APPENDIX D

MARKET ANALYSIS

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1.0 INTRODUCTION

1.1 Background and Setting

One of the most significant transformations in the Alaska fishing industry in the past hundred years has been the emergence of the target species category known as groundfish. As recent as 1980, domestic harvests of groundfish were less than 6,000 of the total quarter million metric tons domestically harvested, and only 0.2 percent of the total value.[1] In terms of value, groundfish now are the largest segment of fishery harvest from Alaskan waters, representing over $1.3 billion annually in product value. This extraordinary growth in the fishery can be substantially traced to the Fishery Conservation and Management Act of 1976, and fishery allocation measures in the late 1980s and early 1990s that led to the so-called Americanization of the fisheries. Groundfish harvested from Alaskan waters include such economically important species as Alaska pollock, Pacific cod, sablefish, rockfish, and a large variety of flatfishes.

Coinciding with these changes in harvest allocation over the past decade have been changes in the marketplace for groundfish, in terms of tastes and preferences, product forms, the competing environment, other species of fish, and economic conditions in countries of major product demand. Most of the products that are produced from Alaskan groundfish enter into an international market. The raw fish may be processed and reprocessed into different forms and final products.

Despite the tremendous economic role that groundfish play in the seafood sector of the economy of the United States in general and Alaska in particular, there is little public knowledge or understanding of the market for groundfish. What products are produced and who buys them? Who are the competitors in terms of countries providing the same species? What species of groundfish will serve as substitutes for one another, and for what products? What is the role of secondary processing abroad? In the domestic market, what is the role of imports? Do they supplement domestic production, or compete with it?

Without a framework or understanding of the product flows, market structure, and market dynamics, it is difficult – if not impossible – to determine the impacts of factors influencing the demand for groundfish, or decisions affecting the management of the fishery resource.

The two most important groundfish stocks harvested from waters off Alaska in terms of value[2] are Alaska pollock and Pacific cod. Most of these stocks are harvested within the United States' jurisdiction in the Gulf of Alaska, the Bering Sea, and near the Aleutian Islands. A third groundfish of interest, also harvested in the Bering Sea and Aleutians, is Atka mackerel. Under many circumstances, fishery management policies that will affect the prosecution of fisheries for pollock and cod also likely impact Atka mackerel fisheries.

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[1] Draft Programmatic SEIS, p. 3.10-3.

[2] "Value" is defined in terms of "first wholesale price," a useful measure from the National Marine Fisheries Service (NMFS) as "value per unit of the fishery resource following the first level of processing."

1.1.1 Steller Sea Lion

The National Marine Fisheries Service (NMFS) is in the process of preparing an Environmental Impact Statement (EIS) on groundfish, incorporating a Regulatory Impact Review (RIR). A central component of the EIS is the development of protective measures for Steller sea lions and their critical habitat, including "reasonable and prudent alternatives" (RPAs). The western population of Steller sea lion is listed as "endangered" under the federal Endangered Species Act (ESA). Commercial fisheries harvest several fish species, including Alaska (Walleye) pollock, that sea lions rely upon for food, and the relationship of commercial fishing to sea lions is not fully understood.

Determining the economic consequences of actions designed to protect the Steller sea lion requires an understanding of the market for Alaska groundfish. In particular, proposed protective measures will affect the management of fisheries and both the manner and timing in which commercial harvesters catch pollock, Pacific cod, and Atka mackerel. In order to determine and estimate the economic effect on the industry, related communities, and the nation's welfare, it is necessary to understand the relationships among factors affecting the supply and demand for these economically important groundfish.

1.2 Purpose

The purpose of this study is two-fold. First, it is to describe and characterize the markets for Alaska pollock, Pacific cod, and Atka mackerel. The second purpose is to use the market descriptions and models to determine the effects of specific proposed protective measures for the Steller sea lion. These effects are to be measured in terms of consumer welfare in the United States, beyond "first wholesale," in order to satisfy the provisions of the National Environmental Policy Act (NEPA).

1.3 Scope

The scope of the study is limited to markets associated with the groundfish species of Alaska pollock, Pacific cod, and Atka mackerel that are caught in Alaskan waters in the eastern Bering Sea, near the Aleutian Islands, and in the Gulf of Alaska.

1.4 Organization of the Report

This report contains five additional primary sections. Section 2 provides a brief overview of the Alaska fishing industry. This is followed by more detailed discussions of the market structure and products associated with Alaska pollock, Pacific cod, and Atka mackerel. Section 3 contains a discussion of data and data sources, availability, and limitations.

In Section 4, we examine the conditions affecting the world market for groundfish, and those affecting the Alaska fishing industry. This is followed by an analysis of recent and future trends that are expected to affect market conditions for the three species of interest.

In Section 5, we use the trend analysis to examine the impacts of protective measures for the Steller sea lion. Three alternatives and the impacts of the protective measures on the markets for products from the three species of interest are examined.

2.0 REGIONAL AND INDUSTRY CHARACTERISTICS

2.1 Overview of the Alaska Fishing Industry and Markets

Commercial landings by U.S. fishermen were 4.2 million metric tons in 1999 valued at $3.5 billion. Of this amount, finfish accounted for 84 percent of landings, but only 45 percent of value. Alaska led all states with 2.0 million metric tons – 43 percent of the nation's total – and $1.4 billion in value.[3] A sizable share of U.S. landings and processed seafood is exported, playing a significant role in the nation's balance of trade. Some 37 percent (by volume) of U.S. exports are imported by Japan, and products from Alaskan waters lead all other states in exports.

In this section, the products and markets for Alaska pollock, Pacific cod, and Atka mackerel are outlined and discussed. Each subsection provides an overview of supply and landings, product forms, and marketing channels. For Alaska pollock and Pacific cod, the product forms vary and enter into different markets. The role of each product form and its major market areas are identified.

2.2 Alaska Pollock

Alaska pollock (*Theragra chalcogramma*), also known as Walleye pollock, is the most abundant groundfish species in the world. Its range is widely distributed throughout the North Pacific Ocean in temperate and subarctic waters. Though it is found off the coast of Oregon, Washington, Canada, Korea, and Japan, by far the largest volume is harvested in the seas near Alaska and Russia. World harvests of Alaska pollock reached a high in the mid-1980s at some 7 million metric tons (MT) annually, but have since declined to just under 4 million MT in recent years.[4]

Pollock[5] is also the most abundant species within the eastern Bering Sea, second most abundant groundfish in the Gulf of Alaska (GOA), and supports the largest fishery in Alaskan waters. It represents about two-thirds of the state's total ex-vessel value of groundfish. Primary products produced from pollock include surimi, fillets, roe, and, to a lesser extent, meal and mince, and are sold in many different markets worldwide. The processed products compete with production by other nations not only of Alaska pollock but of other species as well. The characteristics of the market for pollock are presented in this section.

2.2.1 Brief History of the Pollock Fishery in Alaska Waters

The development of surimi processing in the 1960s and 1970s is responsible for the start of the fishing effort for pollock. The fishery in the Bering Sea was developed primarily by Japan and to a lesser extent by the former Soviet Union and Korea. The implementation of the 200-mile U.S. Exclusive Economic Zone (EEZ) as a result of the Fishery Conservation and Management Act of 1976 led to the phasing out of fishing by

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[3] NMFS, *Fisheries of the United States, 1999*, Office of Science and Technology, Fisheries Statistics and Economics Division, October 2000.

[4] Sjøholt, Trond, *The World Market for Groundfish*, FAO/GLOBEFISH Research Program, Vol. 57, Rome, FAO, November, 1998, p. 9.

[5] In this report, the term "pollock" is used interchangeably with Alaska pollock, and is distinguished from the two pollocks of the Atlantic, *Pollachius pollachius*, and *P. virens*, also known as saithe.

foreign vessels in favor of joint venture operations, with the pollock fishery focusing on surimi and roe production. Most of the product was sold to markets in Japan. Joint ventures were phased out by American investment in catcher/processor vessels, capable of both catching and processing pollock at sea.

By 1990, an estimated 80 percent of the harvest was caught by catcher/processor vessels.[6] Companies, mostly Japanese owned, began constructing processing plants on shore. Controversy developed over how the annual pollock catch should be distributed between the inshore and offshore processors, and in 1991 the North Pacific Fishery Management Council (Council), the fishery management advisory board, developed a formula for allocating catch. As a result, the distinctions of an "inshore sector" and "offshore sector" became significant, and remain important in the analysis of markets for pollock.

During the 1990s, the increased American investment in the groundfish fishery led to a largely overcapitalized, open-access fishery. Though there was a set allocation among inshore and offshore processors, within each sector, the fishery was managed as an "Olympic" system: an overall quota was set, but no limit was set on the amount of harvest by an individual vessel or company. This led to a "race" for fish, as harvesters and processors increased capacity in an effort to garner their share of the catch. At the same time, the number of catcher vessel, catcher/processors, and motherships steadily declined, from 1,895 in 1992 to 1,343 in 1998.[7] In response, and with the support of most processors, Congress enacted the American Fisheries Act of 1998. Among other things, it effectively eliminated the race for fish by enabling vessels in each sector to form cooperatives, each with their own allocation of fish to be subdivided among member boats. The Act also revised the share of the allocation in favor of inshore processors to the following distribution:[8]

Boats harvesting pollock for inshore plants	50.0%
Boats harvesting pollock for motherships	10.0%
Factory trawlers	36.6%
Catcher boats assisting factory trawlers	3.4%

The catcher/processors formed a cooperative before the start of the 1999 season. Both the inshore processors and offshore motherships were authorized to form, and subsequently established, cooperatives in the winter/spring season of 2000.

2.2.2 Supply and Harvests

U.S. harvests of Alaska pollock have averaged about 1.1 million tons annually in recent years, down from a peak of more than 1.4 million tons in 1993 (see Figure 2.1). Almost all harvests occur in Alaska waters, with the largest share of the catch coming from the Bering Sea.

Alaska pollock is harvested not only in Alaska waters, but also in other parts of the North Pacific Ocean. U.S. harvests account for slightly more than one-third of total worldwide harvests. Russia accounts for more than half of total world harvests, and vessels of other nations fishing in Russian waters also catch significant

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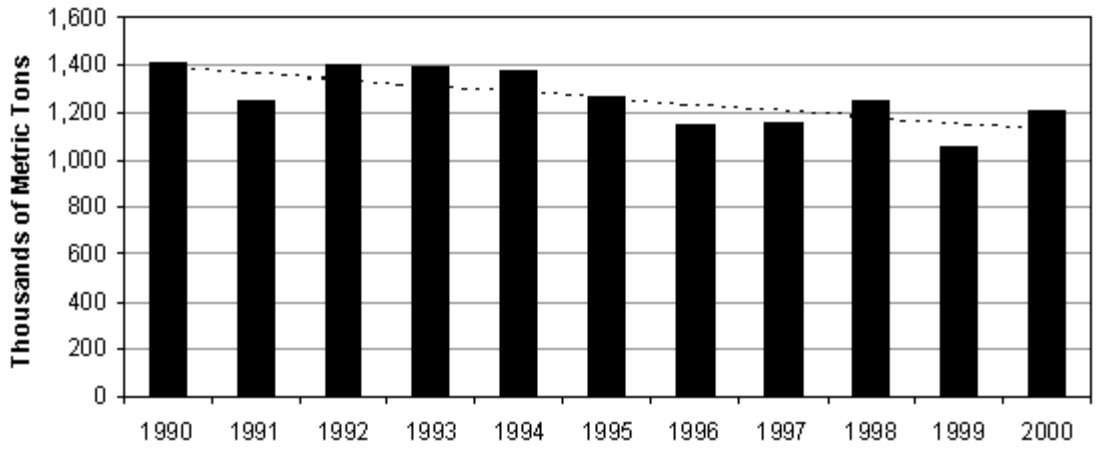
[6] General Accounting Office, "Fishery Management: American Fisheries Act Produces Benefits," GAO/RCED-00-176, June 29, 2000, p. 5.

[7] Draft Programmatic SEIS, p. 3.10-13.

[8] As discussed in Loy, Wesley, "Dividing the Fish," *Pacific Fishing*, November 2000, p. 1.

volumes (see Figure 2.2). The Total Allowable Catch (TAC) in Russia has been over 2.2 million MT in the late 1990s,[9] but has fallen steeply over the past few years to well under 2.0 million MT.[10] These foreign harvests compete directly with U.S. harvests in international markets for Alaska pollock products.

Figure 2.1 U.S. Alaska Pollock Landings



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD; and (2000 data) NMFS Alaska Region website (http://www.fakr.noaa.gov/).

Harvests of Alaska pollock from Russian waters have declined substantially in recent years. Russian resources are generally believed to have been substantially overfished and fishing pressure too high to maintain a sustainable yield. It is likely that harvests from Russian waters will decline even further before they stabilize; one estimate suggests it may be at least 2005 before stocks recover from overfishing.[11]

Japan is third in harvest volume, lagging far behind the United States and Russia. In recent years, the harvest has been just over 300,000 MT, scarcely eight percent of world harvest.[12] Japan previously caught large quantities of Alaska pollock on both the North American and Asian side of the Pacific. When 200-mile EEZs were introduced in several countries in the 1970s, Japanese access to these waters was severely restricted. Japan responded by engaging in joint-venture arrangements for a time,[13] then later invested in and built processing plants in coastal Alaska communities. Thus, although Japanese harvest is relatively small, Japan plays a considerable role in processing, access to the resources, and (as will be demonstrated below) control of the market.

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[9] Sjøholt, p. 10.

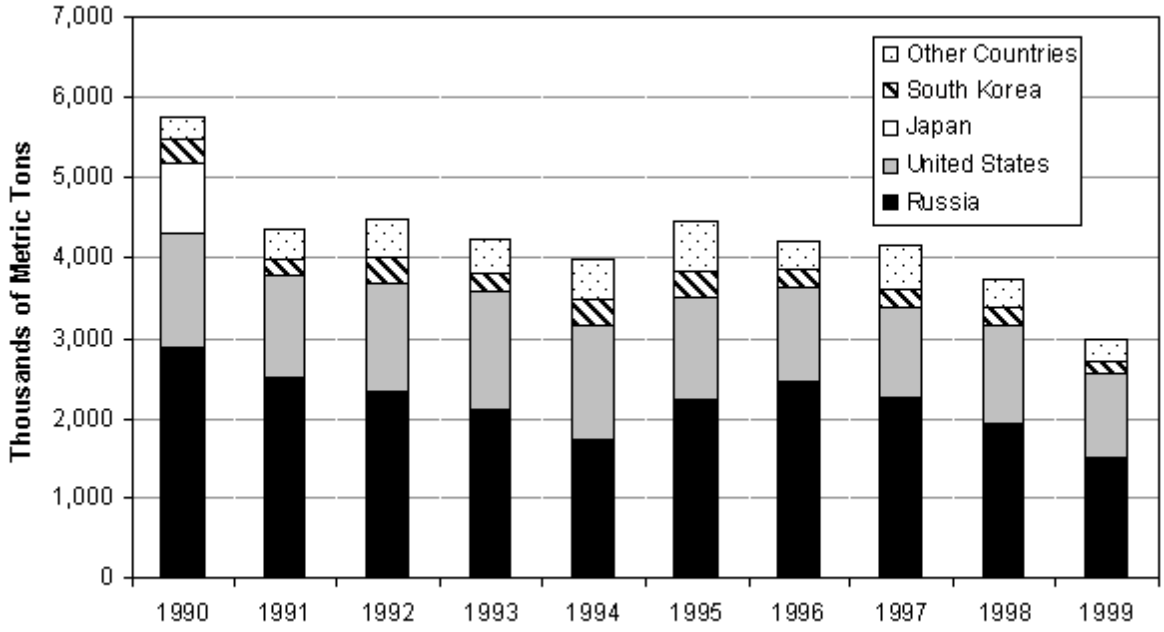
[10] Based on reports of TINRO in *Bill Atkinson's News Report*, March 21, 2001.

[11] Pacific Research Institute of Fisheries and Oceanography, as cited in Sjøholt, p. 11.

[12] FAO, FishStat database, 2000.

[13] Lemieux, Jason, Lewis E. Queirolo, and Richard S. Johnston, "Restricting Trade in Resource Access: Consequences for Foreign Direct Investment in Seafood Processing," unpublished working paper, p. 6.

Figure 2.2 World Harvests of Alaska Pollock



Source: FAO, "FishStat" database.

China, South Korea, and Poland account for most of the remaining world harvest of Alaska pollock. All three countries have intergovernmental agreements with the Russian government to fish in Russian waters, and both China and Poland receive quotas in exchange for not fishing in the international waters of the Sea of Okhotsk, off the coast of Russia.[14]

2.2.3 Product Forms

Alaska pollock are processed into a wide variety of products which are sold in many different markets worldwide, competing with production by other nations that includes not only Alaska pollock, but other species as well. The most valuable of these products are surimi, roe, and fillets.

NMFS estimates of U.S. production of Alaska pollock primary products from Alaska waters are shown in Table 2.1. Primary product is defined as the product form after initial processing following harvest of live fish. This form is consistent with calculations by NMFS of first wholesale price.

During the 1990s, surimi accounted for 51 percent of the total product volume (by weight), and 50 percent of total product first wholesale value. Roe accounted for only 5 percent of total product volume but 22 percent of first wholesale value. Fillet products, both deep-skin and other fillets, accounted for 19 percent of total product volume and 22 percent of first wholesale value. All other products, including minced fish, fish

[14] Sjøholt, p. 12.

meal, H&G (headed and gutted), whole fish, and oil, accounted for 26 percent of product volume but just 7 percent of first wholesale value. Pollock is a fragile fish that deteriorates rather quickly after harvest, so very little is sold fresh.

Table 2.1 Production of Alaska Pollock Products in the Fisheries off Alaska

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Volume (1,000 MT)											
Surimi	177.1	139.8	162.8	150.4	182.0	178.2	160.9	159.9	148.0	153.5	191.0
Roe	12.7	21.7	17.5	11.9	11.8	15.9	14.5	18.7	12.8	11.6	16.3
Fillets	74.9	72.2	42.3	68.0	54.8	59.6	60.2	45.4	66.7	58.5	62.2
Deep-skin fillets					19.5	34.9	36.8	29.3	31.5	36.9	31.6
Other fillets	74.9	72.2	42.3	68.0	35.3	24.7	23.4	16.1	35.2	21.6	30.6
Minced fish	13.6	10.7	14.8	16.4	10.9	9.8	14.2	9.5	17.5	9.8	13.2
Fish meal	57.2	57.3	59.9	54.0	52.1	50.9	46.9	46.4	48.1	50.9	52.2
Other products	9.0	12.3	16.0	17.0	14.7	18.8	17.3	15.6	24.3	28.9	29.2
Total	**344.4**	**314.0**	**313.3**	**317.7**	**326.3**	**333.2**	**314.0**	**295.5**	**317.4**	**313.2**	**364.1**
Value ($ millions)											
Surimi	277.2	452.2	544.7	251.0	369.7	439.8	298.3	363.2	285.1	332.9	
Roe	96.9	213.8	200.9	126.4	134.0	217.5	176.2	167.3	84.4	139.9	
Fillets	171.4	214.6	112.7	130.3	119.2	147.7	153.1	114.0	184.8	190.2	
Deep-skin fillets	0.0	0.0	0.0	0.0	49.0	87.9	100.1	81.2	95.5	129.9	
Other fillets	171.4	214.6	112.7	130.3	70.2	59.8	53.0	32.8	89.3	60.3	
Minced fish	15.8	16.8	16.6	14.3	9.1	8.9	15.2	9.3	20.0	11.0	
Fish meal	31.6	32.2	31.3	27.0	25.5	28.4	28.2	28.1	44.3	32.4	
Other products	5.0	4.6	7.7	4.0	5.2	8.7	9.0	7.8	14.3	14.9	
Total	**597.9**	**934.2**	**913.9**	**553.0**	**662.7**	**851.0**	**680.0**	**689.7**	**632.9**	**721.3**	

Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports. Data for 2000 production volume from NMFS Alaska Region, "Pacific Cod and Pollock Products Reports," http://www.fakr.noaa.gov/.

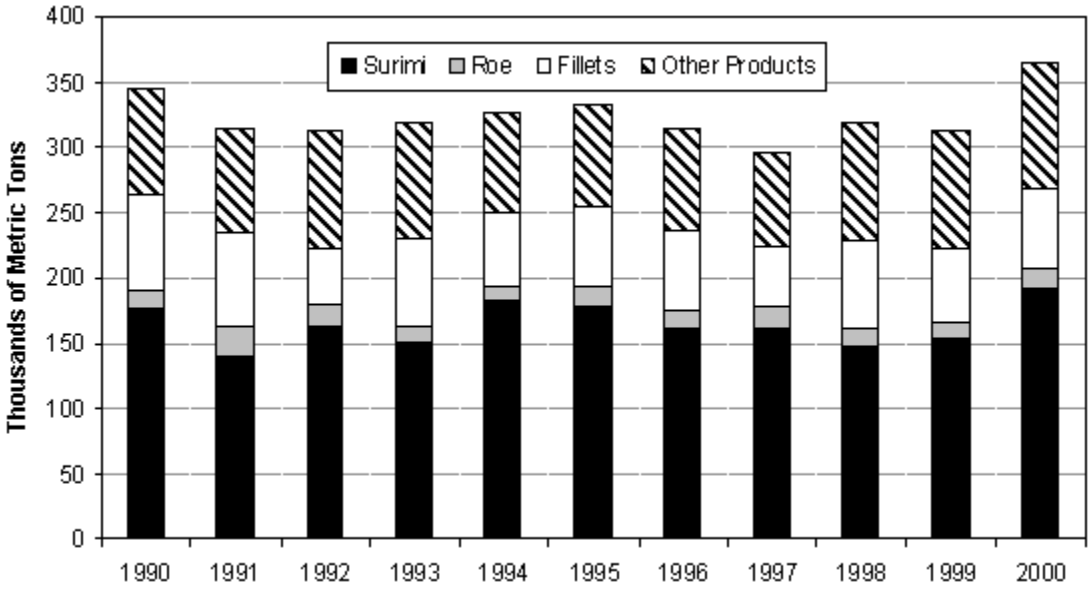
Secondary or "value-added" processing is defined as any processing that takes place after a primary product form. Secondary product forms from pollock include breaded items (such as nuggets, fish sticks, breaded fillets, and fish burgers) from mince and fillets, a wide range of *neriseihin*[15] products from surimi for sale principally in the Japanese market, and analogs from surimi such as imitation crab. Most pollock harvested is exported in primary product form. The product that remains in the domestic market may be reprocessed

[15] Foods made from fish-paste, such as *kamaboko*, a traditional Japanese dish, and fish hams and sausages.

before reaching the retail market. However, little if any secondary processing takes place in Alaska;[16] most takes place at secondary processing plants in the Puget Sound area.[17]

Figures 2.3 and 2.4 show changes over time in total pollock production and value. The volume of production of surimi, roe and fillets has fluctuated from year to year, reflecting differences in total harvest volume, the mix of products produced by processors, and product recovery rates. However, the value of different pollock products has fluctuated much more from year to year than the volume. Changes in value result in part from changes in product volume, but also from changes in average prices.

Figure 2.3 Volume of Production of Pollock Products from Alaska Waters



Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports. Data for 2000 production volume from NMFS Alaska Region, "Pacific Cod and Pollock Products Reports," http://www.fakr.noaa.gov/.

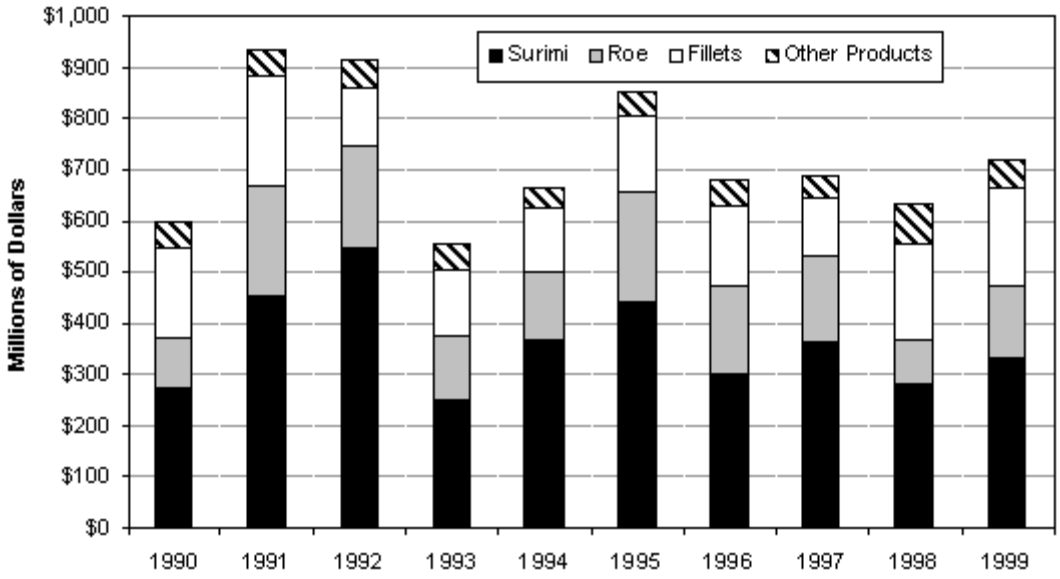
Figure 2.5 shows average first wholesale prices for pollock products for the years 1990 to 1999, calculated by dividing NMFS estimates of total first wholesale value by total product volume. In general, prices were high in 1991 and 1992, dropped sharply in 1993, and peaked again in 1995. Surimi prices fell dramatically between 1995 and 1998, and then rose again sharply in 1999. Fillet prices increased sharply between 1997 and 1999. In 1999, the last year for which NMFS estimates of the first wholesale value of Alaska pollock production are currently available, average prices for Alaska pollock products were generally high, and prices

[16] Alaska Seafood International, an Anchorage secondary processing firm, preparing a variety of retail-ready products, suspended operations in August, 2000. However, a controlling share of the firm was purchased in May, 2001 by a New York investment firm, and the company planned to resume operations in summer, 2001. (http://www.alaska-seafood.com/news.htm).

[17] Draft Programmatic SEIS, p. 3.10-115.

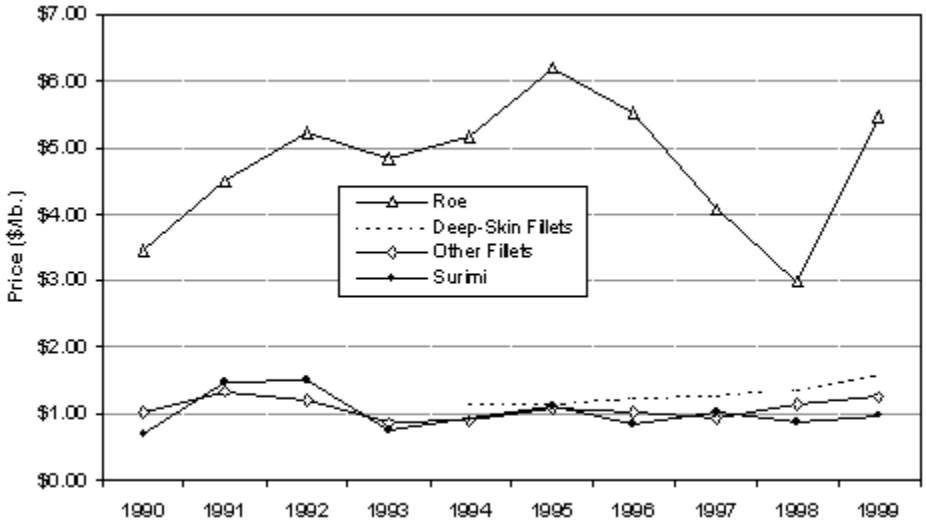
were particularly good for fillet products. However, as discussed in subsequent sections, other data sources and discussions with industry indicate that prices for fillets and surimi have fallen significantly since 1998.

Figure 2.4 Value of Production of Pollock Products from Alaska Waters



Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

Figure 2.5 Average Prices of Pollock Products from Alaska Waters



Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

2.2.4 Resource and Product Flows

This section provides an overview of the market flow of Alaska pollock, from harvest through processing to final consumer. The focus is on primary product forms and market channels, and is intended to provide context for product forms, countries of market demand, competitors, and final consumers. Figure 2.6 provides a visual representation of the resource and product flows for Alaska pollock.

Pollock are targeted with trawl gear by catcher vessels delivering to inshore processors, catcher vessels delivering to motherships in the Bering Sea, and catcher/processors in the open sea. Each sector (inshore and offshore), in aggregate, produces surimi, fillets, and roe, though in varying degrees of emphasis by plant or catcher/processor vessel.[18] Other product forms (minced, H&G, whole, etc.) are also produced by each sector.

Russian harvests of pollock are processed into fillets, blocks, and surimi for sale in many of the same markets targeted by the United States. A significant share of Russian catch is exported in frozen form to China, where it is thawed, reprocessed into fillets, refrozen, and sold as "twice-frozen" or "double-frozen" fillets.

Surimi products from inshore and offshore processors are sent to export markets, where nearly all of it goes to either Japan (primarily) or South Korea. Surimi is then reprocessed in these countries into a variety of traditional fish-paste products. A very small amount of surimi is re-exported to the United States to serve an ethnic Asian market seeking "authentic" *neriseihin*. Surimi retained in the domestic market is often used to make artificial crab and similar products.

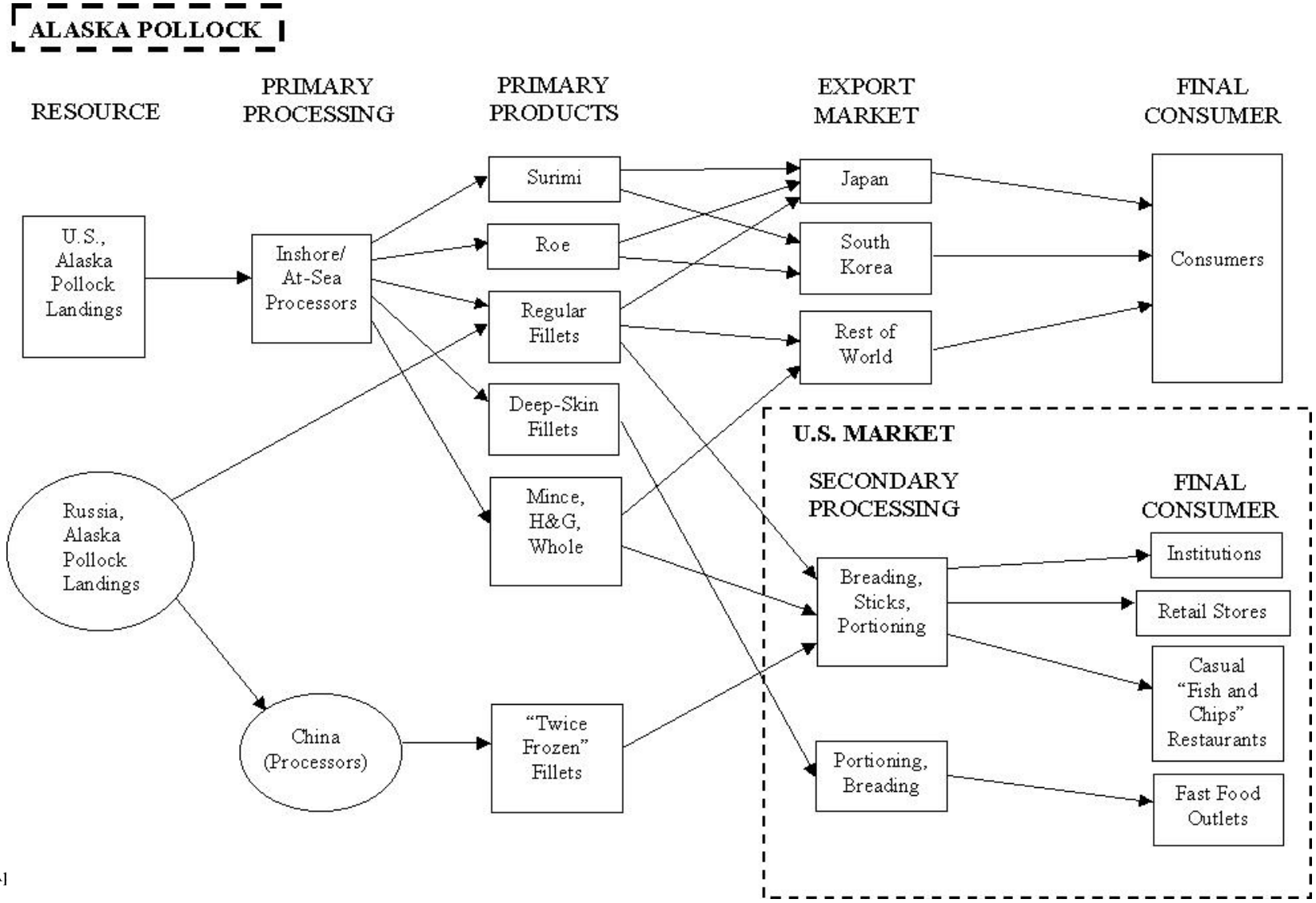
There are two primary forms of fillet products. The first is deep-skin, in which the skin and layer of fat are removed during the filleting process. The fillets are then frozen into block form and sold almost exclusively to several major fast food chains, often under contract. The second form is regular-skinned fillet, sold as individually quick frozen (IQF), shatterpack, or layer pack. A substantial portion of this form is sold to domestic casual ("fish and chips") restaurants and institutions, or is further processed by breading and refreezing for the retail market as fish sticks, fish fillets, or other products.

The United States does not supply all the fillets demanded by domestic consumers. The balance is made up from imports of Alaska pollock blocks primarily from China and Russia. The "twice-frozen" blocks from China are generally lower in quality, but are often substituted for single-frozen blocks when the relative price of blocks is competitive.

Roe is harvested as an ancillary product during the winter spawning season. The highly prized roe is frozen or salted, and the product commands premium prices in the export market to Japan. After the roe is stripped from the pollock, the fish is further processed into surimi or fillets.

[18] Details on the processing forms by inshore processor, catcher/processor, and mothership may be found in the Draft Programmatic SEIS, Section 3.10.

Figure 2.6 Product Flow and Market Channels for Alaska Pollock



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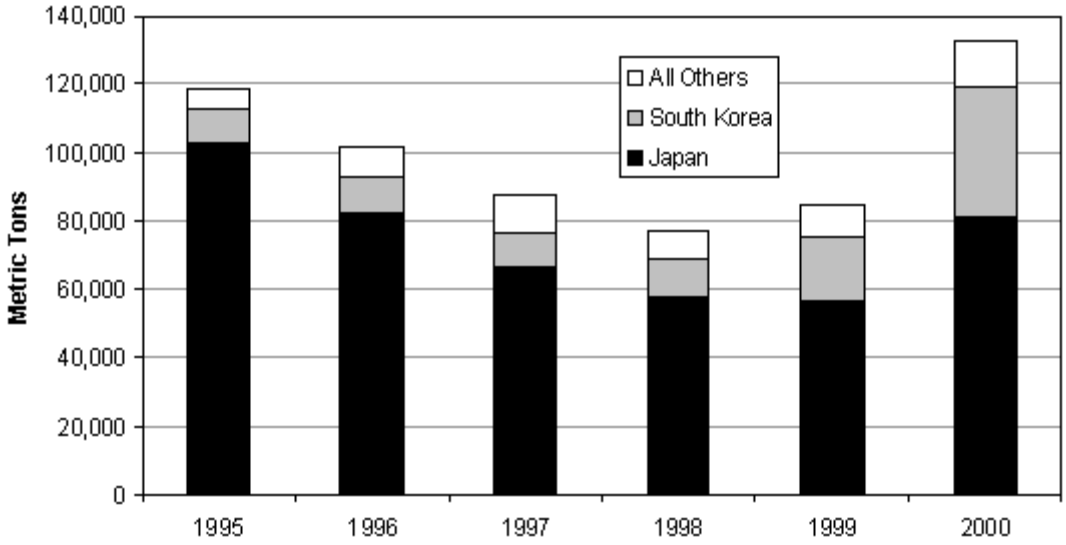
2.2.5 Surimi

Fish surimi is a unique seafood product, involving a highly technical production process and graded on objectively measured quality characteristics. Surimi grades are based on attributes such as color, texture, water content, gel strength, and impurities. Although a common grading schedule has not been adopted, many processors follow grade standards and a ranking system developed by the National Surimi Association in Japan.[19] There are hundreds of surimi-based foods (*neriseihin*) commonly grouped into broad categories: *kamaboko* (steamed), *chikuwa* (broiled), *satsumaage* (fried), fish ham and sausages, and seafood analogs. Each product requires certain characteristics of the surimi base. Pollock surimi tend to have highly desired characteristics of interest to *neriseihin* producers in Japan.

Virtually all pollock surimi harvested in Alaska waters and processed inshore or at-sea are exported. As shown in Figure 2.7, most of these exports are to Japan, although there is a small but growing amount exported to South Korea.[20] The balance of exports reach select ethnic markets in primarily European countries. Pollock surimi exports declined from 1995 to 1998, but have since rebounded; exports in 2000 were higher than the previous five years.

Figure 2.7 U.S. Exports of Alaska Pollock Surimi



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

[19] Larkin, Sherry L. and Gilbert Sylvia, "Firm-Level Hedonic Analysis of U.S. Produced Surimi: Implications for Processors and Resource Managers," *Marine Resource Economics*, Vol. 14, p. 180; and Park, J. and M. Morrissey, "The Need for Developing Uniform Surimi Standards," in *Quality Control & Quality Assurance for Seafood*, G. Sylvia, A.L. Shriver, and M. Morrissey, eds., pp. 64-71, Oregon Sea Grant, Corvallis, OR.

[20] It is not certain the degree to which South Korea processes surimi imported from the United States for domestic consumption or for re-export to Japan.

Alaska pollock is not the only form of surimi exported to Japan (see Figure 2.8). Most of the remainder is made from Pacific whiting, harvested off the coast of Oregon and Washington. However, it is generally acknowledged that the surimi made from Pacific whiting is of lower quality and serves a different niche market.[21]

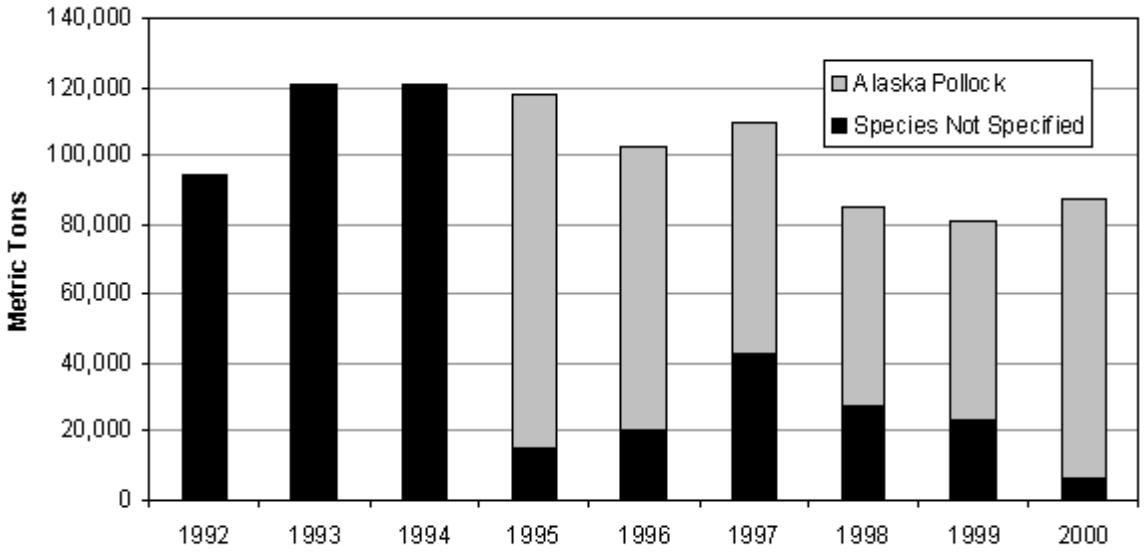


Figure 2.8 U.S. Exports of Surimi to Japan

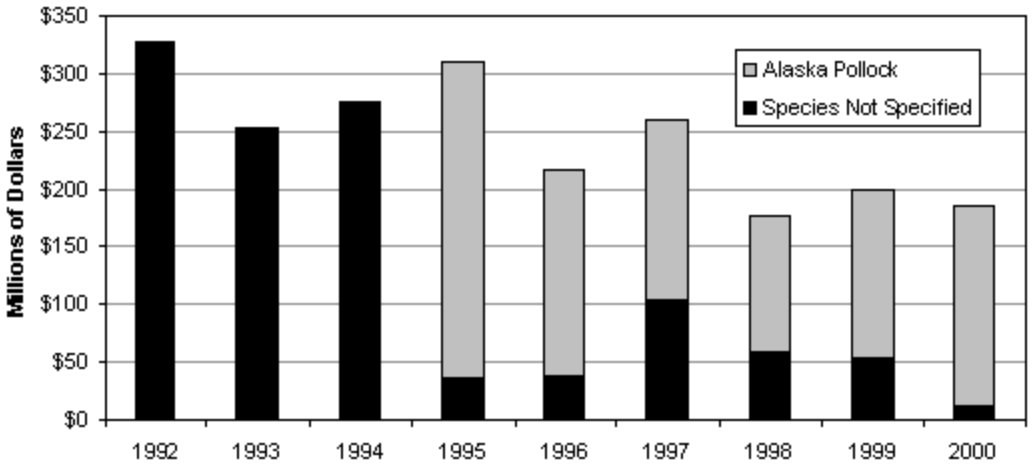
Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

The value of surimi exported to Japan for the years 1992 through 2000 is shown in Figure 2.9. The value declined annually, as did exports, during much of the 1990s, but export value (and quantity) of the Alaska pollock surimi portion was higher in 2000 than in the previous three years, at $174 million. U.S. exports of all surimi to Japan has generally been declining, which seems to mirror the Japanese imports of surimi from all sources (see Figure 2.10). A more complete treatment of recent and future trends for surimi is presented in Section 4 of this report.

Figure 2.11 presents a long term trend of surimi and "marine processed goods." Interest in fish paste products peaked in the 1970s, but has steadily declined since the mid-1980s. The steady decline in pollock surimi imports to Japan, beginning in 1996 corresponds with a change in Japanese inventory patterns, as shown in Figure 2.12. Holdings of pollock surimi ranged from 70,000 MT to over 100,000 MT prior to 1996, and ranged from 40,000 to 60,000 MT since then.

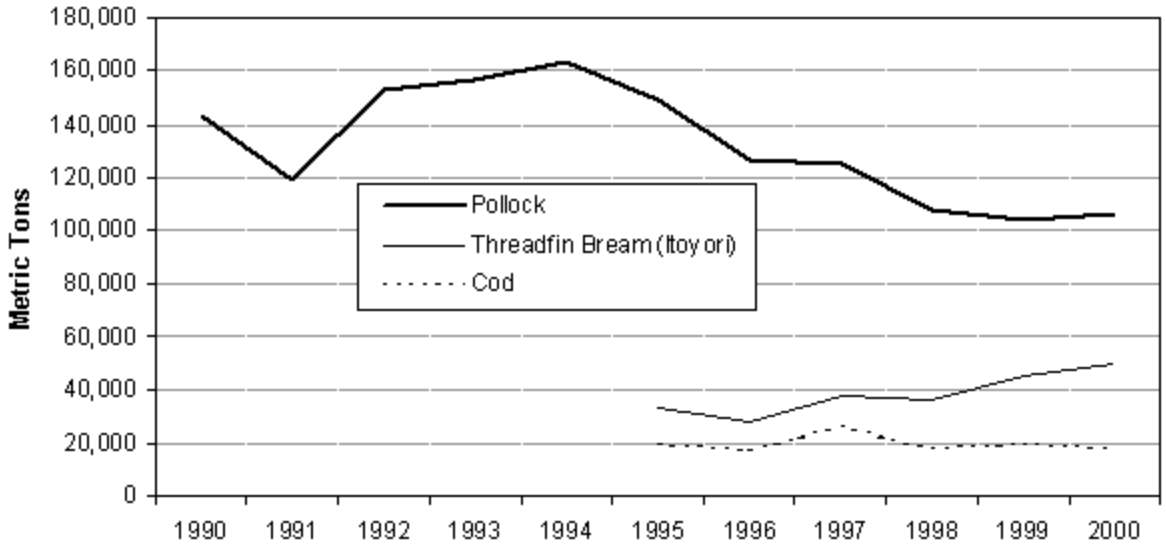
[21] See, for example, Sylvia, Gilbert, "Global Markets and Products of Hake," in *Hake: Biology, Fisheries, and Markets*, Alheit, J. and T.J. Pitcher, eds., Chapman and Hall, London, 1995, and Larkin and Sylvia, 2000.

Figure 2.9 Value of U.S. Surimi Exports to Japan



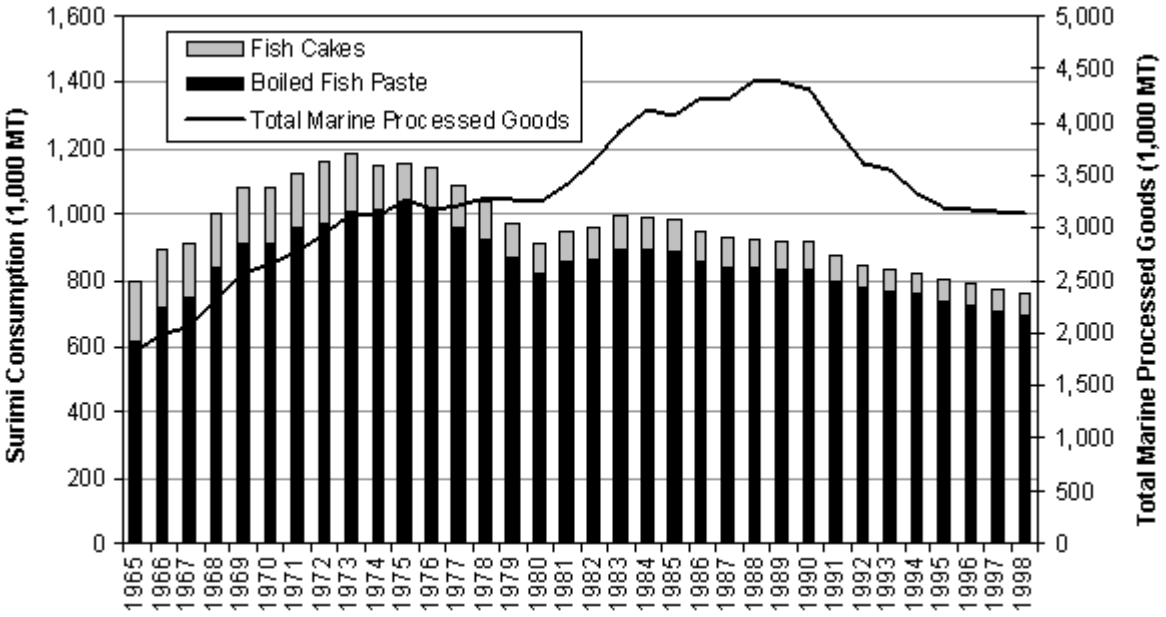
Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.10 Japanese Imports of Surimi – All Forms



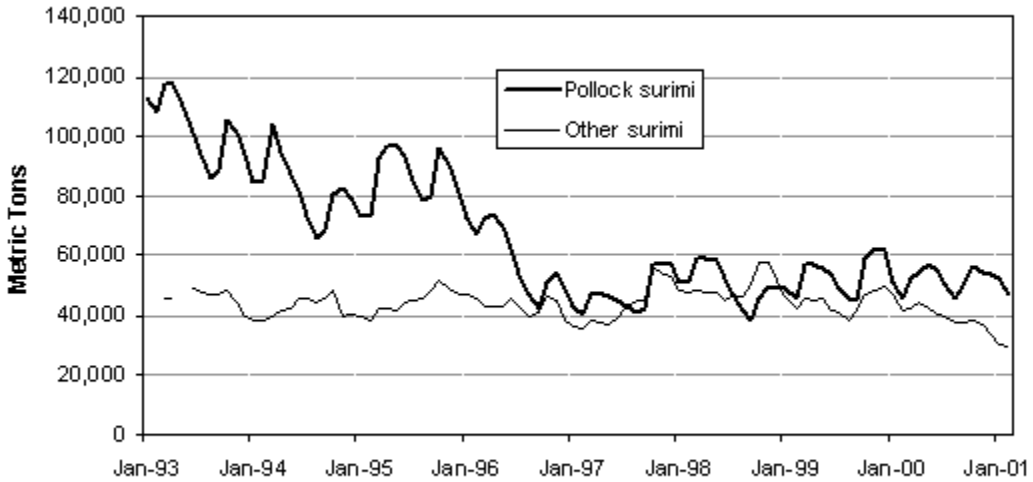
Source: *Bill Atkinson's News Report,* annual import summaries.

Figure 2.11 Japanese Historic Consumption of Marine Processed Goods, Including Surimi



Source: *(Japan) Seafood Daily News*, "Power Seafood Data Book," 2001.

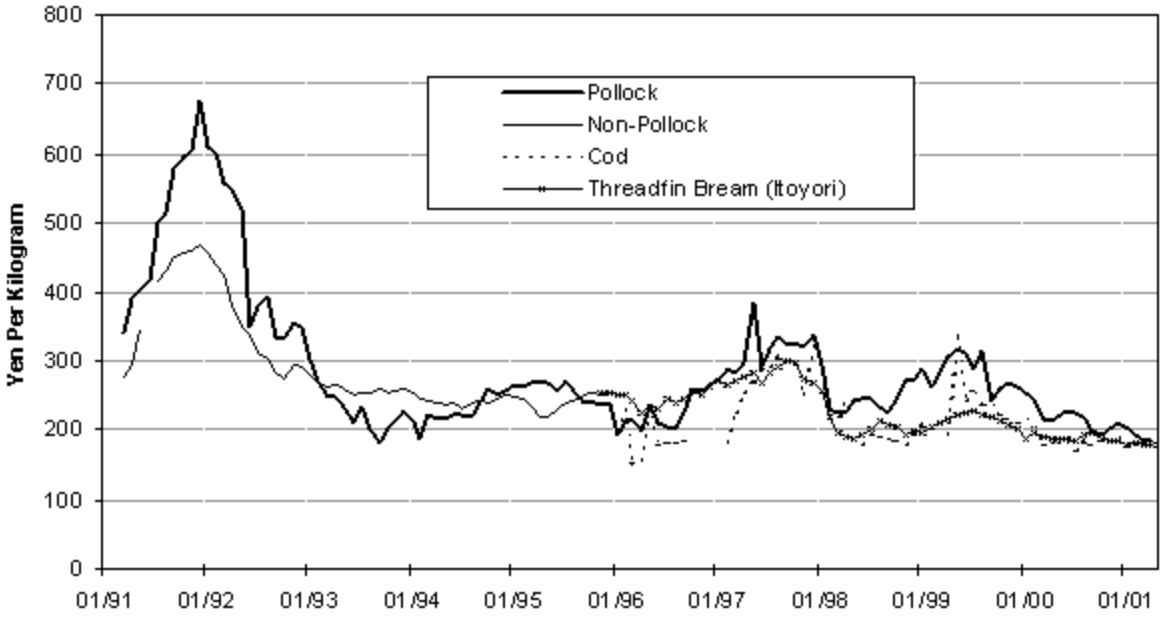
Figure 2.12 Japanese Surimi Inventories



Source: *Bill Atkinson's News Report,* monthly import tables.

Surimi can be made from a number of different species of fish that exhibit the proper characteristics. Japan imports surimi made from Alaska pollock, hake (Pacific whiting), hoki (from Argentina and Chile),[22] and *itoyori* or threadfin bream (from Indonesia). Among these products, only *itoyori* has shown a steady increase in imports. But while pollock surimi still dominates the imports species, it is unclear whether is it being replaced by other species. No one contacted during this study believed that the characteristics and quality found in pollock surimi were matched by surimi from any other species; that is, pollock surimi serves a unique – and superior – quality niche. However, an interesting picture emerges when comparing average prices in Japan for surimi from different sources. Figure 2.13 presents such a comparison (based on information presented in a major trade publication). The findings suggest a remarkably close relationship among prices. It remains to be determined whether buyers or secondary processors in Japan actually perceive attribute differences, or whether pollock merely dominates the market volume and the products may be substitutes at the margins.

Figure 2.13 Average Monthly Price of Japanese Surimi Imports (yen/kilo)



Source: *Bill Atkinson's News Report,* monthly import tables.

2.2.6 Roe

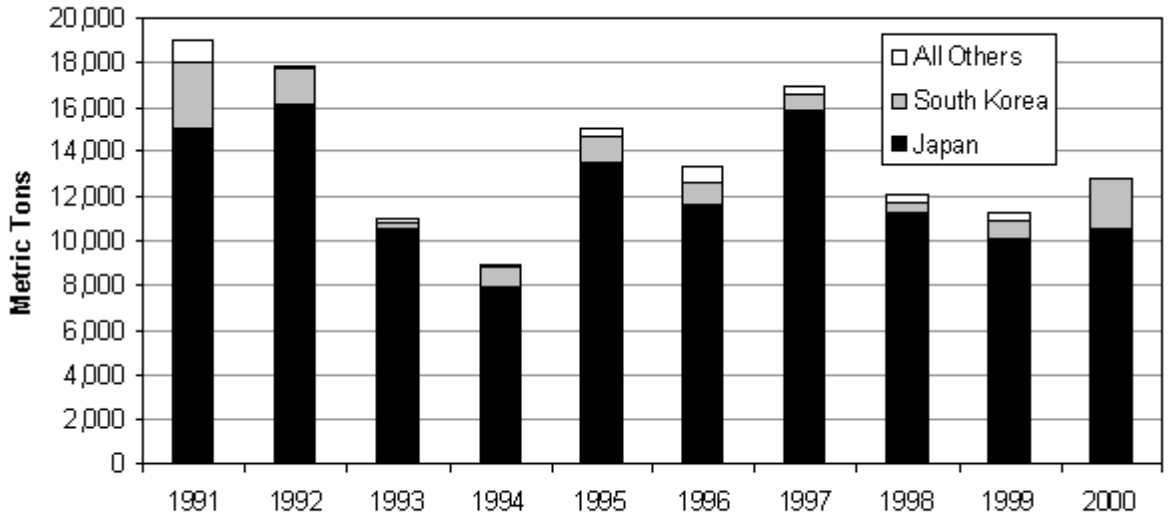
Roe, or fish eggs, from Alaska pollock are a prized seafood commodity in Japan. Traditionally, Japanese consumers buy roe during the Christmas season. Pollock roe are frozen and later prepared in brine (as *tarako*), and often used in rice ball sushi and mixed with side dishes, or seasoned and spiced (as *karashi*

[22] "Hoki" is the common name for *Macrunronus novaezelandie*, also known as blue grenadier or New Zealand whiptail. Hoki is found only in the waters off New Zealand and Australia. Yet, the literature, including the FAO "Globefish" periodical and Japan's Ministry of Agriculture, Forestry, and Fisheries (MAFF) publications, refer to Hoki from Argentina and/or Chile. It is not clear whether the referenced species is Patagonian grenadier or one of several species of hake.

mentaiko) with a salty hot pepper flavor.[23] A very small amount of pollock roe is salted for processing. Alaska pollock roe are harvested during spawning, which coincides with the "A" Season. Pollock are caught ideally at the time when the eggs are at their fullest size and just prior to dispersal by the females. Roe are graded and priced according to size.

Nearly all Alaska pollock roe is exported, and virtually the entire amount is destined for Japan or South Korea (see Figure 2.14). The total annual value of exports to Japan (Figure 2.15) varied considerably during the last decade, ranging from a low of $77 million in 1998 to a high of $164 million in 1992.[24] The Japanese export value per unit (shown in Figure 2.16) also showed that the average annual price fluctuated from $6.89 to $11.98 per kilogram during the last decade.

Figure 2.14 U.S. Exports of Alaska Pollock Roe

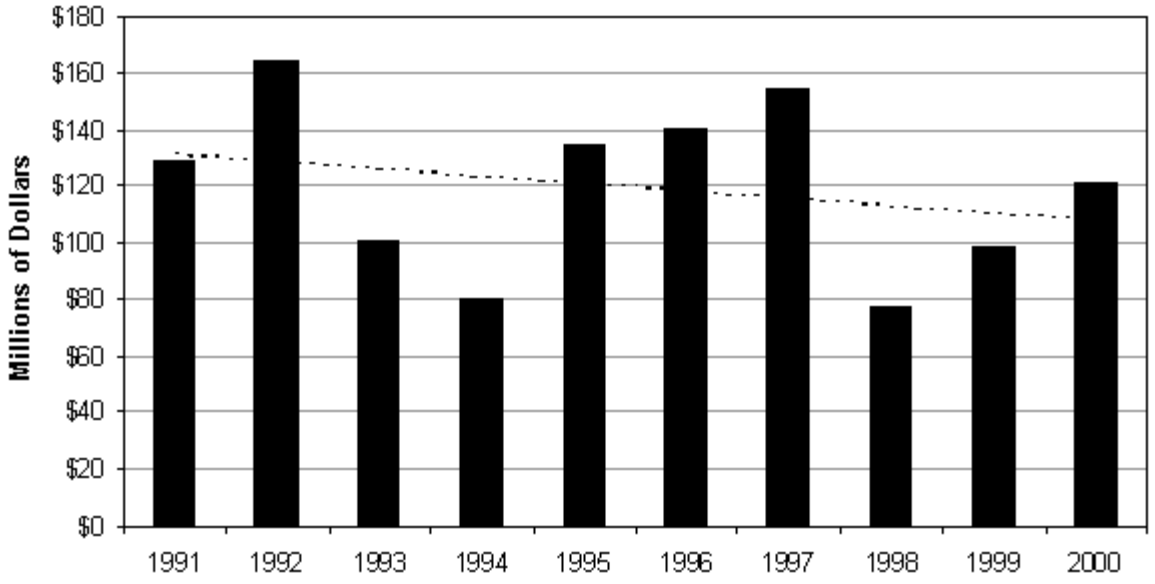


Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

[23] U.S. Department of Agriculture, Foreign Agricultural Service, *Japan Seafood Japanese Fish Roe Report (Salmon and Cod/Pollock) 1999*, December 17, 1999.

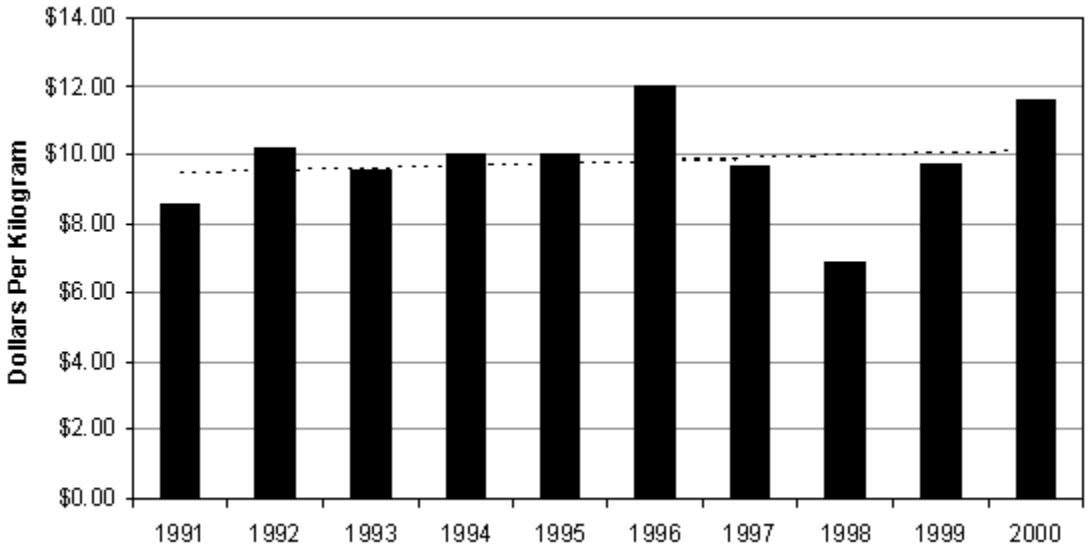
[24] The 2001 roe season appears to have surpassed all years in the last decade, with total annual value exceeding $195 million, according to NMFS.

Figure 2.15 Value of U.S. Exports of Alaska Pollock Roe to Japan



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

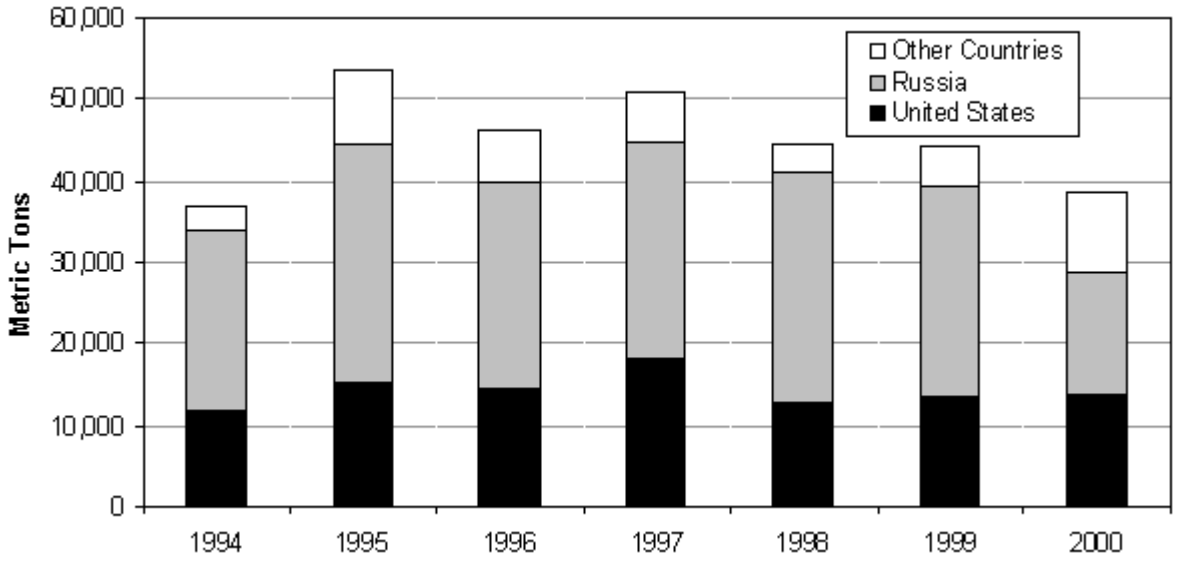
Figure 2.16 Price per Kilogram of U.S. Exports of Frozen Alaska Pollock Roe to Japan



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Japan imports pollock roe primarily from Russia and the United States (see Figure 2.17). In recent years, overall imports of pollock roe have been on a downward trend. This is due primarily to supply limitations on catch in both countries, rather than directly a result of declining demand in Japan. This is demonstrated by comparing the relative market shares of the United States to Russia for 1998 through 2000. Coinciding with the general decline in Russian harvest of Alaska pollock are gains by Alaskan suppliers of market share in amounts that do not quite make up the difference in supply. These correspond with higher prices received.

Figure 2.17 Estimated Japanese Roe Imports, by Country of Origin



Source: Japanese press estimates, as reported in *Bill Atkinson's News Report*, July 12, 2000.

Roe provides those involved in the pollock fishery their greatest opportunity for profit. Although information is not available as to the cost of producing each primary product form, it is clear by inspection of the wholesale revenues (price per unit of fish, as shown previously in Figure 2.5) that the margins provided by revenues from roe are superior to those of the other product forms. Many of those in the industry contacted for this study stated bluntly that, were it not for roe, they could not afford to be in the fishery.

2.2.7 Fillets

After surimi, the most common product form produced from pollock is the fillet. Fillets are prepared in a variety of forms that are targeted to, and for the convenience of, different end users. Fillets are used in a wide range of products. Pollock is the dominant species of whitefish used by quick service ("fast food") restaurant chains, including McDonald's, Long John Silver's, and Burger King, among others. Pollock fillets are also common in other casual "fish and chips" style restaurants, and the primary species for the breaded and frozen fillet retail product.

The two primary filleting types affecting primary processing are regular and "deep-skin." The latter form reflects a deeper cut of the skin to remove the layer of fat. It reflects a higher grade (and price) of fish because of the requirements for larger sized fish, lower retained portion (more waste), and lower fat content.

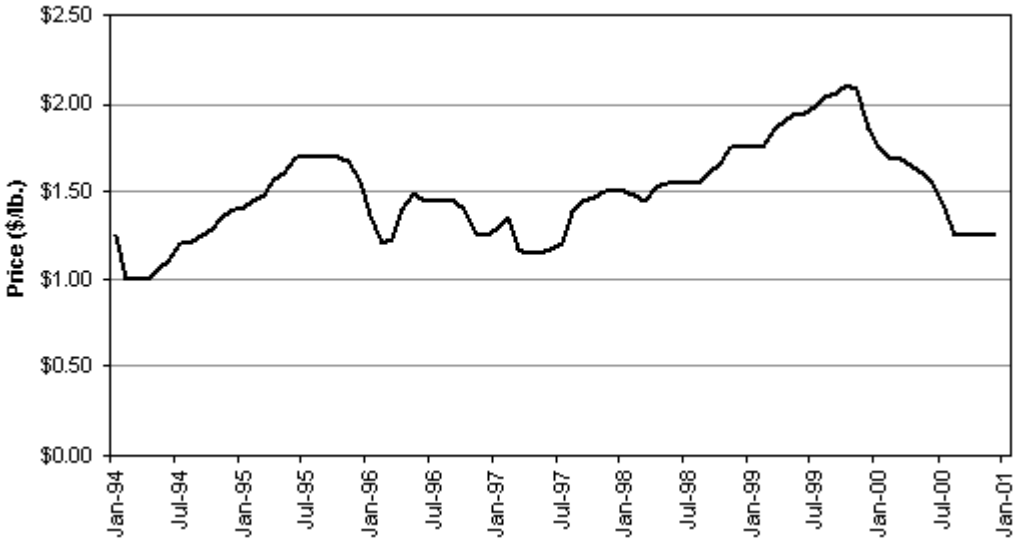
Regular fillets are graded under 2 ounce, 2-4 ounce, 4-6 ounce, and 6-8 ounce forms, and are frozen and packed as IQF (individually quick frozen), shatterpack (layered frozen fillets that separate individually when struck upon a hard surface), and blocks (fish placed in a form and frozen in a plate freezer). Blocks are sold and reprocessed into breaded products. Deep-skin block is the dominant form used in the fast food industry, and most are produced under contract.

The primary market for U.S. produced Alaska pollock fillets is the U.S. domestic market. Figures 2.18 and 2.19 show trends in U.S. wholesale prices for frozen pollock fillets and fillet blocks. Wholesale prices for U.S. produced single-frozen fillets and fillet blocks peaked in 1999 and have since fallen dramatically. In contrast, prices of imported double-frozen fillets and fillet blocks have been much lower and more stable. Since 1999, prices of U.S. products have fallen to close to the levels of imported products.

Contributing to the sharp decline in prices for U.S. product has been a dramatic increase in U.S. imports of pollock, which are primarily frozen fillets and frozen fillet blocks. As shown in Figure 2.20, total calendar-year imports of Alaska pollock increased by 25 percent from 80 thousand tons in 1997 to 100 thousand tons in 1999. Data for December 2000 imports are not yet available. However, as shown in Figure 2.20, imports for January-November 2000 were almost as high as the record levels of 1999.

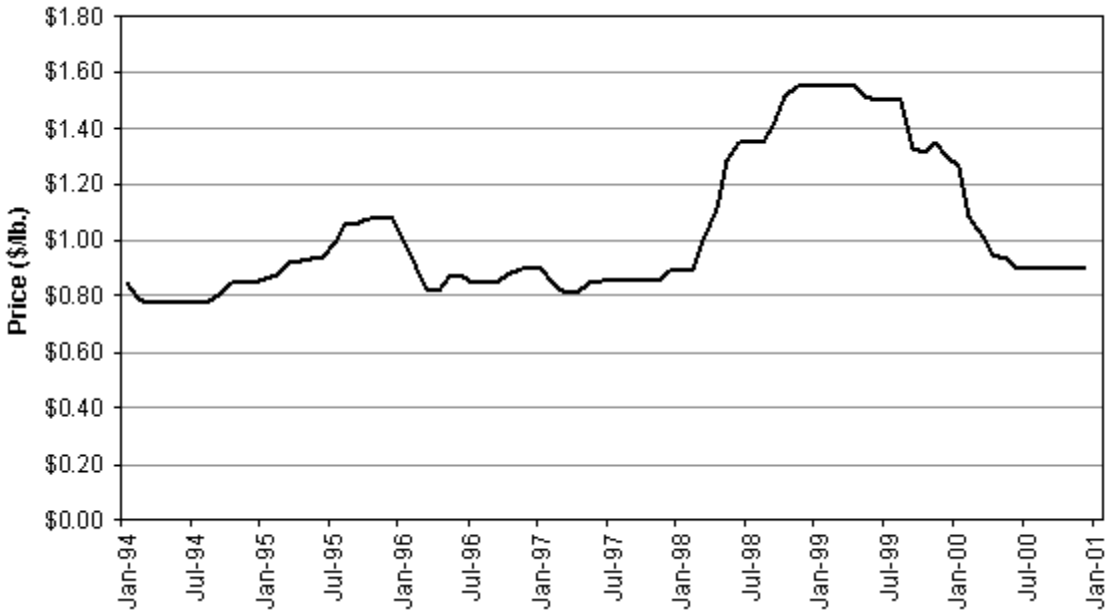
China is the biggest supplier of U.S. imports of pollock, followed by Russia (Figure 2.21). Most of the imports from China are of Alaska pollock harvested in Russian waters by both Russian and foreign fleets. This product is frozen at sea and shipped to China, where it is thawed, processed into fillets, and refrozen for export to primarily U.S. and European markets. Because of low labor costs, this double-frozen product is able to compete successfully in world markets with single-frozen U.S. product. Figure 2.22 demonstrates this fact through a comparison of average annual import prices of pollock fillets and blocks from Russia and China.

Figure 2.18 U.S. Wholesale Prices for Alaska Pollock Fillets



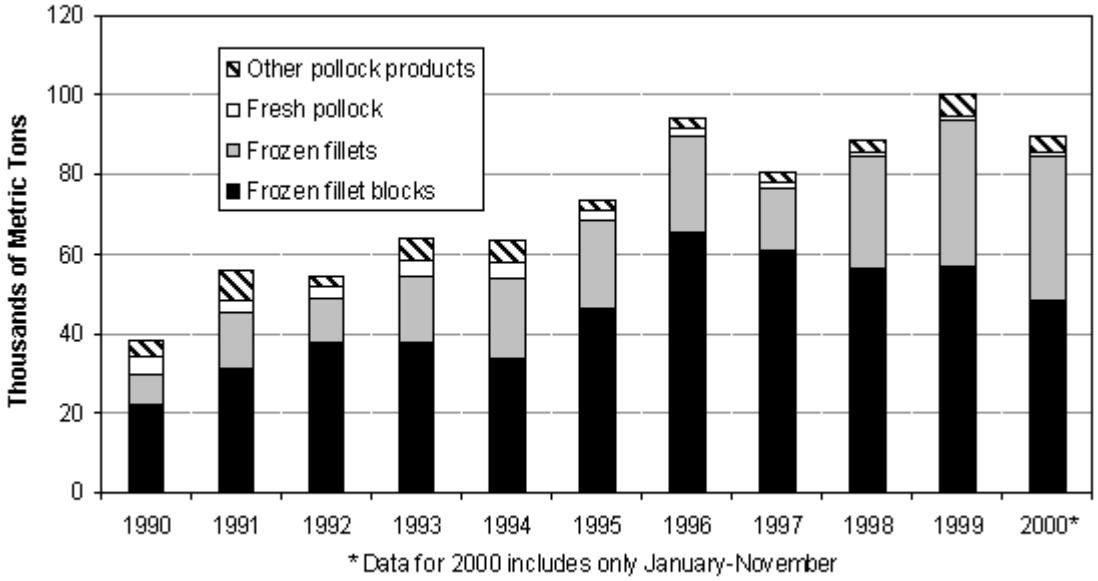
Source: Urner-Barry, *Seafood Price Current*, 2001.

Figure 2.19 U.S. Wholesale Prices for Alaska Pollock Blocks



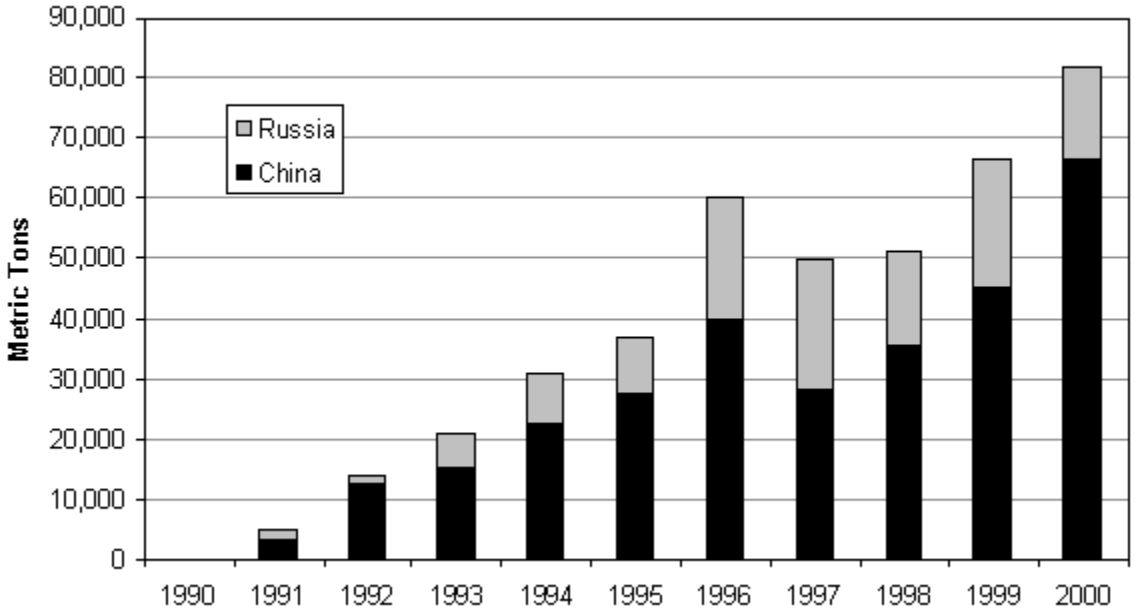
Source: Urner-Barry, *Seafood Price Current*, 2001.

Figure 2.20 U.S. Imports of Pollock Products



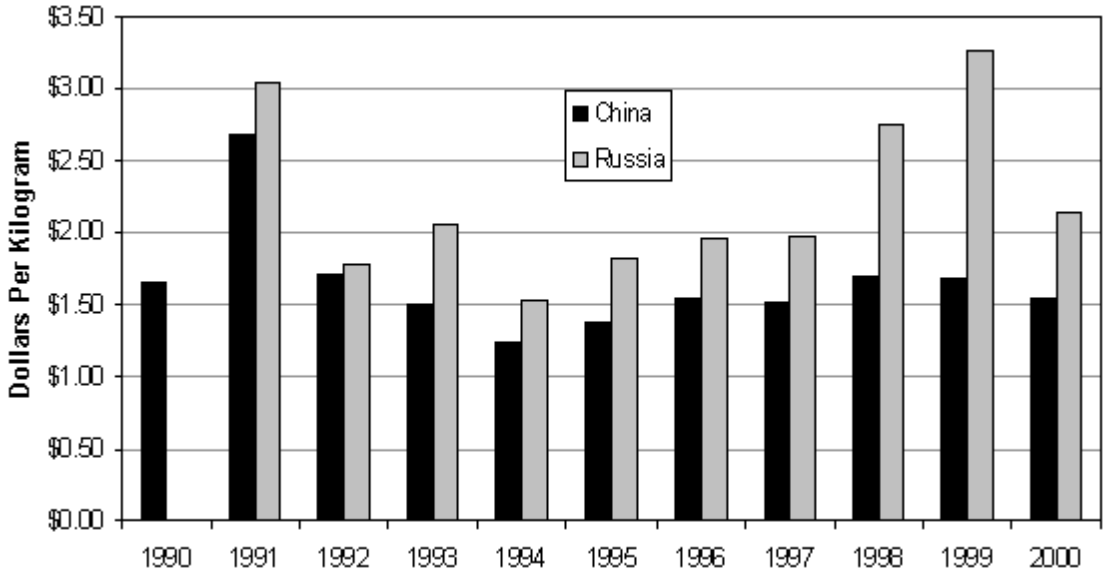
Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.21 U.S. Imports of Frozen Fillets and Blocks from Russia and China



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.22 Price /Kilo of U.S. Imports of Alaska Pollock Fillets and Blocks from Russia and China



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Alaska pollock is a member of the cod family, and pollock fillets compete with those of other cod-like species of fish in the world market. As recent as the late 1980s, the quick service and national seafood restaurant chains used Atlantic cod in their primary products. McDonald's was at the time the world's largest buyer of cod products.[25] When Atlantic cod harvests in Canada and the United States declined significantly in the early 1990s, many chains and smaller restaurants changed to other species. McDonald's and Long John Silver's moved to the more consistently available Alaska pollock as its main source of fillets.

2.3 Pacific Cod

Pacific cod (*Gadus macrocephalus*) is one of the two cod species of commercial importance in the world, the other being the far more abundant Atlantic cod (*Gadus morhua*). The geographic range of Pacific cod is the rim of the North Pacific Ocean, from the Yellow Sea off Korea, through the Bering Strait, along the Aleutians and the Gulf of Alaska, Southeast Alaska, Canada, to Oregon, although some are found as far south as Southern California. The Bering Sea is the center of abundance,[26] and the location of the largest quantity of catch. World harvests of Pacific cod have reached some 500,000 MT in the early 1990s, although it has ranged mostly around 400,000 MT during the past decade. The US leads all countries in harvest of Pacific cod.

Pacific cod is the second largest groundfish fishery in Alaska waters, following Alaska pollock. In the last several years, Pacific cod represented 13 to 15 percent of Alaska groundfish catch by volume, with an ex-vessel value in 1999 of $306.9 million.[27] The primary product forms include headed and gutted (H&G), fillets, and salted cod, but H&G is the most common processed product. Cod enters an international market, but much of it remains in the United States as IQF, or breaded and portioned, for use in restaurants and food service. The characteristics of the market are presented in this section.

2.3.1 Brief History of the Pacific Cod Fishery in Alaska Waters

Pacific cod has been sought commercially for a relatively short period of time compared to other fisheries. In the early 1960s, Japanese longline and trawl operations began fishing for Pacific cod, and in the early 1970s, vessels from the USSR joined the fleet. Foreign fisheries were replaced by joint ventures in the 1980s, and the joint ventures were phased out by 1988. World harvests of Pacific cod were generally less than 200,000 MT as recent as the early 1980s, but rose sharply to more than 400,000 MT a few years later, remaining near those levels today. The increased harvest coincided with the precipitous decline in world Atlantic cod harvests in the late 1980s, followed by the collapse of the Canadian Atlantic cod fishery in the early 1990s. Although Atlantic and Pacific cod are distinct species with some perceived differences, the shortage of Atlantic cod stocks allowed Pacific cod to make inroads into the market, as discussed below.

The fishery for Pacific cod is conducted with pot, bottom trawl, longline, and jig gear. In an attempt to avoid and reduce conflict among the gear groups, the Council implemented an allocation of the Bering Sea and

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[25] Geirsson, Magni, and Torbjorn Trondsen, "Frozen Cod Products in the U.S. Market," in *Econometric Modelling of the World Trade in Groundfish*, W.E. Shrank and N. Ray, eds., North Atlantic Treaty Organization, Scientific Affairs Division and Kluwer Academic Publishers, Boston, 1989.

[26] Draft Programmatic SEIS, p. 3.3-10.

[27] Hiatt, Terry, and Joe Terry, November 10, 2000, Table 36, p. 74.

Aleutian Island harvests between jig, fixed-gear, and trawl fisheries in the early 1990s. The amendment was reauthorized in 1996 with changes in the allocation and a further split between trawl catcher vessels and trawl catcher/processors. The fixed-gear allocation was further subdivided in 1999 between longline catcher/processors, longline catcher vessels, and pot gear vessels.[28] Coincident with the allocation measures and a 1995 Council Groundfish License Limitation Program, which reduced the number of vessels eligible to participate in the groundfish fisheries, was a general reduction in the number of vessels involved in the fishery, from 963 in 1995 to 631 in 1999 (see Table 2.2).

Table 2.2 Number of Vessels Catching Pacific Cod in Alaska by Year

Year	Hook/Line	Pot	Trawl	Total
1995	475	261	227	963
1996	288	214	231	733
1997	451	199	225	875
1998	393	218	207	818
1999	167	267	197	631

Source: Hiatt, Terry, and Joe Terry, "Stock Assessment and Fishery Evaluation Report for the Groundfish

Fisheries of the Gulf of Alaska and Bering Sea/Aleutian Island Area: Economic Status of the Groundfish Fisheries off Alaska, 1999," Socioeconomic Assessments Program, Alaska Fisheries Science Center, NMFS, Seattle, WA, November 10, 2000.

The trawl fishery is typically conducted in the first few months of the year, but fixed gear may operate nearly year-round. Because Pacific cod is often caught as bycatch during the crab and halibut seasons, the Pacific cod fishery often closes before the targeted cod fishery TAC is reached. Pacific cod is also taken as bycatch in the trawl fisheries for pollock, yellowfin sole, and rock sole in the eastern Bering Sea, the trawl Atka mackerel fishery in the Aleutian Islands region, and the trawl fisheries for flatfish, flounder, and flathead sole in the Gulf of Alaska.[29]

2.3.2 Supply and Harvests

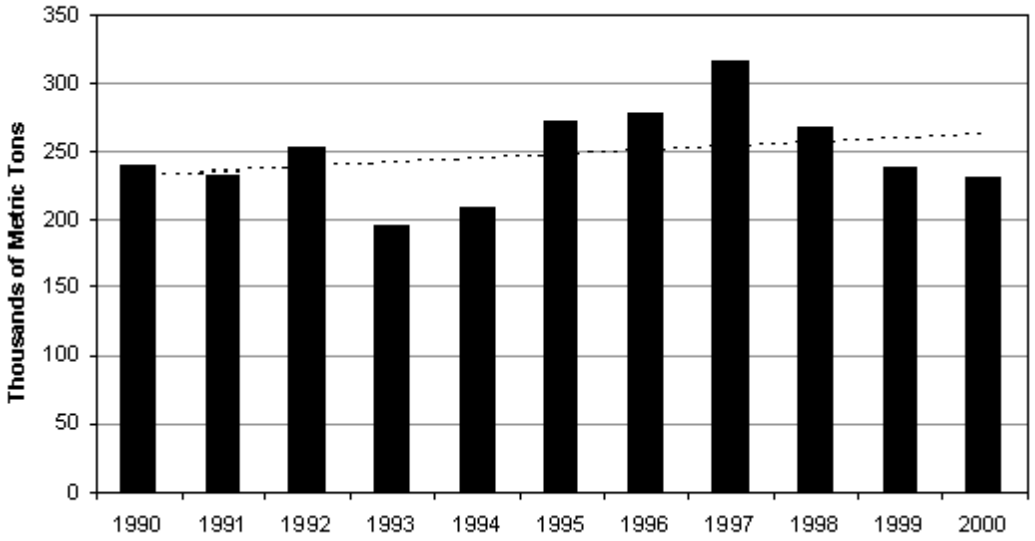
U.S. harvests of Pacific cod over the last ten years have varied greatly, ranging from a low of 194 thousand metric tons in 1993 to nearly 317 thousand metric tons in 1997 (see Figure 2.23). Almost all harvests occur in Alaska waters, with the largest share of the catch coming from the Bering Sea and Aleutian islands. Landings of Pacific cod are made throughout the year, but are highest in the months of February through May (see Figure 2.24). The ex-vessel price varied considerably over the period of 1990 through 1999.

Pacific cod are harvested not only from Alaska waters, but also in other parts of the North Pacific Ocean. The U.S. is the leading harvester of Pacific cod, followed by Russia and Japan, as shown in Figure 2.25. More than half the harvest is from U.S. waters.

[28] Draft Programmatic SEIS, p. 3.10-12.

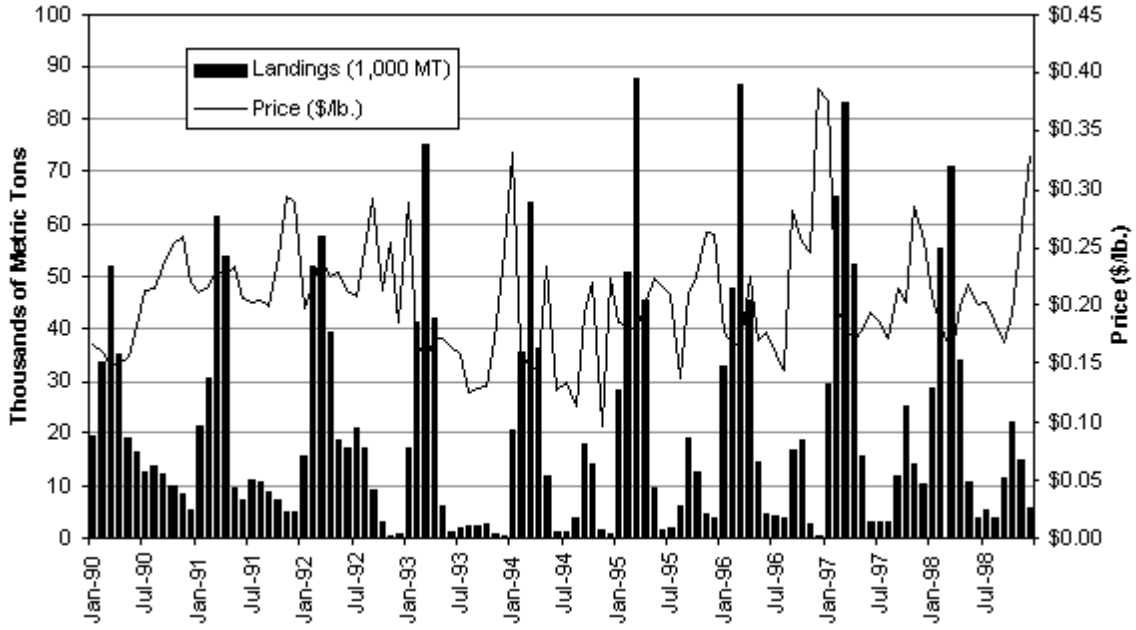
[29] Draft Programmatic SEIS, p. 3.3-15.

Figure 2.23 U.S. Pacific Cod Landings



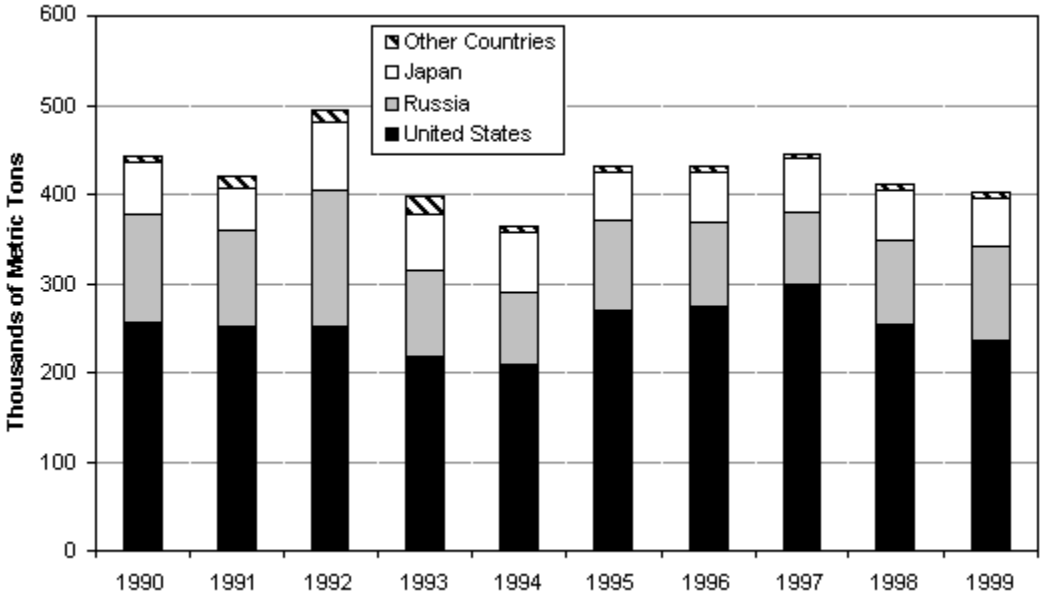
Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.24 Pacific Cod Landings and Price by Month for Alaska



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.25 World Harvests of Pacific Cod



Source: FAO, "FishStat" database.

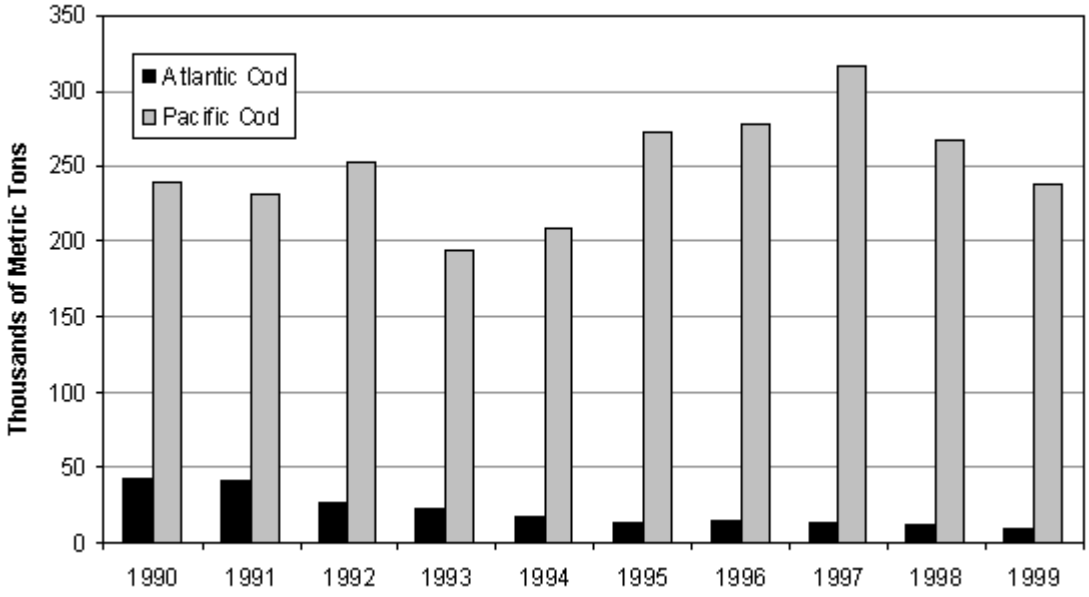
Because Pacific cod enters an international market with Atlantic cod where increasingly it is used interchangeably, it is useful to examine Atlantic cod supplies and harvests. U.S. Pacific cod annual landings are compared with Atlantic cod landings in Figure 2.26, demonstrating that Pacific cod landings are approximately ten times that of Atlantic cod. Landings of Atlantic cod declined from 43.7 thousand metric tons in 1990 to 9.7 thousand metric tons in 1999.

Atlantic cod is found in the North Atlantic Ocean, from Cape Hatteras in the U.S., along the North American coast, to Greenland, around Iceland, the coasts of Europe, to the Barents Sea. It is far more abundant than Pacific cod, and has been harvested for centuries. Pacific cod has varied between 20 and 30 percent of total cod harvests in the past decade.[30]

Overall catches of cod (Atlantic and Pacific combined) have decreased by more than 25 percent from the late 1980s to the present. As shown in Figure 2.27, world landings of 1.9 million MT in 1990 have declined to less than 1.5 million MT in 1999. Much of the decline can be attributed to the collapse of the Canadian cod stock in the early 1990s, previously the largest supplier of cod, and a less-precipitous decline in Icelandic stocks. Meanwhile, Norway and the Russia increased their share of cod harvest, but the stock managed jointly by both countries in the Barents Sea has also declined the last several years.

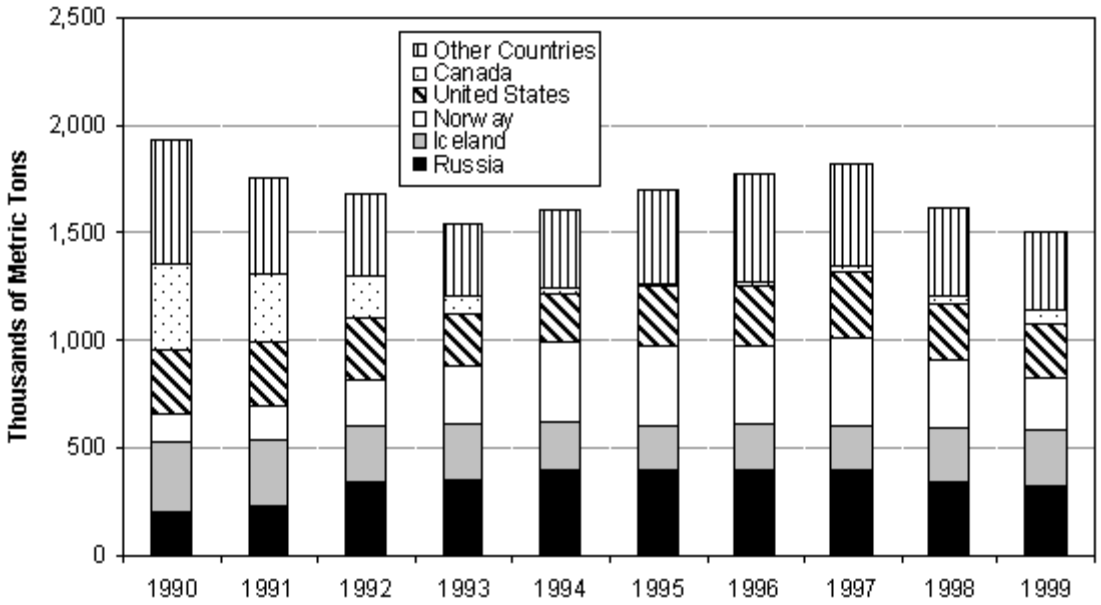
[30] Sjøholt, Trond, p. 56.

Figure 2.26 U.S. Pacific Cod and Atlantic Cod Landings



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.27 World Harvest of Cod



Source: FAO, "FishStat" database.

2.3.3 Product Forms

Pacific cod are processed into a variety of products which are sold in different markets in the United States and rest of the world, competing with production of cod products by other nations. The most valuable of the intermediate products to enter these markets are H&G, fillets, and salted forms.

NMFS estimates of the Pacific cod primary product forms and value from Alaska waters is shown in Table 2.3. Primary product is the form that results after initial processing of live fish. Value is first wholesale as derived by NMFS. Between 50 and 63 percent of the products by volume in each year is processed as H&G and then frozen. Fillets account for 15 to 20 percent of product weight but about a third of the overall value. The filleted form includes those sold as blocks, IQF, and shatterpacks, and fresh. The remainder of cod is salted, minced, or dried.

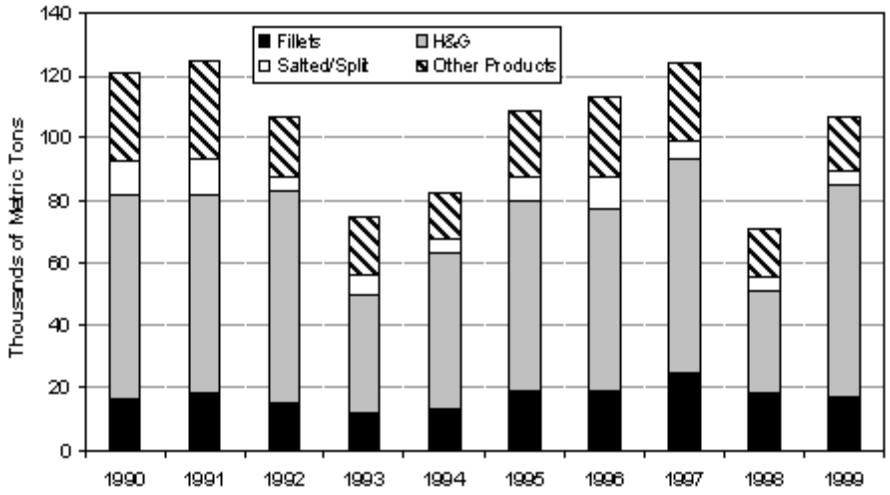
Table 2.3 Production of Pacific Cod Products in the Fisheries off Alaska

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Volume (1,000 MT)										
Fillets	16.8	18.3	14.9	12.5	13.3	19.2	19.3	24.5	18.3	17.4
H&G	65.4	63.7	68.3	37.3	50.5	60.9	57.7	69.0	32.9	67.5
Salted/Split	10.4	11.2	4.7	6.6	4.2	7.6	10.8	5.5	4.6	4.6
Other products	28.5	31.8	19.1	18.1	14.7	21.0	25.1	25.3	14.9	17.1
Total	**121.1**	**125.1**	**107.0**	**74.5**	**82.7**	**108.6**	**112.9**	**123.3**	**100.7**	**106.7**
Value ($ millions)										
Fillets	60.4	91.4	66.2	50.1	48.8	79.0	71.8	98.5	74.9	95.5
H&G	117.8	125.7	114.8	60.2	83.6	91.3	98.2	90.9	126.7	172.6
Salted/Split	35.7	43.1	15.9	16.3	6.4	18.5	23.6	12.0	11.2	17.3
Other products	31.8	35.9	21.4	18.7	15.7	29.0	30.9	24.8	15.9	21.4
Total	**245.7**	**296.1**	**218.3**	**145.3**	**154.5**	**217.8**	**224.6**	**226.1**	**228.6**	**306.9**

Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

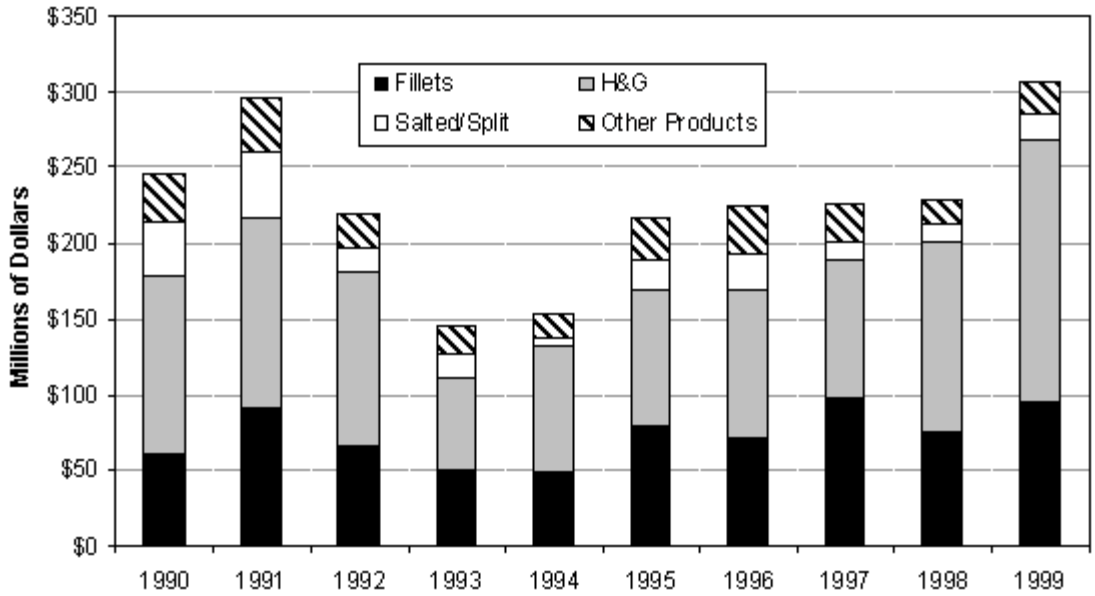
Figures 2.28 and 2.29 show changes over the past decade in total Pacific cod production and value from Alaska waters. The volume of production has fluctuated from year to year, reflecting differences in total harvest volume, but most of the fluctuation was absorbed by the H&G product form. Fillet volume remained relatively uniform over the period, and salted and other product forms remained at levels below 20 percent of total cod products. Value of product forms varied somewhat consistently with production volume, but reflect relative prices between the product forms. This is demonstrated by examining first wholesale prices for the past decade (Figure 2.30). Average annual prices for fillets were high in 1991, but remained below $2.00 per pound until 1999, when they rose to nearly $2.50 per pound. H&G prices were uniform on average through the 1990s, then shot to record high levels in 1998 before receding somewhat in 1999.

Figure 2.28 Volume of Production of Pacific Cod Products from Alaska Waters



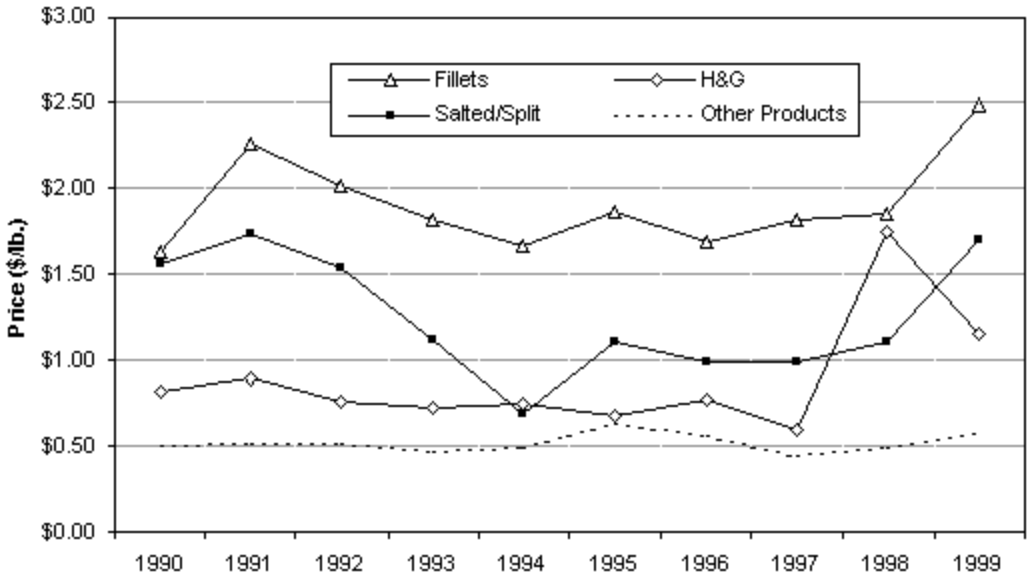
Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

Figure 2.29 Value of Production of Pacific Cod Products from Alaska Waters



Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

Figure 2.30 Average Prices of Pacific Cod Products from Alaska Waters



Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

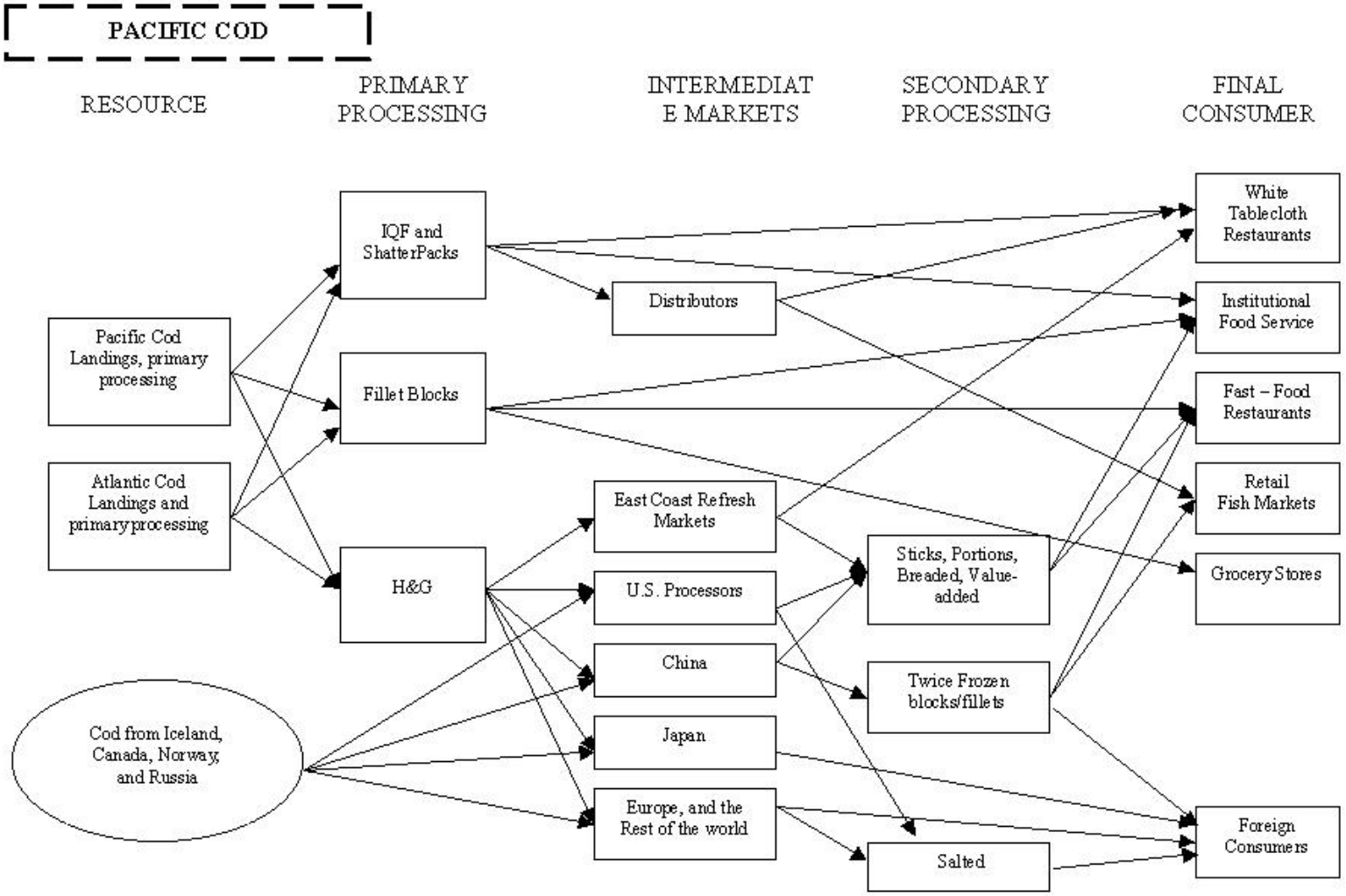
2.3.4 Resource and Product Flows

This section provides an overview of the market flow of Pacific cod from harvest and first processing to final consumer. An outline of the major marketing channels for Pacific cod is presented in schematic form in Figure 2.31. The figure shows the different types of processing of each product and the different markets that are served by the products. Pacific cod landings are represented as the primary resource, with U.S. Atlantic cod landings and foreign cod (which is mostly Atlantic cod) as related and competing resources. Pacific cod is processed as either H&G, fillet blocks, or individually frozen fillets, which are either individually quick-frozen or processed into shatterpacks. Other product forms (e.g., mince and oil) are not shown.

The three product types proceed through various market channels to several different final markets. The final markets, shown at the right of the diagram, include: fine or "white tablecloth" restaurants, institutional food service, quick-service restaurants, retail fish markets, grocery stores, and overseas markets. A brief description of the flows for each of the basic product types follows.

IQF fillets and shatter pack fillets of Pacific cod are used by both white tablecloth restaurants, by institutional food service, and by retail fish markets. In most cases, these products are used with the fillet still intact; hence the processing requires preservation of individual fillets. Larger institutional buyers or retail fish markets may buy the products directly from the processors, while smaller buyers typically purchase through a distributor.

Figure 2.31 Product Flow and Market Channels for Pacific Cod



Fillet blocks are used when the customer desires a product that requires a high degree of uniformity. Blocks are typically cut into smaller portions of uniform size and weight. Breaded fish portions as used in fish sandwiches or casual "fish and chips" style restaurants are typical of this type of use. Institutions, including hospitals, prisons, and schools, also purchase fillet blocks, as do some grocery retailers.

H&G Pacific cod is frozen after the first processing, and then proceeds to another processor within the U.S., or is exported for secondary processing. Some domestic H&G Pacific cod is sent to the East Coast refresh market, where it is thawed and filleted before being processed further, or sold as refreshed. Other U.S. processors may purchase H&G cod and further process it by cutting it into sticks and portions, or breading it for sale in grocery stores or food services. Foreign consumers, especially China, Japan, and Europe, also purchase H&G cod for further processing, including the production of salt cod. Salt cod is very popular in Europe, parts of Africa, and Latin America. Although most of the Pacific cod that becomes salt cod is processed outside the U.S., some U.S. processors are once again producing the product domestically for export, as they have at times in the past.

Some H&G cod obtained by China from the U.S. and other countries is further processed and re-exported to the U.S. This is shown in the diagram in the lower left corner, where cod from Iceland, Canada, Norway, and Russia is exported to China, where it is either breaded and portioned or thawed and refrozen into blocks, referred to as "twice-frozen fillet blocks." These twice-frozen blocks from China have gained considerable popularity in the U.S. during recent years, although the quality of the fish is reported to be lower than the quality of fish in single-frozen, U.S.-produced fillet blocks. Still, the twice-frozen blocks tend to be less expensive, and therefore provide some competition with the single-frozen blocks.

2.3.5 Headed and Gutted

Cod that is headed and gutted, or H&G, is processed with heads and guts (viscera) removed, unlike "dressed" fish, which are typically sold head-on and gutted. H&G is a less-expensive form of processing than filleting, and provides buyers with options for utilization of the net product without sources of contamination like the gills and guts.[31] H&G products generally require further processing.

Disappearance of H&G Pacific cod (67.5 million MT in 1999) is split among the domestic market and exports to Japan and other countries. Although industry experts indicate that the majority of H&G is exported, limitations in the available trade data from NMFS makes it difficult to determine with precision the portion that is exported.[32] Figure 2.32 indicates the quantity of all Pacific cod exports, excluding salted, dried, and minced, by country of destination.[33] The vast majority of these exports are probably in the H&G product form. In

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[31] *SeaFood Business*, "The Seafood Handbook," http://www.seafoodhandbook.com/harvest/ffforms.html, 1999.

[32] NMFS trade records do not specify an "H&G" product form for exports. Although exporters are required to report product form, the relevant categories for cod include only "fillet, frozen," "dried," "minced, frozen," "salted," "fresh," and "frozen." The largest category of export specified (75 percent of all cod exports) is "frozen."

[33] This was determined by isolating those exports of "cod" (species not specified) through the Anchorage and Seattle port districts. "Fresh cod" was included in this aggregation because, according to NMFS, a unknown portion of frozen has probably been improperly identified by exporters as "fresh" (Steve Koplin, NMFS, personal communication).

addition, most of these exports are destined for Japan. The balance are exported to South Korea, Canada, and Europe. Product sold to Korea is containerized and re-exported to Norway and elsewhere.[34]

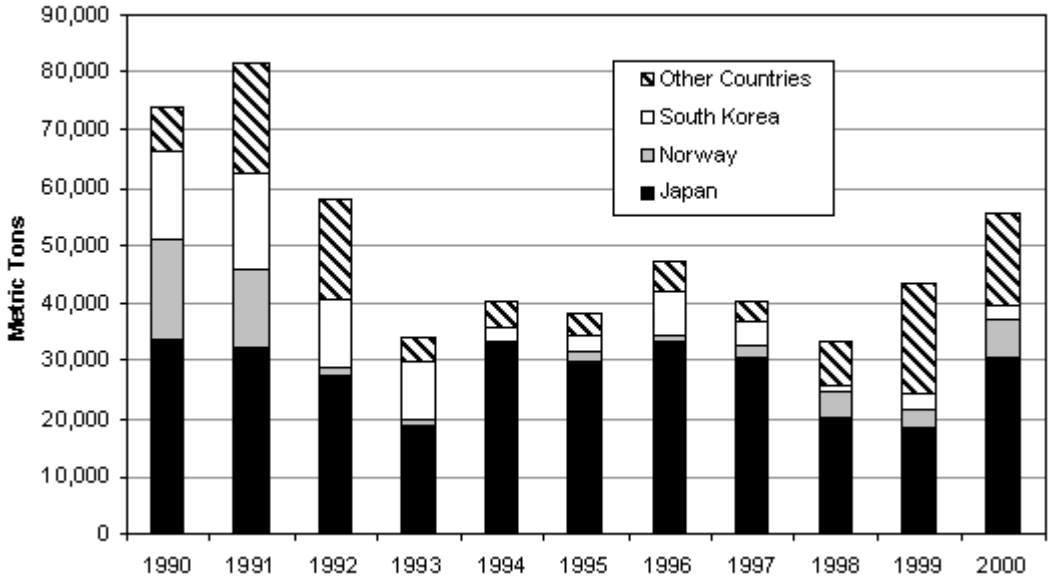


Figure 2.32 U.S. Exports of Pacific Cod, excluding Salted, Dried, and Minced

Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

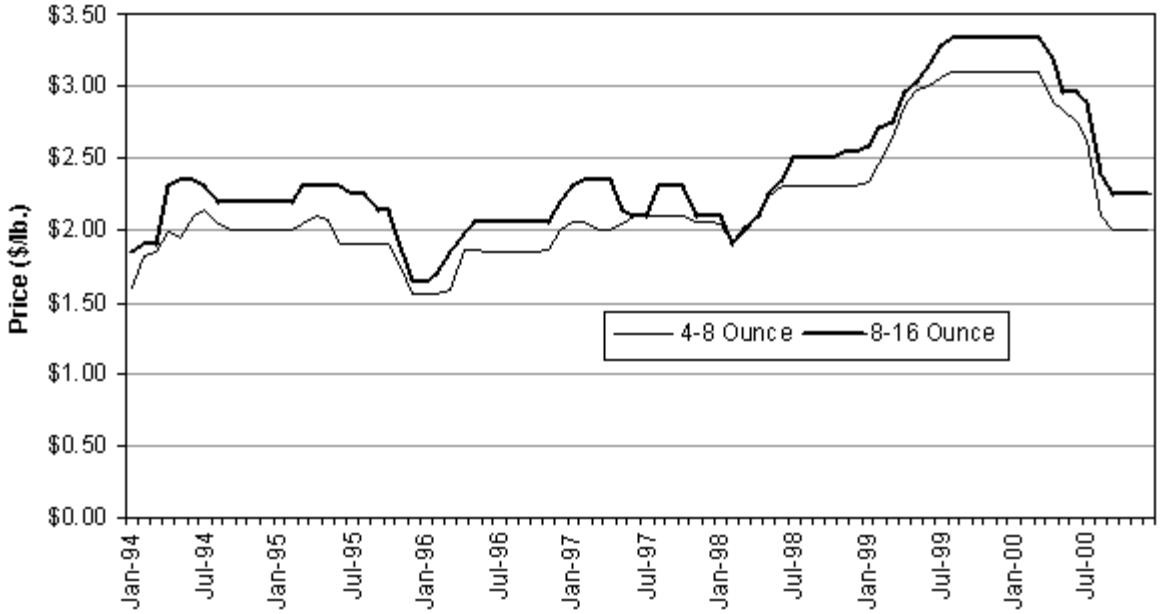
2.3.6 Fillets

After H&G, the most common product form produced from Pacific cod is the fillet. Fillets are processed and frozen into several different forms depending upon the final destination. Fillets are graded as 4-8 ounce, 8-16 ounce, 16-32 ounce, and 32+ ounce, and are packed either IQF, shatterpack, or layer pack. Cod blocks are also prepared for further processing, often portioned and breaded.

Pacific cod fillets are destined primarily for the domestic market. Most of the product is used in finer and casual restaurants, institutions, and retail fish markets. Wholesale prices for Pacific cod fillets sold in shatterpacks are shown in Figure 2.33. The average price per pound for 8-16 ounce fillet shatterpacks ranged from about $1.60 to $2.30 a pound from 1994 to 1998, then surged above $3.25 for much of 1999 before recovering in the latter half of 2000.

[34] Draft Programmatic SEIS, p. 3.10-119.

Figure 2.33 Wholesale Prices for "Alaskan" Cod Shatterpack Fillets

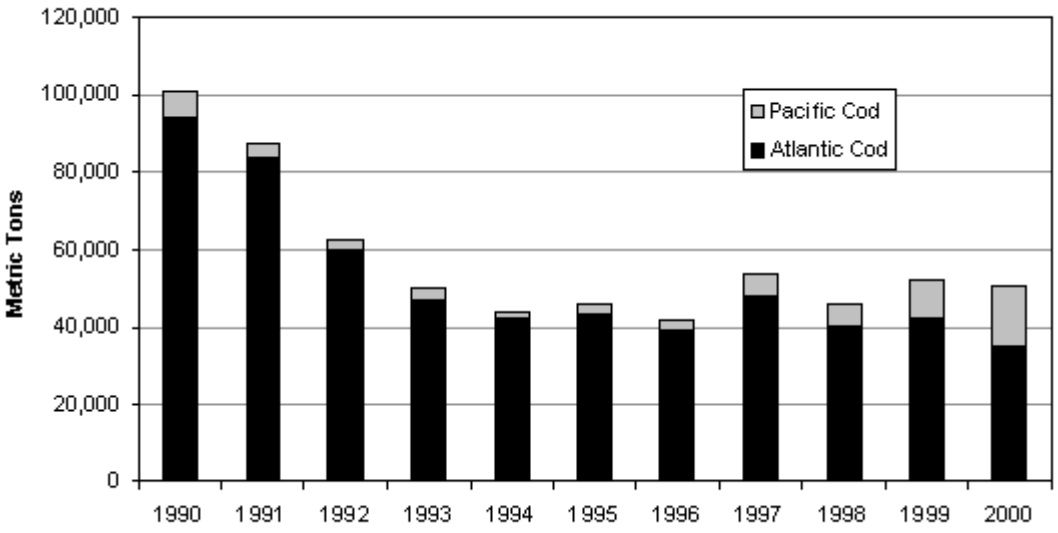


Source: Urner Barry, *Seafood Prices 2001*, Urner Barry Publications, Inc., 2001.

The U.S. is a net importer of fillets, although some U.S.-produced cod fillets are exported to Japan and elsewhere. The U.S. production of Pacific cod fillets has exceeded 20 thousand MT only once in the past decade, yet imports of cod fillets have exceeded 40 thousand MT every year in the same period (see Figure 2.34). Imports of cod have been primarily of the Atlantic species, although in 1999 and 2000, Pacific cod imports have increased in share. A closer examination of imports by country reveals an interesting picture of the changing situation in cod. Figure 2.35 displays the imports of Atlantic cod by country. In the early 1990s, Canada supplied the majority of Atlantic cod imports to the United States. When the Canadian stocks collapsed, no other country made up the lost share. Hence, imports of Atlantic cod fillets declined from more than 80,000 MT in 1991 to about 35,000 MT in 2000.

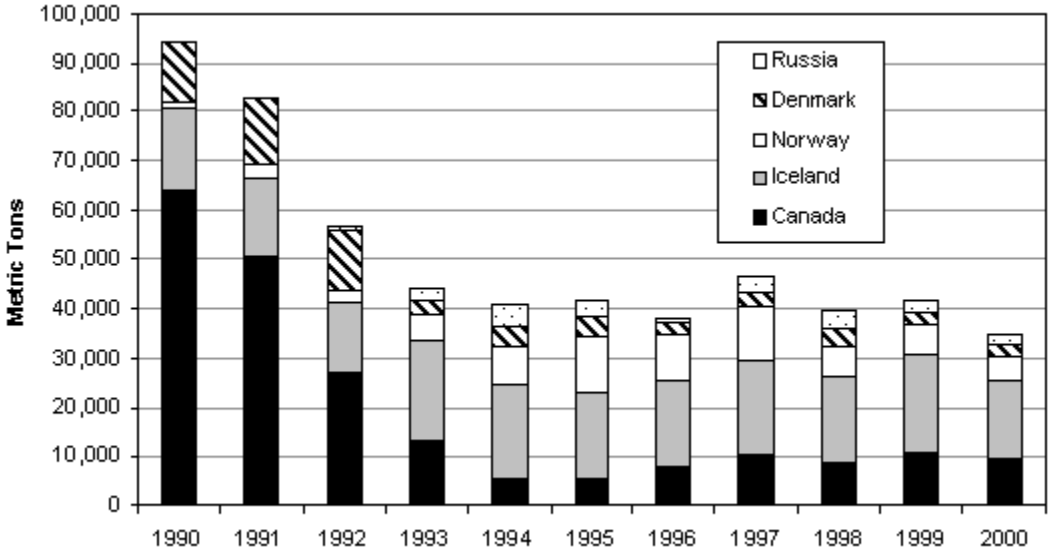
A contrasting situation is presented in Figure 2.36, which displays the imports of Pacific cod over the same period. Although the quantities of imports remain small compared to Atlantic cod, increases in the amount of Pacific cod imported from China the last several years has placed that country second in volume among those exporting cod to the U.S. The majority of cod imported from China is so-called "twice-frozen" fillets: imported by China as whole fish or H&G, thawed, reprocessed as fillets, and re-exported. The twice-frozen product is considered lower in quality and commands a lower price.

Figure 2.34 U.S. Imports of Atlantic and Pacific Cod Fillets



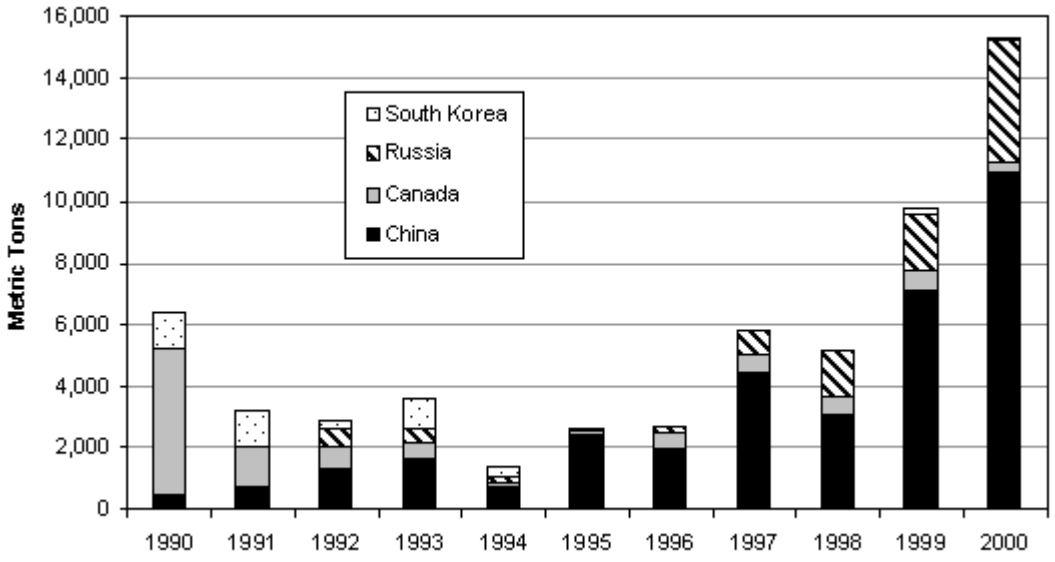
Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.35 U.S. Imports of Atlantic Cod Fillets from Major Importing Countries



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.36 U.S. Imports of Pacific Cod Fillets from Major Importing Countries



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Both Atlantic and Pacific cod appear to enter the same market with some degree of substitution. However, it is important to note that Atlantic cod has a long and well-established history in the U.S. market. Several industry representatives mentioned the distinct market niche of Atlantic cod, particularly on the east coast, and despite their attribute similarities, some differences do exist between the species.[35] This can also be demonstrated by a difference in the import prices of Atlantic and Pacific cod, as shown in Figure 2.37. In summary, Pacific cod is considered in the market to be an inferior product to Atlantic cod, but that may in part be the result of the firm market niche held by Atlantic cod. Nevertheless, reductions is availability of Atlantic cod fillets has provided opportunity for Pacific cod to enter the market.

The U.S. market for all fillets, particularly cod, has also been influenced by the increased production of aquaculture-grown whitefish. The species of greatest significance is catfish, but in recent years there have been increases in both domestically produced and imported tilapia. During the 1990s the production of catfish increased from 208 thousand MT in 1993 to 256 thousand MT in 1998,[36] virtually all of it consumed domestically.

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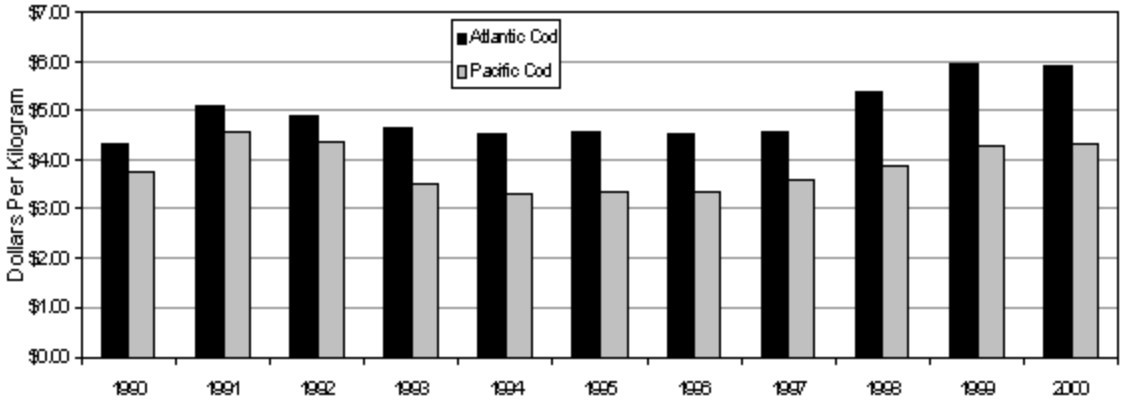
[35] According to *The Seafood Handbook*, "Atlantic cod fillets have a silvery, subcutaneous layer that distinguishes them from Pacific cod.... It's less firm than haddock and sweeter than Pacific cod.... The moisture content [of Pacific cod] is a little higher than that of Atlantic cod, making it less firm.... Use Atlantic and Pacific cod interchangeably, though Pacific cod produces larger, thicker fillets, and its moisture content makes breading difficult." (*SeaFood Business*, "The Seafood Handbook," http://www.seafoodhandbook.com/harvest/ffforms.html, 1999.)

[36] NMFS, *Fisheries of the United States, 1999*, Office of Science and Technology, Fisheries Statistics and Economics Division, October, 2000, p. 23.

Figure 2.37 Price per Kilo for U.S. Imports of Atlantic and Pacific Cod Fillets

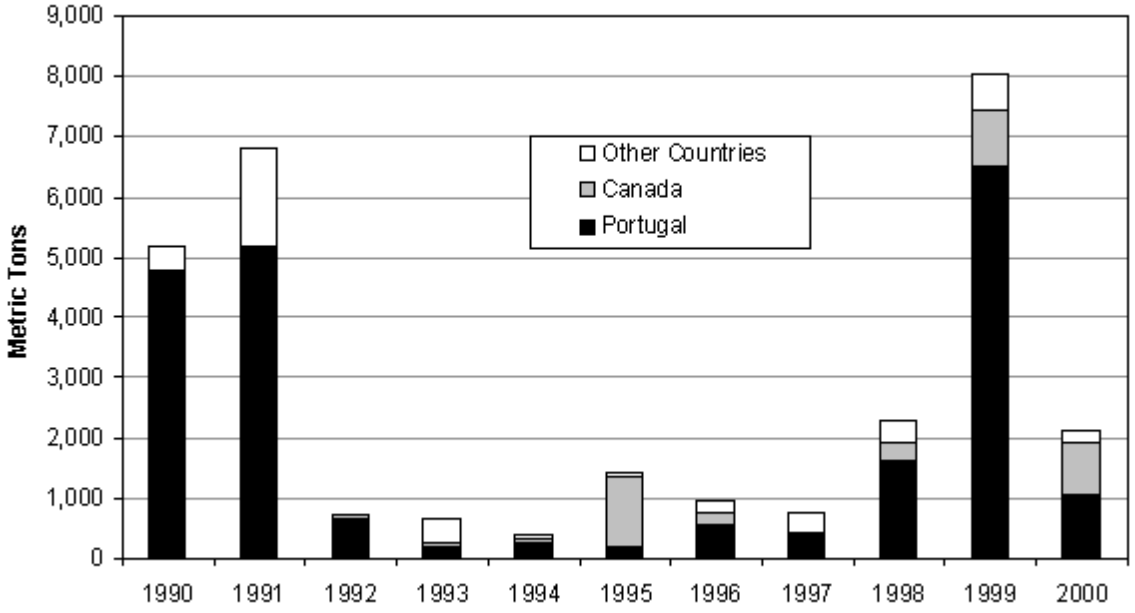


Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

2.3.7 Salted Cod

Salted, dried, minced, and other products account for about 20 percent of annual Pacific cod products by volume and 15 percent of the total value on average over the last five years. Salted cod, the largest of this group, is a traditional product enjoyed primarily by Europeans and Latin Americans. Consequently, most of the 6.6 thousand MT estimated to have been produced annually in the U.S. was exported. The quantity of salted Pacific cod exported through Anchorage, Seattle, and Portland districts is shown in Figure 2.38. Most was sent to Portugal and Canada.

Figure 2.38 U.S. Exports of Salted Pacific Cod, through Anchorage, Seattle, and Portland Districts



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

2.4 Atka Mackerel

Atka mackerel (*Pleurogrammus monopterygius*) are one of the most abundant groundfish species in the Aleutian Islands. They are distributed from the Kamchatka Peninsula throughout the Aleutian Islands and eastern Bering Sea, and eastward to Southeast Alaska, although the center of abundance is the Aleutian Islands.[37] Atka mackerel are an important component to the diet of other groundfish, seabirds, and marine mammals, mainly northern fur seals and Steller sea lions.[38]

Atka mackerel are the target of a directed trawl fishery which caught some 42 thousand MT in the Aleutian Islands in 2000.[39] The primary product forms are headed and gutted (H&G) and whole fish. Nearly all products are exported. The characteristics of the market are presented in this section.

2.4.1 Brief History of the Atka Mackerel Fishery in Alaska Waters

Atka mackerel have been targeted in the Aleutian Islands since at least the 1970s. Vessels from Russia, Japan, and Korea fished the waters near the Aleutians during this period, and annual catches peaked at 24

[37] Draft Programmatic SEIS, p. 3.3-36.
[38] Draft Programmatic SEIS, p. 3.3-37.
[39] Witherell, David, "Groundfish of the Bering Sea and Aleutian Islands Area: Species Profiles 2001," Report of the North Pacific Fishery Management Council, December 21, 2000.

thousand MT.[40] Foreign fisheries were replaced by joint ventures in the 1980s, and the fishery became entirely domestic by 1990. Harvests fluctuated considerably during the 1990s, and rose to a high of 88 thousand MT in 1996 before declining as a result of reduced stocks. Atka mackerel are not commonly caught as bycatch in other directed fisheries. The largest amounts of discards, which are likely undersized fish, occur in the directed Atka mackerel fisheries.[41]

The fishery is targeted by catcher/processor trawlers. In 1999, the fishery involved 17 catcher/processor vessels. In 2001 it is thought that at least three companies and eight boats are involved in the fishery, with five boats from one firm, two from a second, and one from a third.[42] The Atka mackerel fishery is regulated under the BSAI Groundfish Fishery Management Plan, which controls the fishery through permits, seasons, catch quotas, and gear restrictions. Beginning in 1994, the Atka mackerel fishery was apportioned among subareas of the Aleutian Islands. Seven and one-half percent of the TAC is allocated to Community Development Quota (CDQ) groups, and 2 percent is for vessels using jig gear. In 1999, the TAC was further allocated among known Steller sea lion critical habitat.[43]

2.4.2 Supply and Harvests

U.S. harvests of Atka mackerel take place almost entirely in the Bering Sea and Aleutian Islands. Landings during the last decade ranged from a low of 22 thousand MT in 1990 to 88 thousand MT in 1996, as shown in Figure 2.39. The pattern of harvest followed the TAC in the mid-1990s, and the sharp decline in harvests beginning in 1997 reflected the large drop in the biological stock size (and consequently, the TAC); the TAC in 1997 was just 63 percent of that in 1996. In recent years harvests have continued to decline, which is attributed to Steller sea lion protection measures.[44] During the 1990s the ex-vessel price has fluctuated considerably, from $0.13 to $0.15 per pound through 1995, to just $0.05 per pound in 1999 (see Figure 2.40). An important factor in the precipitous price decline is the degree and level of international competition.

World harvests of Atka Mackerel are shown in Figure 2.41. Japan leads all countries in landings with between 98 thousand MT and 241 thousand MT. The U.S. and Russia account for most of the balance. Although world harvests increased yearly through the 1990s, the Japanese harvest was significantly smaller in 1999 than in the previous year, the result of restrictions placed on the Japanese trawl fleet. This led to the first decrease in world supply in a decade.

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[40] Witherell, David, December 21, 2000.

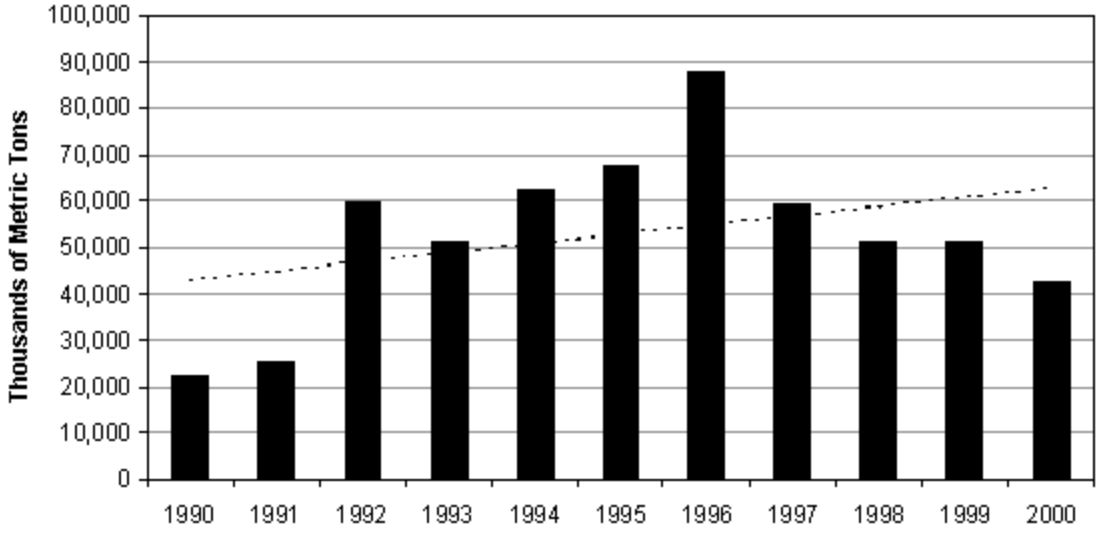
[41] Draft Programmatic SEIS, p. 3.3-39.

[42] Personal communication, Andy Smoker, NMFS, Alaska Region, May 14, 2001.

[43] Witherell, David, December 21, 2000.

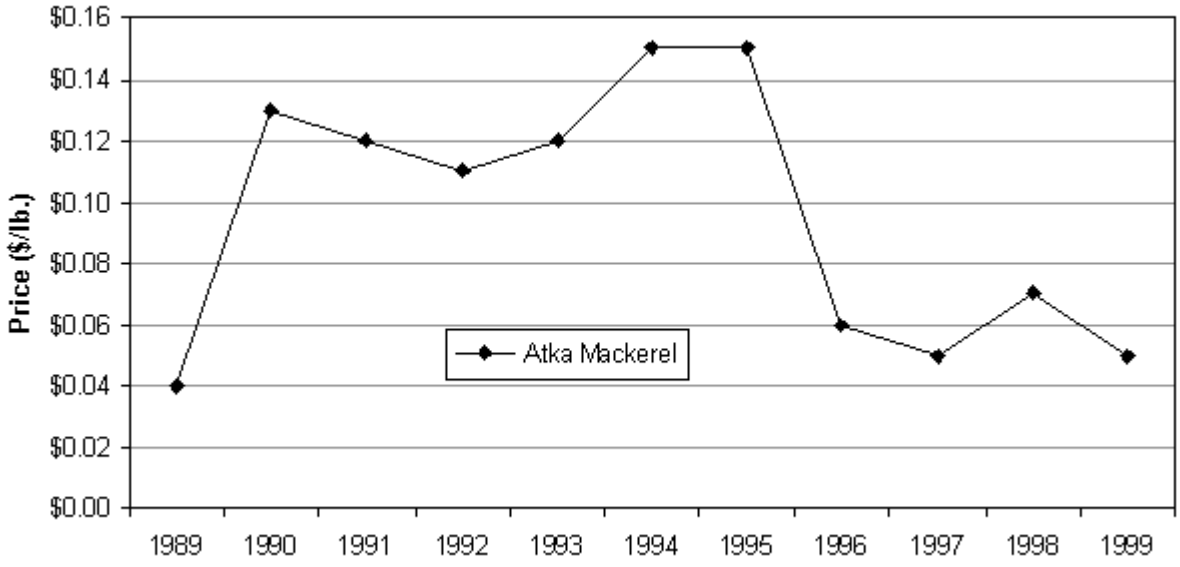
[44] Witherell, David, December 21, 2000.

Figure 2.39 U.S. Atka Mackerel Landings



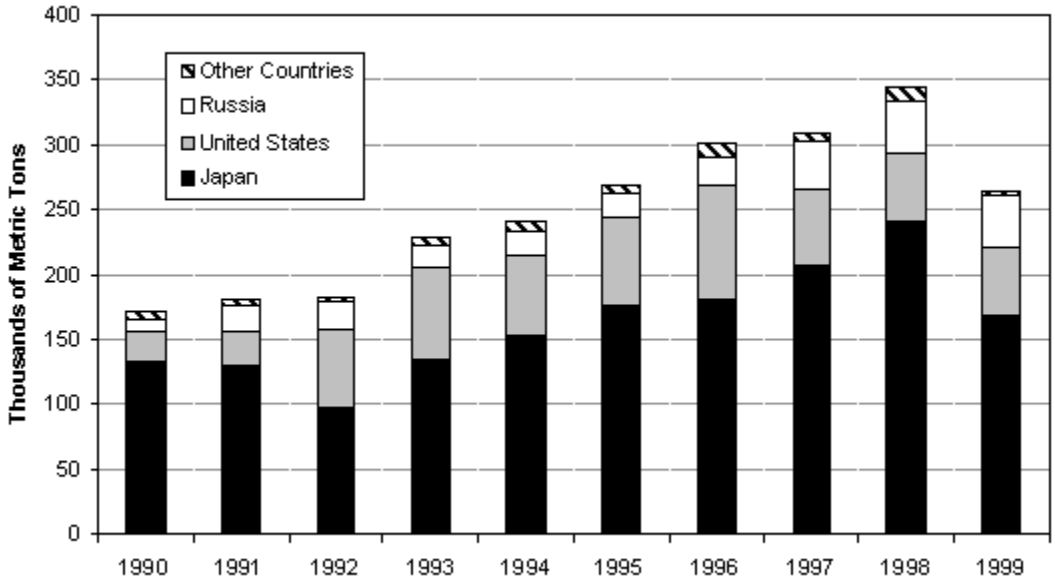
Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.40 Atka Mackerel Ex-Vessel Price in the U.S.



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.41 World Harvests of Atka Mackerel



Source: FAO, "FishStat" database.

2.4.3 Product Forms

Atka mackerel are processed almost exclusively as H&G or sold as whole fish. A small portion has in the past been processed into surimi. Nearly all Atka mackerel products enter the export market destined for Japan, South Korea, or China. NMFS estimates of the Atka mackerel product forms and value from Alaska waters is shown in Table 2.4. Primary product is the form that results after initial processing of live fish. Value is first wholesale as derived by NMFS. Between two-thirds and three-quarters of the products by volume in each year is processed as H&G and then frozen. The balance remains as whole fish.

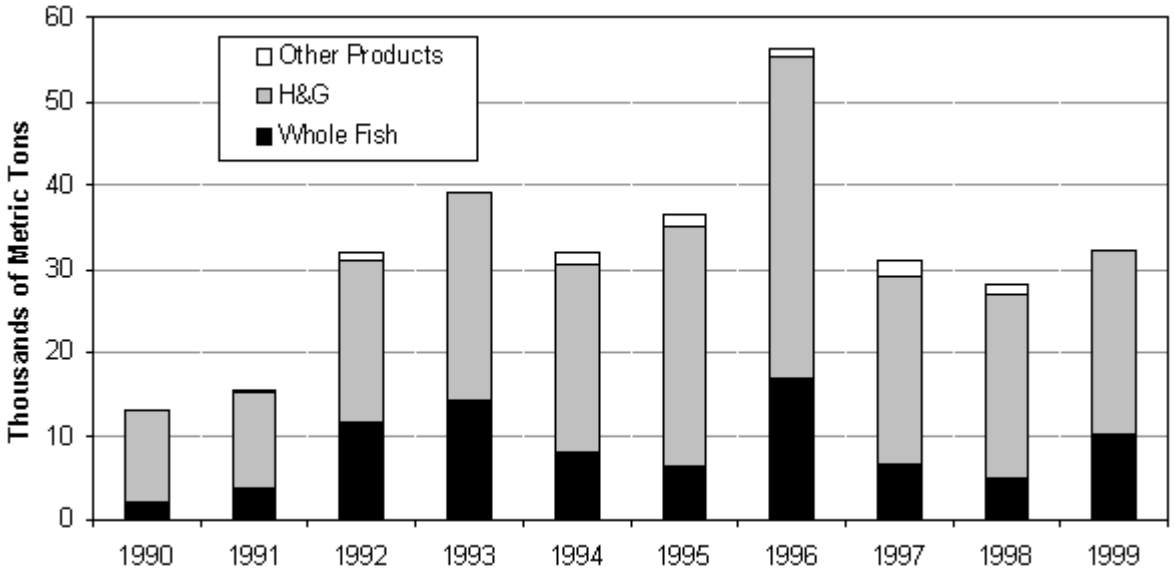
Figures 2.42 and 2.43 show changes over the past decade in total Atka mackerel production and value from Alaska waters. The volume of production has fluctuated from year to year, reflecting differences in total harvest volume, but most of the fluctuation was absorbed by the "whole fish" product form. Value of product forms varied fairly consistently with production volume, but reflect relative prices between the product forms. This is demonstrated by examining prices for the past decade (Figure 2.44). Average annual prices for Atka mackerel products declined from year to year since the peak in 1990. This is due primarily to the fact that final demand is almost entirely limited to Japan and the quantity available to Japanese consumers has increased steadily over the same time period.

Table 2.4 Production of Atka Mackerel Products in the Fisheries off Alaska

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Volume (1,000 MT)										
Whole Fish	2.0	3.8	11.5	14.2	8.1	6.4	16.7	6.8	4.9	10.1
H&G	11.0	11.3	19.5	24.8	22.4	28.6	38.8	22.3	22.0	22.2
Other products	0.0	0.2	1.0	0.0	1.5	1.4	0.8	1.8	1.1	0.0
Total	**18.1**	**15.3**	**32.0**	**39.0**	**32.0**	**36.4**	**56.4**	**31.0**	**27.9**	**32.4**
Value ($ millions)										
Whole Fish	4.2	5.2	12.8	11.7	6.2	5.3	15.1	4.2	2.5	4.7
H&G	21.7	23.3	32.1	42.2	21.9	36.3	52.9	30.0	15.1	18.2
Other products	0.0	0.1	2.1	0.0	2.2	2.6	0.8	2.5	0.8	0.0
Total	**25.9**	**28.6**	**47.0**	**53.9**	**30.3**	**44.3**	**68.7**	**36.7**	**18.4**	**22.9**

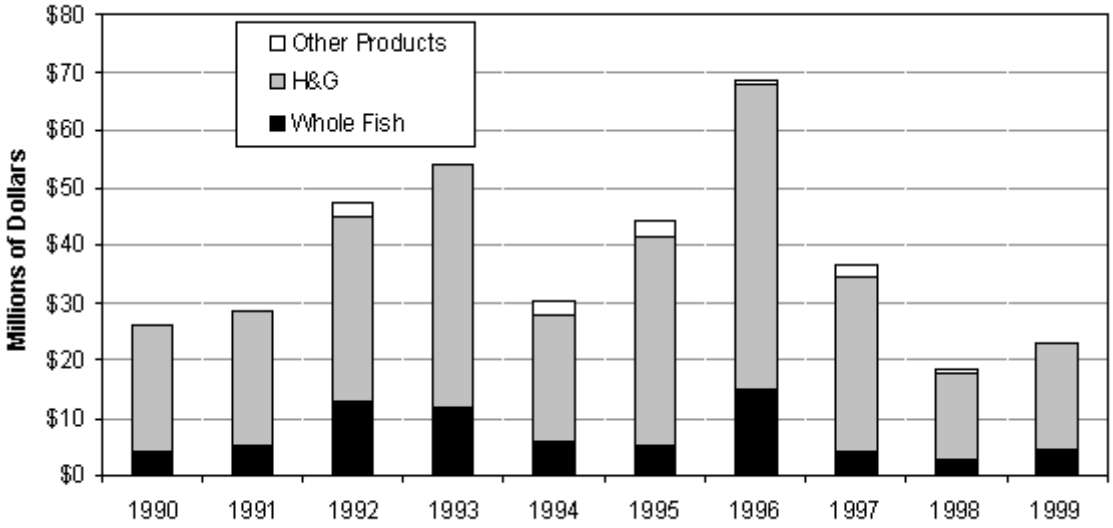
Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

Figure 2.42 Volume of Production of Atka Mackerel Products from Alaska Waters



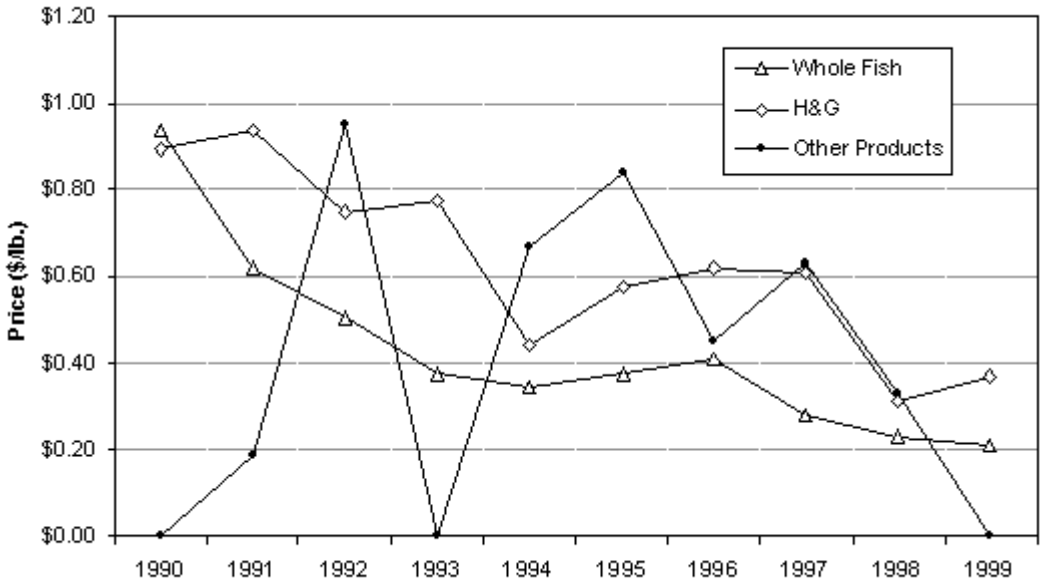
Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

Figure 2.43 Value of Production of Atka Mackerel Products from Alaska Waters



Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

Figure 2.44 Average Prices of Atka Mackerel Products from Alaska Waters

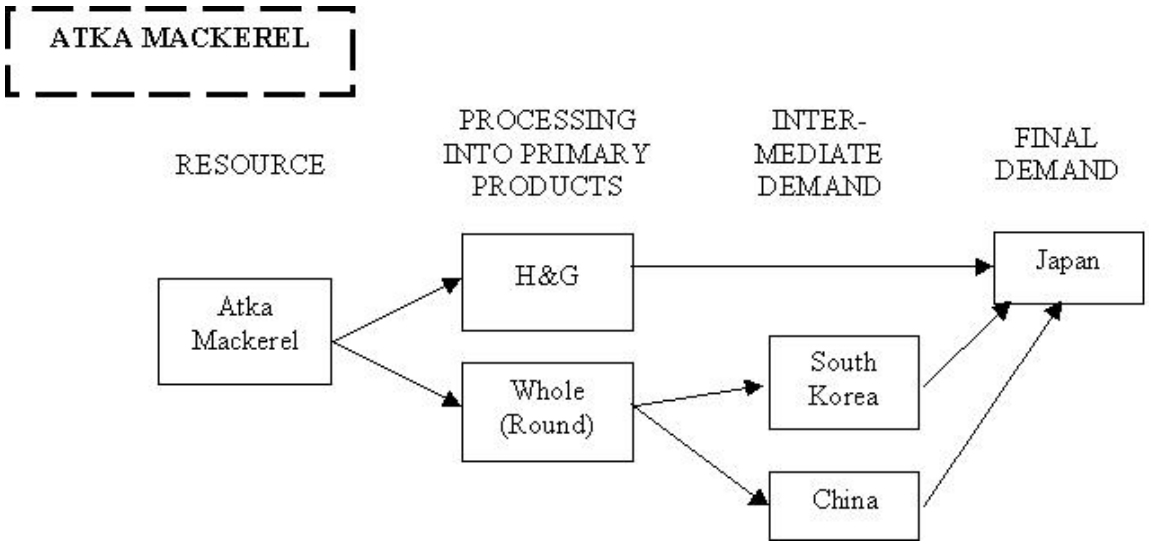


Source: NMFS, "Economic Status of the Groundfish Fisheries off Alaska," various reports.

2.4.4 Resource and Product Flows

An outline of the marketing channels for Atka mackerel is presented in schematic form in Figure 2.45. Atka mackerel are harvested by catcher/processors and processed as either H&G or whole fish. Japanese imports are primarily of H&G product form, while South Korea (and to some extent, China) import whole fish. Most of the product going to South Korea and China is thought to be reprocessed and re-exported to Japan.

Figure 2.45 Product Flow and Market Channels for Atka Mackerel

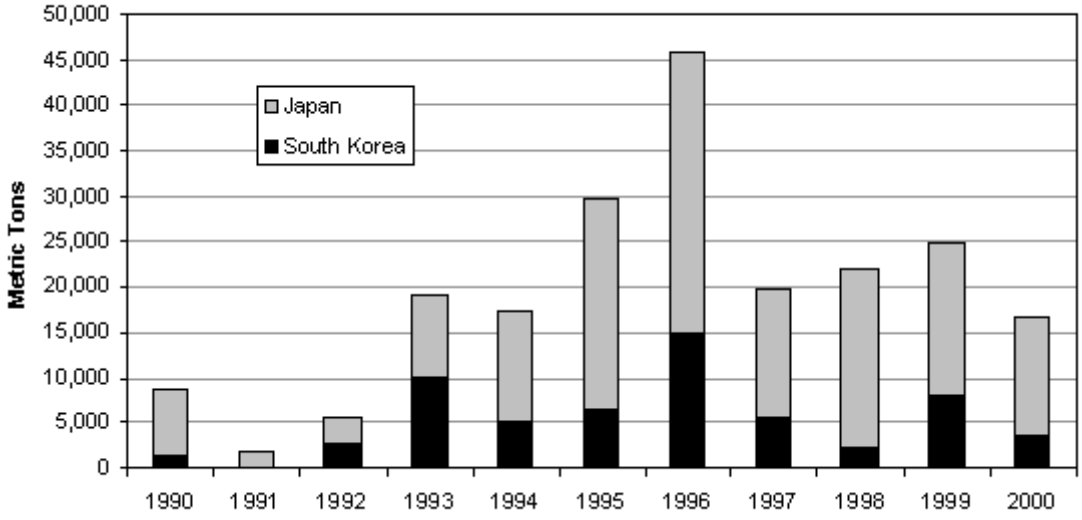


2.4.5 Headed and Gutted

Atka mackerel that is headed and gutted, or H&G, is processed with heads and guts (viscera) removed. In Japan, the mackerel is then split, salted, and grilled. This is reportedly a popular food consumed at social gathering establishments.

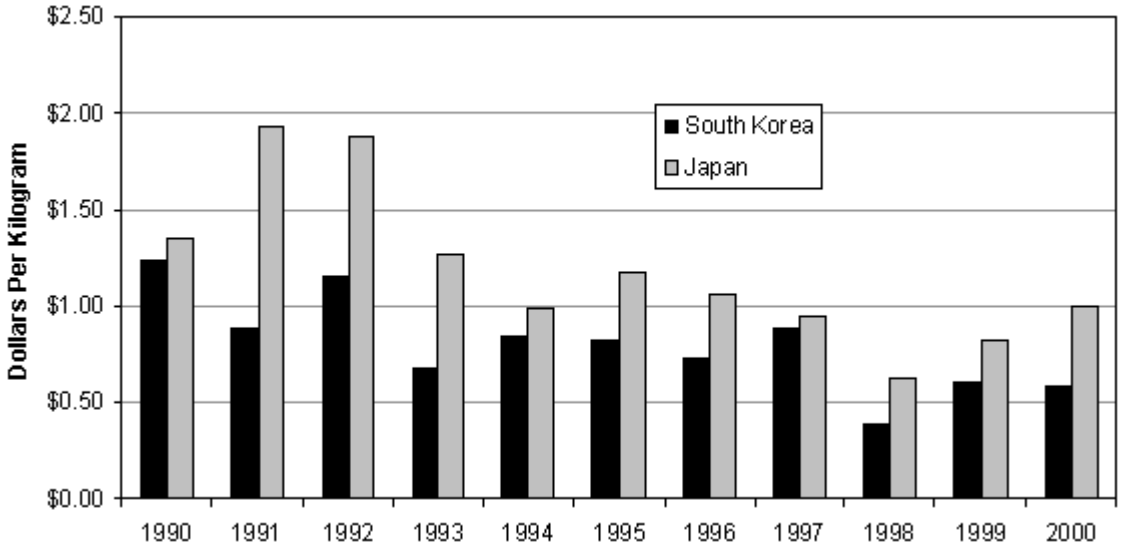
Exports to Japan and South Korea are shown in Figure 2.46, and export prices are shown in Figure 2.47. The export volume closely mirrors the production (and landings) patterns shown in Table 2.4 and Figure 2.39. Considerable year to year variability can be seen in exports to each country, which reflects both a combination of harvests and relative prices (for H&G in Japan and whole fish in South Korea) between the two countries. H&G requires more processing labor than whole fish, so must command a higher purchase price. As prices for whole fish near those for H&G (for example, in 1997), more raw fish will be sold whole. As prices diverge (as in 1998), relatively more will be sold in the H&G processed form.

Figure 2.46 U.S. Exports of Atka Mackerel to Japan and South Korea



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

Figure 2.47 Price per Kilo for U.S. Exports of Atka Mackerel to Japan and South Korea



Source: Personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD.

3.0 DATA AVAILABILITY AND COLLECTION

3.1 Federal/Public Statistics

Data related to landings, exports, and imports of the various relevant groundfish species were obtained from the Fisheries Statistics and Economics Division of NMFS, using databases accessed via the website, http://www.st.nmfs.gov/st1/. All data from this source is cited as "personal communication, NMFS, Fisheries Statistics and Economics Division, Silver Spring, MD." In a few instances, where recent data were not yet available via the website, data were also obtained through special requests directly to NMFS Alaska Fisheries Science Center. Landings data were only available through 1999 on the NMFS national website; data for 2000, where available, were obtained from the NMFS Alaska Region Office (website: http://www.fakr.noaa.gov/).

Data on landings presented within this report are based upon the U.S. domestic commercial landings data collected by NMFS. These include those fish and shellfish that are landed and sold in the 50 states by U.S. fishermen and do not include landings made in U.S. territories or by foreign fishermen. Aquaculture products are not included in landings of groundfish species. Because of confidentiality concerns, federal statutes prohibit public disclosure of information that would allow identification of the data contributors and possibly put them at a competitive disadvantage. Thus, data for individual species may, in some cases, be incomplete. Nevertheless, these data represent the best and most comprehensive information available on landings.

The principal landing statistics collected are "pounds" and "ex-vessel" dollar value identified by species, year, month, state, county, port, water, and fishing gear. The data used in this report are only the pounds (round, or live, weight) and ex-vessel value by species. Landing data are collected at the state level from seafood dealers who submit monthly reports of the weight and value of landings by vessel. States are also gathering more landings data through mandatory trip-tickets. In that case, at the conclusion of every fishing trip, seafood dealers and fishermen record landings by species on trip-tickets, and may include other data such as fishing effort and area fished.

U.S. trade data (exports and imports) are maintained by NMFS in databases form for fishery products from years 1975 to present. NMFS receives the data from the Foreign Trade Division of the Bureau of the Census, after Census has compiled information submitted by importers and exporters to the U.S. Customs Service. Detailed data are available categorized by year and month, fish species and product (categorized using ten character commodity codes), country (origin for import data, or destination for export data), U.S. Customs district, and whether it is an import, export, or re-export. The volume (in kilograms) and value (dollars) of the product are provided for each data record.

The database contains information on three types of trade: imports of fishery products, exports of fishery products, and re-exports of fishery products. Data for imports include imports for "consumption," which is a combination of entries into the U.S. for immediate consumption, and withdrawals from Customs bonded warehouses. These data represent the actual entry into U.S. consumption channels of commodities originating outside the U.S. during a certain time period. Exports include commodities (in this case, fishery products) which are grown, produced, or manufactured in the United States and sold outside the U.S. market. For statistical purposes, domestic exports may also include commodities of foreign origin which have been changed from the form in which they were imported or enhanced in value through manufacturing in the U.S. These re-exports include commodities which have entered the U.S. as imports, were not sold, but are re-

exported in the same condition as when imported. If the items were imported for sale in the U.S. market and later were resold overseas, they are recorded as "exports" rather than re-exports.

For exports and re-exports, the value presented is the f.a.s. (free alongside ship) value, which is defined as the value at the port of export, based on the transaction price including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier. It excludes the cost of loading, freight, insurance, and other charges or transportation costs beyond the export port. For imports, the value presented is the Customs value, which is generally defined as the price actually paid or payable for merchandise when sold for exportation to the U.S. It excludes U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the U.S. market. This value approximates a foreign f.a.s. value similar to the f.a.s. value for U.S. exports.

3.2 Japanese/International Statistics

The significance of Japan with respect to the demand for groundfish products requires that any analysis of markets include Japanese statistical records. In general, Japanese statistical information is considered thorough, detailed, and very reliable. The difficulty for researchers is in acquiring a full set of time series data related to specific, often relatively obscure, consumption patterns within Japan. Much of the Japanese consumer expenditure information for various products originates from the "Annual Report on the Family Income and Expenditure Survey," an annual publication of the Ministry of Agriculture, Forestry, and Fisheries (MAFF). The data were available in various forms, from secondary sources, electronic website (http://www.statgo.jp/english/), and full published reports. The time series is complete from 1996 through March 2001. The website also provided some population and income data.

A considerable amount of inventory, transaction, and price data was provided by the trade publication, *Bill Atkinson's News Report*. This periodical recounts market information and periodical data series from the perspective of Japan. Much of the price information was provided through this publication. Data on fish paste and surimi imports, consumption, and prices were obtained from the 2001 edition of the Japanese book, "Power Seafood Data Book," prepared by the (Japan) Seafood Daily News.

Some international fish harvest, production, and trade data were available from the Food and Agricultural Organization (FAO) of the United Nations, from their website (http://www.fao.org), the FishStat database, periodicals (e.g., *Globefish*), and various recent special publications. Our reliance on these international data sources was fairly limited, and was used only to supplement gaps of information.

3.3 Industry Data

Representatives from various fishing industry firms and organizations were interviewed to provide background information used in this study. The information requested included descriptions of products types, the nature of the markets for different products, and insights into current market trends. The representatives included salespeople, processor managers, seafood exporters, association representatives, and researchers. Several people served as ongoing resources, answering questions that developed during the study, or reviewing and providing comments on resource flow and market channel diagrams. Several industry representatives provided documents that contained additional data and information used in the report.

Wholesale price information was obtained from price series developed by Urner-Barry in their annual publication, *Seafood Price Current.* These included price series for Alaska pollock fillets, blocks, and twice-frozen blocks (imports).

3.4 Data Limitations

In general, data for landings, production, product form, and ex-vessel prices in the United States are available and fairly complete for recent years. This is true in spite of the variability found in product forms and the changes that have taken place over the past decade in the fisheries off Alaska among suppliers.

U.S. trade data (imports and exports) are readily available from the NMFS website in database form. However, there are limitations to the quality of the data that range from minor to substantial, depending on the species, product form, or time series required. This occurs because of the reporting requirements of – and degree of compliance by – importers and exporters of fish products. For example, an importer may specify that fillets are "Pacific cod," "Atlantic cod," or "cod." In some cases, the reported species is probably an error (such as "Pacific cod" imported from Denmark, where only Atlantic cod is harvested). In other cases, commonly used groupings for similar species lead to difficulties in isolating specific trends: "whiting" or "hake" may be used interchangeably for the wide number of hake and grenadier species that serve as substitutes for Alaska pollock and Pacific cod. As a result of these limitations, there is some inconsistency inherent in the data, not all of which could be resolved.

International trade and landings data, primarily that from FAO, for Russia, China, and many developing countries is useful for trends, but of limited value for absolute quantities. In many cases, the reporting standards and data available from these countries are inadequate for more than just general guidance.

4.0 TREND ANALYSIS

4.1 Conditions Affecting the World Market for Groundfish

Groundfish catches have decreased worldwide in the last decade.[45] In aggregate, the decrease in supply will push consumer prices higher and reduce consumption. The extent to which this will take place will depend in part upon the relative prices of groundfish products and those of meat, poultry, and salmon. Also playing a role is the financial situation in major demand markets of Japan, the United States, and Europe. Numerous past studies have indicated that the demand for groundfish is elastic, so that poor economic conditions in demand centers will cause (proportionally) large decreases in the amount of product demanded.

4.2 Conditions Affecting the Alaska Fishing Industry

The American Fisheries Act of 1998 (AFA) provided the most recent and fundamental change to the fishing industry in Alaska. Although the act targeted the pollock fishery, the implications have been felt to some extent in other commercial fisheries by virtue of the size of the pollock fishery and the interrelationship among some catcher vessels and processors. The AFA changed the Bering Sea fishery in several ways: (1) it eliminated nine catcher/processor vessels from fishery participation; (2) it revised the allocation of the fishery

[45] Sjøholt, Trond, *The World Market for Groundfish*, FAO.

among the inshore and offshore sectors, and among the offshore sector catcher/processors, motherships, and catcher vessels; and (3) it provided for the formation of fishing cooperatives, on a staggered schedule.

By nearly all accounts, the effect of the Act, on cooperative members in particular but on other aspects of the fishery as well, has been very positive, even "profound." Among the changes that have taken place is a 24 percent reduction in the size of the active pollock fleet by the transferring of quota within the cooperative.[46]

Conditions in the Japanese economy since 1998 have had an important effect on market conditions for Alaska seafood products. The major collapse of the economy in southeast Asia led to an economic slowdown in Japan, which caused Japanese consumer demand to slow. The yen weakened significantly, and the exchange rate dropped to a low of 144 yen per dollar in August 1998. The weak yen and slackened demand placed great pressure on Alaska producers. The economy has since recovered somewhat, and the Japanese yen has strengthened against the dollar.

4.3 Alaska Pollock - Recent and Future Trends

The single most important exogenous factor affecting the market for Alaska pollock is the future of Alaska pollock harvests in the Russian zone. As noted earlier, Russia supplies the largest share of Alaska pollock to the world market, and competes directly with supplies from U.S. waters off Alaska in all three major product areas. In the past several years, the TAC in Russia has been reduced each year. However, there is general consensus that the Russian stock of Alaska pollock has been overfished and that recovery will take at least several years. Adding to this is financial difficulty in the Russian fishing industry, and an uncertain future. In 2000, an estimated 150 million pounds of finished product were produced, and early estimates for this year suggest that landings will decline 30 percent.[47] The declining trend of harvests from Russian waters suggests a favorable market outlook for pollock from the EEZ off Alaska over the next few years due to tightening world supply.

Americans ate more fish (at 15.3 lbs. per capita) in 1999 than at any time since the 1980s. Alaska pollock ranked fourth overall at 1.57 lbs., after tuna, shrimp, and salmon, in per capita consumption. Consumption of fillets and steaks remained at about 3.2 lbs., while consumption of sticks and portions increased from 0.9 lb. in 1998 to 1.0 lb. per capita.[48]

4.3.1 Impacts of the AFA

To date, the AFA has been credited with a positive impact on the production of pollock fillets at the expense of surimi production.[49] By giving cooperative members more certainty among at-sea processors regarding their share of the fishing quota, the "race for fish" essentially stopped. That gives processors more time to

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[46] Loy, Wesley, "Dividing the Fish," *Pacific Fishing*, November, 2000.

[47] Redmayne, Peter, "Species Focus: Alaska pollock," *Seafood Business*, March, 2001.

[48] NMFS, *Fisheries of the United States*, 1999.

[49] U.S. General Accounting Office, *Fishery Management: American Fisheries Act Produces Benefits*, GAO/RCED-00-176, June 29, 2000, p. 2.

process their catch into fillets, which takes longer to produce than surimi. Also attributable to a slower process is an increased product recovery rate, leading to more product per unit of fish caught; the Pollock Conservation Cooperative (PCC) catcher/processors estimated that their recovery rate increased 35 percent in 2000 over a 1998 (pre-AFA) baseline.[50] Furthermore, within the first year of the cooperative (1999), the resulting product mix by PCC members between surimi and fillet production changed only slightly from the year before. However, the fraction of high value, deep-skin fillets increased substantially, with offsetting decreases in the production of lower grade mince and block fillets.[51]

4.3.2 Surimi Market

A long-term trend of reduced surimi demand in Japan has been noted elsewhere in this report. However, surimi has a small but growing interest in South Korea and elsewhere, including the United States. If harvests in Russia decline over the next several years as expected, producers in Alaska will be in a position to supply much of the balance of demand. This is particularly true if pollock surimi is viewed by Japanese consumers as superior to surimi made from other species.

Processors of pollock from the waters off Alaska will face a greater opportunity, under the AFA and particularly in the "A" season, to respond to market conditions with respect to production of surimi or fillets (or other product forms). Some processors indicated they are responsive to expected revenues from surimi and fillets as reflected in the market. This may not be true to the same extent for those in-shore processors that are predominantly Japanese-owned, who tend to tailor production to supply the surimi market. The likely outcome might be only small changes in the aggregate amount of surimi produced in Alaska as compared to the recent past.

4.3.3 Roe Market

Roe products are traditional foods, and Japanese demand may gradually decline to the extent that younger generations of Japanese consumers tend to prefer more Western food in their diet. There has also been an association made between reduced interest in roe and declining rice consumption at home among Japanese.[52] Over the longer term, Japanese and Korean demand for pollock roe will also have an important effect on market conditions.

Total Japanese pollock roe imports have been decreasing over the past few years, primarily as a result of declining imports from Russia. Declining total imports, together with declining pollock roe inventories, led to a steep decline in total pollock roe supply available to the Japanese market between 1997 and 2000. A comparison of Japanese pollock roe supply from all sources with average import prices shows a clear inverse relationship between total pollock roe supply and average import prices.

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[50] "Joint Report of the Pollock Conservation Cooperative and High Seas Catchers' Cooperative," presented to the North Pacific Fishery Management Council, January 31, 2001, p.19.

[51] Criddle, Keith R. and Seth Macinko, "Political Economy and Profit Maximization in the Eastern Bering Sea Fishery for Walleye Pollock," IIFET 2000 Proceedings, July 12, 2000, p. 3.

[52] Foreign Agricultural Service, "Japan Seafood, Japanese Fish Roe Report (Salmon and Cod/Pollock), 1999," U.S. Department of Agriculture, GAIN Report #JA9160, December 17, 1999.

The AFA is also believed to have benefited the market for roe. With a more relaxed fishing environment, catcher vessels may be better able to harvest and process roe at times that are optimal for quality. This, combined with better economic conditions in Japan, may explain recent strong prices for roe.

As with surimi, future Russian supply seems likely to be the most important factor affecting future pollock roe markets. The likelihood of further reductions in Russian pollock harvests over the next few years suggests a favorable market outlook for Alaska pollock roe. Over time, U.S. processors should have the opportunity to continue to capture further market share from Russian processors.

4.3.4 Fillet Market

The primary market for pollock fillets from U.S. EEZ waters off Alaska is the domestic market. However, there is now considerable competition from imported fillets of Alaska pollock. Russia has supplied as many as 20,000 MT annually of single-frozen fillets for the past five years, but China's twice-frozen blocks and fillets have grown to create a new segment of the market. In addition, pollock fillets have begun to enter the European market, especially Germany, in the last five years, and general shortages in global whitefish supplies have led to high single-frozen pollock prices.

The quality of single-freeze fillets coming from processors is said to be higher than that of a few years ago. This is attributed to the formation of cooperatives under the AFA, which allows catchers and processors to handle catch more carefully.[53]

In 1999, Chinese processors purchased a large quantity of H&G pollock from Russia and aggressively marketed twice-frozen product to buyers in the United States. Low prices for twice-frozen and high prices for single-frozen fillets created an opportunity for a shift among buyers, despite the lower quality. Although some recovery of prices has since taken place, substitution between products is expected to remain a part of the market.

The market for deep-skin pollock blocks is subject to some of the same competition as the single-frozen fillets. However, most deep-skin fillets are processed under contract in part to ensure a consistent and available supply of product. There is also evidence that, because of the AFA, processors are producing deep-skin rather than regular fillets.

Competition among buyers for the deep-skin product has led to greater reliance on substitute species, including hake and hoki fillet blocks. There is also a recent shift towards consideration of twice-frozen blocks as a substitute for the deep-skin product, as it is reportedly of higher quality than in the past.

4.4 Pacific Cod - Recent and Future Trends

The Pacific cod fishery has provided to the domestic market steady supplies of cod and cod products throughout the 1990s during a time when Atlantic cod landings have fallen. During this period, U.S. landings of Atlantic cod fell considerably from over 35 thousand MT annually to under ten thousand MT. In recent

[53] "Alaska Pollock," *Seafood Business Buyers Guide*, October, 2000, http://www.seafoodbusiness.com/.

years, some buyers have switched from cod to pollock because of higher cod prices and the uncertainty of cod supplies.

International trade is an important factor in the market for Pacific cod, as it is for cod in general. Shortfalls in world cod stocks as recently as 1998 caused European and Japanese buyers to bid up demand and prices for Pacific cod. The U.S. is a net importer of cod fillets, but a net exporter of other cod product forms, which are primarily made up of H&G cod. A strengthening dollar may dampen future exports, especially to Japan. However, because of continued declines in the Barents Sea stocks off Russia and Norway, and increasing demand associated with population increases, industry analysts tend to be positive about prices in the near future.

Although Atlantic cod remains the dominant species in the U.S. cod fillet market, Pacific cod has made some inroads into that well-established niche. But price differences between Atlantic and Pacific cod indicate that the two are not viewed as perfect substitutes. Furthermore, there is additional competition and segmenting of the market taking place. The growing quantity of cheaper "twice-frozen" fillet imports from China provides a lower-cost alternative to traditional cod buyers. Second, aquaculture-grown whitefish is increasing in the share of the market, and this trend is expected to continue in the future.

4.5 Atka Mackerel - Recent and Future Trends

The U.S. and Russia are currently the only primary source of Atka mackerel for Japan because of reduced quotas and restrictions on the Japanese trawl fleet.[54] At the same time, supplies have been further reduced by a court injunction temporarily restricting U.S. landings. In late 2000, Japanese inventories were still plentiful, which helped meet the demand from Japanese processors. In early 2001, catches of Atka mackerel were still low after Japanese inventories and catches had both been drawn down, and the price of Atka mackerel rose. While higher prices may have begun to affect consumption,[55] industry experts believe that demand for Atka mackerel may be fairly inelastic, hence prices will strengthen in the face of declining supplies. The opinion that demand may be inelastic is based on speculation that these recent supply shortfalls will continue to improve prices. Although traditional Japanese foods are in general thought to be losing favor among Japanese youth who show an increasing preference for western foods, the popularity of Atka mackerel appears to be able to withstand such trends. It is still not clear whether Atka mackerel will become a premium product in Japan, or whether it will be supplanted by other substitute products such as grilled sardines.

5.0 APPLICATION OF PROTECTIVE MEASURES FOR THE STELLER SEA LION

5.1 Introduction

Five alternatives have been identified in the EIS, to which this markets analysis is appended and upon which it is based, which target harvest areas, season length, or TAC for Alaska pollock, Pacific cod, and Atka mackerel. Detailed descriptions of the alternatives are provided in the EIS, but the names corresponding with each alternative are identified as follows:

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[54] *Bill Atkinson's News Report*, September 27, 2000.

[55] *Bill Atkinson's News Report*, February 24, 2001.

Alternative 1: No action
Alternative 2: Low and slow
Alternative 3: Restricted and closed areas
Alternative 4: Area and fishery specific
Alternative 5: CH catch limits

In this section, we analyze the impacts of the alternatives on the markets associated with products from Alaska pollock, Pacific cod, and Atka mackerel which may be attributable to the various Steller sea lion (SSL) protection alternatives. Specifically, we provide a discussion of the anticipated impacts of the alternatives in terms of the market, including prices, quantities produced, product forms and mix, market share and market penetration, product quality, balance of trade, and final consumers.

NMFS provided the anticipated changes in quantity of retained landings for each species associated with three of the alternatives. These quantities are determined by sector, region (Gulf of Alaska and Bering Sea/Aleutian Islands), and first and second half of the year. The quantitative estimates for the three alternatives provide sufficient information to infer the impacts for the remaining two.

5.2 Changes in Harvested Volume

The scenarios provided by NMFS include Alternative 1 (No Action), Alternative 2 (Low and Slow), and Alternative 4 (Area and Fishery Specific). The retained annual landings for these three alternatives are shown in Tables 5.1, 5.2, and 5.3. The alternatives reflect the application of rules to the Allowable Biological Catch (ABC) for 2001, using vessel patterns based on 1999 records. Details on the approach for estimating harvest level changes are provided in the RIR.

Table 5.1 Alternative 1 "No Action" - Retained Annual Landings

		Total Metric Tonnages		Metric Tons "at risk"		Metric Tons not "at risk"	
		GOA	BSAI	GOA	BSAI	GOA	BSAI
Atka mackerel	CDQ	0	5,198	0	1,725	0	3,473
	Jig	0	144	0	0	0	144
	Trawl	0	63,958	0	7,579	0	56,379
Pacific cod	CDQ	0	17,928	0	45	0	17,883
	Fixed<60	17,236	125	98	0	17,138	125
	Jig	813	319	22	0	792	319
	Longline-CV	702	1,723	0	62	701	1,662
	Longline-CP	1,961	92,696	0	248	1,961	92,448
	Pot-CV	6,169	14,631	20	161	6,148	14,469
	Pot-CP	2,835	4,259	11	56	2,824	4,203
	Trawl-CV-S	7,800	5	210	0	7,590	5
	Trawl-CV-M	12,269	31,675	178	787	12,091	30,887
	Trawl-CV-L	355	7,873	13	307	341	7,566
	Trawl-CP-Fillets	11	6,000	2	672	9	5,328
	Trawl-CP-H&G	698	10,767	40	1,240	658	9,527
Pollock	CDQ	0	140,000	0	2,520	0	137,480
	CV-Shoreside	99,350	604,800	764	3,871	98,586	600,929
	CP	0	483,840	0	6,580	0	477,260
	MS	0	120,960	0	1,972	0	118,988

Table 5.2 Alternative 2 "Low and Slow" - Retained Annual Landings

		Total Metric Tonnages		Metric Tons "at risk"		Metric Tons not "at risk"	
		GOA	BSAI	GOA	BSAI	GOA	BSAI
Atka mackerel	CDQ	0	1,716	0	1,085	0	631
	Jig	0	48	0	0	0	48
	Trawl	0	21,104	0	8,236	0	12,868
Pacific cod	CDQ	0	10,125	0	1,590	0	8,535
	Fixed<60	9,068	221	763	7	8,305	214
	Jig	2,509	474	511	16	1,999	458
	Longline-CV	447	301	41	26	406	274
	Longline-CP	615	85,189	315	11,726	300	73,463
	Pot-CV	5,988	8,703	680	234	5,308	8,469
	Pot-CP	3,505	3,161	3	27	3,502	3,135
	Trawl-CV-S	2,550	2	1,713	0	837	2
	Trawl-CV-M	6,199	15,133	2,100	12,294	4,100	2,839
	Trawl-CV-L	99	3,008	59	2,165	41	842
	Trawl-CP-Fillets	3	1,964	2	643	1	1,321
	Trawl-CP-H&G	656	6,698	137	3,747	519	2,951
Pollock	CDQ	0	113,659	0	32,273	0	81,386
	CV-Shoreside	44,508	431,341	35,817	163,531	8,691	267,810
	CP	0	392,808	0	49,741	0	343,067
	MS	0	98,211	0	15,008	0	83,203

Table 5.3 Alternative 4 "Area and Fishery Specific" - Retained Annual Landings

		Total Metric Tonnages		Metric Tons "at risk"		Metric Tons not "at risk"	
		GOA	BSAI	GOA	BSAI	GOA	BSAI
Atka mackerel	CDQ	0	5,198	0	2,563	0	2,635
	Jig	0	144	0	0	0	144
	Trawl	0	63,958	0	18,900	0	45,058
Pacific cod	CDQ	0	19,628	0	337	0	19,291
	Fixed<60	15,171	134	1,463	6	13,708	127
	Jig	3,470	352	0	0	3,470	352
	Longline-CV	745	1,648	77	278	668	1,370
	Longline-CP	1,186	93,896	172	3,660	1,014	90,236
	Pot-CV	8,605	14,491	3,321	2,035	5,284	12,456
	Pot-CP	3,775	4,399	96	793	3,679	3,606
	Trawl-CV-S	4,977	4	692	0	4,285	4
	Trawl-CV-M	11,693	30,037	1,310	391	10,383	29,646
	Trawl-CV-L	252	7,446	55	268	197	7,178
	Trawl-CP-Fillets	7	5,675	4	880	3	4,796
	Trawl-CP-H&G	968	10,289	46	1,081	921	9,208
Pollock	CDQ	0	140,000	0	14,336	0	125,664
	CV-Shoreside	99,348	604,800	10,795	18,991	88,553	585,809
	CP	0	483,840	0	11,032	0	472,808
	MS	0	120,960	0	2,903	0	118,057

Assumptions were made with respect to interpretation of the estimates. In particular, "total metric tons not at risk" was the quantity used to reflect harvest under the alternative. Strictly speaking, the portion that is "not at risk" is the quantity that is not directly restricted by the proposed action. While it can be argued that some of the tons "at risk" could, in fact, be caught through compensating changes such as vessel location, harvest behavior, or increased cost, the minimum harvest levels (those "not at risk") can be interpreted as providing the worst-case scenario impact.

5.3 Impacts of the Alternatives

5.3.1 Product Mix and Quantity of Products Supplied to the Market

For Alternative 1, the retained landings of pollock were anticipated to be 1,433,243 metric tons. This baseline level of harvest is anticipated to allow processors to supply product quantities to the market at levels comparable to, or somewhat higher than, those of recent years. Pollock landings were just over 1.2 million MT in 2000, which yielded 191 thousand MT of surimi, 62 thousand MT of fillets, 16 thousand MT of roe, and 95 thousand MT of other products, as shown earlier in Table 2.1.

Under Alternative 2, retained harvests are reduced by 43 percent from the baseline estimate. The impact of this reduction will severely affect production of all pollock products. However, the reduction is expected to affect fillet production to a greater extent than surimi. This is due in part to supply contracts and vertical integration among surimi processors, particularly those that are located inshore, with wholesalers and retailers

in Japan. Thus, surimi production would be reduced by a substantial amount – perhaps 25 percent or more – but is not likely to decline in as high a proportion as landings, all else remaining equal.

It was suggested by several industry contacts that, should area closures cause catcher vessels to harvest from sites farther from processors, the additional time required for catchers to haul raw fish to shore will affect the ability of inshore processors to produce high quality fillets. As a result, they may produce proportionally fewer fillets and more surimi than at present. To the extent that the Alternative 2 reduces the availability of larger-sized pollock generally sought for fillets, production of fillets will decline. Thus, reductions in pollock landings as may be experienced in Alternative 2 are likely to have a large effect on fillet production.

The impact on roe supply would be substantial under Alternative 2. The harvesting of roe is limited to a very short period of the year and, given the financial importance of roe to processors, the focus of catcher vessels and catcher/processors will be on targeting the overall TAC toward maximizing roe harvest to the greatest extent possible . Even under these conditions, potential roe harvest could be as little as half that of the no-action alternative.

This is predicated on the assumption that catcher vessels and catcher/processors will continue to operate in the fishery. Though little is known publicly about the cost structure within the pollock fishery, it is generally thought that revenues from roe help to offset costs of production in the other product forms and through the remainder of the year. If the total revenues generated from sale of roe are reduced in large measure on a permanent basis, the fishery as a whole could effectively cease, with repercussions felt throughout all product forms and by pollock markets and consumers.

The balance of trade in the U.S. will be affected as a result of these supply changes. Losses on the export side will be felt from reduced surimi and roe supplies, as the vast majority of these products are sold overseas.

Under Alternative 4, the retained harvests are reduced by a very small amount. This change in landings will result in only small impacts in the supply of surimi, fillets, and roe. The change in supply is not likely to be noticed at the consumer level, and processors are equally unlikely to change product mix explicitly in response to reduced landings. There will be accompanying impacts to the balance of trade.

The baseline alternative for Pacific cod involves retained landings of 234,675 MT. This represents 98 percent of the initial projected retained harvests, and is not expected to alter product composition in any noticeable way. An additional 4,172 MT would be considered at risk. The "at risk" portions in the baseline scenario would most affect trawl catcher/processors producing fillets, which would lose about 16 percent of their initial projected harvests, and trawl catcher/processors producing H&G cod, which would lose about 10 percent of the projected harvests. It is not likely that there would be any effect on either domestic or international markets discernable from a change of this magnitude in world cod supplies.

Alternative 2 represents a total annual TAC of just 127,819 MT. This would be a departure from recent historical landings in the United States, and would represent a distinct drop in world cod landings of nearly 10 percent. The effects of this could likely result in a weakened supply of domestic cod fillets, both domestically produced and those that are re-imported from China to the U.S. market. As domestic prices are bid up, producers would be somewhat compensated for losses in quantities produced, but it is likely that consumers would switch to other, cheaper products, including the wide variety of aquaculture-based whitefish

products available. Others would turn to domestic and imported pollock fillets and other whitefish, such as hake or hoki. International markets would also be affected, and prices would probably increase. In such a scenario, it is not likely that these producers and consumers would return, and Pacific cod producers would lose market share.

Alternative 4 is likely to have a similarly negligible effect on domestic and international markets. Landings not at risk would decline by about 13 thousand MT beyond the baseline scenario, and this would represent about 1 percent of world cod landings.

While the decrease in landings implied by the alternative represents a decrease (by about 5 percent) from the "no action" alternative, it is very near the quantity of landings (and TAC) of recent years, and does not represent a significant change in production. The impact on processors, distributors, and brokers in the market would likely be higher individually and in the aggregate, but would not be widely felt in the general economy.

For Atka mackerel, Alternative 1 represents 60,000 MT – more than recent harvests of Atka mackerel which average around 50,000 MT. Alternative 2 would significantly decrease Atka mackerel landings, to just over 13,500. This would represent roughly 25 percent of current landings, and very likely would result in a significant adverse impact on the fishery. It is very likely that revenues would not be sufficient to cover costs of operating, and vessels might abandon the fishery. The implications of this change would be a loss of a $5 million dollar fishery and the accompanying effect on the balance of trade, as nearly all of the product is exported.

Alternative 4 would result in 48,000 MT in landings, and is not expected to change the market from existing conditions.

5.3.2 Prices

Alaska pollock are processed into a wide variety of product forms sold in different markets around the world. The most valuable of these are surimi, fillets, and roe. Whether the per unit price of pollock will rise depends upon the combined effect on these markets.

Surimi from Alaska is largely sold primarily to markets in Japan, and the United States is by far the leading country providing pollock surimi to this market. Furthermore, surimi made from pollock is considered to be superior to most, if not all, other surimi; there are no close substitutes. Therefore, a change in quantity of pollock surimi supplied would result in a noticeable change in per unit cost. Results from the econometric model suggest that surimi exports to Japan are price ineleastic in this market; that is, demand for surimi will not soften much in response to a modest price increase. This may be attributed in part to supply contracts and vertical integration among surimi processors, wholesalers, and retailers in Japan. As a result, the "internalization" of the market channels may cushion the effects of price for intermediate products such as surimi. In contrast, the relatively recent but growing demand for surimi in South Korea and, to a lesser extent, Europe is likely to be more elastic – and price responsive. In general, buyers in those locations are more likely to reduce their purchases than those in Japan in response to higher prices.

As noted earlier, a supply shock to pollock landings of the magnitude suggested for Alternative 2 could reduce surimi production, but by a smaller percentage than the change in landings. The quantity of reduction would

still be enough to raise export prices for surimi. These higher prices would be more likely to affect the demand for surimi in the more elastic market segments, especially Europe and the United States.

A reduction in pollock supply implied by Alternative 4 would alter surimi production very little, and export prices would change negligibly, if at all.

A very similar story to surimi can be said of pollock roe. Alaska-based pollock roe dominates other supplies in Japan, and there are no close substitutes for pollock roe. In recent years the decline in supplies of roe from Russia have left United States suppliers with opportunity for a larger influence in the market. Thus, a change in the quantity supplied of pollock roe would result in a change in per unit cost. The econometric model indicates that Japanese imports of pollock roe tend to be fairly price inelastic. In the face of higher prices for roe faced by Japanese consumers, imports will decrease, but to a lesser extent, such that total revenue may stay the same or even rise. This circumstance is predicated for non-permanent and relatively small changes in the quantity of roe supplied. Substantial changes in quantity of a permanent nature are likely to lead to profound changes in market demand that are not easy to predict.

Alternative 2 would have a substantial bearing on the production of roe. Prices would rise to levels rarely, if ever, seen before. Such changes in price are likely to change the nature of the demand, to an area of the demand curve that is more responsive to price. Once again, this is predicated on the assumption that the fishery will continue to operate in the face of large reductions in a primary revenue source.

A lesser impact would result from reductions in landings on a scale of that in Alternative 4. Prices for roe would be expected to rise and demand for roe decline, but total revenue may change little, if at all, and could actually increase.

The fillet market is quite different from surimi and roe. Nearly all of the fillets (deep-skin and other forms) produced from pollock end up in the domestic market, and the demand in the United States far exceeds the current supply of fillets. The domestic fillet market, however, is fairly competitive in terms of product form (IQF, block, and twice-frozen), supplying country (Russia and China play major roles), and fillets from other species, including hake and hoki. As a result, the per unit price for pollock fillets will rise only if there is a large change in the amount of fillets supplied to the marketplace. Because pollock is only one (albeit, a significant one) of the sources of whitefish fillets in the world market, several factors, in addition to the size of pollock landings from the U.S. EEZ off Alaska, will ultimately determine these market responses.

Reductions in pollock landings as may be experienced in Alternative 2 are likely to have a large effect on fillet production. Greater reductions in production will take place for fillets than surimi; furthermore, prices are likely to rise, but not to an extent that will offset the reduced supply in terms of total revenue. The impacts will be felt through the market channels to the final consumer in terms of somewhat higher prices. However, the most likely occurrence will be a negative effect on the trade balance, as more fillets are imported to offset the reduced supply.

Alternative 4 will also result in fewer fillets produced, but the impacts would be much less. The reduction in landings is smaller than for Alternative 2, and the resulting decline in fillets produced would be less. The reduction may not be enough to change the price for fillets, and final consumers may not even notice a price change. It is much more likely that imported fillets will mostly or completely offset the pollock fillet shortfall.

Pacific cod enters an international market, but much of the product stays in the United States. More than half of the processed product is H&G and sold to Japan, Europe, South Korea, and China. Some of that sold to China is reprocessed and returns to the United States as "twice-frozen" blocks. Fillets, as IQF and blocks, represent the next largest product form, and about a third of the value, and are sold in domestic markets to fancy and family restaurants, institutions, and retail fish markets. As Atlantic cod stocks in the United States and Canada dwindled during the last decade, Pacific cod effectively filled the void. However, the United States continues to import Atlantic cod (from Iceland, Canada, and Norway), serving a primarily east coast market.

The product forms for Pacific cod are diverse, and Pacific cod often serves as an effective substitute for Atlantic cod, world stocks of which rise and fall. But markets for Atlantic cod, both domestically and abroad, are well-established. If the quantity of Pacific cod is reduced by a small amount, the per unit price may hold steady or rise only slightly.

Atka mackerel is usually processed into H&G, almost entirely exported, and nearly all of it goes to either Japan or South Korea. It is a unique and popular product in those countries, with few substitutes. If the supply is reduced, the per unit price will very likely rise.

5.3.3 Market Share

The product forms that derive from the three species are varied, and enter different market environments. As such, the long-term damage to market share will be more or less significant, depending upon the product. For pollock, surimi and roe are sold predominantly to Japanese markets, but there are no close substitute products and limited alternate supplies from other countries. In recent years, U.S. suppliers have managed to obtain a larger share of the market for both products, as the landings of pollock from Russia have declined. Market share is of great importance in these markets because of the relatively small number of suppliers and buyers. Personal relationships are formed and established, and buyers often track the product by processor and even individual vessels.

The same cannot be said to the same extent for pollock fillets. Several large quick-service restaurant chains in the United States depend upon steady supplies of deep-skin fillets, and use pollock rather than other whitefish primarily because of its reliability in supply and uniform quality. In most cases, the deep-skin fillet product is processed under supplier contracts. Relatively small changes in quantity of landings might not affect the market share. However, if a relatively large proportion of the supply were to be interrupted, a shift would likely take place permanently to other supplying countries, product forms, or substitute species. At present, a significant share of domestic pollock fillet demand is satisfied by imports, and the role of China in supplying "twice-frozen" fillets could increase.

A similar circumstance might befall markets for Pacific cod, which must compete in well-established markets characterized by long-standing relationships. The inroads that Pacific cod has made in filling the void left by the declining Atlantic cod stocks could very well be lost, at least for some time.

5.3.4 Product Quality

Alaska Pollock is a fragile fish whose quality deteriorates rapidly the longer the time from harvest to processing. As such, any factors that will increase the length of time to processing will, in general, lower the quality of the product produced. To the extent that the alternatives result in catcher vessels traveling farther distances from (inshore) processors, and thereby lengthening the time between harvest and processing, the quality of surimi, fillets, and roe will be adversely affected. This may not be true among the at-sea catcher/processors or catcher vessels for motherships; their mobility allows them to move where the harvests take place.

Impacts on quality are notable in the marketplace. Surimi and roe in particular are graded and priced based upon attributes, some of which are affected by freshness. If product quality is lower, prices received are lower and total revenue is affected. This has cumulative and long-term effects upon the market share for these processors and distributors who no longer can compete in the high-end quality market.

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