that UK consumers value the health benefits of fish and the convenience of processed products. UK seafood retailers and caterers also value a sustainability certification for seafood, with the Marine Stewardship Council certification and label seen as the main indication of a sustainable product.

³⁴ Reuters. December 2021. [Brexit: Why is there a row over fishing rights?](#)

³⁵ Seafish. November 2020. [English Aquaculture Strategy](#).

³⁶ USDA, Foreign Agricultural Service. March 2021. [United Kingdom - Fish and Seafood Market Update 2021](#).

³⁷ FAO. 2020. [The State of World Fisheries and Aquaculture 2020](#). Pg. 65.

³⁸ Young's Seafood. April 2015. [Survey by Young's Seafood Reveals the Nation's Favourite Way to Eat Fish and Chips](#).

³⁹ Time. December 2016. [How Climate Change Is Threatening British Fish and Chips](#).

UK Seafood Imports and Exports

The UK imports much more seafood than it exports and has a seafood trade deficit of about \$2.4B. In 2019, the UK imported 854,300 tons of fish products worth \$5B, with five species comprising the majority of UK fish imports: cod, tuna, salmon, prawns, and haddock.⁴⁰

Imported whitefish is primarily Atlantic cod and haddock from the UK's northern neighbors Iceland, Faroe Islands, and Norway. Whitefish also arrives in the UK through triangular trade, originating in Alaska and Russia, reprocessed in China, Germany, Vietnam, Netherlands, and Poland, and then re-exported to the UK. Some of the Pacific cod, flatfish (sole), and salmon that the UK imports originates in Alaska but flows first through reprocessing countries. Those Alaska species and products are noted with an asterisk (*) in the table below.

Table 8. Top UK Seafood Imports, by Partner Country, 2016-2020 Annual Average

Country	Value (\$million)	Volume (MT)	Main Product Types
Iceland	\$374	56,629	Frozen cod fillets, fresh cod fillets, shrimp
China	\$275	63,175	Frozen cod fillets*, frozen pollock fillets*, frozen salmon fillets*
Germany	\$274	53,154	Breaded fish products*, frozen cod fillets, smoked salmon*
Faroe Islands	\$269	36,371	Fresh salmon, fresh haddock, other fresh whitefish
Sweden	\$265	39,223	Fresh Atlantic salmon, smoked Pacific salmon, frozen salmon fillets
Denmark	\$256	43,685	Shrimp, cooked/prepared mackerel
Vietnam	\$256	35,094	Shrimp, frozen pangasius fillets, frozen cod fillets*
Norway	\$158	33,745	H&G haddock, H&G cod, frozen cod fillets
Netherlands	\$153	25,609	Fresh European sea bass fillets, frozen flatfish fillets*, shrimp
India	\$142	17,644	Shrimp, frozen squid
Canada	\$115	10,425	Shrimp, live lobsters, canned salmon
Poland	\$107	18,865	Breaded fish products*, frozen cod fillets, smoked Pacific salmon*
Spain	\$99	18,187	Canned tuna, frozen octopus, shrimp
Ecuador	\$98	19,142	Canned tuna, shrimp
United States	\$98	14,001	Canned salmon*, frozen salmon fillets*, frozen scallops
All others	\$1,175	203,761	Canned tuna, shrimp, frozen cod fillets

⁴⁰ USDA, Foreign Agricultural Service. March 2021. [United Kingdom - Fish and Seafood Market Update 2021](#). Pg. 8

All UK seafood imports	\$4,115	484,951	Canned tuna, fresh salmon fillets, frozen cod fillets
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Source: Trade Data Monitor.

*products may partly originate from Alaska

Note: Columns may not sum due to rounding.

Alaska's direct exports as well as trade with the UK through intermediate countries is described in more detail below.

Direct Exports from Alaska to United Kingdom

Canned salmon is the top seafood product by value and volume directly exported to the UK from Alaska clocking in at \$46.2M in 2020. Primarily pink and sockeye salmon, and to a lesser extent keta salmon, are canned in Alaska, labeled in Washington State, and shipped to domestic and international markets. It is a shelf-stable protein that saw a resurgence of sales during the COVID-19 pandemic.

Frozen Alaska sockeye salmon fillets sold in the UK are first processed into fillets in Alaska, shipped as bulk packed frozen fillets direct to the UK, sometimes repackaged in the UK, and sold as refreshed fillets at retail counters or frozen multi-packs to catering services. H&G frozen sockeye and coho salmon is exported in smaller amounts directly to the UK from the U.S., and it is processed a second time into portions or smoked in the UK.

Fresh salmon are not directly exported to the UK from Alaska because the distance, time, and cost are too great to compete with fresh farmed salmon originating in nearby Scotland, Norway, and Iceland.

Table 9. Alaska Seafood Direct Exports to the UK, 2016-2020 Average

	Value (\$M)	Volume (MT)
Canned sockeye salmon	\$17.0	2,376
Canned salmon NSPF*	\$13.3	2,671
Frozen salmon fillet	\$13.0	1,735
Canned pink salmon	\$9.0	1,920
Frozen pollock fillet	\$4.5	1,699
Frozen pollock mince	\$3.0	1,376
Frozen sockeye salmon**	\$1.2	156
Cured salmon	\$1.0	121
Frozen coho salmon**	\$0.7	156
All other products	\$5.5	1,278
Total direct AK seafood exports to UK	\$68.4	13,487

Source: NMFS, compiled by McKinley Research Group.

*NSPF" = not specifically provided for. Based on price, most of this product is likely pink salmon. This category combines HS codes for canned salmon in oil and without oil.

**Most of this frozen salmon product is headed and gutted.

Indirect Exports to the UK

FROM ALASKA THROUGH EUROPE TO THE UK

The EU seafood reprocessing sector requires raw imported seafood to work at full capacity.⁴¹ Salmon and pollock exported from Alaska to the EU are, in general, not in final consumer product form. These frozen, minimally processed seafood materials are exported directly from Alaska to reprocessing plants in port cities in Germany and Poland. To encourage this, the EU applies reduced or zero autonomous tariff quotas to certain unfinished seafood products to make the EU import market more competitive globally as a reprocessing center.

Shipping fillets or H&G product rather than whole, round reduces the weight, volume and therefore cost of shipments to the EU. Although some fish byproducts are processed into animal feed and fish oil in the EU, other fish waste is discarded under strict EU regulations. It is easiest and cheapest for European buyers and processors to minimize the byproduct that they receive with imported seafood.

The main EU port cities that receive container ships with seafood shipments are Rotterdam, Netherlands; Hamburg, Germany; and Antwerp, Belgium. These port cities are on the North Sea and serve as transportation hubs between sea and land product movement. Bremerhaven, Germany; Gdansk, Poland; and Le Havre, France also receives shipped Alaska salmon and pollock and reprocessing takes place in or near those cities. Seafood products are transported by truck or train within the EU to reprocessing locations, typically in coastal locations nearby shipping ports.

Some ports, such as Rotterdam, Netherlands and Le Havre, France have free-trade zones – areas in the port vicinity where product can be handled and re-exported without going through customs. Bonded warehouses are used in a similar manner to free-trade zones. From those ports with free-trade zones, seafood products can be moved or distributed by truck into the UK where customs duties are then applied.

Trucking seafood from North Sea ports or reprocessing plants in the EU to the UK is common. Trucks (lorries) may make the Calais, France to Dover, UK ferry crossing or may be driven through the France-UK Eurotunnel. In recent years, a growing shortage of truck (lorry) drivers has pinched trucking capacity and Brexit has exacerbated the problem by pushing foreign truckers out of the UK.⁴²

⁴¹ European Commission's Scientific, Technical and Economic Committee for Fisheries. 2019. [The EU Fish Processing Sector: Economic Report](#). Pg. 31

⁴² BBC News. October 2021. [How serious is the shortage of lorry drivers?](#)

FROM ALASKA THROUGH ASIA TO THE UK

Pollock, salmon, sole and sablefish often travel routes from Alaska to the UK through Asia (primarily China).

Typically, H&G frozen fish are shipped from Alaska or Seattle to locations in Asia (China, Thailand) where secondary processing occurs. Secondary or reprocessing usually involves either cutting frozen fish or thawing, filleting, portioning and re-freezing fish. Cooking the fish in Asia-based reprocessing plants is not typical, except for canned and pouched salmon products.

Raw, frozen seafood material is shipped by container ship to receiving ports in Europe, which can take 5 to 11 weeks. Shipments are trucked to nearby EU-based reprocessing facilities and exported to the UK after additional reprocessing and portioning.

Shipments can also go directly from Asia to the UK. The UK has seven major shipping ports⁴³ that receive international freight containers, including those carrying canned salmon and pollock fillet blocks. Third-party distribution companies are used to move product by rail and truck within the UK to commercial warehouses or to UK-based processors for further product alterations. Some products, such as frozen pollock fillets, are portioned and bagged in Asia and are ready for sale into the UK catering market without re-packing.

Although the Alaska-to-Asia-to-Europe trade pathway may seem a long distance for seafood commodities to travel, this trade flow exists because Asia processor labor is high capacity, skilled, and inexpensive. The high level of byproduct utilization in Asia is also a benefit to humanity in that there is less unusable product waste and disposal. As long as shipping and labor remain inexpensive in Asia, it makes economic sense to ship fish in a whole or nearly whole form to Asia.

⁴³ Marine Insight. October 2021. [7 Major Ports in the United Kingdom](#).

Main Alaska Seafood Products Consumed in the UK

Canned Salmon

The top two species of Alaska-origin salmon that are canned and sold into the UK market are sockeye salmon and pink salmon (see table above.)

Pink salmon has a two-year life cycle with different levels of abundance in odd years and even years. Natural cycles of abundance mean that odd years tend to be more productive and therefore more pink salmon are canned in those years. Buyers of canned pink salmon may take more inventory in the odd years and store it to level out the low abundance of pink salmon in even years. If the stockpiled inventory from an odd year is large, a buyer may not buy canned salmon in an even year.



Sockeye salmon, the other major Alaska salmon species going into cans, has a more consistent harvest each year and buyers do not necessarily keep an inventory to deal with natural fluctuations in abundance. Canned salmon has a shelf-life of five years⁴⁴ under typical commercial warehouse storage conditions.⁴⁵

Direct from Alaska

Sockeye and pink salmon are canned in Alaska just after harvest, shipped palletized without labels (called brite-stacked) to Washington State for labeling, and moved by international container ships to the UK. Ocean shipping of large volumes of canned salmon is a timely and cost-effective way to move product from the west coast of the U.S. to the UK. The pathway from Seattle through the Panama Canal and on to the UK takes about seven weeks and depends on other stops made along the way by the ship. With skyrocketing ocean freight rates during the COVID-19 pandemic, at least one company found two weeks of rail freight across Canada (Seattle to Montreal) combined with two weeks of ocean freight across the Atlantic to be price competitive with ocean freight rates from Seattle to the UK.

Once in the UK, canned Alaska salmon is moved by train or truck to warehouses and held by either a retailer or a distributor to be trucked throughout the country to retail outlets.

⁴⁴ Five-year shelf-life refers to salmon packed in containers with sanitary ends (cans that are opened with a can opener), while salmon packed in containers with easy open ends (cans with pull tabs) have a shelf-life of 3 years.

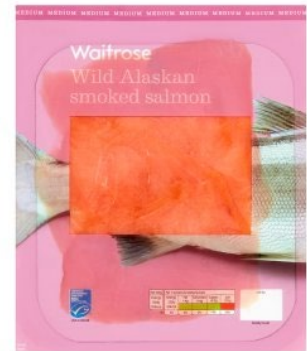
⁴⁵ Seafood Products Association. May 2012. Technical Bulletin CS-09: [Canned Salmon Shelf Life](#).

Indirect through Reprocessing Countries

Pink salmon primarily is headed, gutted, and frozen in Alaska, boxed, and shipped by container or tramper to China or Thailand. At port the container is off-loaded from the vessel and transported by truck to a reprocessing plant. Once there, the salmon is thawed, filleted, canned, labeled, palletized, and loaded into shipping containers. The containers are moved back to port and put onto ocean going shipping vessels on a Europe route. The container vessel may stop in Busan, South Korea or other ports, proceed through the Panama Canal, and ultimately to the EU over a period of about 4 to 5 weeks. Containers with seafood commonly go to the Port of Southampton in southern UK or may go to another European port that has a customs free area (free-trade zone), which allows product to be off-loaded but not go through customs in that off-load country. These pathways from Asia are similar for salmon and pollock products going into the UK market.

Smoked Salmon

A popular specialty product consumed in European countries (Germany, UK, France, Denmark, the Netherlands), smoked and cured/brined salmon is often served during the winter holidays and in restaurants. European consumption and demand for smoked salmon has been on the rise and is expected to continue to grow.⁴⁶ Alaska salmon has heavy competition from Norwegian farmed and smoked salmon in the retail sector.



Poland⁴⁷ and France are major commercial smoked salmon reprocessing centers for the European market. The UK also has a commercial smoked salmon industry, primarily using sockeye, with small amounts of keta and king salmon. EU countries and the UK receive frozen H&G salmon direct from Alaska. After undergoing cutting, brining, smoking, and packaging, smoked salmon product is moved to the UK market by inter-modal transportation (rail, truck, ferry).

EU members exporting to the UK have not faced higher tariffs since Brexit, but other costs have increased due to heavier customs paperwork, inspections, and wait times. Brexit has influenced at least one EU-based smoked salmon producer to shift exports to non-UK markets such as the U.S.⁴⁸

⁴⁶ Global Trade Magazine. February 2020. [Smoked Salmon Market in the EU Reached \\$4.2B and is Set to Expand Further.](#)

⁴⁷ USDA Foreign Agriculture Service. February 2018. 2017 Fish and Seafood Market in Poland.

⁴⁸ The I Newspaper UK. September 2021. [Irish smoked salmon producer says it's now cheaper to send fish to America than the UK due to Brexit costs.](#)

Pollock Products

Alaska pollock, caught in the Bering Sea, Aleutian Islands, and the Gulf of Alaska by mid-water trawl gear, is a whitefish substitute in the end markets for Atlantic cod, haddock and plaice in Northern Europe.

Pollock is typically processed into frozen blocks of fillets or mince on board catcher/processor vessels or at shore-based processors in Alaska. The frozen blocks of fish are transferred to an ocean freight vessel which moves the product by sea either to Europe (Germany, Poland, the Netherlands) or to Asia (China, Thailand, Vietnam) for cutting into fingers or portioning into fillets.



Breading and battering of fish fingers and fillets is not typically done in Asia. Pollock is breaded, battered, or made into ready-to-eat meals nearer the end market. For the EU market breading occurs in the UK, the Netherlands, and Germany. Several billion fish fingers are produced in Bremerhaven, Germany each year, in part from raw whitefish product that is imported from China but originating in Alaska and Russia.⁴⁹

Raw, frozen pollock fillets are portioned and boxed in Asia reprocessing facilities and shipped to the UK for use in the catering sector. This product has heavy competition from Russian pollock in the UK market, as both Russian-origin and Alaska-origin are twice frozen and therefore of similar quality. Price is often the deciding factor for UK-based purchasers of pollock processed in China or other Asia locations.

Sole

Yellowfin sole is caught with trawl gear in the Bering Sea. Sole, together with a mix of other fish, is brought on board the vessel and sorted by species and size. The fish is then headed, gutted, and frozen into blocks. The frozen blocks are sent to the vessel's hold.

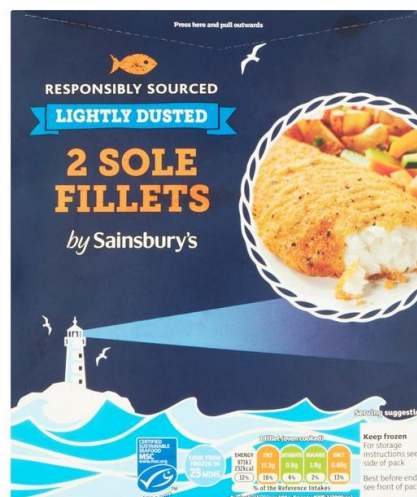
On the vessel's off-load, blocks are stacked on pallets, shrink wrapped and product is moved either by container ship or breakbulk trampers (which carry palletized cargo) that are headed to China.

⁴⁹ Bremeninvest. August 2018. [*The capital of fish fingers: Bremerhaven exports fish fingers around the world.*](#)

Within China, the blocks are thawed and processed into fillets per the buyer's specifications, re-frozen, and shipped by container ship to an EU port. Shipping from China to Europe took approximately 5 weeks prior to the COVID-19 pandemic but is now approximately 11 weeks. This typically does not impact the quality of the seafood, as the shelf-life of most frozen seafood is 18 months after harvest.

The freight vessel delivers the sole as cargo to the free-trade zone of an EU port (typically in Rotterdam, Netherlands) or UK ports. The destination port depends on the shipping line used. Travel time for trucks (lorries) between Rotterdam, Netherlands and the UK is about 3 to 4 hours driving on the Eurotunnel or longer using a ferry.

Yellowfin sole is sold as refreshed product at retail counters, used in individual or mass-catered meat pies, or as frozen breaded/battered/floured pieces or fillets for retail, catering and restaurant sectors.



Other Alaska Seafood Products Consumed in the UK

Many of the Alaska seafood products that interviews indicate are popular in the UK are not exported directly from the United States or are exported on an inconsistent basis. The table below shows export volume for some of these products.

Interviews indicate the UK is a significant final consumer of yellowfin sole, but very little sole (or any other flatfish) has traveled directly from the U.S. to the UK in the last five years. Most Alaska flatfish undergoes reprocessing in China before it travels to the UK market.

Similarly, breaded fish stick products made from Alaska whitefish are popular in the UK, but direct imports of these products from the U.S. are low. Alaska pollock mince or fillets imported through Germany or the Netherlands undergoes the final reprocessing step of breading or battering in the United Kingdom.

Frozen sablefish was once a specialty product category among exports to the UK, worth just under \$2 million in 2014, but sablefish export volumes to the UK have dropped to near zero in the last three years. Direct pollock surimi exports to the UK have also petered out over the past three years.

Table 10. UK Imports of Products with Low Direct Export Volumes (mt), 2016-2020

	2016	2017	2018	2019	2020
Fish sticks	217	16	-	60	-
Frozen cod*	218	-	14	23	94
Pollock surimi	133	-	-	-	-
Frozen sablefish	58	97	4	0.5	-
All flatfish products**	11	-	18	63	0.2

Source: NMFS, compiled by McKinley Research Group.

*Historic exports include cod fillets, but recent direct cod exports are mainly H&G.

**Includes halibut, rock sole, and "not specifically provided for" frozen flatfish.

Re-export of Alaska Products

Although the UK exports salmon and whitefish, it is surmised that Alaska salmon and whitefish are not re-exported from the UK to other markets after a secondary or tertiary processing within the UK.

Exports of salmon from the UK to global markets are mostly Atlantic salmon from farms in Norway, Scotland and elsewhere. UK exports of whitefish are Atlantic cod and haddock harvested by UK-flagged vessels and landed in the UK. Processing capacity in the UK is primarily used to process domestically harvested or farmed fish for export to the EU. Between 70% and 80% of seafood exports from the UK go to the EU.

The UK imports a small amount of H&G salmon direct from Alaska, which may be smoked in the UK and possibly exported to other EU markets or to the U.S., but is more likely consumed domestically.

Alaska pollock fillets are processed into breaded and battered product in the UK but are likely consumed in the UK and not re-exported.

Evolving UK Seafood Supply Chain

Brexit

Moving Seafood Across Borders

Prior to Brexit, over 70% of UK seafood exports went to EU countries.⁵⁰ Post Brexit, the UK negotiated a trade agreement with the EU allowing the continuation of that level of seafood exports to the EU from the UK. However, seafood exported from the UK to EU countries face

⁵⁰ Undercurrent News. April 2019. [Trade Insights: More than 70% of UK seafood exports go to EU.](#)

additional checks and delays at the border for health certificates, catch certificates, customs forms, and notifications.

Although Northern Ireland is part of the UK, the UK has suspended some Brexit conditions for Northern Ireland (called the Northern Ireland Protocol) to maintain trade parity between Republic of Ireland and Northern Ireland, which share a land border. The Northern Ireland Protocol requires Northern Ireland to maintain EU product standards and customs checks on goods passing from the rest of the UK into Northern Ireland. In effect, this has moved the UK border, so that Northern Ireland does not have a hard or security-laden border with the Republic of Ireland.

The Northern Ireland Protocol remains the subject of trade and security talks and political negotiations between the UK and EU. The negative implications for seafood products are real. For at least one company, it is difficult to move imported canned salmon and tuna from an Isle of Great Britain distribution base to Northern Ireland or to the Republic of Ireland.⁵¹ Brexit has forced this salmon importer to find and use new shipping routes directly to the Republic of Ireland.

Implications of Brexit on U.S. Exporters

U.S. exporters must now manage the UK and EU as separate trade partners. In general, the UK and EU regulatory frameworks remain aligned, but the likelihood that they will diverge in the future creates uncertainty for businesses.⁵²

With the separation of the UK from the EU, instances where seafood product (historically) entered EU customs prior to entering the UK are likely to decrease or become non-existent, while direct export to UK or through a customs free transit zone will likely be maintained or increase.

Brexit has pushed UK harvesters to shift their landings to EU ports due to easier transportation and customs checks at EU borders. This decrease in domestic landings has diminished UK seafood processing⁵³ volumes, which could be an opportunity for greater reprocessing of Alaska seafood in the UK going forward.

Addressing IUU in Imports

One regulatory area where the UK wishes to remain in alignment with the EU is regarding illegal, unregulated and unreported (IUU) fishing. The two sides have committed to not lowering the standards on this or other labor and environmental issues. The implication for U.S. seafood is

⁵¹ Undercurrent News. September 2021. [John West averts Northern Ireland post-Brexit supply headache.](#)

⁵² Congressional Research Service. January 2021. [In Focus: Brexit and Outlook for a U.S.-UK Free Trade Agreement.](#)

⁵³ Reuters. January 2021. [Britain's largest fishing port sees 18% fall in catch after Brexit.](#)

that records requirements and country attestation will remain in place for UK customs for seafood coming from countries with domestic IUU fishing activity, such as Thailand, Vietnam, and Indonesia.

However, Brexit may eventually change how the UK addresses IUU. The EU currently has a process⁵⁴ for working with foreign governments to address IUU fishing. It remains a question whether the UK will engage with foreign governments regarding IUU in the same way. Intelligence sharing between EU and UK about IUU is not anticipated.⁵⁵

For now, the UK IUU regulations remain in place and those regulations still mirror the EU's. This is intentional to allow for regulatory parity, as trade is eased when standards and requirements are the same for both trade partners. But without inter-governmental cooperation between the UK and EU, their IUU policies will likely diverge over time. While this should not have an impact on seafood exported directly from the U.S. to the UK, it may lead to changing government documentation requirements for other foreign exporters of seafood to the UK.

Free Trade Agreements

Brexit has provided the UK with the opportunity to negotiate new and preferential trade agreements with global trading partners. The UK has negotiated 60 bilateral trade agreements since the inception of Brexit. In addition, the UK-EU agreement specifies that no tariffs will be applied to EU and UK origin seafood, which helps the UK maintain its top seafood export market. The U.S. and UK have strong incentives to negotiate a free trade agreement: two-way trade was worth \$269 billion in 2020 and high levels of foreign direct investment is reciprocal.⁵⁶

U.S.-UK mutual recognition agreements (MRAs) have been established for several commodities and services, including telecommunication equipment, pharmaceutical procedures, insurance, marine equipment, spirits, and wine.⁵⁷ Seafood is not among the goods that have a negotiated MRA.

The U.S. and UK launched formal bilateral free trade agreement negotiations in May 2020, with several rounds of talks occurring in 2020 prior to the U.S. 2020 Presidential election and change in administration. The Biden administration did not pick up where the Trump administration left off with the U.S.-UK FTA and allowed the Trade Promotion Authority provision to expire on July

⁵⁴ In 2010, the EU IUU regulations went into effect and the UK, as a then EU member state, also adopted regulations to be in compliance with the EU. The EU requires export country government attestation of harvest legality and chain of custody continuity. If IUU fishing activity is found, the EU issues a warning of a trade suspension (the so-called yellow card/red card system). The EU government then works with the foreign trade partner government to address the IUU fishing problems internally and over time.

⁵⁵ IUU Watch. Feb 2017. [Brexit and IUU Fishing](#).

⁵⁶ Office of the US Trade Representative. May 2020. [Joint Statement of USTR Robert Lighthizer and UK Secretary of State for International Trade Elizabeth Truss](#).

⁵⁷ Office of the US Trade Representative. [US-UK Trade Agreement Negotiations](#).

1, 2021. This lapse in Congressionally approved negotiating authority indicates that the U.S.-UK Free Trade Agreement is low on the Biden trade policy agenda.⁵⁸

If successfully negotiated in the future, a U.S.-UK FTA would set the parameters, including commodity tariffs, that each country applies to the other's markets. Negotiated parameters for seafood are likely be more liberal than those established by the World Trade Organization. Without an FTA, the World Trade Organization's terms are the default and would impose up to a 25% tariff on processed fish.

⁵⁸ Bloomberg News. June 2021. [Biden's Fast-Track Trade Authority Is Set to Expire This Week.](#)

United States Case Study

The United States is a top market for many Alaskan fisheries products, including halibut, salmon fillets, crab legs, canned and smoked salmon, and ready-to-cook convenience foods such as fish sticks, fish burgers, and breaded fish fillets.

Certain high-value and other Alaska seafood items destined for the U.S. market move directly from Alaska to contiguous U.S. markets via boat, truck, or plane.

U.S. SEAFOOD MARKET (2020)

Population: 331 million

GDP per capita: \$65,300

Estimated first wholesale value of Alaska seafood products that stay in the U.S.: \$1.04 billion

Total seafood imports: \$21.4 billion

Other Alaska seafood products consumed in the U.S. are processed in foreign countries, especially China. Global oceangoing transportation of frozen seafood makes it possible to inexpensively transport fish from Alaska to a foreign country, process it there, and transport value-added seafood back into the U.S. Conditions that support global seafood supply chains involve healthy bilateral relationships, inexpensive fuel and foreign labor, and consumer demand for inexpensive seafood products. The U.S. bilateral trade relationship with China has deteriorated in recent years, though the Chinese reprocessing sector still plays a major (if declining) role in processing of Alaska seafood.

U.S. Seafood Consumption

The U.S. is a wealthy nation with a large middle-class population. Consumers are increasingly demanding foods that fit Alaska seafood's profile: healthy, sustainable, and domestically produced.

Knowledge about how to cook seafood has historically been a barrier to Americans buying it at retail. This has worked to the advantage of some Alaska species such as pollock, which is used in ready-to-eat forms including fish sandwiches, fish sticks, California rolls, and surimi seafood salads. Changes in consumer shopping and cooking patterns that occurred during pandemic-related foodservice closures appear to have increased familiarity with other seafood products as well.

U.S. per-capita seafood consumption is relatively low compared to seafood-loving nations, at 19 pounds per person in 2020. Over 75% of the seafood consumed in the United States is from ten seafood species categories. U.S. consumers have a taste for imported seafood, particularly

shrimp, tuna, and farmed salmon, although Alaska pollock, cod, and crab are among the top ten seafoods consumed in the U.S. in 2020.

Table 11. Top Ten Seafood Products Consumed in U.S., 2020

Rank	Product Category	Per Capita Consumption (lbs)	Main Sources
1	Shrimp	5.0	India, Vietnam, Indonesia, Ecuador, Mexico
2	Salmon	2.8	Chile, Canada, U.S., Norway
3	Canned Tuna	2.6	Thailand, Indonesia, Ecuador, Vietnam
4	Tilapia	1.1	China, Taiwan
5	Alaska Pollock	0.9	U.S., Russia
6	Cod	0.6	Iceland, U.S.
7	Crab	0.5	Canada, Russia, Indonesia, U.S.
8	Catfish	0.5	Vietnam, China, South Korea
9	Pangasius	0.4	Vietnam
10	Scallops	0.2	Mexico, Vietnam, China, Chile

Source: National Fisheries Institute; NMFS.

Direct to Domestic Markets

Alaska seafood is an iconic brand in the American diet. Yet a lack of public data collection – as opposed to the export data available for foreign markets – challenges visibility into U.S. market volumes and other trends.

Some insights can be gleaned by comparing production volumes in Alaska and subtracting exports and assuming that remaining volume is consumed domestically.⁵⁹ Table 12 below shows this “domestic sales” estimated data by species, ranked by the percentage estimated to go to the domestic market. Dungeness crab tops the list (100%), followed by more than 90% for halibut and nearly 70% for king and snow crab. Salmon fillets mostly stay in the U.S., but about three-fourths of headed and gutted pink and sockeye salmon are exported, and only 12% of salmon roe produced in Alaska goes to the U.S. market. All herring and rock sole, and 97% of flounder are exported.

⁵⁹ There are limitations to this method for estimating domestic consumption of Alaska seafood because of inconsistencies in how seafood products are categorized at the production level versus the export level. In addition, this type of analysis leaves out the large volumes of Alaska seafood that are exported to another country (most commonly China for processing) before being re-imported to the U.S. Alaska seafood products that enter the U.S. indirectly are discussed in the next section.

Table 12. Estimated Alaska Supply to U.S. Market by Species, 2018-2020 Average

Alaska-origin Species	Percent Direct to U.S. Market	Average Production (mt)
Dungeness Crab	100%	2,053
Halibut	92%	6,410
King Crab	68%	2,985
Snow Crab	66%	10,351
Salmon Fillets	58%	18,763
Pacific Cod	41%	98,670
Pink Salmon	27%	70,211
Sockeye Salmon	25%	64,394
Yellowfin Sole	21%	77,754
Alaska Pollock	21%	581,941
Sablefish	17%	7,694
Coho Salmon	17%	6,845
Atka Mackerel	14%	37,393
Salmon Roe	12%	9,731
Keta Salmon	6%	32,893
Pacific Ocean Perch	6%	29,719
Flounder	3%	16,709
Herring	0%	12,912
Rock Sole	0%	13,774

Source: ADF&G; NMFS; McKinley Research Group estimates.

Imported Seafood

The U.S. is by far the largest importer of seafood products in the world by value and is second to China by volume. Between 2017 and 2021, the U.S. imported an average of \$22.9 billion in seafood products annually.

Between 70-85% of the seafood consumed in the U.S. is imported; however, this includes significant amounts of Alaska seafood imported from reprocessing countries such as China.⁶⁰ Incorporating nuances such as this, University of Washington researchers estimated that 62-65% of seafood imported by the U.S. was foreign harvested, while 35-38% originated in the U.S.⁶¹

Many of the main seafood products imported to the U.S. from China are partly of Alaska origin, including frozen salmon, pollock, and Pacific cod fillets.

⁶⁰ NOAA Fisheries. No date. [The Global Picture: Global Wild Fisheries](#).

⁶¹ University of Washington. No date. [How much U.S. Seafood is Imported?](#) Sustainable Fisheries web blog.

Before the U.S.-China trade war began in 2018, an estimated 15% of the volume of Alaska seafood exported to China returned to the U.S. market.⁶² Since the trade war began, the volume of Alaska seafood exported to China has decreased, but the percentage that returns to the U.S. has likely increased as the Chinese domestic market has become increasingly closed to U.S. products.

To a lesser extent than China, Southeast Asian nations are centers for reprocessing as well – as discussed in the Southeast Asia case study. Thailand is an important producer of canned Alaska pink salmon and canned pet food products.

The table below shows the origin of U.S. seafood imports, including reprocessed seafood that originated in the U.S.

Table 13. U.S. Seafood Imports by Partner Country, 2018-2021 Annual Average

	Import Value (\$ billions)	Import Volume (mt)	Main Product Types Imported
Canada	\$3.8	313,100	Atlantic salmon, snow crab, lobster, oysters
India	\$2.8	324,322	Shrimp
Chile	\$2.4	261,765	Atlantic salmon
Indonesia	\$2.1	233,084	Shrimp, crab, canned tuna
China*	\$1.8	416,707	Frozen fillets: cod, tilapia, pollock, and salmon
Vietnam*	\$1.5	239,729	Frozen pangasius fillets, shrimp, tuna
Thailand*	\$1.3	212,192	Canned tuna, shrimp
Ecuador	\$1.2	174,305	Shrimp, canned tuna
Norway	\$1.0	100,224	Salmon and trout
Russia	\$0.9	43,514	King crab and snow crab
Other Countries	\$5.5	714,818	Shrimp, canned tuna, tilapia, pangasius
Total Imports	\$24.2	3,033,759	Shrimp, salmon, canned tuna, tilapia

Source: NMFS, compiled by McKinley Research Group.

*Key reprocessing countries for Alaska seafood

Note: Columns may not sum due to rounding.

Key Transportation Corridors

Seafood leaves Alaska primarily by boat, but also by airplane and truck depending on the product form. After Alaska seafood reaches a location in the contiguous United States, seafood products are transported by truck, train, and airplane to reach reprocessing facilities and major markets throughout the country.

⁶² This is a conservative estimate from a 2018 McKinley Research Group analysis conducted on behalf of ASMI.

Ocean Transportation

Most Alaska seafood enters the U.S. market as a frozen product that is shipped from Alaska by sea. Under the Jones Act, oceangoing freight traveling between U.S. ports (including between Alaska and the contiguous United States) must travel on U.S.-built and U.S.-flagged ships. See the Jones Act policy section below for more information about how this 1936 law affects Alaska seafood transportation.

The fleet of Jones Act-compliant ships that transport Alaska seafood between Alaska and the contiguous states includes barges, container ships, and breakbulk carriers. These ships typically move seafood between Alaska ports and ports in the Puget Sound region, specifically the Port of Seattle and Port of Tacoma.

From these ports, Alaska seafood bound for the U.S. market is transported by truck or rail to secondary processors or distribution warehouses. Rail is the least expensive and slowest method for large-volume loads that travel long distances, such as to the Midwest or Eastern U.S. Major railroad carriers used by the seafood industry include BNSF and Union Pacific. Railroads typically transport frozen seafood in intermodal containers (stacked two high) loaded onto a rail chassis.

Trucks are a primary mode of transportation for seafood within the contiguous U.S. Most frozen seafood arriving from Alaska to a mainland U.S. port will be unloaded from the shipping container to a cold storage warehouse, remaining on pallets or in totes. Product is typically loaded from cold storage warehouse into truck highway trailers (53-foot-long) to be driven to the buyer destination. A highway trailer (with chassis and wheels) can also be loaded onto a railcar, moved to a major metropolitan area by railway, and moved to a cold-storage or distribution center by truck. Interviews indicate shipments of value-added products that were produced in Alaska (such as fillets, canned salmon, or portions), are more likely to be trucked by road to distribution centers than shipped by rail.

Occurring less often, Alaska seafood will remain in the original refrigerated container and be trucked or moved by rail to the next U.S. destination. Standard 40-foot-long refrigerated containers are used for ocean shipping, and both trucks and railcars can accommodate this size of container. Irregular sized containers require adjustable or specialized truck chassis.

Air & Truck Transportation

Fresh products represent an estimated 3.5% of Alaska seafood production, but fresh seafood is a high-value market. Fresh seafood is a key seasonal item in many supermarkets and restaurants, drawing in shoppers and diners with displays and special offers.

Fresh seafood is moved out of Alaska by airplane and truck. Industry interviews indicate that Cordova, Yakutat, Sitka, Juneau, and Ketchikan have steady seafood air freight during peak production periods.

To simplify rate structures, Alaska Airlines air freight rates are the same for all seafood products and all shipments within a given zone (see map at right). Air cargo companies sometimes make exceptions to blanket rates to boost the market for certain products, locations, or producers or to develop new air cargo markets.

Within Alaska, trucks are used primarily to move high-value fresh seafood to Canadian or U.S. markets. Only a handful of Alaska port cities are linked to the North American road system. Anchorage serves as both a trucking and air cargo hub in Southcentral Alaska. From Anchorage, fresh seafood is trucked through

Figure 12. Alaska Airlines Cargo Zone Map



Source: [Alaska Airlines, Air Cargo](https://www.alaskaair.com/cargo).

Glenallen to Tok before entering Canada's Yukon Territory. The main route through the Yukon Territory and British Columbia is the 1,500-mile Alaska Highway (Alcan Highway), which requires 2 to 3 days of driving to reach a U.S. west coast market and longer to reach a central or east coast market.

Interviews indicate that most fresh seafood is moved by air, while trucking is a small fraction. Trucking out of Alaska (to and through Canada) was reduced during the COVID-19 pandemic due to border crossing requirements for truck drivers.

Domestic Secondary Processing of Alaska Fish

Secondary processing takes place in facilities around the U.S. to transform Alaska seafood into the fillets, portions, ready-to-eat meals, and other products that consumers encounter in stores, restaurants, or e-commerce shopping pages.

For seafood cases and restaurants, processing is typically limited to filleting and deboning. When previously frozen whole/headed and gutted seafood is filleted and deboned, it is known as refreshed product. This type of processing is typically done by wholesale distributors or in-house at retail and restaurant facilities. Unlike fillets imported from China, twice-frozen fillets are rarely produced in the U.S.

Other frozen Alaska seafood products undergo value-added processing in the U.S., such as portioning, brining, smoking, or breading. After value-added processing, if the product was partly or fully thawed, it is refrozen for transportation.

Common types of U.S. secondary processing facilities and the activities they support include:

SECONDARY SEAFOOD PLANT PROCESSING

- Process pollock blocks into fish sticks, fish nuggets, sandwich patties, and other value-added retail or foodservice products
- Make surimi products out of surimi paste
- Smoke and cure fish (primarily salmon)
- Make salmon burgers, seasoned salmon portions, and other value-added products

SPECIALTY DISTRIBUTOR PROCESSING

- Thaw and cut frozen H&G fish (salmon, cod, and flatfish) for refresh market, removing skin and pin bones
- Crack, split, score, or shuck cooked crab sections

RETAIL AND FOODSERVICE PROCESSING

- Cut and merchandize frozen, refreshed, or fresh fish
- Marinate and cook

Key U.S. Seafood Processing Hubs

Secondary processing at the distribution and retail level takes place in numerous locations across the country. Some degree of Alaska seafood processing likely occurs in all 50 states.

Larger domestic secondary processing plants are somewhat clustered in the Pacific Northwest and New England. The table below shows the number of people employed in seafood product preparation and packaging among states that employ the largest numbers of seafood processors in 2021.

Table 14. Seafood Processing Employment and Payroll, by State, 2021

	Annual Average Number of Workers	Number of Businesses	Total Annual Payroll (\$millions)	Average Employees/Business
Alaska	8,302	156	\$484	53
Washington	4,978	82	\$384	61
Massachusetts	3,294	48	\$225	69
Mississippi	1,966	23	\$67	85
Florida	1,721	36	\$86	48
Texas	1,556	47	\$61	33
Louisiana	1,478	65	\$54	23
California	1,352	46	\$101	29
Oregon	1,084	35	\$49	31
Virginia	1,072	33	\$52	32
Other	7,071	297	\$358	24
Total U.S.	32,802	835	\$1,868	39

Source: U.S. Bureau of Labor Statistics, Quarterly Census.

Note: Statistics are for NAICS code 3117.

Alaska has by far the largest seafood processing workforce in the U.S., followed by Washington and Massachusetts.

The fishing economies of Washington and Alaska have historically been linked through crew, vessel homeports, maintenance and drydock services, seafood shipping, and value-added processing. Although the volume of domestic value-added seafood processing is not tracked in relation to the harvester state, industry experts interviewed noted Washington is a key state supporting Alaska seafood trade including labeling, domestic and international shipping, cold storage, and specialty seafood distribution.

Massachusetts historically had a substantial cod fishery with associated infrastructure of processing plants and skilled workforce. That infrastructure now also processes raw seafood material from other sources.

Mississippi and several other Gulf Coast states also employ large numbers of seafood processing workers. Much of the seafood processing in this region is associated with farmed catfish and Gulf of Mexico wild fisheries.

States with fewer seafood processing employees tend to also have a lower ratio of seafood processing employees to seafood processing businesses, indicating an absence of large-scale processing plants in these states. Georgia (not seen in the table above) is an outlier with fewer than 700 seafood processing employees but an average of 67 workers per business. The presence of the Trident plant in Carrollton, Georgia likely skews the average. This plant employs 175 people, according to the company.

Distributors

Broadline Distributors

Broadline distributors primarily supply foodservice operations - hotels, restaurants, and institutions - with all food and operational items. A restaurant operator can order food and non-food items such as cutlery, cleaning supplies, and take-out containers from a broadline distributor. Some broadline distributors focus on serving chain restaurants while others focus on full-service and independent restaurants, and some serve both.

Major domestic broadline distributors include the following:

- **Sysco Foods** is the leading global foodservice supplier with 343 distribution facilities in the Americas and Europe and \$51 billion in annual sales. In 2021, Sysco reported that seafood made up 5% of the company's sales. Sysco's Portico brand supplies fresh, frozen, and prepared seafood products. The brand is committed to sourcing most seafood from Marine Stewardship Council certified fisheries.
- **U.S. Foods** has 69 distribution facilities across the U.S., a fleet of about 6,500 trucks, and 28,000 employees. The firm's in-house seafood brand Harbor Banks is 100% sourced from suppliers that meet the company's sustainability goals and packaging standards.
- **Performance Food Group**, headquartered in Virginia, has 107 distribution locations across the U.S. and 23,000 employees. Performance offers products to foodservice, vending, and retail markets. The company has three in-house seafood brands: Bay Winds (top tier), Empire's Treasure (includes breaded and battered items), and World Dock (twice-frozen products).
- **Gordon Food Service**, headquartered in Michigan, is the largest privately held foodservice distributor in North America, employing 20,000 people in Canada and U.S. Gordon has annual sales of over \$16 billion and 16 U.S. distribution centers in eastern, southern, and midwest states.

Specialty Distributors

Specialty seafood distributors supply both retail and foodservice sectors in the U.S. Some specialty distributors focus solely on foodservice or on retail, while others have a diversified portfolio of customers. Restaurants that source most items from a broadline distributor may order certain items, in particular seafood, dairy, or produce, from a specialty distributor.

Specialty distributors of seafood typically focus only on seafood, although that seafood comes from all over the world in many varieties and forms, including from Alaska. A few specialty distributors offer seafood and other types of animal protein, such as red meat or chicken. Most specialty seafood distributors are family-owned businesses and are not publicly traded companies.

Examples of specialty distributors working with Alaska seafood include:

- **Trident Seafoods**, based in Washington, is a vertically integrated company: harvesting in Alaska, processing in Alaska and elsewhere, and distributing domestically harvested and imported seafood.
- **Pacific Seafood Group**, based in Oregon, is a vertically integrated harvesting, processing and distributing company for both domestically harvested species and imported seafood.
- **Red Chamber Company**, based in California, imports, processes, stores, and distributes seafood throughout the U.S.
- **Inland Seafood** is the largest seafood distributor in southeastern U.S. and has a lobster processing facility in Maine.
- **Pacific American Fish Company** (PAFCO) imports, warehouses, processes, distributes, and develops new products. The company has offices in Los Angeles and Boston.
- **Slade Gorton & Co., Inc.** is based in Boston with a long history in seafood trade. Slade Gorton supplies retailers, foodservice, and distributors and has processing facilities and U.S.-wide storage and transportation.
- **Beaver Street Fisheries**, based in Florida, imports, exports, processes, and distributes frozen seafood and meat to wholesale, retail, and foodservice operators.
- **Nippon Suisan USA**, headquartered in Redmond, Washington, is a group of harvesting, processing and seafood importing companies: Gorton's and F.W. Bryce (in Massachusetts), King & Prince Seafood in Georgia, and Unisea and Glacier Fish Co. in Alaska and Washington state. Unisea operates a processing and cold storage facility in Redmond, Washington specifically for Alaska seafood products.
- **High Liner Foods**, a publicly traded company headquartered in Nova Scotia, Canada, processed and sold \$875 million of value-added frozen seafood in 2021 to retail and foodservice. Alaska is identified as a top sourcing region for High Liner Foods.

Supply Chains of Select Alaska Seafood Products Consumed in the U.S.

Fresh Halibut

Prior to 1995, halibut was a derby fishery where fishermen competed during short open seasons to take as much fish as possible. Halibut fishery management changed from a derby fishery to one managed with Individual Fishing Quotas, which means the fishing season is no longer compressed in the same way. Now that harvesters have a nearly year-long season and can choose when to harvest, there is a steady flow of fresh halibut to the domestic market, especially between March and November. Fresh Pacific halibut is a high-value product served in fine dining restaurants and available at retail.

The typical pathway for fresh halibut begins on the water in Southeast Alaska, Prince William Sound, Kenai Peninsula, the Gulf of Alaska, Aleutian Islands, and the southern Bering Sea. Halibut is caught by longline gear, typically on vessels less than 60 feet in length. Halibut are gutted and packed with ice on board and delivered fresh to a shoreside processing plant.

The main ports for halibut landings are Kodiak, Seward, and Homer, which together usually account for 40-50% of the statewide total. After processing, halibut leaves Alaska primarily in headed and gutted form (60%), followed by fillet (20%), gutted (12%) and other forms. Among these other forms are collars and halibut cheeks, considered delicacies. Once processed, fresh halibut is moved by truck to the nearest Alaska commercial airport. An interviewee noted that large volumes of fresh halibut are landed and moved by commercial air freight out of Yakutat. About half to two-thirds of the halibut caught in Alaska goes into the fresh market and the remainder is frozen.

Upon arrival in a regional hub of the contiguous U.S. – for example, San Francisco, Chicago, or Boston – a distributor will take possession of fresh halibut at an airport cold storage facility. Product is moved by refrigerated truck to a distributor's cold storage and cutting facility where it is cut and packaged into portions specified by the buyer. Buyers are retailers and restaurants.

Pollock Fillet Products

Alaska pollock, caught in the Bering Sea, Aleutian Islands, and the Gulf of Alaska by mid-water trawl gear, is the typical whitefish in fish sticks sold in the frozen food section of most retailers. Pollock is also served in fish fillet sandwiches at quick-service restaurants such as McDonalds.

Pollock is typically processed into frozen blocks of fillets or surimi on board catcher/processor vessels or at shore-based processors in Alaska. Frozen fillet blocks are transferred to an ocean freight vessel that moves the product by sea to domestic secondary processors, to Europe (Germany, Poland, the Netherlands), or to Asia (China, Thailand, Vietnam) for cutting into fish sticks or fillets.

Pollock is generally breaded, battered, or made into ready-to-eat meals at plants close to major end markets. For the U.S. market, breading occurs in disparate locations around the continental U.S. Gorton's Seafood, for instance, produces fish sticks or ready-made meals from pollock at the company's processing plant in Gloucester, Massachusetts. This plant also produces the majority of McDonalds' U.S. Filet-O-Fish sandwich fillets, supplemented by Gorton's smaller processing facility in Redmond, Washington. Trident Seafoods produces a variety of pollock fillet products at the company's Anacortes, Washington and Carrollton, Georgia processing facilities.



The U.S. Department of Agriculture purchased \$120 million in Alaska seafood products in 2019, dominated by pollock fish sticks and canned salmon, for U.S. food assistance and nutrition programs. Food assistance programs supply schools, day cares, disaster victims, food banks, food programs for seniors, and disaster response programs.

Lox-style Smoked Salmon

Lox-style smoked salmon is a high-end food item served as an appetizer or on a breakfast or holiday platter in European countries, the United States, and Russia. In the U.S., lox is often paired with bagels and cream cheese as a brunch item. Alaska salmon has heavy competition from Norwegian farmed and smoked salmon in the retail sector. Many U.S. smokeries are located on the East Coast and use Norwegian, Chilean, and Scottish farmed salmon because farmed salmon can be purchased in small amounts, year-round. With the advent of readily available farmed salmon, large smokeries faded away and smaller companies thrived.

Alaska king, sockeye, and coho salmon are also used in lox production. Salmon from Alaska is usually troll (hook and line) caught, individually gilled, gutted, bled, and iced on board the boat, headed at a shoreside plant, individually blast frozen, glazed with a water-sugar mixture, bagged, and boxed. The industry does not use frozen fillets because twice frozen fish is not adequate to produce quality smoked salmon.

Salmon may undergo an interim step during shipping, usually in Washington State in a cold-storage facility, that includes size grading, re-glazing, and re-packing. Grading of fish may not occur in Alaska due to the fast-paced and high-volume nature of salmon fisheries, therefore grading can occur in at the next node of transportation. Re-glazing and re-packaging can preserve or improve product appearance and prepare it for a month-long shipping journey through the Panama Canal to Europe or the U.S. East Coast.

Major U.S. smoked salmon processors are located in Brooklyn, New York; Wilmington, North Carolina; Pompano Beach and Miami, Florida; and Everett, Washington. One smoker might buy 5-100 containers of salmon and hold it in cold storage near the processing plant and pull out the quantities needed for processing over time. After smoked salmon is produced and packaged, it is frozen and shipped to the final market. Most lox-style smoked salmon is sold pre-sliced in shallow tray packaging at grocery stores.

Canned Salmon

The canned salmon processing industry in Alaska peaked in 1936 with over 160 canneries packing 8 million cases (each case contains 48 one-pound cans) of keta, pink, and sockeye salmon.⁶³ In 2020, only five primary processing companies canned salmon in Alaska.

In 2019-2020, canned salmon constituted 19% of salmon products produced in Alaska by weight. Of the salmon canned in Alaska those years, 79% was pink salmon, 19% was sockeye salmon, and the remainder was made up of mostly keta and coho.

Salmon destined for canning is generally caught by gillnet or purse seine, followed by delivery to a shore-based processing plant. Inside the processing facility, the salmon is headed and gutted, rinsed, filleted (for boneless products), and packed into cans. Cans are sealed, pressure cooked, and cooled before they are shipped without labels to one of two primary labeling and quality control facilities in the Seattle area. From there, canned salmon is shipped to retailers in the U.S. by truck or train and to other countries globally by container ship.

Salmon is also canned outside Alaska, primarily in China and Thailand. Thailand has a massive tuna canning industry with workers and machinery that are also used for canning pink and keta salmon and seafood-based pet food (see Southeast Asia case study for more information). Large boxes of frozen headed and gutted salmon are shipped from Alaska in refrigerated containers to these reprocessing centers, which then export canned goods to retail markets in U.S., United Kingdom, and other countries.

Evolving U.S. Seafood Supply Chain Policy

Jones Act

Established in 1936, the Merchant Marine Act (commonly known as the Jones Act) requires that commercial ships operating between U.S. ports must be U.S. flagged and owned, built in U.S. shipyards, and 75% crewed by U.S. labor. The law was intended to support U.S. shipyards and labor from encroachment by foreign vessels and crew. The Jones Act applies to vessels that move goods between Alaska and other U.S. ports.

Vessels built in the U.S. are understood to cost substantially more than those from other countries, and some say the requirement places U.S. companies at a disadvantage relative to global competitors. The act has been criticized as overly protectionist for the U.S. shipbuilding industry.

⁶³ Alaska State Museum. 2014. *History in a Can*.

Others argue, however, that the act is necessary for national security both because it minimizes access to coastal regions by foreign ships and because it helps the U.S. maintain the shipbuilding capacity needed to ensure the industry can meet military and other essential maritime needs.

Efforts to repeal the Jones Act have been mounted over the years, but the general perception is that the Jones Act will not be changed in the near future.

Foreign-flagged ships may transport goods to or from Alaska from other countries, but Jones Act-compliant vessels must be used to transport goods from Alaska to the contiguous United States. Jones Act compliance distinctly shapes supply chain routes and costs. For example, shipments of frozen fish to the U.S. East Coast must either go overland by truck or rail, or by ship through the Panama Canal. Ocean carriers can move more cargo per gallon of fuel than trucks or rail, but there are few U.S. flagged vessels that can legally transport frozen fish between Alaska and U.S. East Coast cities. Tug and barge operations are typically not intended for this type of transportation, and only nine U.S.-flagged small general cargo ships operate in Alaska, making them unlikely to leave Alaska for long-haul transportation services to the Atlantic Ocean.

Fewer than 100 oceangoing carrier vessels (container ships, bulk carriers, tankers, passenger ships, and other similar vessels) are Jones Act compliant and most of these are bulk carriers not used for seafood or not serving Alaska.⁶⁴ The sole Jones Act compliant container shipping company operating in Alaska is Matson Navigation Company.

In the past, some companies used a Jones Act exemption that allowed products to move between U.S. ports when transportation by Canadian railway is also involved. Some Alaska seafood, particularly pollock, was shipped by vessel from Alaska to the east coast of Canada, moved by train a minimal distance in Canada, and then trucked into the U.S. for additional processing and distribution. This pathway, dubbed the Bayside Program, was challenged by the U.S. Customs and Border Protection agency and the route was found to violate the Jones Act. Pollock that was moved from Alaska to the U.S. East Coast will now use alternate trade routes, such as ocean shipping to the U.S. west coast and transport by truck or rail across the continental U.S.

Seafood Traceability and Blocking Illegal Seafood

Supply chain transparency is difficult to achieve when there are many owners, locations, and transformations of products. Seafood can have a particularly complex supply chain starting in remote oceans, moving between vessels, changing form one or more times, and sometimes passing through multiple countries before reaching its end market. Tariff codes and product names can lump together different species from various harvest regions, and each processing event may change the product name or trade code. Tracking seafood through the global supply

⁶⁴ Congressional Research Service. 2019. *Shipping Under the Jones Act: Legislative and Regulatory Background*.

chain is incredibly difficult. In recent years governments, companies, and non-governmental organizations have made efforts to increase seafood supply chain transparency.

Three governments of major seafood markets have taken regulatory action to prevent the importation of illegal, unreported, and unregulated (IUU) seafood: European Union (EU), United States, and Japan. The EU and U.S. have taken different approaches to IUU policy. In 2010, the EU required attestation from the producing country's government that seafood exported to the EU come from legal harvest events. In 2018, the U.S. federal government began requiring key data elements about harvest events from businesses for certain species of fish. Starting in 2020, Japan began the process of implementing a regulation similar to the U.S. focused on business record keeping for select species. None of these programs have necessarily increased the transparency of seafood for consumers, as the data collected by government are kept confidential. Consumers continue to rely on companies and third-party certifications to verify the legality of seafood products.

U.S. Seafood Import Monitoring Program

To block seafood products originating from IUU fisheries from entering the U.S. market, the U.S. federal government implemented reporting requirements for certain high-risk seafood species or categories in 2018. Thirteen species or species groups are regulated under the Seafood Import Monitoring Program (SIMP); however, most of those species are not Alaska-origin products. Red king crab and Pacific cod are among the regulated species but are subject to reporting only if imported. In June 2022, the Biden Administration directed NOAA to expand SIMP to additional species and species groups.

"After just three years of implementation, SIMP is only now reaching the point of establishing [through audits] what the normal and common import patterns are for the species included in the program."

NMFS [Report to Congress on SIMP](#), 2021

In theory, SIMP should reduce or eliminate any illegally harvested red king crab or Pacific cod from competing in the U.S. marketplace against legally harvested products. In practice, SIMP allows seafood products into U.S. commerce as long as the customs entry filing is complete. Random auditing by NOAA of an entry filing's accuracy and veracity may take place after importation. According to a NOAA status report to Congress on SIMP implementation, 1% of all SIMP imports were audited in Federal Fiscal Year 2020, mostly focused on shrimp and tuna imports. NOAA's Office of Law Enforcement initiated 242 SIMP-related cases and issued civil

penalties in 23 cases.⁶⁵ U.S. Customs and Border Protection also requires correct information using 'reasonable care' on entry filings, and violations could result in penalties for the importer; however, Customs violations were not noted in the status report.

Country of Origin Labeling

Since 2005, USDA Country of Origin Labeling (COOL) laws require retailers to inform customers about the country source of fish and shellfish and the production method (wild-caught or farm-raised).⁶⁶ Fish that is changed in character (USDA calls this 'processed') or combined with other ingredients are exempt from COOL. Fish sticks, surimi, canned salmon, smoked salmon, soups, stews, and ready-to-eat meals are exempt. For example, fish that is caught in Alaska and is cooked, cured, canned, smoked, breaded, battered, or combined with other ingredients in a foreign country are exempt from COOL labeling laws when sold at a U.S. retailer.

Despite these exemptions, many seafood products are subject to COOL requirements. Imported seafood products that are cut and packaged in a foreign country are labeled with the country where the cutting and packaging occurred. If that product was harvested in the U.S., COOL allows for the label to list USA together with the processing country. For example, a frozen, portioned salmon fillet harvested in Alaska and portioned, packaged and frozen in Canada may be labeled "Product of USA, Processed in Canada."



Russia - U.S. Seafood Sanctions

Since 2014, Russia has banned U.S. seafood products from entering the Russian Federation's marketplace. This particularly hurt markets for Alaska salmon roe, which had a strong consumer base in Russia. The U.S. did not retaliate with a ban on Russian-origin seafood products and continued to import over \$900 million worth of crab and \$300 million of other seafood annually directly from Russia.

In 2022, in response to the second Russian invasion of Ukraine, the U.S. administration banned direct seafood imports from Russia. This will impact those processors that imported raw pollock and cod for reprocessing in the U.S., as well as king and snow crab buyers and consumers.

⁶⁵ NMFS. 2021. *Efforts to Prevent Importation of Seafood Harvested through Illegal, Unreported, and Unregulated Fishing and Address Imported Seafood Fraud.*

⁶⁶ Foodservice establishments and fish markets are exempt from COOL.

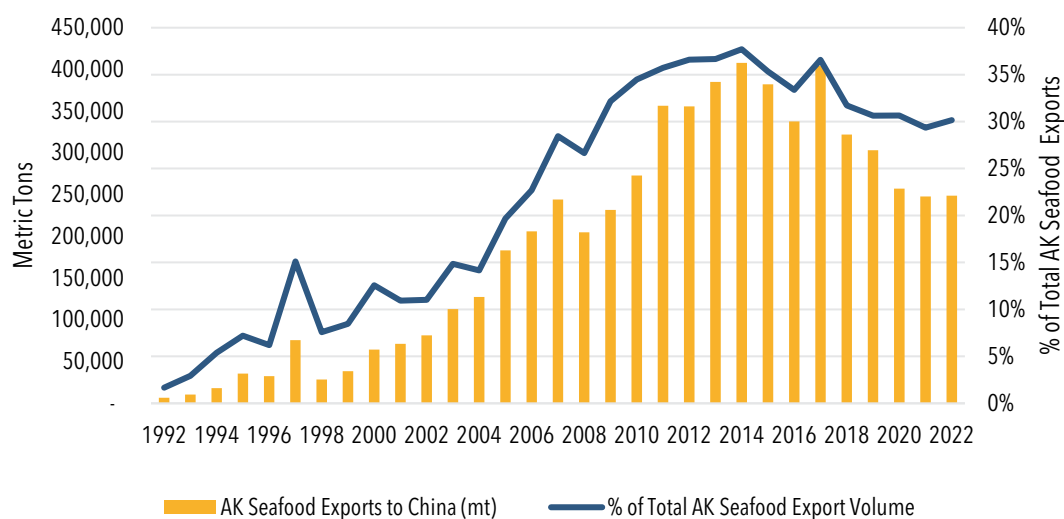
Imports of Russia-origin seafood that is significantly altered in a third country have not yet been blocked by U.S. trade sanctions. U.S. Customs does not currently require country of harvest information for seafood products, other than those species and products regulated by the Seafood Import Monitoring Program. Without data reporting requirements, the harvest area of any imported seafood product is not known by Customs and Border Protection, the primary agency with the power to block imports from entering the country.

China Trade Conflict and COVID-19 Policies

China is a key step in the supply chain for a significant volume of Alaska seafood. This remains the case despite challenges associated with more than four years of trade conflict with China and two years of highly restrictive COVID-19 policies.

In 2021, 29% of Alaska seafood exports by volume went to China, down from a peak of 39% in 2014, but still well above the market share in the 1990s and early 2000s. China was the largest importer of Alaska seafood by volume in 2021 and was second to Japan in imports by value.

Figure 13. Alaska Seafood Exports to China (Metric Tons and Percentage of Total Export Volume), 1992-2022



Source: NMFS, compiled by McKinley Research Group.

China grew rapidly in the early 2000s to become the Alaska seafood industry's top trading partner. Alaska's seafood producers increasingly used fish processing plants concentrated in the northern cities of Dalian and Qingdao to convert frozen H&G fish into fillets and other products.

The U.S.-China trade conflict began in 2018. Chinese tariffs imposed in a series of escalating rounds of retaliatory tariffs with the U.S. led to *ad valorem* rates that currently average 20% above pre-2018 tariff values.

China exempts products from tariffs if the products enter the country for reprocessing (most Alaska products fall into this category); however, some reprocessed Alaska products, such as flatfish fillets, are taxed by U.S. tariffs when they are exported from China to the U.S.

China's zero-COVID policies have added additional challenges for the Alaska seafood supply chain in the form of unpredictable delays and expenses. These policies include mandated inspections of frozen shipments for evidence of the COVID-19 virus (despite lack of evidence that COVID-19 is transmitted via food packaging⁶⁷) and lengthy lockdowns.

⁶⁷ USDA and FDA. 2021. *COVID-19 Update: USDA, FDA Underscore Current Epidemiologic and Scientific Information Indicating No Transmission of COVID-19 Through Food or Food Packaging*.

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