STOCK ASSESSMENT AND FISHERY EVALUATION REPORT FOR THE GROUNDFISH FISHERIES OF THE GULF OF ALASKA AND BERING SEA/ALEUTIAN ISLANDS AREA:

ECONOMIC STATUS OF THE GROUNDFISH FISHERIES OFF ALASKA, 2010

by

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The authors of the Groundfish SAFE Economic Status Report invite users to provide feedback regarding the quality and usefulness of the Report and recommendations for improvement. AFSC's Economic and Social Sciences Research Program staff have begun an initiative to revise the SAFE Economic Status Reports for Alaska Groundfish and BSAI Crab to incorporate additional analytical content and synthesis, improve online accessibility of public data in electronic formats, and otherwise improve the utility of the reports to users. We welcome any and all comments and suggestions for improvements to the SAFE Economic Status Reports, and have developed an online survey to facilitate user feedback. The survey is available at: http://www.afsc.noaa.gov/REFM/Socioeconomics/Contact/SAFE_survey.php.

This report will be available at:
http://www.afsc.noaa.gov/refm/docs/2011/economic.pdf

Time series of data for the tables presented in this report (in CSV format) are available at:
http://www.afsc.noaa.gov/REFM/Socioeconomics/documents.php

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ABSTRACT

The domestic groundfish fishery off Alaska is the largest fishery by volume in the U.S. This report contains detailed information about economic aspects of the fishery, including figures and tables, market profiles for the most commercially valuable species, a summary of the relevant research being undertaken by the Economic and Social Sciences Research Program (ESSRP) at the Alaska Fisheries Science Center (AFSC) and a list of recent publications by ESSRP analysts.

More specifically, the figures and tables in the report provide estimates of total groundfish catch, groundfish discards and discard rates, prohibited species catch (PSC) and PSC rates, the ex-vessel value of the groundfish catch, the ex-vessel value of the catch in other Alaska fisheries, the gross product value (F.O.B. Alaska) of the resulting groundfish seafood products, the number and sizes of vessels that participated in the groundfish fisheries off Alaska, vessel activity, and employment on at-sea processors. Generally, the data presented in this report cover the years 2006 through 2010, but limited catch and ex-vessel value data are reported for earlier years in order to illustrate the rapid development of the domestic groundfish fishery in the 1980s and to provide a more complete historical perspective on catch[1].

In addition, this report contains links to data on some of the external factors that, in part, determine the economic status of the fisheries. Such factors include foreign exchange rates, the prices and price indices of products that compete with products from these fisheries, domestic per capita consumption of seafood products, and fishery imports.

This year, we’ve added a new section to the report that uses indices to analyze the economic performance of the groundfish fisheries off Alaska. Indices for different sectors of the North Pacific fisheries relate changes in value, price, and quantity, across species, product and gear types, to aggregate changes in the market.

This report also updates the set of market profiles for pollock, Pacific cod, sablefish, and flatfish published here in the last four years’ reports. These analyses discuss the relatively recent states of the markets for these species in terms of pricing, volume, supply and demand. We also discuss trade patterns and market share.

We also provide project descriptions and updates for ongoing groundfish-related research activities of the ESSRP at the AFSC. Contact information is included for each of the ongoing projects so that readers may contact us for more detail or an update on the project status. Finally, we will also include a list of publications that have arisen out of our work since 2002.

[1] Pacific halibut (*Hippoglossus stenolepis*) is not included in data for the groundfish fishery in this report because for management purposes halibut is not part of the groundfish complex.

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INTRODUCTION

The domestic groundfish fishery off Alaska is an important segment of the U.S. fishing industry. With a total catch of 1.59 million metric tons (t), a retained catch of 1.52 million t, and an ex-vessel value of $636 million in 2010, it accounted for 43% of the weight and 14% of the ex-vessel value of total U.S. domestic landings as reported in Fisheries of the United States, 2010 (FUS 2010 was not yet available at the time of this draft). The value of the 2010 groundfish catch after primary processing was $1.9 billion (F.O.B. Alaska).

All but a small part of the commercial groundfish catch off Alaska occurs in the groundfish fisheries managed by the National Marine Fisheries Service (NMFS) under the Fishery Management Plans (FMP) for the Gulf of Alaska (GOA) and the Bering Sea/Aleutian Islands area (BSAI) groundfish fisheries. In 2010, other fisheries accounted for only about 23,200 t of the catch reported above. The footnotes for each table indicate if the estimates provided in that table are only for the fisheries with catch that is counted against a federal Total Allowable Catch (TAC) quota (i.e., managed under a federal FMP) or if they also include other Alaska groundfish fisheries. The reader should keep in mind that the distinction between catch managed under a federal FMP and catch managed by the state of Alaska is not merely a geographical distinction between catch occurring outside the 3-mile limit (in the U.S. Exclusive Economic Zone, or EEZ) and catch occurring inside the 3-mile limit (Alaska state waters); the state of Alaska maintains authority over some rockfish fisheries in the EEZ of the GOA, for example, and federal FMPs often manage catch from inside state waters in addition to catch from the EEZ. The reader should also be aware that it is not always possible, depending on the data source(s) from which a particular estimate is derived, to definitively identify a unit of catch (or the price, revenue or other measure associated with a unit of catch) as being part of a federal FMP or otherwise. For Catch-Accounting System data from the NMFS Alaska Regional Office (AKR), for example, distinguishing between the two categories is relatively easy, but the distinction is at best approximate for Alaska Department of Fish & Game (ADF&G) fish ticket data and essentially impossible for Commercial Operator’s Annual Report (COAR) data. Finally, even for catch that can be positively identified as being part of a federal TAC, it’s not always possible to identify what portion of that catch might have come from inside Alaska state waters and what portion came from the federal EEZ. Because of these multiple layers of ambiguity, therefore, the reader should not construe phrases such as “groundfish fisheries off Alaska” or “Alaska groundfish”, as used in this report, to precisely include or exclude any category of state or federally managed fishery or to refer to any specific geographic area; these and similar phrases could be taken to mean groundfish from both Alaska state waters and the federal EEZ off Alaska, or groundfish managed only under federal FMPs or managed by both NMFS and the state of Alaska. Again, refer to the notes for each table for a description of what is meant to be included in the estimates provided in that table.

The fishery management and development policies for the BSAI and GOA groundfish fisheries have resulted in high levels of catch, ex-vessel value (i.e., vessel revenue), processed product value (i.e., processor revenue), exports, employment, and other measures of economic activity. However, the cost or quota-revenue data required to estimate the success of these policies with respect to net benefits to either the participants in these fisheries or the Nation are not available for a majority of the fisheries. The contined existence of a race for fish as a mechanism for allocating many of the groundfish quotas and PSC limits among competing fishing operations has adversely affected at least some aspects of the economic performance of the fisheries. The individual fishing quota (IFQ) program for the fixed gear sablefish fishery, the Western Alaska Community Development Quota (CDQ) program for BSAI groundfish, and the American Fisheries Act (AFA) cooperatives for the BSAI pollock fishery have demonstrated that eliminating the race for fish as the allocation mechanism and replacing it with an historic catch-share-based allocation mechanism can decrease harvesting and processing costs, increase the value of the groundfish catch, and, in some cases, decrease the cost of providing more protection for target species, non-target species, marine mammals, and seabirds. It is anticipated that the recent rationalization programs instituted in the BSAI crab fisheries, the factory trawler head-and-gut fleet, and the central GOA rockfish fleet will generate many of the same benefits.

This report presents the economic status of groundfish fisheries off Alaska in terms of economic activity and outputs using estimates of catch, PSC, ex-vessel prices and value (i.e., revenue), the size and level of activity of the groundfish fleet, and the weight and gross value of (i.e., F.O.B. Alaska revenue from) processed products. The catch, ex-vessel value, and fleet size and activity data are for the fishing industry activities that are reflected in Weekly Production Reports, Observer Reports, fish tickets, and the Commercial Operators' Annual Reports. All catch data reported for 1991-2002 are based on the blend estimates of total catch, which were used by the NMFS Alaska Regional Office (AKR) to monitor groundfish and PSC quotas in those years. Catch data for 2003-10 come from the AKR's catch-accounting system (CAS), which replaces the blend as the primary tool for monitoring groundfish and PSC quotas. We would like to point out that the data descriptions, qualifications, and limitations noted in the overview of the fisheries, market reports and the footnotes to the tables are absolutely critical to understanding the information contained in this report.

A variety of external factors influence the economic status of the fisheries. Therefore, links to information concerning the following external factors are included in this report (see *External Factors*, page 12): foreign exchange rates, the prices and price indices of products that compete with products from these fisheries, Producer Price Indices, fishery imports, and estimates of per-capita consumption of fisheries products. This report updates last year's report (Hiatt et al. 2010) and is intended to serve as a reference document for those involved in making decisions with respect to conservation, management, and use of GOA and BSAI fishery resources.

A new section to the report, added this year, uses an index-based approach to examine the economic performance in groundfish fisheries off Alaska. Indices for different sectors of the North Pacific fisheries relate changes in value, price, and quantity, across species, product and gear types, to aggregate changes in the market.

Another component of this report is a set of market profiles for pollock, Pacific cod, sablefish, and flatfish (yellowfin and rock sole, and arrowtooth flounder). The goal of these profiles is to discuss and, where possible, explain the market trends observed in pricing, volume, supply, and demand for each of these groundfish species.

Specifically, the market reports provide information on the relatively recent trends in the prices and product choices for first-wholesale production of a given species, and the volumes and prices of exports, as well as changes in the volume of exports to different trading partners. For example, some groundfish caught off Alaska have a large share of the world market and observed changes may be tied to changes in the Alaskan supply (TAC), while in other cases the Alaskan share for that product may be relatively low and changes in the market could be driven by other countries' actions. Changes in consumer demand or the emergence of substitute products can also drive the market for a product or species. Thus, these reports discuss the way in which the particular species or product fits into the world market and how this fit is changing over time (e.g., the market share for the Alaska product may be growing or declining).

One fact that becomes evident when reading these profiles is that the type of information available for explaining the historical trends in a market varies greatly by species. Generally speaking, the amount of information available for each species is related to its value or market share, and as a result, some species have been more adequately assessed in this report.

There is considerable uncertainty concerning the future conditions of stocks, the resulting quotas, and future changes to the fishery management regimes for the BSAI and GOA groundfish fisheries. The management tools used to allocate the catch between various user groups can significantly affect the economic health of either the domestic fishery as a whole or segments of the fishery. Changes in fishery management measures are expected as the result of continued concerns with: 1) the catch of prohibited species; 2) the discard and utilization of groundfish catch; 3) the effects of the groundfish fisheries on marine mammals and sea birds; 4) other effects of the groundfish fisheries on the ecosystem and habitat; 5) excess harvesting and processing capacity; and 6) the allocations of groundfish quotas among user groups.

OVERVIEW OF FEDERALLY MANAGED FISHERIES OFF ALASKA, 2010

The commercial groundfish catch off Alaska totaled 1.59 million t in 2010. This amount was up about 5% from the 2009 catch (Fig. 1 and Table 1), and three to four times larger than the catch off Alaska of all other commercial species combined (Table 1A). The real ex-vessel value of the catch, including the imputed value of fish caught almost exclusively by catcher/processors, decreased from $744 million in 2009 to $636 million in 2010 (Fig. 3 and Table 16). The gross value of the 2010 catch after primary processing was approximately $1.9 billion (F.O.B. Alaska) (Table 25), an increase of 11% from 2009. The groundfish fisheries accounted for the largest share (41%) of the ex-vessel value of all commercial fisheries off Alaska in 2010 (Fig. 4, Tables 16 and 17), while the Pacific salmon (*Oncorhynchus spp*.) fishery was second with $506 million or 32% of the total Alaska ex-vessel value. The value of the shellfish fishery amounted to $206.3 million or 13% of the total for Alaska and exceeded the value of Pacific halibut (*Hippoglossus stenolepis*) by about $5.8 million.

Catch Data

During the last 11 years, estimated total catch in the commercial groundfish fisheries off Alaska varied between 1.5 and 2.2 million t (Fig. 1 and Table 1). The rapid displacement of the foreign and joint-venture fisheries by the domestic fishery between 1984 and 1991 can be seen by comparing Figures 1 and 2. By 1991, the domestic fishery accounted for all of the commercial groundfish catch off Alaska.

Walleye (Alaska) pollock (*Theragra chalcogramma*) has been the dominant species in the commercial groundfish catch off Alaska. The 2010 pollock catch of 888,500 t accounted for 56% of the total groundfish catch of 1.6 million t (Table 1). The pollock catch increased by about 3.7% from 2009 as a result of an increase in the TAC. The 2010 catch of flatfish, which includes yellowfin sole (*Pleuronectes asper*), rock sole (*Pleuronectes bilineatus*), and arrowtooth flounder (*Atheresthes stomias*), was 291,800 t or 18.3% of the total 2010 groundfish catch, an increase of about 8% from 2009. The Pacific cod (*Gadus macrocephalus*) catch in 2010 accounted for 250,300 t or 16% of the total 2010 groundfish catch, up about 9% from a year earlier. Pollock, Pacific cod, and flatfish comprised just under 90% of the total 2010 catch. Other important species are sablefish (*Anoplopoma fimbria*), rockfish (*Sebastes* and *Sebastolobus spp.*), and Atka mackerel (*Pleurogrammus monopterygius*). The contributions of the major groundfish species or species groups to the total catch in the domestic groundfish fisheries off Alaska are depicted in Figure 2.

Trawl, hook and line (including longline and jigs), and pot gear account for virtually all the catch in the BSAI and GOA groundfish fisheries. There are catcher vessels and catcher/processor vessels within each of these three gear groups. Table 2 presents catch data by area, gear, vessel type, and species. The catch data in Table 2 and the catch, PSC, and vessel information in the tables of the rest of this report are for the BSAI and GOA FMP fisheries, unless otherwise indicated.

In the last five years, the trawl catch averaged about 90% of the total catch, while the catch with hook-and-line gear accounted for 8.2%. Most species are harvested predominately by one type of gear, which typically accounts for 90% or more of the catch. The one exception is Pacific cod, of which 35.2% (80,000 t) was taken by trawls in 2010, 47.1% (107,000 t) by hook-and-line gear, and 17.6% (40,000 t) by pot gear. In each of the years since 2006, catcher vessels took 41-47% of the total catch and catcher/processors took the remainder. That increase from years prior to 1999 (not shown in Table 2) is explained in part by the AFA, which among other things increased the share of the BSAI pollock TAC allocated to catcher vessels delivering to shoreside processors. The distribution of catch between catcher vessels and catcher/processor vessels differed substantially by species and area.

Target fisheries are defined by area, gear and target species. The target designations are used to estimate PSC, apportion PSC allowances by fishery, and monitor those allowances. The target fishery designations can also be used to provide estimates of catch and PSC data by fishery. The blend catch data are assigned to a target fishery by processor, week, area, and gear. The new catch-accounting system, which replaced the blend as the primary source of catch data in 2003, assigns the target at the trip level rather than weekly, except for the small fraction of total catch (0-4% in different years) that comes from NMFS Weekly Production Reports (WPR). CDQ fishing activity is targeted separately from non-CDQ fishing. Generally, the species or species group that accounts for the largest proportion of the retained catch of the TAC species is considered the target species. One exception to the dominant retained-catch rule is that the target for the pelagic pollock fishery is assigned if 95% or more of the total catch is pollock. Tables 3 and 4 provide estimates of total catch by species, area, gear, and target fishery for the GOA and the BSAI, respectively.

Residents of Alaska and of other states, particularly Washington and Oregon, are active participants in the BSAI and GOA groundfish fisheries. Catch data by residency of vessel owners are presented in Table 5. These data were extracted from the NMFS blend and catch accounting system catch databases and from the State of Alaska groundfish fish ticket database and vessel-registration file, which includes the stated residency of each vessel owner. For the domestic groundfish fishery as a whole, 79% of the 2010 catch volume was made by vessels with owners who indicated that they were not residents of Alaska. The catches of the two vessel-residence groups were much closer to being equal in the GOA where Alaskan vessels accounted for the majority of the Pacific cod catch. Notice that this year we changed the method by which we produced Table 5. Since the Alaska Region's catch-accounting system (CAS) data (unlike the earlier Blend data) now include catcher-vessel IDs for all processing sectors, and information on vessel-owner residency is readily available from both NMFS and the state of Alaska, we can obtain direct estimates of groundfish catch by owner residence. Previously, we had estimated the amount of catch by residency for the shoreside sector by prorating CAS estimates based on the fraction of catch by residency obtained from shoreside fish-ticket data, which have always included catcher-vessel IDs.

Groundfish Discards and Discard Rates

The discards of groundfish in the groundfish fishery have received increased attention in recent years by NMFS, the Council, Congress, and the public at large. Table 6 presents the catch-accounting system estimates of discarded groundfish catch and discard rates by gear, area, and species for years 2006-10. The discard rate is the percent of total catch that is discarded.

Although these are the best available estimates of discards and are used for several management purposes, these estimates are not necessarily accurate. The groundfish TACs are established and monitored in terms of total catch, not retained catch; this means that both retained catch and discarded catch are counted against the TACs. Therefore, the catch-composition sampling methods used by at-sea observers provide the basis for NMFS to make good estimates of total catch by species, not the disposition of that catch. Observers on vessels sample randomly chosen catches for species composition. For each sampled haul, they also make a rough visual approximation of the weight of the non-prohibited species in their samples that are being retained by the vessel. This is expressed as the percent of that species that is retained. Approximating this percentage is difficult because discards occur in a variety of places on fishing vessels. Discards include fish falling off of processing conveyor belts, dumping of large portions of nets before bringing them on-board the vessel, dumping fish from the decks, size sorting by crewmen, quality-control discard, etc. Because observers can be in only one place at a time, they can provide only this rough approximation based on their visual observations rather than data from direct sampling. The discard estimate derived by expanding these approximations from sampled hauls to the remainder of the catch may be inaccurate because the approximation may be inaccurate. The numbers derived from the observer discard approximation can provide users with some information as to the disposition of the catch, but the discard numbers should not be treated as sound estimates. At best, they should be considered a rough gauge of the quantity of discard occurring.

For the BSAI and GOA fisheries as a whole, the annual discard rate for groundfish was about 5%- 6% for the years 2006-10. The overall discard rate in 2006 represents a two-thirds reduction from the 1997 rate of 14.5% (not shown in Table 6), a result of prohibiting pollock and Pacific cod discards in all BSAI and GOA groundfish fisheries beginning in 1998. Total discards decreased by about 60% from 1997 to 2006 due to the reduction in the discard rate, while the total catch increased by about 6%. The prohibition on pollock and Pacific cod discards was so effective in decreasing the overall discard rate because the discards of these two species had accounted for 43% of the overall discards in 1997. The benefits and costs of the reduction in discards since 1997 have not been determined. In 2010, the overall discard rates were about 10% and 4%, respectively, for the GOA and the BSAI compared to 16% and 14% in 1997.

Although the fixed gear fisheries accounted for a small part of both total catch or total discards in 1998 and later years, the overall discard *rates* were substantially higher for fixed gear (10% in 2010) than for trawl gear (4% in 2010). Prior to 1998, the overall discard rates had been similar for these two gear groups. This change occurred because the prohibition on pollock and Pacific cod discards had a much larger effect on trawl discards than on fixed gear discards. In the BSAI, the 2010 discard rates were 11% and 3% for fixed and trawl gear, respectively. In the GOA, however, the corresponding discard rates were 8% and 11%. One explanation for the relatively low discard rates for the BSAI trawl fishery is the dominance of the pollock fishery with very low discard rates. The mortality rates of groundfish that are discarded are thought to differ by gear or species; however, estimates of groundfish discard mortality are not available.

Tables 7 and 8, and 9 and 10, respectively, provide estimates of discarded catch and discard rates by species, area, gear, and target fishery. Within each area or gear type, there are substantial differences in discard rates among target fisheries. Similarly, within a target fishery, there are often substantial differences in discard rates by species. Typically, in each target fishery the discard rates are very high except for the target species. The regulatory exceptions to the prohibition on pollock and Pacific cod discards explain, in part, why there are still high discard rates for these two species in some fisheries.

Prohibited-Species Catch

The catch of Pacific halibut, king and tanner crab (*Chionoecetes, Lithodes* and *Paralithodes* spp.), Pacific salmon (*Oncorhynchus* spp.), and Pacific herring (*Clupea pallasi*) has been an important management issue for roughly thirty years. The retention of these species was prohibited first in the foreign groundfish fisheries. This was done to ensure that groundfish fishermen had no incentive to target these species. Estimates of the catch of these “prohibited species” for 2007-10 are summarized by area and gear in Table 11. More detailed estimates of prohibited species catch (PSC) and of PSC rates for 2009 and 2010 are in Tables 12 - 15. The estimates for halibut are in terms of PSC mortality because the PSC limits for halibut are set and monitored using estimated discard mortality rates. The estimates for the other prohibited species are of total PSC; this is in part due to the lack of well-established discard mortality rates for these species. The discard mortality rates probably approach 100% for salmon and herring in the groundfish fishery as a whole; the discard mortality rates for crab, however, may be much lower.

There was a very large increase of other king crab PSC in 2007, mostly in the BSAI Pacific cod and sablefish pot fisheries. The “other king crab” category includes blue king crab (*Paralithodes platypus*) and golden king crab (*Lithodes aequispina*). The total other-king-crab PSC in 2007 was about 10 times the average annual PSC for the years 1994-2006; other-king-crab PSC declined in 2008 and then again in 2009, but still remained at roughly three times the long-term average. In 2010, the other king-crab PSC declined to a little more than one and a half times the 1994-2006 average. The increase in blue king crab PSC in 2007 is partly explained by the expansion of effort in the Pacific cod pot fishery northward to NMFS reporting area 524 in the vicinity of St. Matthew Island, where a floating processor was stationed to accept deliveries of Pacific cod (the processor was not present in 2006, 2008 or 2009). The rest of the explanation for the 2007 increase is most likely the lack of observer coverage in the sablefish and Pacific cod pot fisheries (pot vessels over 60 feet in length are required to have observer coverage for only 30% of their fishing days), so that a few observed pot lifts with large crab PSC resulted in high calculated PSC rates that were then applied to the rest of the fisheries. The decline of other-king-crab PSC in 2008 is explained in part by the reduction of effort in area 524 (no Pacific cod pot harvest occurred in area 524 in 2008, and only about 540 t occurred in 2009, compared to over 2,000 t in 2007), but also possibly due to a change in fishing patterns after managers informed the industry that high PSC was occurring in certain areas. The total number of observed pot vessels in area 524 in 2008 and 2009 combined was 90% fewer than the number observed in 2007 alone.

The at-sea observer program was developed for the foreign fleets and then extended to the domestic fishery once it had all but replaced participation by foreign fishing and processing vessels. The observer program, now managed by the Fisheries Monitoring and Analysis Division (FMA) of the Alaska Fisheries Science Center, resulted in fundamental changes in the nature of the PSC problem. First, by providing good estimates of total groundfish catch and non-groundfish PSC by species, it eliminated much of the concern that total fishing mortality was being underestimated due to fish that were discarded at sea. Second, it made it possible to establish, monitor, and enforce the groundfish quotas in terms of total catch as opposed to only retained catch. Third, it made it possible to implement and enforce PSC quotas for the non-groundfish species that by regulation had to be discarded at sea. Finally, it provided extensive information that managers and the industry could use to assess methods to reduce PSC and PSC mortality. In summary, the observer program provided fishery managers with the information and tools necessary to prevent PSC from adversely affecting the stocks of the PSC species. Therefore, PSC in the groundfish fishery is principally not a conservation problem but it can be an allocation problem. Although this does not make it less controversial, it does help identify the types of information and management measures that are required to reduce PSC to the extent practicable, as is required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

Ex-Vessel Prices and Value

Table 18 contains the estimated ex-vessel prices that were used with estimates of retained catch to calculate ex-vessel values. The estimates of ex-vessel value by area, gear, type of vessel, and species are in Table 19. Notice that the estimates of ex-vessel prices and value for trawl-caught GOA rockfish in this year’s report are no longer based on fractions of processed-product prices and value as in the past (refer to the footnote to Table 18). An analysis by AFSC staff earlier this year determined that in every year since 2000, at least 20% of all rockfish retained landings in Alaska was caught by trawl gear in the GOA and delivered to shoreside processors; this means that we have adequate data on these shoreside landings to estimate ex-vessel prices (and, thus, values) directly.

The ex-vessel value of the domestic landings in the FMP fisheries, excluding the value added by at-sea processing, decreased from $839 million in 2006 to $824 million in 2007, increased to $991 million in 2008, decreased to $685 million in 2009, and decreased further to $636 million in 2010. The substantial decrease in 2009 results mostly from significant decreases in ex-vessel prices, particularly for Pacific cod, due largely to the economic recession that deepened at the end of 2008. The distribution of ex-vessel value by type of vessel differed by area, gear and species. In 2010, catcher vessels accounted for 47% of the ex-vessel value of the groundfish landings compared to 42% of the total catch because catcher vessels take larger percentages of higher-priced species such as sablefish, which was $3.96 per pound in 2010. Similarly, trawl gear accounted for only 70% of the total ex-vessel value compared to 88% of the catch because much of the trawl catch is of low-priced species such as pollock, which was about $0.14 per pound in 2010.

Tables 20 and 21 summarize the ex-vessel value of catch delivered to shoreside processors by vessel-size class, gear, and area. Table 20 gives the total ex-vessel value in each category and Table 21 gives the ex-vessel value per vessel. The relative dominance of each of the three vessel size classes differs by area and by gear.

Table 22 provides estimates of ex-vessel value by residency of vessel owners, area, and species. For the BSAI and GOA combined, 75% of the 2010 ex-vessel value was accounted for by vessels with owners who indicated that they were not residents of Alaska. Vessels with owners who indicated that they were residents of Alaska accounted for about 25% of the total. The vessels owned by residents of Alaska accounted for a larger share of the ex-vessel value than of catch (25% compared to 21%) because these vessels accounted for relatively large shares of the higher-priced species such as sablefish. Notice that, as with Table 5, we have revised the method for producing Table 22 to use information on catcher-vessel IDs in catch-accounting system data to better determine the residency of participants in the fisheries.

Table 23 presents estimates of ex-vessel value of catch delivered to shoreside processors, and Table 24 gives the ex-vessel value of groundfish as a percentage of the ex-vessel value of all species delivered to shoreside processors. The data in both tables, which include both state and federally managed groundfish, are reported by processor group, which is a classification of shoreside processors based primarily on their geographical locations. The processor groups are described in the footnote to the tables.

First Wholesale Production, Prices and Value

Estimates of weight and value of the processed products made with BSAI and GOA groundfish catch are presented by species, product form, area, and type of processor in Tables 25, 28 and 29. Product price-per-pound estimates are presented in Table 26, and estimates of total product value per round metric ton of retained catch (first wholesale prices) are reported in Table 27. As for ex-vessel value, there were significant declines in the product value of Pacific cod between 2008 and 2009, and most of the change appears to have been driven by declines in prices resulting from the economic downturn that deepened at the end of 2008 and continued through 2009. The first wholesale value of Pacific cod products rebounded in 2010, but only to a little over 75% of its maximum in 2008.

Gross product value (F.O.B. Alaska) data, through primary processing, are summarized by category of processor and by area in Table 31, and by catcher/processor category, size class and area in Table 32. Table 33 reports gross product value per vessel, categorized in the same way as Table 32. Tables 34 and 35 present gross product value of groundfish processed by shoreside processors and the groundfish gross product value as a percentage of all-species gross product value, with both tables broken down by processor group. The processor groups are the same as in Tables 23 and 24 and no distinction is made between groundfish catch from the state and federally managed groundfish fisheries.

Table 30 reports estimates of the weight and first-wholesale value of processed products from catch in the non-groundfish commercial fisheries of Alaska, which enables comparison with the groundfish first-wholesale value estimates reported in Table 25. In all years reported here except 2009, the total first-wholesale value of just the pollock and Pacific cod groundfish fisheries easily exceeds that of all non-groundfish fisheries combined. We present Table 30 to provide a further means, besides the ex-vessel value estimates reported in Table 16, of comparing the groundfish and non-groundfish fisheries.

Counts and Average Revenue of Vessels That Meet a Revenue Threshold

For the purposes of Regulatory Flexibility Act analyses, a business involved in fish harvesting is defined by the Small Business Administration as a small business if it is independently owned and operated, not dominant in its field of operation (including its affiliates), and has combined annual receipts no greater than $4.0 million for all its affiliated operations worldwide. The information necessary to determine if a vessel is independently owned and operated and had gross earnings no greater than $4.0 million is not available. For example, vessel earnings can include tendering income, which is not tracked, and revenue from fishing activities outside of Alaska, which is data we lack access to. By using estimates of vessels' revenue from the catch or processing of Alaska groundfish and other species, however, it is possible to identify vessels that clearly are not small entities.

Estimates of both the numbers of fishing vessels that clearly are not small entities and the numbers of fishing vessels that could be small entities are presented in Tables 36 and 37, respectively. With more complete revenue, ownership and affiliation information, some of the vessels included in Table 37 would be determined to be large entities. Estimates of the average revenue per vessel for the vessels in Tables 36 and 37, respectively, are presented in Tables 38 and 39. As data become available, we hope in the future to improve revenue estimates by including revenue from participation in fisheries in the lower 48 states and by incorporating information about the vessels' cooperative affiliations. In addition, a proposed change may raise the small-business revenue threshold (for catcher/processors only) from $4.0 million to $20.0 million.

Effort (Fleet Size, Weeks of Fishing, Crew Weeks)

Estimates of the numbers and registered net tonnage of vessels in the groundfish fisheries are presented by area and gear in Table 40, and estimates of the numbers of vessels that landed groundfish are depicted in Fig. 6 by gear type. More detailed information on the BSAI and GOA groundfish vessels by type of vessel, vessel size class, catch amount classes, and residency of vessel owners is in Tables 41 - 46. In particular, Table 43 gives detailed estimates of the numbers of smaller (less than 60 feet) hook-and-line catcher vessels.

Estimates of the number of vessels by month, gear, and area are in Table 47. Table 48 provides estimates of the number of catcher vessel weeks by size class, area, gear, and target fishery. Table 49 contains similar information for catcher/processor vessels.

The Weekly Production Reports include employment data for at-sea processors but not inshore processors. Those data are summarized in Table 50 by month and area. The data indicate that in 2010, the crew weeks (defined as the number of crew aboard each vessel in a week summed over the entire year) totaled 87,092 with the majority of them (82,603) occurring in the BSAI groundfish fishery. In 2010, the maximum monthly employment (13,373) occurred in February. Much of this was accounted for by the BSAI pollock fishery.

Observer Coverage and Costs

The information provided by the FMA division of the AFSC has had a key role in the success of the groundfish management regime. For example, it would not be possible to monitor total allowable catches (TACs) in terms of total catch without observer data from the FMA. Similarly, the PSC limits, which have been a key factor in controlling the catch of prohibited species, could not be used without such data. In recent years, the reliance on observer data for individual vessel accounting is of particular importance in the management of the CDQ program, AFA pollock, BSAI crab, and Amendment 80 fisheries. In addition, much of the information that is used to assess the status of groundfish stocks, to monitor the interactions between the groundfish fishery and marine mammals and sea birds, and to analyze fishery management actions is provided by the FMA. Table 51 presents estimates of the numbers of vessels and plants with observers, the numbers of observer-deployment days, and observer costs by year and type of operation for 2009-10.

External Factors

There are a variety of at least partially external factors that affect the economic performance of the BSAI and GOA groundfish fisheries. They include landing market prices in Japan, wholesale prices in Japan, U.S. imports of groundfish products, U.S. per capita consumption of seafood, U.S. consumer and producer price indices, and foreign exchange rates. We have discontinued publishing these data, presented in Tables 52-60 in previous years, either because the data are no longer available or because they are readily available online, often in a more useful format.

In particular, the Japanese Ministry of Agriculture, Forestry & Fisheries has discontinued reporting landing market prices and wholesale prices for all but one of the species previously reported in Tables 52 and 53. Without a continuous time series of prices for a variety of commodities, we feel that these data are no longer useful.

Estimates of U.S. imports and per-capita consumption of various fisheries products, previously published in Table 54-56 of this report, are available in Fisheries of the United States (FUS), published annually by the NMFS Office of Science & Technology. The 2010 FUS is available at: http://www.st.nmfs.noaa.gov/st1/fus/fus10/index.html.

Annual and monthly U.S. economic indicators (producer and consumer price indices), published in past years in Tables 57 and 58 are available from the U.S. Department of Labor Statistics at: http://www.bls.gov/data/sa.htm. Instead of the gross domestic product (GDP) implicit price deflators we've used in the past, we now use the Producer Price Index (PPI) for unprocessed and packaged fish to deflate the ex-vessel and first-wholesale value estimates reported in Tables 16 and 30, respectively. The PPIs are available from the Bureau of Labor Statistics at: http://data.bls.gov/cgi-bin/srgate, using the series ID 'WPU0223'.

Foreign exchange rates, which we've previously published in Tables 59 and 60, are available from the U.S. Federal Reserve Board (for all currencies except the Icelandic kronur) at: www.federalreserve.gov. Exchange rates for Iceland's kronur are available at: www.oanda.com.

REQUEST FOR FEEDBACK

The estimates in this report are intended both to provide information that can be used to describe the Alaska groundfish fisheries and to provide the industry and others an opportunity to comment on the validity of these estimates. It is hoped that the industry and others will identify any data or estimates in this report that can be improved and provide the information and methods necessary to improve them for both past and future years. There are two reasons why it is important that such improvements be made. First, with better estimates, the report will be more successful in monitoring the economic performance of the fisheries and in identifying changes in economic performance that may be attributable to regulatory actions. Second, the estimates in this report often will be used as the basis for estimating the effects of proposed fishery management actions. Therefore, improved estimates in this report will allow more informed decisions by those involved in managing and conducting the Alaska groundfish fisheries. The industry and other stakeholders in these fisheries can further improve the usefulness of this report by suggesting other measures of economic performance that should be included in the report, or other ways of summarizing the data that are the basis for this report, and participating in voluntary survey efforts NMFS may undertake in the future to improve existing data shortages. An online survey to facilitate user feedback is available at: http://www.afsc.noaa.gov/REFM/Socioeconomics/Contact/SAFE_survey.php.

CITATIONS

Terry Hiatt, Michael Dalton, Ron Felthoven, Ben Fissel, Brian Garber-Yonts, Alan Haynie, Stephen Kasperski, Dan Lew, Christina Package, Jennifer Sepez and Chang Seung. 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, NPFMC, November, 2010. http://www.afsc.noaa.gov/refm/docs/2010/economic.pdf

National Marine Fisheries Service, 2010. Fisheries of the United States, 2010. http://www.st.nmfs.noaa.gov/st1/fus/fus10/index.html

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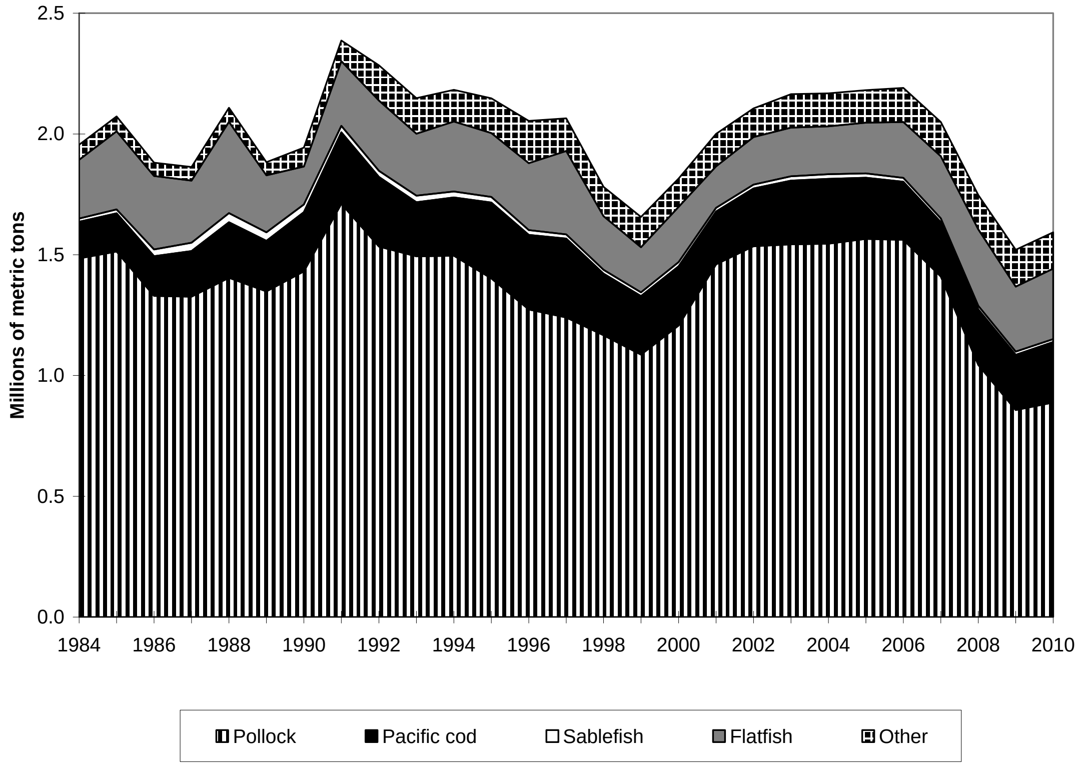

Figure 1. Groundfish catch in the commercial fisheries off Alaska by species, 1984-2010.

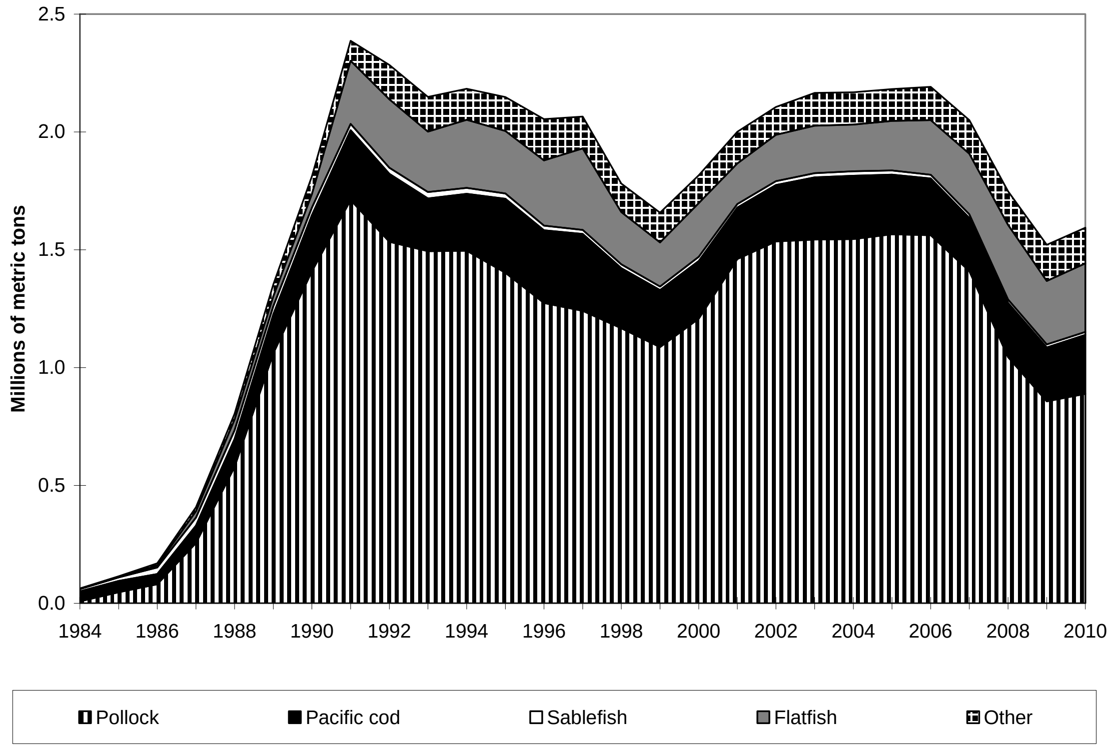

Figure 2. Groundfish catch in the domestic commercial fisheries off Alaska by species, 1984-2010.

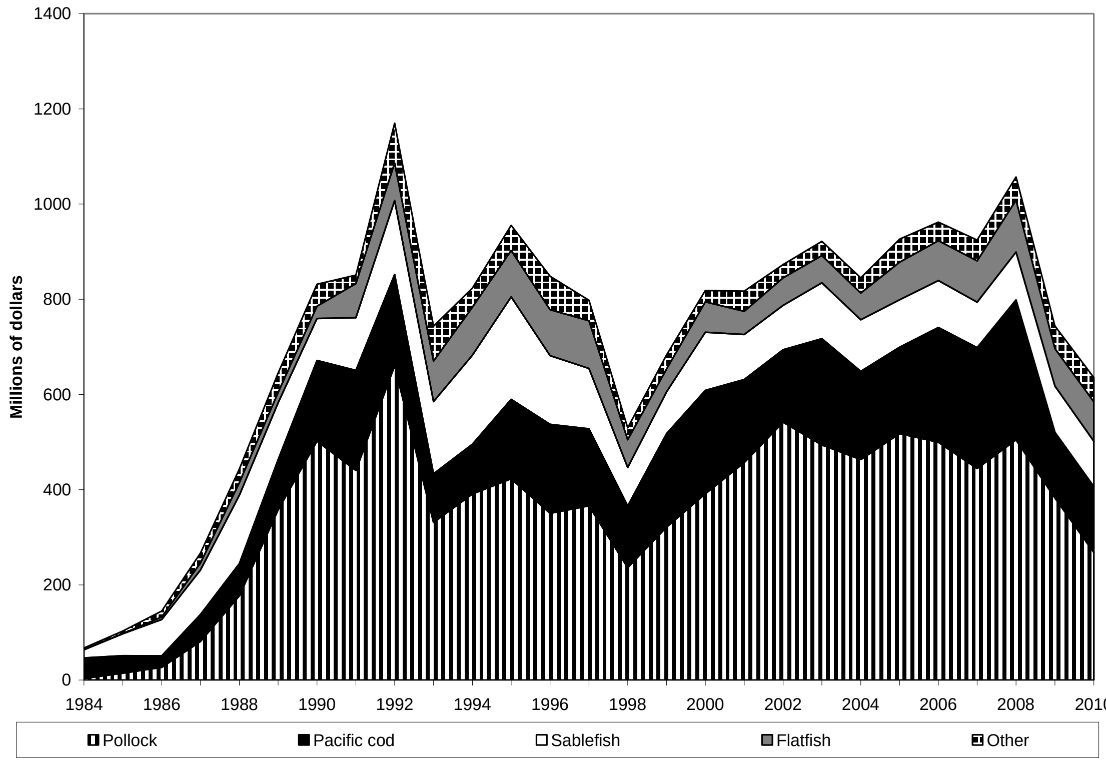

Figure 3. Real ex-vessel value of the groundfish catch in the domestic commercial fisheries off Alaska by species, 1984-2010 (base year = 2010).

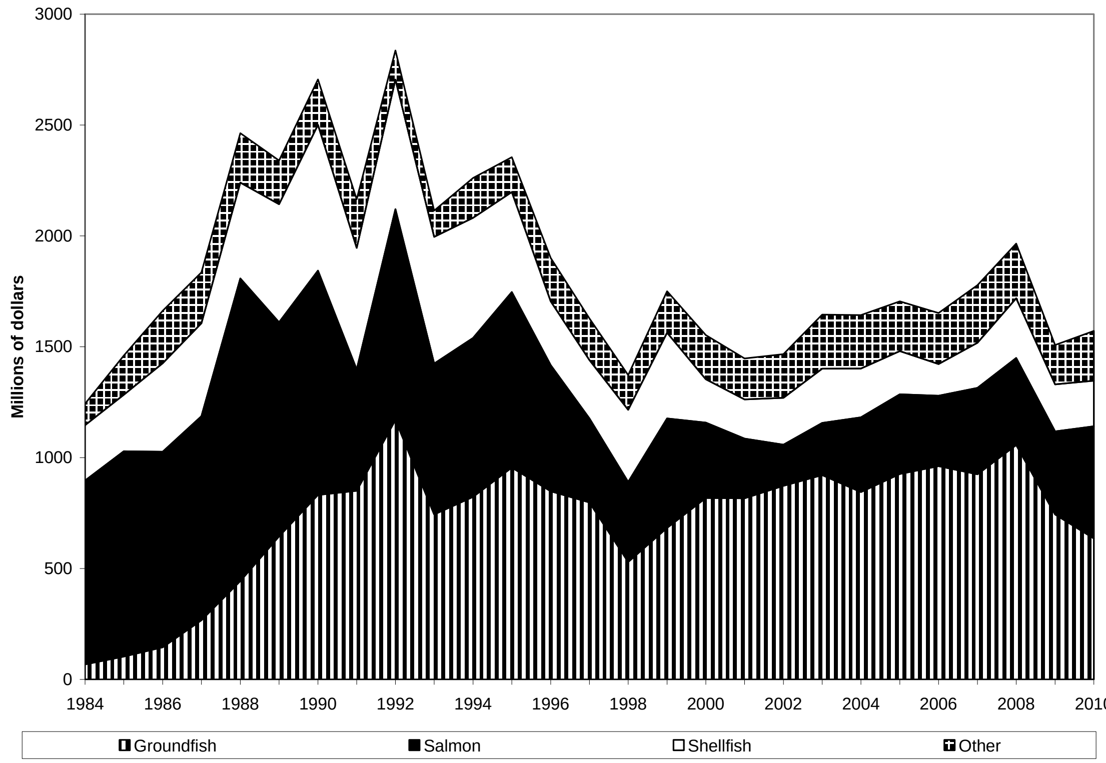

Figure 4. Real ex-vessel value of the domestic fish and shellfish catch off Alaska, 1984-2010 (base year = 2010).

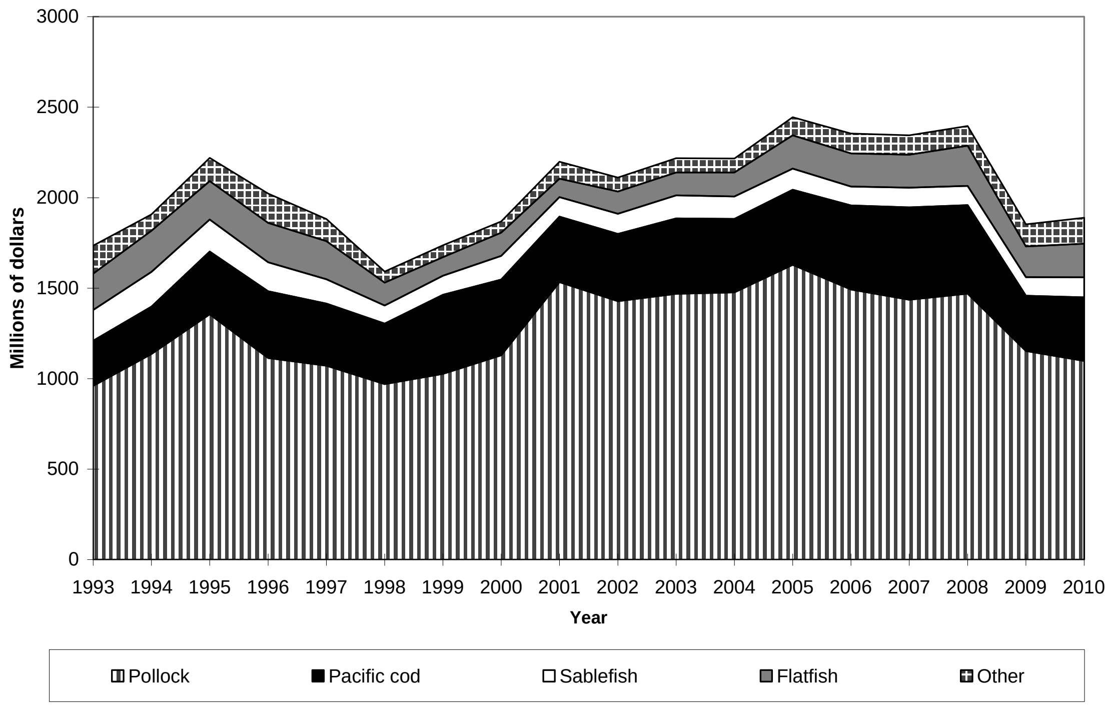

Figure 5. Real gross product value of the groundfish catch off Alaska, 1993-2010 (base year = 2010).

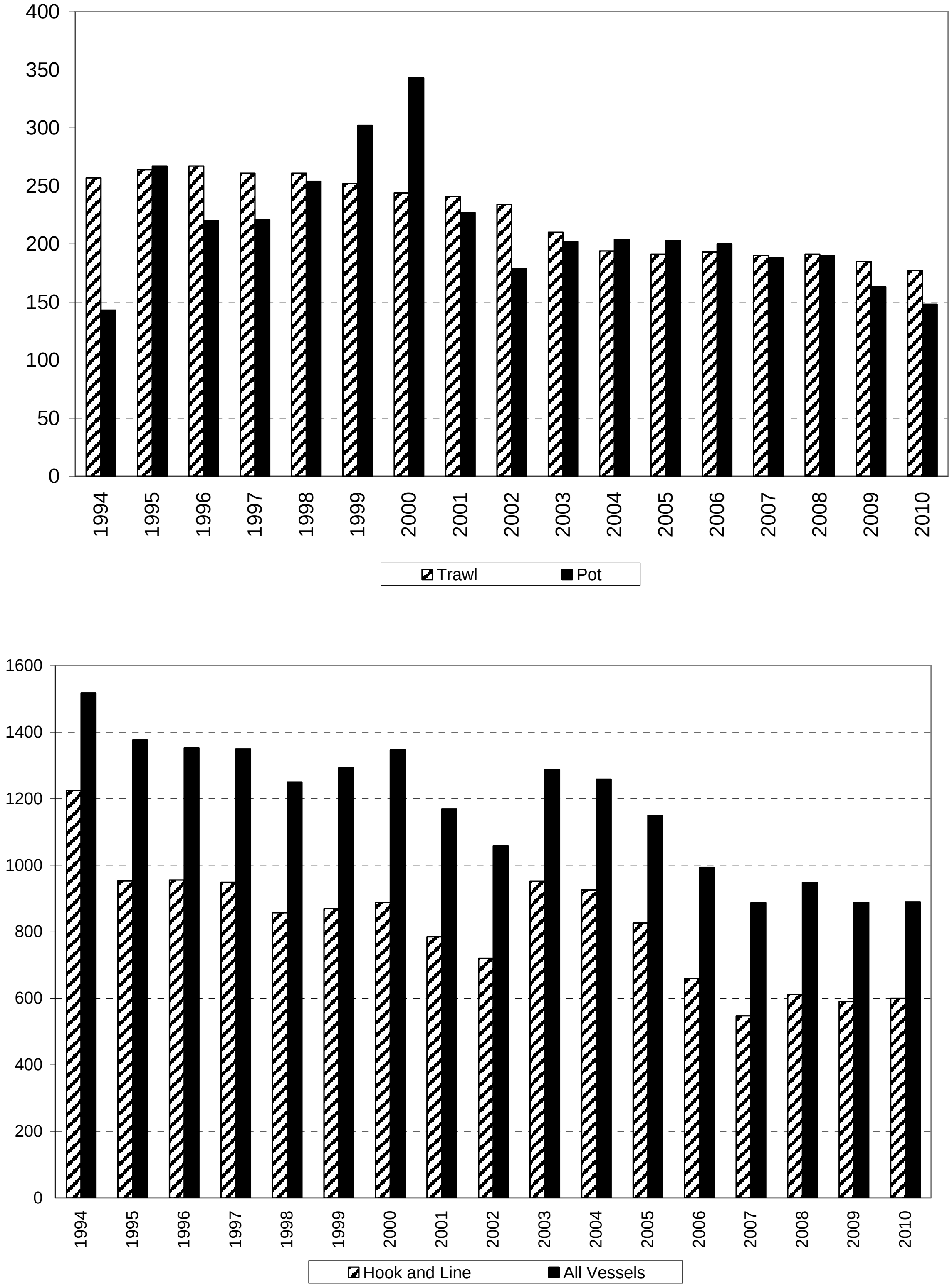

Figure 6. Number of vessels in the domestic groundfish fishery off Alaska by gear type, 1994-2010

Table 1. Groundfish catch in the commercial fisheries off Alaska by area and species, 2000-10 (1,000 metric tons, round weight).

		Pollock	Sablefish	Pacific cod	Flatfish	Rockfish	Atka mackerel	Total
Gulf of Alaska	2000	73.1	15.7	54.5	37.3	21.5	.2	207.9
	2001	72.1	13.2	41.6	31.8	21.5	.1	185.0
	2002	51.9	13.6	42.3	34.1	22.2	.1	168.4
	2003	50.7	15.5	52.6	42.0	23.7	.6	191.5
	2004	63.8	17.0	56.6	23.4	22.3	.8	188.7
	2005	81.0	15.0	47.6	30.0	20.6	.8	200.3
	2006	72.0	13.5	47.9	42.2	24.3	.9	208.8
	2007	52.7	12.8	51.5	40.5	23.4	1.5	189.5
	2008	52.5	12.6	59.0	46.1	23.0	2.1	201.8
	2009	44.2	11.2	52.9	42.4	22.7	2.2	183.2
	2010	76.9	10.1	78.1	37.9	25.3	2.4	237.6
Bering Sea and Aleutian Islands	2000	1,134.0	1.8	191.0	190.9	16.4	47.2	1,607.9
	2001	1,388.3	1.9	176.7	140.2	17.6	61.6	1,815.4
	2002	1,483.0	2.3	197.4	162.7	16.8	45.3	1,937.4
	2003	1,492.6	2.1	211.0	159.8	20.8	58.1	1,973.5
	2004	1,481.7	2.0	212.2	174.7	17.7	60.6	1,979.2
	2005	1,484.6	2.5	205.6	180.5	15.1	62.0	1,981.1
	2006	1,489.4	2.2	193.0	189.5	17.7	61.9	1,982.1
	2007	1,357.0	2.3	174.1	216.4	23.6	58.8	1,860.3
	2008	991.9	2.0	170.8	270.5	21.7	58.1	1,546.0
	2009	812.5	2.0	175.7	226.8	19.5	72.8	1,337.6
	2010	811.7	1.8	172.3	253.9	23.5	68.6	1,355.6
All Alaska	2000	1,207.1	17.5	245.5	228.2	37.9	47.4	1,815.7
	2001	1,460.4	15.1	218.4	172.0	39.1	61.6	2,000.4
	2002	1,534.9	15.8	239.7	196.9	39.0	45.4	2,105.8
	2003	1,543.2	17.6	263.5	201.8	44.6	58.7	2,165.0
	2004	1,545.5	19.0	268.8	198.1	40.0	61.4	2,167.8
	2005	1,565.6	17.6	253.2	210.5	35.7	62.8	2,181.4
	2006	1,561.4	15.7	240.9	231.7	42.0	62.8	2,190.9
	2007	1,409.7	15.1	225.6	256.9	47.0	60.2	2,049.7
	2008	1,044.4	14.7	229.8	316.6	44.7	60.2	1,747.8
	2009	856.8	13.1	228.7	269.3	42.2	75.0	1,520.8
	2010	888.5	11.9	250.3	291.8	48.8	71.1	1,593.2

Notes: These estimates include catch from federal and state of Alaska fisheries. Totals may include additional categories.

Source: Blend estimates for 2000-02. Catch-accounting system estimates for 2003-10.
National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 1A. Catch of species other than groundfish in the domestic commercial fisheries off Alaska by species group, 1994-2010 (1,000 metric tons)

	Crab	Other Shellfish	Salmon	Herring	Halibut	Total
1994	81.1	4.0	393.4	47.7	23.4	549.5
1995	47.9	4.9	500.4	48.1	18.4	619.7
1996	43.6	4.1	387.7	48.7	20.3	504.4
1997	64.6	5.9	244.0	52.4	29.1	396.0
1998	126.7	4.2	284.0	39.4	30.5	484.7
1999	93.5	4.1	363.6	38.7	34.4	534.3
2000	23.8	3.3	275.2	30.8	32.5	365.6
2001	21.4	2.8	311.3	38.4	33.7	407.8
2002	26.3	3.8	237.3	31.7	35.4	334.3
2003	25.8	2.5	286.0	31.3	34.8	380.4
2004	23.9	3.6	316.6	32.2	34.7	410.9
2005	25.9	2.9	395.7	38.9	33.5	496.9
2006	31.4	2.5	287.8	36.2	31.4	389.2
2007	32.1	2.1	390.7	30.5	30.5	485.8
2008	45.1	2.3	290.4	38.2	29.3	405.4
2009	40.6	2.4	304.4	39.4	26.2	413.1
2010	36.2	2.0	343.3	49.0	24.9	455.4

Note: These estimates include catch from both federal and state of Alaska fisheries.

Source: National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics Division, Fisheries of the United States.

Table 2. Groundfish catch off Alaska by area, vessel type, gear and species, 2006-10 (1,000 metric tons, round weight).

			Gulf of Alaska			Bering Sea and Aleutian			All Alaska		
			Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total
All gear	All Groundfish	2006	159	41	199	863	1,115	1,978	1,022	1,156	2,178
		2007	140	38	177	788	1,068	1,856	928	1,106	2,034
		2008	149	38	187	592	949	1,542	741	987	1,728
		2009	127	43	170	496	840	1,336	623	883	1,506
		2010	173	46	219	483	869	1,351	655	915	1,570
Hook & Line	Sablefish	2006	11	2	12	0	1	1	11	2	13
		2007	10	2	12	0	0	1	10	2	12
		2008	11	1	12	0	0	1	11	2	13
		2009	9	1	10	1	1	1	10	2	11
		2010	9	1	9	1	1	1	9	1	10
	Pacific cod	2006	7	4	10	1	99	100	8	103	110
		2007	7	4	12	1	81	81	8	85	93
		2008	7	5	12	1	93	95	9	98	107
		2009	9	6	14	1	101	102	9	107	116
		2010	9	8	17	1	89	90	9	98	107
	Flatfish	2006	0	0	1	0	5	5	0	5	6
		2007	0	0	1	0	4	4	0	4	5
		2008	1	0	1	0	4	4	1	4	5
		2009	0	0	0	0	5	5	0	5	5
		2010	0	0	1	0	5	5	0	5	6
	Rockfish	2006	1	0	2	0	0	0	1	1	2
		2007	1	0	1	0	0	0	1	1	2
		2008	1	0	1	0	0	0	1	1	2
		2009	1	0	1	0	0	0	1	1	2
		2010	1	0	1	0	1	1	1	1	2
	All Groundfish	2006	23	6	29	1	123	125	24	130	154
		2007	21	7	29	1	101	102	22	109	131
		2008	22	7	29	3	118	122	25	126	151
		2009	22	7	30	1	126	127	24	133	157
		2010	21	11	31	2	113	114	22	123	146
Pot	Pacific cod	2006	15	-	15	16	3	19	31	3	34
		2007	13	-	13	15	3	18	28	3	30
		2008	11	-	11	16	3	19	27	3	30
		2009	11	-	11	11	4	14	22	4	26
		2010	20	-	20	17	3	20	37	3	40

Table 2. Continued.

			Gulf of Alaska			Bering Sea and Aleutian			All Alaska		
			Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total
Trawl	Pollock	2006	71	0	72	798	688	1,486	869	689	1,558
		2007	52	1	53	722	632	1,354	774	632	1,406
		2008	52	1	52	525	462	987	576	462	1,039
		2009	42	2	44	435	373	808	477	375	852
		2010	75	1	77	424	383	807	500	384	884
	Sablefish	2006	1	1	1	0	0	0	1	1	1
		2007	1	1	1	0	0	0	1	1	1
		2008	0	0	1	0	0	0	0	1	1
		2009	0	0	1	0	0	0	0	1	1
		2010	0	0	1	0	0	0	0	1	1
	Pacific cod	2006	12	1	13	34	36	70	46	38	83
		2007	14	1	15	32	39	71	46	41	86
		2008	19	1	20	31	22	53	50	23	73
		2009	12	2	14	30	27	57	42	29	71
		2010	21	1	22	28	30	58	49	31	80
	Flatfish	2006	25	16	42	7	177	184	33	193	226
		2007	26	13	40	11	201	212	37	215	252
		2008	32	13	45	10	257	266	41	270	311
		2009	27	15	42	10	212	222	37	227	264
		2010	23	15	37	4	244	249	27	259	286
	Rockfish	2006	8	14	23	1	16	17	9	31	40
		2007	9	13	22	1	22	23	10	35	45
		2008	9	13	22	1	20	21	10	33	43
		2009	8	14	21	1	18	19	9	31	40
		2010	9	15	24	1	21	23	11	36	47
	Atka mackerel	2006	0	1	1	1	61	62	1	61	62
		2007	0	1	1	2	57	59	2	58	60
		2008	0	2	2	1	57	58	2	59	60
		2009	0	2	2	3	69	73	3	72	75
		2010	0	2	2	4	65	69	4	67	71
	All Groundfish	2006	121	34	155	843	989	1,832	964	1,023	1,987
		2007	105	30	135	770	964	1,735	875	995	1,870
		2008	115	30	146	572	828	1,399	687	858	1,545
		2009	93	36	128	483	710	1,193	575	746	1,321
		2010	131	35	167	464	753	1,216	595	788	1,383

Note: The estimates are of total catch (i.e., retained and discarded catch). All groundfish include additional species categories. These estimates include only catch counted against federal TACs. A dash (-) indicates that data are not available, either because there was no activity or to preserve confidentiality.

Source: Catch Accounting System estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 3. Gulf of Alaska groundfish catch by species, gear, and target fishery, 2009-10 (1,000 metric tons, round weight).

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2009 Gear/ Target	Hook & line	Sablefish	.0	8.5	.1	.2	-	-	.0	.0	.6	-	.3	9.6
		Pacific cod	.2	.0	13.2	.1	.0	-	-	.0	.1	.0	1.8	15.4
		Halibut	.0	1.7	1.0	.1	.0	-	.0	.0	.5	-	1.4	4.8
		Total	.2	10.3	14.3	.4	.0	-	.0	.0	1.2	.0	3.6	29.9
	Pot	Pacific cod	.0	-	11.6	.0	.0	-	-	.0	.0	.0	.4	12.0
		Total	.0	-	11.6	.0	.0	-	-	.0	.0	.0	.4	12.0
	Trawl	Pollock, bottom	9.4	.0	.4	.5	.2	.0	.0	.0	.1	-	.3	10.7
		Pollock, pelagic	30.0	-	.2	.3	.1	.0	-	.0	.0	.0	.2	30.7
		Sablefish	.0	.3	.0	.1	.0	.0	.0	.0	.1	-	.0	.5
		Pacific cod	.3	-	7.1	.7	.1	.1	.0	.2	.1	.0	.1	8.7
		Arrowtooth	1.2	.0	.6	11.1	1.2	.8	.0	.2	.1	.0	.8	16.2
		Flathead sole	.1	.0	.3	1.3	.7	.2	.0	.1	.0	-	.1	2.9
		Rex sole	.6	.1	.6	6.2	.6	3.4	.3	.0	.6	.2	.4	13.2
		Flatfish, shallow	1.2	.0	4.2	4.0	.8	.1	.0	7.8	.0	.0	1.6	19.8
		Rockfish	1.3	.4	.6	.5	.0	.1	.0	.1	20.5	1.9	.1	25.5
		Total	44.1	.9	14.0	24.6	3.7	4.8	.4	8.5	21.5	2.2	3.6	128.2
	All gear	Total	44.2	11.1	39.8	25.1	3.7	4.8	.4	8.5	22.7	2.2	7.6	170.1

Table 3. Continued.

2010 Gear/ Target			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
	Hook & line	Sablefish	.0	8.0	.1	.2	-	-	.0	.0	.7	-	.3	9.2
		Pacific cod	.3	.0	16.4	.2	.0	.0	.0	.0	.1	.0	2.4	19.5
		Halibut	-	1.2	.6	.1	-	-	.0	-	.5	-	.2	2.6
		Total	.3	9.2	17.1	.5	.0	.0	.0	.0	1.3	.0	3.0	31.4
	Pot	Pacific cod	.0	-	20.1	.0	-	-	-	.0	.0	.1	.4	20.6
		Total	.0	-	20.1	.0	-	-	-	.0	.0	.1	.4	20.6
	Trawl	Pollock, bottom	22.3	.0	1.3	1.7	.3	.1	.0	.1	.1	.0	.2	26.0
		Pollock, pelagic	50.8	.0	.2	.4	.1	.0	.0	.0	.0	.0	.3	51.7
		Sablefish	.0	.2	.0	.1	-	.0	.0	.0	.1	-	.0	.4
		Pacific cod	.3	.1	15.4	.3	.1	.0	.0	.7	.0	.0	.4	17.2
		Arrowtooth	.7	.1	.7	12.1	1.1	1.1	.2	.5	.2	.2	.9	17.7
		Flathead sole	.3	.0	.3	2.7	1.2	.4	.0	.1	.1	.0	.2	5.4
		Rex sole	.4	.1	.4	4.2	.4	1.9	.1	.0	.4	.0	.4	8.4
		Flatfish, shallow	.7	.0	2.8	1.8	.5	.1	.0	4.1	.0	.0	1.2	11.2
		Rockfish	1.0	.4	.7	.7	.0	.1	.0	.0	22.9	2.1	.1	28.3
		Total	76.5	.9	21.8	23.9	3.8	3.6	.4	5.5	24.0	2.4	3.6	166.3
	All gear	Total	76.9	10.1	59.0	24.3	3.8	3.6	.4	5.5	25.3	2.4	7.0	218.3

Notes: Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area, and gear. These estimates include only catch counted against federal TACs.

Source: Catch-accounting system estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 4. Bering Sea and Aleutian Islands groundfish catch by species, gear, and target fishery, 2009-10 (1,000 metric tons, round weight).

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2009 Gear/ Target	Hook & line	Sablefish	-	.9	.0	.2	.0	-	.1	-	.0	.2	-	.1	1.5
		Pacific cod	4.6	.0	102.0	1.7	.3	.0	.1	.7	.1	.2	.1	13.5	123.2
		Turbot	.0	.1	.0	.2	.0	-	1.2	-	-	.1	-	.2	1.7
		Halibut	-	.2	.0	.0	-	-	.0	-	-	.0	-	.0	.3
		Total	4.6	1.2	102.1	2.2	.3	.0	1.4	.7	.1	.5	.1	13.8	126.8
	Pot	Sablefish	-	.6	-	.1	-	-	.0	-	-	.0	-	.0	.8
		Pacific cod	.0	-	14.3	.0	.0	.0	-	.0	.0	.0	.0	.1	14.5
		Total	.0	.6	14.3	.1	.0	.0	.0	.0	.0	.0	.0	.1	15.3
	Trawl	Pollock, bottom	131.8	.0	3.7	1.2	2.5	5.8	.0	.2	.3	.1	.0	2.5	148.0
		Pollock, pelagic	654.8	.0	4.2	1.0	2.2	1.8	.0	.1	.2	.1	.0	2.0	666.3
		Pacific cod	3.4	.0	30.6	.5	.5	1.2	.0	.3	.1	.1	.4	.7	37.7
		Arrowtooth	.5	.1	.2	19.9	.2	.0	1.4	.0	.7	.6	.0	.4	24.1
		Flathead sole	3.2	-	2.0	1.2	8.6	1.5	.0	1.4	.6	.2	-	.8	19.5
		Rock sole	6.1	-	3.6	.6	1.8	29.1	.0	6.6	3.0	.0	-	2.2	53.0
		Turbot	.0	.0	-	1.1	.0	-	1.3	-	.0	.0	.0	.0	2.6
		Yellowfin	7.0	-	10.8	1.9	3.5	9.1	.0	98.2	11.0	.0	.0	4.4	145.9
		Other flatfish	.0	-	.0	.2	.0	.0	-	.0	.2	.0	-	.0	.5
		Rockfish	.8	.0	.1	.4	.0	.0	.1	-	.0	10.4	2.4	.2	14.3
		Atka mackerel	.4	.0	2.1	.2	.0	.1	.1	-	.0	7.5	69.9	.9	81.2
		Total	807.9	.2	57.2	28.2	19.3	48.7	3.1	106.8	16.0	19.0	72.7	14.1	1,193.2
	All gear	Total	812.5	2.0	173.7	30.4	19.6	48.7	4.5	107.5	16.1	19.5	72.8	28.1	1,335.3

Table 4. Continued.

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2010 Gear/ Target	Hook & line	Sablefish	.0	.9	.0	.1	-	-	.1	-	.0	.1	-	.1	1.3
		Pacific cod	4.2	.0	89.9	1.6	.3	.0	.1	.2	.1	.4	.1	12.4	109.3
		Arrowtooth	-	.0	-	.1	.0	-	.1	-	-	.0	-	.0	.2
		Turbot	.0	.1	.1	.5	.0	-	1.8	-	.0	.1	-	.4	3.0
		Halibut	-	.2	.0	.0	-	-	.1	-	-	.0	-	.0	.4
		Total	4.2	1.2	90.0	2.3	.3	.0	2.1	.2	.1	.7	.1	12.9	114.1
	Pot	Pacific cod	.0	-	20.4	.0	.0	.0	-	.0	.0	.0	.0	.3	20.7
		Total	.0	-	20.4	.0	.0	.0	-	.0	.0	.0	.0	.3	20.7
	Trawl	Pollock, bottom	78.0	.0	2.5	.9	2.2	1.6	.0	.6	.2	.2	.1	1.1	87.5
		Pollock, pelagic	711.5	.0	4.4	.6	2.2	.6	.0	.4	.1	.2	.0	1.3	721.3
		Pacific cod	2.2	-	29.2	.5	.2	1.3	.0	.5	.1	.1	.2	.6	34.8
		Arrowtooth	.4	.1	.1	28.1	.1	.0	1.7	.0	.2	.4	.1	.3	31.4
		Flathead sole	3.1	-	2.0	2.3	9.0	2.5	.0	2.1	1.4	.1	-	.5	23.1
		Rock sole	6.0	-	6.7	1.8	3.4	37.3	.0	12.0	3.0	.0	-	2.1	72.4
		Turbot	-	-	-	.1	-	-	.1	-	-	.0	-	-	.2
		Yellowfin	5.2	-	11.1	1.7	2.7	9.7	.0	102.7	13.0	-	.0	3.6	149.7
		Other flatfish	.0	-	-	.0	.0	.0	-	.1	.2	-	-	-	.3
		Rockfish	.5	.0	.2	.6	.1	.0	.1	-	.0	12.2	1.1	.1	14.9
		Atka mackerel	.4	.0	1.6	.4	.0	.1	.1	-	.0	9.7	67.1	.9	80.3
		Total	807.4	.1	57.9	37.0	19.8	53.2	2.0	118.4	18.2	22.8	68.5	10.6	1,216.0
	All gear	Total	811.7	1.3	168.3	39.3	20.1	53.2	4.1	118.6	18.3	23.5	68.6	23.8	1,350.8

Notes: Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area, and gear. These estimates include only catch counted against federal TACs.

Source: Catch-accounting system estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 5. Groundfish catch off Alaska by area, residency, and species, 2006-10 (1,000 metric tons, round weight).

		Gulf of Alaska		Bering Sea and Aleutian		All Alaska	
		Alaska	Other	Alaska	Other	Alaska	Other
All groundfish	2006	75	124	331	1,647	406	1,771
	2007	68	110	315	1,541	383	1,651
	2008	69	118	270	1,271	339	1,389
	2009	70	100	216	1,119	286	1,220
	2010	94	125	236	1,116	330	1,241
Pollock	2006	26	46	261	1,229	287	1,274
	2007	20	33	243	1,114	262	1,148
	2008	20	32	181	811	201	843
	2009	19	26	123	689	142	715
	2010	33	44	134	678	167	721
Sablefish	2006	6	7	1	2	7	9
	2007	6	7	1	2	7	8
	2008	6	6	1	1	7	7
	2009	6	5	1	1	6	7
	2010	5	5	0	1	6	6
Pacific cod	2006	23	15	30	160	53	175
	2007	23	17	27	143	51	159
	2008	23	21	24	142	47	164
	2009	23	17	28	145	52	162
	2010	33	26	30	138	64	164
Flatfish	2006	10	33	34	155	44	188
	2007	11	30	38	178	49	208
	2008	11	35	59	211	71	246
	2009	13	30	59	168	71	198
	2010	11	26	67	187	78	214
Rockfish	2006	6	18	1	16	7	35
	2007	5	18	1	23	5	41
	2008	5	18	0	21	5	40
	2009	5	17	1	19	6	36
	2010	7	18	1	23	8	41
Atka mackerel	2006	0	1	1	61	1	62
	2007	0	1	1	58	1	59
	2008	0	2	0	58	0	60
	2009	0	2	0	73	0	75
	2010	0	2	0	69	0	71

Notes: These estimates include only catch counted against federal TACs. Catch delivered to motherships is classified by the residence of the owner of the mothership. All other catch is classified by the residence of the owner of the fishing vessel. All groundfish include additional species categories. Other includes catch by vessels for which residency information was unavailable; this catch was over 500 metric tons (but less than 1,000 metric tons) in only one case.

Source: Catch Accounting System estimates, fish tickets, CFEC vessel data, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 6. Discards and discard rates for groundfish catch off Alaska by area, gear, and species, 2006-10 (1,000 metric tons, round weight).

			Fixed		Trawl		All gear	
			Total Discards	Discard Rate	Total Discards	Discard Rate	Total Discards	Discard Rate
Gulf of Alaska	All Groundfish	2006	5.4	12%	20.1	13%	25.5	13%
		2007	4.3	10%	17.4	13%	21.7	12%
		2008	4.6	11%	21.1	15%	25.7	14%
		2009	5.4	13%	21.9	17%	27.3	16%
		2010	4.0	8%	17.8	11%	21.9	10%
	Pollock	2006	.0	20%	1.9	3%	1.9	3%
		2007	.0	8%	1.5	3%	1.5	3%
		2008	.1	30%	3.6	7%	3.6	7%
		2009	.0	4%	2.5	6%	2.6	6%
		2010	.1	44%	1.1	1%	1.2	2%
	Sablefish	2006	.3	2%	.3	25%	.6	4%
		2007	.2	2%	.2	16%	.4	3%
		2008	.7	6%	.1	8%	.8	6%
		2009	.8	8%	.1	9%	.9	8%
		2010	.4	4%	.0	5%	.4	4%
	Pacific cod	2006	.4	2%	1.4	11%	1.8	5%
		2007	.3	1%	1.1	8%	1.5	4%
		2008	.3	1%	3.0	15%	3.3	8%
		2009	.9	3%	3.0	21%	3.9	10%
		2010	.4	1%	2.4	11%	2.8	5%
	Flatfish	2006	.5	84%	12.4	30%	12.9	31%
		2007	.6	91%	10.9	27%	11.6	29%
		2008	.9	93%	10.2	23%	11.1	24%
		2009	.4	91%	12.5	30%	12.9	30%
		2010	.5	93%	10.3	27%	10.8	28%
	Rockfish	2006	.7	38%	2.3	10%	2.9	12%
		2007	.4	27%	.9	4%	1.3	6%
		2008	.3	22%	1.3	6%	1.6	7%
		2009	.3	25%	1.6	8%	1.9	9%
		2010	.4	29%	1.3	6%	1.7	7%
	Atka mackerel	2006	.0	100%	.4	43%	.4	43%
		2007	.0	100%	.6	38%	.6	39%
		2008	.0	100%	1.3	62%	1.3	63%
		2009	.0	100%	.9	41%	.9	41%
		2010	.1	100%	1.2	49%	1.2	51%

Table 6. Continued.

			Fixed		Trawl		All gear	
			Total Discards	Discard Rate	Total Discards	Discard Rate	Total Discards	Discard Rate
Bering Sea & Aleutians	All Groundfish	2006	16.8	12%	76.2	4%	93.0	5%
		2007	14.0	11%	88.2	5%	102.2	6%
		2008	18.0	13%	51.2	4%	69.2	4%
		2009	16.3	11%	45.1	4%	61.4	5%
		2010	15.0	11%	40.1	3%	55.1	4%
	Pollock	2006	.5	15%	15.4	1%	15.9	1%
		2007	.5	16%	16.0	1%	16.5	1%
		2008	.9	16%	6.8	1%	7.7	1%
		2009	.6	13%	5.8	1%	6.4	1%
		2010	.8	20%	3.1	0%	3.9	0%
	Sablefish	2006	.1	3%	.0	7%	.1	3%
		2007	.1	3%	.0	7%	.1	3%
		2008	.1	5%	.0	0%	.1	5%
		2009	.0	1%	.0	4%	.0	1%
		2010	.0	2%	.0	3%	.0	2%
	Pacific cod	2006	1.8	1%	.9	1%	2.7	1%
		2007	1.6	2%	1.0	1%	2.5	1%
		2008	1.7	1%	.5	1%	2.2	1%
		2009	1.6	1%	.6	1%	2.3	1%
		2010	1.7	2%	1.3	2%	3.1	2%
	Flatfish	2006	2.3	45%	42.7	23%	45.0	24%
		2007	2.2	52%	51.1	24%	53.3	25%
		2008	2.8	66%	30.7	12%	33.4	12%
		2009	2.9	62%	23.8	11%	26.7	12%
		2010	2.3	45%	22.8	9%	25.1	10%
	Rockfish	2006	.2	50%	5.1	30%	5.3	30%
		2007	.3	61%	6.2	27%	6.5	28%
		2008	.2	56%	2.3	11%	2.6	12%
		2009	.2	50%	2.0	11%	2.3	12%
		2010	.3	42%	1.4	6%	1.7	7%
	Atka mackerel	2006	.4	100%	2.7	4%	3.0	5%
		2007	.1	97%	2.0	3%	2.1	4%
		2008	.1	98%	1.1	2%	1.3	2%
		2009	.1	84%	2.9	4%	2.9	4%
		2010	.1	52%	3.9	6%	4.0	6%

Table 6. Continued.

			Fixed		Trawl		All gear	
			Total Discards	Discard Rate	Total Discards	Discard Rate	Total Discards	Discard Rate
All Alaska	All Groundfish	2006	22.2	12%	96.3	5%	118.5	5%
		2007	18.3	11%	105.6	6%	123.9	6%
		2008	22.6	12%	72.3	5%	94.9	5%
		2009	21.8	12%	67.0	5%	88.8	6%
		2010	19.0	10%	57.9	4%	76.9	5%
	Pollock	2006	.5	15%	17.3	1%	17.8	1%
		2007	.5	15%	17.5	1%	18.0	1%
		2008	.9	17%	10.4	1%	11.3	1%
		2009	.6	13%	8.3	1%	8.9	1%
		2010	1.0	22%	4.1	0%	5.1	1%
	Sablefish	2006	.3	2%	.3	23%	.6	4%
		2007	.3	2%	.2	15%	.5	3%
		2008	.8	6%	.1	7%	.9	6%
		2009	.8	7%	.1	8%	.9	7%
		2010	.4	4%	.1	5%	.5	4%
	Pacific cod	2006	2.2	2%	2.4	3%	4.5	2%
		2007	1.9	2%	2.1	2%	4.0	2%
		2008	2.0	1%	3.5	5%	5.5	3%
		2009	2.5	2%	3.6	5%	6.1	3%
		2010	2.1	1%	3.8	5%	5.9	3%
	Flatfish	2006	2.8	49%	55.1	24%	57.9	25%
		2007	2.8	58%	62.1	25%	64.9	25%
		2008	3.7	71%	40.8	13%	44.5	14%
		2009	3.4	65%	36.2	14%	39.6	15%
		2010	2.8	50%	33.1	12%	35.9	12%
	Rockfish	2006	.9	40%	7.4	19%	8.3	20%
		2007	.7	36%	7.2	16%	7.9	17%
		2008	.5	30%	3.6	8%	4.1	9%
		2009	.5	32%	3.7	9%	4.2	10%
		2010	.7	33%	2.8	6%	3.4	7%
	Atka mackerel	2006	.4	100%	3.0	5%	3.4	5%
		2007	.1	97%	2.5	4%	2.6	4%
		2008	.1	98%	2.4	4%	2.6	4%
		2009	.1	87%	3.8	5%	3.9	5%
		2010	.1	67%	5.1	7%	5.2	7%

Notes: All groundfish and all gear may include additional categories. These estimates include only catch counted against federal TACs. Although these are the best available estimates of discards and are used for several management purposes, these estimates are not necessarily accurate. The reasons for this are as follows: 1) they are wholly or partially derived from observer estimates; 2) discards occur at many different places on vessels; 3) observers record only a rough approximation of what they see; 4) the sampling methods used by at-sea observers provide the basis for NMFS to make good estimates of total catch by species, not the disposition of that catch.

Source: Catch-accounting system estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 7. Gulf of Alaska groundfish discards by species, gear, and target fishery, 2009-10 (1,000 metric tons, round weight).

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2009 Gear/ Target	Hook & line	Sablefish	.0	.2	.0	.2	-	-	.0	.0	.1	-	.2	.8
		Pacific cod	.0	.0	.2	.1	.0	-	-	.0	.0	.0	1.3	1.6
		Halibut	.0	.5	.6	.1	.0	-	.0	.0	.1	-	1.3	2.7
		Total	.0	.8	.8	.4	.0	-	.0	.0	.3	.0	2.8	5.1
	Pot	Pacific cod	.0	-	.1	.0	.0	-	-	.0	.0	.0	.1	.3
		Total	.0	-	.1	.0	.0	-	-	.0	.0	.0	.1	.3
	Trawl	Pollock, bottom	.1	.0	.0	.2	.0	.0	.0	.0	.0	-	.0	.4
		Pollock, pelagic	.5	-	.0	.0	.0	.0	-	.0	.0	.0	.0	.6
		Sablefish	.0	.0	.0	.0	.0	.0	.0	.0	.0	-	.0	.1
		Pacific cod	.1	-	.0	.6	.0	.0	.0	.0	.0	.0	.1	.9
		Arrowtooth	.7	.0	.1	.4	.0	.0	.0	.0	.1	.0	.4	1.7
		Flathead sole	.0	.0	.0	1.2	.0	.0	.0	.0	.0	-	.0	1.3
		Rex sole	.2	.0	.1	5.6	.0	.0	.3	.0	.3	.0	.1	6.7
		Flatfish, shallow	.7	.0	2.7	3.4	.0	.0	.0	.1	.0	.0	.6	7.5
		Rockfish	.3	.0	.0	.4	.0	.0	.0	.0	1.1	.8	.1	2.9
		Total	2.5	.1	3.0	11.8	.1	.0	.3	.1	1.6	.9	1.3	21.9
	All gear	Total	2.6	.9	3.9	12.2	.1	.0	.4	.1	1.9	.9	4.3	27.3

Table 7. Continued.

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2010 Gear/ Target	Hook & line	Sablefish	.0	.2	.0	.2	-	-	.0	.0	.2	-	.3	.9
		Pacific cod	.1	.0	.2	.2	.0	.0	.0	.0	.0	.0	1.6	2.2
		Halibut	-	.1	.1	.1	-	-	.0	-	.1	-	.1	.5
		Total	.1	.4	.4	.4	.0	.0	.0	.0	.4	.0	2.0	3.7
	Pot	Pacific cod	.0	-	.0	.0	-	-	-	.0	.0	.1	.2	.3
		Total	.0	-	.0	.0	-	-	-	.0	.0	.1	.2	.3
	Trawl	Pollock, bottom	.0	.0	.0	.1	.0	.0	.0	.0	.1	.0	.1	.3
		Pollock, pelagic	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.4
		Sablefish	.0	.0	.0	.1	-	.0	.0	.0	.0	-	.0	.1
		Pacific cod	.1	.0	.0	.2	.0	.0	.0	.2	.0	.0	.2	.7
		Arrowtooth	.1	.0	.2	.9	.1	.0	.0	.0	.1	.2	.3	1.9
		Flathead sole	.2	.0	.1	2.5	.0	.0	.0	.0	.1	.0	.0	2.9
		Rex sole	.2	.0	.1	4.0	.0	.0	.1	.0	.2	.0	.1	4.7
		Flatfish, shallow	.3	.0	2.0	1.3	.0	.0	.0	.1	.0	.0	.5	4.2
		Rockfish	.0	.0	.0	.5	.0	.0	.0	.0	.8	1.0	.1	2.5
		Total	1.1	.0	2.4	9.6	.2	.1	.2	.3	1.3	1.2	1.5	17.8
	All gear	Total	1.2	.4	2.8	10.0	.2	.1	.2	.3	1.7	1.2	3.7	21.9

Notes: Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area, and gear. These estimates include only catch counted against federal TACs. Although these are the best available estimates of discards and are used for several management purposes, these estimates are not necessarily accurate. The reasons for this are as follows: 1) they are wholly or partially derived from observer estimates; 2) discards occur at many different places on vessels; 3) observers record only a rough approximation of what they see; and 4) the sampling methods used by at-sea observers provide NMFS the basis to make good estimates of total catch by species, not the disposition of that catch.

Source: Catch-accounting system estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 8. Bering Sea and Aleutian Islands groundfish discards by species, gear, and target fishery, 2009-10 (1,000 metric tons, round weight).

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2009 Gear/ Target	Hook & line	Sablefish	-	.0	.0	.1	.0	-	.0	-	.0	.1	-	.1	.4
		Pacific cod	.6	.0	1.6	1.4	.2	.0	.0	.6	.1	.2	.1	10.3	15.2
		Turbot	.0	.0	.0	.1	.0	-	.0	-	-	.0	-	.2	.3
		Halibut	-	.0	.0	.0	-	-	.0	-	-	.0	-	.0	.1
		Total	.6	.0	1.6	1.7	.3	.0	.1	.6	.1	.2	.1	10.6	15.9
	Pot	Sablefish	-	.0	-	.1	-	-	.0	-	-	.0	-	.0	.1
		Pacific cod	.0	-	.0	.0	.0	.0	-	.0	.0	.0	.0	.1	.2
		Total	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1	.3
	Trawl	Pollock, bottom	.1	.0	.0	.3	.1	.3	.0	.0	.0	.0	.0	.7	1.5
		Pollock, pelagic	.6	.0	.0	.4	1.0	1.2	.0	.0	.1	.0	.0	1.3	4.7
		Pacific cod	2.2	.0	.2	.4	.2	.6	.0	.0	.1	.0	.0	.6	4.4
		Arrowtooth	.1	.0	.0	.8	.0	.0	.3	.0	.0	.1	.0	.3	1.6
		Flathead sole	.7	-	.1	.5	.1	.1	.0	.0	.1	.0	-	.7	2.3
		Rock sole	1.1	-	.1	.5	.1	1.3	.0	.3	1.4	.0	-	1.7	6.5
		Turbot	.0	.0	-	.0	.0	-	.0	-	.0	.0	.0	.0	.1
		Yellowfin	.5	-	.2	1.2	.4	1.5	.0	5.7	4.2	.0	.0	3.7	17.6
		Other flatfish	.0	-	.0	.0	.0	.0	-	.0	.0	.0	-	.0	.1
		Rockfish	.3	.0	.0	.2	.0	.0	.0	-	.0	.4	.2	.1	1.2
		Atka mackerel	.0	.0	.0	.1	.0	.0	.0	-	.0	1.4	2.6	.8	5.1
		Total	5.8	.0	.6	4.4	1.8	5.2	.3	6.2	5.9	2.0	2.9	10.1	45.1
	All gear	Total	6.4	.0	2.3	6.2	2.0	5.2	.5	6.9	6.0	2.3	2.9	20.8	61.3

Table 8. Continued.

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2010 Gear/ Target	Hook & line	Sablefish	.0	.0	.0	.1	-	-	.0	-	.0	.0	-	.1	.2
		Pacific cod	.8	.0	1.7	1.3	.3	.0	.0	.2	.1	.2	.0	9.0	13.6
		Arrowtooth	-	.0	-	.0	.0	-	.0	-	-	.0	-	.0	.0
		Turbot	.0	.0	.0	.1	.0	-	.0	-	.0	.0	-	.3	.6
		Halibut	-	.0	.0	.0	-	-	.1	-	-	.0	-	.0	.1
		Total	.8	.0	1.7	1.5	.3	.0	.1	.2	.1	.3	.0	9.5	14.6
	Pot	Pacific cod	.0	-	.0	.0	.0	.0	-	.0	.0	.0	.0	.2	.3
		Total	.0	-	.0	.0	.0	.0	-	.0	.0	.0	.0	.2	.3
	Trawl	Pollock, bottom	.0	.0	.0	.3	.1	.1	.0	.0	.0	.0	.0	.2	.9
		Pollock, pelagic	.5	.0	.0	.2	.9	.3	.0	.3	.0	.0	.0	.7	3.0
		Pacific cod	1.2	-	.2	.4	.1	.6	.0	.0	.1	.0	.0	.5	3.3
		Arrowtooth	.1	.0	.0	1.3	.0	.0	.1	.0	.0	.1	.0	.3	1.8
		Flathead sole	.4	-	.0	1.1	.2	.2	.0	.1	.2	.0	-	.4	2.7
		Rock sole	.3	-	.1	1.1	.1	1.0	.0	.4	1.1	.0	-	1.7	5.7
		Turbot	-	-	-	.0	-	-	.0	-	-	.0	-	-	.0
		Yellowfin	.4	-	1.0	.8	.1	.9	.0	4.3	5.8	-	.0	2.9	16.2
		Other flatfish	.0	-	.0	.0	.0	.0	-	.0	.0	-	-	.0	.0
		Rockfish	.1	.0	.0	.2	.0	.0	.0	-	.0	.2	.0	.1	.5
		Atka mackerel	.1	.0	.0	.1	.0	.0	.0	-	.0	1.1	3.9	.7	5.9
		Total	3.1	.0	1.3	5.7	1.5	3.1	.1	5.2	7.2	1.4	3.9	7.5	40.1
	All gear	Total	3.9	.0	3.1	7.2	1.8	3.1	.2	5.4	7.3	1.7	4.0	17.2	54.9

Notes: Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area, and gear. These estimates include only catch counted against federal TACs. Although these are the best available estimates of discards and are used for several management purposes, these estimates are not necessarily accurate. The reasons for this are discussed in the Notes for Table 7.

Source: Catch-accounting system estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 9. Gulf of Alaska groundfish discard rates by species, gear, and target fishery, 2009-10 (percent).

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2009 Gear/ Target	Hook & line	Sablefish	6	3	33	86	-	-	98	100	23	-	96	8
		Pacific cod	3	76	2	100	100	-	-	98	66	100	70	11
		Halibut	68	32	57	93	97	-	100	91	20	-	94	56
		Total	3	8	6	91	99	-	99	98	24	100	80	17
	Pot	Pacific cod	21	-	1	99	36	-	-	99	100	100	34	2
		Total	21	-	1	99	36	-	-	99	100	100	34	2
	Trawl	Pollock, bottom	1	49	6	44	7	9	3	9	24	-	16	4
		Pollock, pelagic	2	-	1	2	1	0	-	2	53	0	25	2
		Sablefish	97	0	3	87	68	44	73	96	26	-	95	22
		Pacific cod	39	-	0	84	12	0	79	9	26	97	45	10
		Arrowtooth	58	60	15	4	0	0	4	1	56	39	48	10
		Flathead sole	19	23	3	90	2	6	92	2	19	-	21	45
		Rex sole	28	7	15	91	6	1	94	8	56	17	23	51
		Flatfish, shallow	55	12	64	84	3	0	2	1	30	86	39	38
		Rockfish	23	9	5	85	12	8	45	33	6	43	86	11
		Total	6	9	21	48	3	1	80	1	8	41	37	17
	All gear	Total	6	8	10	49	3	1	81	2	9	42	57	16

Table 9. Continued.

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2010 Gear/ Target	Hook & line	Sablefish	57	3	8	85	-	-	100	100	31	-	99	10
		Pacific cod	42	94	1	100	97	100	100	98	69	100	66	12
		Halibut	-	7	23	96	-	-	86	-	22	-	54	21
		Total	42	4	2	93	97	100	100	98	28	100	67	12
	Pot	Pacific cod	75	-	0	100	-	-	-	77	100	100	50	1
		Total	75	-	0	100	-	-	-	77	100	100	50	1
	Trawl	Pollock, bottom	0	32	3	6	3	5	0	4	53	0	52	1
		Pollock, pelagic	0	55	1	6	4	9	84	3	7	0	54	1
		Sablefish	51	1	47	100	-	97	92	100	14	-	100	23
		Pacific cod	19	0	0	76	37	56	90	23	36	94	48	4
		Arrowtooth	22	14	28	7	6	3	4	4	39	99	32	11
		Flathead sole	54	2	19	94	4	4	52	2	67	2	24	55
		Rex sole	37	5	13	96	3	0	86	8	57	72	39	57
		Flatfish, shallow	40	11	74	73	2	2	33	2	51	100	40	38
		Rockfish	3	6	4	67	17	8	60	27	4	46	82	9
		Total	1	5	11	40	4	2	45	5	6	49	42	11
	All gear	Total	2	4	5	41	5	2	46	5	7	51	53	10

Notes: Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area, and gear. These estimates include only catch counted against federal TACs. Although these are the best available estimates of discards and are used for several management purposes, these estimates are not necessarily accurate. The reasons for this are as follows: 1) they are wholly or partially derived from observer estimates; 2) discards occur at many different places on vessels; 3) observers record only a rough approximation of what they see; and 4) the sampling methods used by at-sea observers provide the basis for NMFS to make good estimates of total catch by species, not the disposition of that catch.

Source: Catch-accounting system estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 10. Bering Sea and Aleutian Islands groundfish discard rates by species, gear, and target fishery, 2009-10 (percent).

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2009 Gear/ Target	Hook & line	Sablefish	-	1	2	79	100	-	40	-	100	40	-	99	25
		Pacific cod	13	50	2	83	99	98	24	99	100	74	85	76	12
		Turbot	8	2	1	42	100	-	2	-	-	11	-	99	18
		Halibut	-	0	1	65	-	-	47	-	-	17	-	91	16
		Total	13	1	2	78	99	98	6	99	100	50	85	76	13
	Pot	Sablefish	-	0	-	99	-	-	96	-	-	93	-	93	16
		Pacific cod	65	-	0	100	19	94	-	100	100	100	87	91	1
		Total	65	0	0	99	19	94	96	100	100	96	87	91	2
	Trawl	Pollock, bottom	0	1	0	21	3	5	2	5	8	15	4	30	1
		Pollock, pelagic	0	76	1	42	44	69	28	33	42	23	4	63	1
		Pacific cod	66	15	1	87	32	53	37	9	59	41	10	89	12
		Arrowtooth	12	3	2	4	1	4	20	5	2	23	17	85	7
		Flathead sole	23	-	3	43	1	5	14	2	14	10	-	86	12
		Rock sole	19	-	2	78	6	5	38	5	46	50	-	75	12
		Turbot	1	1	-	2	2	-	2	-	20	1	25	97	4
		Yellowfin	8	-	2	65	10	17	57	6	39	41	82	85	12
		Other flatfish	57	-	0	28	0	4	-	12	1	20	-	87	18
		Rockfish	39	11	23	50	34	61	9	-	39	4	8	79	9
		Atka mackerel	4	3	2	35	13	29	2	-	26	19	4	91	6
		Total	1	4	1	16	9	11	11	6	37	11	4	71	4
	All gear	Total	1	1	1	20	10	11	10	6	37	12	4	74	5

Table 10. Continued.

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2010 Gear/ Target	Hook & line	Sablefish	97	1	82	72	-	-	20	-	95	16	-	98	15
		Pacific cod	20	8	2	83	95	93	15	91	100	55	38	73	12
		Arrowtooth	-	6	-	10	100	-	2	-	-	16	-	73	19
		Turbot	13	17	17	28	96	-	1	-	44	25	-	91	19
		Halibut	-	3	0	33	-	-	88	-	-	25	-	92	32
		Total	20	3	2	68	95	93	6	91	99	41	38	73	13
	Pot	Pacific cod	50	-	0	98	59	100	-	100	98	100	99	81	1
		Total	50	-	0	98	59	100	-	100	98	100	99	81	1
	Trawl	Pollock, bottom	0	4	0	37	3	8	3	7	5	14	1	18	1
		Pollock, pelagic	0	0	0	36	42	41	32	81	19	20	3	53	0
		Pacific cod	53	-	1	96	66	46	34	10	64	72	12	88	9
		Arrowtooth	21	4	2	5	4	7	5	17	4	17	0	82	6
		Flathead sole	14	-	1	48	2	7	18	4	15	8	-	81	12
		Rock sole	5	-	2	60	3	3	85	3	36	81	-	78	8
		Turbot	-	-	-	12	-	-	0	-	-	5	-	-	6
		Yellowfin	7	-	9	51	4	9	16	4	45	-	100	81	11
		Other flatfish	0	-	0	41	1	3	-	4	4	-	-	66	8
		Rockfish	11	0	6	28	12	32	3	-	6	1	1	83	3
		Atka mackerel	15	0	1	27	41	26	2	-	29	11	6	87	7
		Total	0	3	2	15	8	6	5	4	39	6	6	71	3
	All gear	Total	0	3	2	18	9	6	5	5	40	7	6	72	4

Notes: Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area, and gear. These estimates include only catch counted against federal TACs. Although these are the best available estimates of discards and are used for several management purposes, these estimates are not necessarily accurate. The reasons for this are discussed in the Notes for Table 9.

Source: Catch-accounting system estimates, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 11. Prohibited species bycatch by species, area and gear, 2007-10 (metric tons (t) or number in 1,000s)

			Halibut mort. (t)	Herring (t)	Chinook (1,000s)	Other salmon (1,000s)	Red king crab (1,000s)	Other k. crab (1,000s)	Bairdi (1,000s)	Other tanner (1,000s)
Bering Sea & Aleutians	Hook & Line	2007	535	-	0	0	8	5	17	44
		2008	769	0	0	0	8	10	33	95
		2009	694	0	0	0	7	15	35	67
		2010	633	-	0	0	2	2	26	61
	Pot	2007	4	-	0	-	24	523	475	593
		2008	7	-	-	-	40	203	1,428	585
		2009	2	-	-	-	3	148	424	578
		2010	5	-	-	-	2	70	347	247
	Trawl	2007	3,539	409	129	97	101	9	759	1,903
		2008	2,835	216	24	17	90	31	677	795
		2009	2,886	63	14	47	76	18	481	527
		2010	2,819	359	13	15	60	13	508	1,721
	All gear	2007	4,077	409	130	97	133	538	1,250	2,540
		2008	3,611	216	24	17	139	243	2,138	1,474
		2009	3,581	63	14	47	86	181	940	1,172
		2010	3,457	359	13	15	64	86	880	2,030
Gulf of Alaska	Hook & Line	2007	-	-	0	0	-	0	0	0
		2008	-	-	-	0	0	0	2	0
		2009	-	-	-	0	-	0	1	0
		2010	-	-	-	0	-	-	2	0
	Pot	2007	15	-	-	-	-	-	108	4
		2008	21	-	-	-	-	-	104	0
		2009	5	-	-	-	-	-	17	-
		2010	24	-	-	-	-	-	140	-
	Trawl	2007	1,945	20	40	3	-	0	204	2
		2008	1,955	1	16	2	-	0	133	2
		2009	1,829	9	8	2	-	3	228	1
		2010	1,636	2	55	2	-	3	93	0
	All gear	2007	1,960	20	41	4	-	0	312	7
		2008	1,976	1	16	2	0	0	238	2
		2009	1,834	9	8	2	-	3	246	1
		2010	1,661	2	55	2	-	3	235	0
All Alaska	All gear	2007	6,037	429	170	101	133	538	1,562	2,546
		2008	5,588	217	40	19	139	244	2,376	1,476
		2009	5,415	72	22	50	86	184	1,185	1,173
		2010	5,118	361	67	17	64	89	1,115	2,030

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The estimates of halibut bycatch mortality are based on the IPHC discard mortality rates that were used for in-season management. The halibut IFQ program allows retention of halibut in the hook-and-line groundfish fisheries, making true halibut bycatch numbers unavailable. This is particularly a problem in the GOA for all hook-and-line fisheries and in the BSAI for the sablefish hook-and-line fishery. Therefore, estimates of halibut bycatch mortality are not included in this table for those fisheries.

Source: Catch Accounting System, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 12. Prohibited species catch in the Gulf of Alaska by species, gear, and groundfish target fishery, 2009-10 (Metric tons (t) or number in 1,000s).

			Halibut mortality (t)	Herring (t)	Red king crab (1,000s)	Other king crab (1,000s)	Bairdi (1,000s)	Other tanner (1,000s)	Chinook (1,000s)	Other salmon (1,000s)
2009 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	.0	.2	.0	.0	.2
		Pacific cod	n.a.	.0	.0	.0	.3	.0	.0	.0
		Rockfish	n.a.	.0	.0	.0	.1	.0	.0	.0
		Total	n.a.	.0	.0	.0	.6	.0	.0	.2
	Pot	Pacific cod	5.4	.0	.0	.0	16.8	.0	.0	.0
		Total	5.4	.0	.0	.0	16.8	.0	.0	.0
	Trawl	Pollock, bottom	36.5	.1	.0	.0	6.6	.0	1.1	.2
		Pollock, pelagic	1.2	7.9	.0	.0	.0	.0	1.8	.1
		Sablefish	2.3	.0	.0	.0	.1	.1	.0	.0
		Pacific cod	288.8	.0	.0	.0	2.4	.0	.1	.0
		Arrowtooth	289.2	.0	.0	.0	40.7	.0	.0	.0
		Flathd. sole	60.7	.0	.0	.0	7.7	.0	.1	.0
		Rex sole	273.8	.0	.0	.1	140.4	.0	1.9	.1
		Flat shallow	802.2	.7	.0	.0	30.3	.8	1.8	1.1
		Rockfish	73.1	.0	.0	3.3	.2	.0	1.4	.5
		Total	1,828.9	8.7	.0	3.3	228.4	.9	8.2	2.1
	All gear	Total	1,834.3	8.7	.0	3.4	245.8	.9	8.2	2.3

Table 12. Continued.

			Halibut mortality (t)	Herring (t)	Red king crab (1,000s)	Other king crab (1,000s)	Bairdi (1,000s)	Other tanner (1,000s)	Chinook (1,000s)	Other salmon (1,000s)
2010 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	.0	.1	.0	.0	.2
		Pacific cod	n.a.	.0	.0	.0	2.4	.0	.0	.0
		Total	n.a.	.0	.0	.0	2.4	.1	.0	.2
	Pot	Pacific cod	24.3	.0	.0	.0	140.0	.0	.0	.0
		Total	24.3	.0	.0	.0	140.0	.0	.0	.0
	Trawl	Pollock, bottom	18.3	.0	.0	.0	.1	.0	32.0	.4
		Pollock, pelagic	13.8	.9	.0	.0	.0	.0	12.8	.3
		Sablefish	2.9	.0	.0	.0	.1	.0	.0	.0
		Pacific cod	246.8	.0	.0	.0	2.6	.0	.4	.1
		Arrowtooth	410.0	.0	.0	.0	47.2	.0	3.9	.1
		Flathd. sole	166.8	.8	.0	.0	6.5	.0	.5	.0
		Rex sole	248.0	.1	.0	.0	14.3	.0	2.3	.1
		Flat shallow	434.2	.0	.0	.0	21.8	.0	1.0	.4
		Rockfish	94.6	.2	.0	3.0	.1	.0	1.6	.4
		Atka mack.	1.0	.0	.0	.0	.0	.0	.0	.0
		Total	1,636.4	1.9	.0	3.0	92.6	.0	54.5	1.9
	All gear	Total	1,660.7	1.9	.0	3.0	235.0	.1	54.5	2.0

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area and gear. The estimates of halibut PSC mortality are based on the International Pacific Halibut Commission discard mortality rates that were used for in-season management. The halibut Individual Fishing Quota program allows retention of halibut in the hook-and-line groundfish fisheries, making true halibut PSC numbers unavailable. Therefore, estimates of halibut PSC mortality are not included in this table for those fisheries.

Source: Catch Accounting System, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 13. Prohibited species catch in the Bering Sea and Aleutian Islands by species, gear, and groundfish target fishery, 2009-10 (Metric tons (t) or number in 1,000s).

			Halibut mortality (t)	Herring (t)	Red king crab (1,000s)	Other king crab (1,000s)	Bairdi (1,000s)	Other tanner (1,000s)	Chinook (1,000s)	Other salmon (1,000s)
2009 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	.3	.0	.0	.0	.0
		Pacific cod	684.9	.0	7.2	14.2	34.5	67.1	.0	.1
		Arrowtooth	.1	.0	.0	.0	.0	.0	.0	.0
		Turbot	6.8	.0	.0	.0	.1	.0	.0	.0
		Rockfish	.5	.0	.0	.0	.0	.0	.0	.0
		Total	693.6	.0	7.2	14.6	34.8	67.1	.0	.1
	Pot	Sablefish	1.4	.0	.0	145.7	1.7	.0	.0	.0
		Pacific cod	.3	.0	3.1	2.3	422.2	578.5	.0	.0
		Total	1.6	.0	3.1	148.0	423.9	578.5	.0	.0
	Trawl	Pollock, bottom	213.1	.2	1.1	.0	5.2	4.2	4.0	4.1
		Pollock, pelagic	245.9	39.3	.0	.0	.9	3.2	8.6	42.5
		Pacific cod	257.4	.0	1.7	.2	15.4	15.4	1.0	.1
		Arrowtooth	236.7	.1	.1	8.1	2.7	2.7	.0	.1
		Flathd. sole	185.9	.5	.7	1.4	46.0	201.8	.0	.1
		Rock sole	602.6	.2	48.0	.3	79.8	12.1	.2	.0
		Turbot	5.7	.0	.0	.7	.0	.0	.0	.0
		Yellowfin	1,019.6	22.7	22.8	.4	330.1	287.0	.0	.2
		Flat, other	11.9	.0	.0	.9	.8	.1	.0	.0
		Rockfish	35.0	.0	.1	2.2	.1	.0	.1	.0
		Atka mack.	71.9	.0	1.1	3.8	.0	.0	.1	.3
		Total	2,886.0	63.0	75.8	18.1	481.0	526.6	14.0	47.4
	All gear	Total	3,581.2	63.0	86.1	180.7	939.7	1,172.2	14.0	47.5

Table 13. Continued.

			Halibut mortality (t)	Herring (t)	Red king crab (1,000s)	Other king crab (1,000s)	Bairdi (1,000s)	Other tanner (1,000s)	Chinook (1,000s)	Other salmon (1,000s)
2010 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	1.0	.0	.0	.0	.0
		Pacific cod	621.4	.0	2.0	1.3	25.5	60.9	.0	.0
		Arrowtooth	.5	.0	.0	.1	.0	.0	.0	.0
		Turbot	10.9	.0	.0	.1	.0	.2	.0	.0
		Total	632.8	.0	2.0	2.5	25.5	61.1	.0	.1
	Pot	Sablefish	3.0	.0	.0	26.0	.0	2.2	.0	.0
		Pacific cod	2.3	.0	2.3	44.4	347.0	245.3	.0	.0
		Total	5.3	.0	2.3	70.4	347.0	247.5	.0	.0
	Trawl	Pollock, bottom	142.5	161.8	1.0	.0	12.0	5.1	2.6	.9
		Pollock, pelagic	120.5	192.5	.0	.0	.8	4.3	7.3	12.8
		Pacific cod	288.0	.1	.5	.0	27.6	5.4	1.3	.0
		Arrowtooth	190.4	.0	.8	5.5	3.0	1.2	.0	.0
		Flathd. sole	176.9	.5	.8	.2	74.4	96.9	.0	.0
		Rock sole	918.6	.5	36.8	.1	97.4	29.7	.5	.2
		Turbot	1.8	.0	.0	.1	.0	.0	.0	.0
		Yellowfin	863.7	3.3	18.5	.2	290.2	1,577.6	.1	.0
		Flat, other	3.1	.0	.0	.2	1.4	.4	.0	.0
		Rockfish	57.7	.0	.0	3.5	.7	.5	.5	.0
		Atka mack.	55.4	.0	1.3	3.1	.1	.0	.2	.8
		Total	2,818.9	358.7	59.7	12.9	507.7	1,721.1	12.5	14.9
	All gear	Total	3,457.1	358.7	64.1	85.8	880.2	2,029.7	12.5	15.0

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area and gear. The estimates of halibut PSC mortality are based on the International Pacific Halibut Commission discard mortality rates that were used for in-season management. The halibut Individual Fishing Quota program allows retention of halibut in the hook-and-line groundfish fisheries, making true halibut PSC numbers unavailable. This is particularly a problem in the Bering Sea and Aleutian Islands sablefish hook-and-line fishery. Therefore, estimates of halibut PSC mortality are not included in this table for that fishery.

Source: Catch Accounting System, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 14. Prohibited species catch rates in the Gulf of Alaska by species, gear, and groundfish target fishery, 2009-10 (Metric tons per metric ton or numbers per metric ton).

			Halibut mortality (t/t)	Herring (t/t)	Red king crab (No./t)	Other king crab (No./t)	Bairdi (No./t)	Other tanner (No./t)	Chinook (No./t)	Other salmon (No./t)
2009 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	.003	.026	.000	.000	.023
		Pacific cod	n.a.	.000	.000	.000	.022	.001	.000	.000
		Rockfish	n.a.	.000	.000	.000	4.640	1.694	.000	.000
		Total	n.a.	.000	.000	.001	.026	.002	.000	.009
	Pot	Pacific cod	.000	.000	.000	.000	1.406	.000	.000	.000
		Total	.000	.000	.000	.000	1.406	.000	.000	.000
	Trawl	Pollock, bottom	.004	.000	.000	.000	.635	.000	.102	.019
		Pollock, pelagic	.000	.000	.000	.000	.002	.000	.067	.005
		Sablefish	.008	.000	.000	.000	.323	.356	.000	.000
		Pacific cod	.033	.000	.000	.000	.272	.000	.013	.000
		Arrowtooth	.018	.000	.000	.000	2.535	.000	.000	.000
		Flathd. sole	.021	.000	.000	.000	2.652	.000	.041	.000
		Rex sole	.021	.000	.000	.004	10.660	.000	.145	.010
		Flat shallow	.041	.000	.000	.000	1.529	.039	.089	.055
		Rockfish	.004	.000	.000	.166	.012	.000	.073	.026
		Total	.016	.000	.000	.028	1.937	.007	.069	.018
	All gear	Total	.012	.000	.000	.022	1.600	.006	.053	.015

Table 14. Continued.

			Halibut mortality (t/t)	Herring (t/t)	Red king crab (No./t)	Other king crab (No./t)	Bairdi (No./t)	Other tanner (No./t)	Chinook (No./t)	Other salmon (No./t)
2010 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	.000	.007	.005	.000	.017
		Pacific cod	n.a.	.000	.000	.000	.126	.001	.000	.000
		Total	n.a.	.000	.000	.000	.088	.002	.000	.006
	Pot	Pacific cod	.001	.000	.000	.000	6.828	.000	.000	.000
		Total	.001	.000	.000	.000	6.828	.000	.000	.000
	Trawl	Pollock, bottom	.001	.000	.000	.000	.004	.000	1.240	.017
		Pollock, pelagic	.000	.000	.000	.000	.000	.000	.260	.006
		Sablefish	.015	.000	.000	.000	.286	.141	.000	.096
		Pacific cod	.015	.000	.000	.000	.152	.000	.026	.006
		Arrowtooth	.024	.000	.000	.000	2.712	.000	.227	.004
		Flathd. sole	.031	.000	.000	.000	1.204	.000	.092	.000
		Rex sole	.030	.000	.000	.000	1.721	.000	.277	.011
		Flat shallow	.039	.000	.000	.000	1.977	.000	.092	.040
		Rockfish	.005	.000	.000	.143	.005	.000	.077	.018
		Atka mack.	.366	.000	.000	.000	.000	.000	.000	2.174
		Total	.011	.000	.000	.019	.596	.000	.351	.012
	All gear	Total	.008	.000	.000	.015	1.156	.000	.268	.010

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area and gear. The estimates of halibut PSC mortality are based on the International Pacific Halibut Commission discard mortality rates that were used for in-season management. The halibut Individual Fishing Quota program allows retention of halibut in the hook-and-line groundfish fisheries, making true halibut PSC numbers unavailable. Therefore, estimates of halibut PSC mortality are not included in this table for those fisheries.

Source: Catch Accounting System, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 15. Prohibited species catch rates in the Bering Sea and Aleutian Islands by species, gear, and groundfish target fishery, 2009-10 (Metric tons per metric ton or numbers per metric ton).

			Halibut mortality (t/t)	Herring (t/t)	Red king crab (No./t)	Other king crab (No./t)	Bairdi (No./t)	Other tanner (No./t)	Chinook (No./t)	Other salmon (No./t)
2009 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.009	.284	.030	.000	.000	.005
		Pacific cod	.006	.000	.059	.117	.282	.549	.000	.000
		Arrowtooth	.002	.000	.000	.000	.118	.000	.000	.000
		Turbot	.004	.000	.000	.000	.077	.016	.000	.005
		Rockfish	.019	.000	.000	.519	.000	.000	.000	.000
		Total	.006	.000	.058	.117	.278	.537	.000	.001
	Pot	Sablefish	.002	.000	.007	213.792	2.426	.018	.000	.000
		Pacific cod	.000	.000	.214	.163	29.654	40.628	.000	.000
		Total	.000	.000	.205	9.921	28.410	38.773	.000	.000
	Trawl	Pollock, bottom	.002	.000	.008	.000	.037	.030	.029	.029
		Pollock, pelagic	.000	.000	.000	.000	.001	.005	.014	.071
		Pacific cod	.007	.000	.050	.007	.444	.446	.030	.001
		Arrowtooth	.012	.000	.007	.394	.131	.131	.000	.007
		Flathd. sole	.010	.000	.035	.072	2.363	10.376	.000	.004
		Rock sole	.011	.000	.908	.006	1.510	.228	.003	.001
		Turbot	.002	.000	.000	.289	.000	.000	.000	.000
		Yellowfin	.007	.000	.159	.003	2.294	1.995	.000	.001
		Flat, other	.025	.000	.079	1.872	1.659	.218	.000	.000
		Rockfish	.005	.000	.018	.286	.013	.000	.009	.002
		Atka mack.	.002	.000	.027	.091	.000	.000	.003	.007
		Total	.003	.000	.071	.017	.451	.494	.013	.044
	All gear	Total	.003	.000	.071	.150	.779	.971	.012	.039

Table 15. Continued.

			Halibut mortality (t/t)	Herring (t/t)	Red king crab (No./t)	Other king crab (No./t)	Bairdi (No./t)	Other tanner (No./t)	Chinook (No./t)	Other salmon (No./t)
2010 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	1.004	.000	.000	.000	.000
		Pacific cod	.006	.000	.019	.012	.236	.564	.000	.000
		Arrowtooth	.002	.000	.000	.350	.041	.000	.000	.000
		Turbot	.004	.000	.000	.032	.007	.076	.000	.013
		Total	.006	.000	.018	.022	.228	.545	.000	.001
	Pot	Sablefish	.007	.000	.000	56.319	.000	4.663	.000	.000
		Pacific cod	.000	.000	.113	2.174	16.992	12.016	.000	.000
		Total	.000	.000	.111	3.371	16.617	11.853	.000	.000
	Trawl	Pollock, bottom	.002	.002	.011	.000	.139	.058	.030	.011
		Pollock, pelagic	.000	.000	.000	.000	.001	.006	.011	.019
		Pacific cod	.009	.000	.017	.000	.910	.179	.041	.000
		Arrowtooth	.006	.000	.027	.181	.099	.039	.001	.000
		Flathd. sole	.008	.000	.033	.007	3.197	4.165	.000	.001
		Rock sole	.013	.000	.511	.001	1.354	.412	.006	.003
		Turbot	.007	.000	.000	.347	.000	.000	.000	.000
		Yellowfin	.006	.000	.126	.002	1.976	10.740	.001	.000
		Flat, other	.006	.000	.000	.467	2.690	.741	.000	.000
		Rockfish	.006	.000	.000	.347	.066	.048	.054	.000
		Atka mack.	.001	.000	.031	.077	.001	.000	.006	.021
		Total	.003	.000	.053	.012	.453	1.537	.011	.013
	All gear	Total	.003	.000	.051	.068	.702	1.620	.010	.012

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, determined by NMFS staff, is based on processor, trip, processing mode, NMFS area and gear. The estimates of halibut PSC mortality are based on the International Pacific Halibut Commission discard mortality rates that were used for in-season management. The halibut Individual Fishing Quota program allows retention of halibut in the hook-and-line groundfish fisheries, making true halibut PSC numbers unavailable. This is particularly a problem in the Bering Sea and Aleutian Islands sablefish hook-and-line fishery. Therefore, estimates of halibut PSC mortality are not included in this table for that fishery.

Source: Catch Accounting System, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 16. Real ex-vessel value of the catch in the domestic commercial fisheries off Alaska by species group, 1984-2010 ($ millions, base year = 2010)

	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
1984	249.9	829.0	49.3	47.4	67.4	1,243.1
1985	254.1	926.1	87.7	89.1	103.2	1,460.2
1986	399.1	881.3	83.7	152.9	145.3	1,662.3
1987	418.7	920.3	81.1	148.5	266.8	1,835.4
1988	431.6	1,364.6	102.6	121.1	443.7	2,463.5
1989	532.2	965.9	35.6	160.9	644.9	2,339.5
1990	657.1	1,011.7	44.4	160.8	831.8	2,705.9
1991	548.6	546.8	52.1	166.9	850.9	2,165.4
1992	584.8	950.2	47.1	83.8	1,170.0	2,835.9
1993	571.8	680.7	24.5	93.3	743.7	2,114.1
1994	542.1	716.3	36.5	143.0	823.4	2,261.2
1995	451.2	790.9	62.4	94.9	955.6	2,355.0
1996	287.7	568.9	73.6	121.8	848.6	1,900.6
1997	263.2	379.0	24.3	162.9	798.1	1,627.5
1998	325.2	360.9	16.1	139.9	529.9	1,372.0
1999	387.0	493.3	20.3	166.8	683.4	1,750.7
2000	196.1	339.1	13.2	185.4	818.6	1,552.3
2001	176.3	269.1	14.8	170.3	817.1	1,447.7
2002	212.0	185.1	13.0	183.6	873.0	1,466.7
2003	244.6	234.5	12.4	231.4	921.9	1,644.9
2004	220.0	336.7	18.5	222.8	845.2	1,643.1
2005	195.1	359.3	16.4	208.2	926.4	1,705.3
2006	142.9	317.3	8.6	221.5	962.1	1,652.3
2007	203.0	390.0	16.6	243.9	924.8	1,778.2
2008	268.3	392.7	24.4	222.9	1,057.2	1,965.6
2009	212.3	374.2	31.8	146.1	743.9	1,508.4
2010	206.3	505.7	23.0	200.5	635.6	1,571.1

Note: These estimates include the value of catch from both federal and state of Alaska fisheries. The data have been adjusted to 2010 dollars by applying the Producer Price Index for unprocessed and packaged fish (series number WPU0223) from the Bureau of Labor Statistics at: http://data.bls.gov/cgi-bin/srgate.

Source: Blend and Catch-Accounting System estimates, Weekly Production Reports (WPR), Commercial Operators Annual Reports (COAR), Fisheries of the United States. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 17. Percentage distribution of ex-vessel value of the catch in the domestic commercial fisheries off Alaska by species group, 1984-2010.

	Shellfish	Salmon	Herring	Halibut	Groundfish
1984	20.1%	66.7%	4.0%	3.8%	5.4%
1985	17.4%	63.4%	6.0%	6.1%	7.1%
1986	24.0%	53.0%	5.0%	9.2%	8.7%
1987	22.8%	50.1%	4.4%	8.1%	14.5%
1988	17.5%	55.4%	4.2%	4.9%	18.0%
1989	22.7%	41.3%	1.5%	6.9%	27.6%
1990	24.3%	37.4%	1.6%	5.9%	30.7%
1991	25.3%	25.3%	2.4%	7.7%	39.3%
1992	20.6%	33.5%	1.7%	3.0%	41.3%
1993	27.0%	32.2%	1.2%	4.4%	35.2%
1994	24.0%	31.7%	1.6%	6.3%	36.4%
1995	19.2%	33.6%	2.6%	4.0%	40.6%
1996	15.1%	29.9%	3.9%	6.4%	44.6%
1997	16.2%	23.3%	1.5%	10.0%	49.0%
1998	23.7%	26.3%	1.2%	10.2%	38.6%
1999	22.1%	28.2%	1.2%	9.5%	39.0%
2000	12.6%	21.8%	.9%	11.9%	52.7%
2001	12.2%	18.6%	1.0%	11.8%	56.4%
2002	14.5%	12.6%	.9%	12.5%	59.5%
2003	14.9%	14.3%	.8%	14.1%	56.1%
2004	13.4%	20.5%	1.1%	13.6%	51.4%
2005	11.4%	21.1%	1.0%	12.2%	54.3%
2006	8.6%	19.2%	.5%	13.4%	58.2%
2007	11.4%	21.9%	.9%	13.7%	52.0%
2008	13.7%	20.0%	1.2%	11.3%	53.8%
2009	14.1%	24.8%	2.1%	9.7%	49.3%
2010	13.1%	32.2%	1.5%	12.8%	40.5%

Note: These estimates report the distribution of the value of catch from both federal and state of Alaska fisheries.

Source: Blend and Catch-Accounting System estimates, Weekly Production Reports (WPR), Commercial Operators Annual Reports (COAR), Fisheries of the United States. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 18. Ex-vessel prices in the groundfish fisheries off Alaska by area, gear, and species, 2006-10 ($/lb, round weight).

		Gulf of Alaska		Bering Sea and Aleutians		All Alaska
		Fixed	Trawl	Fixed	Trawl	All gear
Pollock	2006	.083	.135	.015	.128	.128
	2007	.107	.145	.098	.129	.129
	2008	.110	.181	.015	.210	.208
	2009	.109	.174	.150	.189	.188
	2010	.117	.173	.205	.134	.138
Sablefish	2006	2.702	2.048	2.301	1.084	2.600
	2007	2.818	1.858	2.233	1.092	2.660
	2008	3.281	2.023	2.874	1.333	3.123
	2009	3.455	3.338	2.782	1.440	3.322
	2010	4.081	3.267	3.701	1.764	3.955
Pacific cod	2006	.398	.369	.448	.342	.404
	2007	.493	.494	.497	.425	.472
	2008	.551	.429	.592	.542	.560
	2009	.309	.265	.256	.231	.259
	2010	.276	.231	.269	.223	.257
Flatfish	2006	.446	.139	.221	.200	.191
	2007	.462	.153	.178	.188	.183
	2008	.279	.142	.135	.175	.170
	2009	.171	.133	.067	.145	.143
	2010	.766	.107	.015	.153	.147
Rockfish	2006	.702	.161	.726	.262	.219
	2007	.713	.167	.626	.209	.202
	2008	.726	.172	.820	.175	.191
	2009	.696	.091	.937	.182	.152
	2010	.684	.124	.936	.233	.194
Atka mackerel	2006	-	.117	.015	.114	.114
	2007	-	.121	-	.139	.138
	2008	-	.195	-	.170	.170
	2009	-	.279	-	.188	.190
	2010	-	.277	.015	.209	.211

Notes: 1) Prices are for catch from both federal and state of Alaska fisheries.
2) Prices do not include the value added by at-sea processing except for the value added by dressing fish at sea where the fish have not been frozen. The unfrozen landings price is calculated as landed value divided by estimated or actual round weight.
3) Trawl-caught sablefish, rockfish and flatfish in the BSAI and trawl-caught Atka mackerel in both the BSAI and the GOA are not well represented by on-shore landings. A price was calculated for these categories from product-report prices; the price in this case is the value of the product divided by the calculated round weight and multiplied by a constant 0.4 to correct for value added by processing.
4) The "All Alaska/All gear" column is the weighted average of the other columns.

Source: Catch Accounting System, Commercial Operators Annual Report (COAR), weekly processor reports, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 19. Ex-vessel value of the groundfish catch off Alaska by area, vessel category, gear, and species, 2006-10, ($ millions).

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total
All gear	All species	2006	132.7	22.7	155.4	277.6	405.6	683.2	410.3	428.2	838.5
		2007	139.9	25.5	165.4	264.0	394.8	658.9	403.9	420.4	824.3
		2008	162.9	24.6	187.5	316.2	487.4	803.6	479.1	512.0	991.2
		2009	122.7	20.4	143.2	212.2	329.8	542.0	334.9	350.3	685.2
		2010	153.3	21.8	175.1	148.4	312.1	460.5	301.7	334.0	635.6
	Pollock	2006	20.8	.1	20.9	223.0	191.5	414.5	243.8	191.5	435.3
		2007	16.2	.1	16.3	203.0	176.8	379.8	219.1	176.9	396.1
		2008	19.3	.2	19.5	243.4	210.3	453.8	262.8	210.5	473.3
		2009	15.4	.5	15.9	180.5	155.9	336.4	195.9	156.4	352.3
		2010	28.4	.4	28.8	115.7	123.5	239.2	144.1	123.9	268.0
	Sablefish	2006	65.2	10.6	75.8	7.4	2.8	10.1	72.5	13.4	85.9
		2007	63.7	11.2	74.9	7.8	2.6	10.4	71.5	13.8	85.3
		2008	73.4	9.9	83.3	7.6	3.5	11.2	81.0	13.4	94.5
		2009	68.8	9.4	78.2	7.0	4.5	11.5	75.8	13.9	89.7
		2010	76.7	8.7	85.5	5.5	4.6	10.0	82.2	13.3	95.5
	Pacific cod	2006	35.2	4.2	39.5	44.2	126.7	170.9	79.5	130.9	210.4
		2007	46.9	6.5	53.4	49.5	123.4	172.9	96.5	129.8	226.3
		2008	55.2	6.4	61.6	61.1	152.8	213.9	116.4	159.2	275.6
		2009	27.3	4.9	32.2	21.3	73.5	94.8	48.6	78.4	127.0
		2010	37.8	6.1	43.8	25.3	69.1	94.4	63.1	75.2	138.3
	Flatfish	2006	6.4	2.7	9.1	2.2	61.8	64.0	8.6	64.4	73.0
		2007	7.2	2.6	9.8	3.2	64.3	67.5	10.4	66.9	77.3
		2008	8.3	2.7	11.0	2.9	88.3	91.1	11.1	91.0	102.1
		2009	6.7	1.9	8.7	2.6	61.2	63.8	9.4	63.1	72.5
		2010	4.7	1.7	6.5	1.1	75.4	76.4	5.8	77.1	82.9
	Rockfish	2006	4.1	4.8	8.9	.4	7.0	7.4	4.5	11.8	16.3
		2007	4.7	4.7	9.4	.4	7.7	8.0	5.1	12.3	17.4
		2008	4.6	4.7	9.3	.5	7.1	7.6	5.1	11.9	17.0
		2009	2.8	2.6	5.4	.6	6.7	7.3	3.4	9.3	12.7
		2010	3.8	3.8	7.6	.8	11.0	11.8	4.6	14.8	19.4
	Atka mackerel	2006	.0	.1	.1	.1	14.7	14.8	.1	14.8	14.9
		2007	.0	.2	.2	.1	16.9	16.9	.1	17.1	17.2
		2008	.0	.3	.3	.4	20.8	21.3	.4	21.2	21.6
		2009	.0	.8	.8	.0	27.6	27.6	.0	28.4	28.4
		2010	.0	.7	.7	.0	28.2	28.2	.0	28.9	28.9

Table 19. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total	Catcher vessels	Catcher proces sors	Total
Trawl	All species	2006	41.1	10.1	51.1	253.4	300.5	553.9	294.4	310.6	605.0
		2007	42.9	10.5	53.4	239.2	300.7	539.9	282.1	311.2	593.3
		2008	49.2	10.5	59.7	285.8	353.8	639.6	335.0	364.3	699.3
		2009	33.6	9.4	42.9	198.0	264.9	463.0	231.6	274.3	505.9
		2010	49.3	10.1	59.4	131.2	251.6	382.8	180.5	261.6	442.2
	Pollock	2006	20.8	.1	20.9	223.0	191.4	414.4	243.8	191.5	435.2
		2007	16.1	.1	16.3	203.0	176.2	379.2	219.1	176.3	395.4
		2008	19.3	.2	19.5	243.4	210.2	453.6	262.7	210.4	473.1
		2009	15.4	.5	15.9	180.5	154.6	335.1	195.9	155.1	351.0
		2010	28.4	.4	28.8	115.7	122.0	237.7	144.1	122.4	266.4
	Sablefish	2006	1.9	1.8	3.7	.0	.3	.3	1.9	2.1	4.1
		2007	2.0	1.8	3.8	.0	.3	.3	2.0	2.1	4.1
		2008	1.9	1.6	3.5	.0	.8	.8	1.9	2.4	4.3
		2009	3.3	2.6	5.9	.0	.5	.5	3.3	3.1	6.5
		2010	3.3	2.9	6.1	.0	.4	.4	3.3	3.2	6.5
	Pacific cod	2006	8.6	.9	9.5	27.6	26.9	54.5	36.2	27.8	64.1
		2007	13.6	1.2	14.9	32.5	36.2	68.7	46.2	37.4	83.6
		2008	15.4	1.0	16.4	38.4	27.1	65.5	53.9	28.1	81.9
		2009	5.6	.8	6.4	14.2	14.9	29.1	19.8	15.7	35.6
		2010	9.3	.6	9.9	13.7	15.2	28.9	23.0	15.8	38.8
	Flatfish	2006	6.4	2.6	9.0	2.2	60.4	62.6	8.6	63.0	71.6
		2007	7.2	2.6	9.8	3.2	63.5	66.7	10.4	66.1	76.5
		2008	8.3	2.7	11.0	2.8	87.9	90.7	11.1	90.5	101.7
		2009	6.7	1.9	8.7	2.6	60.9	63.5	9.4	62.8	72.2
		2010	4.7	1.7	6.4	1.1	75.3	76.4	5.8	77.0	82.8
	Rockfish	2006	2.7	4.5	7.2	.3	6.7	7.0	3.0	11.2	14.2
		2007	3.3	4.4	7.7	.4	7.4	7.8	3.7	11.9	15.5
		2008	3.1	4.5	7.6	.5	6.8	7.3	3.6	11.3	15.0
		2009	1.5	2.5	4.0	.5	6.3	6.8	2.1	8.7	10.8
		2010	2.5	3.6	6.2	.7	10.3	11.0	3.2	14.0	17.2
	Atka mackerel	2006	.0	.1	.1	.1	14.7	14.8	.1	14.8	14.9
		2007	.0	.2	.2	.1	16.9	16.9	.1	17.1	17.2
		2008	.0	.3	.3	.4	20.8	21.3	.4	21.2	21.6
		2009	.0	.8	.8	.0	27.6	27.6	.0	28.4	28.4
		2010	.0	.7	.7	.0	28.2	28.2	.0	28.9	28.9

Table 19. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Catcher vessels	Catcher processors	Total	Catcher vessels	Catcher processors	Total	Catcher vessels	Catcher processors	Total
Hook and line	All species	2006	71.7	12.6	84.3	2.9	101.9	104.9	74.6	114.5	189.2
		2007	72.3	15.0	87.3	1.7	94.1	95.9	74.0	109.1	183.2
		2008	83.5	14.1	97.6	3.5	127.5	131.0	87.0	141.6	228.6
		2009	75.3	11.1	86.3	4.1	62.0	66.1	79.4	73.1	152.5
		2010	83.7	11.8	95.5	6.0	57.2	63.2	89.7	68.9	158.7
	Sablefish	2006	63.3	8.8	72.0	2.1	2.5	4.6	65.4	11.2	76.6
		2007	61.7	9.4	71.1	.9	2.3	3.2	62.6	11.7	74.4
		2008	71.5	8.3	79.8	1.7	2.8	4.5	73.3	11.0	84.3
		2009	65.4	6.8	72.2	3.6	4.0	7.6	69.1	10.8	79.8
		2010	73.4	5.9	79.3	5.5	4.2	9.6	78.9	10.1	89.0
	Pacific cod	2006	6.7	3.3	10.1	.8	96.6	97.4	7.5	100.0	107.5
		2007	8.9	5.2	14.1	.8	87.1	87.9	9.7	92.4	102.1
		2008	10.0	5.4	15.4	1.7	119.6	121.3	11.7	125.0	136.7
		2009	8.1	4.1	12.2	.4	55.7	56.1	8.5	59.8	68.3
		2010	8.6	5.5	14.0	.4	50.5	51.0	9.0	56.0	65.0
	Flatfish	2006	.0	.1	.1	-	1.4	1.4	.0	1.5	1.5
		2007	.0	.1	.1	-	.8	.8	.0	.9	.9
		2008	.0	.0	.0	-	.4	.4	.0	.5	.5
		2009	.0	.0	.0	-	.3	.3	.0	.3	.3
		2010	.0	.1	.1	-	.1	.1	.0	.2	.2
	Rockfish	2006	1.4	.3	1.7	.0	.3	.4	1.5	.6	2.0
		2007	1.4	.2	1.7	.0	.2	.3	1.4	.5	1.9
		2008	1.5	.2	1.7	.1	.3	.3	1.5	.5	2.0
		2009	1.2	.2	1.4	.1	.4	.5	1.3	.6	1.9
		2010	1.3	.1	1.4	.1	.7	.8	1.4	.8	2.2
Pot	Pacific cod	2006	19.9	-	19.9	15.8	3.1	18.9	35.7	3.1	38.8
		2007	24.4	-	24.4	16.2	-	16.2	40.6	-	40.6
		2008	29.9	-	29.9	21.0	6.1	27.1	50.8	6.1	56.9
		2009	13.6	-	13.6	6.6	2.9	9.5	20.2	2.9	23.1
		2010	19.9	-	19.9	11.2	3.4	14.5	31.1	3.4	34.5

Note: These estimates include the value of catch from both federal and state of Alaska fisheries. Ex-vessel value is calculated using prices on Table 18. Please refer to Table 18 for a description of the price derivation. All groundfish includes additional species categories. The value added by at-sea processing is not included in these estimates of ex-vessel value.

Source: Catch Accounting System, Commercial Operators Annual Report (COAR), weekly processor reports. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 20. Ex-vessel value of Alaska groundfish delivered to shoreside processors by area, gear and catcher-vessel length, 2000-10. ($ millions)

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		<60	60-125	>=125	<60	60-125	>=125	<60	60-125	>=125
Fixed	2000	57.8	29.3	.8	2.2	5.9	3.3	60.1	35.2	4.2
	2001	42.2	18.7	-	3.0	6.6	1.3	45.2	25.2	1.3
	2002	40.6	16.2	-	3.7	5.5	1.2	44.2	21.8	1.2
	2003	62.6	20.1	.5	6.1	11.2	2.4	68.7	31.3	2.9
	2004	61.8	22.9	.1	3.8	8.2	1.8	65.6	31.1	1.9
	2005	55.4	25.1	.3	4.1	10.8	1.9	59.5	36.0	2.2
	2006	60.1	31.4	.2	6.3	14.2	3.9	66.3	45.5	4.1
	2007	67.1	29.8	.0	5.6	16.6	2.7	72.7	46.4	2.7
	2008	79.0	34.4	.3	9.3	17.3	3.8	88.3	51.8	4.1
	2009	63.2	26.0	-	5.2	7.4	1.6	68.3	33.4	1.6
	2010	73.6	30.2	-	7.5	8.1	1.5	81.2	38.4	1.5
Trawl	2000	9.8	34.1	-	-	73.6	78.1	9.8	107.6	78.1
	2001	9.0	28.5	-	.3	71.1	82.6	9.3	99.6	82.6
	2002	4.6	20.5	-	1.5	83.4	94.7	6.1	103.9	94.7
	2003	3.2	22.7	-	2.7	84.8	92.4	6.0	107.4	92.4
	2004	4.4	23.7	-	.9	80.6	87.5	5.4	104.3	87.5
	2005	8.1	28.9	-	.3	89.3	106.8	8.4	118.2	106.8
	2006	7.7	33.4	-	.4	95.1	114.4	8.1	128.5	114.4
	2007	8.7	34.2	-	1.1	92.7	100.4	9.8	126.9	100.4
	2008	10.8	38.2	-	.7	108.8	121.9	11.4	147.0	121.9
	2009	6.5	27.1	-	.4	74.4	86.4	6.8	101.5	86.4
	2010	10.3	39.0	-	.6	58.6	66.1	10.9	97.7	66.1
All gear	2000	67.6	63.4	.8	2.2	79.4	81.4	69.8	142.8	82.3
	2001	51.2	47.2	-	3.3	77.6	84.0	54.5	124.8	84.0
	2002	45.1	36.7	-	5.2	88.9	95.9	50.3	125.6	95.9
	2003	65.8	42.8	.5	8.9	96.0	94.8	74.6	138.7	95.2
	2004	66.2	46.5	.1	4.7	88.8	89.3	71.0	135.3	89.4
	2005	63.5	54.0	.3	4.4	100.2	108.7	67.9	154.2	109.0
	2006	67.7	64.8	.2	6.7	109.2	118.3	74.4	174.0	118.5
	2007	75.9	64.0	.0	6.7	109.3	103.0	82.6	173.3	103.0
	2008	89.8	72.6	.3	10.0	126.2	125.6	99.8	198.8	126.0
	2009	69.6	53.1	-	5.5	81.8	88.0	75.2	134.9	88.0
	2010	83.9	69.3	-	8.1	66.8	67.6	92.1	136.0	67.6

Note: These estimates include catch from both federal and state of Alaska fisheries.

Source: NMFS Alaska Region Catch-Accounting System and Weekly Processor reports; ADF&G COAR buying data. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 21. Ex-vessel value per catcher vessel for Alaska groundfish delivered to shoreside processors by area, gear and catcher-vessel length, 2000-10. ($ thousands)

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		<60	60-124	>=125	<60	60-124	>=125	<60	60-124	>=125
Fixed	2000	69	181	76	44	70	118	70	183	122
	2001	57	168	-	44	91	78	59	166	78
	2002	61	149	-	56	98	76	65	159	76
	2003	68	169	92	97	138	160	74	198	168
	2004	64	176	30	71	110	101	67	193	102
	2005	62	211	60	63	169	127	65	238	147
	2006	68	253	55	103	225	350	74	307	370
	2007	73	276	9	78	286	222	77	336	224
	2008	79	341	76	121	284	379	87	404	372
	2009	69	276	-	75	158	198	74	288	198
	2010	78	325	-	109	173	188	85	342	188
Trawl	2000	208	524	-	-	968	2,604	208	970	2,604
	2001	200	419	-	43	947	3,060	206	905	3,060
	2002	117	359	-	166	1,127	3,641	152	1,009	3,641
	2003	97	378	-	161	1,130	3,553	165	1,043	3,553
	2004	193	439	-	118	1,074	3,241	215	1,086	3,241
	2005	300	566	-	52	1,258	4,108	311	1,285	4,108
	2006	307	696	-	137	1,320	4,400	323	1,367	4,400
	2007	336	744	-	155	1,288	3,860	378	1,426	3,860
	2008	399	868	-	136	1,555	4,352	424	1,652	4,352
	2009	239	616	-	54	1,111	3,202	253	1,194	3,202
	2010	428	908	-	117	946	2,447	435	1,221	2,447
All gear	2000	81	292	76	44	500	1,404	81	489	1,286
	2001	68	273	-	44	528	1,908	70	488	1,908
	2002	67	231	-	71	684	2,283	73	539	2,283
	2003	71	250	92	117	619	2,311	79	551	2,215
	2004	69	266	30	79	600	1,985	72	550	1,944
	2005	71	335	60	63	748	2,651	74	662	2,659
	2006	77	402	55	104	815	3,196	82	756	3,202
	2007	82	429	9	85	847	2,711	87	784	2,712
	2008	89	519	76	122	970	3,307	97	942	3,230
	2009	76	399	-	73	724	2,515	80	692	2,515
	2010	89	529	-	111	613	1,931	95	727	1,931

Note: These estimates include catch from both federal and state of Alaska fisheries.

Source: NMFS Alaska Region Catch-Accounting System and Weekly Processor reports; ADF&G COAR buying data. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 22. Ex-vessel value of the groundfish catch off Alaska by area, residency, and species, 2006-10, ($ millions).

		Gulf of Alaska		Bering Sea and Aleutians		All Alaska	
		Alaska	Other	Alaska	Other	Alaska	Other
All groundfish	2006	75.1	79.0	111.4	571.7	186.5	650.7
	2007	82.7	82.7	110.3	548.5	193.0	631.2
	2008	94.1	92.8	144.2	659.4	238.3	752.2
	2009	73.5	69.1	86.9	455.0	160.5	524.1
	2010	91.2	83.9	64.5	395.6	155.7	479.5
Pollock	2006	7.6	13.2	71.0	343.5	78.6	356.7
	2007	6.0	10.3	68.0	311.8	74.0	322.1
	2008	7.4	12.2	87.0	366.7	94.4	378.9
	2009	6.6	9.4	50.7	285.7	57.3	295.1
	2010	12.4	16.4	23.1	216.1	35.6	232.4
Sablefish	2006	35.9	39.1	2.7	7.4	38.6	46.5
	2007	36.3	38.6	2.6	7.7	39.0	46.3
	2008	41.8	40.9	4.5	6.7	46.3	47.5
	2009	39.5	38.1	3.4	8.0	43.0	46.2
	2010	43.9	41.5	2.2	7.4	46.2	48.9
Pacific cod	2006	26.2	12.7	26.5	144.4	52.7	157.1
	2007	34.6	18.8	27.7	145.2	62.2	164.0
	2008	38.4	23.2	31.7	182.2	70.1	205.4
	2009	21.6	10.6	15.8	79.0	37.4	89.6
	2010	28.8	15.0	17.7	76.7	46.5	91.7
Flatfish	2006	2.2	6.8	10.3	53.7	12.5	60.5
	2007	2.7	7.2	11.4	56.1	14.0	63.3
	2008	2.8	8.2	20.7	70.5	23.5	78.6
	2009	3.0	5.7	16.7	47.1	19.7	52.8
	2010	2.2	4.3	21.0	55.4	23.2	59.7
Rockfish	2006	2.6	6.3	.7	6.7	3.3	13.0
	2007	2.4	7.0	.1	7.9	2.6	14.9
	2008	2.4	6.9	.1	7.5	2.5	14.4
	2009	1.7	3.6	.2	7.1	1.9	10.7
	2010	2.5	5.1	.3	11.5	2.8	16.6
Atka mackerel	2006	.0	.1	.1	14.8	.1	14.9
	2007	.0	.2	.3	16.6	.3	16.8
	2008	.0	.3	.0	21.3	.0	21.6
	2009	.0	.8	.0	27.6	.1	28.3
	2010	.1	.6	.0	28.2	.1	28.8

Note: These estimates include catch from both federal and state of Alaska fisheries. Ex-vessel value is calculated using prices on Table 18. Please refer to Table 18 for a description of the price derivation. Catch delivered to motherships is classified by the residence of the owner of the mothership. All other catch is classified by the residence of the owner of the fishing vessel. All groundfish include additional species categories. For catch for which the residence is unknown, there are either no data or the data have been suppressed to preserve confidentiality.

Source: Catch Accounting System, Commercial Operators Annual Report (COAR), ADFG fish tickets, weekly processor reports. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 23. Ex-vessel value of groundfish delivered to shoreside processors by processor group, 2004-10. ($ millions)

	2004	2005	2006	2007	2008	2009	2010
Bering Sea Pollock	166.1	191.1	199.8	178.3	224.2	149.9	140.1
AK Peninsula/Aleutians	33.6	39.1	55.3	60.7	60.2	33.9	33.4
Kodiak	28.7	40.5	50.0	56.1	66.8	41.7	59.9
South Central	23.9	24.1	24.3	22.1	23.3	22.9	27.0
Southeastern	35.1	32.9	32.8	30.0	36.3	30.8	33.7
TOTAL	287.3	327.7	362.3	347.1	410.8	279.2	294.3

Table 24. Ex-vessel value of groundfish as a percentage of the ex-vessel value of all species delivered to shoreside processors by processor group, 2004-10. (percent)

	2004	2005	2006	2007	2008	2009	2010
Bering Sea Pollock	74.3	76.7	79.9	71.7	71.4	68.6	65.9
AK Peninsula/Aleutians	17.5	17.8	24.6	22.8	19.3	13.3	11.4
Kodiak	39.4	39.9	44.0	42.0	43.9	35.2	42.9
South Central	17.5	15.0	16.2	12.6	12.7	16.7	9.3
Southeastern	18.6	18.2	16.1	13.9	15.0	16.1	13.5
TOTAL	34.7	35.2	37.5	32.6	33.4	29.4	23.8

Note: These tables include the value of groundfish purchases reported by processing plants, as well as by other entities, such as markets and restaurants, that normally would not report sales of groundfish products. Keep this in mind when comparing ex-vessel values in this table to gross processed-product values in Table 34. The data are for catch from both federal and state of Alaska fisheries. The processor groups are defined as follows:
"Bering Sea Pollock" are the AFA inshore pollock processors including the two AFA floating processors.
"AK Peninsula/Aleutian" are other processors on the Alaska Peninsula or in the Aleutian Islands.
"Kodiak" are processors on Kodiak Island.
"South Central" are processors west of Yakutat and on the Kenai Peninsula.
"Southeastern" are processors located from Yakutat south.

Source: ADFG Commercial Operators Annual Report, ADFG intent to process. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 25. Production and gross value of groundfish products in the fisheries off Alaska by species, 2006-10 (1,000 metric tons product weight and million dollars).

		2006		2007		2008		2009		2010	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Pollock	Whole fish	1.95	$1.1	1.94	$1.2	1.70	$1.1	2.04	$2.1	1.24	$1.1
	Head & gut	23.80	$29.7	31.11	$44.9	24.30	$42.1	57.27	$85.0	60.81	$95.4
	Roe	29.97	$291.5	30.47	$262.0	20.79	$241.9	18.49	$162.9	16.45	$98.0
	Deep-skin fill.	53.16	$153.6	64.59	$197.3	42.39	$154.9	41.28	$166.8	40.28	$155.2
	Other fillets	117.26	$320.1	106.13	$295.6	79.67	$301.8	76.57	$296.2	71.17	$263.7
	Surimi	178.51	$364.8	161.62	$352.5	125.70	$526.3	87.12	$249.8	103.59	$357.2
	Minced fish	28.47	$50.9	27.68	$45.6	20.36	$40.4	22.10	$42.2	21.59	$41.5
	Fish meal	66.93	$68.5	58.81	$60.4	43.89	$48.7	29.63	$37.7	38.32	$60.3
	Other products	26.34	$21.0	24.51	$20.5	19.45	$21.2	22.91	$18.7	26.25	$26.4
	All products	526.40	$1,301.1	506.85	$1,280.0	378.24	$1,378.3	357.41	$1,061.5	379.72	$1,098.8
Pacific cod	Whole fish	1.56	$2.1	2.10	$4.0	3.28	$4.8	4.58	$5.3	3.01	$2.8
	Head & gut	81.93	$289.1	88.29	$345.3	82.00	$335.7	72.28	$187.7	80.32	$232.2
	Salted/split	2.00	$8.0	2.18	$10.7	1.58	$5.0	.02	$.0	-	-
	Fillets	9.84	$69.2	7.90	$64.2	9.24	$81.3	11.00	$63.3	14.67	$85.7
	Other products	16.04	$36.1	13.23	$30.6	14.55	$31.8	12.42	$25.0	17.47	$30.0
	All products	111.37	$404.5	113.71	$454.8	110.65	$458.7	100.29	$281.4	115.47	$350.8
Sablefish	Head & gut	8.58	$85.9	8.93	$94.4	7.32	$90.5	6.79	$87.5	6.70	$105.2
	Other products	.55	$4.7	.43	$2.8	.99	$8.5	.68	$7.1	.49	$5.2
	All products	9.13	$90.6	9.36	$97.2	8.32	$99.0	7.47	$94.6	7.18	$110.5

Table 25. Continued.

		2006		2007		2008		2009		2010	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Flatfish	Whole fish	25.76	$33.3	27.31	$36.6	19.76	$25.3	19.39	$23.4	19.84	$21.9
	Head & gut	71.96	$120.7	73.44	$117.5	118.34	$171.8	101.95	$121.9	120.18	$153.5
	Fillets	.73	$3.4	.91	$5.0	1.02	$5.3	.82	$4.8	.28	$1.3
	Other products	2.50	$2.9	2.91	$3.5	3.75	$6.3	4.29	$6.5	4.31	$8.6
	All products	100.95	$160.3	104.57	$162.6	142.87	$208.7	126.44	$156.6	144.62	$185.3
Rockfish	Whole fish	3.31	$6.7	1.98	$5.0	1.73	$3.6	2.28	$4.3	3.44	$6.1
	Head & gut	14.32	$39.2	15.66	$33.3	17.79	$33.0	16.14	$30.9	20.17	$49.7
	Other products	.44	$1.8	1.14	$5.1	.82	$4.2	.49	$1.9	.54	$2.3
	All products	18.08	$47.7	18.79	$43.5	20.35	$40.8	18.91	$37.2	24.15	$58.1
Atka mackerel	Whole fish	2.57	$2.1	-	-	2.89	$2.0	3.66	$3.3	2.15	$1.7
	Head & gut	32.74	$33.3	32.67	$40.3	30.04	$46.9	37.34	$64.3	37.84	$72.7
	All products	35.44	$35.5	32.76	$40.4	32.94	$48.9	41.01	$67.7	39.99	$74.4
All species	Total	808.66	$2,051.4	792.71	$2,090.2	699.64	$2,246.0	656.12	$1,706.2	716.87	$1,889.4

Notes: Total includes additional species not listed in the production details as well as confidential data from Tables 28 and 29. These estimates are for catch from both federal and state of Alaska fisheries.

Source: Weekly processor report and commercial operators annual report. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 26. Price per pound of groundfish products in the fisheries off Alaska by species and processing mode, 2006-10 (dollars).

		2006		2007		2008		2009		2010	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Pollock	Whole fish	$.36	$.24	$.57	$.26	$.48	$.28	$.85	$.28	$.45	$.39
	H&G	$.57	$.55	$.67	$.62	$.78	$.80	$.51	$.79	$.74	$.70
	Roe	$5.08	$3.61	$4.61	$3.07	$6.01	$4.35	$4.83	$3.15	$3.51	$2.00
	Deep-skin	$1.35	$1.22	$1.46	$1.25	$1.74	$1.51	$1.99	$1.55	$1.89	$1.45
	Other fillets	$1.25	$1.23	$1.25	$1.27	$1.77	$1.66	$1.70	$1.81	$1.64	$1.71
	Surimi	$1.01	$.84	$1.08	$.88	$2.00	$1.79	$1.37	$1.23	$1.75	$1.37
	Minced fish	$.82	$.79	$.77	$.70	$.91	$.88	$.85	$.98	$.87	$.89
	Fish meal	$.52	$.44	$.53	$.43	$.65	$.43	$.67	$.52	$.86	$.63
	Other products	$.58	$.33	$.59	$.34	$.62	$.46	$.47	$.31	$.58	$.37
	All products	$1.28	$.97	$1.29	$1.00	$1.83	$1.46	$1.45	$1.24	$1.49	$1.15
Pacific cod	Whole fish	$.61	$.60	$.66	$.84	$.55	$.64	$.54	$.61	$.41	$.58
	H&G	$1.68	$1.32	$1.86	$1.57	$1.91	$1.71	$1.22	$.91	$1.41	$.99
	Salted/split	-	$1.82	-	$2.22	-	$1.43	-	$1.19	-	-
	Roe	$1.58	$1.62	$1.37	$1.60	$1.20	$1.40	$.64	$.72	$.58	$.60
	Fillets	$3.37	$3.18	$2.72	$3.69	$3.99	$4.01	$2.91	$2.62	$2.45	$2.66
	Other products	$1.02	$.73	$.93	$.83	$.79	$.79	$.76	$.83	$1.02	$.72
	All products	$1.66	$1.62	$1.83	$1.80	$1.86	$1.90	$1.20	$1.44	$1.39	$1.37
Sablefish	H&G	$4.17	$4.63	$4.33	$4.90	$5.16	$5.71	$5.40	$5.95	$6.40	$7.26
	Other products	$1.66	$4.14	$1.34	$3.24	$1.58	$4.09	$1.27	$5.13	$2.16	$5.52
	All products	$4.06	$4.60	$4.20	$4.83	$4.98	$5.49	$5.17	$5.87	$6.04	$7.15
Deep-water flatfish	Whole fish	-	$.46	-	$.10	-	-	-	$.80	-	$.12
	H&G	-	$.63	$.55	$.50	-	$.59	-	-	-	$.54
	Fillets	-	-	-	$2.41	-	$2.22	-	$1.97	-	$1.61
	All products	-	$.56	$.55	$.54	-	$.72	-	$1.29	-	$.61

Table 26. Continued.

		2006		2007		2008		2009		2010	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Shallow-water flatfish	Whole fish	-	$.58	-	$.71	-	$.56	-	$.43	-	$.48
	H&G	$.78	$.63	$.66	$.70	$.60	$.67	$.50	$.84	$.62	$.56
	Fillets	-	$2.19	-	$2.65	-	$2.43	-	$2.70	-	$2.11
	Other products	$1.41	$.89	$1.25	-	$1.29	-	-	-	-	$.79
	All products	$.90	$1.00	$.77	$1.15	$.64	$1.06	$.50	$1.01	$.62	$.71
Other flatfish	Whole fish	$.93	-	$.98	$1.40	$1.05	-	$.99	$.70	$.88	-
	H&G	$.49	-	$.71	-	$.43	-	$.43	-	$.46	-
	Other products	$.29	$.29	$.44	$.37	$.11	$.05	$.37	$.38	$.56	$.56
	All products	$.76	$.29	$.85	$1.30	$.53	$.05	$.54	$.53	$.50	$.56
Arrowtooth	Whole fish	-	$.29	-	$.31	-	$.61	-	$.23	-	$.40
	H&G	$.57	$.47	$.51	$.45	$.61	$.45	$.47	$.35	$.47	$.36
	Fillets	-	$1.08	-	-	-	-	-	-	-	-
	Other products	$.29	$.41	$.37	$.45	$.15	$.90	$.38	$.37	$.56	$.71
	All products	$.57	$.46	$.51	$.45	$.61	$.57	$.47	$.35	$.47	$.47
Flathead sole	Whole fish	$.35	$.31	$.39	$1.01	$.42	$.49	$.40	$.38	$.46	$.47
	H&G	$.86	$.63	$.88	$.55	$.79	$.56	$.59	$.56	$.69	$.51
	Fillets	-	$1.17	-	$2.32	-	$1.97	-	$2.53	-	$1.82
	Other products	$1.25	$.44	$.84	$.50	$.96	$.13	$.64	$.42	$.69	$.59
	All products	$.98	$.41	$.87	$.75	$.80	$.54	$.59	$.50	$.69	$.55
Rock sole	Whole fish	$.45	-	$.42	-	$.41	-	$.36	-	$.33	$.41
	H&G	$.71	-	$.73	-	$.62	-	$.51	-	$.56	-
	H&G with roe	$1.54	-	$1.24	-	$1.23	-	$.89	-	$.84	-
	Other products	$.29	$.29	$.27	$.27	$.05	$.05	$.37	$.37	$.56	$.56
	All products	$.95	$.29	$.85	$.27	$.76	$.05	$.60	$.37	$.61	$.54

Table 26. Continued.

		2006		2007		2008		2009		2010	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Rex sole	Whole fish	$1.06	$1.05	$.99	$1.24	$1.01	$.95	$.86	$.97	$.91	$.91
	H&G	-	-	$.80	-	-	$.88	-	-	-	-
	Fillets	-	-	-	-	-	$1.75	-	-	-	-
	All products	$1.06	$1.05	$.99	$1.24	$1.01	$1.00	$.86	$.97	$.91	$.91
Yellowfin sole	Whole fish	$.51	-	$.51	-	$.51	-	$.43	-	$.41	-
	H&G	$.66	-	$.68	-	$.61	-	$.50	-	$.54	-
	Other products	$.47	$.29	$.56	$.39	$.70	$.05	$.73	$.37	$.96	$.56
	All products	$.61	$.29	$.62	$.39	$.59	$.05	$.49	$.37	$.52	$.56
Greenland turbot	H&G	$1.72	-	$1.34	-	$1.44	-	$1.35	-	$1.86	-
	Other products	$1.33	$.29	$1.27	$.53	$1.51	$.05	$1.50	$.37	$1.60	$.56
	All products	$1.61	$.29	$1.32	$.53	$1.46	$.05	$1.39	$.37	$1.78	$.56
Rockfish	Whole fish	$1.07	$.85	$1.18	$1.12	$1.53	$.76	$1.09	$.74	$.95	$.72
	H&G	$1.24	$1.26	$.97	$.96	$.83	$.89	$.86	$.94	$1.11	$1.19
	Other products	$.52	$2.00	$.55	$2.18	$1.11	$2.33	$1.07	$1.77	$1.09	$1.92
	All products	$1.23	$1.13	$.97	$1.32	$.85	$1.12	$.87	$.97	$1.10	$1.06
Atka mackerel	Whole fish	$.38	-	-	-	$.32	-	$.41	-	$.37	-
	H&G	$.46	-	$.56	-	$.71	-	$.78	-	$.87	-
	Other products	$.29	$.29	$.37	$.37	$.05	$.05	$.45	$.16	$.56	$.56
	All products	$.45	$.29	$.56	$.37	$.67	$.05	$.75	$.16	$.84	$.56

Note: These estimates are based on data from both federal and state of Alaska fisheries. Prices based on confidential data have been excluded.

Source: Weekly production reports and Commercial Operators Annual Reports (COAR). National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 27. Total product value per round metric ton of retained catch in the groundfish fisheries off Alaska by processor type, species, area and year, 2006-10, (dollars).

		Bering Sea and Aleutians					Gulf of Alaska				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Motherships	Pacific cod	97	399	704	847	-	-	-	-	-	-
	Pollock	716	775	1,281	1,069	-	-	-	-	-	-
Catcher/ processors	Atka mackerel	601	724	848	949	1,131	793	388	919	1,081	1,134
	Flatfish	988	886	788	692	743	1,201	1,075	1,004	1,213	1,099
	Other species	323	503	406	278	459	449	1,035	1,185	729	689
	Pacific cod	1,786	2,034	2,044	1,250	1,498	1,790	1,963	2,298	1,293	1,426
	Pollock	919	1,012	1,454	1,321	1,333	407	609	652	614	658
	Rockfish	1,452	1,099	964	977	1,310	1,365	1,046	961	960	1,251
	Sablefish	5,653	6,328	6,920	7,583	9,389	5,871	6,008	7,324	7,629	8,711
Shoreside processors	Flatfish	502	324	249	239	530	744	817	774	664	560
	Other species	717	977	297	195	708	653	1,031	1,154	867	1,170
	Pacific cod	1,621	2,198	2,097	1,188	1,438	1,605	2,007	2,035	1,383	1,323
	Pollock	799	870	1,258	1,272	1,244	778	762	976	839	863
	Rockfish	1,643	1,416	390	879	1,651	1,425	1,204	1,184	1,063	1,274
	Sablefish	4,773	5,927	5,697	6,231	12,390	6,245	6,894	7,375	7,939	9,396

Notes: These estimates include the product value of catch from both federal and state of Alaska fisheries. A dash indicates that data were not available or were withheld to preserve confidentiality.

Source: Weekly processor reports, commercial operators annual report (COAR), and catch accounting system estimates of retained catch. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 28. Production of groundfish products in the fisheries off Alaska by species, product and area, 2006-10 (1,000 metric tons product weight).

		Bering Sea and Aleutians					Gulf of Alaska				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Pollock	Whole fish	1.44	1.28	.98	1.39	.71	.51	.66	.72	.66	.53
	Head & gut	16.25	23.79	18.60	51.30	49.23	7.56	7.32	5.70	5.97	11.57
	Roe	28.16	28.52	19.66	17.90	15.34	1.82	1.95	1.13	.59	1.11
	Fillets	165.01	168.19	119.72	115.24	106.74	5.41	2.53	2.33	2.61	4.72
	Surimi	171.61	156.56	121.33	84.57	97.06	6.90	5.06	4.37	2.54	6.54
	Minced fish	28.47	27.68	20.36	22.10	21.59	-	-	-	-	-
	Fish meal	64.92	58.60	43.89	29.63	38.32	2.01	.21	-	-	-
	Other products	24.78	24.18	19.04	22.56	25.45	1.56	.33	.41	.35	.81
Pacific cod	Whole fish	.75	.35	1.36	2.70	.89	.43	.62	.93	1.13	.81
	Head & gut	74.35	76.14	69.91	65.22	66.42	7.56	12.15	12.09	7.05	13.81
	Fillets	4.66	3.10	3.59	4.74	5.59	5.26	5.08	5.88	6.75	9.21
	Other products	9.75	8.28	8.35	7.31	10.97	6.61	5.81	6.96	5.38	7.76
Sablefish	Head & gut	1.12	1.33	.97	1.01	1.18	7.46	7.59	6.35	5.78	5.51
	Other products	.03	.05	.03	.04	.05	.52	.39	.97	.65	.44
Flatfish	Whole fish	20.78	22.22	15.18	12.55	15.01	4.98	5.10	4.58	6.84	4.83
	Head & gut	64.12	66.35	108.99	95.64	114.22	7.82	7.09	9.36	6.31	5.96
	Fillets	-	-	-	-	-	.73	.91	1.02	.82	.28
	Other products	2.23	2.77	2.31	4.00	3.42	.28	.15	1.43	-	.89
Rockfish	Whole fish	.84	.52	.18	.16	.22	2.43	1.44	1.53	2.08	3.18
	Head & gut	5.68	7.72	9.43	8.05	10.87	8.64	7.94	8.36	8.09	9.30
	Other products	.08	.14	.02	.02	.03	.42	1.02	.83	.51	.56
Atka mackerel	Whole fish	2.57	-	2.89	3.66	2.15	-	-	-	-	-
	Head & gut	32.39	32.38	29.63	36.78	37.30	.35	.30	.41	.56	.54

Notes: These estimates include production resulting from catch from federal and state of Alaska fisheries. A dash indicates that data were not available or were withheld to preserve confidentiality. Confidential data withheld from this table are included in the grand totals in Table 25.

Source: Weekly processor reports. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 29. Production of groundfish products in the fisheries off Alaska by species, product and processing mode, 2006-10 (1,000 metric tons product weight).

		At-sea					On-shore				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Pollock	Whole fish	.38	.13	.09	.70	.04	1.57	1.81	1.61	1.35	1.20
	Head & gut	15.16	22.21	17.42	23.81	19.80	8.65	8.90	6.88	33.46	41.00
	Roe	16.34	16.52	11.65	9.30	7.64	13.63	13.95	9.14	9.20	8.81
	Fillets	89.71	89.25	68.00	64.40	58.80	80.71	81.46	54.06	53.45	52.66
	Surimi	92.99	89.87	64.93	44.03	52.78	85.52	71.74	60.77	43.08	50.81
	Minced fish	20.45	19.62	14.80	19.34	17.75	8.02	8.05	5.56	2.76	3.83
	Fish meal	21.43	19.70	15.35	12.30	14.64	45.50	39.11	28.54	17.33	23.67
	Other products	3.22	4.33	4.30	8.59	10.63	23.12	20.18	15.15	14.32	15.63
Pacific cod	Whole fish	.55	.23	1.14	2.74	.81	.63	.73	1.15	1.09	.89
	Head & gut	64.63	61.35	59.41	62.23	61.53	17.28	26.94	22.59	10.05	18.70
	Fillets	.88	.64	.72	.96	.85	9.04	7.54	8.75	10.52	13.95
	Other products	4.28	3.65	3.28	2.95	3.62	12.08	10.44	12.03	9.73	15.11
Sablefish	Head & gut	1.58	1.65	1.40	1.27	1.03	7.00	7.27	5.92	5.52	5.67
	Other products	.07	.07	.07	.07	.09	.48	.37	.92	.61	.40
Flatfish	Whole fish	23.26	23.52	16.01	15.71	17.49	2.50	3.80	3.75	3.67	2.35
	Head & gut	67.37	69.22	112.31	97.22	116.69	4.57	4.22	6.03	4.73	3.49
	Fillets	-	-	-	-	-	.73	.91	1.02	.82	.28
	Other products	1.62	1.92	1.66	2.30	2.45	.89	.99	2.09	1.69	1.87
Rockfish	Whole fish	.72	.64	.38	.63	1.01	2.55	1.32	1.33	1.61	2.39
	Head & gut	12.09	13.79	15.49	14.05	17.54	2.23	1.88	2.30	2.08	2.63
	Other products	.03	.10	.01	.01	.02	.46	1.06	.84	.53	.57
Atka mackerel	Whole fish	2.57	-	2.89	3.66	2.15	-	-	-	-	-
	Head & gut	32.74	32.67	30.04	37.34	37.84	-	-	-	-	-
	Other products	.00	.00	.00	.00	.00	.13	.08	.00	.00	.00

Notes: These estimates include production resulting from catch from federal and state of Alaska fisheries. A dash indicates that data were not available or were withheld to preserve confidentiality. Confidential data withheld from this table are included in the grand totals in Table 25.

Source: Weekly processor reports. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 30. Production and real gross value of non-groundfish products in the commercial fisheries of Alaska by species group and area of processing, 2006-10 (1,000 metric tons product weight and $ millions, base year = 2010).

		Bering Sea & Aleutians		Gulf of Alaska		All Alaska	
		Quantity	Value	Quantity	Value	Quantity	Value
2006	Salmon	61.1	321.6	159.3	673.6	220.4	995.2
	Halibut	2.5	34.2	16.6	212.8	19.1	247.1
	Herring	21.2	22.7	11.8	16.0	33.0	38.7
	Crab	15.0	150.4	6.6	75.4	21.6	225.8
	Other	.2	1.2	1.9	23.0	2.1	24.2
	Total	99.9	530.1	196.2	1,000.8	296.2	1,531.0
2007	Salmon	64.1	348.8	207.6	829.1	271.7	1,177.9
	Halibut	2.9	41.2	15.5	217.1	18.3	258.3
	Herring	10.8	16.0	14.3	27.5	25.0	43.5
	Crab	15.6	217.6	4.3	58.1	19.9	275.6
	Other	.1	.5	1.4	20.1	1.6	20.7
	Total	93.5	624.2	243.0	1,151.9	336.6	1,776.1
2008	Salmon	54.8	336.8	153.6	803.5	208.4	1,140.3
	Halibut	2.9	35.8	16.2	212.7	19.1	248.5
	Herring	16.8	20.9	17.5	36.6	34.3	57.5
	Crab	20.0	269.8	4.7	62.6	24.8	332.4
	Other	.2	.9	3.0	18.3	3.2	19.1
	Total	94.7	664.1	195.1	1,133.8	289.8	1,797.9
2009	Salmon	58.1	370.5	152.1	714.9	210.1	1,085.5
	Halibut	2.7	26.4	16.1	170.2	18.8	196.5
	Herring	18.5	25.3	17.1	37.1	35.6	62.4
	Crab	20.6	231.4	5.2	57.3	25.9	288.7
	Other	.4	1.0	1.5	20.4	1.9	21.4
	Total	100.3	654.6	192.0	999.8	292.3	1,654.4
2010	Salmon	63.3	449.8	187.1	905.7	250.4	1,355.5
	Halibut	2.5	43.3	13.5	190.8	16.0	234.2
	Herring	24.9	26.6	22.2	32.9	47.2	59.5
	Crab	18.6	236.4	4.2	56.0	22.9	292.4
	Other	.5	1.4	1.6	25.6	2.1	27.0
	Total	109.8	757.5	228.7	1,211.1	338.5	1,968.6

Note: These estimates include production resulting from catch in both federal and state of Alaska fisheries. The data have been adjusted to 2010 dollars by applying the Producer Price Index for unprocessed and packaged fish (series number WPU0223) from the Bureau of Labor Statistics at: http://data.bls.gov/cgi-bin/srgate.

Source: ADF&G Commercial Operators Annual Report. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

**Table 31. Gross product value of Alaska groundfish by area and processing mode,
1992-2010 ($ millions).**

	Gulf of Alaska		Bering Sea and Aleutians		All Alaska
	At-sea	Shoreside	At-sea	Shoreside	Total
1992	71.1	186.7	844.4	329.4	1,431.5
1993	45.7	170.3	585.1	195.5	996.6
1994	37.1	186.0	640.1	267.2	1,130.4
1995	46.0	212.1	784.7	349.3	1,392.1
1996	48.5	181.1	706.0	296.1	1,231.7
1997	30.2	200.9	706.3	293.2	1,230.5
1998	28.3	184.4	599.4	258.3	1,070.4
1999	43.0	209.5	639.0	325.3	1,216.7
2000	41.5	209.5	691.9	416.1	1,359.0
2001	31.0	167.1	877.6	464.5	1,540.1
2002	36.5	157.6	810.3	477.5	1,482.0
2003	39.4	160.4	855.2	535.1	1,590.1
2004	32.1	177.2	953.4	516.3	1,678.9
2005	38.5	218.1	1,128.5	612.3	1,997.3
2006	48.3	218.6	1,175.7	608.9	2,051.4
2007	46.3	229.1	1,199.9	614.9	2,090.2
2008	47.3	256.0	1,300.0	642.7	2,246.0
2009	41.0	190.3	977.0	497.9	1,706.2
2010	49.7	259.7	1,065.4	514.6	1,889.4

Note: These estimates include the product value of catch from both federal and state of Alaska fisheries.

Source: NMFS weekly production reports and ADFG Commercial Operators Annual Reports (COAR). National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 32. Gross product value of Alaska groundfish by catcher/processor category, vessel length, and area, 2004-10 ($ millions).

		Gulf of Alaska		Bering Sea and Aleutians		
		Vessel length		Vessel length		
		<125	>=125	<125	125-165	>165
Fixed Gear	2004	9.4	5.5	31.6	67.0	43.5
	2005	7.9	4.0	41.7	80.9	55.3
	2006	9.8	6.1	48.8	86.9	59.9
	2007	15.6	4.5	50.6	79.6	55.5
	2008	12.3	8.1	65.4	90.9	60.5
	2009	9.8	5.4	45.4	64.0	36.7
	2010	9.6	8.9	50.0	68.5	42.3
Fillet Trawl	2004	-	-	-	-	122.2
	2005	-	-	-	-	133.5
	2006	-	-	-	-	115.7
	2009	-	-	-	-	62.0
H&G Trawl	2004	4.1	13.0	28.4	28.0	125.7
	2005	8.3	18.2	30.0	32.5	163.1
	2006	9.7	22.2	37.7	35.0	167.9
	2007	8.1	17.6	42.3	40.8	179.0
	2008	9.4	16.8	42.2	46.8	201.7
	2009	9.0	16.8	28.9	39.9	177.3
	2010	7.5	23.6	35.9	50.8	216.2
Surimi Trawl	2004	-	-	-	-	417.6
	2005	-	-	-	-	476.8
	2006	-	-	-	-	517.8
	2007	-	-	-	-	637.6
	2008	-	-	-	-	620.6
	2009	-	-	-	-	434.8
	2010	-	-	-	-	474.2
All Trawl	2004	4.1	13.0	28.4	28.0	665.5
	2005	8.3	18.2	30.0	32.5	773.5
	2006	9.7	22.2	37.7	35.0	801.5
	2007	8.1	17.6	42.3	40.8	816.5
	2008	9.4	16.8	42.2	46.8	822.2
	2009	9.0	16.8	28.9	39.9	674.0
	2010	7.5	23.6	35.9	50.8	690.4

Note: These estimates include the product value of catch from both federal and state of Alaska fisheries.

Source: NMFS weekly production reports, Commercial Operators Annual Reports (COAR), and NMFS permits. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 33. Gross product value per vessel of Alaska groundfish by catcher/processor category, vessel length, and area 2004-10 ($ millions).

		Gulf of Alaska		Bering Sea and Aleutians		
		<125	>=125	<125	125-165	>165
Fixed Gear	2004	.9	.6	2.4	3.7	4.0
	2005	.8	.4	3.2	4.5	5.0
	2006	.9	.5	3.8	4.8	5.0
	2007	1.2	.5	3.6	5.0	5.0
	2008	.9	.7	3.8	5.7	5.5
	2009	.8	.4	3.0	4.0	3.3
	2010	.8	1.0	2.9	4.6	4.2
Fillet Trawl	2004	-	-	-	-	24.4
	2005	-	-	-	-	26.7
	2006	-	-	-	-	28.9
	2009	-	-	-	-	20.7
H&G Trawl	2004	1.0	1.1	4.1	7.0	10.5
	2005	2.1	1.5	5.0	8.1	13.6
	2006	1.6	2.2	6.3	8.8	14.0
	2007	2.0	1.6	7.1	10.2	14.9
	2008	2.3	1.7	7.0	11.7	16.8
	2009	1.8	1.3	4.8	10.0	16.1
	2010	2.5	1.7	7.2	12.7	19.7
Surimi Trawl	2004	-	-	-	-	34.8
	2005	-	-	-	-	39.7
	2006	-	-	-	-	39.8
	2007	-	-	-	-	39.8
	2008	-	-	-	-	41.4
	2009	-	-	-	-	36.2
	2010	-	-	-	-	36.5
All Trawl	2004	1.0	1.1	4.1	7.0	22.9
	2005	2.1	1.5	5.0	8.1	26.7
	2006	1.6	2.2	6.3	8.8	27.6
	2007	2.0	1.6	7.1	10.2	29.2
	2008	2.3	1.7	7.0	11.7	30.5
	2009	1.8	1.3	4.8	10.0	25.9
	2010	2.5	1.7	7.2	12.7	28.8

Note: These estimates include the product value of catch from both federal and state of Alaska fisheries.

Source: NMFS weekly production reports, Commercial Operators Annual Reports (COAR), and NMFS permits. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 34. Gross product value of groundfish processed by shoreside processors by processor group, 2004-10. ($ millions)

	2004	2005	2006	2007	2008	2009	2010
Bering Sea Pollock	468.0	557.8	553.8	490.8	573.4	400.5	447.0
AK Peninsula/Aleutians	74.4	102.9	136.3	130.0	120.9	67.7	78.0
Kodiak	67.0	88.9	109.1	118.0	131.1	90.0	128.5
South Central	27.7	33.8	41.5	33.6	37.8	31.7	36.2
Southeastern	52.6	45.9	38.9	37.2	44.3	33.2	41.5
TOTAL	689.6	829.3	879.6	809.5	907.5	623.1	731.2

Table 35. Groundfish gross product value as a percentage of all-species gross product value by shoreside processor group, 2004-10. (percent)

	2004	2005	2006	2007	2008	2009	2010
Bering Sea Pollock	86.3	88.3	89.3	83.7	83.9	81.3	80.5
AK Peninsula/Aleutians	19.8	21.9	27.3	23.6	21.4	13.4	13.4
Kodiak	41.5	39.9	43.4	40.9	45.4	34.5	42.9
South Central	12.1	11.8	15.4	9.4	10.1	12.1	7.2
Southeastern	14.6	14.2	10.5	9.2	10.6	8.8	8.9
TOTAL	40.4	41.9	42.6	36.2	38.1	31.8	29.2

Note: The data are for catch from both federal and state of Alaska fisheries. The processor groups are defined as follows:
"Bering Sea Pollock" are the AFA inshore pollock processors including the two AFA floating processors.
"AK Peninsula/Aleutian" are other processors on the Alaska Peninsula or in the Aleutian Islands.
"Kodiak" are processors on Kodiak Island.
"South Central" are processors west of Yakutat and on the Kenai Peninsula.
"Southeastern" are processors located from Yakutat south.

Source: ADFG Commercial Operators Annual Report, ADFG intent to process. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 36. Number of groundfish vessels that caught or caught and processed more than $4.0 million ex-vessel value or product value of groundfish and other species by area, vessel type and gear, 2006-10.

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels
2006	All gear	0	34	34	15	74	89	15	75	90
	Hook & line	0	19	19	0	35	35	0	35	35
	Pot	0	0	0	1	3	4	1	3	4
	Trawl	0	15	15	15	38	53	15	39	54
2007	All gear	0	35	35	12	73	85	12	74	86
	Hook & line	0	20	20	0	33	33	0	33	33
	Pot	0	0	0	1	1	2	1	1	2
	Trawl	0	15	15	11	39	50	11	40	51
2008	All gear	4	32	36	22	73	95	23	74	97
	Hook & line	0	18	18	0	33	33	0	33	33
	Pot	4	1	5	4	3	7	5	4	9
	Trawl	0	13	13	18	38	56	18	39	57
2009	All gear	0	33	33	6	61	67	6	62	68
	Hook & line	0	16	16	0	26	26	0	26	26
	Pot	0	1	1	0	1	1	0	2	2
	Trawl	0	16	16	6	34	40	6	35	41
2010	All gear	0	29	29	3	60	63	3	61	64
	Hook & line	0	13	13	0	25	25	0	25	25
	Pot	0	0	0	0	3	3	0	3	3
	Trawl	0	16	16	3	34	37	3	35	38

Note: Includes only vessels that fished part of federal groundfish TACs. Determination that a vessel was above the $4.0 million threshold was based on total revenue from catching or processing all species, not just groundfish.

Source: CFEC fish tickets, weekly processor reports, NMFS permits, Commercial Operators Annual Report (COAR), ADFG intent-to-operate listings. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 37. Number of groundfish vessels that caught or caught and processed less than $4.0 million ex-vessel value or product value of groundfish and other species by area, vessel type and gear, 2006-10.

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels
2006	All gear	772	5	777	199	8	207	895	9	904
	Hook & line	598	4	602	46	5	51	618	6	624
	Pot	145	0	145	69	2	71	194	2	196
	Trawl	74	1	75	93	1	94	138	1	139
2007	All gear	668	3	671	206	7	213	792	9	801
	Hook & line	494	2	496	36	5	41	508	6	514
	Pot	137	1	138	69	2	71	183	3	186
	Trawl	72	0	72	103	0	103	139	0	139
2008	All gear	724	5	729	192	11	203	839	12	851
	Hook & line	547	4	551	46	7	53	571	8	579
	Pot	139	0	139	61	3	64	178	3	181
	Trawl	73	1	74	91	2	93	132	2	134
2009	All gear	681	9	690	188	18	206	800	20	820
	Hook & line	530	6	536	38	15	53	547	17	564
	Pot	122	1	123	51	3	54	158	3	161
	Trawl	71	2	73	104	2	106	142	2	144
2010	All gear	692	11	703	186	18	204	806	20	826
	Hook & line	545	10	555	41	14	55	559	16	575
	Pot	111	0	111	47	4	51	141	4	145
	Trawl	67	1	68	100	1	101	138	1	139

Note: Includes only vessels that fished part of federal groundfish TACs. Determination that a vessel was below the $4.0 million threshold was based on total revenue from catching or processing all species, not just groundfish.

Source: CFEC fish tickets, weekly processor reports, NMFS permits, Commercial Operators Annual Report (COAR), ADFG intent-to-operate listings. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 38. Average revenue of groundfish vessels that caught or caught and processed more than $4.0 million ex-vessel value or product value of groundfish and other species, by area, vessel type, and gear, 2006-10. ($ millions)

		Gulf of Alaska			Bering Sea & Aleutians			All Alaska		
		Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels
2006	All gear	-	8.31	8.31	5.40	15.60	13.86	5.40	15.45	13.75
	Hook & line	-	5.97	5.97	-	5.93	5.93	-	5.93	5.93
	Trawl	-	11.29	11.29	5.40	24.51	19.10	5.40	23.98	18.82
2007	All gear	-	8.59	8.59	5.05	16.11	14.64	5.05	15.95	14.53
	Hook & line	-	6.39	6.39	-	6.08	6.08	-	6.08	6.08
	Trawl	-	11.54	11.54	5.05	24.59	20.29	5.05	24.09	19.99
2008	All gear	4.40	11.29	10.50	5.21	17.37	14.49	5.18	17.19	14.28
	Hook & line	-	7.40	7.40	-	6.97	6.97	-	6.97	6.97
	Pot	4.40	-	4.40	4.41	-	4.41	4.40	-	4.40
	Trawl	-	16.67	16.67	5.39	26.40	19.65	5.39	25.84	19.38
2009	All gear	-	9.88	9.88	5.43	15.27	14.38	5.43	15.10	14.24
	Hook & line	-	5.36	5.36	-	5.25	5.25	-	5.25	5.25
	Trawl	-	14.40	14.40	5.43	22.94	20.31	5.43	22.43	19.94
2010	All gear	-	12.97	12.97	-	17.45	17.45	-	17.23	17.23
	Hook & line	-	6.11	6.11	-	6.14	6.14	-	6.14	6.14
	Trawl	-	18.55	18.55	-	25.76	25.76	-	25.16	25.16

Notes: Includes only vessels that fished part of federal groundfish TACs. Categories with fewer than four vessels are not reported. Averages are obtained by adding the total revenues, across all areas and gear types, of all the vessels in the category, and dividing that sum by the number of vessels in the category. Averages include revenue realized from catching or processing all species, not just groundfish.

Source: CFEC fish tickets, weekly processor reports, NMFS permits, commercial operators annual report (COAR), ADFG intent-to-operate listings. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 39. Average revenue of groundfish vessels that caught or caught and processed less than $4.0 million ex-vessel value or product value of groundfish and other species, by area, vessel type and gear, 2006-10. ($ millions)

		Gulf of Alaska			Bering Sea & Aleutians			All Alaska		
		Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels
2006	All gear	.50	2.94	.51	1.44	3.22	1.48	.64	3.01	.66
	Hook & line	.42	2.94	.44	.78	3.22	1.02	.42	3.01	.45
	Pot	.61	-	.61	1.05	-	1.05	.69	-	.69
	Trawl	1.12	-	1.12	2.00	-	2.00	1.62	-	1.62
2007	All gear	.61	-	.61	1.53	2.58	1.56	.79	2.58	.80
	Hook & line	.52	-	.52	.70	2.58	.93	.51	2.58	.53
	Pot	.76	-	.76	1.41	-	1.41	.94	-	.94
	Trawl	1.25	-	1.25	1.91	-	1.91	1.68	-	1.68
2008	All gear	.61	1.53	.62	1.68	2.52	1.71	.78	2.48	.79
	Hook & line	.49	1.53	.49	.58	2.52	.83	.48	2.48	.51
	Pot	.85	-	.85	1.77	-	1.77	1.07	-	1.07
	Trawl	1.48	-	1.48	2.12	-	2.12	1.86	-	1.86
2009	All gear	.45	2.49	.47	1.39	2.53	1.47	.62	2.42	.66
	Hook & line	.39	2.49	.41	.60	2.53	1.15	.39	2.42	.45
	Pot	.57	-	.57	1.40	-	1.40	.79	-	.79
	Trawl	.94	-	.94	1.67	-	1.67	1.43	-	1.43
2010	All gear	.56	1.90	.58	1.49	2.39	1.56	.71	2.15	.74
	Hook & line	.48	1.90	.50	.86	2.41	1.25	.48	2.13	.52
	Pot	.76	-	.76	1.83	2.69	1.89	1.01	2.69	1.05
	Trawl	1.13	-	1.13	1.60	-	1.60	1.43	-	1.43

Notes: Includes only vessels that fished part of federal groundfish TACs. Categories with fewer than four vessels are not reported. Averages are obtained by adding the total revenues, across all areas and gear types, of all the vessels in the category, and dividing that sum by the number of vessels in the category. Averages include revenue realized from catching or processing all species, not just groundfish.

Source: CFEC fish tickets, weekly processor reports, NMFS permits, commercial operators annual report (COAR), ADFG intent-to-operate listings. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 40. Number and total registered net tons of vessels that caught groundfish off Alaska by area and gear, 2003-10.

		Gulf of Alaska		Bering Sea and Aleutians		All Alaska	
		Number of Vessels	Registered net tons	Number of Vessels	Registered net tons	Number of Vessels	Registered net tons
Hook & Line	2003	908	31,152	109	14,441	952	37,351
	2004	879	29,005	90	13,896	925	36,480
	2005	779	26,786	96	15,100	826	35,266
	2006	621	25,689	86	14,951	659	32,312
	2007	516	21,499	74	13,577	547	28,336
	2008	569	22,115	86	14,073	612	29,530
	2009	552	22,618	79	14,255	590	29,699
	2010	568	22,268	80	13,233	600	28,560
Pot	2003	141	8,194	88	11,104	202	16,169
	2004	150	8,934	83	11,072	204	17,186
	2005	152	9,189	74	9,597	203	16,651
	2006	145	8,870	75	9,038	200	15,676
	2007	138	8,328	73	8,616	188	15,144
	2008	144	8,505	71	8,522	190	14,603
	2009	124	7,023	55	6,515	163	12,132
	2010	111	6,311	54	6,833	148	11,588
Trawl	2003	114	17,617	162	52,984	210	56,533
	2004	93	15,007	156	53,034	194	56,062
	2005	94	14,987	148	51,931	191	55,308
	2006	90	13,391	147	51,244	193	54,820
	2007	87	12,482	153	52,010	190	54,886
	2008	87	13,937	149	51,877	191	55,203
	2009	89	14,258	146	46,418	185	49,692
	2010	84	13,925	138	47,569	177	50,892
All gear	2003	1,097	52,935	347	77,632	1,288	105,122
	2004	1,067	49,591	322	76,922	1,258	104,927
	2005	964	47,012	308	75,741	1,150	102,444
	2006	811	45,175	296	74,103	994	98,827
	2007	706	40,103	298	74,019	887	95,880
	2008	765	42,396	298	73,782	948	96,245
	2009	723	41,360	273	66,474	888	88,142
	2010	732	40,284	267	66,936	890	88,222

Note: These estimates include only vessels fishing federal TACs. Registered net tons totals exclude mainly smaller vessels for which data were unavailable. The percentages of vessels missing are: 2003 - 3%, 2004 - 2%, 2005 - 2%, 2006 - 2%, 2007 - 1%, 2008 - 2%, 2009 - 2%, 2010 - 1%.

Source: Blend estimates, Catch Accounting System, fish tickets, observer data, federal permit file, CFEC vessel data, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 41. Number of vessels that caught groundfish off Alaska by area, vessel category, gear and target, 2006-10.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Catcher vessels	Catcher/ processors	Total	Catcher vessels	Catcher/ processors	Total	Catcher vessels	Catcher/ processors	Total
All Gear	All groundfish	2006	772	39	811	214	82	296	910	84	994
		2007	668	38	706	218	80	298	804	83	887
		2008	728	37	765	214	84	298	862	86	948
		2009	681	42	723	194	79	273	806	82	888
		2010	692	40	732	189	78	267	809	81	890
Hook & Line	Sablefish	2006	355	12	367	23	10	33	362	15	377
		2007	316	14	330	21	10	31	324	17	341
		2008	307	11	318	17	10	27	316	16	332
		2009	307	13	320	22	10	32	318	19	337
		2010	311	9	320	26	9	35	324	14	338
	Pacific cod	2006	196	15	211	29	39	68	217	39	256
		2007	187	14	201	23	38	61	200	38	238
		2008	262	18	280	36	39	75	282	41	323
		2009	229	16	245	17	38	55	241	39	280
		2010	223	20	243	17	36	53	232	40	272
	Flatfish	2006	0	1	1	2	13	15	2	14	16
		2007	0	0	0	0	12	12	0	12	12
		2008	0	0	0	0	7	7	0	7	7
		2009	0	0	0	0	9	9	0	9	9
		2010	0	0	0	0	12	12	0	12	12
	Rockfish	2006	151	1	152	1	4	5	151	5	156
		2007	58	0	58	1	3	4	59	3	62
		2008	50	1	51	0	0	0	50	1	51
		2009	41	1	42	0	2	2	41	2	43
		2010	56	0	56	0	3	3	56	3	59
	All groundfish	2006	598	23	621	46	40	86	618	41	659
		2007	494	22	516	36	38	74	508	39	547
		2008	547	22	569	46	40	86	571	41	612
		2009	530	22	552	38	41	79	547	43	590
		2010	545	23	568	41	39	80	559	41	600
Pot	Pacific cod	2006	143	0	143	65	4	69	188	4	192
		2007	137	1	138	64	3	67	179	4	183
		2008	143	1	144	57	6	63	175	7	182
		2009	122	2	124	43	4	47	151	5	156
		2010	111	0	111	43	7	50	137	7	144

Table 41. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Catcher vessels	Catcher/ process ors	Total	Catcher vessels	Catcher/ process ors	Total	Catcher vessels	Catcher/ process ors	Total
Trawl	Pollock	2006	65	0	65	90	19	109	136	19	155
		2007	59	0	59	91	20	111	131	20	151
		2008	61	0	61	89	33	122	130	33	163
		2009	62	1	63	89	33	122	130	33	163
		2010	63	0	63	90	29	119	134	29	163
	Sablefish	2006	1	0	1	0	0	0	1	0	1
		2007	14	0	14	0	1	1	14	1	15
		2008	13	0	13	0	3	3	13	3	16
		2009	15	1	16	0	1	1	15	2	17
		2010	12	1	13	0	0	0	12	1	13
	Pacific cod	2006	58	3	61	57	19	76	107	19	126
		2007	60	2	62	65	24	89	110	24	134
		2008	64	3	67	66	14	80	113	14	127
		2009	59	4	63	54	16	70	103	17	120
		2010	52	1	53	48	16	64	90	17	107
	Flatfish	2006	29	10	39	4	28	32	32	29	61
		2007	29	12	41	4	30	34	30	31	61
		2008	33	6	39	3	34	37	35	35	70
		2009	33	6	39	1	29	30	34	30	64
		2010	27	6	33	0	29	29	27	30	57
	Rockfish	2006	25	11	36	0	8	8	25	16	41
		2007	27	7	34	2	8	10	29	13	42
		2008	28	11	39	2	12	14	29	15	44
		2009	26	15	41	2	11	13	28	15	43
		2010	27	15	42	2	15	17	29	19	48
	Atka mackerel	2006	0	0	0	0	21	21	0	21	21
		2007	0	1	1	1	17	18	1	17	18
		2008	0	0	0	2	9	11	2	9	11
		2009	0	0	0	1	12	13	1	12	13
		2010	0	1	1	2	7	9	2	8	10
	All groundfish	2006	74	16	90	108	39	147	153	40	193
		2007	72	15	87	114	39	153	150	40	190
		2008	73	14	87	109	40	149	150	41	191
		2009	71	18	89	110	36	146	148	37	185
		2010	67	17	84	103	35	138	141	36	177

Note: The target is determined based on vessel, week, catching mode, NMFS area, and gear. These estimates include only vessels that fished part of federal TACs.

Source: Catch Accounting System estimates, fish tickets, observer data, federal permit file, CFEC vessel data, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 42. Number of vessels, mean length and mean net tonnage for vessels that caught groundfish off Alaska by area, vessel-length class (feet), and gear, 2006-10 (excluding catcher-processors).

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			<60	60-125	>=125	<60	60-125	>=125	<60	60-125	>=125
Number of vessels	Hook & Line	2006	528	70	0	39	7	0	544	74	0
		2007	437	57	0	31	5	0	450	58	0
		2008	490	57	0	42	4	0	513	58	0
		2009	471	59	0	31	7	0	485	62	0
		2010	488	57	0	32	9	0	499	60	0
	Pot	2006	103	40	2	18	42	10	117	68	10
		2007	101	35	1	19	40	11	106	67	11
		2008	108	32	3	18	37	10	115	58	10
		2009	97	25	0	19	24	8	105	45	8
		2010	86	24	1	13	25	9	90	42	9
	Trawl	2006	26	48	0	5	77	26	28	99	26
		2007	26	46	0	8	79	27	27	96	27
		2008	27	44	2	5	76	28	27	95	28
		2009	27	44	0	7	75	28	27	93	28
		2010	24	43	0	5	70	28	25	88	28

Note: If the permit files do not report a length for a vessel, the vessel is counted in the "less than 60 feet" class.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			<60	60-125	>=125	<60	60-125	>=125	<60	60-125	>=125
Mean vessel length (feet)	Hook & Line	2006	45	74	-	50	77	-	45	75	-
		2007	46	72	-	47	72	-	46	73	-
		2008	45	72	-	47	76	-	45	73	-
		2009	45	73	-	48	84	-	45	74	-
		2010	46	74	-	48	81	-	46	74	-
	Pot	2006	53	94	134	53	102	131	53	98	131
		2007	54	92	133	53	104	128	54	97	128
		2008	54	92	132	55	105	129	53	98	129
		2009	54	87	-	56	105	134	54	95	134
		2010	54	91	133	56	105	134	54	97	134
	Trawl	2006	57	93	-	58	106	157	57	102	157
		2007	58	94	-	58	106	156	58	103	156
		2008	58	93	137	58	106	155	58	103	155
		2009	58	94	-	58	107	155	58	103	155
		2010	58	93	-	58	106	155	58	102	155

Table 42. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			<60	60-125	>=125	<60	60-125	>=125	<60	60-125	>=125
Mean registered net tons	Hook & Line	2006	25	71	-	30	95	-	25	73	-
		2007	27	63	-	28	77	-	27	64	-
		2008	26	63	-	28	91	-	26	64	-
		2009	27	61	-	35	99	-	27	65	-
		2010	26	65	-	36	106	-	27	69	-
	Pot	2006	39	113	147	45	120	159	39	116	159
		2007	44	106	97	46	129	135	43	118	135
		2008	43	102	142	53	126	135	43	114	135
		2009	45	96	-	61	129	132	46	110	132
		2010	46	96	97	66	119	149	45	107	149
	Trawl	2006	60	100	-	55	118	234	60	113	234
		2007	62	100	-	64	118	235	62	114	235
		2008	64	103	204	68	119	232	64	114	232
		2009	66	102	-	67	116	235	66	114	235
		2010	71	102	-	67	117	235	71	114	235

Note: These estimates include only vessels that fished part of federal TACs.

Source: Catch Accounting System, ADFG fish tickets, observer data, NMFS permits. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 43. Number of smaller hook-and-line vessels that caught groundfish off Alaska, by area and vessel-length class (feet), 2006-10 (excluding catcher-processors).

			Vessel length class							
			<26	26-30	30-35	35-40	40-45	45-50	50-55	55-60
Number of vessels	Gulf of Alaska	2006	13	4	68	60	118	81	65	119
		2007	8	4	47	42	93	76	53	114
		2008	15	7	53	66	94	82	55	118
		2009	15	6	54	52	90	77	56	121
		2010	10	5	59	60	88	83	59	124
	Bering Sea and Aleutian Islands	2006	0	1	5	1	4	3	4	21
		2007	0	0	2	5	7	3	3	11
		2008	1	0	5	8	3	4	5	16
		2009	1	0	3	4	2	6	3	12
		2010	1	0	3	5	2	5	3	13
	All Alaska	2006	13	5	73	61	119	82	67	124
		2007	8	4	49	45	95	78	54	117
		2008	15	7	58	71	96	82	58	126
		2009	16	6	56	54	90	80	57	126
		2010	11	5	60	63	88	84	59	129

Note: If the permit files do not report a length for a vessel, the vessel is counted in the "<26" class.

Source: Catch Accounting System, ADFG fish tickets, observer data, NMFS permits. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115- 0070.

Table 44. Number of vessels, mean length and mean net tonnage for vessels that caught and processed groundfish off Alaska by area, vessel-length class (feet), and gear, 2006-10.

			Gulf of Alaska					Bering Sea and Aleutians					All Alaska				
			Vessel length class					Vessel length class					Vessel length class				
			<125	125-164	165-234	235-259	>260	<125	125-164	165-234	235-259	>260	<125	125-164	165-234	235-259	>260
Number of vessels	Hook & Line	2006	11	6	6	0	0	12	17	11	0	0	13	17	11	0	0
		2007	12	4	6	0	0	13	15	10	0	0	14	15	10	0	0
		2008	13	4	5	0	0	15	15	10	0	0	16	15	10	0	0
		2009	11	5	6	0	0	16	15	10	0	0	18	15	10	0	0
		2010	14	4	5	0	0	16	14	9	0	0	18	14	9	0	0
	Pot	2006	0	0	0	0	0	1	2	2	0	0	1	2	2	0	0
		2007	1	0	0	0	0	1	1	1	0	0	2	1	1	0	0
		2008	0	1	0	0	0	4	1	1	0	0	4	2	1	0	0
		2009	1	1	0	0	0	2	1	1	0	0	2	2	1	0	0
		2010	0	0	0	0	0	4	2	1	0	0	4	2	1	0	0
	Trawl	2006	6	2	7	1	0	6	4	11	3	15	7	4	11	3	15
		2007	4	3	7	1	0	6	4	11	3	15	7	4	11	3	15
		2008	4	1	7	1	1	7	4	11	3	15	8	4	11	3	15
		2009	5	3	8	1	1	6	4	10	3	13	7	4	10	3	13
		2010	3	3	9	1	1	5	4	9	3	14	6	4	9	3	14

Note: If the permit files do not report a length for a vessel, the vessel is counted in the "less than 125 feet" class.

Table 44. Continued.

			Gulf of Alaska					Bering Sea and Aleutians					All Alaska				
			Vessel length class					Vessel length class					Vessel length class				
			<125	125-164	165-234	235-259	>260	<125	125-164	165-234	235-259	>260	<125	125-164	165-234	235-259	>260
Mean vessel length (feet)	Hook & Line	2006	113	148	180	-	-	119	147	178	-	-	115	147	178	-	-
		2007	114	145	176	-	-	118	146	178	-	-	114	146	178	-	-
		2008	106	146	176	-	-	111	146	178	-	-	108	146	178	-	-
		2009	106	143	175	-	-	110	146	178	-	-	105	146	178	-	-
		2010	100	145	176	-	-	108	147	176	-	-	102	147	176	-	-
	Pot	2006	-	-	-	-	-	104	165	170	-	-	104	165	170	-	-
		2007	76	-	-	-	-	104	165	166	-	-	90	165	166	-	-
		2008	-	165	-	-	-	107	165	166	-	-	107	165	166	-	-
		2009	104	165	-	-	-	106	165	166	-	-	106	165	166	-	-
		2010	-	-	-	-	-	98	165	166	-	-	98	165	166	-	-
	Trawl	2006	115	150	203	238	-	118	148	203	245	303	116	148	203	245	303
		2007	111	144	198	238	-	118	148	203	245	303	116	148	203	245	303
		2008	109	160	212	238	295	115	148	203	245	303	114	148	203	245	303
		2009	108	144	209	238	295	113	148	204	245	308	112	148	204	245	308
		2010	112	144	204	238	295	115	148	204	245	305	113	148	204	245	305

Table 44. Continued.

			Gulf of Alaska					Bering Sea and Aleutians					All Alaska				
			Vessel length class					Vessel length class					Vessel length class				
			<125	125-164	165-234	235-259	>260	<125	125-164	165-234	235-259	>260	<125	125-164	165-234	235-259	>260
Mean registered net tons	Hook & Line	2006	143	324	643	-	-	143	326	531	-	-	144	326	531	-	-
		2007	146	285	526	-	-	144	333	546	-	-	145	333	546	-	-
		2008	129	358	562	-	-	138	333	546	-	-	139	333	546	-	-
		2009	132	347	555	-	-	127	333	546	-	-	129	333	546	-	-
		2010	125	285	562	-	-	136	338	471	-	-	123	338	471	-	-
	Pot	2006	-	-	-	-	-	111	464	303	-	-	111	464	303	-	-
		2007	134	-	-	-	-	111	793	192	-	-	123	793	192	-	-
		2008	-	135	-	-	-	145	793	192	-	-	145	464	192	-	-
		2009	111	135	-	-	-	105	793	192	-	-	105	464	192	-	-
		2010	-	-	-	-	-	136	464	192	-	-	136	464	192	-	-
	Trawl	2006	146	255	718	611	-	153	194	670	985	1590	144	194	670	985	1590
		2007	125	214	647	611	-	153	194	670	985	1590	144	194	670	985	1590
		2008	129	380	670	611	1085	153	194	670	985	1590	146	194	670	985	1590
		2009	130	214	623	611	1085	138	194	573	985	1568	131	194	573	985	1568
		2010	121	214	568	611	1085	138	194	568	985	1637	130	194	568	985	1637

Note: These estimates include only vessels that fished part of federal TACs.

Source: Catch Accounting System, NMFS permits. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 45. Number of vessels that caught groundfish off Alaska by area, tonnage caught, and gear, 2003-10.

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		Tonnage caught			Tonnage caught			Tonnage caught		
		Less than 2t	2t to 25t	More than 25t	Less than 2t	2t to 25t	More than 25t	Less than 2t	2t to 25t	More than 25t
Hook & Line	2003	371	301	236	22	28	59	373	314	265
	2004	345	295	239	12	26	52	352	301	272
	2005	297	267	215	17	25	54	307	271	248
	2006	207	212	202	11	23	52	212	219	228
	2007	120	179	217	11	19	44	125	183	239
	2008	152	207	210	9	24	53	155	220	237
	2009	120	227	205	10	15	54	126	231	233
	2010	131	218	219	8	26	46	133	222	245
Pot	2003	41	19	81	3	11	74	41	27	134
	2004	35	18	97	0	10	72	30	24	149
	2005	40	22	90	6	5	63	43	27	133
	2006	41	14	90	4	13	58	45	25	130
	2007	24	20	94	3	4	66	21	21	146
	2008	24	31	89	3	4	64	25	27	138
	2009	33	15	76	0	7	47	30	20	112
	2010	13	9	89	0	5	48	13	13	121
Trawl	2003	4	3	107	0	0	161	1	3	206
	2004	0	0	93	0	0	152	0	0	192
	2005	0	4	90	0	0	147	0	2	189
	2006	0	0	90	0	0	145	0	0	193
	2007	0	0	85	0	0	152	0	0	190
	2008	0	0	86	0	3	146	0	0	191
	2009	0	0	86	0	0	145	0	0	183
	2010	0	0	84	0	0	137	0	0	176
All gear	2003	388	303	406	21	37	289	386	321	581
	2004	358	304	405	11	34	273	359	312	585
	2005	313	276	375	17	28	262	323	280	547
	2006	228	217	366	12	30	252	234	230	530
	2007	134	192	378	14	23	260	136	197	554
	2008	170	229	365	10	28	260	175	234	539
	2009	140	232	350	10	20	241	143	240	504
	2010	142	222	368	8	29	228	144	228	516

Note: These estimates include only vessels fishing part of federal TACs.

Source: Blend estimates, Catch Accounting System, fish tickets, observer data, federal permit file, CFEC vessel data. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 46. Number of vessels that caught groundfish off Alaska by area, residency, gear, and target, 2006-10.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Alaska	Other	Unk.	Alaska	Other	Unk.	Alaska	Other	Unk.
All Gear	All groundfish	2006	608	203	0	79	215	2	644	348	2
		2007	523	183	0	78	220	0	555	332	0
		2008	573	192	0	78	220	0	609	339	0
		2009	545	177	1	73	200	0	573	314	1
		2010	563	168	1	75	192	0	588	301	1
Hook & Line	Pollock	2006	0	0	0	1	1	0	1	1	0
		2007	2	1	0	0	0	0	2	1	0
		2008	0	0	0	0	1	0	0	1	0
		2009	1	0	0	0	0	0	1	0	0
		2010	1	0	0	0	0	0	1	0	0
	Sablefish	2006	266	101	0	16	17	0	272	105	0
		2007	234	96	0	16	15	0	242	99	0
		2008	227	91	0	13	14	0	235	97	0
		2009	226	94	0	19	13	0	237	100	0
		2010	234	86	0	19	16	0	242	96	0
	Pacific cod	2006	172	39	0	30	38	0	194	62	0
		2007	172	29	0	27	34	0	187	51	0
		2008	244	36	0	33	42	0	261	62	0
		2009	217	27	1	22	33	0	230	49	1
		2010	215	28	0	19	34	0	224	48	0
	Flatfish	2006	1	0	0	4	11	0	5	11	0
		2007	0	0	0	1	11	0	1	11	0
		2008	0	0	0	0	7	0	0	7	0
		2009	0	0	0	0	9	0	0	9	0
		2010	0	0	0	2	10	0	2	10	0
	Rockfish	2006	131	21	0	1	4	0	132	24	0
		2007	52	6	0	1	3	0	53	9	0
		2008	44	7	0	0	0	0	44	7	0
		2009	36	6	0	0	2	0	36	7	0
		2010	49	6	1	0	3	0	49	9	1
	All groundfish	2006	485	136	0	40	46	0	505	154	0
		2007	399	117	0	35	39	0	415	132	0
		2008	451	118	0	42	44	0	472	140	0
		2009	436	115	1	40	39	0	454	135	1
		2010	458	109	1	39	41	0	468	131	1
Pot	Pacific cod	2006	121	22	0	29	39	1	137	54	1
		2007	118	20	0	24	43	0	129	54	0
		2008	117	27	0	21	42	0	126	56	0
		2009	108	16	0	17	30	0	114	42	0
		2010	96	15	0	21	29	0	105	39	0
	All groundfish	2006	123	22	0	31	43	1	141	58	1
		2007	118	20	0	27	46	0	131	57	0
		2008	117	27	0	25	46	0	130	60	0
		2009	108	16	0	22	33	0	118	45	0
		2010	96	15	0	24	30	0	108	40	0

Table 46. Continued.

			Gulf of Alaska		Bering Sea and Aleutians			All Alaska		
			Alaska	Other	Alaska	Other	Unk.	Alaska	Other	Unk.
Trawl	Pollock	2006	23	42	10	98	1	29	125	1
		2007	21	38	9	102	0	25	126	0
		2008	22	39	13	109	0	30	133	0
		2009	25	38	13	109	0	32	131	0
		2010	28	35	13	106	0	36	127	0
	Sablefish	2006	0	1	0	0	0	0	1	0
		2007	4	10	0	1	0	4	11	0
		2008	3	10	0	3	0	3	13	0
		2009	7	9	0	1	0	7	10	0
		2010	4	9	0	0	0	4	9	0
	Pacific cod	2006	28	33	6	70	0	33	93	0
		2007	27	35	7	82	0	32	102	0
		2008	27	40	4	76	0	29	98	0
		2009	29	34	7	63	0	35	85	0
		2010	23	30	5	59	0	26	81	0
	Flatfish	2006	13	26	6	26	0	16	45	0
		2007	12	29	7	27	0	14	47	0
		2008	11	28	6	31	0	17	53	0
		2009	15	24	7	23	0	21	43	0
		2010	13	20	8	21	0	20	37	0
	Rockfish	2006	13	23	2	6	0	14	27	0
		2007	13	21	1	9	0	13	29	0
		2008	13	26	3	11	0	16	28	0
		2009	15	26	2	11	0	15	28	0
		2010	17	25	3	14	0	18	30	0
	Atka mackerel	2006	0	0	5	16	0	5	16	0
		2007	0	1	3	15	0	3	15	0
		2008	0	0	0	11	0	0	11	0
		2009	0	0	1	12	0	1	12	0
		2010	0	1	0	9	0	0	10	0
	All groundfish	2006	34	56	16	130	1	41	151	1
		2007	32	55	17	136	0	37	153	0
		2008	30	57	15	134	0	38	153	0
		2009	35	54	15	131	0	39	146	0
		2010	33	51	14	124	0	37	140	0

Note: The target is determined based on vessel, week, processing mode, NMFS area, and gear. Vessels are classified by the residency of the owner of the fishing vessel. These estimates include only vessels fishing part of federal TACs.

Source: Catch Accounting System, fish tickets, observer data, federal permit file, CFEC vessel data. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 47. Number of vessels that caught groundfish off Alaska by month, area, vessel type, and gear, 2006-10.

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Gulf of Alaska	Catcher-vessels (excluding C/Ps)	Hook & line	2006	67	67	89	185	213	167	128	104	164	116	39	37	598
			2007	61	77	99	102	181	160	84	90	133	96	76	56	494
			2008	85	87	117	136	190	153	115	121	146	75	35	10	547
			2009	100	56	74	184	242	112	66	74	127	107	19	5	530
			2010	83	60	93	169	215	114	79	74	149	78	21	15	545
		Pot	2006	57	84	112	78	3	0	1	0	15	16	22	27	145
			2007	71	88	84	58	9	0	0	0	20	25	19	26	137
			2008	82	88	97	29	0	0	0	0	26	28	26	5	143
			2009	71	79	52	32	1	0	0	0	21	27	12	0	122
			2010	69	88	43	8	2	1	0	0	45	23	1	2	111
		Trawl	2006	57	55	68	27	9	5	25	26	44	44	8	0	74
			2007	51	51	61	22	20	17	21	26	34	34	16	2	72
			2008	40	50	61	37	22	11	19	34	40	42	21	4	73
			2009	46	50	49	22	19	18	10	34	39	50	13	6	71
			2010	52	53	48	37	24	16	14	36	53	50	12	3	67
		All gear	2006	169	197	249	287	225	172	153	130	223	174	69	64	772
			2007	174	206	232	182	210	177	105	116	187	153	110	84	668
			2008	205	220	266	200	212	164	134	155	211	144	82	19	728
			2009	215	183	170	236	262	130	76	108	185	176	44	11	681
			2010	202	192	180	214	241	131	93	110	240	149	34	20	692
	Catcher/ Processors	Hook & line	2006	1	8	10	10	7	2	3	3	2	13	13	0	23
			2007	0	9	12	9	5	4	3	3	2	5	1	4	22
			2008	1	14	15	9	4	2	2	3	4	4	0	0	22
			2009	2	14	3	7	10	1	2	3	2	5	4	0	22
			2010	3	17	5	4	5	3	2	3	11	6	0	0	23
		Pot	2007	1	1	1	0	0	0	0	0	0	1	1	0	1
			2008	0	1	1	0	0	0	0	0	0	0	0	0	1
			2009	0	2	0	0	0	0	0	0	0	0	0	0	2
		Trawl	2006	0	3	2	5	3	1	12	5	7	4	0	0	16
			2007	1	4	6	2	8	1	8	11	4	2	0	0	15
			2008	2	3	4	6	2	0	13	3	2	4	1	0	14
			2009	0	2	1	5	2	0	17	4	3	3	1	1	18
			2010	0	1	4	5	2	0	16	1	1	2	2	2	17
		All gear	2006	1	11	12	15	10	3	15	8	9	17	13	0	39
			2007	2	14	19	11	13	5	11	14	6	8	2	4	38
			2008	3	18	20	15	6	2	15	6	6	8	1	0	37
			2009	2	18	4	12	12	1	19	7	5	8	5	1	42
			2010	3	18	9	9	7	3	18	4	12	8	2	2	40

Table 47. Continued.

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Bering Sea & Aleutian Islands	Catcher-vessels (excluding C/Ps)	Hook & line	2006	4	6	8	11	18	14	17	12	12	9	7	5	46
			2007	3	6	6	3	8	10	15	11	8	6	3	1	36
			2008	5	8	10	2	10	14	11	22	12	6	2	1	46
			2009	7	8	9	2	3	11	10	12	11	7	2	1	38
			2010	2	4	2	2	11	15	15	17	18	8	4	0	41
		Pot	2006	38	36	9	15	11	4	5	5	25	30	11	8	70
			2007	49	8	15	5	13	9	7	6	27	13	4	0	70
			2008	43	7	14	7	14	7	7	4	25	28	9	1	65
			2009	28	14	15	7	12	8	6	4	6	11	6	5	51
			2010	27	8	14	5	5	3	2	2	10	17	11	0	47
		Trawl	2006	83	100	98	44	1	46	67	68	66	57	5	0	108
			2007	89	102	105	49	3	52	69	78	73	60	36	0	114
			2008	84	101	104	50	3	59	68	62	61	30	5	0	109
			2009	65	96	103	49	0	68	71	66	30	10	1	0	110
			2010	47	89	99	58	0	59	67	64	29	12	0	0	103
		All gear	2006	124	142	114	65	29	64	87	85	103	96	23	13	214
			2007	141	116	126	56	24	71	91	95	108	79	43	1	218
			2008	132	116	128	59	27	80	86	87	98	64	16	2	214
			2009	100	118	127	58	15	86	87	82	47	28	9	6	194
			2010	76	101	115	65	16	77	84	83	57	37	15	0	189
	Catcher/ Processors	Hook & line	2006	38	39	17	10	6	6	18	39	40	39	5	14	40
			2007	36	36	14	7	3	11	13	36	38	36	3	18	38
			2008	36	36	15	6	3	8	14	39	38	37	34	17	40
			2009	37	37	14	8	5	9	16	36	37	36	34	32	41
			2010	36	36	13	7	7	9	15	25	27	28	26	20	39
		Pot	2006	0	1	2	3	0	1	1	1	3	3	1	0	5
			2007	3	3	1	1	0	1	0	0	3	0	0	0	3
			2008	5	0	1	1	1	1	1	1	5	4	1	0	6
			2009	3	2	1	1	2	2	0	0	3	3	3	3	4
			2010	3	4	3	3	3	3	0	2	5	4	3	1	7
		Trawl	2006	38	39	37	28	20	27	35	36	33	20	3	1	39
			2007	38	39	38	29	22	36	35	35	26	17	11	1	39
			2008	34	38	39	24	20	23	31	34	34	29	19	3	40
			2009	31	34	34	26	15	18	29	32	29	22	8	0	36
			2010	28	33	32	22	19	24	28	29	25	20	12	2	35
		All gear	2006	76	79	56	40	26	34	54	76	76	62	9	15	82
			2007	77	78	53	37	25	48	48	71	67	53	14	19	80
			2008	75	74	55	31	24	32	46	74	76	69	54	20	84
			2009	71	73	49	35	21	29	45	68	69	61	45	35	79
			2010	67	72	48	32	29	36	43	56	57	52	41	23	78

Table 47. Continued.

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
All Alaska	Catcher-vessels (excluding C/Ps)	Hook & line	2006	71	71	95	194	226	178	138	114	172	121	45	40	618
			2007	63	82	101	105	189	168	96	100	139	99	77	57	508
			2008	90	91	126	138	197	167	125	142	155	81	37	11	571
			2009	107	62	82	186	245	121	75	86	136	114	21	6	547
			2010	85	62	95	170	224	128	89	90	162	85	25	15	559
		Pot	2006	93	114	120	92	14	4	6	5	39	46	33	35	195
			2007	116	94	95	63	22	9	7	6	45	37	23	26	184
			2008	113	92	106	36	14	7	7	4	51	55	34	6	183
			2009	96	90	62	39	13	8	6	4	27	38	18	5	158
			2010	94	94	55	13	7	4	2	2	55	38	12	2	141
		Trawl	2006	136	147	148	68	10	51	85	94	109	100	13	0	153
			2007	139	149	148	69	23	64	84	103	105	93	52	2	150
			2008	124	145	147	83	25	69	83	95	97	72	26	4	150
			2009	111	145	140	70	19	79	81	99	68	60	14	6	148
			2010	99	135	134	91	24	71	78	97	82	60	12	3	141
		All gear	2006	287	322	342	345	249	233	226	213	320	265	91	75	910
			2007	309	315	332	236	234	241	187	209	289	227	151	85	804
			2008	325	323	370	254	236	243	215	240	302	207	97	21	862
			2009	312	295	279	293	275	207	162	189	229	204	53	17	806
			2010	276	282	280	274	255	203	169	189	292	181	49	20	809
	Catcher/ Processors	Hook & line	2006	38	39	22	14	11	7	21	40	41	40	16	14	41
			2007	36	36	20	12	8	14	15	37	39	36	4	19	39
			2008	37	37	23	13	6	10	16	40	41	40	34	17	41
			2009	38	38	16	12	12	10	18	37	39	38	36	32	43
			2010	38	38	17	9	11	10	16	27	32	31	26	20	41
		Pot	2006	0	1	2	3	0	1	1	1	3	3	1	0	5
			2007	4	4	2	1	0	1	0	0	3	1	1	0	4
			2008	5	1	2	1	1	1	1	1	5	4	1	0	7
			2009	3	4	1	1	2	2	0	0	3	3	3	3	5
			2010	3	4	3	3	3	3	0	2	5	4	3	1	7
		Trawl	2006	38	40	39	30	21	28	37	39	36	21	3	1	40
			2007	38	40	40	30	23	36	38	38	28	19	11	1	40
			2008	36	40	41	27	22	23	35	36	35	30	19	3	41
			2009	31	35	35	29	17	18	34	34	30	24	9	1	37
			2010	28	34	33	25	20	24	31	30	26	21	13	4	36
		All gear	2006	76	80	63	46	32	36	59	80	80	64	20	15	84
			2007	78	80	62	43	31	51	53	75	70	56	16	20	83
			2008	78	77	66	41	29	34	52	77	80	73	54	20	86
			2009	72	76	52	42	30	30	52	71	72	65	48	36	82
			2010	69	75	53	37	34	37	47	59	63	56	42	25	81

Note: These estimates include only vessels fishing part of federal TACs.

Source: Catch Accounting System, fish tickets, observer data, federal permit file, CFEC vessel data. National Marine Fisheries Service, P. O. Box 15700, Seattle, WA 98115-0070.

Table 48. Catcher vessel (excluding catcher-processors) weeks of fishing groundfish off Alaska by area, vessel-length class (feet), gear, and target, 2006-10.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			<60	60-124	>=125	<60	60-124	>=125	<60	60-124	>=125
Hook & line	Sablefish	2006	897	248	-	44	6	-	942	254	-
		2007	742	217	-	30	9	-	772	226	-
		2008	686	208	-	42	5	-	728	213	-
		2009	687	189	-	53	18	-	740	207	-
		2010	748	197	-	77	23	-	825	220	-
	Pacific cod	2006	812	44	-	132	2	-	944	46	-
		2007	1018	30	-	102	0	-	1120	31	-
		2008	1109	45	-	142	0	-	1251	45	-
		2009	1128	44	-	61	-	-	1189	44	-
		2010	984	25	-	74	0	-	1057	25	-
	Flatfish	2006	-	-	-	-	2	-	-	2	-
	Rockfish	2006	253	7	-	0	-	-	253	7	-
		2007	101	2	-	1	-	-	102	2	-
		2008	65	1	-	-	-	-	65	1	-
		2009	58	2	-	-	-	-	58	2	-
		2010	70	7	-	-	-	-	70	7	-
	All groundfish	2006	1972	299	-	177	11	-	2148	310	-
		2007	1863	250	-	133	9	-	1996	259	-
		2008	1861	254	-	185	5	-	2046	259	-
		2009	1887	235	-	114	18	-	2002	253	-
		2010	1817	230	-	151	23	-	1968	253	-
Pot	Pacific cod	2006	715	292	7	84	229	64	799	522	71
		2007	724	294	2	99	192	56	823	486	58
		2008	741	236	5	98	179	56	838	415	61
		2009	617	146	-	114	65	21	732	211	21
		2010	585	140	2	103	129	32	687	269	34
	All groundfish	2006	719	293	7	102	299	64	821	592	71
		2007	724	294	2	119	276	56	843	570	58
		2008	742	236	5	118	246	56	859	482	61
		2009	617	147	-	126	134	39	744	281	39
		2010	589	140	2	103	177	54	691	317	56

Table 48. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			<60	60-124	>=125	<60	60-124	>=125	<60	60-124	>=125
Trawl	Pollock	2006	139	401	-	-	947	650	139	1348	650
		2007	96	243	-	-	1093	663	96	1337	663
		2008	92	228	1	-	850	528	92	1079	529
		2009	95	131	-	-	783	450	95	914	450
		2010	194	325	-	1	711	433	195	1036	433
	Sablefish	2006	-	0	-	-	-	-	-	0	-
		2007	-	9	-	-	-	-	-	9	-
		2008	-	12	-	-	-	-	-	12	-
		2009	-	15	-	-	-	-	-	15	-
		2010	-	9	-	-	-	-	-	9	-
	Pacific cod	2006	104	106	-	10	292	22	114	398	22
		2007	92	143	-	21	298	23	113	441	23
		2008	119	166	1	15	301	44	134	467	45
		2009	102	71	-	28	222	22	130	293	22
		2010	37	128	-	18	196	25	55	325	25
	Flatfish	2006	0	204	-	-	10	1	0	214	1
		2007	17	232	-	-	12	6	17	244	6
		2008	19	268	4	-	5	15	19	273	19
		2009	16	323	-	-	-	4	16	323	4
		2010	16	194	-	-	-	-	16	194	-
	Rockfish	2006	-	71	-	-	-	-	-	71	-
		2007	4	96	-	-	1	2	4	97	2
		2008	1	86	1	-	6	3	1	92	4
		2009	2	79	-	-	-	9	2	79	9
		2010	2	90	-	-	-	5	2	90	5
	Atka mackerel.	2007	-	-	-	-	-	9	-	-	9
		2008	-	-	-	-	0	7	-	0	7
		2009	-	-	-	-	-	14	-	-	14
		2010	-	-	-	-	1	13	-	1	13
	All groundfish	2006	243	783	-	10	1249	673	253	2032	673
		2007	209	724	-	21	1405	703	230	2129	703
		2008	231	761	7	15	1162	597	246	1923	604
		2009	215	622	-	28	1005	499	243	1627	499
		2010	249	746	-	19	909	476	268	1655	476
All gear	All groundfish	2006	2933	1375	7	289	1559	737	3222	2934	744
		2007	2796	1268	2	273	1691	759	3069	2958	761
		2008	2834	1250	12	317	1414	653	3151	2664	665
		2009	2720	1004	-	269	1157	538	2989	2161	538
		2010	2656	1115	2	272	1110	530	2928	2225	532

Notes: These estimates include only vessels fishing part of federal TACs. A vessel that fished more than one category in a week is apportioned a partial week based on catch weight. A target is determined based on vessel, week, processing mode, NMFS area, and gear. All groundfish include additional target categories.

Source: Catch Accounting System, fish tickets, observer data, federal permit file, CFEC vessel data, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 49. Catcher/processor vessel weeks of fishing groundfish off Alaska by area, vessel-length class (feet), gear, and target, 2006-10.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			<60	60-124	125-230	<60	60-124	125-230	<60	60-124	125-230
Hook & line	Sablefish	2006	8	41	21	-	26	8	8	67	29
		2007	12	52	19	-	24	12	12	76	31
		2008	11	36	13	1	30	9	12	66	22
		2009	5	28	20	6	49	11	11	77	30
		2010	6	14	17	-	44	10	6	58	27
	Pacific cod	2006	-	34	20	-	228	557	-	261	576
		2007	-	33	10	-	205	443	-	238	453
		2008	9	38	15	5	274	553	14	312	568
		2009	2	52	12	6	289	562	8	341	575
		2010	16	51	24	12	230	495	28	281	519
	Flatfish	2006	-	-	2	-	14	43	-	14	45
		2007	-	-	-	-	9	39	-	9	39
		2008	-	-	-	-	11	18	-	11	18
		2009	-	-	-	-	23	28	-	23	28
		2010	-	-	-	3	29	47	3	29	47
	Rockfish	2006	-	-	1	-	-	2	-	-	3
		2007	-	-	-	-	-	1	-	-	1
		2008	1	-	-	-	-	-	1	-	-
		2009	-	-	2	-	-	1	-	-	3
		2010	-	-	-	-	-	0	-	-	0
	All groundfish	2006	8	76	45	-	269	612	8	345	658
		2007	12	86	30	-	239	498	12	325	528
		2008	21	74	28	7	316	580	28	390	608
		2009	7	80	34	12	361	605	19	441	639
		2010	22	65	41	15	304	554	37	369	595
Pot	Sablefish	2006	-	-	-	-	8	3	-	8	3
		2007	-	-	-	-	7	-	-	7	-
		2008	-	-	-	-	6	-	-	6	-
	Pacific cod	2006	-	-	-	-	4	29	-	4	29
		2007	-	15	-	-	8	24	-	23	24
		2008	-	-	2	-	34	21	-	34	23
		2009	-	4	2	-	32	37	-	36	39
		2010	-	-	-	0	67	25	0	67	25
	All groundfish	2006	-	-	-	-	12	33	-	12	33
		2007	-	15	-	-	15	25	-	30	25
		2008	-	-	2	-	40	22	-	40	24
		2009	-	4	2	-	32	37	-	36	39
		2010	-	-	-	0	67	25	0	67	25

Table 49. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			60-124	125-230	>230	60-124	125-230	>230	60-124	125-230	>230
Trawl	Pollock	2006	-	-	-	1	28	347	1	28	347
		2007	-	-	-	1	31	358	1	31	358
		2008	-	-	-	1	36	289	1	36	289
		2009	0	-	-	4	16	242	4	16	242
		2010	-	-	-	2	9	237	2	9	237
	Pacific cod	2006	2	-	-	60	72	15	62	72	15
		2007	3	-	-	53	87	13	56	87	13
		2008	6	0	-	4	9	8	10	9	8
		2009	6	0	-	6	9	6	12	9	6
		2010	0	-	-	5	7	8	5	7	8
	Flatfish	2006	59	12	-	88	236	66	147	249	66
		2007	46	16	-	96	250	65	142	266	65
		2008	53	8	-	190	389	74	243	397	74
		2009	57	9	-	158	333	49	216	342	49
		2010	49	9	-	148	357	51	198	366	51
	Rockfish	2006	1	27	1	2	11	5	3	38	6
		2007	3	24	1	0	12	5	3	36	6
		2008	8	23	2	0	15	8	8	38	9
		2009	9	28	2	1	11	8	11	38	10
		2010	3	33	3	0	18	7	3	51	10
	Atka mackerel.	2006	-	-	-	4	82	24	4	82	24
		2007	-	0	-	9	72	27	9	73	27
		2008	-	-	-	2	62	23	2	62	23
		2009	-	-	-	1	76	33	1	76	33
		2010	-	0	-	-	77	33	-	77	33
	All groundfish	2006	62	39	1	155	431	456	217	470	457
		2007	52	41	1	160	455	467	212	495	468
		2008	67	31	2	196	511	401	263	542	403
		2009	73	37	2	171	445	339	244	482	341
		2010	53	43	3	158	467	335	211	510	338

Table 49. Continued.

			Gulf of Alaska				Bering Sea and Aleutians				All Alaska			
			Vessel length class				Vessel length class				Vessel length class			
			<60	60-124	125-230	>230	<60	60-124	125-230	>230	<60	60-124	125-230	>230
All gear	All groundfish	2006	8	138	84	1	-	436	1076	456	8	574	1160	457
		2007	12	153	70	1	-	413	978	467	12	567	1048	468
		2008	21	141	61	2	7	552	1113	401	28	693	1174	403
		2009	7	156	73	2	12	565	1087	339	19	721	1160	341
		2010	22	118	84	3	15	528	1046	335	37	646	1130	338

Notes: These estimates include only vessels fishing part of federal TACs. A vessel that fished more than one category in a week is apportioned a partial week based on catch weight. A target is determined based on vessel, week, processing mode, NMFS area, and gear. All groundfish include additional target categories.

Source: Catch Accounting System, fish tickets, observer data, federal permit file, CFEC vessel data, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 50. Total at-sea processor vessel crew weeks in the groundfish fisheries off Alaska by month and area, 2005-10.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Gulf of Alaska	2005	76	72	618	919	144	77	1,292	68	264	-	-	-	3,566
	2006	-	267	429	629	293	62	1,372	345	234	371	418	-	4,429
	2007	-	366	678	367	476	221	866	336	344	420	-	67	4,201
	2008	84	695	706	850	116	-	1,233	232	126	226	-	-	4,312
	2009	-	698	138	605	405	-	1,480	305	139	451	165	-	4,455
	2010	70	616	235	547	265	58	1,543	86	449	443	-	-	4,489
Bering Sea and Aleutian Islands	2005	10,252	16,293	11,127	4,305	2,807	4,889	13,048	12,101	10,861	7,175	3,340	2,602	98,798
	2006	9,447	15,654	11,898	5,602	2,110	3,526	12,423	12,649	14,310	6,583	806	526	95,531
	2007	9,418	15,191	13,693	4,771	2,016	6,372	11,144	11,796	14,338	6,620	1,593	751	97,700
	2008	6,228	14,457	12,467	3,260	3,536	3,424	8,671	13,929	12,677	9,357	3,990	1,026	93,021
	2009	7,982	12,018	10,209	4,562	2,686	4,492	9,383	12,910	9,745	6,970	3,125	1,081	85,161
	2010	7,793	12,758	10,919	4,405	3,899	5,439	10,445	9,231	6,901	6,080	3,407	1,326	82,603
All Alaska	2005	10,327	16,364	11,745	5,224	2,951	4,966	14,339	12,169	11,124	7,175	3,340	2,639	102,363
	2006	9,458	15,921	12,326	6,231	2,402	3,588	13,794	12,994	14,543	6,953	1,224	526	99,960
	2007	9,447	15,557	14,371	5,137	2,491	6,592	12,009	12,131	14,681	7,040	1,628	817	101,901
	2008	6,312	15,152	13,173	4,110	3,652	3,458	9,904	14,161	12,802	9,583	4,001	1,026	97,332
	2009	8,009	12,716	10,347	5,167	3,091	4,499	10,863	13,214	9,885	7,420	3,290	1,117	89,617
	2010	7,863	13,373	11,154	4,952	4,164	5,497	11,988	9,317	7,350	6,524	3,532	1,379	87,092

Note: Crew weeks are calculated by summing weekly reported crew size over vessels and time period. These estimates include only vessels targeting groundfish counted toward federal TACs. Catcher processors accounted for the following proportions of the total crew weeks in all areas: 2005 - 92%, 2006 - 92%, 2007 - 90%, 2008 - 91%, 2009 - 91%, 2010 - 93%.

Source: Weekly Processor Reports. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 51. Numbers of vessels and plants with observers, observer-deployment days, and estimated observer costs ($1,000) by year, type of operation, gear and vessel length, 2009-10.

			2009			2010		
			Count	Obs. days	Cost	Count	Obs. days	Cost
Catcher vessels	Hook & line	60-125	35	380	133	38	394	138
	Pot	60-125	33	363	127	31	423	148
		>=125	7	66	23	8	77	27
		Total	40	429	150	39	500	175
	Trawl	60-125	80	1,930	676	79	1,951	683
		>=125	27	1,473	516	27	1,293	453
		Total	107	3,403	1,191	106	3,244	1,135
CV Total			182	4,212	1,474	183	4,138	1,448
Catcher/ processors	Hook & line	60-125	11	1,536	538	12	1,475	516
		>=125	27	4,270	1,495	25	4,030	1,411
		Total	38	5,806	2,032	37	5,505	1,927
	Pot	>60	4	193	68	3	66	23
	Surimi trawler	>=125	12	2,601	910	13	2,525	884
	Fillet trawler	>=125	3	478	167	-	-	-
	H&G trawler	60-125	7	2,118	741	6	1,920	672
		>=125	15	5,823	2,038	15	6,233	2,182
		Total	22	7,941	2,779	21	8,153	2,854
	Trawl Total		37	11,020	3,857	34	10,678	3,737
C/P Total			79	17,019	5,957	74	16,249	5,687
Motherships			3	642	225	-	-	-
All vessels			264	21,873	7,656	257	20,387	7,135
Shore plants			19	3,144	1,100	18	3,378	1,182
Grand totals			283	25,017	8,756	275	23,765	8,318

Notes: The estimates are only for vessels fishing part of federal TACs. The cost estimates are based on an estimated average cost per day of $350. This includes the payment to observer providers and the cost of transportation and board.

Source: Fisheries Monitoring and Analysis Division (FMA) observer data, Alaska Fisheries Science Center, National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Economic Performance in the North Pacific Groundfish Fisheries: an Index-based Approach to Examining Economic Changes

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Introduction

Fisheries markets are complex. A multitude of factors influence demand, supply, price, catch composition, product types produced and other forms of market activity. Indices are a common method used by agencies to synthesize market information in a digestible format. They establish a baseline that helps characterize trends in the market for values, prices and quantities of fisheries goods. Market indices have many uses. From a management perspective indices can both retrospectively characterize changes in the market that may be related to policy decisions or allow managers to evaluate current market conditions in the context of future policy change. Indices may also be useful to market participants when making business decisions.

This contribution to the SAFE Groundfish Economic Status Report attempts to distill the numerous factors that affect the North Pacific groundfish markets into a simple set of indices that can be used to track performance. Indices of value, price and quantity are presented for each of the four primary sectors: the Bering Sea and Aleutian Island (BSAI) at-sea, the BSAI shoreside, the Gulf of Alaska (GOA) at-sea, and the GOA shoreside. For the at-sea sectors, index analysis will focus on the wholesale market; for the shoreside sectors, index analysis will consider both the wholesale and ex-vessel markets. To help understand and evaluate the indices, we plot the value share stratified by species and product type for wholesale markets, and by species and gear type for the ex-vessel markets. The value share is the proportion of total value from each of the stratified components, such as the proportion of total value that comes from pollock. Additionally, bar graphs provide detail on the division of production among species, product types and gear types. Specifically, for the wholesale market, these graphs show species by product type and product type by species, and in the ex-vessel market, they show species by gear type and gear type by species.

Aggregate indices, by their very nature, cumulate over the many species, products types, and gear types that apply to a sector. The values, prices, and quantities from individual components of these factors (e.g., individual species) may contribute to the movements of the aggregate indices in very different ways. The myriad of market influences makes it difficult to disentangle the relative importance of different species or products when monitoring aggregate performance, a problem that can be addressed by using a value-share decomposition to examine the influence of these different components on the aggregate index. The decomposition relates the indices for each of the components of a single factor to the aggregate through its value share.

For example, consider an aggregate price index for a sector. The aggregate price index is a function of all the prices for each of the species sold (e.g., pollock, Pacific cod, sablefish). Here species type is the factor and the component indices of this factor are the price indices for each of the species (e.g., pollock price index, Pacific cod price index). The importance of each individual species price index is determined by the proportion of total value in the sector for each species. By decomposing the aggregate index in this way, we can see how each of the species price indices influence the movement in the aggregate price index. Similar value-share decompositions are also done for product types in the wholesale market, and for gear types in the ex-vessel market.

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The next section provides a more in-depth explanation of the indices and how to understand them. Understanding the indices and their construction facilitates accurate interpretation. The indices are presented and discussed in remaining sections. The discussion explicitly references the plots in Figures 2-14. Each section starts by analyzing the distribution and composition of value across species and product (or gear) types. Throughout, “wholesale value” and “ex-vessel value” refer to the revenue from sales of product on the first wholesale market or from sales of catch on the ex-vessel market, respectively. Walleye pollock will often be referred to simply as “pollock”; similarly, Pacific cod will often be referred to as “cod”.

Understanding an Index

Indices measure changes in the levels of a set of related economic variables. The set of variables is aggregated to provide a single number that is meant to summarize the cumulative state of the market. This aggregation is done in a way that achieves two objectives. The first is that the more “important” variables should be weighted more heavily in the index. The second is that the index should be comparable over time. Indices and the methods used to construct them to achieve these basic objectives have a deep theoretical foundation in both statistics and economics. An in-depth treatment of these foundations can be found in Coelli *et al.* (2005) and Diewert *et al.* (1993). The discussion here is presented with the intent of providing the reader with an intuitive understanding of the index. This intuitive understanding will help in both general interpretations of the indices and relating the decomposed indices to the aggregate. Details on the precise methods used for constructing indices will be given in the in-progress NOAA Technical memorandum Fissel (2012).

The basic intuition behind an economic index is the same for value indices, price indices and quantity indices. For the sake of exposition, we will consider an aggregate price index for the shoreside wholesale market in the GOA but the discussion applies equally well to the quantity and value indices as well as to the other sectors and markets. We will write the two-period price index between 2010 and 2009 as $P_{2009}(2010)$. This price index gives the aggregate price level in 2010 using 2009 as a reference period. If the price index in 2009 was $P_{2008}(2009) = 1$ and the price index in 2010 was $P_{2009}(2010) = 1.1$ then the price index would indicate that when you consider all the prices together for the GOA shoreside wholesale market there was a 10% increase in prices over the year. There are many species and products that GOA shoreside processors sell onto the first wholesale market, including headed-and-gutted sablefish and Pacific cod fillets, which each have their own price. The index $P_{2009}(2010)$ is formed by taking a weighted sum of the relative prices between 2010 and 2009 over all of these goods: $P_{2009}(2010) = \sum_{i=1}^{N} \frac{p^i(2010)}{p^i(2009)} * \omega^i_{2009}(2010)$. Here, $p^i(2010)$ is the price of good i (e.g., Pacific cod fillets) in 2010 and $\omega^i_{2009}(2010)$ is the weight representing the “importance” of good i between 2009 and 2010 in the GOA shoreside wholesale market. The economic measure that is used to determine this importance is the proportion of total value that good i makes up in the market, the value share.

Using the same basic weighting idea we can relate the factor indices (e.g., species price indices) to their individual components for either *individual species* or for *aggregations* across species. For example, a Pacific cod index, $P^{cod}_{2009}(2010)$, would be a weighted sum of all the cod-based product prices, whereas the aggregate species index, $P_{2009}(2010)$, would be a weighted sum over all the individual species indices. Specifically, $P_{2009}(2010) = \sum_{s=1}^{S} P^s_{2009}(2010) * w^s_{2009}(2010)$, where each $P^s_{2009}(2010)$ is the species index of species “s” for species $s \in \{cod, pollock, sablefish, ...\}$ and $w^s_{2009}(2010)$ can be thought of as an “importance” weight determined by the value share for each species s (the proportion of total value for the species). This decomposition of the aggregate index into the species indices is referred to here as the value share decomposition. This decomposition can be done for other factors as well; for example, the aggregate price index can be expressed as a weighted sum of the individual product price indices: $P_{2009}(2010)=\sum_{k=1}^{K}P_{2009}^{k}(2010)*w_{2009}^{k}(2010)$, where k runs over product types, $k\in\{fillet, head\ \&\ gut, surimi,\ ...\}$ and $w_{2009}^{k}(2010)$ is the value share of product k. Value and quantity indices, $V_{t-1}^{i}(t)$ and $Q_{t-1}^{i}(t)$, are constructed analogously. These examples show how an aggregate index can be decomposed into its constituent parts. Plotting the factor indices together with the aggregate index provides a perspective on the common movements between associated objects in a market.[2]

Indices may be compared across multiple periods by chaining consecutive two-period estimates together to create a chain index. The consumer price index and other such indices often mentioned in the news are chain indices. Chain indices specify a base period in which the index is equal to 100. For the economic indices presented here, we use 2006 as the base year. Taking our GOA shoreside price index as an example, the 2008 chained price index is given by $I_{2006}^{P}(2008)=100*P_{2006}(2007)*P_{2007}(2008)$. The 2009 chained price index is obtained by multiplying the 2008 index by the two-period price increment between 2008 and 2009, $I_{2006}^{P}(2009)=I_{2006}^{P}(2008)*P_{2008}(2009)$, thus chaining the index forward. To provide a concrete numerical example, suppose 2006 is our base year in which the index is equal to 100 and assume there was a 50% increase in aggregate prices in 2007, so that $P_{2006}(2007)=1.5$. The chained price index in 2007 would be $I_{2006}^{P}(2007)=I_{2006}^{P}(2006)*P_{2006}(2007)=100*1.5=150$. Now suppose there was a 50% decrease in aggregate prices between 2007 and 2008 ($P_{2007}(2008)=.50$). The 2008 chained price index would now be $I_{2006}^{P}(2008)=I_{2006}^{P}(2007)*P_{2007}(2008)=150*0.5=75$. Thus, the value of the index in 2008 makes sense with respect to both 2006 and 2007. That is, 2008 prices are 75% of their 2006 level and half their 2007 level. Notice also that the weights in the chain index $w_{t-1}^{k}(t)$ are adapting to potential shifts in the value share that may be occurring due to swings in output or production. This is an important feature of the index in fisheries where output can change significantly based on changes in the stock and the TAC.[3]

The primary tools we will use to analyze market performance are Figures 1-14. The index figures in Figures 2-14 are designed to help the reader visualize changes in the indices and relate the changes to shifts in aggregate value, prices, and quantities. All indices use 2006 as the base year for the index. All calculations and statistics are made using nominal U.S. dollars[4]. Aggregate indices are located in the upper-left panel and the value share decomposition of the aggregate index is below in the lower-left panels of the figures. Changes in the indices

[2] The formulation presented here is intended to give an intuitive understanding of indices. The Fisher index method was used in the actual creation of the indices. The Fisher index is the geometric mean of Laspeyres' index, which uses weights that favor the reference period, and Paasche's index, which uses weights that favor the current period. The Fisher index provides a more central index measure and enjoys some desirable theoretic properties that lead it to be preferred over other indices. The Fisher index cannot strictly be written as a linear combination of relative price ratios. However, the Fisher index is bounded by two linear objects that in practice don't differ significantly and the linear perspective is correct to a first-order approximation. Hence, there is little loss from using the linear intuition given by the other indices when thinking of the Fisher index. Further details on the Fisher index can be found in the in-progress NOAA Technical Memorandum Fissel (2012) as well as Coelli *et al.* (2005) and Diewert *et al.* (1993)

[3] The alternative to a chain index is a fixed-base index that references each year to a single base year without considering the changes in the intervening periods. When output/production changes significantly over short periods, (e.g., changing TAC) the fixed base index can be quite sensitive to the base year chosen.

[4] U.S. Nominal dollars are used so price indices capture unadjusted changes in prices throughout time allowing them to be used as deflator indices. For readers comparing these indices to other figures in the SAFE denominated in inflation adjusted terms this adjustment should be kept in mind.

have been color coded to indicate the relevance in determining aggregate index movements. Following the notation above, the relevance of a change in the price index in year t is calculated by $(year-on-year\%change)*(share\ weight) = (P^i_{t-1}(t)-1)*\tilde{w}^i(t)$ where $\tilde{w}^i(t) = \frac{p^i_t * q^i_t}{\sum_i p^i_t * q^i_t}$ is the year t value share. When the $(year-on-year\%change)*(share\ weight)$ is roughly zero, indicating little to no change or influence on the aggregate index, it is colored blue. When this value is less than -0.1, the index is colored red to indicate that it has had a significant negative impact on the aggregate index. When this value is greater than 0.1, the index is colored green, indicating a significant positive impact on the aggregate index. Shades in between these colors indicate intermediate impacts. Changes in the value and quantity indices are similarly calculated by replacing $P^i_{t-1}(t)$ with the value index and quantity index increments: $V^i_{t-1}(t)$, and $Q^i_{t-1}(t)$. The indices can take on these "significant colors" if the percentage change is large and/or the value share is large. The value share plot in the upper-right corner of each figure helps to discern the difference. For each sector and market, two decompositions are presented. The wholesale market is decomposed by species and product type, and the ex-vessel market is decomposed by species and gear type. To help relate the different decompositions, bar graphs in the lower-right panel of each figure show the composition of one factor (e.g., product type) for each relevant category of the other factors (e.g., species) as measured by production. Furthermore, the height of the bars shows the annual output in that market. Only the components of a factor with a value share greater than 1% have been plotted, although all prices and quantities were used in the construction of the aggregate index.

To properly interpret the indices, the reader must realize that the indices are merely descriptive and characterize the state of the market relative to other periods, and display the co-movement of different species, product types, or gear types both individually and in aggregate. The indices have no inherent causal interpretation. For example, it would be wrong to assert from these indices that a change in surimi prices "caused" a change in pollock price. Nor could we say the converse. We can say that they are connected, as surimi is a significant portion of the value from pollock in some regions, but causality is beyond the scope of indices. Carefully designed regression analysis is better suited for addressing such causality questions.

Economic Performance of the BSAI At-Sea Sector

BSAI At-Sea Wholesale Market

Wholesale value in the BSAI at-sea region is largely concentrated in pollock (upper-right panel Figure 3), which makes up over 50% of the value share. Pacific cod and the flatfish species complex (primarily yellowfin sole and rock sole) make up most of the balance of the value share. Flatfish in particular, whose value share has increased approximately 10% over the last ten years, are an increasingly important species complex. The largest product type sent to first-wholesale markets by this sector is headed-and-gutted fish (upper-right panel Figure 4). Roe, which in 2001 accounted for approximately 30% of the value share, has steadily been declining in significance and currently accounts for approximately 10%. The head-and-gut product type has increased in relative importance.

The production composition plots (lower-right panels of Figures 3 and 4) show that most non-pollock species are made into head-and-gut products with a small but significant fraction of flatfish being sold as whole fish. Pollock accounts for most of the diversity in product types produced from this sector. Surimi and fillets are the most significant product types for pollock, as measured by weight produced. Reductions in pollock and cod quantities are the result of the conservation reductions in the TAC. Quantity of flatfish produced in 2009 also fell slightly despite the fact that only approximately 50% of the 2009 TAC was used (Witherell *et al.* 2011) and the price index of flatfish indicates only a marginal reduction in the price of flatfish goods. Aside from the small 2009 decrease in production, flatfish quantity and value have been increasing (approximately 50%) since

2006, likely as a result of reduced TACs for pollock and cod, which are historic staples of this sector. The quantity index shows that production and sales have leveled off in 2010, and even increased slightly in aggregate.

Price increases between 2009 and 2010 appear to have been a significant driver in 2010 value increase. Price index increases were seen uniformly across all species and in most product types (Figures 3 and 4). In particular, prices for surimi and head-and-gut products had a significant impact on the aggregate price increase, despite downward trending roe prices and a leveling of fillet prices. A prominent feature of the price index is the precipitous decline in aggregate prices from 2008-2009. Species indices indicate that the 2009 decline was associated with a drop in prices for pollock, Pacific cod and, to a much smaller extent, flatfish products. The product indices show that the key products experiencing a price decrease in 2009 were surimi, head-and-gut, and roe.

Aggregate value in 2010 showed an increase of 9%. The species indices show that this increase reflects an accumulation of value increases in all products produced from all species, with flatfish and Pacific cod making the largest contributions. The product type index decomposition shows that the aggregate value increase was driven by value increases in surimi and head-and-gut products, in light of decreasing value for both roe and fillets. The 2009 drop in value from 110 to 80 (27%) is a prominent feature of the index time series (Figures 3 and 4). Aggregate indices show that the drop in value is the result of both the reversion of prices from their 2008 spike price coupled with reductions in quantity produced continuing from 2008.

While value in the BSAI at-sea sector is below its 2006-2008 peak, there has still been an over 20% increase in value from the early 2000's to 2010. This is despite a steady decline in the quantity produced to a level slightly below 2001 output. While early and mid-decade value increases were driven by pollock and Pacific cod, value growth in the last part of the decade has come more from other species such as flatfish and rockfish. Thus, harvesters and the at-sea processing sector appear to be diversifying their portfolio of species. Price increases have offset the necessary reductions in TACs, leaving the sector on a seeming continued path of positive growth in value at the end of the decade.

Economic Performance of the BSAI Shoreside Sector

BSAI Shoreside Wholesale Market

Value in the BSAI shoreside wholesale market is highly concentrated in pollock, which comprises roughly 90% of the total value (upper-right panel of Figure 5). The remaining production is mostly cod ($\pm$9%) with sablefish bringing in just 1-2% of the total value. Much of the value share in recent years has come from the production of fillets (both standard and deep-skin), which currently make up just under 40% of the product types produced, in contrast to the roughly 20% of their value share in the early 2000's (upper-right panel of Figure 5). Surimi accounts for about 20% of value. As with the at-sea sector, the significance in value share of roe has been steadily decreasing and in 2010 was 7%. Head-and-gut products have gradually filled in the remainder. In contrast to the at-sea producers, the shoreside sector is more highly concentrated in the production of fillets and less in head-and-gut products. This is likely the result of the shoreside sector’s continued concentration on pollock and cod in contrast to the at-sea sector, which has diversified to flatfish.

Composition bar graphs (lower-right panels of Figures 5 and 6) show a predictable division of pollock product types, given the distribution of value share. A recent change in the species composition by product (Figure 6) shows that head-and-gut production rose significantly and in the last two years has become an important pollock-based product. Meal production has been declining. Quantity indices (left panels of Figures 5 and 6) show that aggregate quantity produced is up in 2010 by approximately 4%. The species quantity indices show that the increase in 2010 was mostly in cod, which rose 39% to 102, just above the 2006 benchmark. Precipitous drops in the aggregate quantity index in 2008 and 2009 were brought about by decreases in pollock and cod, reflecting reductions in the TACs. Sablefish production, which rose 49% in 2010 still accounts for just 3% of total value. This may be a sign of the shift by processors toward sablefish, similar to the at-sea sector's shift toward flatfish. However, production of sablefish was considerably higher in the middle of the decade, presumably because the physical capacity was available. Yet with the increasing sablefish price and considering that the 2010 catch was only 40% of the available TAC (Witherell *et al.* 2011), it would appear that the BSAI shoreside sector could diversify its portfolio a bit to weather the recent reductions in pollock and cod. However, other market forces may be responsible; since the BSAI region as a whole has a sablefish TAC of only 4,860 metric tons in 2010, the prospects for increasing sablefish revenue are limited. Product type quantity indices show head-and-gut product output is rising while surimi output is falling.

Price indices (left panels of Figures 5 and 6) indicate that in aggregate the price of products sold by the shoreside sector is down slightly in 2010 with a drop in the index from 118 to 115 (3%). The drop is associated with the slight drop in pollock-based products, as shown by the species price indices. This may be attributable in part to the falling prices for roe, which was a significant source of value for the industry in the early part of the decade. The 2010 drop in prices came after a 17% drop in the price index in 2009, which was in turn preceded by a 39% price increase in 2008. Both of these spikes appear to come from similar price changes in the surimi price index. The pollock, surimi, and aggregate price indices are highly correlated. The current price level appears to represent a reversion to the historical upward price trend over the last decade. The pollock price index is also significantly correlated with the cod price index. As these two whitefish species make up about 97% of its total value, the BSAI shoreside sector is highly exposed to price changes of both the species themselves and the products in which they are concentrated. While the sablefish price index has been steadily rising, with only 3% of the value coming from this species, the increase hasn't translated into significant price gains for the sector.

The uptick in the quantity index was enough to offset the slight price decline for a net 3% gain in the aggregate value index (left panels of Figures 5 and 6). Most of the aggregate value increase came from cod, whose quantity and value indices increased significantly. Value and price increases in surimi also contributed to the value index increase. While sablefish makes up only a very small portion of the market, its price increase coupled with the increase in sablefish production resulted in an increase of 96% in the sablefish value index. Pollock, the primary source of value for the shoreside sector, has been less volatile. Although the pollock value index decreased only slightly in 2010, the heavy dependence of the shoreside sector on pollock makes even small movements in pollock value significant. The roe price change and corresponding decrease in roe value likely contributed to the decreasing pollock value. The comparatively higher value index from 2005 to 2008 is associated with the high production of pollock and cod in those years.

While production has fallen over the last few years, the increased prices in aggregate have played a significant role in maintaining value for the BSAI shoreside sector. The conservation measures that have reduced the pollock and cod TACs since 2008 have been comparatively more disruptive to the revenues of the shoreside sector than the at-sea sector. Flatfish, which at-sea producers have incorporated into their production portfolio, tend to be concentrated further offshore. High concentration of the BSAI shoreside sector in only pollock and cod, two species with correlated outcomes, has left the sector highly exposed to changes in the species' TACs or prices. The recent uptick in sablefish value and the opportunity (although very limited) for increased catch under the TAC may help to diversify the portfolio of shoreside producers to some extent. Considering the longer time series of aggregate value back to 2001, we see that the pollock value index is roughly at its 2001 level while cod value has increased 60% and sablefish value has more than doubled. In aggregate, the 2010 value index is up 11% from 2001 levels.

BSAI Shoreside Ex-Vessel Market

The BSAI ex-vessel market consists of catcher vessels that sell their catch to shoreside processors who process the catch into products that are sold on the first wholesale market. Thus, the distribution of value share across species in the ex-vessel market is, as expected, virtually identical to the wholesale distribution (upper-right panel of Figure 7). Analysis of the ex-vessel market provides additional insight into the gear types (Figure 8) used to harvest delivered catch. Comparison of the ex-vessel market to the wholesale market also provides insight into pass-through of value from the wholesale to the ex-vessel market.

As in the wholesale market, value in the ex-vessel market is highly concentrated in pollock and cod, with roughly 80% of the value share going to pollock, 16% going to cod, and a small fraction (4%) going to sablefish (upper-right panels of Figures 7 and 8). Almost all of the catch and consequent value comes from trawl gear (88%). Trawl gear is used to harvest pollock and a portion of the cod harvest (lower-right panels of Figures 7 and 8). The remaining harvest of cod is largely carried out using pot gear, which accounts for 8% of the value share. Hook-and-line gear, which primarily targets sablefish, accounts for 4% of value for the ex-vessel sector. The gear-type quantity indices (lower-left panel Figure 8) show that the uptick in delivered catch came from catcher vessels using pot gear. Species quantity indices mirror the wholesale quantity indices and show that the aggregate quantity uptick came primarily from cod.

Because each gear type is largely focused on the catch of a single species, the gear-type price indices closely track the price indices of their corresponding species. The 2010 aggregate price index dropped from 127 to 102, a 19% decrease (left panels Figures 7 and 8) that continues a similar decrease in 2009. The drop in the aggregate ex-vessel price index can be attributed to the drop in the ex-vessel pollock price index, which fell 24%. From 2007 to 2009, the aggregate price index spiked 51% in 2008 then fell 19% in 2009. Volatile prices over this time were largely associated with changes in the ex-vessel pollock price index. Correlated changes in cod prices from 2007 to 2009 amplified movements in aggregate price. The ex-vessel sablefish price index has been steadily increasing; however, this species comprises only a small proportion of catch and value. The ex-vessel price index in 2010 is at 103 indicating a 3% increase over the 2006 base year. The drop in pollock prices coupled with the decline in catch quantity has heavily impacted value in the ex-vessel sector. The aggregate value index in the BSAI shoreside ex-vessel market for 2010 is down 18%, falling from 75 to 62.

A comparison of the aggregate ex-vessel value index in 2010 and 2001 shows that value has fallen 10% over the last decade. Changes in market prices and in the TAC have thus been difficult for the shoreside ex-vessel sector. It is the only sector that in 2010 had a value index below the 2001 level. As the ex-vessel sector is intrinsically connected to the wholesale market, they suffer from the same lack of diversity in the portfolio of species they bring to market.

Economic Performance of the GOA At-Sea Sector

GOA At-Sea Wholesale Market

The GOA at-sea sector is the smallest, by measure of wholesale value, of the four sectors (Figure 1). In terms of catch and distribution of value share across species, it is the most diversified (upper-right panel Figure 9). Value for this region is split fairly evenly between sablefish (18%), rockfish (34%), cod (27%) and flatfish (16%). The distribution of value across species from this region has remained stable over time. While diversified in species, value from the product types in this region is concentrated in head-and-gut products (85%) with a small percentage going to whole fish (13%). The product composition by species shows that, for most of the species, almost all of the catch is made into head-and-gut products; the exception is flatfish, for which roughly half of the catch is sold as whole fish on the wholesale market.

Aggregate quantity indices show that production was up 6% in 2010 (left panels of Figures 9 and 10) and that, in general, aggregate quantities produced over the last 5 years have been stable. The gains in the quantity index were a result of increased production in cod, which rose 31%, and rockfish, which rose 15%. The 2010 quantity index gains were mitigated by the continued decline in sablefish production, which fell 18%. An interesting feature of the product-type quantity indices is the 76% increase in the whole fish index in 2009. The product composition bar graphs (lower-right panels of Figures 9 and 10) indicate that this was the result of proportionally more of the flatfish being marketed as whole fish. The head-and-gut price drop may have been a contributing factor in this production decision.

The aggregate price index is up 14% from 84 to 96 in 2010 (left panels of Figures 9 and 10). Because a diversified portfolio of species contributes wholesale value to the GOA at-sea sector, no single species price index completely drives the aggregate price index; the price index increases from cod, rockfish and sablefish all contributed to the aggregate price increase. From the product type price indices, the only truly influential index is the head-and-gut price index; this is due to the high concentration in this product type. Over the last 5 years, the aggregate price index had been falling somewhat as a result of a drop in rockfish prices in 2007 and drops in cod and flatfish prices in 2009. The 2010 price rebound has returned aggregate prices to just below the 2006 baseline.

The increases in both the price and quantity indices resulted in a 21% increase in the aggregate value index (left panels of Figures 9 and 10). Over the last five years, variation in the price index has been driving much of the variation in aggregate value, as aggregate quantities have been relatively stable. The current level of the value index (103) is just above the 2006 base year. The 2007 and 2009 drops in aggregate value can largely be attributed to value (and price) decreases for rockfish and cod. Since 2001, aggregate value has increased 60%. Much of the value increase is the result of rising price between 2001 and 2006.

A precipitous decline in the aggregate quantity index in 2004 is a prominent feature of the indices in these early years. The output drop was driven almost entirely by declines in flatfish production, for which the drop was particularly stark, and cod production, which in 2004 continued a decline that began in 2003 and ended in 2005. The reason for this broad-scale decrease in production is unclear from the indices, particularly since flatfish catch is well under the TAC. Aside from the 2004 output decline, the indices across species appear relatively uncorrelated. While the value index for any individual species may have been somewhat volatile or trending up or down, substantial contributions to total value from a diverse set of species have mitigated some of the adverse impacts on the aggregate index. The result has been a growing aggregate value wholesale market that appears to be robust.

Economic Performance of the GOA Shoreside Sector

GOA Shoreside Wholesale Market

The GOA shoreside wholesale market is primarily comprised of sablefish, cod and pollock (upper-right panels Figures 11 and 12). As a proportion of total value in 2010, sablefish accounted for 31%, cod 35%, and pollock 25%. Flatfish and rockfish collectively made up 9% of total value. The shoreside market is fairly diversified in value, although the high correlation between changes in the pollock and cod markets increases the potential for volatility. Across product types, value largely comes from head-and-gut products (48%) and fillets (28%) with the remaining value distributed across a variety of product types.

Composition bar graphs show that, for most species, output is distributed across a variety of product types (lower-right panel of Figures 11 and 12). In particular, pollock, cod, flatfish and rockfish production is balanced across fillets, head-and-gut, surimi, whole fish, and “other” product types. Sablefish is the exception and is highly concentrated in head-and-gut products. Because pollock and cod are the major species processed shoreside, they make up disproportionate shares of the species composition by product type. Surimi and roe both come almost entirely from pollock. This is the only sector for which the “other” product type is meaningful[5]. Fillets are basically either pollock or cod. In contrast, both head-and-gut and whole fish production are balanced across species.

The aggregate quantity index is up 30% in 2010, indicating a significant jump in the amount of product produced and sold on the wholesale market. The jump comes after iterative declines over the previous three years. The 2010 quantity index increase was the result of significant increases in the cod and pollock indices,

[5] The “other” product type typically consists of ancillary products such as heads, stomachs, etc. For cod the “other” product is any product that is not whole fish, headed and gutted, fillet, or salted and split

and, to a lesser extent, the rockfish index. The sablefish quantity index has been trending down over the last six years as the GOA sablefish TAC has been reduced. Until 2010, pollock output had also been trending down, also as a result of a decreasing TAC. The sizable increase in flatfish and rockfish production over roughly the same period indicates that effort shifted to production of products from these species as abundances of pollock and sablefish decreased.

The aggregate price index increased 4% in 2010 from 108 to 112 (left panels of Figures 11 and 12). Similar to the price dynamics in other sectors focused on pollock and cod, the 2010 price index increase comes after a marked drop in prices in 2009 which was preceded by a price spike in 2008. The drop in 2009 thus appears to be a reversion of prices to the upward trend in prices earlier in the decade. Species price indices show that the 2010 price increase was primarily driven by increases in the price of sablefish (15%), whose price has been increasing over the last decade. The increase in the 2008 aggregate price and corresponding drop in the 2009 price were driven largely by volatility in cod and pollock prices during which time sablefish price increases were more modest. As with other sectors, the pollock and cod price increases in 2008 were associated with an increase in the surimi price index. Changes in the fillet and head-and-gut price indices were the primary drivers in subsequent aggregate price index changes, although all product types contributed to the sharp drop in 2009. As production is diversified across a variety of product types, these price indices don't point to a single product type that is driving most of the variation in aggregate prices.

The simultaneous increase in both price and quantity indices in 2010 resulted in a 37% increase in the aggregate value index (left panels of Figures 11 and 12). This erased the equally large drop in value that had occurred in the previous year. The dramatic changes in value are primarily the result of value changes for cod and pollock. The increases in cod and pollock production in 2010, and the leveling off of prices for these key species, have resulted in a return of the value index to its 2008 levels. To a lesser extent, sablefish and rockfish value changes contributed as well, particularly in the 2010 value index increase.

Looking at the longer time horizon, we see that the aggregate value index in the GOA shoreside wholesale sector is well above the 2001 level. With the value index at 119 in 2010 and 76 in 2001, this translates to a 55% increase in wholesale value over the last decade. Diversification across product types and species has contributed to the increase. Shoreside production volume and value are still somewhat concentrated in pollock and cod, and hence sensitive to changes in the availability and price of these species. However, the significance of sablefish in value share and the observed ability to shift production to flatfish and rockfish have helped buffer the shoreside market.

GOA Shoreside Ex-Vessel Market

Because the delivery of catch feeds production and sales to the wholesale market, trends in the GOA shoreside wholesale sector are largely mirrored in the ex-vessel market. Value from deliveries is largely concentrated in three key species: sablefish, cod and pollock (upper-right panel of Figures 13 and 14). Sablefish has a much larger value share in the ex-vessel market, where it accounts for 50% of 2010 value, than in the wholesale market, where it accounts for only 30% of 2010 value. Since the wholesale sector processes the same fish landed in the ex-vessel sector, the difference in relative value share between the wholesale and ex-vessel markets must come from differences in the relative prices of the three primary species. The much larger value share for sablefish in the ex-vessel market than in the wholesale market, for example, indicates that the ex-vessel price for sablefish is much closer to the wholesale price than it is for either pollock or cod; this is largely because most sablefish is minimally processed into head-and-gut products while more value is added to the cod and pollock catch by processing it into products like fillets. Hook-and-line gear, because it is used in the harvest of sablefish, accounts for half of the value share. Deliveries of fish caught using pot gear account for 13% of the value, and trawl gear accounts for 32% of the value.

Composition bar graphs show that, with the exception of cod, all species are harvested using a single gear type (lower-right panel of Figures 13 and 14). The gear type composition for cod shows that pot gear (which is used only for cod) has become increasingly important. Increases in the quantity of cod delivered have largely come from catcher vessels using pot gear, although hook-and-line deliveries have increased as well. Despite the distribution of value across gear types, trawl gear accounts for roughly two-thirds of the total quantity (weight) delivered to processors; with the implied difference being the relative prices of species targeted and caught using the different gears. The aggregate quantity index increased by 18% in 2010 (left panels of Figures 13 and 14). Species quantity indices indicate that the increase was due to significant increases in pollock and cod deliveries. The pollock quantity index, which had been steadily falling over the last 5 years, increased significantly in 2010, returning the index to its 2006 level. Cod has been fairly stable over the last 5 years despite a slight decrease in deliveries in 2009. The sablefish quantity index has been gradually declining since 2005 as a result of decreases in the TAC. Commensurate with the decline in sablefish quantity, the hook-and-line quantity index has fallen as well. The comparatively constant, and even increasing, delivered weight from hook-and-line vessels (lower-right panel Figure 14) shows that effort from these vessels has been redirected to the catch of lower-priced cod. The trawl gear quantity index has been relatively stable compared to the declining pollock index (the species primarily targeted by trawl gear); because as shown by the flatfish quantity index, the trawl sector has shifted effort toward flatfish species as the availability of pollock fell.

The aggregate price index rose 6% in 2010 from 107 to 113 (left panels of Figures 13 and 14). Over the last 5 years, the market’s aggregate price index rose, peaking at 125 in 2008. In 2009, the price dropped significantly (14%), some of which was subsequently made up by the 2010 price increase. With the aggregate price index at 113, 2010 prices are still well above the 2006 base year of the index. Price increases have been driven primarily by steady increases in the sablefish price index. Changes in the cod price index have contributed significantly to the observed aggregate price variation; in particular, the 2008 drop in the aggregate price came mostly from a drop in the cod price index. The high correspondence between the price index for the wholesale market and the ex-vessel price index indicates an effective ex-vessel market, in which wholesale prices effectively pass through from one market to the other.

Increasing quantity and increasing price resulted in a significant increase (25%) in the aggregate value index for 2010 (left panels of Figures 13 and 14). Over the last five to seven years, the steady rise in the price index and low volatility in the quantity index have translated to an upward-trending value index. The 2010 increase in the aggregate value index was driven by two factors: increases in the cod and pollock value indices resulting from quantity index increases; and a sablefish value increase due to the rising price. The steep decline in aggregate value in 2009 was driven mainly by a reduction in cod catch together with a drop in price. Gear type value indices show that the aggregate gains in value (and loss in 2009) have been experienced by all gear types.

Despite a significant drop in 2009, the stability of the sablefish fishery and increases in cod catch resulted in a return of aggregate ex-vessel value in 2010 to near its 2008 levels. Except for the considerable volatility over the last couple of years, the ex-vessel value of the sector has grown steadily, resulting in a 56% increase in value since 2001. Steady value growth in light of TAC reductions in pollock and sablefish was achieved by a shift to flatfish by the trawl sector and the shift to cod by the hook-and-line sector.

Conclusions

Standard economic indices can be used to characterize both the aggregate and disaggregate behavior of economic variables. These indices provide market participants and fisheries managers with a broad perspective on aggregate performance in a digestible format that is useful for quickly analyzing changes in a fishery. The perspective provided by these indices is useful for considering both the retrospective impact of management decisions as well as informing future policy. Indices are visually presented in a manner that is intended to facilitate the understanding of the relative influence that various species, product types and gear types carry in determining aggregate trends.

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Figures

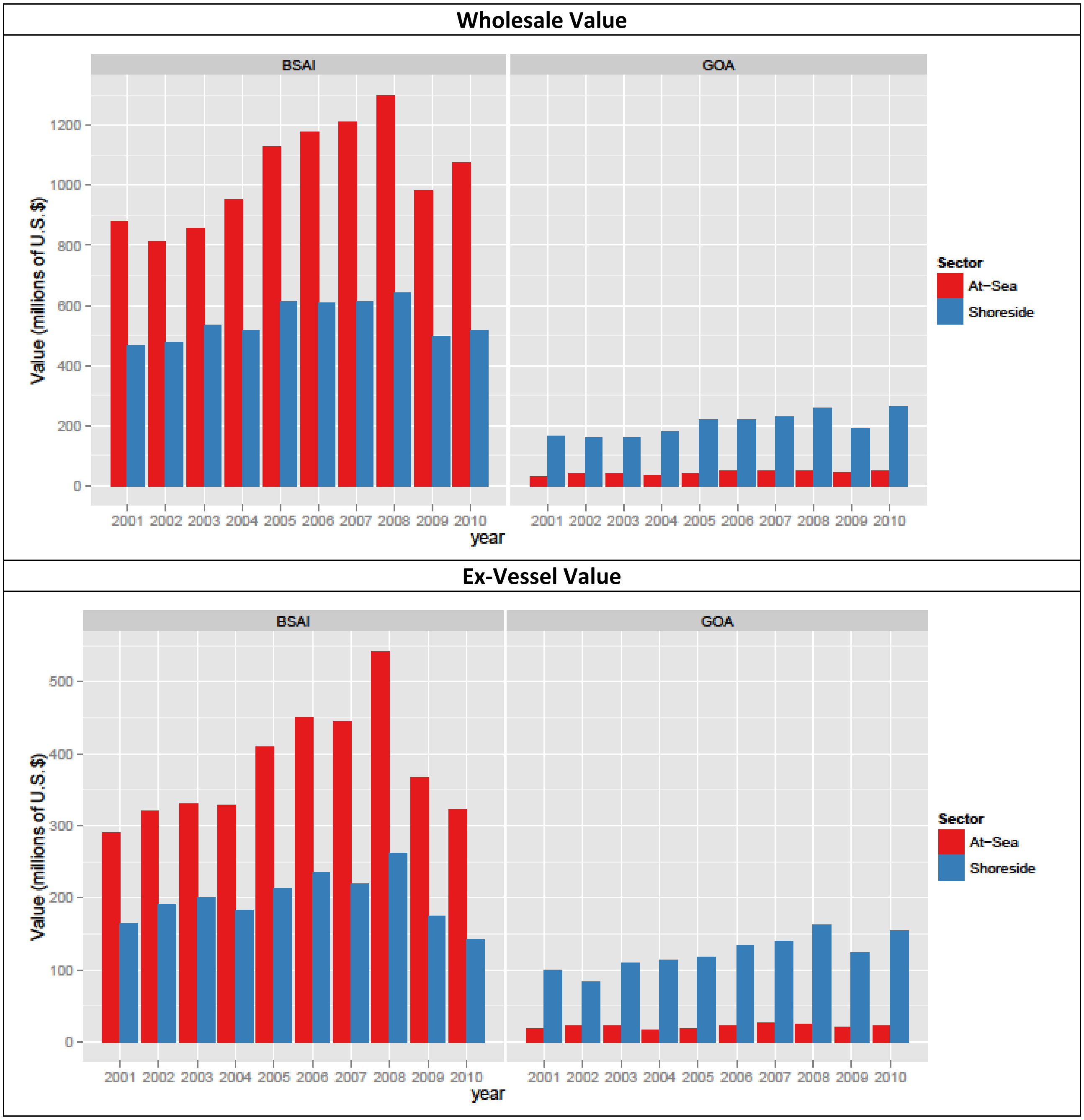

Figure 1: Wholesale and Ex-Vessel Value by Region and Sector

Source: NMFS Alaska Region's Catch-accounting system (CAS) and Weekly Production Report (WPR) estimates; Alaska Department of Fish and Game (ADF&G) Commercial Operator's Annual Report (COAR), National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

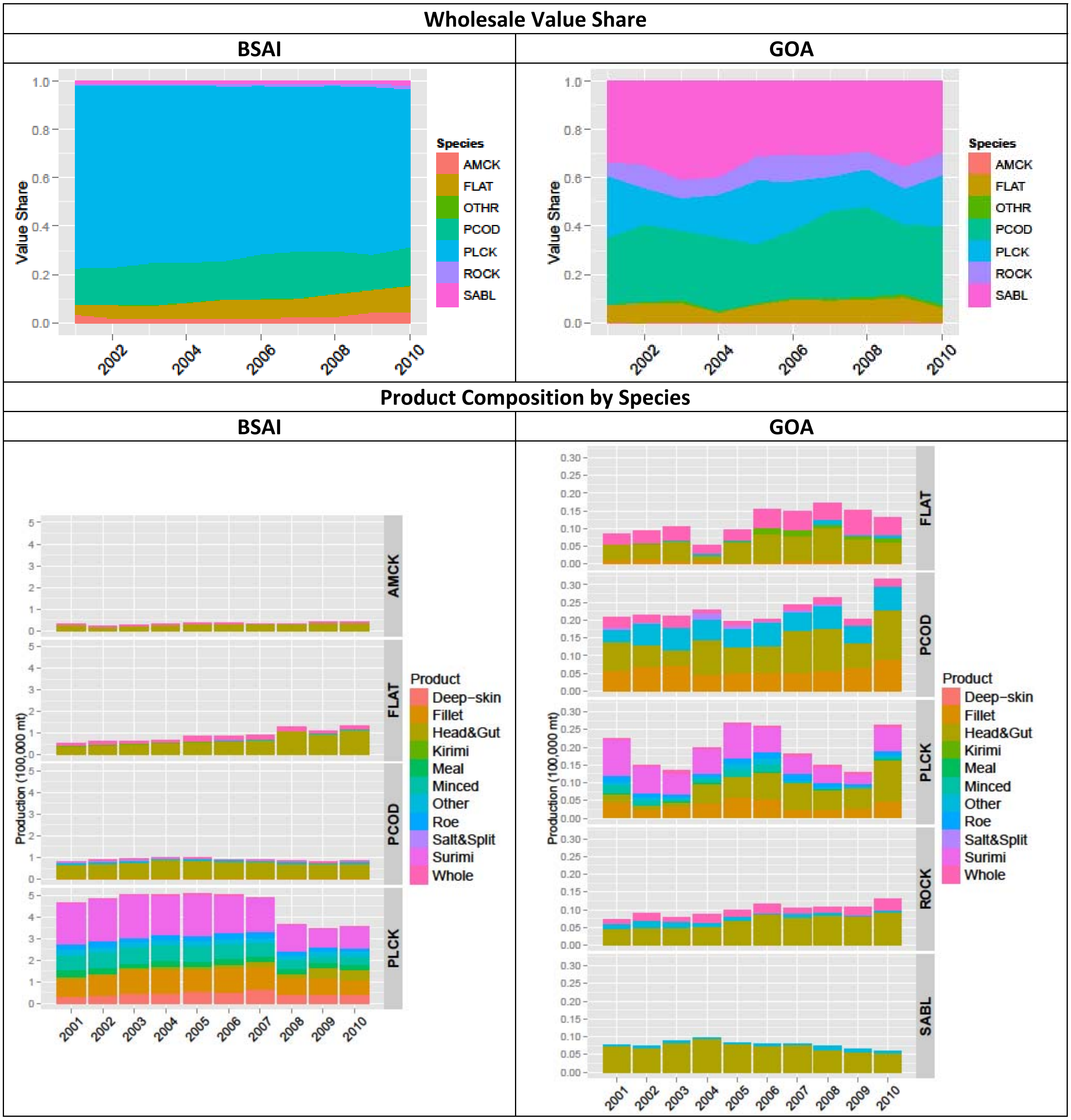

Figure 2: Wholesale Value Share and Species Product Composition by Region

Note: Species with a value share less than 1% were not included.
Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

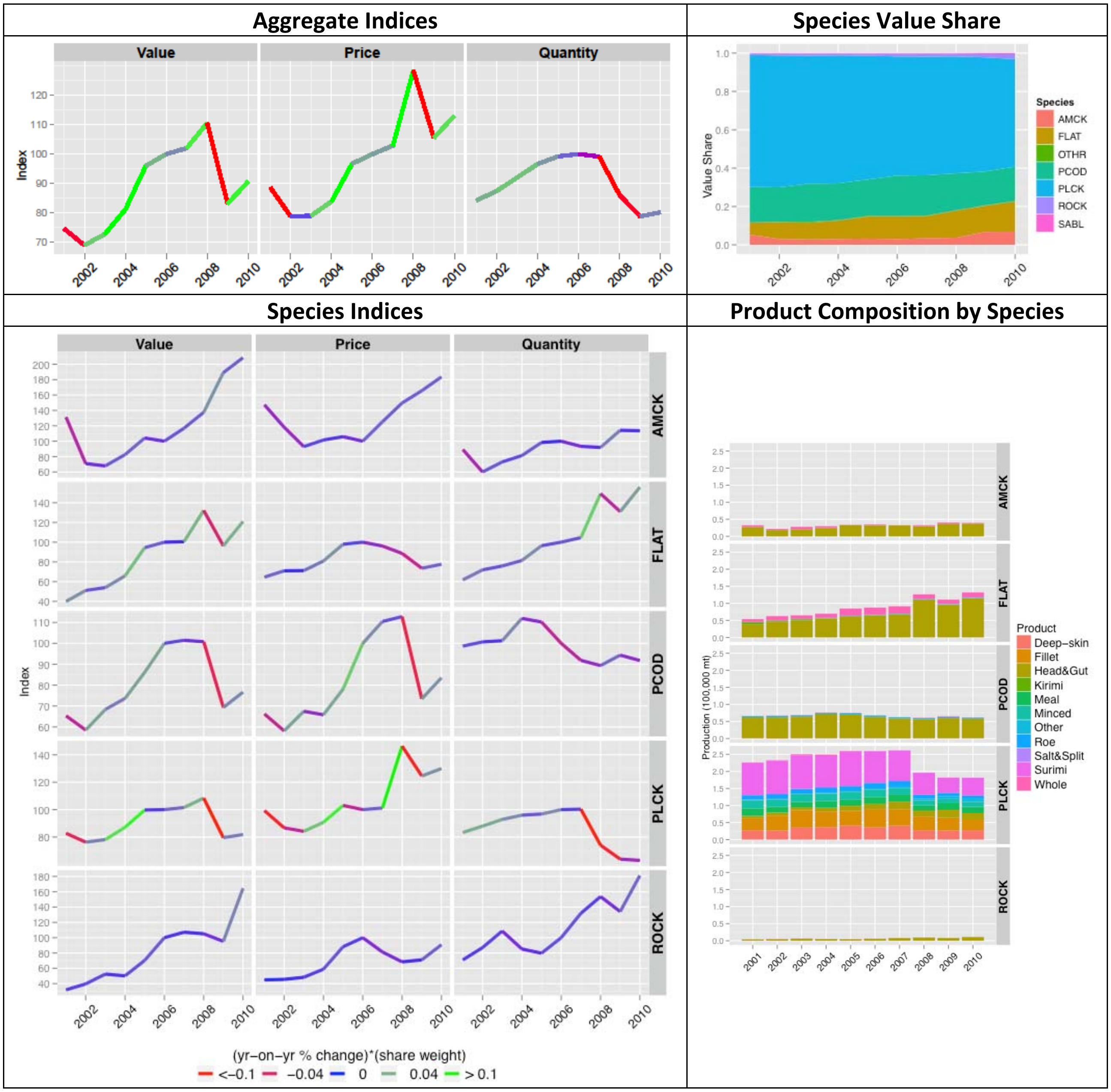

Figure 3: BSAI At-Sea Wholesale Market: Species Decompostion

Note: Species with a value share less than 1% were not included. All groundfish species were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and species decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov.
Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

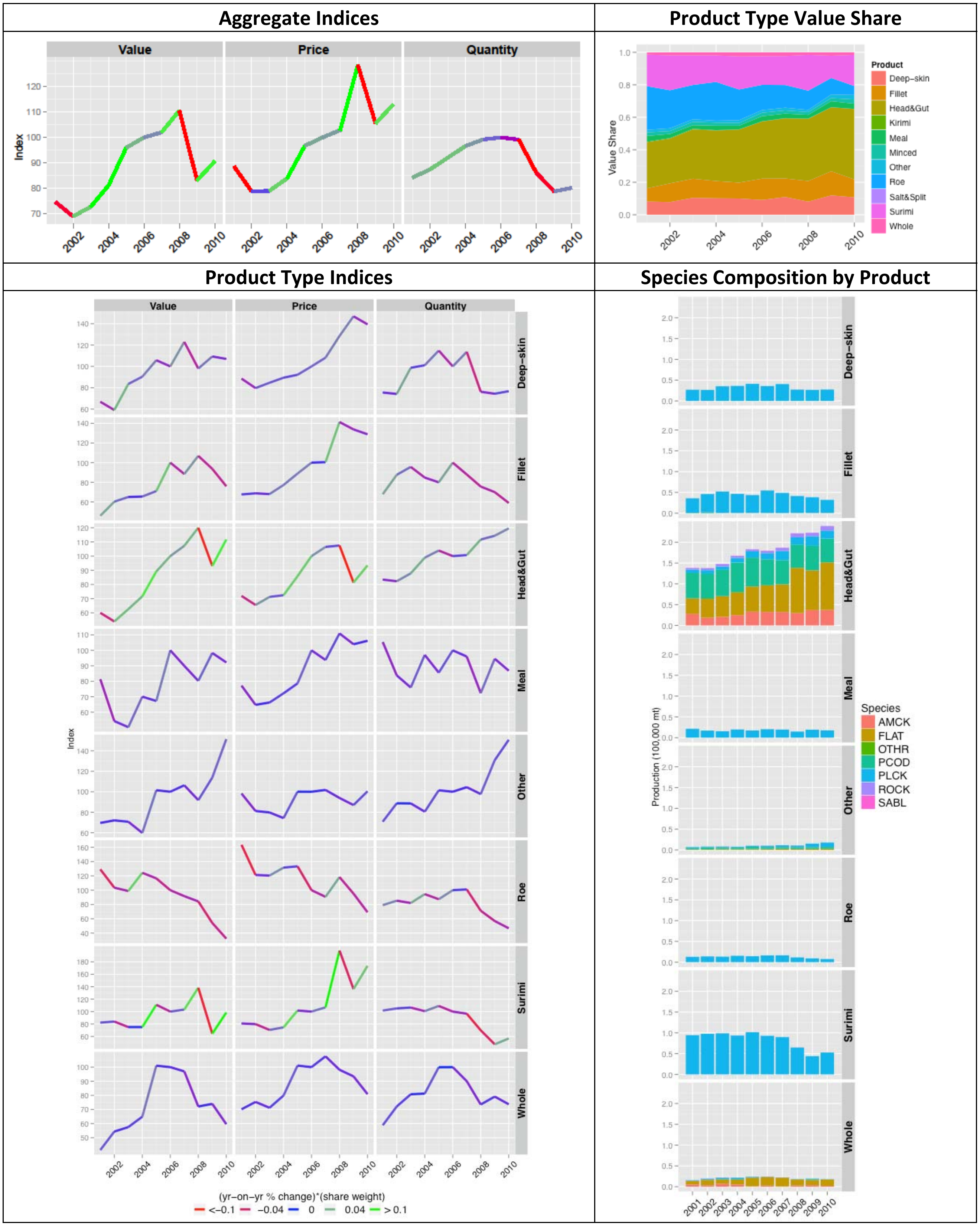

Figure 4: BSAI At-Sea Wholesale Market: Product Decompostion

Note: Product types with a value share less than 1% were not included. The minced product type has not been included. All product ypes were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and product decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

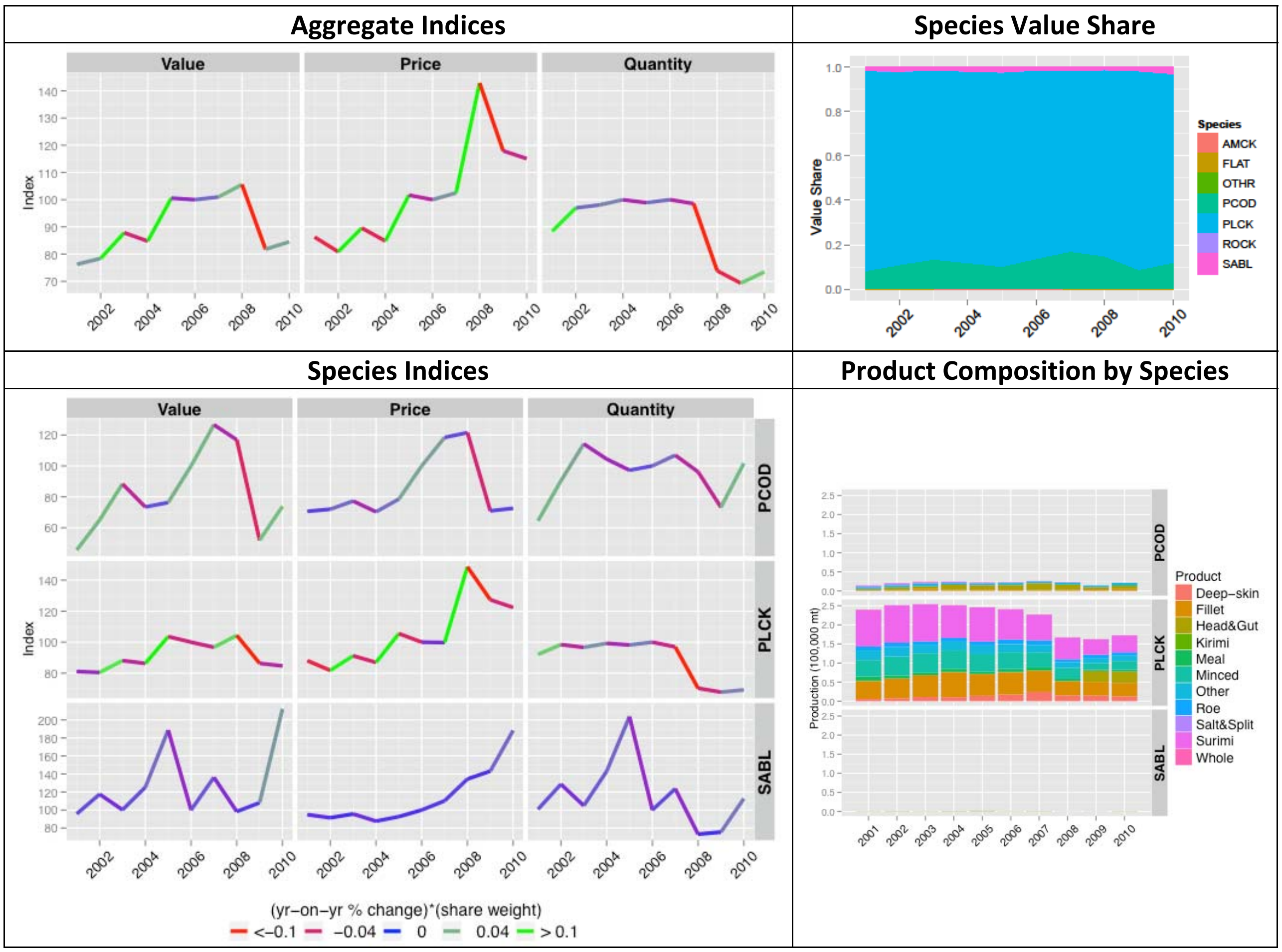

Figure 5: BSAI Shoreside Wholesale Market: Species Decomposition

Note: Species with a value share less than 1% were not included. All groundfish species were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and species decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
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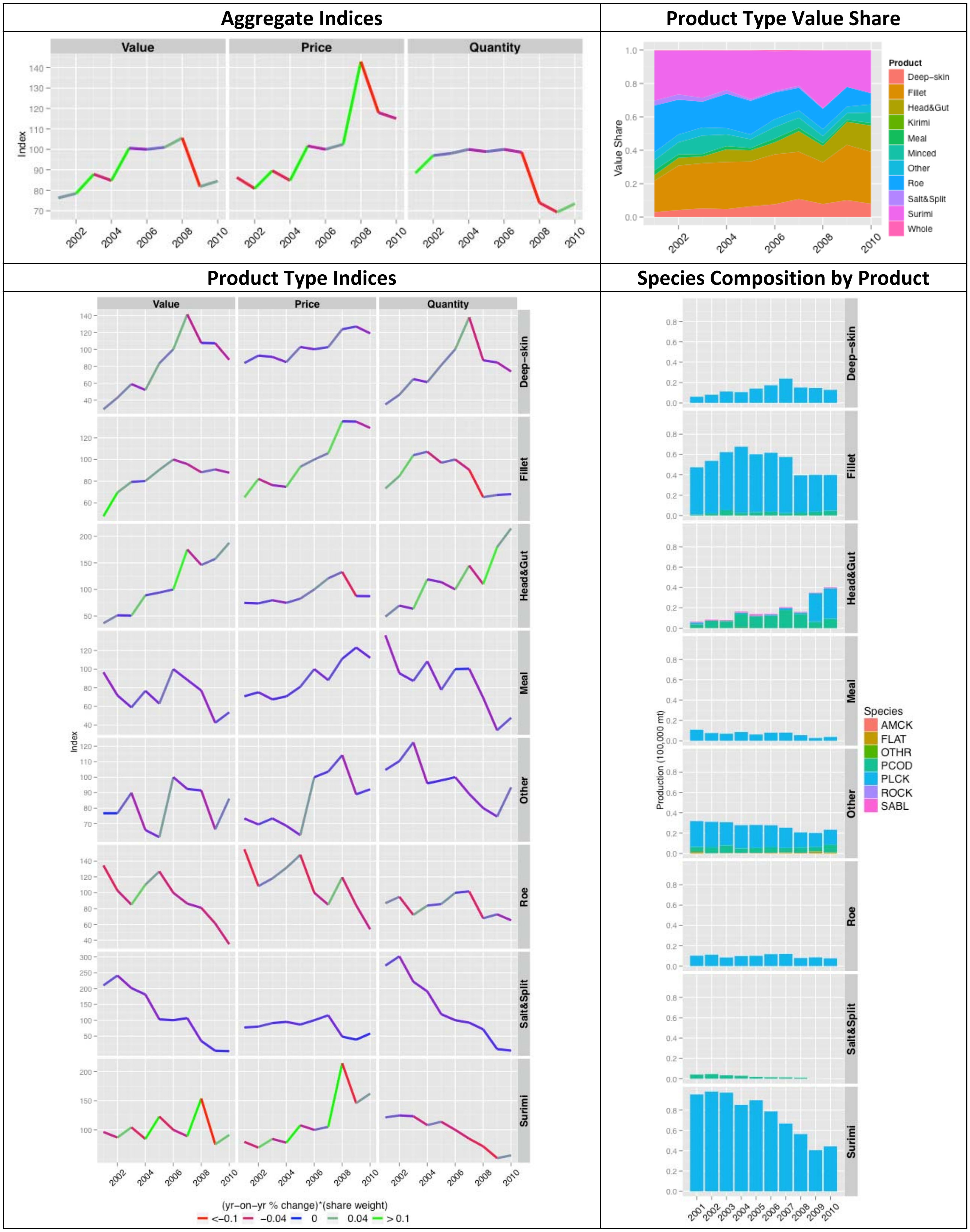

Figure 6: BSAI Shoreside Wholesale Market: Product Decompostion

Note: Product types with a value share less than 1% were not included. The minced product type has not been included. All product ypes were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and product decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
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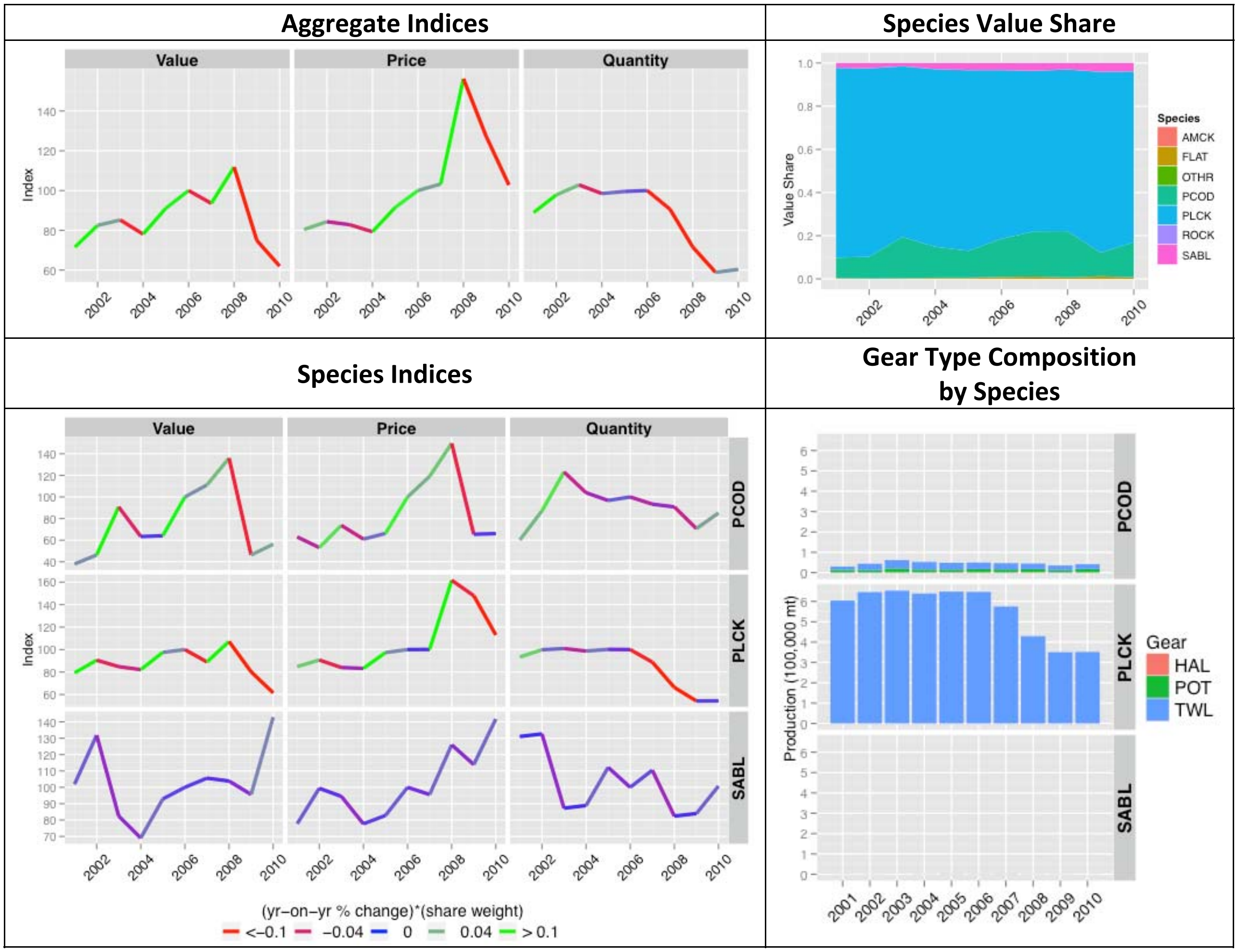

Figure 7: BSAI Shoreside Ex-vessel Market: Species Decompostion

Note: Species with a value share less than 1% were not included. All groundfish species were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and species decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

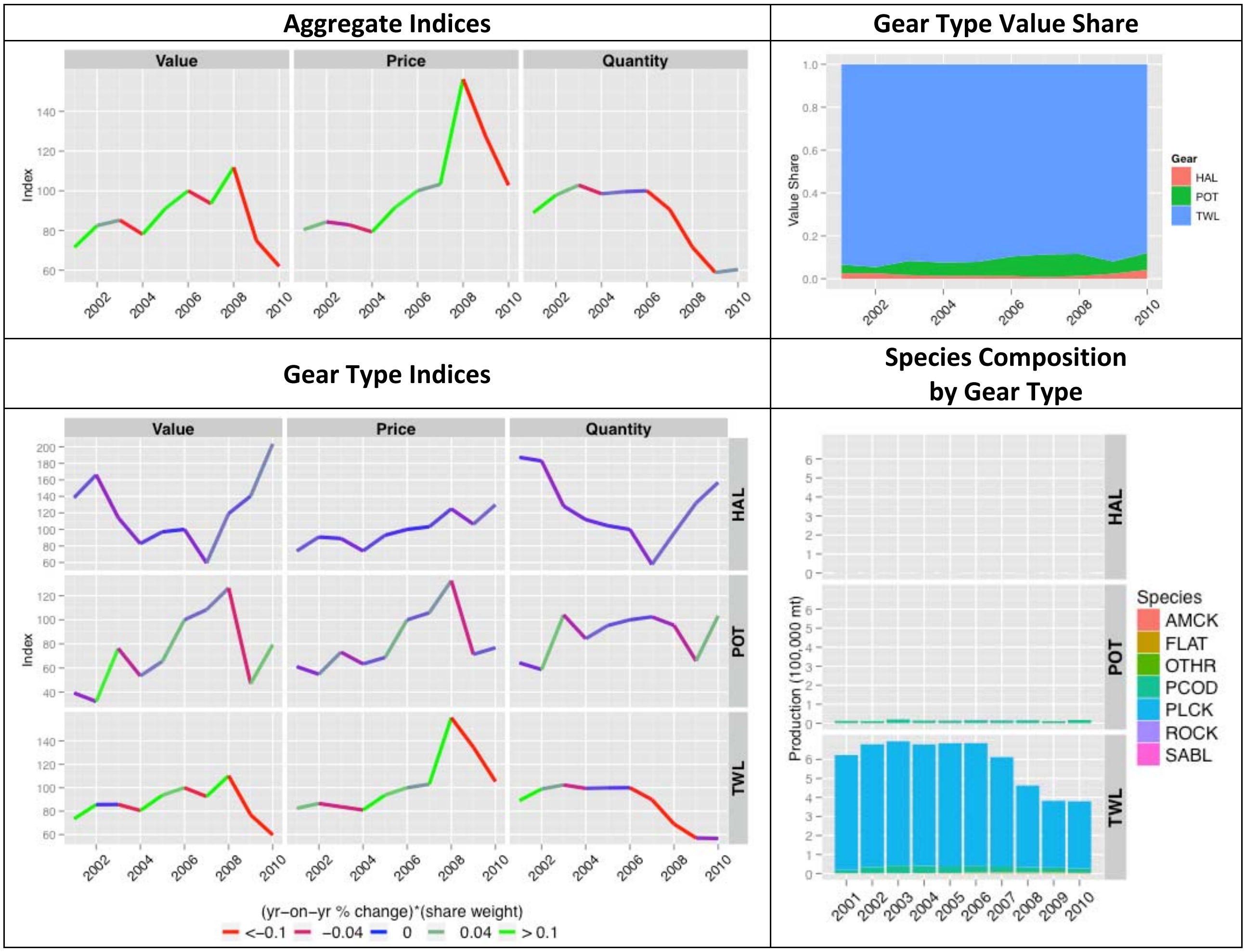

Figure 8: BSAI Shoreside Ex-vessel Market: Gear Decompostion

Note: The Fisher index method was used to construct the indices. Further details on index construction and gear decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

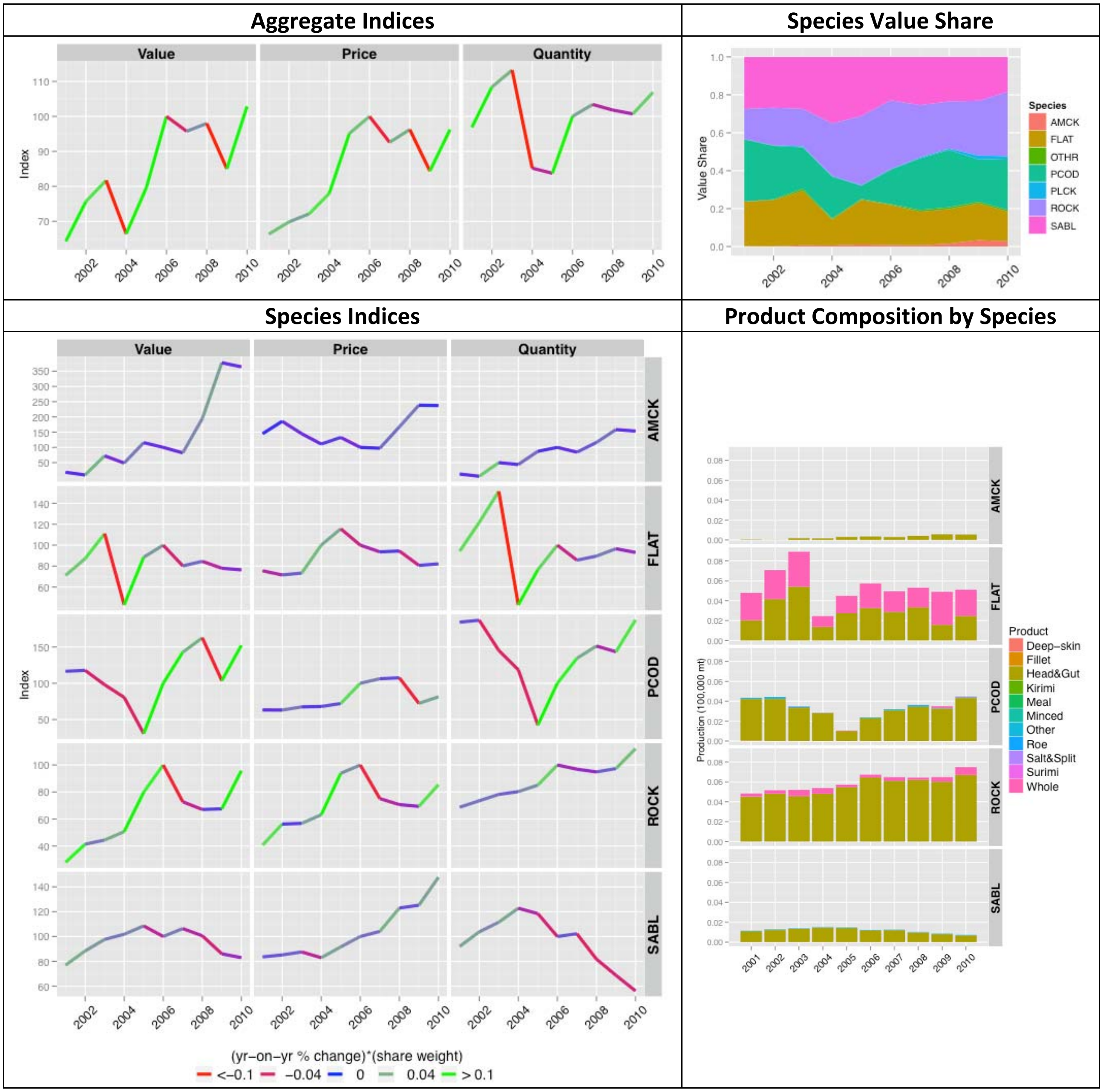

Figure 9: GOA At-Sea Wholesale Market: Species Decompostion

Note: Species with a value share less than 1% were not included. All groundfish species were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and species decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
Source: NMFS Alaska Region’s WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

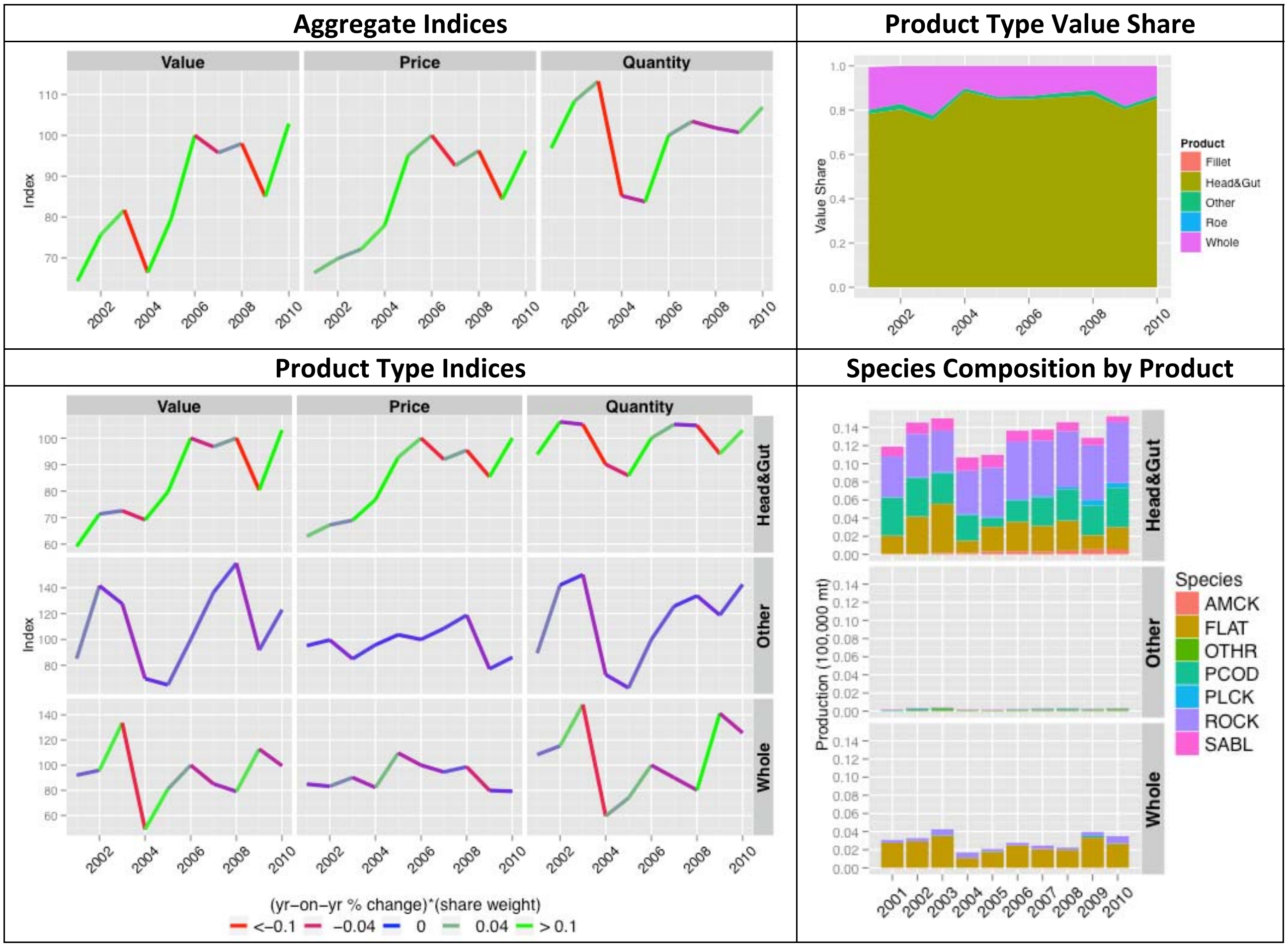

Figure 10: GOA At-Sea Wholesale Market: Product Decompostion

Note: Product types with a value share less than 1% were not included. The minced product type has not been included. All product ypes were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and product decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

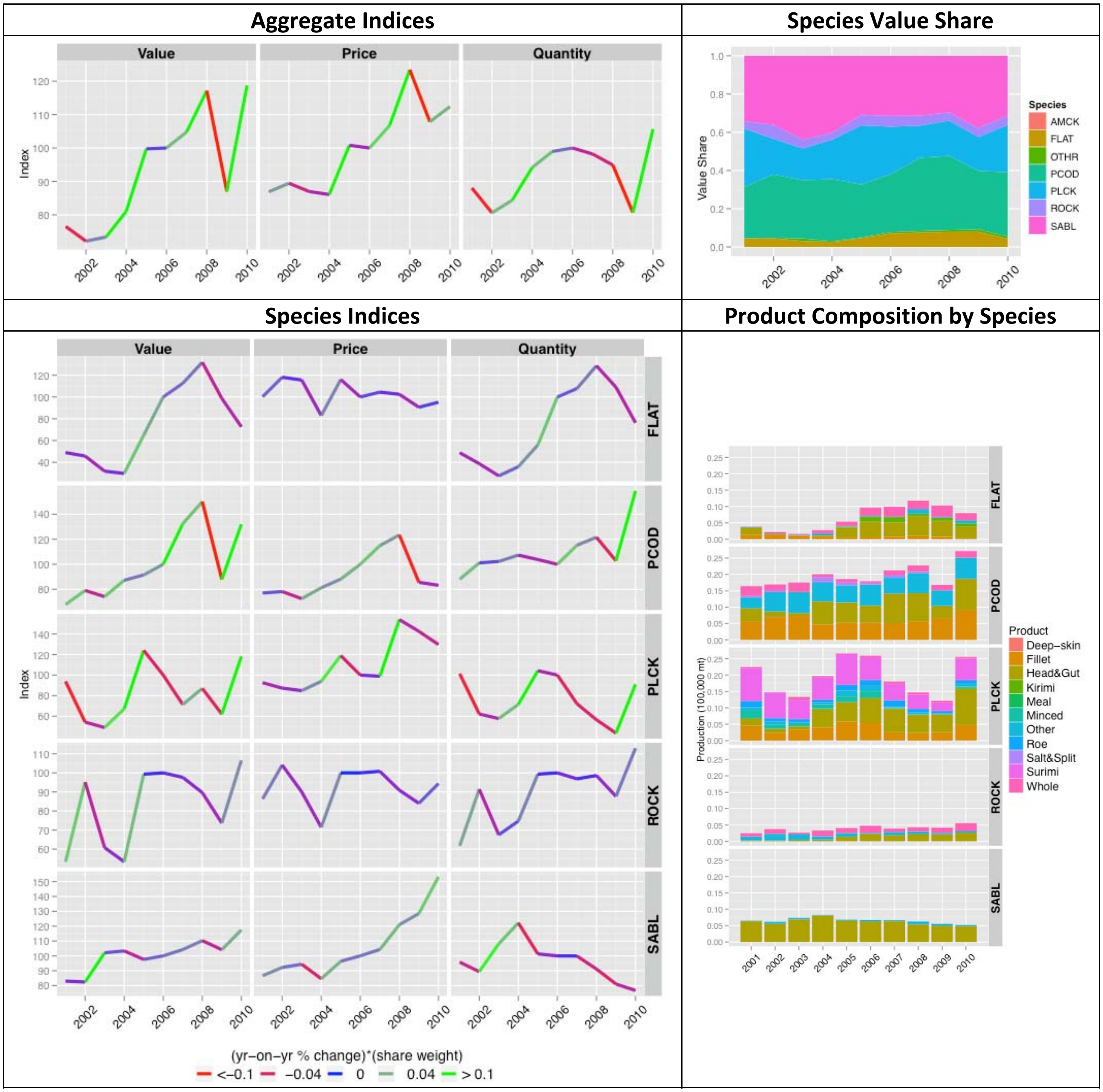

Figure 11: GOA Shoreside Wholesale Market: Species Decomposition

Note: Species with a value share less than 1% were not included. All groundfish species were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the indices. Further details on index construction and species decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov.
Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

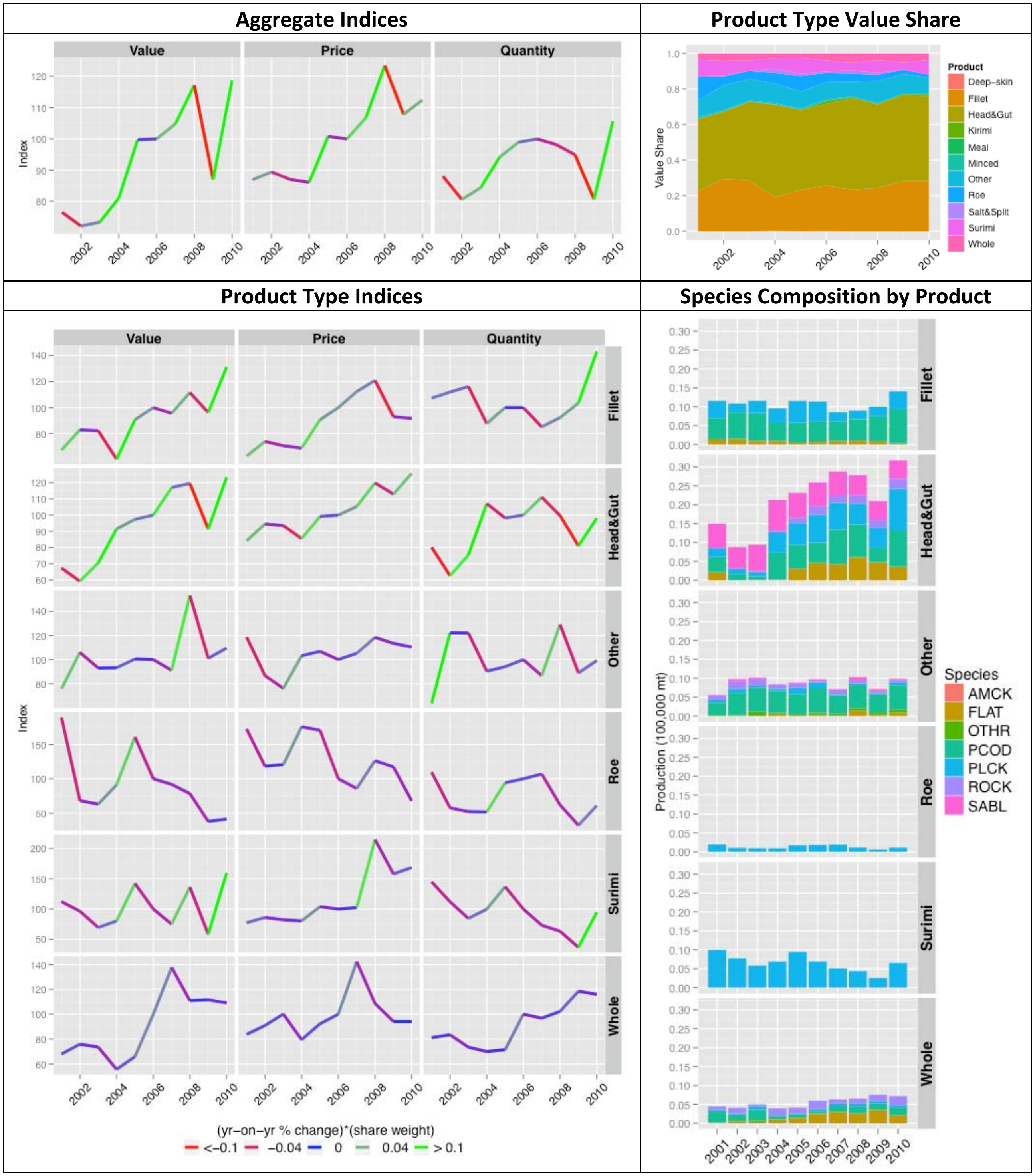

Figure 12: GOA Shoreside Wholesale Market: Product Decompostion

Note: Product types with a value share less than 1% were not included. The minced product type has not been included. All product ypes were used to construct aggreagate indices and value shares. The Fisher

index method was used to construct the indices. Further details on index construction and product decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov
Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

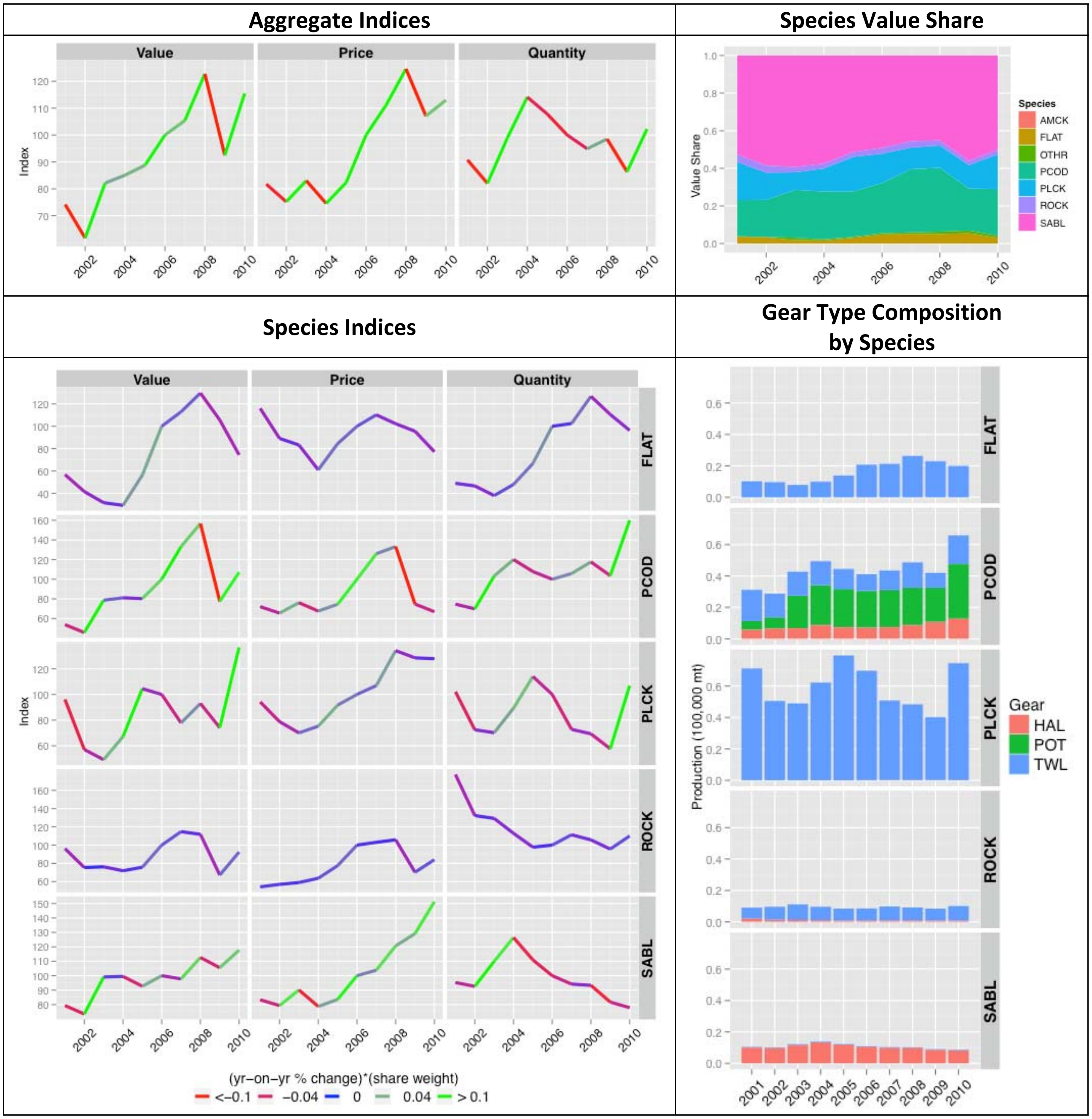

Figure 13: GOA Shoreside Ex-vessel Market: Species Decompostion

Note: Species with a value share less than 1% were not included. All groundfish species were used to construct aggreagate indices and value shares. The Fisher index method was used to construct the

indices. Further details on index construction and species decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov .
Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

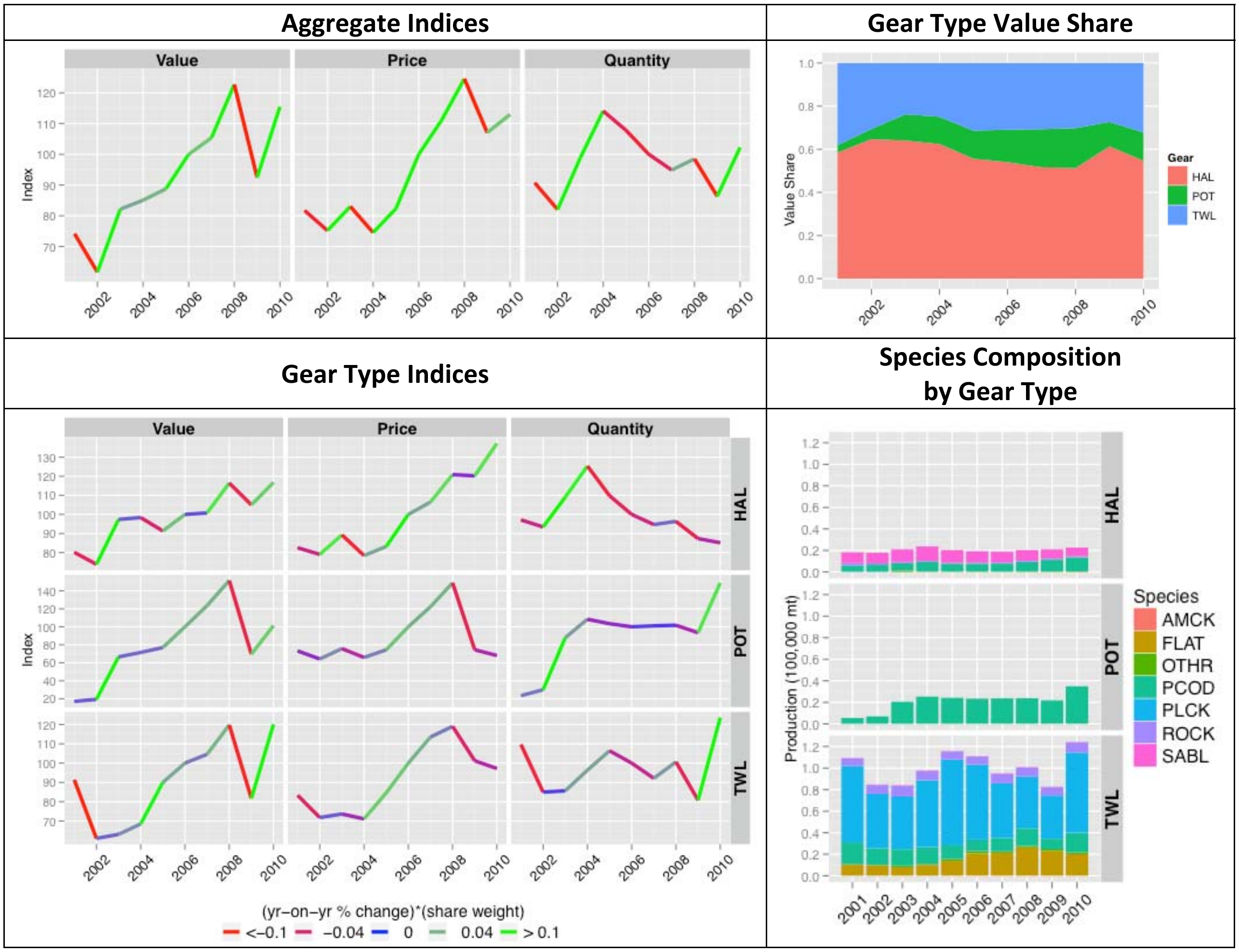

Figure 14: GOA Shoreside Ex-vessel Market: Gear Decompostion

Note: The Fisher index method was used to construct the indices. Further details on index construction and gear decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov.
Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

Tables

	Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	74.63	68.91	72.74	81.09	95.98	100.00	102.06	110.57	83.10	90.62
Price Index	Aggregate	88.65	78.78	79.00	83.88	96.71	100.00	102.91	128.54	105.51	113.07
Quantity Index	Aggregate	84.19	87.47	92.08	96.67	99.25	100.00	99.17	86.03	78.76	80.15
Value Index	AMCK	131.24	70.91	67.89	82.55	104.13	100.00	116.84	137.55	189.08	208.51
Price Index	AMCK	147.25	118.22	92.93	101.56	105.88	100.00	125.22	149.66	165.60	183.57
Quantity Index	AMCK	89.12	59.98	73.05	81.29	98.35	100.00	93.31	91.90	114.18	113.59
Value Share	AMCK	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.07	0.07
Value Index	FLAT	39.89	51.04	53.96	65.89	94.42	100.00	100.52	132.22	96.33	120.94
Price Index	FLAT	64.57	70.96	71.17	80.92	97.93	100.00	96.10	88.59	73.56	77.63
Quantity Index	FLAT	61.79	71.93	75.82	81.42	96.42	100.00	104.60	149.24	130.96	155.79
Value Share	FLAT	0.06	0.09	0.09	0.10	0.12	0.12	0.12	0.14	0.14	0.16
Value Index	PCOD	65.32	58.48	68.35	73.66	86.09	100.00	101.47	100.79	69.28	76.65
Price Index	PCOD	66.19	58.08	67.50	65.80	78.11	100.00	110.45	112.79	73.42	83.52
Quantity Index	PCOD	98.68	100.69	101.26	111.94	110.21	100.00	91.87	89.36	94.37	91.77
Value Share	PCOD	0.19	0.18	0.20	0.19	0.19	0.21	0.21	0.19	0.18	0.18
Value Index	PLCK	82.70	76.27	78.14	87.08	99.74	100.00	101.53	108.40	79.55	81.82
Price Index	PLCK	99.27	86.72	84.16	90.75	103.08	100.00	101.20	146.38	124.57	129.95
Quantity Index	PLCK	83.31	87.96	92.84	95.96	96.76	100.00	100.32	74.06	63.86	62.96
Value Share	PLCK	0.69	0.69	0.67	0.67	0.65	0.62	0.62	0.61	0.59	0.56
Value Index	ROCK	31.88	39.62	52.49	50.16	70.30	100.00	107.14	105.13	95.22	164.44
Price Index	ROCK	44.93	45.51	48.28	58.86	88.17	100.00	81.31	68.40	71.02	90.78
Quantity Index	ROCK	70.97	87.06	108.72	85.21	79.73	100.00	131.78	153.69	134.07	181.15
Value Share	ROCK	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.03

Table 1: Species Indicies and Value Share for the BSAI At-Sea Wholesale Market.

Note: Species with a value share less than 1% were not included. All groundfish species were used to construct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Product	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	74.63	68.91	72.74	81.09	95.98	100.00	102.06	110.57	83.10	90.62
Price Index	Aggregate	88.65	78.78	79.00	83.88	96.71	100.00	102.91	128.54	105.51	113.07
Quantity Index	Aggregate	84.19	87.47	92.08	96.67	99.25	100.00	99.17	86.03	78.76	80.15
Value Index	Deep-skin	66.86	59.14	83.54	90.35	105.79	100.00	122.93	97.98	109.29	107.00
Price Index	Deep-skin	88.52	79.69	84.67	89.40	92.14	100.00	108.16	128.49	146.92	139.37
Quantity Index	Deep-skin	75.52	74.21	98.66	101.07	114.82	100.00	113.65	76.26	74.39	76.78
Value Share	Deep-skin	0.08	0.08	0.10	0.10	0.10	0.09	0.11	0.08	0.12	0.11
Value Index	Fillet	45.94	60.26	65.05	65.47	71.06	100.00	88.40	106.90	93.66	75.93
Price Index	Fillet	67.66	68.76	68.01	77.23	88.88	100.00	100.51	141.36	133.83	128.86
Quantity Index	Fillet	67.90	87.63	95.65	84.78	79.96	100.00	87.95	75.62	69.98	58.92
Value Share	Fillet	0.08	0.12	0.12	0.11	0.10	0.13	0.11	0.13	0.15	0.11
Value Index	Head&Gut	60.02	53.92	62.57	71.65	89.18	100.00	107.27	120.02	93.07	111.72
Price Index	Head&Gut	71.92	65.53	71.23	72.44	85.81	100.00	106.48	107.47	81.38	93.43
Quantity Index	Head&Gut	83.45	82.28	87.84	98.91	103.94	100.00	100.74	111.68	114.37	119.57
Value Share	Head&Gut	0.28	0.27	0.30	0.31	0.33	0.35	0.37	0.38	0.39	0.43
Value Index	Meal	81.31	54.26	50.32	70.05	67.26	100.00	89.96	80.26	98.28	92.17
Price Index	Meal	77.18	64.77	66.25	72.20	78.61	100.00	93.74	110.91	103.93	106.15
Quantity Index	Meal	105.35	83.78	75.95	97.03	85.56	100.00	95.97	72.36	94.57	86.83
Value Share	Meal	0.03	0.02	0.02	0.03	0.02	0.03	0.03	0.02	0.04	0.03
Value Index	Other	69.57	72.06	70.73	59.85	101.49	100.00	106.31	91.80	113.84	151.34
Price Index	Other	98.24	81.20	79.80	74.30	100.08	100.00	101.75	93.93	87.01	100.42
Quantity Index	Other	70.81	88.75	88.63	80.54	101.41	100.00	104.48	97.74	130.83	150.70
Value Share	Other	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.03
Value Index	Roe	129.14	103.50	98.81	124.30	116.50	100.00	91.64	84.29	54.12	32.31
Price Index	Roe	163.33	121.28	120.44	131.52	133.36	100.00	90.69	118.28	95.18	69.14
Quantity Index	Roe	79.07	85.34	82.04	94.51	87.36	100.00	101.05	71.27	56.87	46.73
Value Share	Roe	0.27	0.23	0.21	0.24	0.19	0.16	0.14	0.12	0.10	0.06

Table 2 (part) : Product Indicies and Value Share for the BSAI At-Sea Wholesale Market.

Value Index	Surimi	82.22	83.98	75.09	75.13	110.97	100.00	103.26	138.33	64.47	98.51
Price Index	Surimi	80.88	79.87	70.50	74.63	101.73	100.00	106.84	198.10	136.15	173.53
Quantity Index	Surimi	101.66	105.14	106.51	100.67	109.08	100.00	96.65	69.83	47.35	56.76
Value Share	Surimi	0.19	0.21	0.18	0.16	0.20	0.18	0.18	0.22	0.14	0.19
Value Index	Whole	41.26	54.34	57.51	64.88	101.02	100.00	96.97	72.11	73.96	59.58
Price Index	Whole	70.14	75.34	71.20	79.88	101.08	100.00	107.66	98.11	93.45	80.88
Quantity Index	Whole	58.82	72.13	80.77	81.23	99.94	100.00	90.07	73.51	79.14	73.67
Value Share	Whole	0.01	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02

Table 2 (continued) : Product Indicies and Value Share for the BSAI At-Sea Wholesale Market.

Note: Products with a value share less than 1% were not included. All product types were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov. Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	76.27	78.41	87.85	84.77	100.56	100.00	100.99	105.55	81.78	84.51
Price Index	Aggregate	86.25	80.85	89.60	84.79	101.68	100.00	102.48	142.89	117.96	115.08
Quantity Index	Aggregate	88.43	96.97	98.05	99.97	98.90	100.00	98.55	73.87	69.33	73.44
Value Index	PCOD	45.56	65.00	88.32	73.40	76.32	100.00	126.67	116.91	51.92	73.82
Price Index	PCOD	70.59	71.95	77.27	70.27	78.51	100.00	118.43	121.56	70.89	72.57
Quantity Index	PCOD	64.54	90.33	114.29	104.46	97.21	100.00	106.96	96.17	73.24	101.72
Value Share	PCOD	0.08	0.11	0.13	0.11	0.10	0.13	0.17	0.15	0.08	0.12
Value Index	PLCK	81.07	80.46	88.11	86.29	103.63	100.00	96.69	104.38	86.31	84.67
Price Index	PLCK	88.03	81.75	91.19	86.94	105.54	100.00	99.74	148.58	127.35	122.38
Quantity Index	PLCK	92.10	98.42	96.62	99.25	98.19	100.00	96.94	70.25	67.77	69.19
Value Share	PLCK	0.90	0.87	0.85	0.86	0.88	0.85	0.81	0.84	0.90	0.85
Value Index	SABL	95.74	117.55	100.21	125.31	188.71	100.00	136.20	98.29	108.11	212.12
Price Index	SABL	94.89	91.37	95.63	87.65	92.62	100.00	110.18	134.36	143.19	188.27
Quantity Index	SABL	100.89	128.65	104.79	142.96	203.75	100.00	123.62	73.15	75.50	112.67
Value Share	SABL	0.01	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.01	0.03

Table 3: Species Indicies and Value Share for the BSAI Shoreside Wholesale Market.

Note: Species with a value share less than 1% were not included. All groundfish species were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region’s WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Product	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	76.27	78.41	87.85	84.77	100.56	100.00	100.99	105.55	81.78	84.51
Price Index	Aggregate	86.25	80.85	89.60	84.79	101.68	100.00	102.48	142.89	117.96	115.08
Quantity Index	Aggregate	88.43	96.97	98.05	99.97	98.90	100.00	98.55	73.87	69.33	73.44
Value Index	Deep-skin	29.13	42.79	58.88	51.91	83.41	100.00	141.19	107.49	107.08	87.56
Price Index	Deep-skin	83.77	92.51	90.96	84.82	102.68	100.00	102.52	123.65	126.84	118.77
Quantity Index	Deep-skin	34.78	46.25	64.74	61.19	81.24	100.00	137.72	86.94	84.42	73.72
Value Share	Deep-skin	0.03	0.04	0.05	0.05	0.06	0.08	0.11	0.08	0.10	0.08
Value Index	Fillet	47.73	69.60	79.38	80.23	90.53	100.00	95.81	88.21	90.91	87.82
Price Index	Fillet	65.08	82.14	76.35	74.85	93.30	100.00	105.82	135.15	134.90	129.06
Quantity Index	Fillet	73.35	84.73	103.97	107.19	97.03	100.00	90.55	65.27	67.39	68.04
Value Share	Fillet	0.19	0.27	0.27	0.28	0.27	0.30	0.28	0.25	0.33	0.31
Value Index	Head&Gut	36.39	51.31	50.66	88.86	94.04	100.00	175.15	146.02	157.45	187.61
Price Index	Head&Gut	74.61	73.74	79.71	74.68	82.66	100.00	120.92	132.90	87.59	87.27
Quantity Index	Head&Gut	48.77	69.57	63.56	118.99	113.76	100.00	144.85	109.87	179.76	214.98
Value Share	Head&Gut	0.03	0.05	0.04	0.07	0.07	0.07	0.12	0.10	0.14	0.16
Value Index	Meal	96.62	71.79	58.89	76.64	62.97	100.00	88.47	77.00	42.39	53.59
Price Index	Meal	70.90	75.14	67.48	70.69	81.04	100.00	88.16	111.11	123.19	112.18
Quantity Index	Meal	136.27	95.54	87.27	108.42	77.70	100.00	100.35	69.30	34.41	47.77
Value Share	Meal	0.03	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.01
Value Index	Other	76.69	76.72	89.89	65.89	61.26	100.00	92.39	91.45	66.33	86.12
Price Index	Other	73.27	69.50	73.37	68.64	62.56	100.00	103.60	114.22	88.95	92.18
Quantity Index	Other	104.67	110.39	122.51	95.99	97.92	100.00	89.18	80.07	74.57	93.43
Value Share	Other	0.05	0.05	0.05	0.04	0.03	0.05	0.04	0.04	0.04	0.05
Value Index	Roe	134.45	102.81	85.02	110.22	126.89	100.00	86.32	81.02	61.25	35.15
Price Index	Roe	154.80	108.34	118.08	131.46	147.87	100.00	84.92	119.51	84.10	53.91
Quantity Index	Roe	86.85	94.89	72.00	83.84	85.81	100.00	101.64	67.80	72.84	65.20
Value Share	Roe	0.28	0.21	0.15	0.21	0.20	0.16	0.14	0.12	0.12	0.07

Table 4 (part): Product Indicies and Value Share for the BSAI Shoreside Wholesale Market.

Value Index	Salt&Split	210.17	241.28	201.51	181.18	102.66	100.00	106.68	34.31	3.36	2.22
Price Index	Salt&Split	77.08	79.89	90.92	94.79	86.31	100.00	115.52	48.26	38.48	57.93
Quantity Index	Salt&Split	272.68	302.02	221.64	191.13	118.94	100.00	92.35	71.11	8.73	3.83
Value Share	Salt&Split	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
Value Index	Surimi	96.35	86.87	104.34	84.40	122.84	100.00	89.19	153.59	75.22	91.27
Price Index	Surimi	79.43	69.60	84.51	78.04	107.85	100.00	105.15	214.11	145.87	162.07
Quantity Index	Surimi	121.32	124.80	123.47	108.16	113.89	100.00	84.82	71.74	51.56	56.31
Value Share	Surimi	0.30	0.26	0.28	0.24	0.29	0.24	0.21	0.34	0.22	0.26

Table 4 (continued) : Product Indicies and Value Share for the BSAI Shoreside Wholesale Market.

Note: Product types with a value share less than 1% were not included. The minced product type has not been included. All product ypes were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details on index construction and product decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: Catch-accounting system estimates, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	71.56	82.50	85.19	78.09	91.09	100.00	93.55	111.82	74.91	62.05
Price Index	Aggregate	80.46	84.35	82.83	79.27	91.51	100.00	103.26	156.21	127.23	102.80
Quantity Index	Aggregate	88.94	97.81	102.85	98.50	99.54	100.00	90.59	71.58	58.88	60.36
Value Index	PCOD	37.93	46.29	90.80	63.36	64.12	100.00	111.13	135.91	46.28	56.27
Price Index	PCOD	62.98	53.15	73.74	60.96	66.27	100.00	119.05	149.67	65.47	66.08
Quantity Index	PCOD	60.23	87.11	123.13	103.93	96.75	100.00	93.35	90.80	70.69	85.15
Value Share	PCOD	0.09	0.10	0.19	0.14	0.12	0.18	0.21	0.21	0.11	0.16
Value Index	PLCK	79.24	90.58	84.83	82.16	97.53	100.00	88.99	107.19	80.26	61.52
Price Index	PLCK	84.86	90.73	84.05	83.24	97.34	100.00	100.14	161.64	147.91	113.03
Quantity Index	PLCK	93.38	99.84	100.92	98.70	100.19	100.00	88.86	66.32	54.26	54.43
Value Share	PLCK	0.88	0.87	0.79	0.82	0.84	0.78	0.74	0.75	0.84	0.79
Value Index	SABL	101.91	131.85	82.44	69.04	92.90	100.00	105.61	103.82	95.63	142.82
Price Index	SABL	77.77	99.41	94.47	77.68	82.81	100.00	95.60	125.97	113.89	141.76
Quantity Index	SABL	131.05	132.63	87.27	88.88	112.19	100.00	110.47	82.42	83.97	100.74
Value Share	SABL	0.02	0.02	0.01	0.03	0.03	0.03	0.04	0.03	0.04	0.04

Table 5: Species Indicies and Value Share for the BSAI Shoreside Ex-Vessel Market.

Note: Species with a value share less than 1% were not included. All groundfish species were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Gear	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	71.56	82.50	85.19	78.09	91.09	100.00	93.55	111.82	74.91	62.05
Price Index	Aggregate	80.46	84.35	82.83	79.27	91.51	100.00	103.26	156.21	127.23	102.80
Quantity Index	Aggregate	88.94	97.81	102.85	98.50	99.54	100.00	90.59	71.58	58.88	60.36
Value Index	HAL	138.46	166.01	114.15	82.84	97.11	100.00	59.40	119.18	140.44	203.64
Price Index	HAL	73.95	90.80	89.03	74.04	92.98	100.00	103.20	124.90	106.40	129.85
Quantity Index	HAL	187.24	182.84	128.22	111.88	104.44	100.00	57.56	95.43	132.00	156.83
Value Share	HAL	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.04
Value Index	POT	39.24	32.20	76.21	53.43	65.52	100.00	108.41	126.40	47.03	79.34
Price Index	POT	61.09	54.84	73.18	63.36	68.77	100.00	105.82	132.44	71.33	76.82
Quantity Index	POT	64.24	58.71	104.15	84.34	95.28	100.00	102.45	95.44	65.93	103.29
Value Share	POT	0.04	0.03	0.07	0.06	0.07	0.09	0.11	0.10	0.06	0.08
Value Index	TWL	73.40	85.60	85.69	80.52	93.60	100.00	92.51	110.23	76.82	59.69
Price Index	TWL	82.43	86.55	83.73	80.96	93.74	100.00	102.99	159.78	134.66	105.33
Quantity Index	TWL	89.04	98.90	102.35	99.47	99.85	100.00	89.83	68.99	57.05	56.67
Value Share	TWL	0.93	0.95	0.92	0.92	0.92	0.90	0.89	0.88	0.92	0.88

Table 6: Gear Indicies and Value Share for the BSAI Shoreside Ex-Vessel Market.

Note: The Fisher index method was used to construct the indices. Further details on index construction and gear decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	64.31	75.71	81.69	66.43	79.66	100.00	95.76	97.98	85.01	102.87
Price Index	Aggregate	66.38	69.83	72.15	77.96	95.12	100.00	92.59	96.25	84.40	96.24
Quantity Index	Aggregate	96.88	108.42	113.23	85.21	83.75	100.00	103.42	101.81	100.72	106.89
Value Index	AMCK	18.37	9.59	72.44	48.64	115.61	100.00	81.96	194.55	377.82	364.34
Price Index	AMCK	144.94	185.58	144.96	110.91	132.78	100.00	97.31	167.27	238.43	237.32
Quantity Index	AMCK	12.67	5.17	49.98	43.86	87.07	100.00	84.23	116.30	158.46	153.52
Value Share	AMCK	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03
Value Index	FLAT	71.16	87.11	111.02	42.93	88.52	100.00	80.22	84.56	77.95	76.43
Price Index	FLAT	75.52	71.54	73.33	100.08	115.63	100.00	93.63	94.42	80.68	82.14
Quantity Index	FLAT	94.24	121.77	151.40	42.90	76.55	100.00	85.68	89.56	96.62	93.05
Value Share	FLAT	0.24	0.24	0.29	0.14	0.24	0.21	0.18	0.18	0.19	0.16
Value Index	PCOD	116.51	117.83	97.96	80.60	30.64	100.00	142.77	162.69	103.63	152.31
Price Index	PCOD	63.24	63.06	67.45	67.97	72.13	100.00	106.24	107.51	72.25	81.37
Quantity Index	PCOD	184.23	186.86	145.22	118.58	42.48	100.00	134.39	151.33	143.43	187.17
Value Share	PCOD	0.33	0.28	0.22	0.22	0.07	0.18	0.27	0.30	0.22	0.27
Value Index	ROCK	27.98	41.34	44.41	50.68	79.88	100.00	72.76	67.05	67.53	95.77
Price Index	ROCK	40.70	56.24	56.77	63.12	93.86	100.00	75.09	70.68	69.36	85.44
Quantity Index	ROCK	68.74	73.51	78.23	80.29	85.11	100.00	96.89	94.87	97.37	112.10
Value Share	ROCK	0.16	0.20	0.20	0.28	0.36	0.36	0.28	0.25	0.29	0.34
Value Index	SABL	76.92	88.36	97.67	101.80	108.56	100.00	106.39	100.58	86.04	82.96
Price Index	SABL	83.58	85.16	87.58	82.92	91.66	100.00	104.11	122.95	125.20	147.67
Quantity Index	SABL	92.03	103.76	111.52	122.78	118.43	100.00	102.20	81.81	68.72	56.18
Value Share	SABL	0.27	0.27	0.27	0.35	0.31	0.23	0.25	0.23	0.23	0.18

Table 7: Species Indicies and Value Share for the GOA At-Sea Wholesale Market.

Note: Species with a value share less than 1% were not included. All groundfish species were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Product	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	64.31	75.71	81.69	66.43	79.66	100.00	95.76	97.98	85.01	102.87
Price Index	Aggregate	66.38	69.83	72.15	77.96	95.12	100.00	92.59	96.25	84.40	96.24
Quantity Index	Aggregate	96.88	108.42	113.23	85.21	83.75	100.00	103.42	101.81	100.72	106.89
Value Index	Head&Gut	59.12	71.38	72.60	69.17	79.68	100.00	96.79	100.03	80.41	103.06
Price Index	Head&Gut	63.00	67.25	69.02	76.76	92.79	100.00	91.99	95.45	85.45	100.07
Quantity Index	Head&Gut	93.84	106.15	105.19	90.11	85.87	100.00	105.21	104.79	94.10	102.99
Value Share	Head&Gut	0.78	0.80	0.76	0.88	0.85	0.85	0.86	0.87	0.80	0.85
Value Index	Other	85.16	141.57	127.62	69.70	64.82	100.00	136.44	159.00	91.80	122.95
Price Index	Other	95.20	99.62	85.00	95.81	103.67	100.00	108.50	118.84	77.21	86.20
Quantity Index	Other	89.45	142.11	150.15	72.75	62.53	100.00	125.76	133.79	118.89	142.63
Value Share	Other	0.02	0.03	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.02
Value Index	Whole	92.04	95.95	133.62	49.01	81.02	100.00	85.12	79.10	112.80	99.58
Price Index	Whole	84.93	83.21	90.20	82.26	109.66	100.00	94.58	98.69	79.90	79.22
Quantity Index	Whole	108.37	115.31	148.13	59.58	73.88	100.00	89.99	80.15	141.19	125.69
Value Share	Whole	0.19	0.17	0.22	0.10	0.14	0.14	0.12	0.11	0.18	0.13

Table 8: Product Indicies and Value Share for the GOA At-Sea Wholesale Market.

Note: Product types with a value share less than 1% were not included. The minced product type has not been included. All product ypes were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details on index construction and product decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	76.48	72.10	73.36	81.05	99.75	100.00	104.81	117.14	86.99	118.75
Price Index	Aggregate	86.89	89.45	86.97	86.07	100.81	100.00	106.73	123.43	107.86	112.40
Quantity Index	Aggregate	88.02	80.60	84.35	94.17	98.96	100.00	98.19	94.91	80.65	105.64
Value Index	FLAT	48.94	45.76	31.86	29.81	64.92	100.00	112.50	131.85	98.68	72.60
Price Index	FLAT	100.24	118.12	115.58	82.90	116.02	100.00	104.44	102.47	90.55	95.17
Quantity Index	FLAT	48.82	38.75	27.57	35.96	55.95	100.00	107.72	128.68	108.98	76.28
Value Share	FLAT	0.05	0.04	0.03	0.03	0.05	0.07	0.08	0.08	0.08	0.04
Value Index	PCOD	67.87	79.10	74.15	87.20	91.49	100.00	132.33	150.05	87.95	131.94
Price Index	PCOD	77.07	78.22	72.53	81.24	88.16	100.00	114.88	123.41	85.59	83.21
Quantity Index	PCOD	88.06	101.13	102.24	107.34	103.78	100.00	115.19	121.59	102.75	158.57
Value Share	PCOD	0.27	0.33	0.31	0.32	0.28	0.30	0.38	0.39	0.31	0.34
Value Index	PLCK	93.80	54.28	49.01	67.14	124.02	100.00	71.34	87.05	62.02	118.10
Price Index	PLCK	92.60	87.33	84.87	93.90	118.98	100.00	98.83	153.95	142.51	129.72
Quantity Index	PLCK	101.30	62.15	57.74	71.50	104.23	100.00	72.19	56.54	43.52	91.04
Value Share	PLCK	0.30	0.19	0.17	0.21	0.31	0.25	0.17	0.18	0.18	0.25
Value Index	ROCK	53.34	95.17	60.78	53.36	99.30	100.00	97.64	89.63	73.67	106.55
Price Index	ROCK	86.37	104.11	90.02	71.44	100.00	100.00	100.81	90.90	84.04	94.37
Quantity Index	ROCK	61.76	91.42	67.52	74.69	99.31	100.00	96.86	98.61	87.66	112.90
Value Share	ROCK	0.04	0.07	0.05	0.04	0.06	0.06	0.05	0.04	0.05	0.05
Value Index	SABL	82.99	82.39	102.07	103.34	97.61	100.00	104.24	110.26	104.14	117.47
Price Index	SABL	86.64	92.19	94.39	84.57	96.35	100.00	104.31	120.97	128.49	153.16
Quantity Index	SABL	95.79	89.37	108.13	122.20	101.30	100.00	99.93	91.15	81.05	76.70
Value Share	SABL	0.34	0.36	0.44	0.40	0.31	0.32	0.31	0.30	0.38	0.31

Table 9: Species Indicies and Value Share for the GOA Shoreside Wholesale Market.

Note: Species with a value share less than 1% were not included. All groundfish species were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Product	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	76.48	72.10	73.36	81.05	99.75	100.00	104.81	117.14	86.99	118.75
Price Index	Aggregate	86.89	89.45	86.97	86.07	100.81	100.00	106.73	123.43	107.86	112.40
Quantity Index	Aggregate	88.02	80.60	84.35	94.17	98.96	100.00	98.19	94.91	80.65	105.64
Value Index	Fillet	67.37	82.86	82.19	60.41	90.64	100.00	95.64	111.59	96.24	131.18
Price Index	Fillet	62.76	74.00	70.73	68.92	90.57	100.00	112.34	120.91	92.95	91.69
Quantity Index	Fillet	107.35	111.98	116.20	87.65	100.08	100.00	85.13	92.29	103.54	143.08
Value Share	Fillet	0.22	0.29	0.29	0.19	0.23	0.26	0.23	0.24	0.28	0.28
Value Index	Head&Gut	67.32	59.23	70.46	91.48	97.39	100.00	116.97	119.50	91.38	123.25
Price Index	Head&Gut	84.09	94.56	93.55	85.42	99.15	100.00	105.28	119.80	112.92	125.62
Quantity Index	Head&Gut	80.05	62.64	75.32	107.10	98.22	100.00	111.10	99.75	80.93	98.12
Value Share	Head&Gut	0.41	0.38	0.44	0.52	0.45	0.46	0.51	0.47	0.48	0.48
Value Index	Other	75.95	105.93	93.06	93.26	100.49	100.00	91.13	153.01	101.01	109.55
Price Index	Other	118.73	86.69	76.25	103.15	106.77	100.00	105.12	118.49	113.53	110.44
Quantity Index	Other	63.97	122.19	122.05	90.42	94.11	100.00	86.68	129.13	88.97	99.20
Value Share	Other	0.09	0.14	0.12	0.11	0.10	0.10	0.08	0.12	0.11	0.09
Value Index	Roe	189.21	68.28	63.17	91.07	160.91	100.00	91.88	78.40	38.03	41.45
Price Index	Roe	172.60	118.32	120.76	175.81	170.75	100.00	85.92	126.47	117.28	67.95
Quantity Index	Roe	109.62	57.71	52.31	51.80	94.24	100.00	106.93	61.99	32.42	61.00
Value Share	Roe	0.13	0.05	0.05	0.06	0.09	0.05	0.05	0.04	0.02	0.02
Value Index	Surimi	112.15	96.48	69.56	80.28	142.09	100.00	75.02	136.07	58.30	159.87
Price Index	Surimi	77.44	86.17	82.30	80.44	103.83	100.00	102.34	214.85	158.21	168.71
Quantity Index	Surimi	144.82	111.96	84.52	99.80	136.85	100.00	73.30	63.33	36.85	94.76
Value Share	Surimi	0.09	0.08	0.06	0.06	0.09	0.06	0.04	0.07	0.04	0.08
Value Index	Whole	67.97	75.88	73.54	55.64	65.92	100.00	137.81	110.95	111.62	109.14
Price Index	Whole	83.78	90.94	100.09	79.48	92.27	100.00	142.40	108.56	94.10	94.05
Quantity Index	Whole	81.13	83.44	73.48	70.00	71.44	100.00	96.78	102.20	118.61	116.05
Value Share	Whole	0.04	0.04	0.04	0.03	0.03	0.04	0.05	0.04	0.05	0.04

Table 10: Product Indicies and Value Share for the GOA Shoreside Wholesale Market.

Note: Product types with a value share less than 1% were not included. The minced product type has not been included. All product ypes were used to contruct aggregate indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's WPR; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Species	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	74.12	61.67	82.13	85.07	88.75	100.00	105.40	122.74	92.46	115.49
Price Index	Aggregate	81.70	75.18	83.03	74.56	82.31	100.00	111.07	124.60	107.07	112.96
Quantity Index	Aggregate	90.73	82.03	98.92	114.10	107.82	100.00	94.89	98.50	86.36	102.24
Value Index	FLAT	56.76	41.56	31.60	29.23	56.26	100.00	112.93	129.70	105.63	74.35
Price Index	FLAT	115.93	89.14	83.24	60.99	84.40	100.00	110.22	102.27	95.56	77.18
Quantity Index	FLAT	48.96	46.62	37.96	47.94	66.66	100.00	102.46	126.82	110.54	96.33
Value Share	FLAT	0.04	0.03	0.02	0.02	0.03	0.05	0.05	0.05	0.05	0.03
Value Index	PCOD	53.77	45.78	78.62	81.13	80.32	100.00	133.18	156.71	77.43	107.14
Price Index	PCOD	72.05	65.52	76.15	67.58	74.51	100.00	125.94	133.22	74.72	66.95
Quantity Index	PCOD	74.63	69.88	103.25	120.04	107.80	100.00	105.75	117.64	103.63	160.03
Value Share	PCOD	0.19	0.20	0.25	0.25	0.24	0.27	0.34	0.34	0.22	0.25
Value Index	PLCK	96.08	57.07	49.15	67.16	104.49	100.00	77.79	92.97	74.11	136.64
Price Index	PLCK	94.11	78.78	70.03	75.24	91.67	100.00	106.89	134.13	128.49	127.85
Quantity Index	PLCK	102.08	72.45	70.19	89.25	113.98	100.00	72.77	69.31	57.67	106.87
Value Share	PLCK	0.20	0.14	0.09	0.12	0.18	0.16	0.12	0.12	0.13	0.19
Value Index	ROCK	96.18	75.45	76.22	71.88	75.75	100.00	114.73	111.81	67.17	92.43
Price Index	ROCK	54.26	57.01	58.97	63.67	77.50	100.00	103.05	105.77	70.22	84.03
Quantity Index	ROCK	177.24	132.34	129.24	112.89	97.73	100.00	111.32	105.71	95.65	110.00
Value Share	ROCK	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
Value Index	SABL	79.34	73.45	99.10	99.50	92.70	100.00	97.79	112.62	105.54	117.74
Price Index	SABL	83.30	79.30	90.12	78.68	83.55	100.00	103.84	120.67	129.14	151.23
Quantity Index	SABL	95.24	92.63	109.96	126.46	110.95	100.00	94.18	93.33	81.72	77.86
Value Share	SABL	0.53	0.58	0.59	0.57	0.51	0.49	0.46	0.45	0.56	0.50

Table 11: Species Indicies and Value Share for the GOA Shoreside Ex-Vessel Market.

Note: Species with a value share less than 1% were not included. All groundfish species were used to contruct aggregate indices and value share. The Fisher index method was used to construct the indices. Further details can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

	Gear	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value Index	Aggregate	74.12	61.67	82.13	85.07	88.75	100.00	105.40	122.74	92.46	115.49
Price Index	Aggregate	81.70	75.18	83.03	74.56	82.31	100.00	111.07	124.60	107.07	112.96
Quantity Index	Aggregate	90.73	82.03	98.92	114.10	107.82	100.00	94.89	98.50	86.36	102.24
Value Index	HAL	80.14	73.85	97.37	98.35	91.33	100.00	100.79	116.46	104.99	116.80
Price Index	HAL	82.52	79.03	89.28	78.44	83.18	100.00	106.47	120.86	120.24	137.16
Quantity Index	HAL	97.11	93.45	109.07	125.38	109.80	100.00	94.67	96.36	87.31	85.15
Value Share	HAL	0.58	0.65	0.64	0.62	0.56	0.54	0.52	0.51	0.61	0.55
Value Index	POT	17.13	19.33	66.56	71.48	76.94	100.00	123.62	151.38	69.56	101.29
Price Index	POT	73.18	64.22	75.73	65.93	74.38	100.00	122.29	148.80	74.47	68.07
Quantity Index	POT	23.40	30.10	87.89	108.42	103.44	100.00	101.09	101.73	93.42	148.81
Value Share	POT	0.03	0.05	0.12	0.13	0.13	0.15	0.18	0.19	0.11	0.13
Value Index	TWL	91.32	60.99	63.09	68.50	89.98	100.00	104.57	119.78	81.73	120.11
Price Index	TWL	83.33	71.79	73.65	71.10	84.57	100.00	113.52	119.03	101.21	97.20
Quantity Index	TWL	109.59	84.96	85.66	96.34	106.40	100.00	92.12	100.63	80.76	123.57
Value Share	TWL	0.38	0.31	0.24	0.25	0.31	0.31	0.31	0.30	0.27	0.32

Table 12: Gear Indicies and Value Share for the GOA Shoreside Ex-Vessel Market.

Note: The Fisher index method was used to construct the indices. Further details on index construction and gear decomposition can be found in the text or by contacting Ben.Fissel@NOAA.gov.

Source: NMFS Alaska Region's CAS and WPR estimates; ADF&G COAR, National Marine Fisheries Serivces, P.O. Box 15700, Seattle, WA 98115-0070.

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Preface

Contributors

The primary author of this document was Donald M. Schug of Northern Economics, Inc. Other contributors from Northern Economics were Marcus L. Hartley and Anne Bunger. Quentin Fong of the Fishery Information and Technology Center, University of Alaska Fairbanks assisted with gathering information on seafood processors in the People's Republic of China.

Seafood industry representatives were interviewed during the preparation of this document. These individuals participated with the assurance that information they provided would not be directly attributed to them. The information they offered provided new insights in seafood markets and was also used to cross-check published material. Listed in no specific order, the industry participants are as follows:

Dave Little and Paul Gilliland, Bering Select Seafoods Company
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William Guo, Qingdao Fortune Seafoods, Inc.
Merle Knapp, Glacier Fish Company
Bill Orr, Best Use Cooperative

Sources of Market Information

For information on seafood markets presented in the original 2008 report and for some of the updates in the current report, the following online sources were consulted:

- Seafood.com News, a seafood industry daily news service. This service also publishes BANR JAPAN REPORTS, selected articles and statistical data originally sourced and translated from the Japanese Fisheries Press.
- GLOBEFISH, a non-governmental seafood market and trade organization associated with the United Nations.
- FAS Worldwide, a magazine from the U.S. Department of Agriculture's Foreign Agricultural Service.
- IntraFish.com, a seafood industry daily news service.
- SeaFood Business, a trade magazine for seafood buyers.

Archival information from these sources was also reviewed in order to obtain a broader perspective of market trends. Other news services consulted were FISHupdate.com and Fishnet.ru.

For a general overview of Alaska pollock and Pacific cod markets, the analysis relied primarily on the following reports:

- Studies of Alaska pollock and Pacific cod markets prepared by Gunnar Knapp, Institute of Social and Economic Research, University of Alaska Anchorage for the North Pacific Fisheries Management Council developed in 2005 and 2006.
- A description of markets for Alaska pollock and Pacific cod prepared by the National Marine Fisheries Service for the 2001 *Steller Sea Lion Protection Measures Final Supplemental Environmental Impact Statement*.

Information from the above news services and reports was supplemented with market facts found in various reports and articles identified through Web searches. In sifting through the extensive information garnered from these searches, the following precautionary advice offered by Gunnar Knapp was considered:

> *In reading trade press articles about market conditions, it is important to keep in mind that individual articles tend to be narrowly focused on particular topics—such as a particular auction or supply or product quality from a particular fishery. A "bigger picture" view of market conditions only emerges after reading articles over a long period of time—ideally several years.*
>
> *In addition, it is important to keep in mind that … seafood trade press articles—like any press analysis of any topic--are not necessarily objective or accurate. Some articles reflect the point of view of particular market participants.* [1]

Several sources of fishery statistics were used to prepare and update the figures presented in this document, including databases maintained by the National Marine Fisheries Service (NMFS) Alaska Regional Office, Alaska Department of Fish and Game (ADF&G), Pacific Fisheries Information Network (PacFIN), Foreign Trade Division of the U.S. Census Bureau, and U.N. Food and Agriculture Organization (FAO).

A Notice on Terminology

In this document, we make frequent use of such terms as "Alaska groundfish fishery", "groundfish fishery off Alaska", and "Alaska fishery" for various groundfish species. These terms should be taken to include both groundfish fisheries managed under a federal Fisheries Management Plan (FMP) developed by the North Pacific Fisheries Management Council (NPFMC) and groundfish fisheries managed by the state of Alaska. Similarly, such terms as "Alaskan waters" or "waters off Alaska" should be understood to mean both waters inside the 3-mile limit of the state of Alaska and waters outside Alaska's 3-mile limit in the federal exclusive economic zone (EEZ). Consequently, all of the catch, production, and revenue information presented in this report applies to all groundfish catch from both Alaska-state waters and waters of the EEZ off Alaska, whether the catch was made under a federal FMP or under Alaska-state management. No attempt has been made to include only one of these categories of Alaskan groundfish or to exclude the other. The reader of this document should also be aware that the export data presented in this report in some cases include both groundfish caught in the waters off Alaska and groundfish of the same species caught elsewhere in the U.S. The profiles for the individual species will discuss what portion of the total exports of the species is represented by catch from Alaskan fisheries.

[1] Knapp, G. 2005. An Overview of Markets for Alaska Pollock Roe. Paper prepared for the North Pacific Fisheries Management Council, Anchorage, AK. p.34.

Alaska Pollock Fillets Market Profile

Description of the Fishery

Alaska pollock or walleye pollock (*Theragra chalcogramma*) is widely distributed in the temperate to boreal North Pacific, from Central California into the eastern Bering Sea, along the Aleutian arc, around Kamchatka, in the Okhotsk Sea and into the southern Sea of Japan.

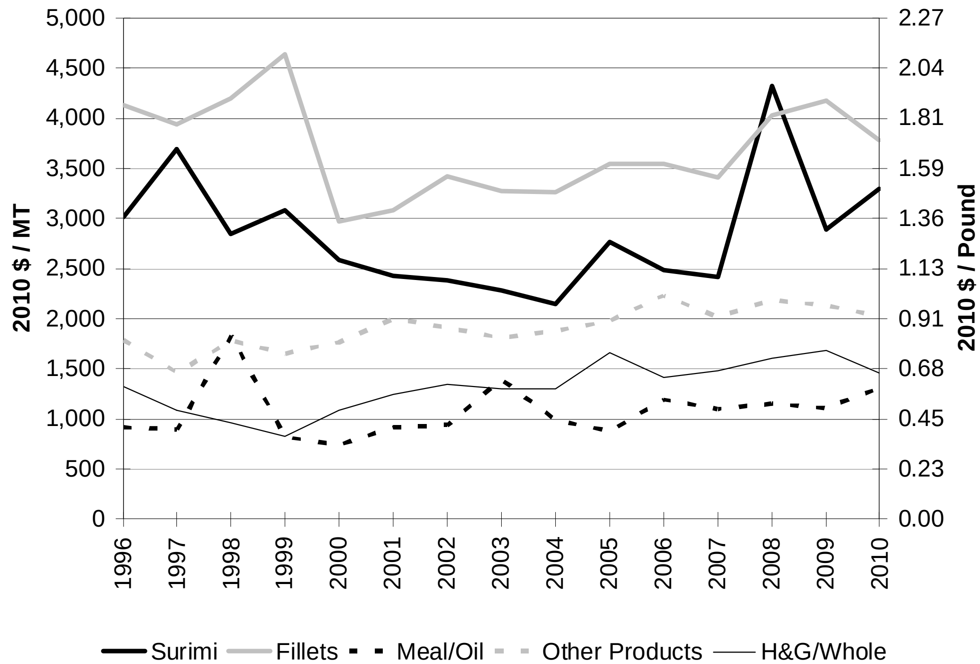
The Alaska pollock fishery in the waters off Alaska is among the world's largest fisheries. Under U.S. federal law, the fishery is subject to total allowable catch (TAC) limitations, quota allocations among the different sectors of participants in the fishery, and rules that give exclusive harvesting rights to specifically identified vessels, with the result that any potential new competitors face significant barriers to entry. In recent years, approximately 95 percent of the Alaska pollock fishery has been harvested in the Bering Sea and Aleutian Islands (BSAI) with the remaining 5 percent harvested in the Gulf of Alaska (GOA).

The American Fisheries Act (AFA) specifies how the TAC is allocated annually among the three sectors of the BSAI pollock fishery (inshore, catcher processors, and motherships) and community development quota (CDQ) groups. The AFA also specifically identifies the catcher/processors and catcher vessels that are eligible to participate in the Bering Sea-Aleutian Islands (BSAI) pollock fishery, and provides for the formation of cooperatives that effectively eliminates the race for fish. Under the cooperative agreements, members limit their individual catches to a specific percentage of the TAC allocated to their sector. Once the catch is allocated, members can freely transfer their quota to other members.

The BSAI pollock fishery is also split into two distinct seasons, known as the “A” and “B” seasons. The “A” season opens in January and typically ends in April. The “A” season accounts for 40% of the annual quota, while the “B” season accounts for the remaining 60%. During the “A” season, pollock are spawning and develop significant quantities of high-value roe, making this season the more profitable one for some producers. During the “A” season other primary products, such as surimi and fillet blocks, are also produced although yields on these products are slightly lower in “A” season compared to “B” season due to the high roe content of pollock harvested in the “A” season. The “B” season occurs in the latter half of the year, typically beginning in July and extending through the end of October. The primary products produced in the “B” season are surimi and fillet blocks. Figure 1 shows the wholesale prices for U.S. primary production of Alaska pollock products. Roe prices are not included because the per unit value of roe is so much higher than other products; the wholesale price of Alaska pollock roe was about $15,800 per mt in 2005, for example, and $4900 per mt in 2010 (Figure 21) (the wholesale price estimates are in 2010 dollars and were derived from Commercial Operator’s Annual Report data collected and maintained by the Alaska Department of Fish and Game).

Prior to the implementation of the American Fisheries Act, most of the U.S. Alaska pollock catches were processed into surimi. Since the BSAI fishery was managed as an “open-access” fishery, the focus was on obtaining as large a share of the TAC as possible. Surimi production can handle more raw material in a short period of time than fillet and fillet block production. With the establishment of the quota allocation program and cooperative, the companies involved were given more time to produce products according to the current market situation (Sjøholt 1998). As the global decrease in the supply of traditional whitefish strengthened the demand for other product forms made from Alaska pollock, the share of fillets in total Alaska pollock production increased (Knapp 2006; Guenneugues and Morrissey 2005). The changes in the quantity and wholesale value of fillet and other product production are shown in Figure 2 and Figure 3. Notice that the production volume for all pollock products has declined since 2006 due largely to reduced TACs.

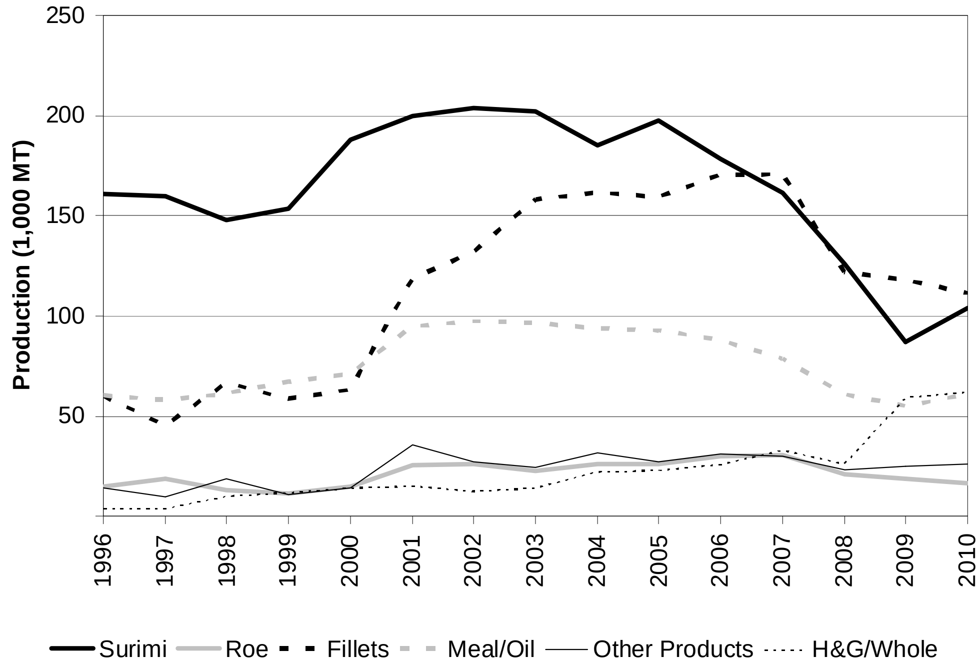
Figure 1. Wholesale Prices for Alaska Primary Production of Alaska Pollock Products (excluding Roe) by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

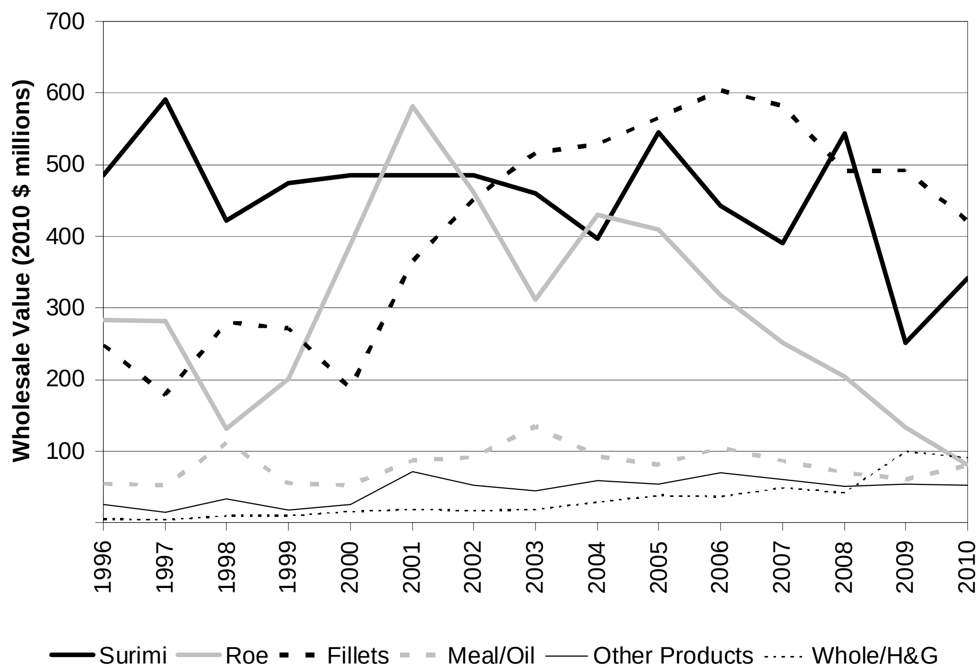
Figure 2. Alaska Primary Production of Alaska Pollock by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010.

Figure 3. Wholesale Value of Alaska Primary Alaska Pollock Production by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

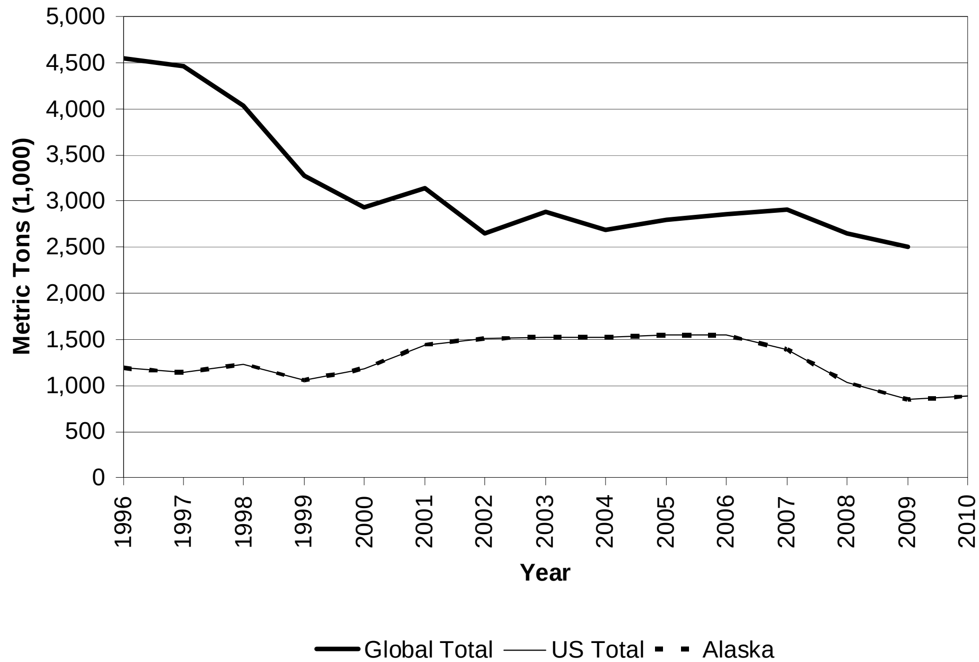
Production

The Alaska pollock is the most abundant groundfish/whitefish species in the world (Sjøholt 1998), and it is the world's highest-volume groundfish harvested for human consumption. With the exception of a small portion caught in Washington State, all of the Alaska pollock landed in the United States is harvested in the fishery off the coast of Alaska (Figure 4). This fishery is the largest U.S. fishery by volume. Of all the products made from Alaska-caught pollock, fillet production increased particularly rapidly, until the sharp decline in 2008, due to increased harvests, increased yields, and the aforementioned shift by processors from surimi to fillet production (Knapp 2006).

In the early 1990s, the spike in cod pricing that followed the decrease in the Atlantic cod supply led to the conversion of most fillet customers to lower-priced, relatively more abundant pollock as a primary source of groundfish. (American Seafoods Group LLC 2002).

U.S. Alaska pollock fillet producers face competition from Russian Alaska pollock processed in China. Catches in Russia's pollock fishery in the Sea of Okhotsk, which used to be twice the size of catches in the U.S. Bering Sea-Aleutian Islands pollock fishery, have until recently shown a declining trend. This decrease accounts for the generally falling global production of Alaska pollock shown in Figure 4. The pollock stocks in the US EEZ are also falling. In 2007, the TAC for BSAI pollock fell from 1.5 million mt to 1.4 million mt which doubtless led to the decline in harvests in 2007 shown in Figure 4. The BSAI pollock TAC dropped again to 1.0 million mt in 2008, and then to just over 0.8 million mt in 2009, which represents a 46% reduction from the 2006 TAC. The BSAI pollock TAC remained at about 0.8 million mt in 2010 and was increased to 1.25 million mt for 2011.

Figure 4. Alaska, Total U.S. and Global Retained Harvests of Alaska Pollock, 1996 – 2010



Note: Data for 2010 were unavailable for global total.

Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html; Global data from FAO, "FishStat" database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

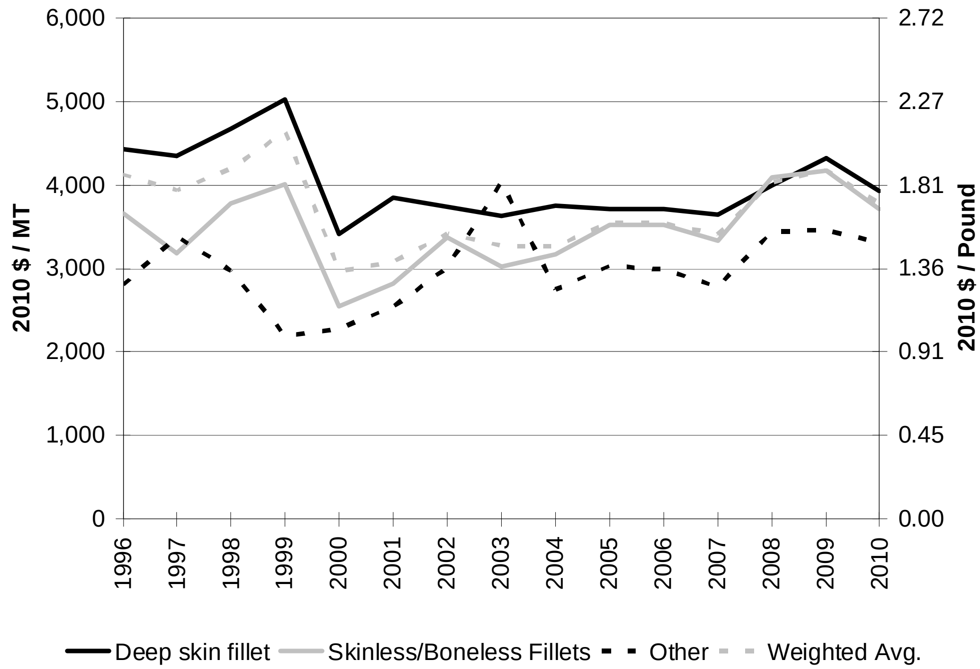
Product Composition and Flow

Pollock fillets are typically sold as fillets and fillet blocks (frozen, compressed slabs of fillets used as raw material for value-added products such as breaded items, including nuggets, fish sticks, and fish burgers), either as pin bone out fillets, pin bone in fillets, or deep-skinned fillets. Deep-skinned fillets are generally leaner and whiter than other fillets and command the highest wholesale price (Figure 5).

The price of pollock fillets also varies according to the freezing process. The highest-priced pollock fillets are single-frozen, frozen at sea (FAS), product produced by Alaska and Russian catcher/processors. Next would be single-frozen fillets processed by Alaska shoreside plants. Twice-frozen (also referred to as double-frozen or refrozen) pollock fillets, most of which are processed in China, have traditionally been considered the lowest grade of fillets and have sold at a discount, especially in comparison to FAS single-frozen fillets (Pacific Seafood Group undated). Twice-frozen fillets can be stored for a maximum of six months, whereas single-frozen can be stored for nine to 12 months; moreover, twice-frozen fillets are reportedly greyer in color and often have a fishy aroma (Eurofish 2003). However, industry representatives noted that, by the early 2000's, the acceptability of twice-frozen fillets had been increasing in many markets, and the quality of this product was considered by some to be similar to that of land-frozen fillets (GSGislason & Associates Ltd. 2003). Pollock is a fragile fish that deteriorates rather quickly after harvest, so little is sold fresh (NMFS 2001).

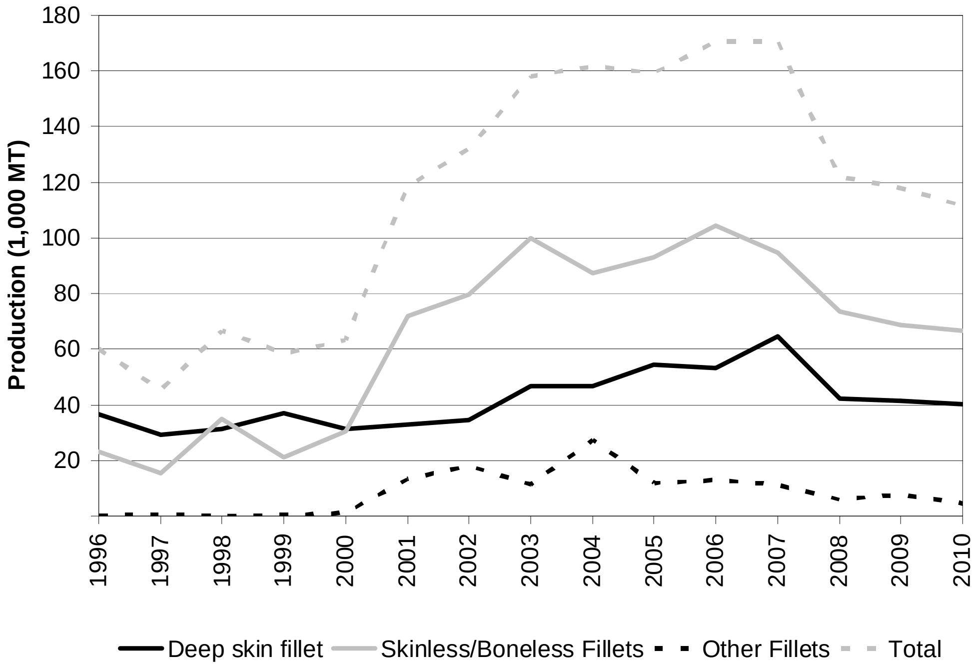
Historically, the primary market for pollock fillets has been the domestic market. Fillets made into deep-skin blocks were destined primarily for U.S. foodservice industry, including fast food restaurants such as McDonald's, Long John Silver's, and Burger King. (NMFS 2001). According to an industry representative, these high-volume buyers utilized enough product that they could cut it into portion sizes while still semi-frozen for re-processing as battered fish fillets or fish sticks. In recent years, however, the U.S market has shown more interest in skinless/boneless fillets than in deep-skin blocks (Figure 6 and Figure 7). Regular-skinned fillets are sold as individually quick frozen (IQF), shatterpack (layered frozen fillets that separate individually when struck upon a hard surface) or layer pack. Over the years 2002-2006, groundfish block imports were cut by half, while fillet imports expanded by 30%. During this time period, the market was thus demanding more value addition rather than a commodity product (GLOBEFISH 2007).

Figure 5. Wholesale Prices for Alaska Primary Production of Alaska Pollock Fillets by Fillet Type, 1996 – 2010



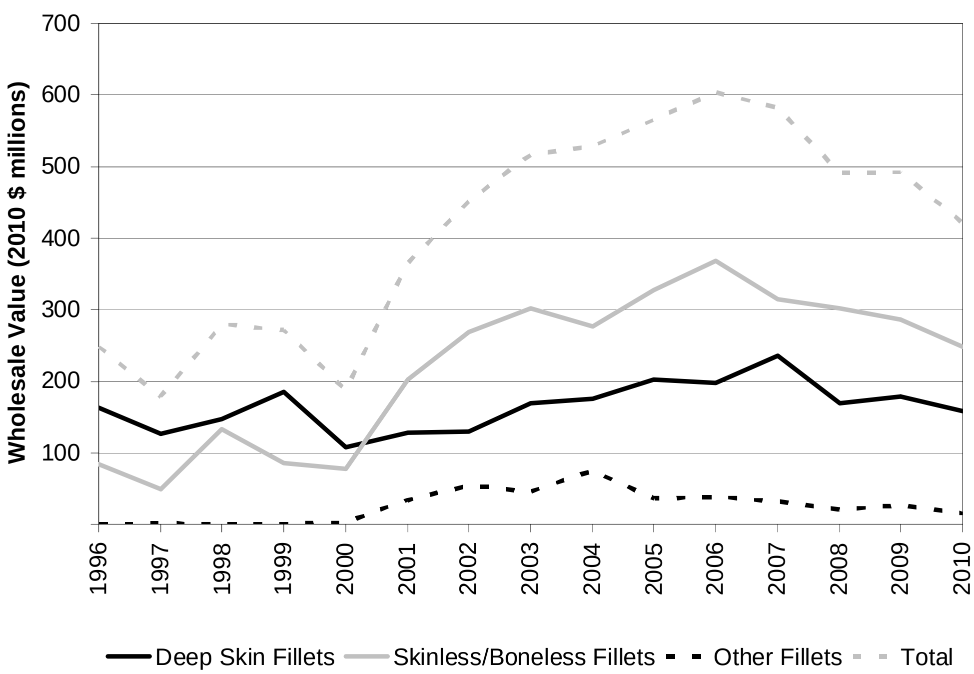
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 6. Alaska Primary Production of Alaska Pollock Fillets by Fillet Type, 1996 – 2010



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 7. Wholesale Value of Alaska Primary Production of Alaska Pollock Fillets by Fillet Type, 1996 – 2010



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010.

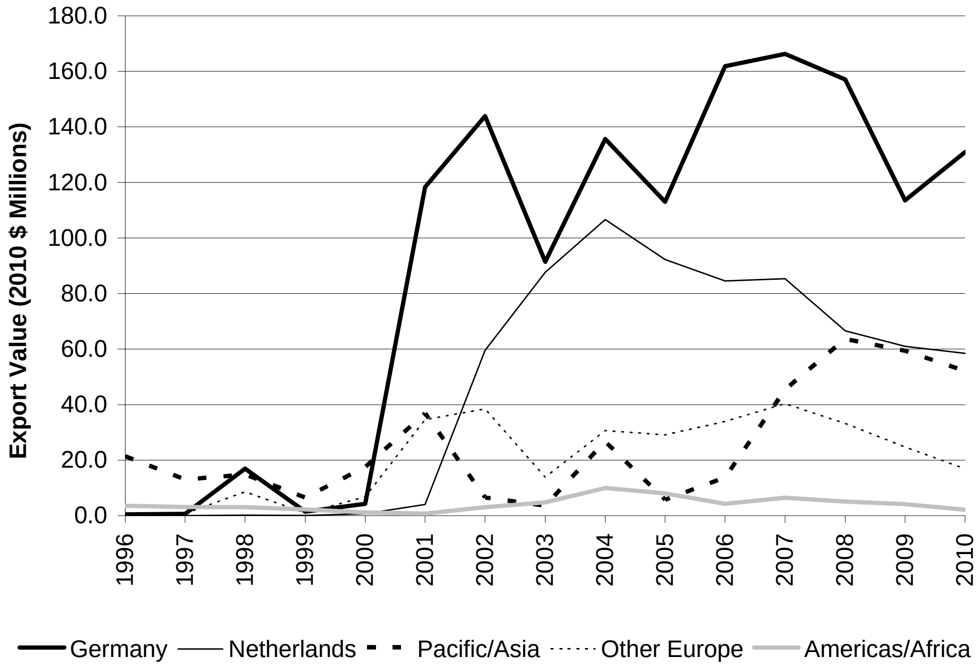
International Trade

As Russian pollock stocks and harvests decreased in the early years of this century, U.S. producers of pollock were provided with a competitive advantage in implementing their strategy to increase their presence in the European and United Kingdom markets (American Seafoods Group LLC 2002). In addition, the declining catch quotas available for whitefish species in European Union waters, coupled with the depreciation of the dollar against the Euro, led to an increase of U.S. exports of pollock fillets to the European market (GLOBEFISH 2006; EU Fish Processors' Association 2006). As shown in Figure 8, the single most important export market for pollock fillets has been Germany since 2001. Another important European destination for Alaska-caught pollock is the Netherlands because it has two of Europe's leading ports (Rotterdam and Amsterdam) and is in close proximity to other countries in Western Europe; most product imported by the Netherlands is further processed and re-exported to other EU countries (Chetrick 2007).

An increasing amount of headed and gutted pollock is being exported to China, which has been rapidly expanding imports of raw material fish as the world's "seafood processing plant" since the latter half of the 1990s. Transport costs to China can be offset by significant presentational and yield improvements achieved by use of a highly skilled labor force (EU Fish Processors' Association 2006). This is in contrast to the need for mainly mechanical filleting and preparation by U.S. processors, with consequent yield loss. One observer of the Chinese seafood processing industry (Ng 2007) made the claim (greeted with considerable skepticism by some in the U.S. industry) that American factories and trawlers require 69% more fish to produce the same quantity of pollock fillets as compared to Chinese processors. To avoid paying high import duties and going through formal customs procedures some Chinese processors process and store raw material delivered from overseas in a free-trade or "bonded" zone (Retherford 2007; pers. comm., Tom Asakawa, Commercial Specialist, NMFS, September 20, 2007). The twice-frozen pollock fillets are exported to markets in North America, Europe and elsewhere. A negligible amount of Alaska-caught pollock and other groundfish is sold in the domestic Chinese market. The increased production of H&G and whole pollock since 2008 (shown in Figure 2) indicates a continuation of this trend.

U.S. seafood companies are increasingly taking advantage of the higher recovery rates and lower labor costs associated with outsourcing some fish processing operations. For example, Premier Pacific Seafoods built a new facility on its 680-ft. mothership M/V *Ocean Phoenix* to prepare Alaska pollock for sale to re-processors in China. The fish are headed and gutted, then frozen and sent to China for further processing (Choy 2005). According to Premier Pacific Seafoods' president, supermarket chains and nationwide retailers are helping to drive the practice of outsourcing: "You're dealing with national retail chains that have strict product specifications that are so exacting that they require hand processing" (Choy 2005).

Figure 8. U.S. Export Value of Alaska Pollock Fillets to Leading Importing Countries, 1996 - 2010



Note: Data include all exports of Alaska pollock from all U.S. Customs Districts
Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/

Market Position

One significant advantage that U.S. producers of pollock have over competitors who harvest pollock and other groundfish in other fisheries is a relatively abundant and stable fishery (American Seafoods Group LLC 2002). This advantage may have slipped recently, however, due to the falling stock levels seen between 2006 and 2010.

The delicate texture, white color and mild flavor of the pollock's flesh have proven ideal for every segment of the foodservice market from fast food to “white tablecloth” restaurants. What's more, its relatively stable supply through 2006 enabled restaurants to maintain consistent menu pricing throughout the year (NMFS 2001).

European and United Kingdom whitefish supplies have been tight in recent years, strengthening demand for Alaska whitefish such as pollock. In addition, the dollar has depreciated against the euro, making it less expensive for Europeans to buy U.S. seafood (Hedlund 2007). This cost advantage drove increased European purchases of whitefish from Alaska and was one of the reasons for the growth of whitefish consumption in Europe, through 2007, despite the increasing prices. On a currency weighted basis, the cost of pollock fillets was not increasing in Europe (SeafoodNews.com 2007a). Despite the continued devaluation of the dollar through 2010, which meant that the overseas markets could have sustained higher U.S. dollar prices for pollock products (Seafood.com News 2008a), European consumption of Alaska pollock fillets declined dramatically between 2007 and 2009, partly due to decreased supply of pollock products resulting from lower TACs and partly due to consequences of the deepening financial crisis in 2008. The price increases for pollock fillets from 2007 through 2009, shown in Figure 5, helped producers weather a period of soaring marine fuel costs—according to the Fisheries Economics Data Program (2008), fuel prices at the port of Dutch Harbor increased by nearly 70% between August of 2007 and August of 2008, but have since dropped as a result of the global recession (in August, 2010, nominal fuel prices in Dutch Harbor were about 11% higher than they were in August, 2007). Real first wholesale prices for pollock fillets declined in 2010.

Pollock fillet producers in Alaska face competition in the U.S. domestic market from imported twice-frozen pollock fillets and fillet blocks—caught in Russia and reprocessed in China (Knapp 2006). One challenge for pollock marketers is the use of the term "Alaska pollock" to refer to Russian-produced pollock, as well as its Alaska counterpart (Seafood Market Bulletin 2005). Because Alaska pollock is the correct species name for any pollock harvested in the Bering Sea, regardless of national boundaries, Russian pollock is not technically misbranded. But pollock companies are compelled to differentiate the product from that which is produced in Russia. With federal funding from the Alaska Fisheries Marketing Board, U.S. pollock producers have begun a "Genuine Alaska Pollock Producers" marketing campaign to promote Alaska-harvested pollock as sustainably managed and superior to twice-frozen Russian pollock (Association of Genuine Alaska Pollock Producers 2004; Knapp 2006).

This marketing campaign was bolstered by Marine Stewardship Council (MSC) certification of the U.S. pollock fishery in the waters off Alaska as a "well managed and sustainable fishery." The MSC certification is expected to boost Alaska-harvested pollock sales and help develop the already strong European market for pollock (Van Zile 2005). Consumers in Western Europe are generally perceived by the seafood industry as having more familiarity with the MSC certification than those in the United States (Van Zile 2005). For example, Young's Bluecrest, the largest seafood producer in Britain, having recognized the potential value of the MSC label, has embarked on a major brand redesign that highlights fish which have been independently assessed as coming from properly managed and sustainable sources (FISHupdate.com 2007). In 2006, the company began using MSC-accredited Alaska-caught pollock in the UK's best-selling battered fish product (Young's Bluecrest Seafood Holdings Ltd 2006). Similarly, Birds Eye (Europe) announced in 2007 that its new line of fish fingers, the company's staple product, will be made from pollock sourced from the Alaska fishery rather than from Atlantic cod, and the MSC label will be affixed on the consumer package (Marine Stewardship Council 2007). Outside of the United Kingdom, the French market saw the appearance of Alaska-caught pollock products with MSC labels during 2007. Market leaders in the French frozen fillet segment, Findus and Iglo, introduced a range of breaded pollock-based products which carry the MSC label (GLOBEFISH 2008).

There have also been eco-label initiatives at the retailer level in Europe, with Carrefour, Europe's leading chain, launching an Alaska pollock fillet product under its own Agir Eco Planete brand and carrying the MSC label. The 1 kg pack was being promoted early in 2008 at €5, a price which compares with €3.65 for a 1 kg pack produced in China and selling in a competing retail chain (GLOBEFISH 2008).

American exposure to eco-labeled seafood products is expected to increase as major U.S. retail chains begin to more aggressively market these products; for example, Wal-Mart Stores, Inc. is planning to fulfill its seafood needs from MSC-certified products where possible; in 2006, these products included "wild Alaskan pollock fillets" (Marine Stewardship Council 2006; Wal-Mart Stores, Inc. 2006).

With Russian pollock in short supply due to declining catches in the early years of this century, twice-frozen fillets from China had become more expensive and imports had dropped. However, trade press reports point to increasing Russian Alaska pollock quota (GLOBEFISH 2007) (the Russian pollock TAC was about 1.9 million mt in 2010 [SeafoodNews.com, 2010a]), while the U.S. quota has shown a downward trend through 2010. As mentioned earlier, the North Pacific Fisheries Management Council set the Bering Sea subarea TAC for Alaska pollock at 1.4 million mt for 2007—a 5.8% reduction. The 2008 and 2009 TACs were even lower—1.0 and 0.8 million mt, respectively, for the Bering Sea subarea. The BSAI pollock TAC remained at 0.8 million mt in 2010, but, as noted above, rose to about 1.25 million mt in 2011. These quota adjustments, together with a surge in surimi prices in 2008, have led to a reduction in U.S. pollock fillet production (Seafood.com News 2008b). A relatively steady price trend during much of 2007 changed towards the end of the year as it became evident that a reduced U.S. quota would be implemented during 2008. Dollar prices for fillets maintained an upward trend during the first quarter of 2008 (GLOBEFISH 2008), continued to increase through 2008 into 2009 (Figure 5), but declined in 2010.

As shown in Figure 9, export prices of Alaska pollock fillets peaked in September, 2008, and then declined sharply into 2009 as the global financial crisis deepened. The price trended slightly downward through the rest of 2009, but rebounded a bit in 2010 . Figure 10 shows that the volume of Alaska pollock fillet exports decreased from its peak in early 2007 through 2009 and leveled off in 2010, a trend that mirrors the size of the TACs. The decline in exports to European markets was quite sharp, however—combined total exports of pollock fillets to Germany and the Netherlands declined by about 38% between 2007 and 2009. Such exports rebounded a bit in 2010 while nominal prices have remained about 21% above their 2007 level for the last three years. The effects of having two distinct pollock seasons cause the within-year variation of pollock exports seen in Figure 10 and Figure 12.

With high pollock prices, some species substitution is inevitable. Alaska-caught pollock competes in world fillet markets with numerous other traditional whitefish marine species, such as Pacific and Atlantic cod, hake (whiting), hoki (blue grenadiers), and saithe (Atlantic pollock). Price competitive whitefish fillets and products can also be prepared from freshwater species such as pangasius (basa catfish), Nile perch, and tilapia, so that while freshwater whitefish currently represent a relatively small sector of the total market, it can be anticipated that they will be used to both substitute for traditional whitefish marine species as well as to be used to grow the overall market (EU Fish Processors' Association 2006).

Another long term development that could affect the market position of U.S. pollock fillets is the possible participation of Russia's Alaska pollock fishery in the MSC certification program. In late 2006, the Vladivostok-based Russian Pollock Catchers Association, which claims to represent about 70% of the Russian pollock fishery, decided to request a preliminary assessment of the fishery's compliance with the environmental standards set by the MSC (Fishnet.ru 2006; SeafoodNews.com 2007b). The Russian producers note that MSC-certified Alaska-caught pollock are preferred by a number of large international buyers and are selling at $200 per mt more than the uncertified product (Fishnet.ru 2006; Fishnet.ru 2007). MSC certification of Russia-harvested pollock is encouraged by buyers committed to supplying markets in the United Kingdom and Germany with MSC-labeled products. These buyers are concerned about a shortage of fish due to cutbacks in the U.S. TAC for pollock (Seafood.com News 2008c). The Russian Pollock Fisheries Improvement Partnership, which includes BAMR-ROLIZ, BirdsEye-Iglo Group, FRoSTA, Royal Greenland, FoodVest, Pickenpack, Delmar, High Liner and the Fishin' Company, has brought together resources and expertise to support the Russian Pollock Catchers Association in their efforts to meet the requirements of the MSC (Seafood.com News 2008d).

The Alaska Seafood Marketing Institute has indicated that the market for Alaska-processed pollock is strong and that MSC certification of the Russian fishery is unlikely to hurt Alaskan companies (Rogers 2007); however, some Alaska producers have gone on the marketing offensive, arguing that the Russian fishery should not be certified because the fishery has a history of overfishing (Fishnet.ru 2007; Sackton 2007). An additional concern expressed by industry representatives is that Russian pollock harvests may rebound over the next few years, while the U.S. TAC for pollock continues to be reduced. Some observers believe that climate change is shifting Bering Sea pollock resources northward into Russian fishing grounds (Eaton 2007). Over time, this redistribution of pollock resources would provide Russian processors an opportunity to re-capture market share from U.S.

processors. Representatives of the U.S. and Russia met in September, 2010, to discuss cooperation in the exploitation and preservation of the pollock stocks along the demarcation line between the two countries (Seafood.com News 2010b). Additional meetings are planned for later in 2010.

Finally, the short and long term effects of food safety issues in China on the market position of Alaska-caught pollock and other groundfish must be considered given the increasing amount of Alaska groundfish sent to China for processing and re-export. In 2007, the U.S. Food and Drug Administration (FDA) announced a broader import control of all farm-raised catfish, basa, shrimp, dace and eel from China, to protect U.S. consumers from unsafe residues that have been detected in these products (U.S. Food and Drug Administration 2007). These products will be detained at the border until shipments are proven to be free of residues of drugs not approved in the United States for use in farm-raised aquatic animals. The European Union banned the import of all products of animal origin from China in 2002 over similar concerns about the safety of Chinese aquaculture and fishery products; this embargo was gradually lifted after the Chinese government agreed to implement stricter testing (EUROPA 2002).

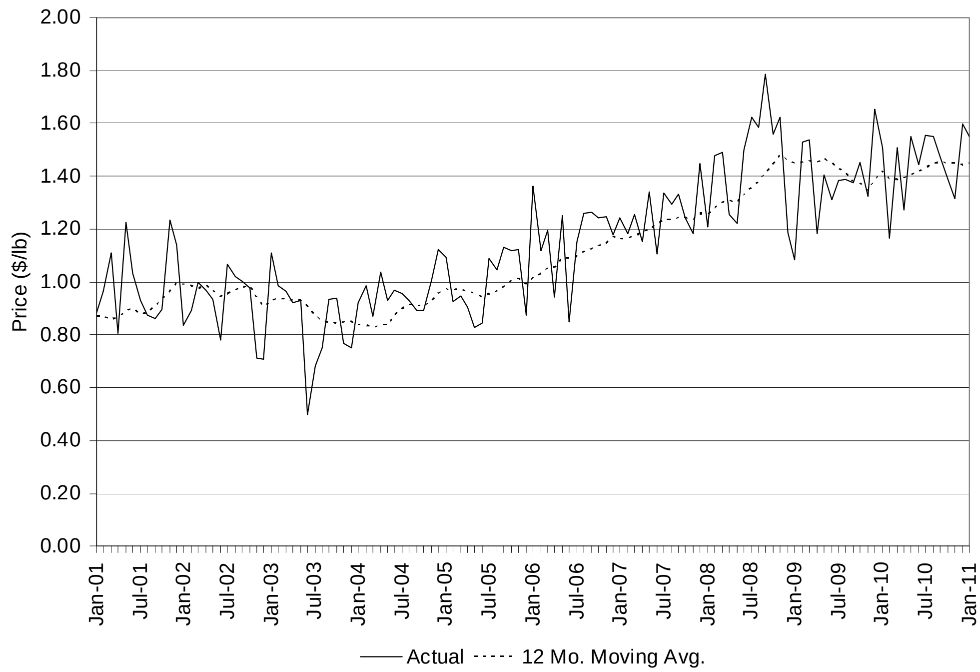
Although U.S.-caught fish sent to China for processing are not covered by FDA's import alert, the concern within the seafood industry is that customers will tend to lump all China seafood products together (Schmit 2007). Consumer market research indicates that the FDA's action, together with media attention China received for safety problems relating to other consumer goods, has led to rising distrust among American consumers in seafood imported from China. For example, a consumer survey found that China was by far the country most often targeted for respondents' personal food safety concerns (Pirog and Larson 2007).

Furthermore, an industry representative noted that there has been criticism among some buyers about a too high content of polyphosphates in frozen Alaska pollock fillets from China. Soluble salts of phosphoric acids have many functional uses in fresh and frozen fillets and other seafood products, including, but not limited to, natural moisture and flavor retention, color and lipid oxidation inhibition, drip reduction and shelf-life extension (Lampila and Godber 2002). However, protracted soaking in a phosphate-based solution leads to sensory defects (a soapy taste), texture deterioration and the potential for charges of economic fraud due to dramatic increases in the ratio of water to protein (Aitken 1975; Lampila and Godber 2002). Some Chinese processors using this method to inflate their product recovery figures claim recovery rates as high as 80 to 100 percent (Sánchez et al. 2008).

In response to concerns raised about the quality of seafood imported from China, spokesmen for Ocean Beauty Seafoods LLC and Trident Seafoods Corporation, two major Seattle-based processors of Alaska seafood, have publicly stated that no matter where their companies process fish, the processing is done to the same strict quality control standards (Bauman 2007). Moreover, some seafood industry analysts have expressed confidence that, although a few customers have temporarily stopped buying Chinese seafood products, that response will quickly fade as headlines shift and buyers get assurance that the products are of good quality (Schmit 2007). To date, concerns about the safety and quality of fish products imported from China have had no discernible effect on the market for Alaska groundfish processed in China. The production of headed and gutted pollock for export to China showed continued growth in 2007 and early 2008, although by a small margin (Seafood.com News 2008b). The slower production of headed and gutted product was likely due primarily to U.S. pollock quota cutbacks, which have led to an overall decrease in production of U.S. pollock products.

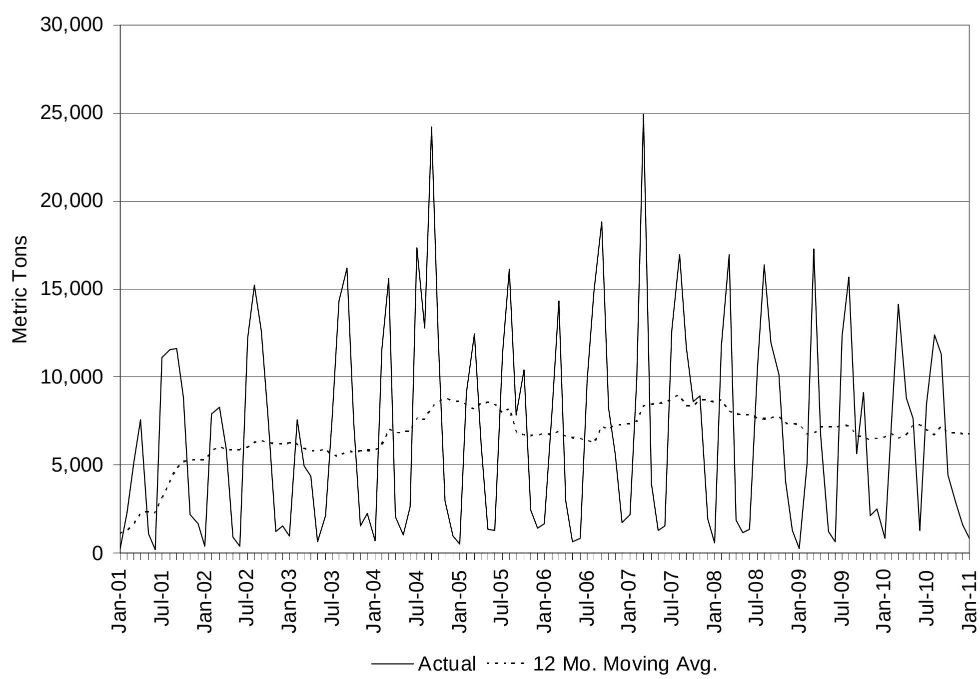
Alaska Pollock Fillets Market Profile

Figure 9. Nominal U.S. Export Prices of Alaska Pollock Fillets to All Countries, 2001 - 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

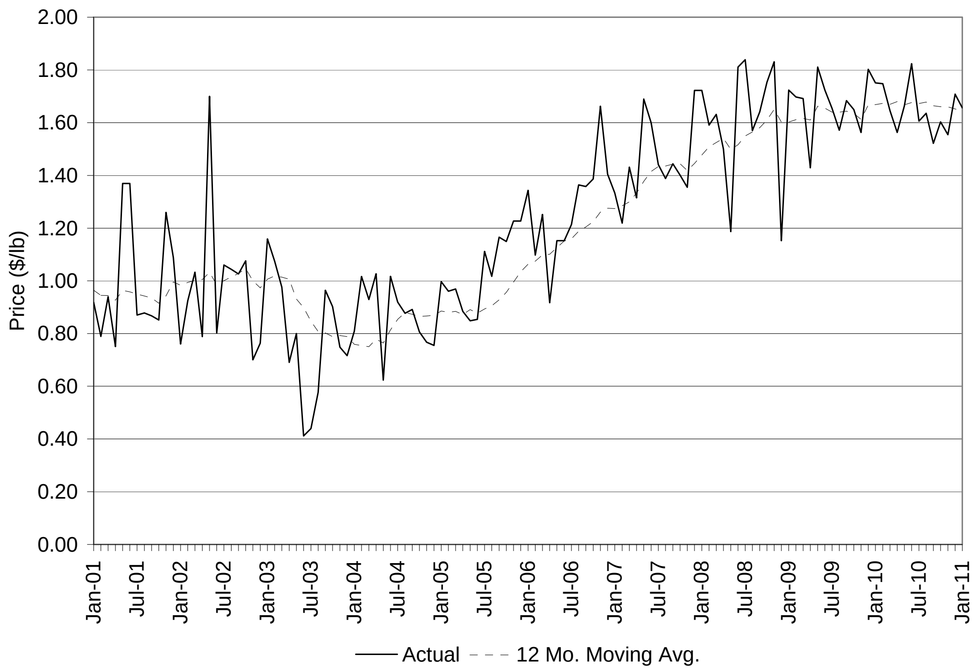
Figure 10. U.S. Export Volumes of Alaska Pollock Fillets to All Countries, 2001 - 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

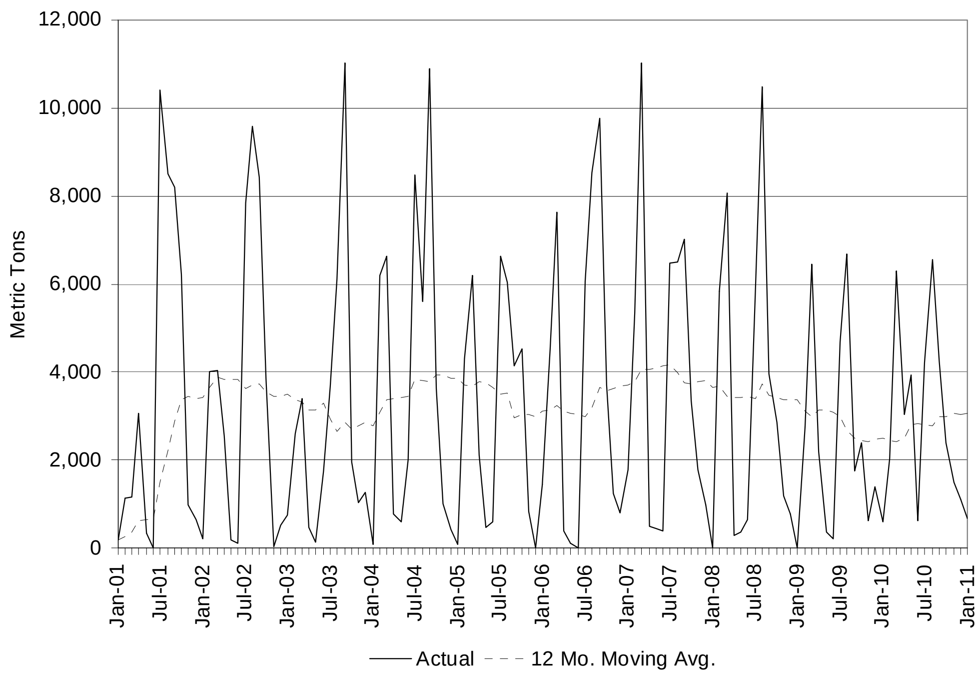
Alaska Groundfish Market Profiles

Figure 11. Nominal U.S. Export Prices of Alaska Pollock Fillets to Germany, 2001-2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 12. U.S. Export Volumes of Alaska Pollock Fillets to Germany, 2001-2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

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Alaska Pollock Surimi Market Profile

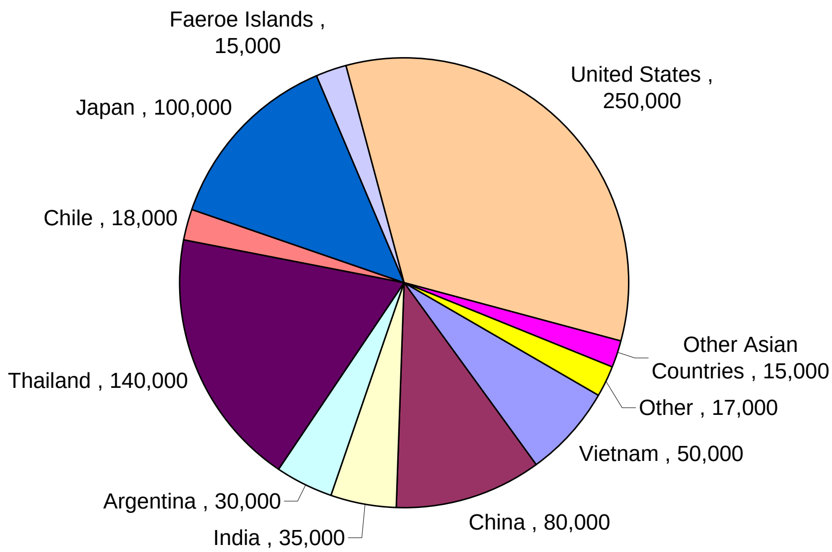
Description of the Fishery

See *Alaska Pollock Fillets Market Profile*

Production

Surimi production almost doubled in the 10 years 1996-2005 (GLOBEFISH 2006). In 2005, two to three million mt of fish from around the world, amounting to 2 to 3% of the world fisheries supply, were used for the production of about 750,000 mt of surimi (GLOBEFISH 2006; GLOBEFISH 2007a).

Figure 13. Estimated World Surimi Production (MT), 2005



Source: GLOBEFISH (2006)

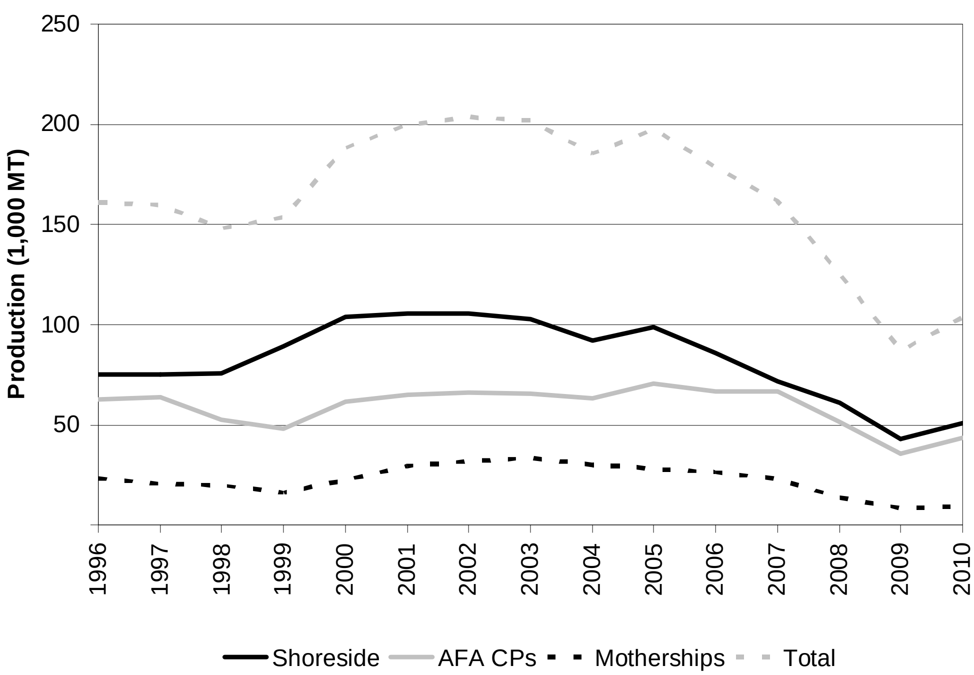
Most of the surimi is produced for Asian markets, with Japan being the single largest market. In 2005, the United States was by far the leading country providing Alaska pollock surimi to Asian markets. Although Alaska pollock continues to account for a large proportion of the surimi supply, new sources of production, such as Chile, India, and China, have taken the opportunity of the surimi market's growth to greatly increase their production using alternative types of whitefish. Southeast Asia initiated the expansion by utilizing threadfin bream to make surimi (known as *itoyori*), which represented 25% of the total volume of surimi production by the middle of the first decade of this century (Guenneugues and Morrissey 2005).

The successful growth of the surimi industry was initially based on Alaska pollock, and approximately half of the surimi produced continues to be based on this species. However, Alaska pollock surimi production rose only slightly in the late 1990s (Knapp 2006). Rising harvests and yields of Alaska pollock were offset by a shift from surimi to fillet and fillet block production. Particularly significant was the product shift by catcher/processors active in the Bering Sea/Aleutian Islands (BSAI) pollock fishery, as these at-sea operations were critical to the production of surimi for world markets

(Guenneugues and Morrissey 2005). In 1998, the passage of the American Fisheries Act (AFA) ended the "race-for-fish" in the BSAI fishery, and AFA-eligible catcher/processors were given more time to produce products according to the current market situation (Sjøholt 1998). As the demand for other product forms made from Alaska pollock increased, the vessels reduced the share of harvests going to surimi production (Knapp 2006; Guenneugues and Morrissey 2005). This reduction has been partially offset by the significant increase in yields in pollock surimi processing that occurred from 1998 onward, particularly as a result of better cutting of the fish and implementation of the recovery of meat from the frames and wash water (Guenneugues and Morrissey 2005).

The result of this more efficient processing is that the volume and value of surimi produced from Alaska-harvested pollock remained fairly stable through 2005 (Figure 14 and Figure 15) even though fillet production increased substantially over the same period. Both the volume and value of surimi production declined from 2005 to 2007. Production volume continued its decline in 2008 and 2009 and rebounded a bit in 2010, while the value rebounded sharply in 2008, due to a large increase in the wholesale price, declined steeply in 2009, and increased slightly in 2010. Alaska pollock surimi wholesale prices were relatively high in the late 1990's, declined in 2000, remained relatively stable through 2007, spiked dramatically upward in 2008, declined nearly as dramatically in 2009, and rose again in 2010 (Figure 16). Reductions in the BSAI pollock TAC are likely the most important factor in both the decline of surimi production after 2005 and the high prices in the late '90s and in 2008. Industry representatives note that fluctuations in wholesale prices may also be influenced by changes in the grade of surimi being produced as well as differences in the prices by grade. Data indicating the grades of pollock surimi produced are not generally available. Industry representatives indicate that, overall, the pollock surimi produced in the United States has shifted toward lower levels of quality ("recovery grades"), as a greater portion of surimi production utilizes flesh trimmed during the production of fillets.

Figure 14. Alaska Primary Production of Alaska Pollock Surimi by Sector, 1996 – 2010

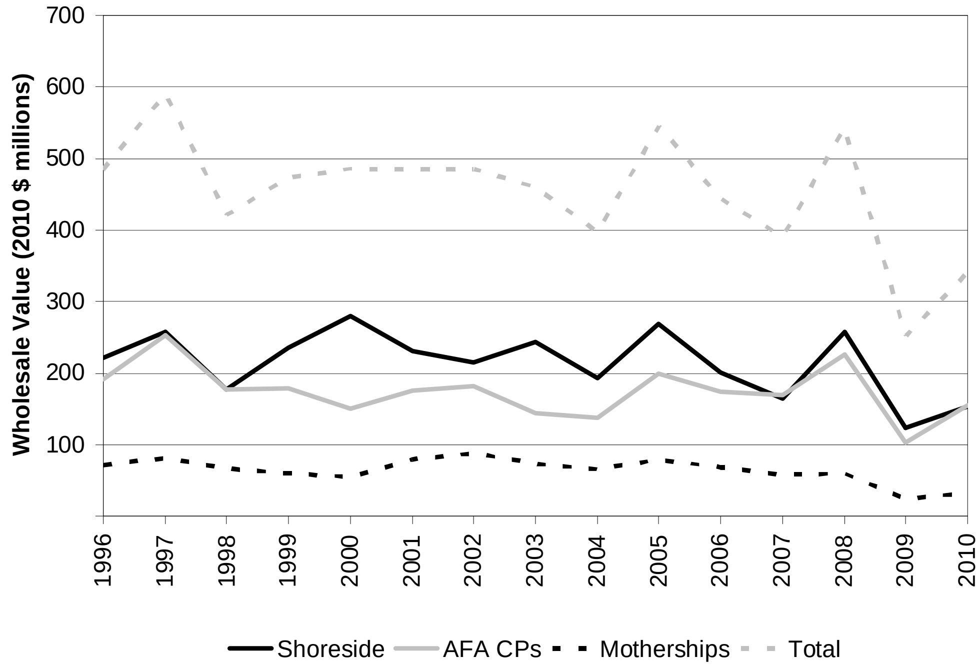


Note: Reported surimi production and value do not specify the grade of products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Alaska Pollock Surimi Market Profile

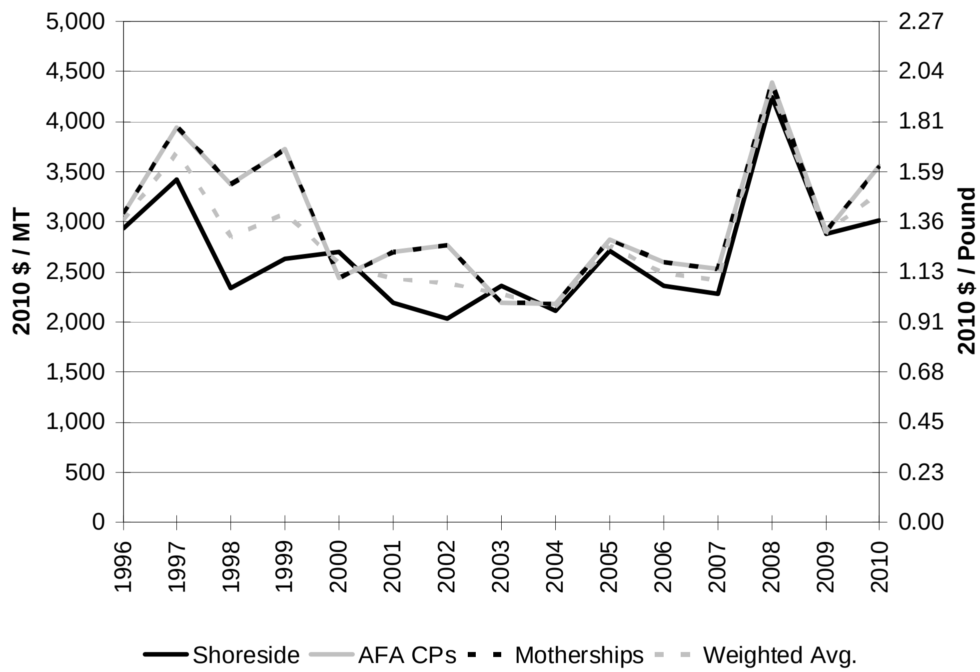
Figure 15. Wholesale Value of Alaska Primary Production of Alaska Pollock Surimi by Sector, 1996 – 2010



Note: Reported surimi production and value do not specify the grade of products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 16. Average Wholesale Prices for US Primary Production of Pollock Surimi by Sector, 1996 – 2010



Note: Reported surimi production and value do not specify the grade of products and therefore the recent price declines shown here may be a reflection of higher volumes of lower grade surimi. Also note that AFA-eligible catcher/processors and motherships are treated as a single sector for the purpose of price calculations.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Product Composition and Flow

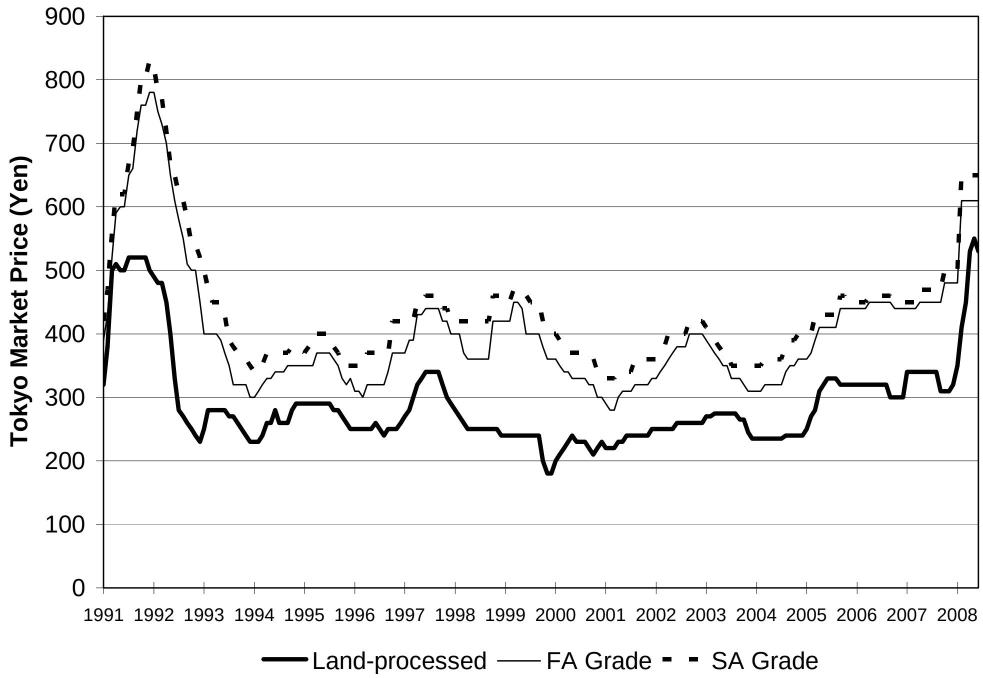
Surimi is the generic name for a processed white paste made from whitefish. In the case of Alaska pollock surimi, the fish are first filleted and then minced. Fat, blood, pigments and odorous substances are removed through repeated washing and dewatering. As washings continue, lower-quality product is funneled out; thus, higher quality surimi is more costly to produce since it requires additional water, time and fish (Hawco and Reimer 1987 cited in Larkin and Sylvia 2000). Cryoprotectants, such as sugar and/or sorbitol, are then added to maintain important gel strength during frozen storage. The resulting surimi is an odorless, high protein, white paste that is an intermediate product used in the preparation of a variety of seafood products. Analog shellfish products are made from surimi that has been thawed, blended with flavorings, stabilizers and colorings and then heat processed to make fibrous, flake, chunk and composite molded products, most commonly imitating crab meat, lobster tails, and shrimp. Higher-end surimi is mixed with actual crab, lobster or shrimp. In Japan, surimi is also used to make a wide range of *neriseihin* products, including fish hams and sausages and *kamaboko*, a traditional Japanese food typically shaped into loaves, and then steamed until fully cooked and firm in texture (NMFS 2001).

The demand for surimi-based products in Japan is highest during the winter season as a result of the increased consumption of *kamaboko* during the New Year holidays. In the United States, the demand is highest during the summer months when artificial crab meat and other surimi-based products are popular as salad ingredients (Park 2005).

Producers assign commercial grades to surimi based on the level of color, texture, water content, gelling ability, pH level, impurities and bacterial load (Park and Morrissey 1994). However, there is not necessarily a close direct correlation between surimi grade and surimi price. This could be because there is no common grading schedule for surimi, implying that each manufacturer decides which characteristics to include, how they are measured, and the levels and nomenclature that define each grade (Burden et al. 2004; Park and Morrissey 1994). Although there are no uniform grades among companies, many suppliers have adopted the general nomenclature and relative rankings of the grades developed by the National Surimi Association in Japan (Larkin and Sylvia 2000). The highest quality surimi is given the SA grade, and the FA grade is typically applied to the second highest quality (Park and Morrissey 1994). For lower grades the nomenclature becomes more variable. Either "AA" or "A" often denote third grade surimi, and the labels "KA" or "K" are frequently applied to the fourth grade of surimi. The lowest grade products may be designated "RA" or "B."

Figure 17 shows the wholesale price trend for three grades of frozen surimi delivered to processors of surimi-based products in Japan. To achieve the SA grade, which as noted above is the highest grade product, the gel-strength and the product's color must meet certain levels. The prices of surimi in the Japanese market normally increase with greater gel strength. This reflects the preferences of Japanese buyers, who demand the highest possible gel strength in their products (Trondsen 1998). In Japan, first grade SA quality yields a price that is approximately 10% higher than the price of second (FA) quality grade. The quality of a given lot of surimi is also assessed from information on production location, i.e., shoreside versus at-sea. Sproul and Queirolo (1994) note that the Japanese generally believe that, due to faster conversion from live fish to frozen surimi, ship-processed surimi is of higher quality than land-processed surimi. Hence, surimi produced by shoreside processors commands a lower price than either the SA or FA grade produced by at-sea operations. On average, the price of surimi from land-processed pollock is about 65% that of grade SA.

Figure 17. Wholesale Price of Frozen Surimi by Grade in Japan, 1991-2008



Note: Prices of SA and FA grades are for surimi from ship-processed pollock. Grade designations can have variable meanings depending upon the supplier. No grade designation for land-processed surimi is given.
Source: Seafood.com News (2008a).

World demand for lower-quality surimi has allowed processors to market recovery grade or to blend it with primary grades to produce medium/low-quality surimi (Guenneugues and Morrissey 2005). In a survey of U.S. and EU surimi buyers, which account for more than half of the total surimi purchases in their markets, Trondsen (1998) found that most mainly use the second, third and fourth quality grades in their product mixes. SA and FA grades are only used as a part of the raw material mix. AA is the grade most used, both with respect to the number of users and to the share of the product mix. A lower grade product allows the use of protein that was formerly lost in surimi processing waste and used for fish meal production (Guenneugues and Morrissey 2005). In addition, industry representatives noted that it allows the use of flesh trimmed during the production of fillets.

The price trends in Figure 16 show the average prices received for US pollock surimi, while Figure 17 shows surimi wholesale prices in Japan. The two figures appear to contradict each other—US prices were declining between 2005 and 2007, but Japanese prices during the same period were increasing. The apparent contradiction can be explained as a function of two major factors: surimi grades and exchange rates.

1) The "prices" shown in Figure 16 are calculated by taking total reported wholesale value from all grades of surimi and dividing by the total reported volume of all grades of surimi—thus the prices in Figure 16 are weighted average prices across all grades of surimi for the year. According to industry sources the average grade of pollock surimi produced in the US has fallen in recent years. Two trends contribute to the lower average grade of surimi production:

    a. There has been and continues to be a shift from surimi as a primary product (which has the potential to be turned into the highest grades of surimi), to recovery surimi—an ancillary product made from the skins and trimmings left over from the production of fillets. The shift is coincidental with the shift from primary production of surimi to primary production of fillets. Under AFA, fillet producers have the time to recover as much of these lower grades of surimi as possible.

b. The second trend contributing to overall lower grade of surimi production is a reported shift in fishing practices for shorebased pollock harvesters. In recent years shorebased vessels have had to go farther west to find sufficient quantities of pollock. This, coupled with the fact that higher fuel prices are forcing vessel operators to make sure they have full holds when they return to port, result in longer overall trips. Longer trips reduce the quality of pollock and results in lower grade surimi products even when surimi is the primary product.

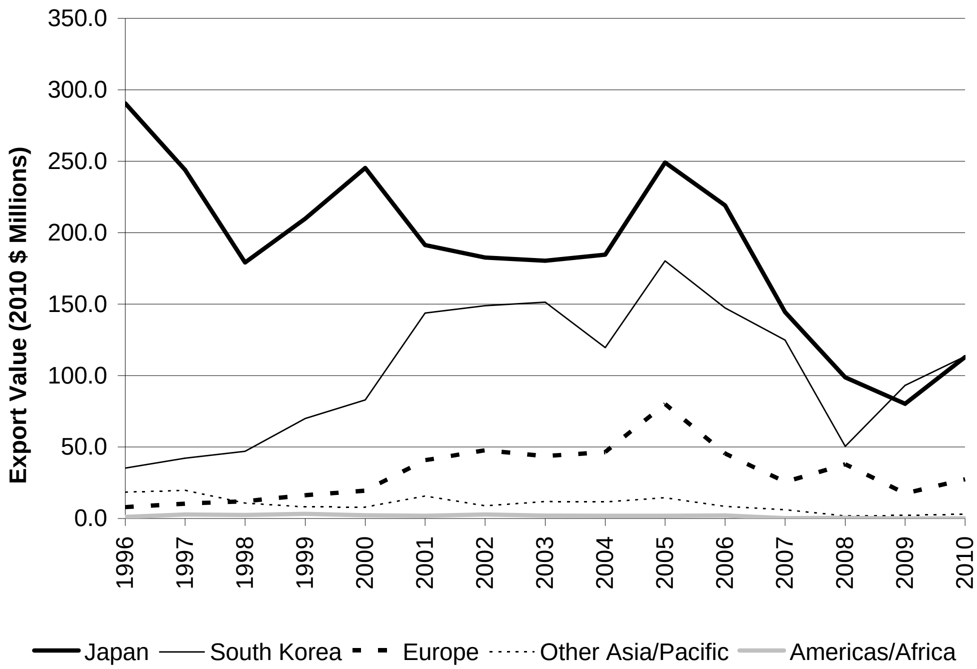
2) The second factor to take into consideration is the yen-dollar exchange rate. From January 2005 through July 2007 the dollar was gaining relative to the yen. On January 1, 2005, one dollar purchased 102.44 yen; On July 14, 2007, one dollar purchased 122.34 yen (Oanda, 2008). Thus, prices for surimi in Japan would have had to have risen by nearly 20 percent in order for the US price to have remained at 2005 levels. The weakening of the US dollar between July 2007 and December 2008 (when one dollar purchased only 91.28 yen) and the production declines resulting from significantly lower pollock TACs are good explanations for the much higher average prices received for US pollock surimi in 2008.

International Trade

As shown in Figure 18, most U.S. Alaska pollock surimi production is exported, the primary buyers being Japan and South Korea. Most of the balance of exports reaches European countries. Over the past few years, greater amounts of American-produced surimi have been exported to Korea, as the demand for seafood in Korea is strong and Korea's local catch is shrinking. However, the amount delivered to Korea includes not only that directed to the Korean domestic market but also the amount kept in custody at the bonded warehouse in Busan, which is an international hub port. The surimi products deposited at Busan are finally destined to the Japanese market in most cases. In the period from 2000 to 2005, U.S. Alaska pollock surimi exports to EU markets also grew. Several factors played a role in the growing U.S. exports to the EU, including seafood’s popularity due to interest in healthy eating and the great variety of surimi-based convenience foods sold in the retail sector (Chetrick 2005). According to an industry representative, exports to EU markets consisted mainly of recovery grades of pollock surimi.

In 2006, however, U.S. Alaska pollock surimi exports to all leading importers fell (Figure 18) and continued to fall through 2008 and 2009, except for a slight increase in exports to the EU in 2008 from their level in 2007 and a significant increase in exports to South Korea in 2009 from their level in 2008. Exports to Japan, South Korea and the EU all increased in 2010. The decline in exports between 2006 and 2009 occurred despite the dollar's weakening versus the yen, won, euro, and yuan. The reason for the decline is deemed to have been the relatively high prices for U.S. surimi. U.S. surimi is replaced by lower-priced Asian-produced surimi in Korea, by Chilean horse-mackerel surimi in the EU, and by domestically-produced mixed surimi in China (Seafood.com News 2007a).

Figure 18. U.S. Export Value of Alaska Pollock Surimi to Leading Importing Countries, 1996 - 2010



Note: Data include all exports of Alaska pollock from the U.S. Customs Pacific District.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Market Position

In addition to grade mix, the price for U.S. Alaska pollock surimi is influenced by factors such as Japanese inventory levels and seasonal production from the U.S. and Russian pollock fisheries. Over the longer term, prices depend on changing demand for surimi-based products in Japan and other markets, and the supply of surimi from other sources.

In Japan, where heavy surimi consumption is a tradition, rising prices of Alaska pollock surimi raw material, dwindling birth rates and changing food habits are challenging surimi-based products consumption. In 2005, surimi products sales at wholesale markets in Japan saw a decrease of 5% in volume—confirming a continuous decrease (GLOBEFISH 2006). Among Japanese consumers surimi made from Alaska pollock is considered to be superior to most, if not all, other surimi; there are no close substitutes (NMFS 2001). Consequently, Alaska pollock surimi exports to Japan have tended to be price inelastic—the demand for this surimi does not soften much in response to a modest price increase. The effects of price for intermediate products such as surimi may also be cushioned by supply contracts and vertical integration among surimi processors, wholesalers, and retailers in Japan (NMFS 2001). For example, both Maruha Group Inc. and Nippon Suisan Kaisha Ltd. are extremely vertically integrated, with ownership of firms all along the surimi supply chain (Fell 2005). However, the demand for traditional surimi products, such as *kamaboko*, may be declining in Japan. One possible reason is that much of the demand comes from older Japanese. The younger generation in Japan and many other Asian countries appears to prefer Western foods (NMFS 2001).

Despite changing market conditions in Japan, Alaska pollock surimi prices have remained firm as international supply-demand for Alaska pollock surimi has become tighter (GLOBEFISH 2006; Seafood.com News 2007b). Cuts in the U.S. pollock quota along with (until recently, at least) high demand for pollock as whitefish fillets in Europe and declining Russian production have contributed to a stringent surimi purchase environment. In addition, in countries having recently become surimi consumers, especially Western countries, changing food habits are fueling the development of surimi consumption. The domestic surimi market received a boost in 2006, when the U.S. Food and Drug Administration began allowing surimi to be labeled as “crab-flavored seafood” or whatever seafood it is made to resemble, rather than as “imitation” (Ramseyer 2007). In addition, producers are presenting wider surimi-based product ranges. New consumption trends are now targeted: development of fresh products, snacks, food for children, organic products, high value products, and inexpensive products (GLOBEFISH 2006).

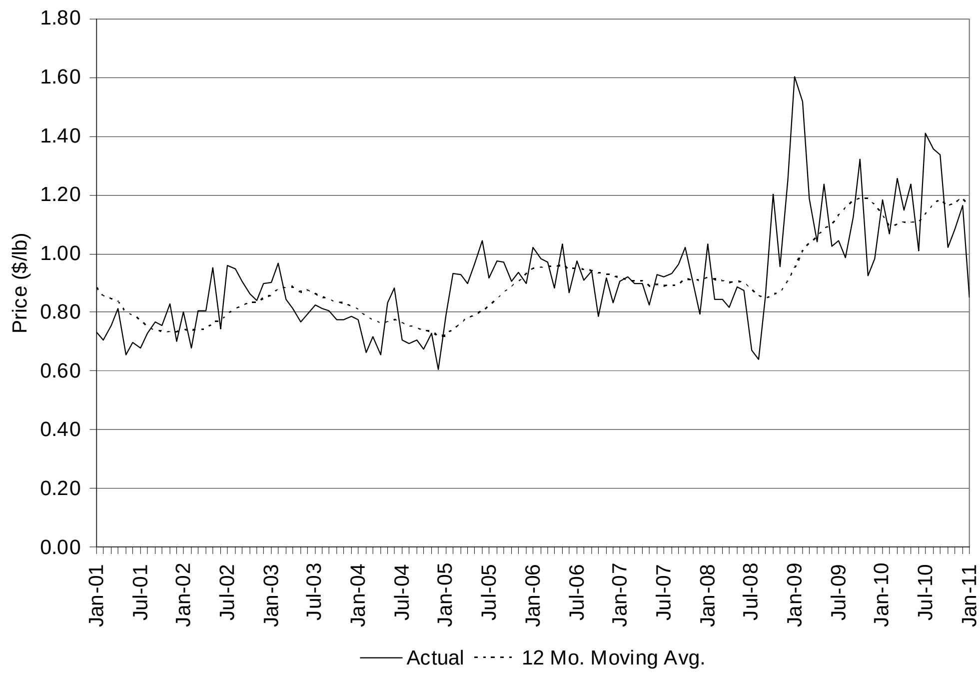
Marine Stewardship Council certification of the U.S. Bering Sea-Aleutian Islands pollock fishery as a “well managed and sustainable fishery” is also expected to boost sales of surimi products made from Alaska-harvested pollock. In 2006, the large U.S. retail chain, Wal-Mart Stores, Inc., began marketing the world's first MSC-labeled surimi products, all of which are made from Alaska-caught pollock (Wal-Mart Stores, Inc. 2006). In 2007, Coraya, Europe’s leading surimi brand, launched a range of MSC-labeled surimi products made from Alaska-harvested pollock; the products will be initially distributed in Switzerland (Marine Stewardship Council 2007).

A seafood market report in 2007 summarized the market situation for surimi made from Alaska-caught pollock by stating that, with the increasing demand for surimi-based products in many markets and the reduction in the supply of Alaska pollock for these products, there appeared to be good reasons for U.S. producers to be able to keep a “bullish posture” over the short term (Seafood.com News 2007c). Initially, market analysts had anticipated that U.S. pollock surimi output would decline by a larger percentage than the U.S. pollock quota cutback due to an expected increase in production of fillet and headed and gutted product. However, the actual percentage decline in surimi production was smaller than the quota decrease rate because of a surge in surimi prices in 2008 (Seafood.com News 2008). As shown in Figure 16, however, the 2008 surge in surimi prices was reversed by a sharp decline in 2009. Consequently, the production of pollock surimi in 2009 continued to decline at about the same rate as in 2008, while the rate of decline of fillet production lessened somewhat (Figure 2). Prices, production and wholesale value of Alaska pollock surimi all increased in 2010.

The three fold increase in surimi raw material prices in 2008 was fueled by anticipated declines in supply caused by reduced landings of U.S. pollock and warm-water surimi species in Southeast Asia (Fiorillo 2008). The prices reached levels not seen since the early 1990s (Figure 17), when apprehension over a raw material shortage was caused by the phase-out of pollock joint-venture operations in the U.S. EEZ, increased demand for pollock fillets, and other factors (Sproul and Queirolo 1994). The price decrease in 2009, shown in Figure 16, could be attributed to continued reductions in demand exacerbated by the economic crisis that deepened at the end of 2008 and continued through 2009.

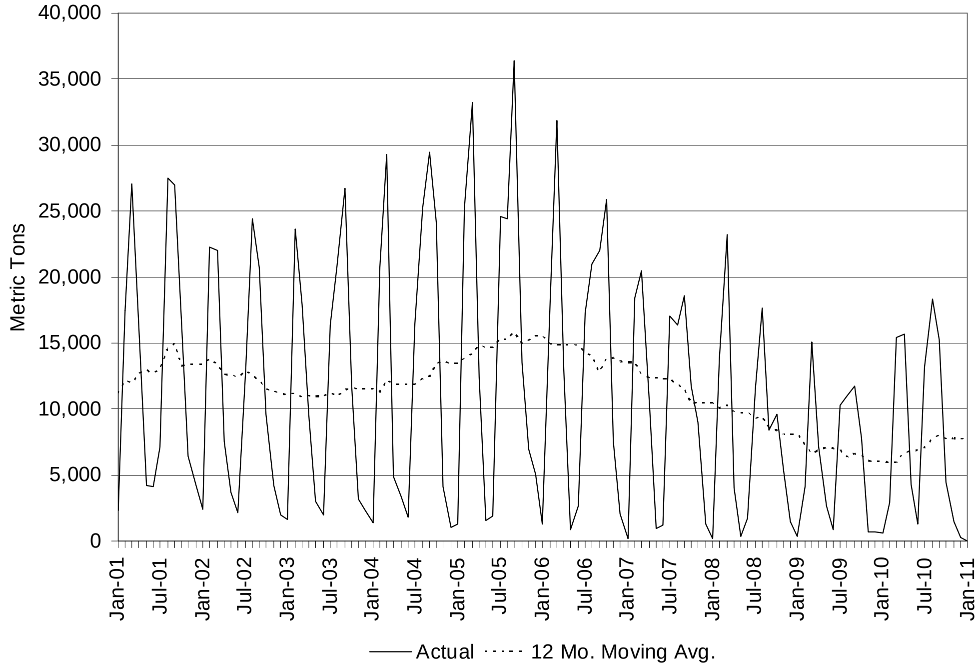
The increase in prices for surimi raw material based on Alaska pollock that continued through 2008 caused surimi producers to look for alternative species, which could bring surimi prices down again. However, alternative species generally result in a lower quality surimi product (GLOBEFISH 2008). Over the longer term, the proportion of use of non-pollock materials in surimi production is expected to rise. New origins are generally offering lower prices in comparison with Alaska pollock surimi. According to GLOBEFISH (2007b), the use of low-quality fish has already had its effect on prices and quality of surimi. In the future, the market is expected to become even more dichotomized between Alaska pollock-based surimi products and cheap surimi products processed from low-quality species. As of 2005, over 50% of global production was based on non-Alaska pollock fish species that were caught all over the world. These products can be derived from either coldwater whitefish species (for example, Pacific whiting, hoki (blue grenadier), northern and southern blue whiting), or coldwater pelagic fishes (for example, Peruvian anchovy, Atka mackerel, jack mackerel), but more importantly tropical fish species such as threadfin bream, lizard fish, and big eye (Guenneugues and Morrissey 2005). Further, to meet the world's developing demand for surimi, the seafood industry has been constantly working to adapt surimi production technologies to new aquatic species, including to cephalopods, like squid (GLOBEFISH 2006). The search for surimi raw material has been a strategic issue for large multinational firms producing either surimi or surimi-based items, with numerous investments and joint ventures in countries with such resources being actively carried out for that purpose (GLOBEFISH 2006).

Figure 19. Nominal U.S. Export Prices of Alaska Pollock Surimi to All Countries, 2001 - 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 20. U.S. Export Volumes of Alaska Pollock Surimi to All Countries, 2001 - 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

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Alaska Pollock Roe Market Profile

Description of the Fishery

See *Alaska Pollock Fillets Market Profile*

Production

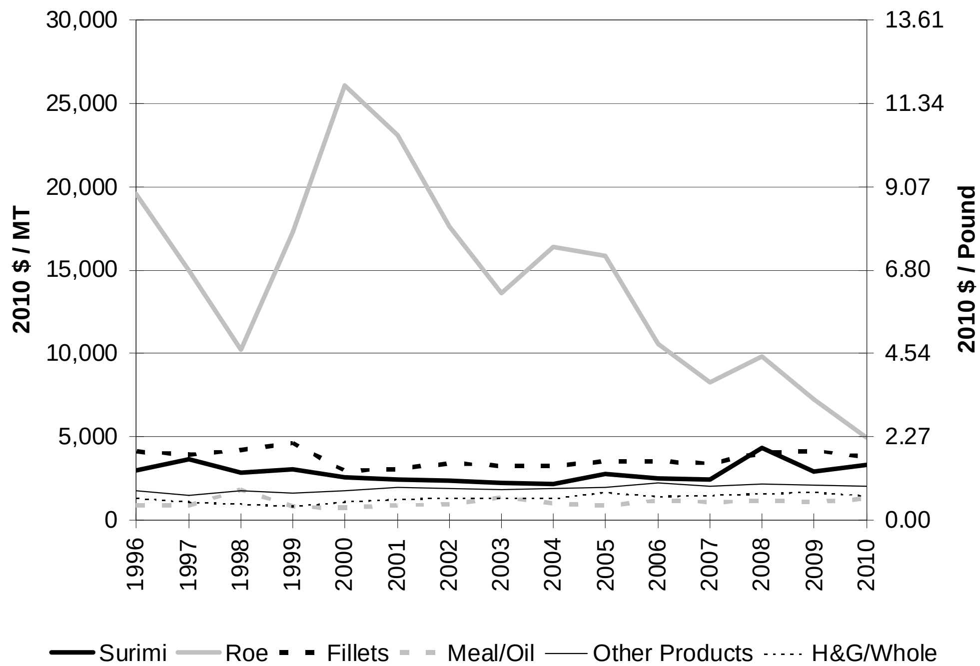
The two major sources of Alaska pollock roe are the United States and Russia. U.S. pollock roe production between 1999 and 2006 was significantly higher than in prior years, reflecting both an increase in pollock harvests as well as an increase in pollock roe yields—the latter a result of the AFA according to industry representatives interviewed for this assessment. However, increasing U.S. production of pollock roe through 2006 was offset in world markets by a decline in Russian pollock harvests. Despite increased U.S. production, total Japanese pollock roe imports in the first few years of the 2000's were lower than in the previous decade, because of reduced imports of Russian pollock roe (Knapp 2005). U.S. production of roe remained stable in 2007 despite lower overall harvests as shown in Figure 22, but declined dramatically in 2008. U.S. pollock roe production declined further in both 2009 and 2010, but not as sharply as in 2008.

The best time for harvesting pollock for roe production is in winter, just before the pollock spawn, which is when the eggs are largest. Most U.S. pollock roe production is from the "A" season, when yields are significantly higher (Knapp 2005).

Roe is one of the most important products made from Alaska pollock. Although pollock roe accounts for only a small share of the volume of Alaska pollock products, it is a high-priced product that accounts for a high share of the total value. The wholesale prices of pollock roe and other pollock products are compared in Figure 21. For some producers the sale of pollock roe is their highest margin business (American Seafoods Group LLC 2002). Production of pollock roe by Alaska processors increased through 2006 due to an increase in pollock harvests and the increase in pollock roe yields that correspond to the implementation of AFA in 2000 (Figure 22).

Knapp's (2005) caution that averaging prices across many different grades of pollock roe can make an interpretation of trends difficult applies to Figure 21 and Figure 23. Knapp notes that "a change in average prices may reflect not only a change in prices paid for a given grade, but also a change in the mix of products sold. For example, even if the prices for 'low grade' and 'high grade' pollock roe remain unchanged, the average price will decline if the relative percentage of lower-priced low grade roe increases, and the average price will increase if the relative percentage of higher-priced high grade roe increases" (p. 20). Due to averaging prices across grades, it is uncertain if the changes in wholesale prices in Figure 21 are due to differences in the mix of grades sold or differences in the prices by grade.

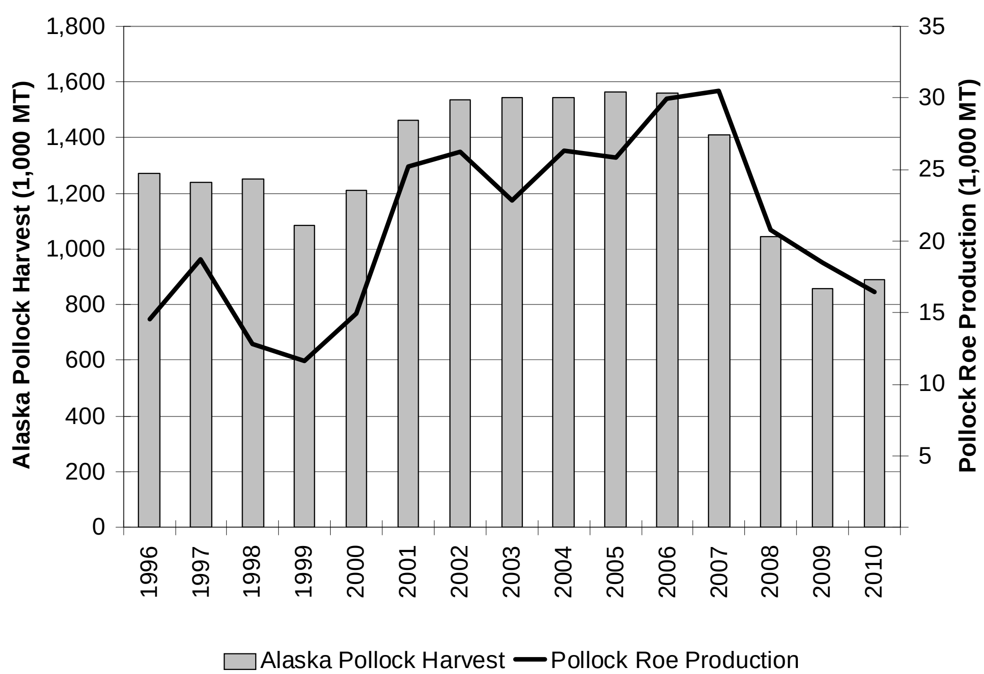
Figure 21. Wholesale Prices for Alaska Primary Production of Pollock by Product Types, 1996 – 2010



Note: Reported roe production and value do not specify the grade of products.

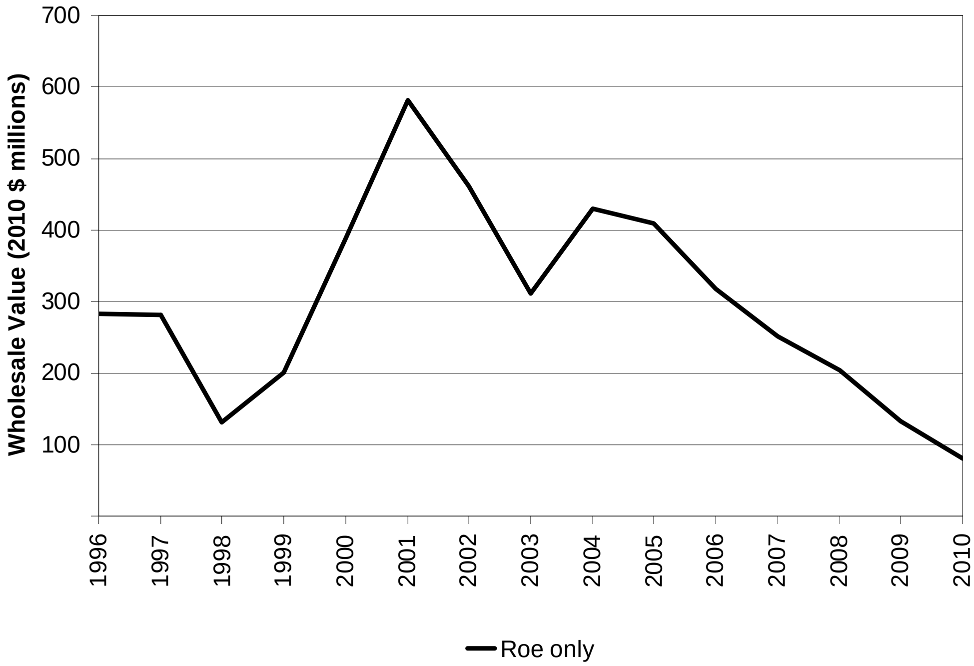
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 22. Alaska Pollock Harvest and Primary Production of Pollock Roe, 1996 – 2010



Source: NMFS Blend, Catch-Accounting System, and Weekly Production Reports 1996-2010

Figure 23. Wholesale Value of Alaska Primary Production of Pollock Roe, 1996 – 2010



Note: Reported roe production and value do not specify the grade of products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Product Composition and Flow

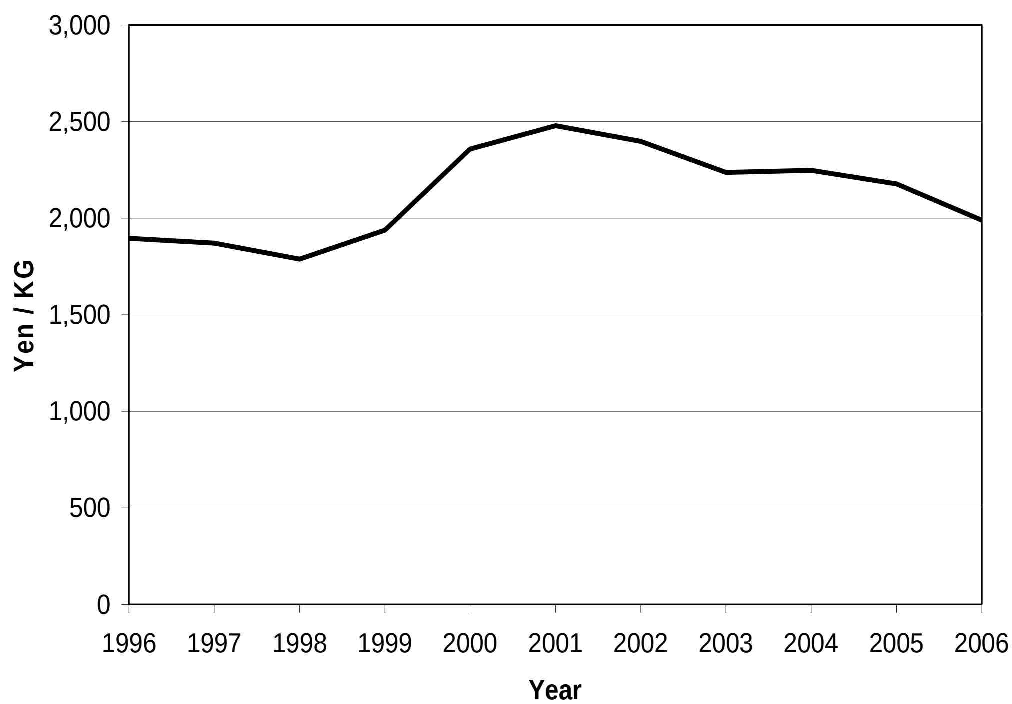
The roe is extracted from the fish after heading, separated from the other viscera, washed, sorted, and frozen. After the roe is stripped from the pollock, the fish can be further processed into surimi or fillets (NMFS 2001). There are dozens of different grades of pollock roe, which command widely varying prices. The grade is determined by the size and condition of the roe skeins (egg sacs), color and freshness of the roe, and the maturity of the fish caught. The highest quality is defect-free matched skeins in which both ovaries are of uniform size with the oviduct intact, with no bruises, no prominent dark veins, no discolorations, and no cuts. Intact skeins of pollock roe, which include defects, are of lower value, and broken skeins of roe are of the lowest value (Bledsoe et al. 2003). According to Knapp (2005), different producers have different grading system—there is no standardized industry-wide grading system. However, Bledsoe et al. (2003) note that *mako* is the grade of pollock roe with no defects. Important defects include defective (generally, *kireko*), broken skeins, skeins with cuts or tears, discolorations (*aoko* for a blue green discoloration from contact with bile; *kuroko* for dark colored roe; *iroko* for orange stains from contact with digestive fluids), hemorrhages or bruising, crushed roe skeins, large veins or unattractive veining, immature (*gamako*), overly mature (*mizuko*), soft (*yawoko*), fracture of the oviduct connection between the two skeins, paired skeins of non-uniform size, and skeins that are not uniform in color or no longer connected together (Bledsoe et al. 2003).

Most U.S. pollock roe is sold at auctions held each year in Seattle and Busan, South Korea, in which numerous pollock roe producers and buyers participate (Knapp 2005). The buyers must fill their individual product needs, and their keen sight and sense of smell are critical to setting the price. Once the pollock roe is purchased and exported to Japan or Korea, it is processed into two main types of products: salted pollock roe, which is often used in rice ball sushi or mixed with side dishes, and seasoned or "spicy" pollock roe (Knapp 2005). Lower-grade pollock roe is commonly used for producing spicy pollock roe. Examples of seasonings include salt, sugar, monosodium glutamate, garlic and other spices, sesame, soy sauce, and sake. Spicy roe is sold as a condiment in Korean markets (Bledsoe et al. 2003).

Pollock roe may also be used as an ingredient in a variety of other products including salad dressings, pastes, spreads, and soup seasonings (Bledsoe et al. 2003). Retail packages of intact skeins can be as small as a single vacuum-packaged pack containing a set of matched skeins. Other product forms include 4, 8, and 16 oz. plastic trays (traditionally black in color with a clear lid), 500 g or larger boxes of attractively-arranged skeins, or marinated products sold in glass jars. Pollock roe may also be packaged in flat 100-g (3.5 oz) cans for retail sale (Bledsoe et al. 2003). Roe products sold as whole skeins are considered a high-end gourmet food product in Japan and are traditionally used for gift giving. However, demand for pollock roe as a gift product may be declining (Fukuoka Now 2006). Instead, processed pollock roe is increasingly becoming more mainstream in Japan and available in supermarkets as varying qualities enter the market (American Seafoods Group LLC 2002).

Catcher/processors are more likely to produce higher quality roe because they process the fish within hours of being caught, rather than days, as is typically the case with shoreside processors (American Seafoods Group LLC 2002). Knapp (2005) notes that prices for pollock roe produced at sea were generally \$1.50-\$2.00/lb higher than pollock roe produced by shoreside processors, presumably reflecting higher roe quality for at-sea production. Figure 24 shows average annual wholesale prices of salted pollock roe at ten central wholesale markets in major cities in Japan. The similarities in pollock roe price trends shown in Figure 21 and Figure 24 indicate that there is a linkage between U.S. and Japanese prices. 2006 was the last year for which the Japanese Ministry of Agriculture, Forestry and Fisheries published the prices shown in Figure 24.

Figure 24. Average Wholesale Prices of Salted Pollock Roe at Ten Major Central Wholesale Markets in Japan, 1996 - 2006



Source: U.S. Census Bureau Foreign Trade Data available at http://swr.nmfs.noaa.gov/fmd/sunee/salesvol/svw.htm

International Trade

Almost all U.S. pollock roe production is exported, the primary buyers being Japan and South Korea (Figure 25). It is possible that a substantial amount of the pollock roe exported to Korea is subsequently re-exported from Korea to Japan. Most Japanese pollock roe imports occur between March and July, with imports being highest in April and May (Knapp 2005).

Figure 25. U.S. Export Value of Alaska Pollock Roe to Leading Importing Countries, 1996 - 2010

Note: Data include all exports of Alaska pollock from the U.S. Customs Pacific District.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

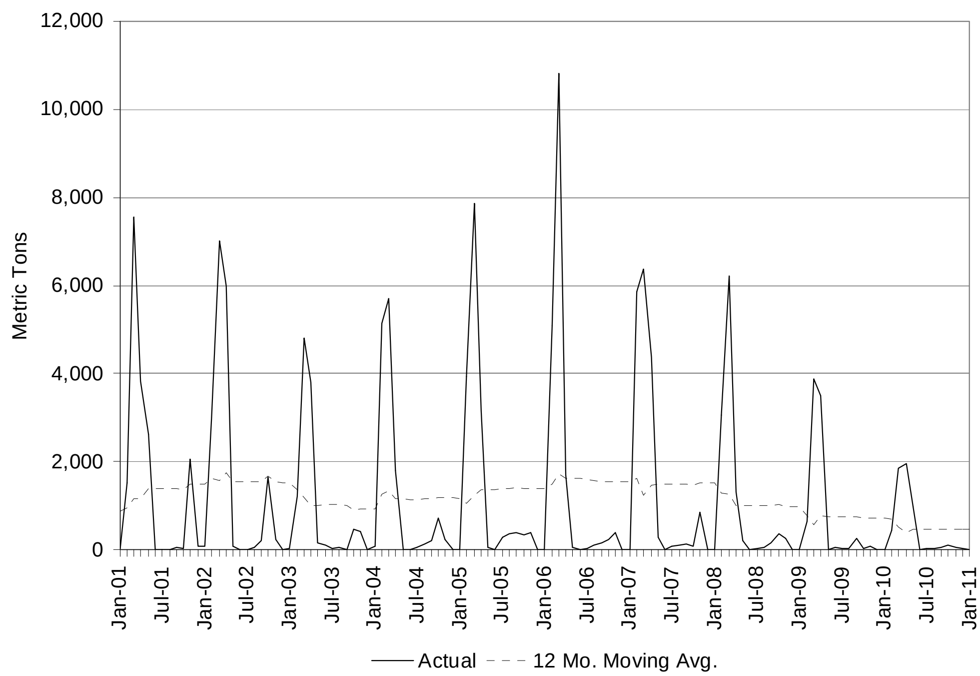
Market Position

U.S. pollock roe commands premium prices in Japan because of its consistent quality. However, U.S. pollock roe also competes in Asian markets with Russian pollock roe. In general, the decline in Russian pollock production during the early 2000's reduced competition for U.S. pollock roe producers and helped to strengthen markets for pollock roe (SeafoodNews.com 2007). What happens to Russian production in the future will be an important factor affecting markets for pollock roe (Knapp 2005), especially if the downward trend in U.S. pollock quota continues. As mentioned previously in the discussion of the Market Position for Alaska pollock fillets, the trend in 2010 is for increasing Russian pollock quotas.

Another factor that will affect future pollock roe markets is even more difficult to predict: Japanese and Korean consumer tastes for traditional and new pollock roe products (Knapp 2006). As roe products in these markets become more mainstream and demand for pollock roe as a gourmet gift product declines consumers may become less discriminating among different types and qualities of roe. For example, spicy roe can also be made from Pacific cod, Atlantic cod, capelin, herring, mullet, whiting, hoki, flying fish, or lumpfish roe (Bledsoe et al. 2003).

Historically, Japanese wholesale prices for pollock roe have been inversely related to total supply. However, the price of pollock roe is also heavily influenced by the size and condition of roe skeins, color and freshness and the maturity of the fish caught. In addition, prices are influenced by anticipated Russian and U.S. production and Japanese inventory carryover. As a result, pollock roe prices have often experienced significant volatility (American Seafoods Group LLC 2002) (Figure 27 and Figure 29). In 2008, auction prices for both U.S. and Russian pollock roe were up, reportedly in response to the decreased supply caused by cuts in the U.S. pollock quota (Seafood Market Bulletin 2008; SeafoodNews.com 2008). Prices for pollock roe exports to Japan continued a slight upward trend through 2009 and leveled off in 2010; prices for exports to Korea were trending downward through 2009 but reversed course to an upward trend in 2010. The difference in the price trends could be partly explained by differences in either the demand for roe in the two countries or the overall quality of roe exported to them.

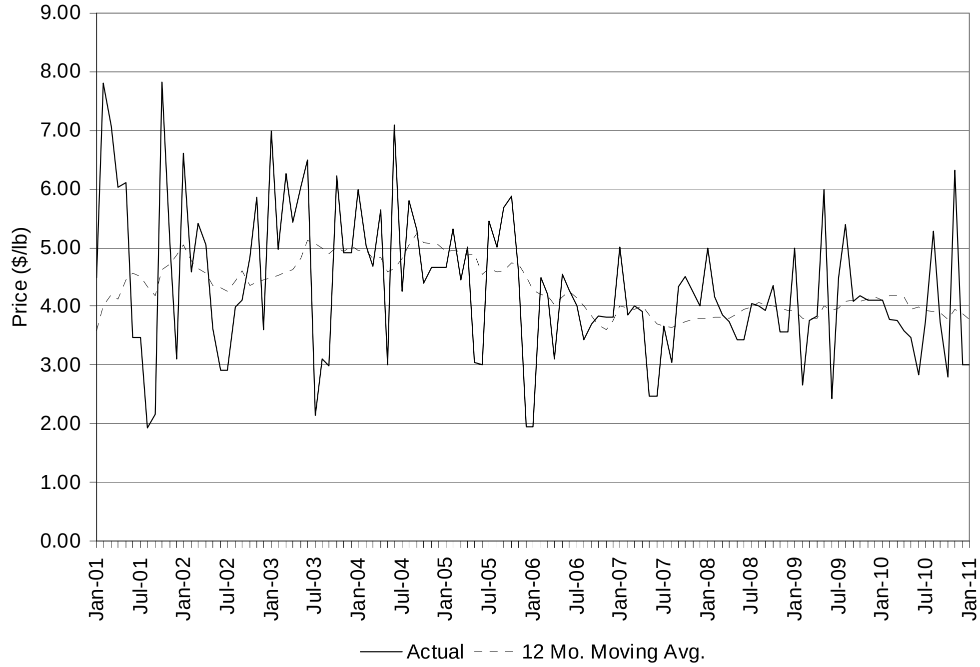
Figure 26. U.S. Export Volumes of Pollock Roe to Japan, 2001-2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

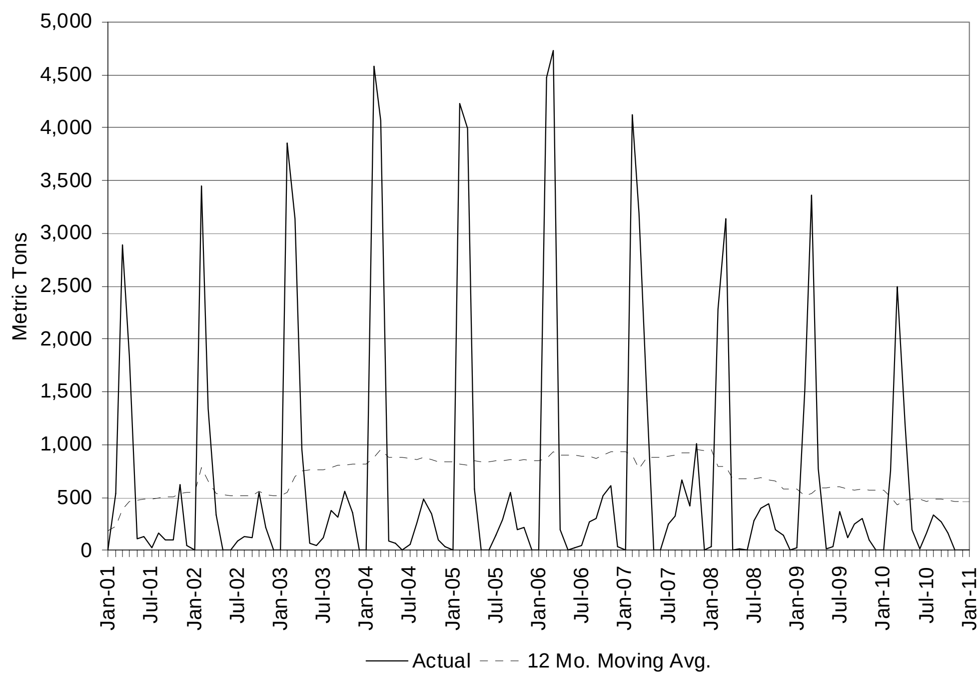
Alaska Pollock Roe Market Profile

Figure 27. Nominal U.S. Export Prices of Pollock Roe to Japan, 2001-2010



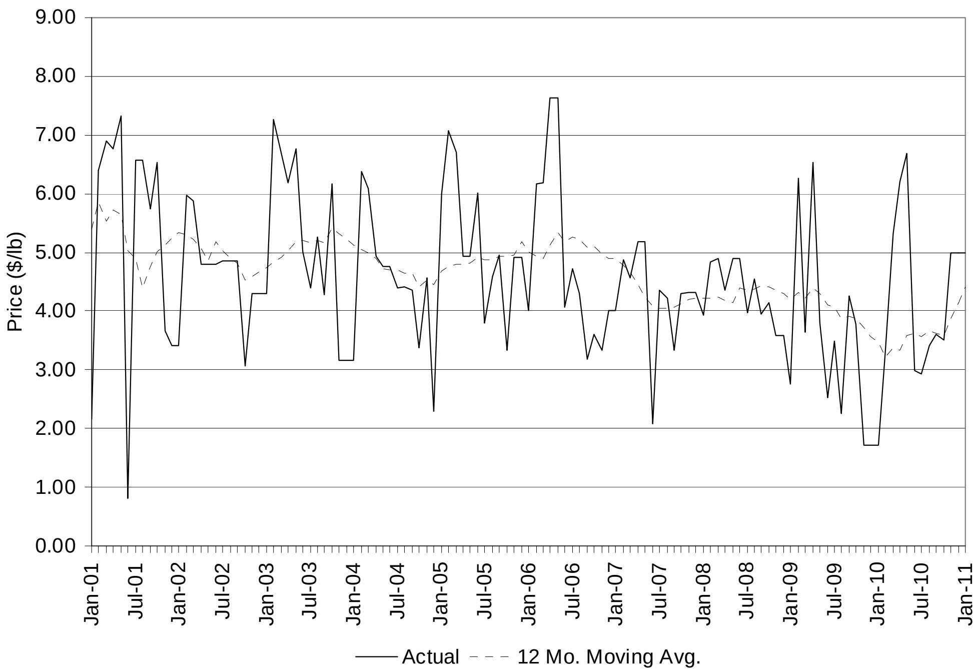
Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 28. U.S. Export Volumes of Pollock Roe to Korea, 2001-2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 29. Nominal U.S. Export Prices of Pollock Roe to Korea, 2001-2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

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Pacific Cod Market Profile

Description of the Fishery

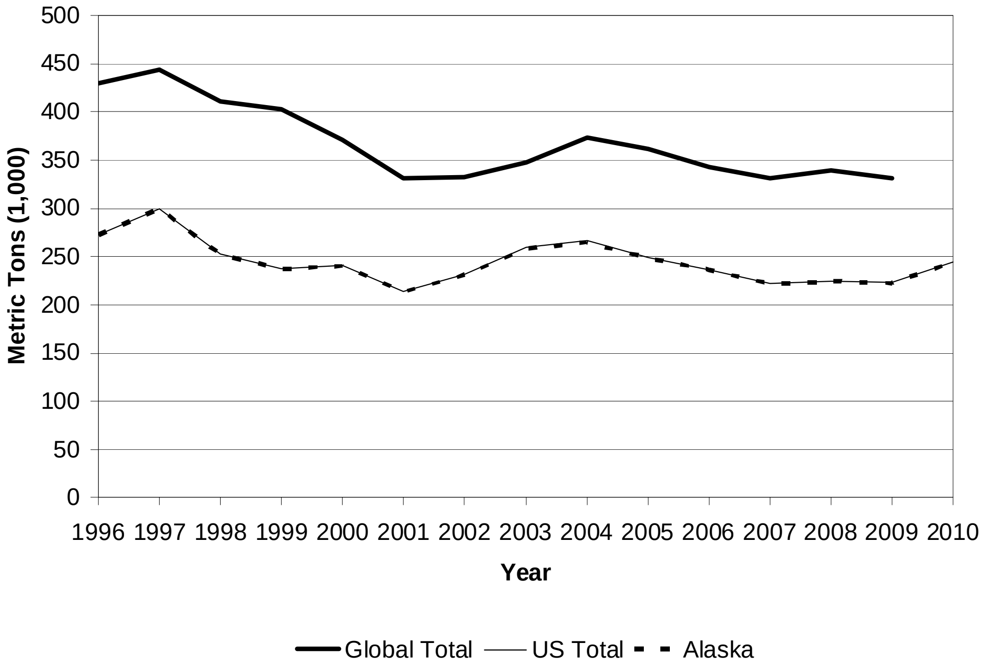
Pacific cod (*Gadus macrocephalus*) is widely distributed over the eastern Bering Sea and Aleutian Islands (BSAI) areas. Behind Alaska pollock, Pacific cod is the second most dominant species in the commercial groundfish catch off Alaska. The BSAI Pacific cod fishery is targeted by multiple gear types, primarily by trawl gear and hook-and-line catcher/processors, and in smaller amounts by hook-and-line catcher vessels, jig vessels, and pot gear. The BSAI Pacific cod TAC has been apportioned among the different gear sectors since 1994, and the CDQ Program has received a BSAI Pacific cod allocation since 1998.

The Gulf of Alaska (GOA) Pacific cod fishery is also targeted by multiple gear types, including trawl, longline, pot, and jig components. In addition to area allocations, GOA Pacific cod is also allocated on the basis of processor component (inshore/offshore) and season. The longline and trawl fisheries are also associated with a Pacific halibut (*Hippoglossus stenolepis*) mortality limit which sometimes constrains the magnitude and timing of harvests taken by these two gear types.

Production

Until the 1980s, Japan accounted for most of the world harvests of Pacific cod. In the 1980s, harvests of both the Soviet Union and the United States increased rapidly. Since the late 1980s, harvests of both Japan and the Soviet Union/Russia have fallen by about half, while U.S. harvests have remained relatively stable. As a result, by the middle of the last decade the United States accounted for more than two-thirds of the world Pacific cod supply (Knapp 2006); this trend continued through 2009, the last year for which we have global totals. As seen in Figure 30, virtually all of the U.S. Pacific cod catches are from Alaska waters—Pacific cod harvests from the U.S. West Coast were on average only 1 percent of the total U.S. harvest.

Figure 30. Alaska, Total U.S. and Global Retained Harvests of Pacific Cod, 1996 – 2010



Note: Data for 2010 were unavailable for global total. The fish landing statistics of some countries may not distinguish between Pacific cod and other cod species.

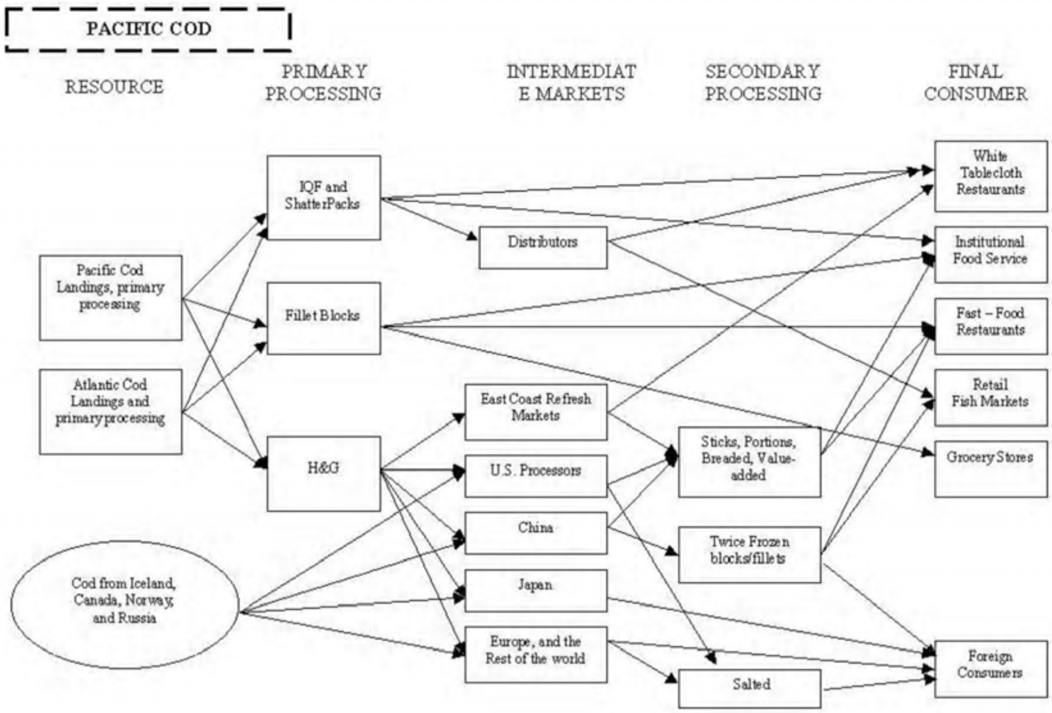
Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html; Global data from FAO, "FishStat" database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

Product Composition and Flow

Product flows for Pacific cod have changed dramatically in recent years, following the decline of Atlantic cod (*G. morhua*) harvests. For example, buyers from Norway and Portugal are now purchasing Pacific cod from Alaska for the first time. Historically, Pacific cod has been considered an inferior product compared to Atlantic cod, but the lack of Atlantic cod has made Pacific cod more acceptable. As a result, Pacific cod harvests, while still lower than Atlantic cod harvests, have in recent years represented about one-fourth to one-third of total world cod supply (Knapp 2006). Pacific cod now accounts for more than 95% of the U.S. domestic cod harvest, and more than 99% of this harvest is from Alaska waters (Knapp 2006).

As shown in Figure 31, Pacific cod, and its close substitute, Atlantic cod, are processed as either headed and gutted (H&G), fillet blocks, or individually frozen fillets, which are either individually quick-frozen (IQF) or processed into shatterpack (layered frozen fillets that separate individually when struck upon a hard surface) or layer pack.

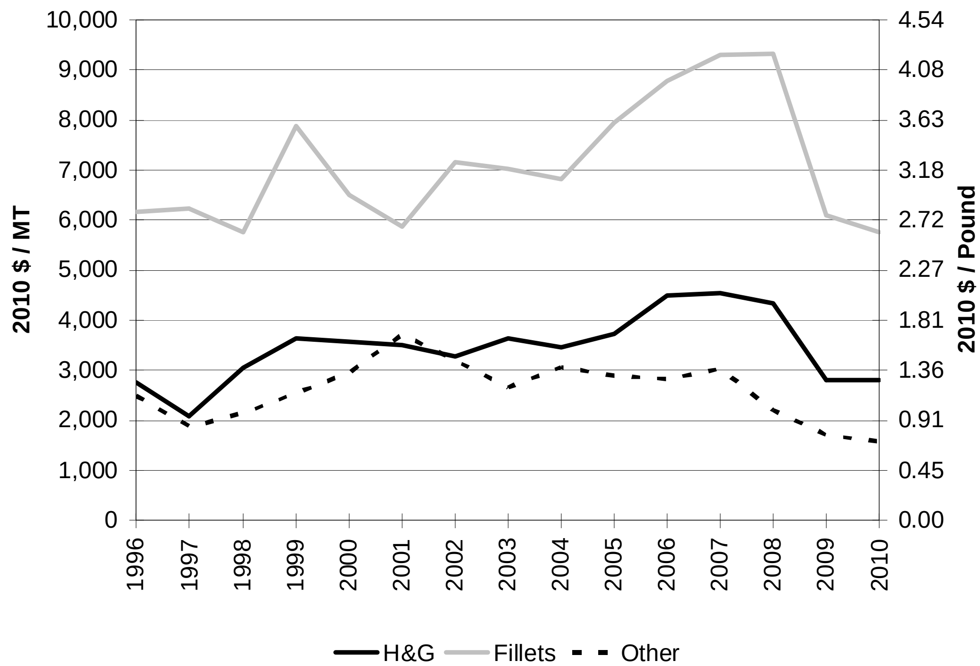
Figure 31. Product Flow and Market Channels for Pacific Cod.



Source: NMFS (2001)

Wholesale prices are highest for fillet products, but H&G fish account for by far the largest share of Alaska Pacific cod production. This share has been increasing over time, from just over 50% in 1996 to about 69% in 2010. Over the same period, the product share of skinless-boneless fillets has declined from approximately 16% to about 12%. The shift from fillets to H&G product is likely due to a combination of factors, including increased exports of H&G product to China where it is filleted and re-exported, and regulations that led to a redistribution of the Pacific cod harvest among sectors, with trawl "head-and-gut" catcher/processors accounting for a larger share of the total catch.

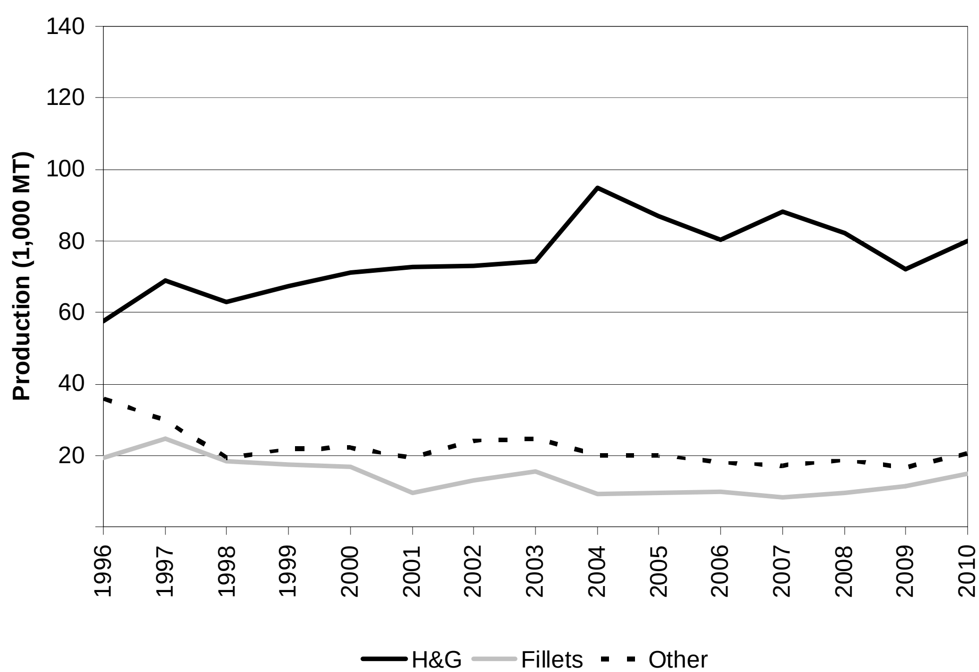
Figure 32. Wholesale Prices for Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2010



Notes: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

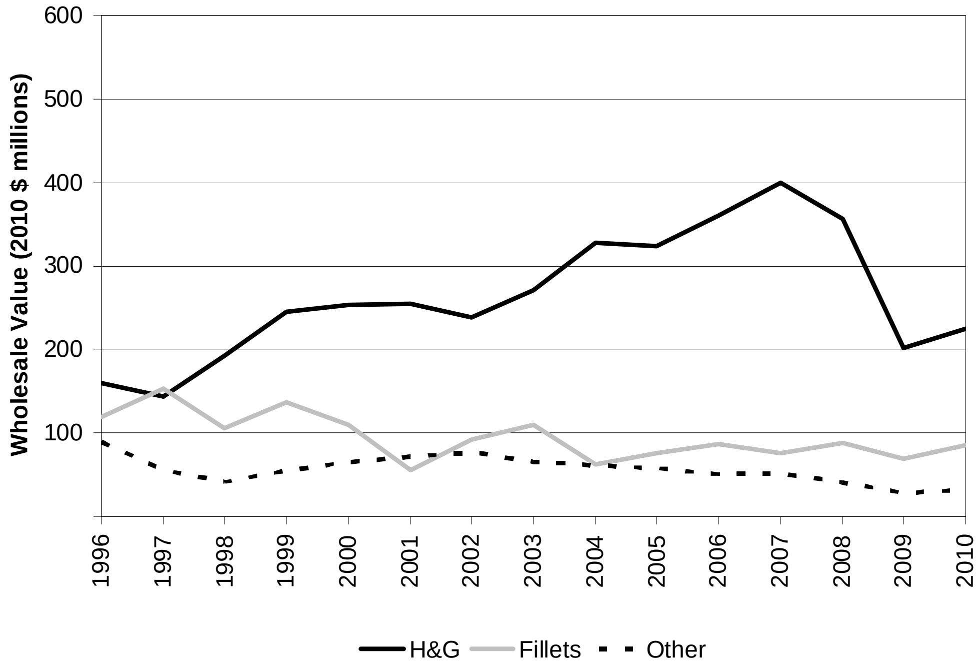
Figure 33. Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 34. Wholesale Value of Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

The three product types proceed through various market channels to several different final markets. The final markets, shown at the right of Figure 31, include: fine or "white tablecloth" restaurants, institutional food service, quick-service restaurants, retail fish markets, grocery stores, and overseas markets. The following brief description of the flow for each of the basic product types is based largely on NMFS (2001).

IQF and shatterpack fillets of Pacific cod are graded as 4-8 ounce, 8-16 ounce, 16-32 ounce, and 32+ ounce. They are used by 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.

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 Pacific 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 Pacific cod for further processing, including the production of salt cod. According to industry representatives, large H&G Pacific cod command the highest price, and it is these fish that are processed into salt cod. Salt cod is a high-value product popular in Europe, parts of Africa, and Latin America (Chetrick 2007). Early Easter is the peak consumption period for salt cod, and Brazil is the largest market for salted Pacific cod. Most of the Pacific cod that becomes salt cod is processed outside the U.S.; for example, Alaska-caught Pacific cod is finding a large and growing market with re-processors in Portugal (Chetrick 2007).

H&G cod obtained by China from the United States and other countries is further processed and re-exported to the United States, Europe and other overseas markets. Since the latter half of the 1990s, China has consolidated its leading position as a supplier of frozen Pacific cod fillets to international markets, a development which reflects the country's success as a re-processor of seafood raw materials. Thailand has also achieved a sizeable increase in imports due to shifts in processing sites caused by concerns about potential food safety risks in China (SeafoodNews.com 2007a).

Overseas processors either bread and portion the H&G cod or thaw and refreeze it into blocks, referred to as "twice-frozen fillet blocks." These twice-frozen blocks from China have gained considerable popularity in the United States. Traditionally, the quality of the fish was considered to be lower than the quality of fish in single-frozen, U.S.-produced fillet blocks and commanded a lower price. However, industry representatives note that the quality and workmanship of overseas processors has improved; as a result, twice-frozen is more acceptable, and in some cases has become the standard (GSGislason & Associates Ltd. 2003).

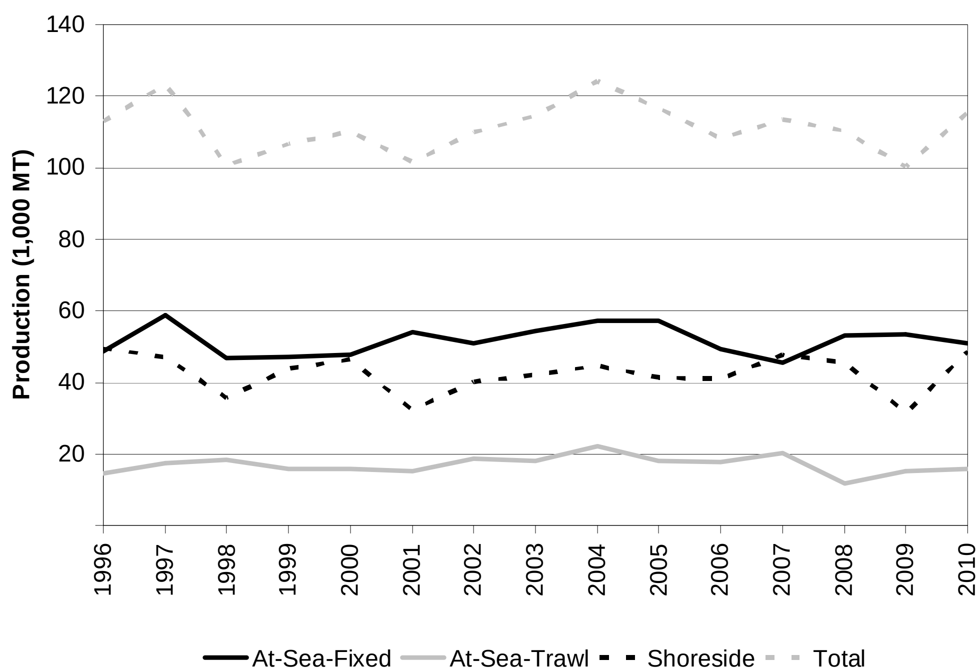
Figure 35 shows that wholesale prices for H&G Pacific cod caught and processed by fixed gear (freezer longline) vessels have been consistently higher than the prices received by trawl vessels. According to an industry representative, this price difference occurs because fish caught by longline gear can be bled while still alive, which results in a better color fish, and there is less skin damage and scale loss than if they are caught in nets. Shoreside processors obtain fish from both fixed gear and trawl vessels. Two factors may contribute to the lower prices received by these processors for H&G Pacific cod: 1) the fish have been dead for many hours before they are processed (although they are generally kept in refrigerated saltwater holds; and 2) the fish delivered are from near-shore fishing grounds, and these fish tend to be more infected with parasitic nematodes ("codworms"). Labor intensive ''candling'' of fillets for these and other parasites can account for approximately half of the production cost for Pacific cod from the BSAI and GOA (Bublitz and Choudhury 1992).

Figure 35. Wholesale Prices for Alaska Primary Production of H&G Cod by Sector, 1996 – 2010

Note: Product type may include several more specific products. Data are not available to calculate separate prices for the two at-sea sectors prior to 2001.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

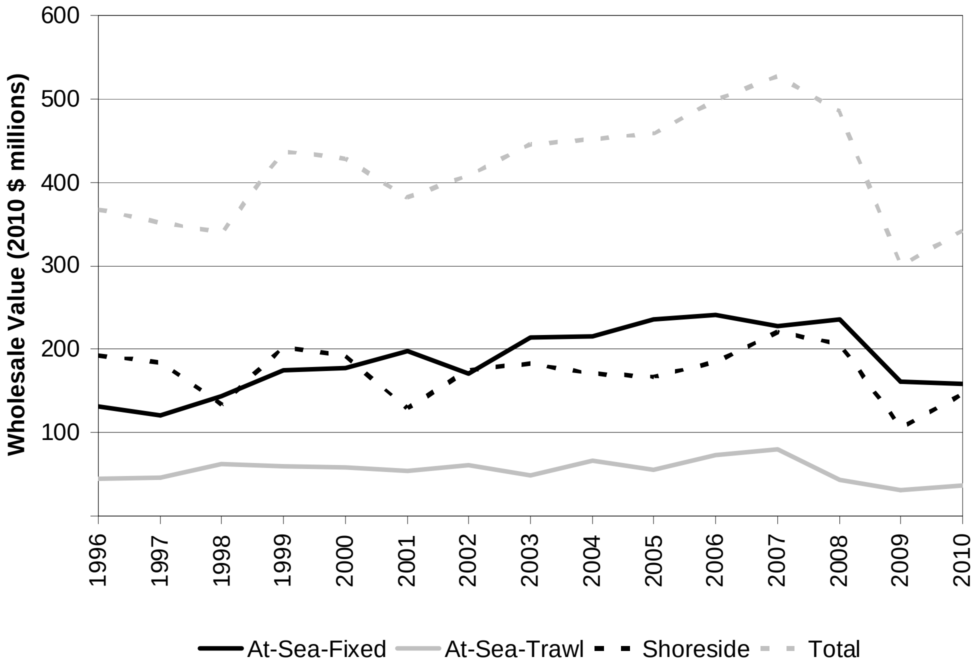
Figure 36. Alaska Primary Production of H&G Pacific Cod by Sector, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 37. Wholesale Value of Alaska Primary Production of H&G Pacific Cod by Sector, 1996 – 2010



Note: Product type may include several more specific products.

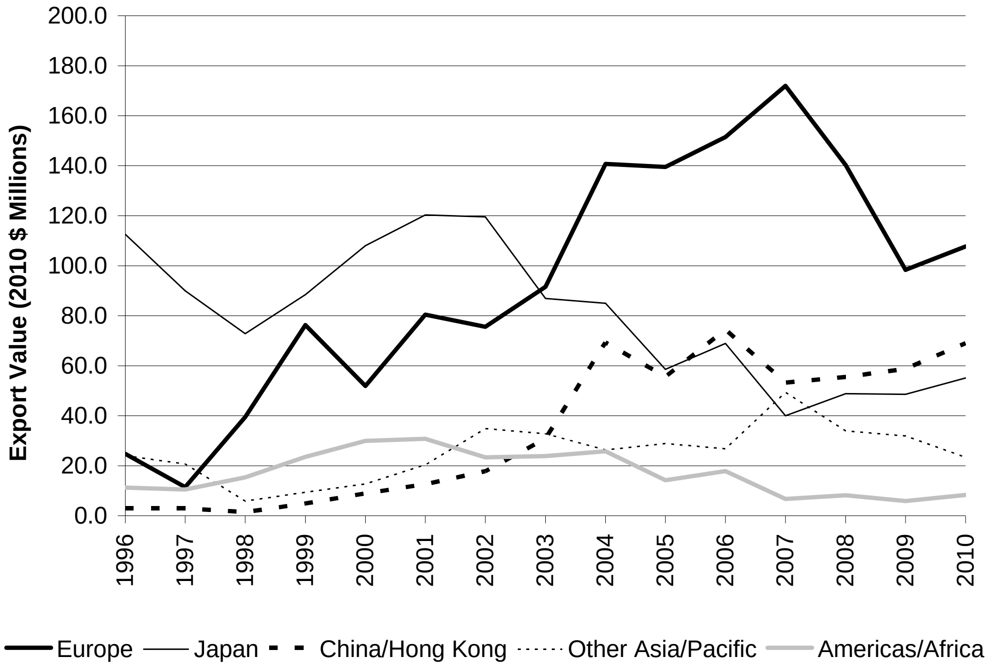
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

International Trade

Most domestically-produced Pacific cod fillets are destined primarily for the domestic market for use in the foodservice industry. However, Pacific cod harvested in Alaska groundfish fisheries and processed as H&G primarily enters the international market. U.S. foreign trade statistics do not differentiate between Pacific and Atlantic cod; exports of both species are coded as "cod." However, given the preponderance of Pacific cod in total U.S. landings, it is likely that exports are also overwhelmingly Pacific Cod (Knapp 2006). Furthermore, the fact that over 97% of this product category is exported from the U.S. West Coast indicates that Pacific cod dominates U.S. production. Little, if any, of the U.S. Atlantic cod harvest is exported as it is mainly sold in distinct market niches for fresh cod on the East Coast (NMFS 2001; pers. comm., Todd Clark, Endeavor Seafood, Inc., September 26, 2007). U.S. foreign trade records also do not specify an "H&G" product form for exports. The export value of H&G product is included in Figure 38.

The value of Pacific cod moving into European markets increased steadily from 2002 through 2007, declined in 2008 and 2009, and increased again in 2010 (Figure 38). Industry representatives indicate the growth of exports to Europe is a function of stock declines of Atlantic cod and the growing acceptance of Pacific cod as a substitute. Leading importers in Europe are Norway, Portugal and the Netherlands, although industry sources indicate that the UK has become more important in recent years. As noted earlier, Alaska-caught Pacific cod is finding a large and growing market with re-processors in Portugal where it is made into salt cod destined for domestic markets and re-exported to Spain. Other significant European re-processors of Pacific cod are located in the Netherlands and Norway (Seafood Market Bulletin 2007). In Norway, according to industry sources, Pacific cod is processed as salt cod and re-exported to Southern Europe, Brazil and Caribbean countries. Cod exported to Portugal and Spain is also converted to salt-cod products. Exports to China also increased markedly—this is consistent with trends across many fisheries products, with the seafood industry looking to the Asian country for low-cost processing of value-added products (Seafood Market Bulletin 2006a). Meanwhile, Japan's share of frozen cod exports has substantially declined (SeafoodNews.com 2008), though data are not available to assess the re-export destinations of China's processed product.

Figure 38. U.S. Export Value of Frozen Pacific Cod to Leading Importing Countries, 1996 - 2010



Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Market Position

According to Halhjem (2006), 2006 was a turning point in the market for Pacific cod; in that year the price of Pacific cod exceeded that of Atlantic cod. Given worldwide shortages of Atlantic cod and acceptance of Pacific cod in overseas and domestic markets, the outlook is a continuing strong market demand for Alaska Pacific cod. Pacific cod is a popular item in the foodservice sector because of its versatility, abundance and year-round availability (NMFS 2001; Seafood Market Bulletin 2006a). In addition, the product is used in finer and casual restaurants, institutions, and retail fish markets.

U.S. export prices and volumes of frozen cod are shown in Figure 39 and Figure 40, with much of the product destined for re-processors in China and Europe (Figure 41 through Figure 44). The demand for Pacific cod fillets processed from H&G product especially increased in EU markets, as the dollar depreciated against the euro, making it less expensive for Europeans to buy U.S. seafood (Hedlund 2007). In addition, European whitefish supplies have been tight due to declining stocks—for example, Iceland cut its Atlantic cod harvest quota by 32% for the 2008-2009 fishing year (Evans and Cherry 2007). In 2007, the EU reduced tariffs further on cod to aid local processors (SeafoodNews.com 2007b). The volume of frozen cod exported to all countries peaked in 2006, declined through 2009, and increased again in 2010, although the peak for these exports to European markets occurred later, in 2008. The export prices of these products increased dramatically from 2003 through 2008, declined in 2009 due largely to the global economic recession that deepened at the end of 2008, and have shown an upward trend in 2010.

The market for Alaska-caught Pacific cod perhaps received an additional boost (at least temporarily) from certification by the Marine Stewardship Council of the Bering Sea and Aleutian Islands freezer longline Pacific cod fishery in February 2006. This fishery became the first cod fishery in the world to be certified by the MSC as a "well managed and sustainable fishery." However, this certification does not apply to all Pacific Cod longliners; to be certified vessels and companies must opt in by paying the required fees. To date, 9 of the 36 vessels that comprise this fishery have signed up to participate in the MSC certification program (Bering Select Seafoods Company 2007a). As the demand for MSC-certified Pacific cod products grows it is expected that more vessels will join the program. In 2006, Pacific cod products with the MSC label sold at a 3% premium (Halhjem 2006). In 2006, members of the Alaska Fisheries Development Foundation Inc., a non-profit organization supporting Alaska's seafood industry, began seeking certification of sustainability from the MSC for all Pacific cod fisheries in Alaska (Alaska Fisheries Development Foundation Inc. 2008). The MSC certified all Alaskan Pacific Cod fisheries as sustainable on January 22, 2010 (Marine Stewardship Council 2010).

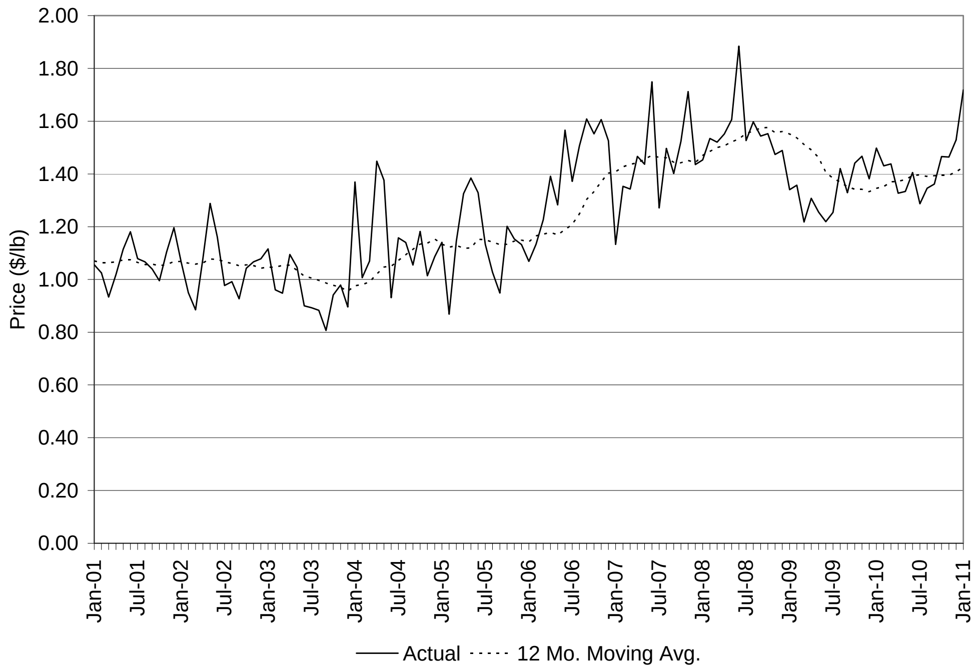
Marketing seafood from well-managed fisheries, such as Pacific cod, is especially important to EU seafood processors (Chetrick 2005). Some U.S. companies have also begun to shift their seafood purchases toward species caught in fisheries considered sustainable. In 2006, for example, Compass Group USA, a large food service company, announced that it would replace Atlantic cod with Pacific cod and other more "environmentally-sound" alternatives (Compass Group North America 2006). A potential complication is that environmental organizations have produced "fish lists" of "good and bad fish species" that consumers should select or reject according to the state of the stocks. These lists are usually generic in nature, so that cod, for example, is black-listed because of the state of the North Sea stock, but without considering the healthy stocks around Alaska (EU Fish Processors' Association 2006). A partial solution to this problem is that only companies that have obtained MSC chain-of-custody certification are eligible to display the MSC eco-label on packaging of seafood products (Bering Select Seafoods Company 2007b; Marine Stewardship Council 2007).

Industry representatives also noted that they expect to benefit from expanded use of the name "Alaska cod" to market Pacific cod products. The term "Alaska" conjures up a positive flavor and quality image in seafood consumers' minds due to the branding efforts of organizations such as the Alaska Seafood Marketing Institute (Munson 2004). "Alaska cod" is one of the existing acceptable market names for Pacific cod according to the U.S. Food and Drug Administration (2005).

Through 2008, the continuing strong demand for whitefish, particularly in the United States and Europe because of consumers' preference for healthy food, maintained the upward pressure on Pacific cod prices. As Pacific cod prices rose, some species substitution was inevitable. Alaska Pacific cod competes in world fillet markets with numerous other traditional whitefish marine species, such as Atlantic cod, hake (whiting), Alaska pollock, hoki (grenadiers), and saithe (Atlantic pollock). Attractively priced whitefish fillets and products can also be prepared from freshwater species such as pangasius (basa catfish), Nile perch, and tilapia, so that while freshwater whitefish represent a relatively small sector of the total market at this time, it can be anticipated that they will be used to both substitute for traditional whitefish marine species as well as to be used to grow the overall market (EU Fish Processors' Association 2006).

In the future Alaska-caught Pacific cod may be in direct competition with farmed cod. Cod farming looks set to rival salmon farming in terms of the number of operations and level of production. Several experienced seafood aquaculture firms are involved in farmed cod development, and significant volumes of cultured cod are already being raised in Norway. In 2004, 3,000 mt of cod were produced by 200 farms in Norway, and the production increased to 11,000 mt in 2006 and 15,000 mt in 2007 (Lexmon 2007; Moe et al. 2005; Seafood Market Bulletin 2008). Cod aquaculture is also a developing industry in Scotland, Ireland, and Canada. Because the development of farmed cod is occurring largely in the private sector, comprehensive third-party data on projected farmed cod production does not exist. However, the available data point toward a significant trend—substantial growth in farmed cod, and a likelihood that cod farming will surpass wild harvest of cod as the most significant source of cod in the next two decades (Seafood Market Bulletin 2006b).

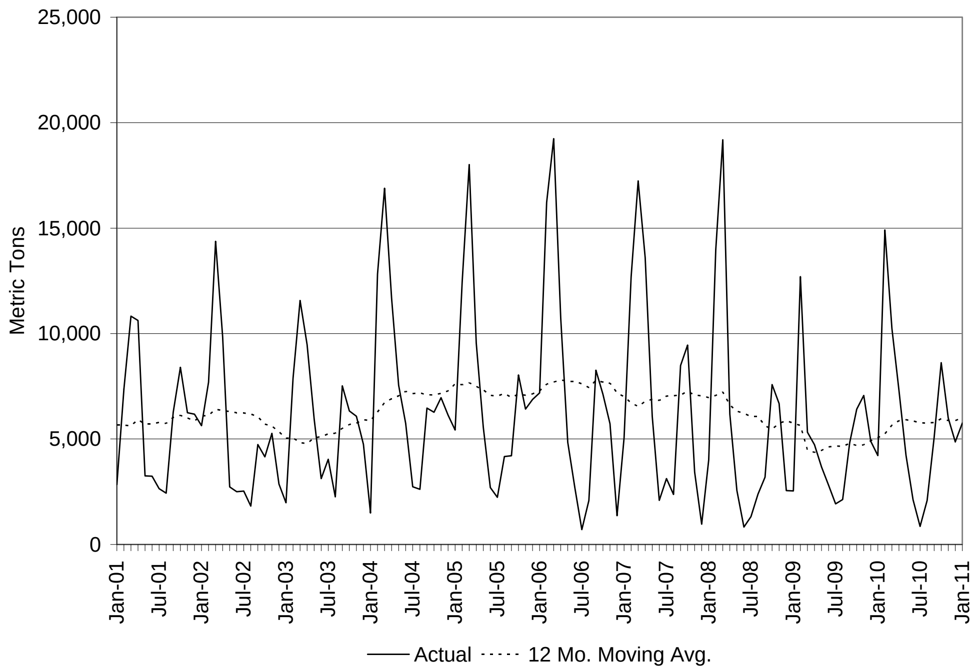
Figure 39. U.S. Export Prices of Frozen Cod to All Countries, 2001 – 2010



Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

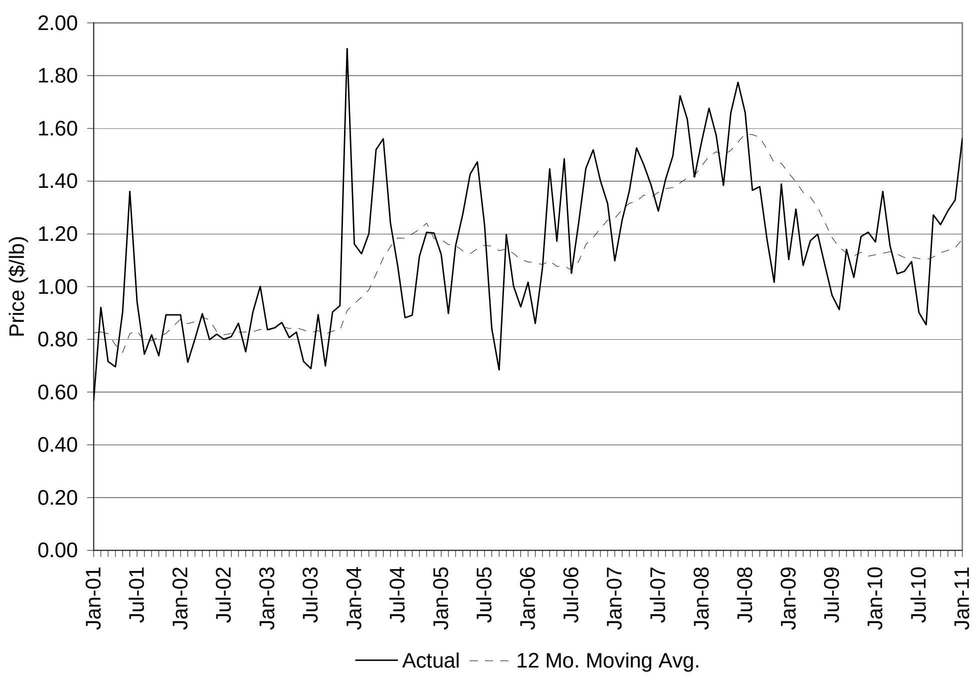
Figure 40. U.S. Export Volumes of Frozen Cod to All Countries, 2001 – 2010



Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 41. Nominal U.S. Export Prices of Frozen Cod to China, 2001 – 2010

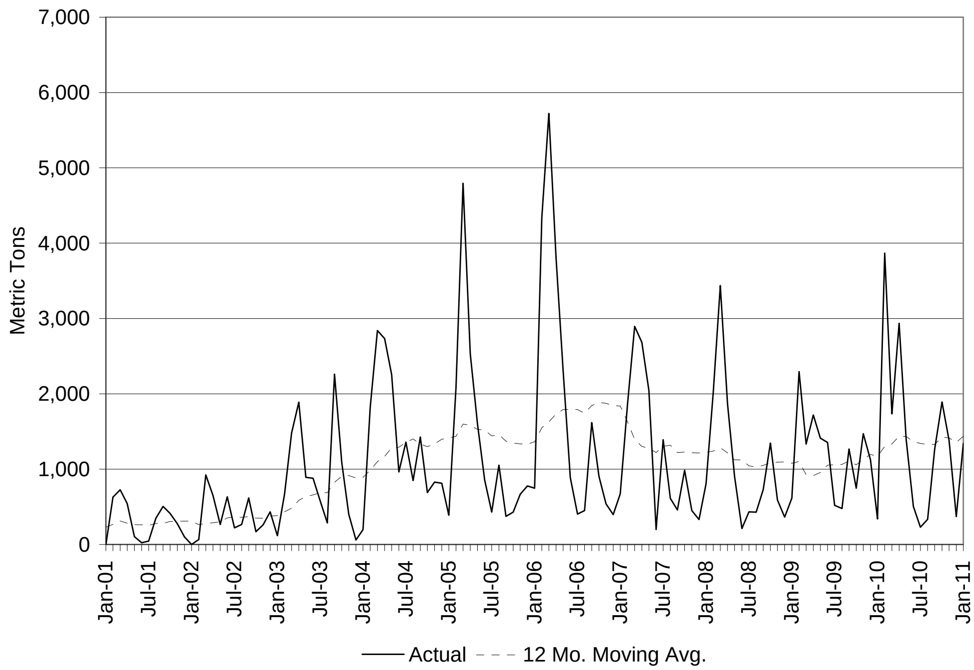


Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Pacific Cod Market Profile

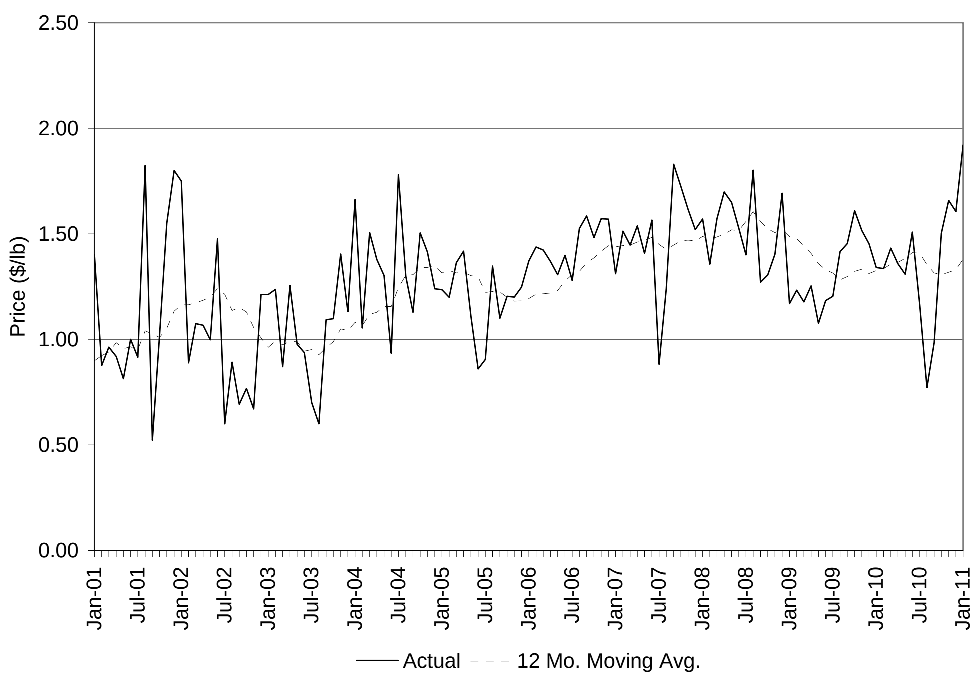
Figure 42. U.S. Export Volumes of Frozen Cod to China, 2001 – 2010



Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

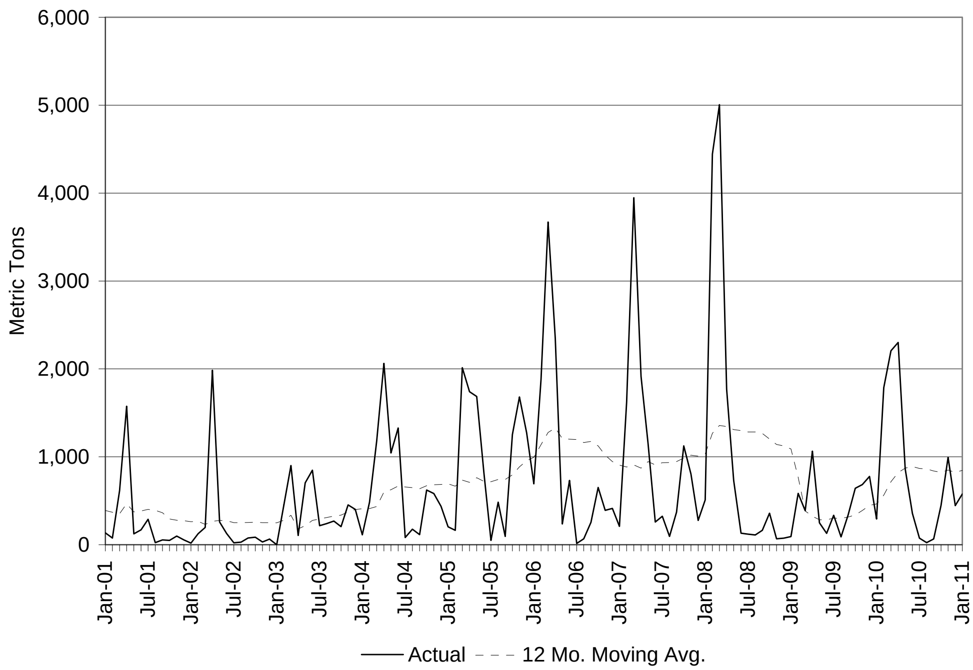
Figure 43. Nominal U.S. Export Prices of Frozen Cod to Portugal, 2001 – 2010



Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 44. U.S. Export Volumes of Frozen Cod to Portugal, 2001 – 2010



Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

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Sablefish Market Profile

Description of the Fishery

Sablefish (*Anoplopoma fimbria*) are distributed along the continental shelf and slope of the North Pacific Ocean from Baja California through Alaska and the Bering Sea, and westward to Japan. The greatest abundance of sablefish is found in the Gulf of Alaska and Bering Sea. In Federal waters off Alaska, the total allowable catch for Bering Sea and Aleutian Islands sablefish is typically about one-third of that for Gulf of Alaska sablefish.

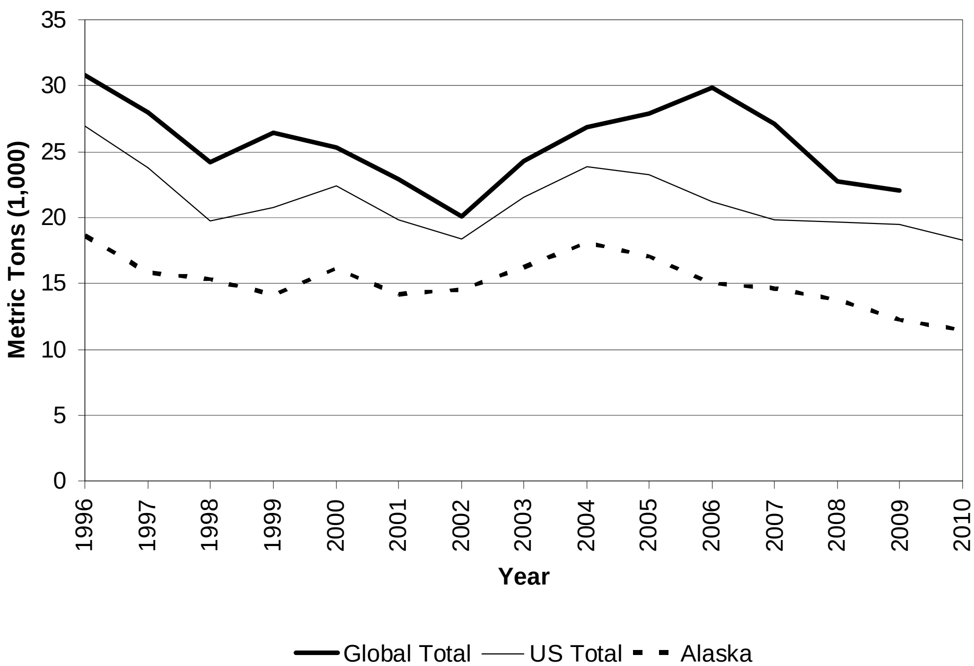
The fishing fleet for sablefish is primarily composed of owner-operated vessels that use hook-and-line or pot (fish trap) gear. An IFQ program for the Alaska sablefish and halibut fisheries was developed by the North Pacific Fishery Management Council and implemented by NMFS in 1995. The program was designed, in part, to help improve safety for fishermen, enhance efficiency, reduce excessive investment in fishing capacity, and protect the owner-operator character of the fleet. The program set caps on the amount of quota that any one person may hold, limited transfers to bona fide fishermen, issued quota in four vessel categories, and prohibited quota transfers across vessel categories.

The IFQ system has allowed fishers to time their catch to receive the best prices. In a survey of sablefish fishers in the first year of the program, more than 75 percent said that price was important in determining when to fish IFQs (Knapp and Hull 1996).

Production

Most of the total world catch of sablefish comes from Alaska (Figure 45). Alaska accounted for approximately two-thirds (63%) of total U.S. harvests in 2010. This share of total U.S. harvests has remained relatively stable throughout the years. Outside of the United States, sablefish are caught along the British Columbia coast, from the Vancouver area north to the Alaskan border (Cascorbi 2007).

Figure 45. Alaska, Total U.S. and Global Production of Sablefish, 1996 – 2010



Note: Data for 2010 were unavailable for Global totals.

Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html; Global data from FAO, "FishStat" database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

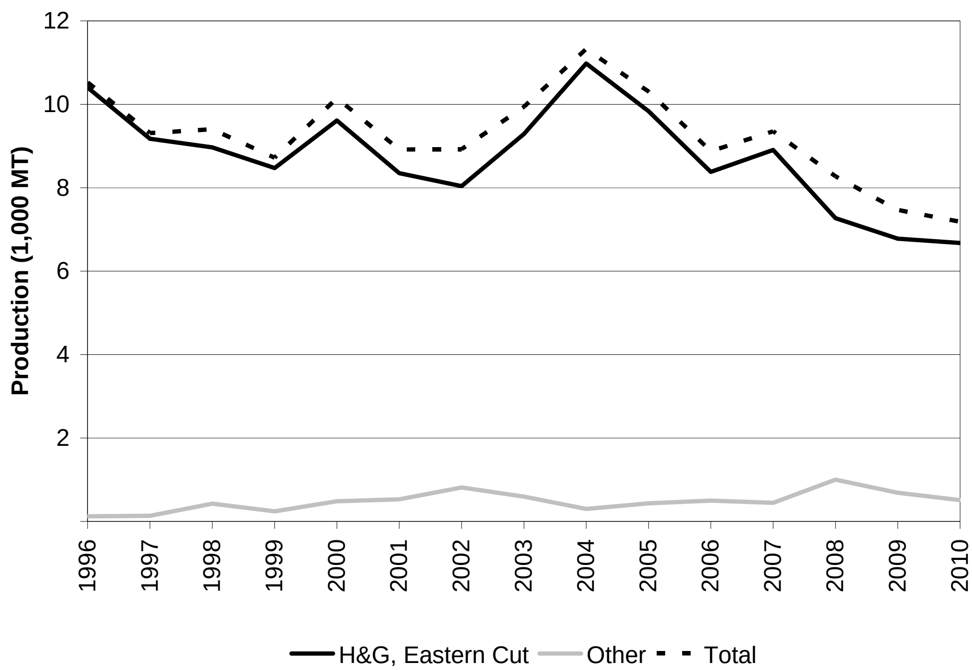
Product Composition and Flow

Until recently, about 90 percent of sablefish delivered by catcher vessels to shoreside processors was already headed and gutted (H&G) in an eastern cut—head removed just behind the collar bone (pers. comm., Jeannie Heltzel, Fisheries Analyst, North Pacific Fishery Management Council, September 19, 2007). In 2006, however, the percentage of eastern cut H&G deliveries declined to 75 percent, and as of September 2007, eastern cut H&G represented only 55 percent of deliveries, with almost all the remaining sablefish harvest delivered in the round (pers. comm., Jeannie Heltzel, Fisheries Analyst, North Pacific Fishery Management Council, September 19, 2007; pers. comm., Jessica Gharrett, Data Manager, NMFS, September 19, 2007). By 2009, only about 41 percent of commercial sablefish landings by catcher vessels to shore-based processors were in the form of H&G eastern cut; about 57 percent of the 2009 landings were as whole fish (estimates derived from CFEC fish-ticket data). At the shoreside plants the fish are graded by size into small (less than 4¼ or 5 pounds), medium (4¼ or 5 to 7 pounds), and large (over 7 pounds), with larger sablefish garnering higher prices per pound (Flick et al. 1990). This trend persists as Tokyo wholesale prices from 2010 indicate that 5-7 pound fish sell at approximately a $0.52 premium over 4-5 pound fish. As shown in Figure 46, most sablefish are sold as H&G product, eastern cut.

As a result of its high oil content, sablefish is an excellent fish for smoking. Smoked "sable" has long been a working-class Jewish deli staple in New York City (Cascorbi 2007). It is normally hot-smoked and requires additional cooking. In addition, as a premium-quality whitefish with a delicate texture and moderate flavor, sablefish is prized in up-scale restaurants (Cascorbi 2007). Sablefish has several market names in its processed forms. The U.S. consumer may see smoked sablefish as smoked Alaskan cod or sable, and fresh and frozen fillets as butterfish or black cod (Flick et al. 1990).

Sablefish is a mature market that is sensitive to relatively minor changes in supply, indicated by prices which in general respond inversely to fluctuations in the Alaska sablefish harvest (Seafood Market Bulletin 2006; Sonu 2000) (Figure 48).

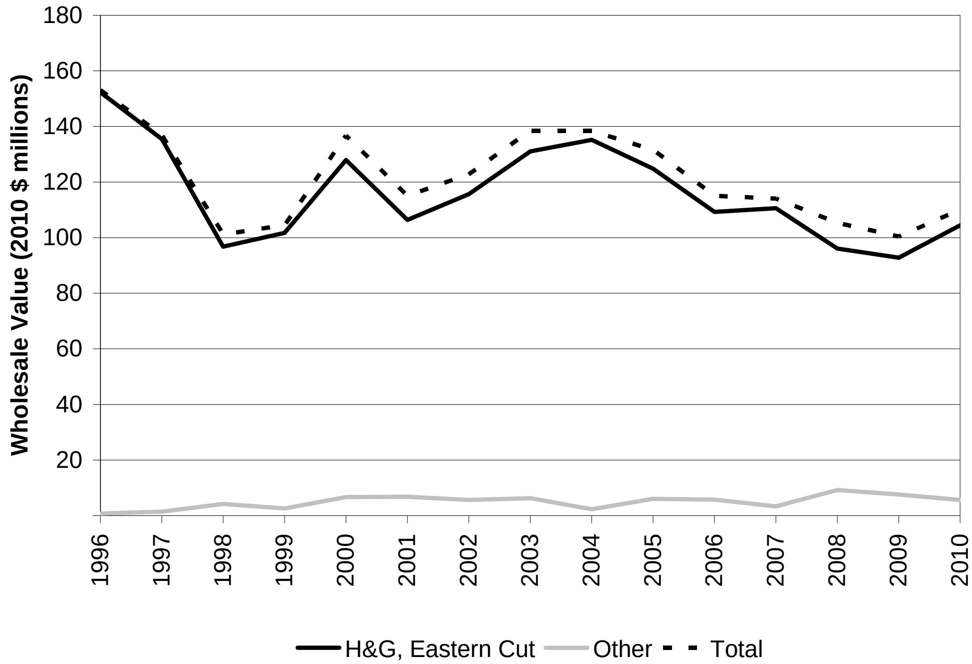
Figure 46. Alaska Primary Production of Sablefish by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

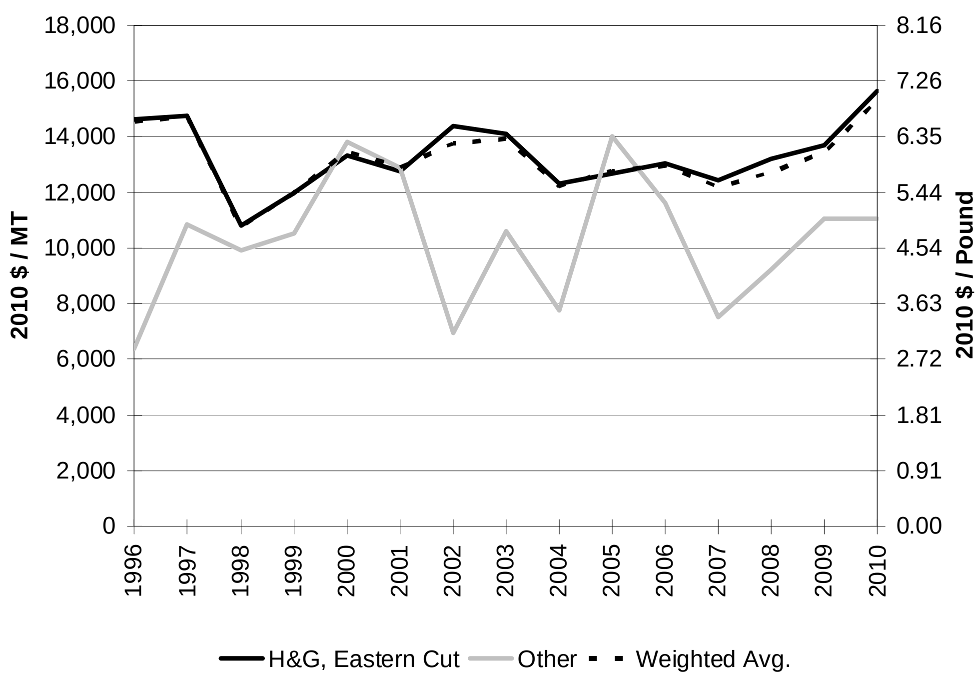
Figure 47. Wholesale Value of Alaska Primary Production of Sablefish by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 48. Wholesale Prices for Alaska Primary Production of Sablefish by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

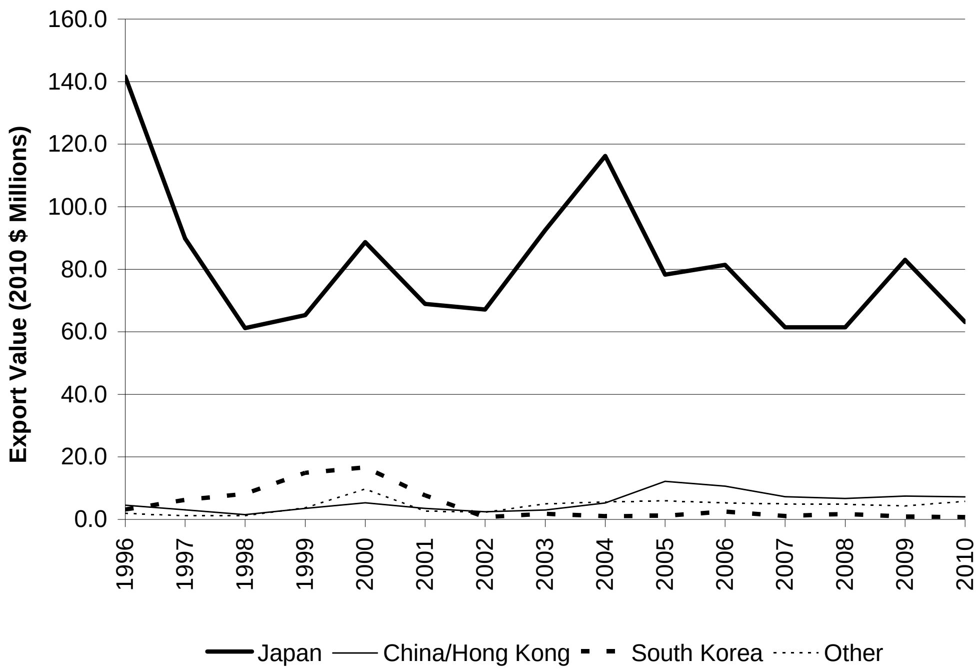
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

International Trade

Although smoked sable has long been a traditional item in the U.S. deli trade, most of the Alaska sablefish catch has historically been exported to Japan, where it is a popular fish that is primarily consumed during the winter months (Niemeier 1989). Japan continues to be the major market as is evident from U.S. export data (Figure 49). Sonu (2000) states that in Japan, sablefish is sold in retail stores for home consumption in steak and fillet form, and as *kasuzuke* (marinated in Japanese rice wine lees). The most popular sablefish dish is fish stew, which typically consists of sliced fish, vegetables, and soup stock. The dish is consumed primarily during the winter months. Sablefish steaks and fillet, as well as *kasuzuke*, are also used in grilled, broiled, or baked form. Sablefish may also be used as *sashimi* (thinly sliced raw fish).

It is believed that the majority of sablefish shipped to China was re-exported to Japan, rather than used for domestic Chinese consumption. Product shipped to other Asian (e.g., South Korea) and European markets was largely for local consumption.

Figure 49. U.S. Export Value of Frozen Sablefish to Leading Importing Countries, 1996 – 2010.



Note: Data include all exports of frozen sablefish recorded at the Anchorage and Seattle offices of the U.S. Customs Pacific District. It should be noted that sablefish are also harvested on the West Coast and that it is likely that some of this sablefish may be from West Coast harvests.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

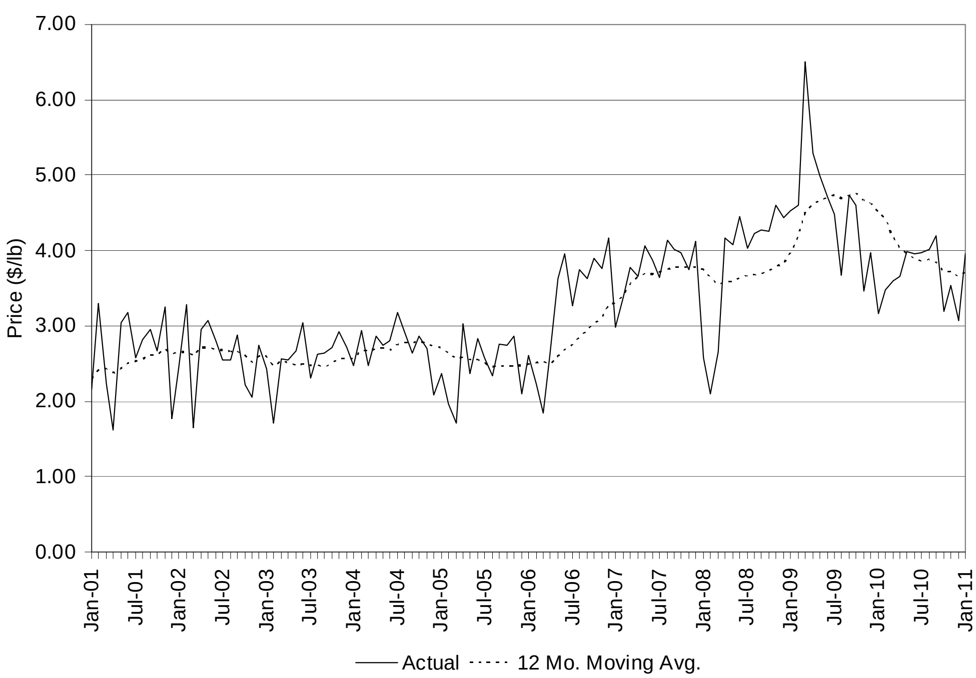
Market Position

Historically, sablefish has competed with species such as rockfish and turbot, which have similar seasons and has sometimes substituted for salmon when salmon prices are high (Niemeier 1989). In addition, sablefish has been marketed as a substitute for Chilean sea bass (*Dissostichus eleginoides*) because of its similar taste and texture. Chilean sea bass is currently over-fished in all oceans, and the "Take a Pass on Chilean Sea Bass" media campaign of environmental groups bolstered the consumption of sablefish in the United States, although it is unlikely to replace the sales of Chilean sea bass (Redmayne 2002). Sablefish has also gained popularity in the growing number of U.S. restaurants that feature Asian or Pan Asian cuisine (Burros 2001; Redmayne 2002).

Japan remains the primary market destination for Alaska sablefish. As noted above, sablefish market prices generally respond inversely to fluctuations in the Alaska sablefish harvest. The reduction in the Alaska sablefish catch due to a steadily decreasing TAC (from 20,100 mt in 2007 to 15,230 in 2010), combined with growing demand for sablefish in alternative markets, was expected to create upward pressure for sablefish prices (Seafood Market Bulletin 2008), a trend that held through early 2009, as depicted in Figure 50. Despite the leveling off or downward trending U.S. sablefish export prices, Alaska sablefish prices have continued to rise (Figure 48). Sablefish hatcheries have developed in British Columbia and in 2008 Sablefish Canada Ltd. began selling fish from its Vancouver Island farms, enabling fresh fish to reach the market on a regular basis. The company expected to produce 500 mt of sablefish in 2008 and hoped that production would increase to 5,000 mt in the next five years (Gill 2008). The continued upward trend of Alaska sablefish prices indicates that farmed sablefish has not yet significantly impacted the wild-caught Alaskan sablefish market perhaps because sablefish is a delicacy.

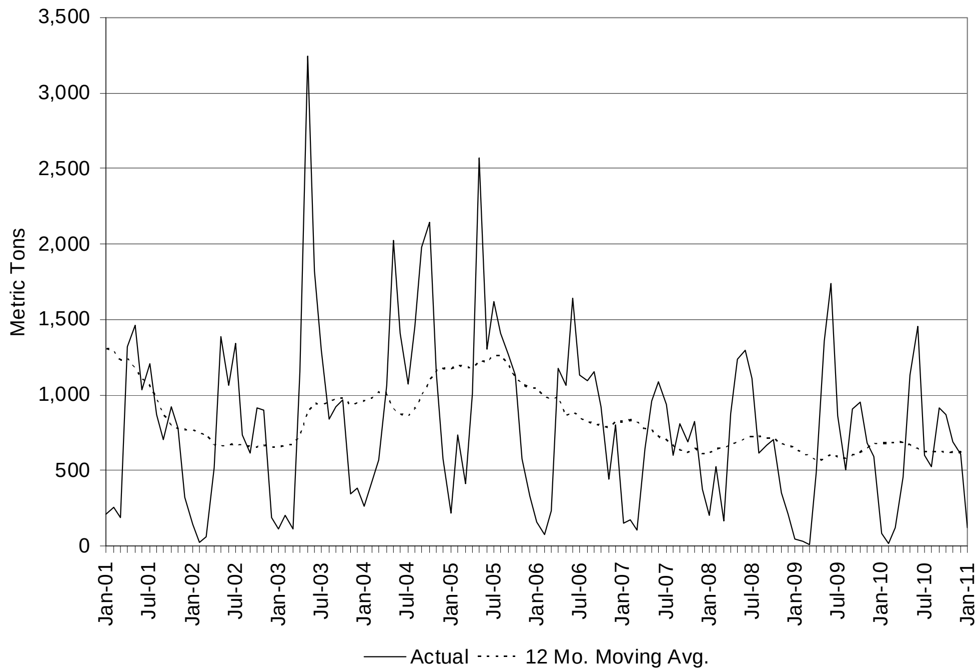
Marine Stewardship Council certified the Alaska sablefish longline fishery as a "well managed and sustainable fishery" starting in 2006. The longline sector entered re-assessment in May 2010 and trawl sector is currently under an initial assessment for MSC certification. To capitalize on the MSC certification, the Fishing Vessel Owners' Association, which spearheaded and paid for the fishery assessment that led to the eco-friendly seafood label, has partnered with the Deep Sea Fishermen's Union to form a tax exempt corporation called Eat on the Wild Side to expand the sablefish market beyond Japan (Welch 2006). In 2007, FreshDirect, one of the leading online fresh food grocers in the United States, began to offer Alaska-caught sablefish and other MSC-certified seafood (IntraFish Media 2007).

Figure 50. Nominal U.S. Export Prices of Sablefish to All Countries, 2001 – 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 51. U.S. Export Volumes of Sablefish to All Countries, 2001 – 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

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Yellowfin and Rock Sole Market Profile

Description of the Fishery

The yellowfin sole (*Limanda aspera*) is one of the most abundant flatfish species in the eastern Bering Sea. Yellowfin sole are targeted primarily by trawl catcher/processors, and the directed fishery typically occurs from spring through December. Seasons are generally limited by closures to prevent exceeding the Pacific halibut apportionment or red king crab bycatch allowance.

The northern rock sole (*Lepidopsetta polyxystra* n. sp.) is distributed primarily on the eastern Bering Sea continental shelf and in much lesser amounts in the Aleutian Islands region. Rock sole are important as the target of a high value roe fishery, which has historically accounted for the majority of the annual catch. There is no prohibition on roe-stripping in this fishery. Historically, the fishery has been conducted as a "race-for-fish" wherein fishers compete for roe-bearing rock sole before the prohibited species catch allowance for halibut or red king crab are exhausted or the prime roe period is over, the former being more likely to occur before the latter (Gauvin and Blum 1994). In addition, large amounts of male rock sole were discarded overboard because of their relatively low value. In recent years, however, a larger percentage of these fish has been retained as a result of development of markets for male rock sole. Retention is expected to increase in the future due to enactment of improved retention/utilization regulations by the North Pacific Fishery Council. Further, management measures implemented in 2008 allow the trawl "head-and-gut" fleet to form fishing cooperatives. By operating collectively, the fleet is expected to minimize Pacific halibut bycatch and to optimize catches of target species by spreading out the yellowfin sole harvest over the fishing season and concentrating the rock sole harvest during the roe season.

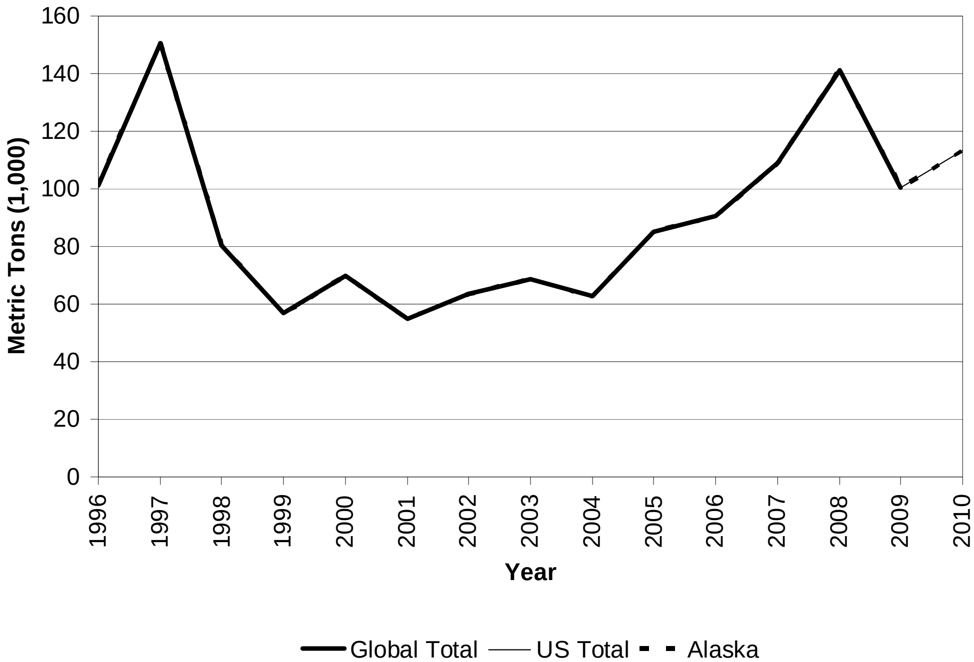
Production

The yellowfin sole and rock sole fisheries off Alaska are the largest flatfish fisheries in the United States. These species together account for approximately 50% of U.S. flatfish landings from the Pacific and Atlantic Oceans combined. U.S. catches of yellowfin sole occur only in the waters off Alaska, and rock sole catches almost entirely so (Figure 52 and Figure 53). West Coast landings comprise less than 1% of total U.S. landings for rock sole (Roberts and Stevens 2006).

Most of the yellowfin sole is landed in the summer when the Pacific cod fishery is closed. Rock sole, on the other hand, is fished in February and March, when females are ripe with roe (SeaFood Business undated).

The fish landings statistics available indicate that Alaska fisheries account for the entire worldwide production of yellowfin and rock sole (Figure 52 and Figure 53). However, the catch reporting standards and fisheries landings data available from some countries may be inadequate, and commonly used groupings for similar species lead to difficulties in isolating species-specific landings (NMFS 2001). For example, seafood market reports (e.g., IntraFish Media 2004; SeaFood Business undated), seafood supplier Web sites (e.g., Siam Canadian Foods Company, Ltd. 2004), scientific articles (e.g., Kupriyanov 1996) and other information sources (e.g., Vaisman 2001) refer to Russian harvests of yellowfin sole in the western Bering Sea. However, no records of these catches are found in fishery statistics compiled by the U.N. Food and Agriculture Organization.

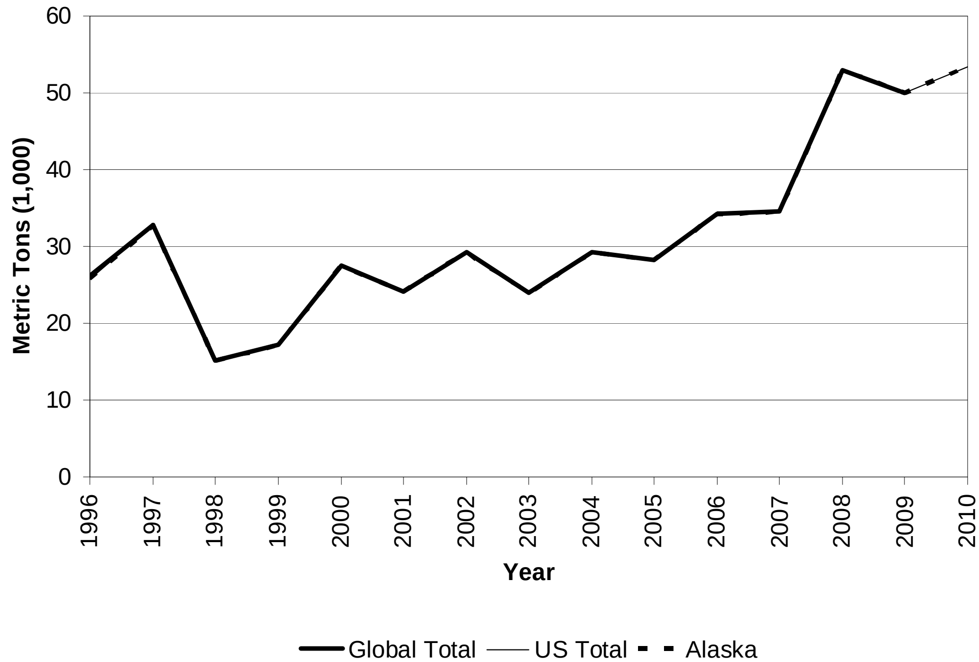
Figure 52. Alaska, Total U.S. and Global Retained Harvest of Yellowfin Sole, 1996 – 2010



Note: The global harvest estimate may not be accurate because the fish landing statistics of some countries may not distinguish between yellowfin sole and other flatfish species. The global total in the figure is the higher of the FAO estimate or U.S. total. Global estimates for 2010 are unavailable.

Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html; Global data from FAO, “FishStat” database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

Figure 53. Alaska, Total U.S. and Global Production of Rock Sole, 1996 – 2010



Note: The global harvest estimate may not be accurate because the fish landing statistics of some countries may not distinguish between rock sole and other flatfish species. The global total in the figure is the higher of the FAO estimate or U.S. total. Global estimates for 2010 are unavailable.

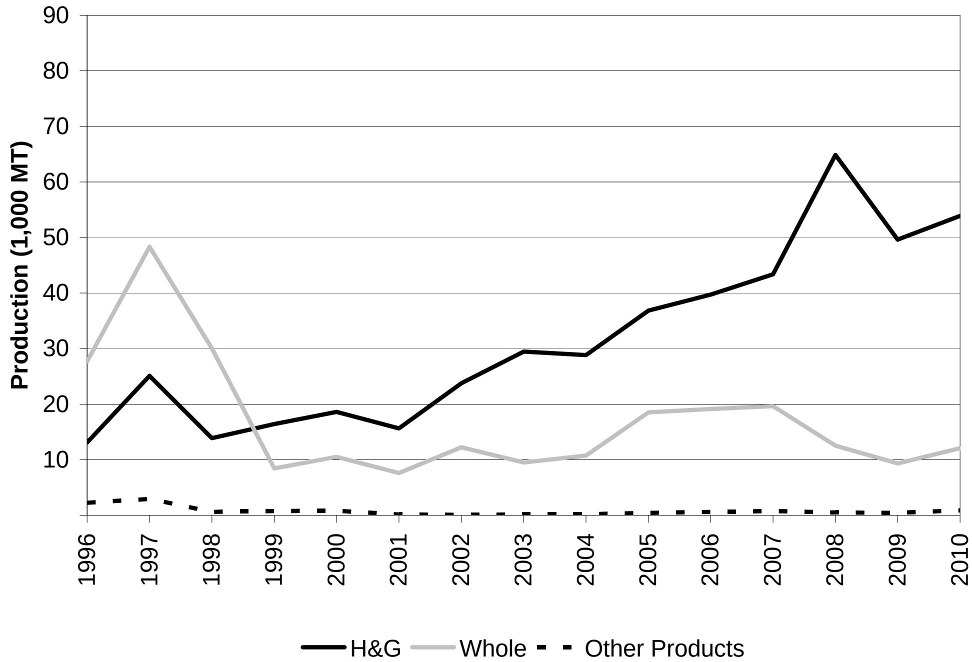
Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html. Global data from FAO, "FishStat" database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

Product Composition and Flow

Yellowfin sole products processed offshore are sold as whole fish and headed and gutted (H&G) fish (Figure 54). Industry representatives indicate that fish that yield a fillet of 3 oz. or more receive a higher price. H&G fish is primarily sold to re-processors in China for conversion into individual frozen skinless, boneless fillets. A relatively low percentage of yellowfin sole products are sold as *kirimi*, a steak-like product with head and tail off. Smaller fish tend to be used in the production of *kirimi*.

Rock sole with roe are exported to Japan, where whole, roe-in rock sole is a supermarket staple (SeaFood Business undated). Fish may also be sliced diagonally in strips containing both flesh and roe, or the roe may be removed and processed separately on-board (Bledsoe et al. 2003). Male rock sole are exported to China, where it is filleted and exported back to the United States (SeaFood Business undated). As with yellowfin sole, larger fish receive a higher price. An industry representative noted that Chinese re-processors tend to export fillets of small rock sole and yellowfin sole in the same pack. Consequently, market prices for fillets of the two species have tended to follow the same trend in recent years (compare the prices of H&G fish in Figure 56 and Figure 59). The wholesale market price of rock sole with roe shows a decreasing trend (Figure 59). However, industry representatives state that sales of this product remain an important source of early season cash flow for the trawl "head-and-gut" fleet.

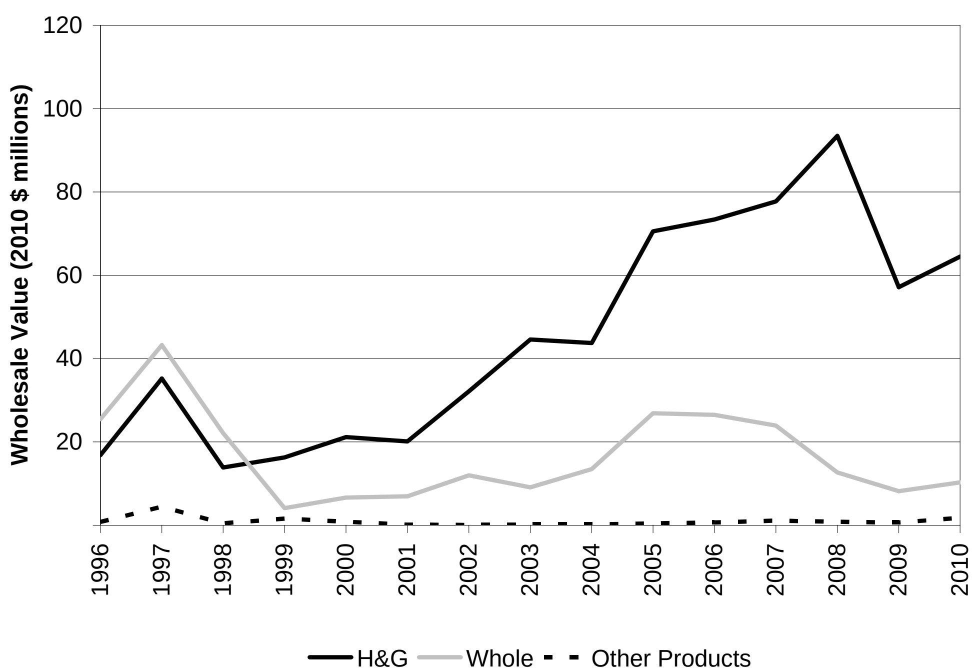
Figure 54. Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

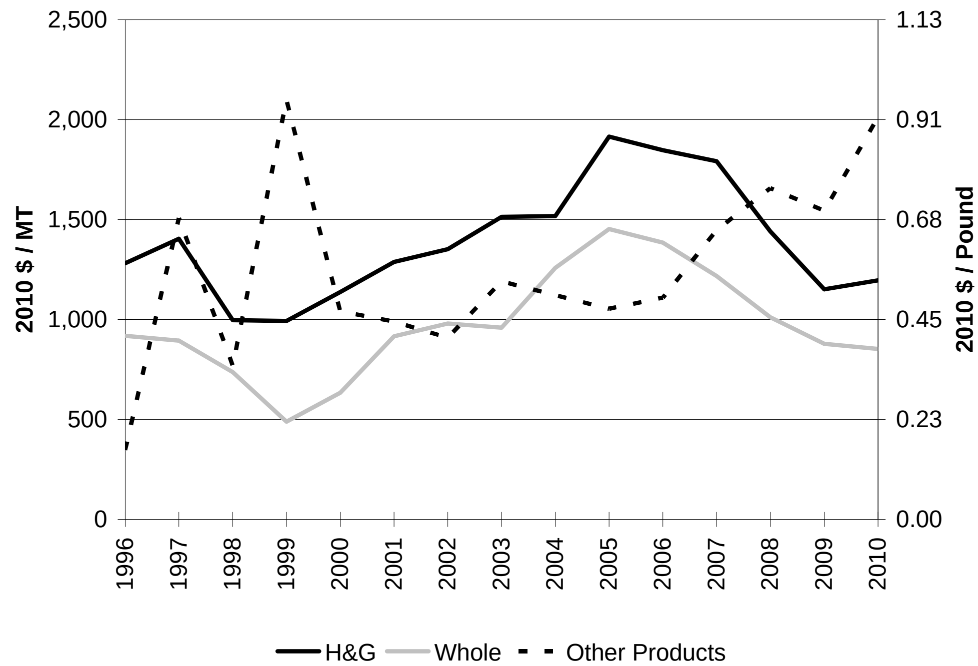
Figure 55. Wholesale Value of Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

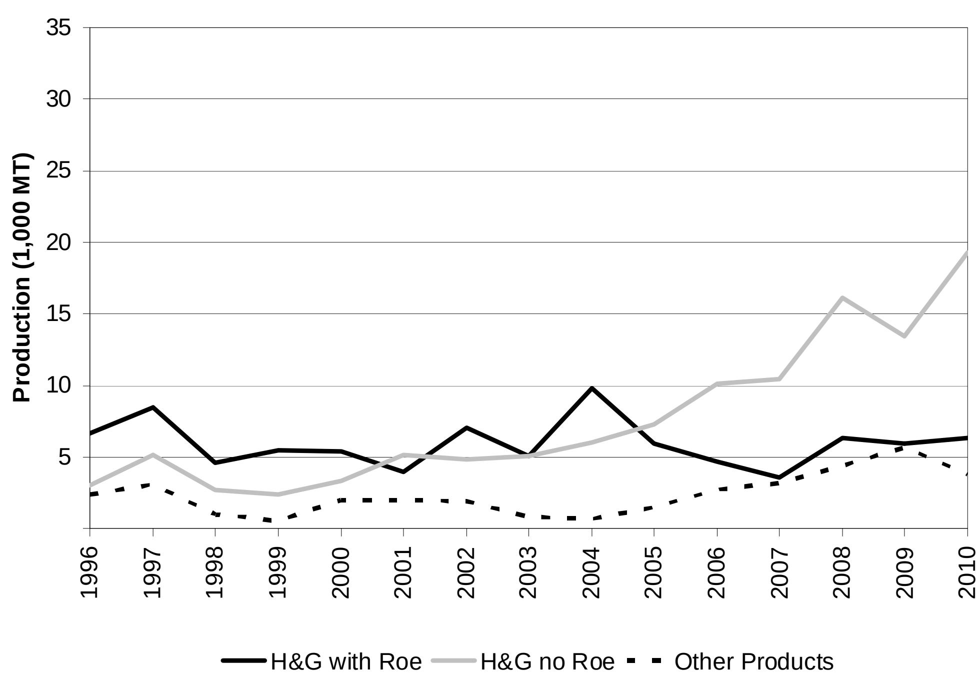
Figure 56. Wholesale Prices for Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

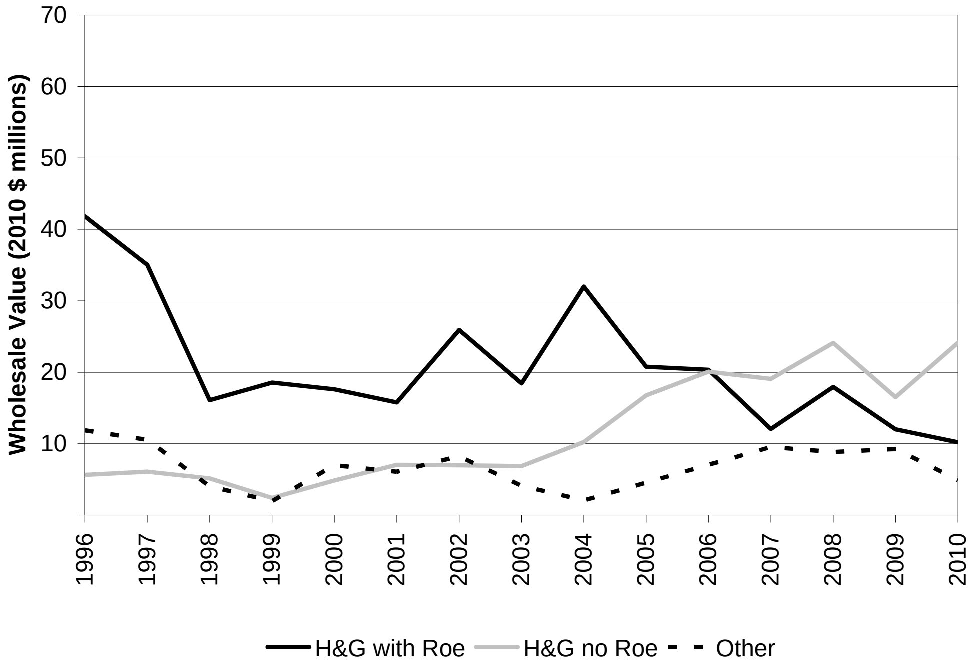
Figure 57. Alaska Primary Production of Rock Sole by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

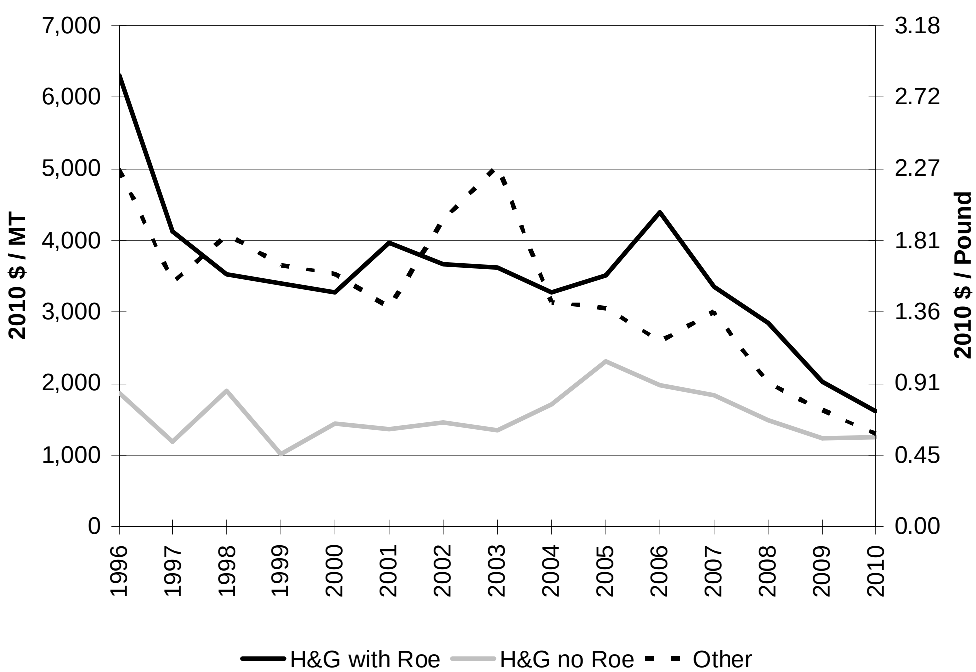
Figure 58. Wholesale Value of Alaska Primary Production of Rock Sole by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 59. Wholesale Prices for Alaska Primary Production of Rock Sole by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

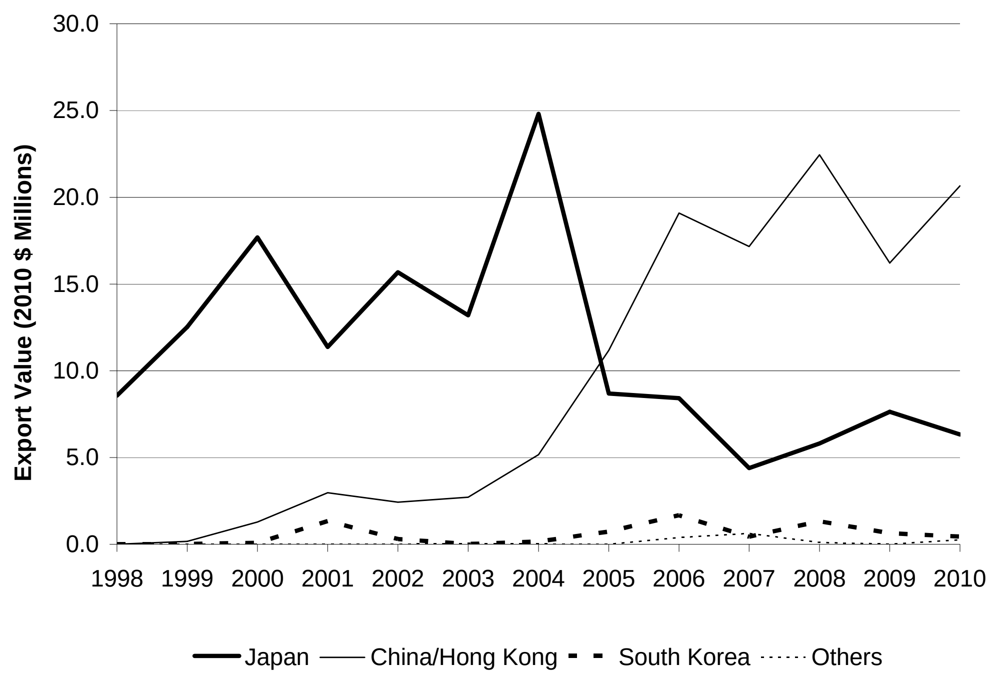
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

International Trade

Approximately 80 to 90% of the sole harvested in the Alaska groundfish fisheries is shipped to Asia. Except for spikes in 2002 and 2004, the export value of rock sole Japan has generally been declining. In 2010 the total value of this product was well less than half what it had been through the early 2000s. Exports have been increasing to China, where rock sole are filleted and re-exported (Figure 60). Whole and H&G yellowfin sole have separate and distinct markets (Figure 61). Whole round fish is generally sold to South Korea for domestic consumption (American Seafoods Group LLC 2002). As noted above, headed and gutted fish are primarily sold to re-processors in China for conversion into individual frozen skinless, boneless fillets. The majority of these fillets are eventually exported from China to the United States and Canada for use in foodservice applications (American Seafoods Group LLC 2002). As of 2007, however, an increasing portion of the China-processed fillets were being exported to Europe or sold in China itself (Ramseyer 2007).

U.S. shoreside processors produce some fillets as well as other products, with some products going to Asia and others remaining in the United States. However, the relatively small fillets of yellowfin sole have a high labor cost per pound. This high labor cost makes it more attractive to ship the fish to China, where labor costs for secondary processing tend to be relatively low (NMFS 2001). Yellowfin sole processed into *kirimi* is exported to Japan.

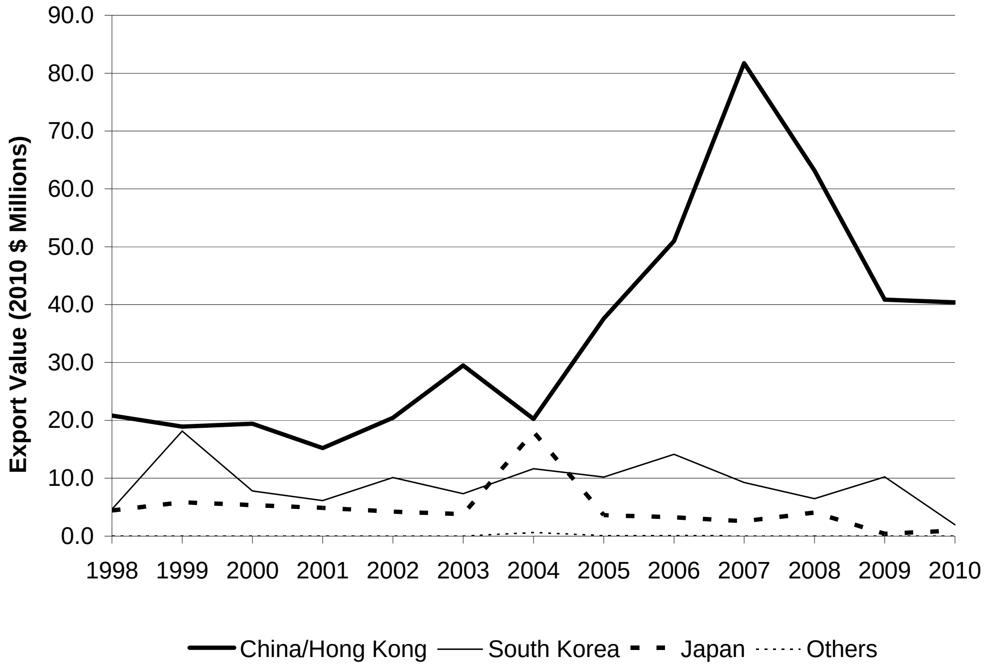
Figure 60. U.S. Export Value of Rock Sole to Leading Importing Countries, 1998 – 2010



Note: Data include all exports of rock sole from the U.S. Customs Pacific District.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 61. U.S. Export Value of Yellowfin Sole to Leading Importing Countries, 1998 – 2010



Note: Data include all exports of yellowfin sole from the U.S. Customs Pacific District.

Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Market Position

Yellowfin and rock sole harvested off Alaska compete in international markets with other flatfish species caught in fisheries off Alaska and the U.S. West and East Coasts and in foreign fisheries. Landings off the U.S. West Coast are likely to remain low for the foreseeable future as allowable catches have been drastically cut to protect overfished rockfish stocks (Roberts and Stevens 2006). After years of strict conservation the New England flatfish harvest has bounced back; according to a seafood market report, Alaska processors are finding it harder to market their H&G frozen flatfish to New England processors for “refreshing” (thawing and filleting) (SeaFood Business undated). The market in Europe for Alaska-harvested yellowfin sole is expected to remain strong due to quota cuts by the EU’s Fishing Council for plaice, the most commercially valuable European flatfish. Value-added flatfish processors in the Netherlands, which is a major supplier of sole products to other EU countries, had been increasing their purchases of frozen skinless, boneless yellowfin sole fillets from re-processors in China (Saulnier 2005); the significant decline of yellowfin sole exports to China since 2007, however, along with effects of the global financial crisis may have significantly altered that market.

Over the short term the primary market for rock sole in Japan will continue to be for roe-in females; however, new products are occasionally tested in the Japanese market. In 2004, for example, the large Japanese processor, Nichirei Corporation, started to market a new product line of fish products where the bones could be eaten; among the species used in the products are yellowfin and rock sole from U.S. and Russian fisheries (IntraFish Media 2004).

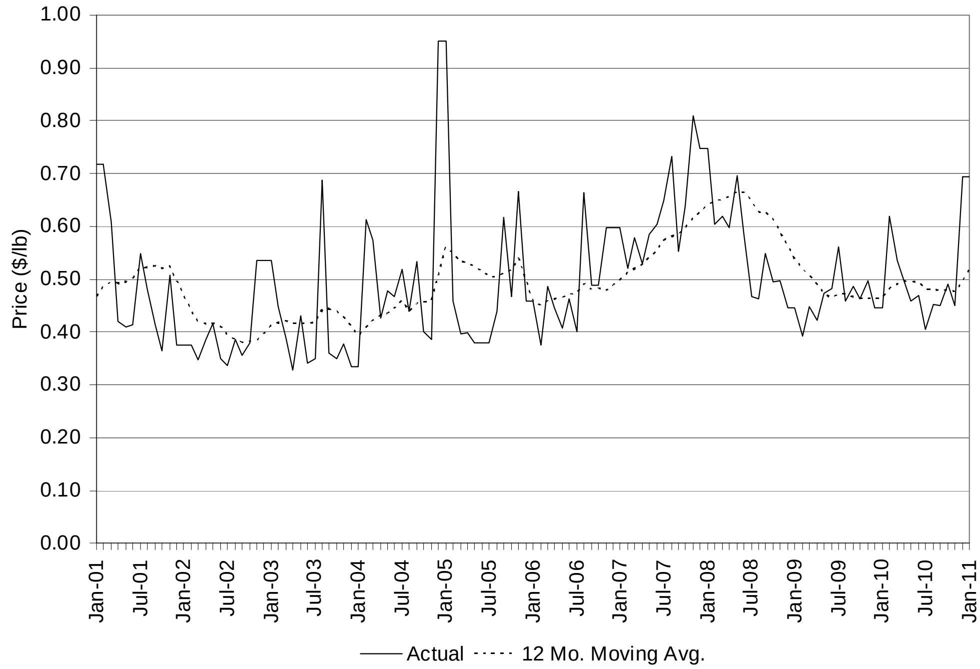
BSAI landings of both yellofin sole and rock sole increased slightly from 2009 to 2010. Landings of yellowfin sole in 2010 were 114,600 mt, a slight increase over the 2009 landings of 103,805. The 2010 yellowfin sole TAC was 219,000 mt, thus landings are well below the TAC. Landings of rock sole also increased slightly in 2010 to 53,111 mt from the 2009 levels of 48,593. With the 2010 TAC at 90,00 mt landings are approximately half the TAC. Increases in landings may in-part be because of the fleet's ability to act collectively and avoid halibut prohibited species catch (PSC) when fishing for rock sole. Indeed, Tables 13 and 15 in the *SAFE Economic Status of the Groundfish Fisheries off Alaska, 2008*, showed that both total halibut PSC mortality and halibut PSC rates declined in the BSAI trawl rock sole fishery in 2008 compared to 2007. Despite the more than doubling of the TAC since 2006, industry has been reluctant to increase catch perhaps because of market conditions. Market reports indicate that industry stakeholders are striving to boost sales of yellowfin sole and other flatfish with new value-added products and region-specific marketing initiatives (Ramseyer 2007). It is likely that Alaska-harvested yellowfin sole competes in international markets with yellowfin sole harvested by Russian trawlers operating in the western Bering Sea. However, as discussed earlier, the harvest levels in the Russian fishery are uncertain. Similar to the Alaska harvest, most of the Russian yellowfin sole catch is likely imported by China as H&G, thawed, reprocessed as fillets and re-exported.

To help distinguish Alaska's flatfish fisheries from other flatfish fisheries around the world, the Best Use Cooperative, a fishing cooperative of Bering Sea "freezer trawler" fishing companies, and other companies involved in Alaska flatfish fisheries applied to the Marine Stewardship Council for sustainability certification. As part of this certification process, both the shoreside and at-sea processing sectors of the Gulf of Alaska flatfish fishery sought MSC certification concurrent with the Bering Sea flatfish MSC certification process (Best Use Cooperative 2007). The MSC granted certificates of sustainability to both the BSAI and GOA trawl flatfish fisheries on June 1, 2010 (Marine Stewardship Council 2010). Besides northern rock sole and yellowfin sole, the MSC sustainability certificates apply to flathead sole (*Hippoglossoides elassodon*), arrowtooth flounder (*Atheresthes stomias*), rex sole (*Glyptocephalus zachirus*), and southern rock sole (*Lepidopsetta bilineata*).

Alaska-harvested yellowfin and rock sole compete in domestic and foreign markets with farmed flatfish as well as other wild-caught flatfish species. At the time of this report's initial publication, fish farms accounted for a small percentage of the worldwide flatfish production. However, that percentage was expected to steadily increase because of the declining trends in wild catches, and because of the high prices paid for many flatfish species (Sjøholt 2000). For example, European turbot was being farmed extensively in France, Spain, Portugal and Chile, and the farmed tonnage at the time exceeded the wild catch. Flatfish are also cultured in coastal areas of South Korea, Japan, and China. According to United Nations Food and Agriculture Organization data, most of the flatfish production in China is from aquaculture (Roberts and Stevens 2006). In the United States, summer flounder has been farmed commercially in Massachusetts and New Hampshire, and experimental work has been conducted into commercial production of Southern flounder (Brown 2002).

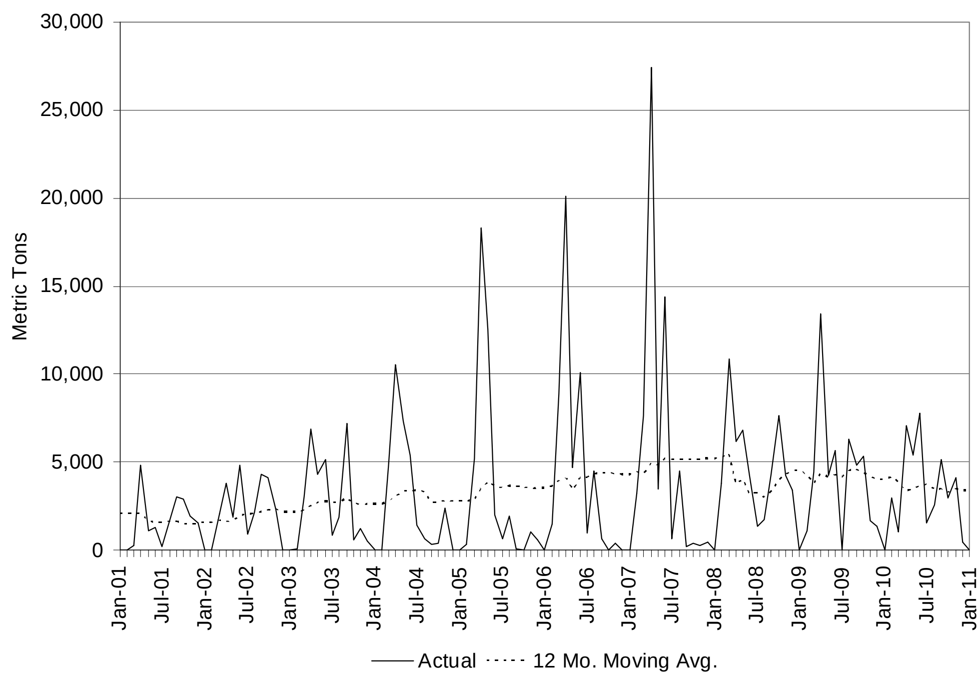
Alaska Groundfish Market Profiles

Figure 62. Nominal U.S. Export Prices of Yellowfin Sole to All Countries, 2001 – 2010



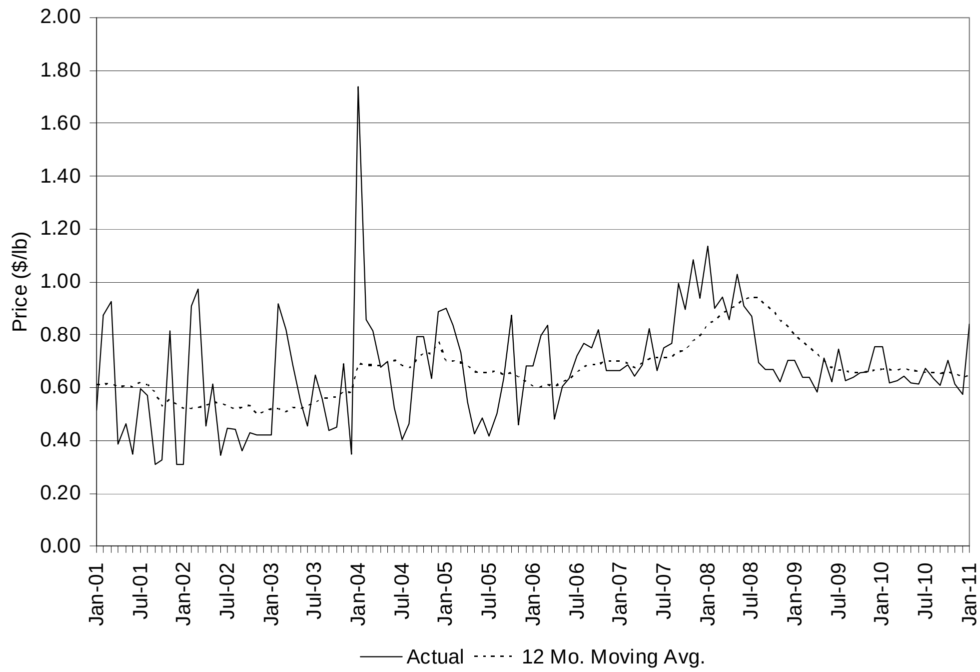
Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 63. U.S. Export Volumes of Yellowfin Sole to All Countries, 2001 – 2010



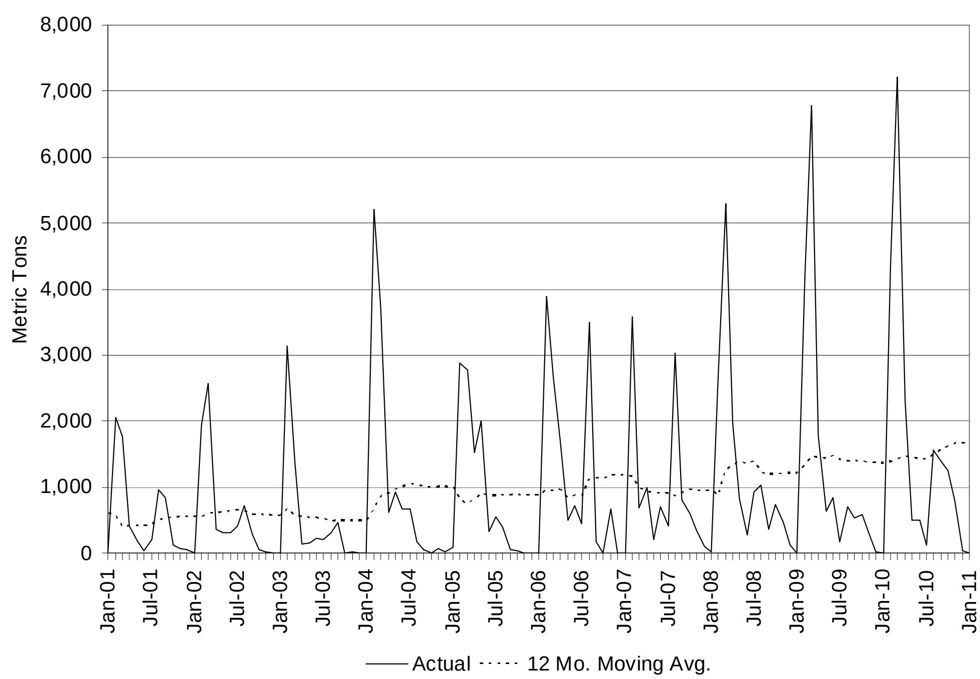
Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 64. Nominal U.S. Export Prices of Rock Sole to All Countries, 2001 – 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

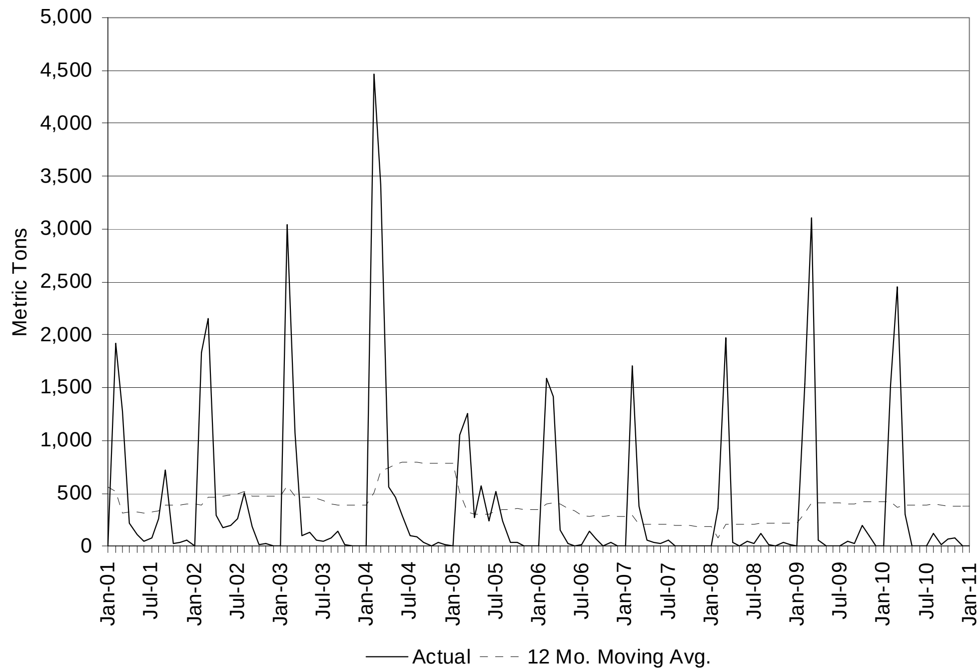
Figure 65. U.S. Export Volumes of Rock Sole to All Countries, 2001 – 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

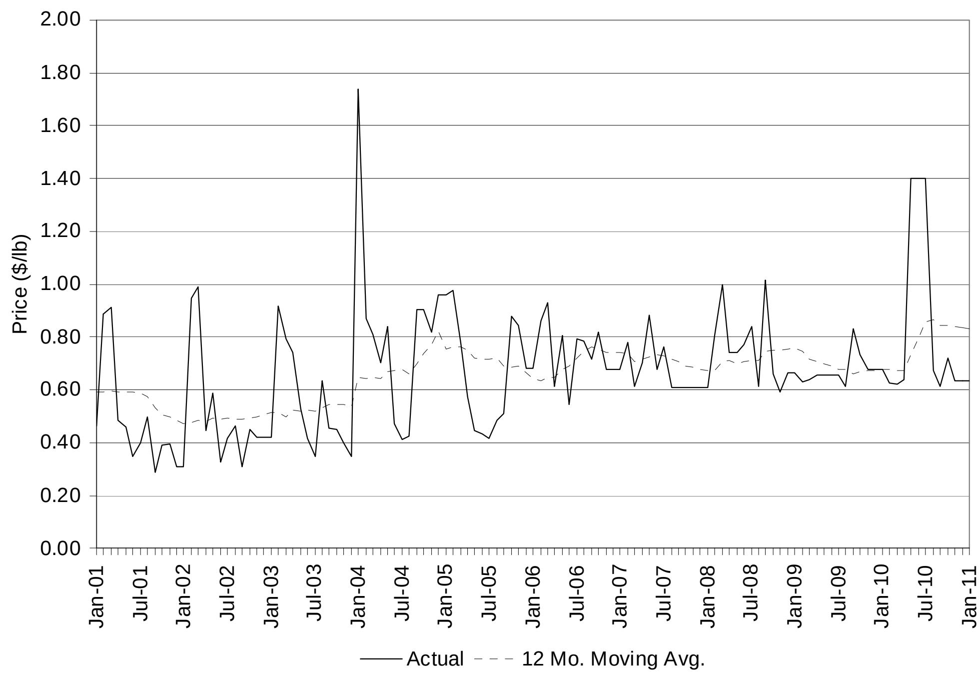
Alaska Groundfish Market Profiles

Figure 66. U.S. Exports Volumes of Rock Sole to Japan, 2001 – 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 67. Nominal U.S. Export Prices of Rock Sole to Japan, 2001 – 2010



Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

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SeaFood Business. Undated. Buyer's Guide: Flounder/sole. Available at: http://www.seafoodbusiness.com/buyguide/issue_flounder.htm. Accessed August 20, 2007.

Siam Canadian Foods Company, Ltd. 2004. Yellowfin sole. Available at: http://www.siamcanadian.com/yellowfin-sole/index.htm. Accessed August 20, 2007.

Sjøholt, T. 2000. *The World Market for Flatfish*. Food and Agriculture Organization of the United Nations, Fishery Industries Division, Rome.

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Arrowtooth Flounder Market Profile

Description of the Fishery[2]

Arrowtooth flounder (*Atheresthes stomias)* range from central California to the eastern Bering Sea and are currently the most abundant groundfish species in the Gulf of Alaska (GOA).

In the GOA the arrowtooth flounder fishery is almost exclusively prosecuted by catcher vessels and catcher/processors using bottom trawl gear (NMFS 2007). Although the arrowtooth flounder fishery is open to other vessel categories and gear types, very small amounts of arrowtooth flounder are harvested by other gear types and then only as incidental catch (Figure 68). In recent years catcher vessels participating in the arrowtooth flounder fishery generally fish for Pacific cod and pollock during the roe season. Following the seasonal closure of these fisheries, vessels target arrowtooth flounder until the second seasonal halibut prohibited species catch (PSC) cap for the deepwater complex is reached (usually in May). The catcher vessels deliver most of their arrowtooth flounder harvest to shoreside processors in Kodiak.

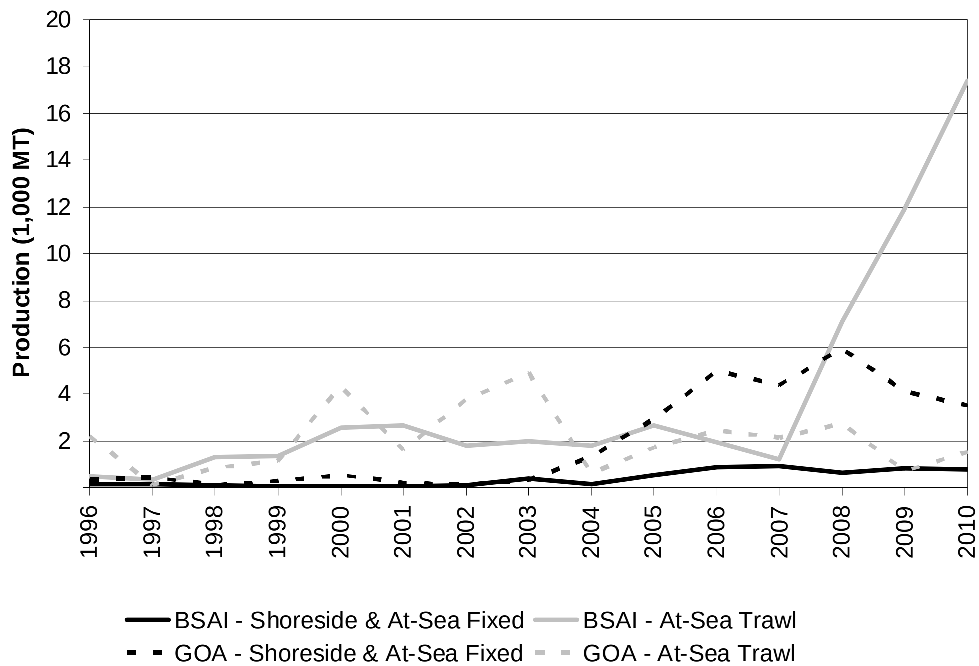
The catcher/processors participating in the GOA arrowtooth flounder fishery enter the fishery following the closure of rock sole and yellowfin sole in the Bering Sea (NMFS 2007). Most of the harvest of arrowtooth flounder occurs from March through May. Depending upon the availability of the halibut PSC allowance for the deep-water complex, vessels may also target arrowtooth flounder in October and November. After the arrowtooth flounder fishery closes, these vessels generally shift to several different targets; notably flatfish species in the shallow-water complex, rockfish, pollock, and Pacific cod as the seasonal allowances of these targets become available. The implementation of the Rockfish Pilot Program in the Central GOA in 2007 may result in shifts in effort and timing of the arrowtooth flounder fishery (NMFS 2007).

In 2010, the arrowtooth flounder TAC for the BSAI and the GOA combined was 118,000 mt with just over 60% allocated to the BSAI. There is no target fishery for arrowtooth flounder in the Bering Sea and Aleutian Islands (BSAI) region. The species is primarily captured by catcher/processors in pursuit of other high value species, and the arrowtooth flounder caught are often discarded. About half of the arrowtooth flounder catch in the BSAI region was discarded in 2005, and more than half was discarded in both 2006 and 2007. Retention improved in 2008, when slightly more than one quarter of the BSAI catch was discarded, largely due to the reauthorization of improved retention/utilization regulations in the GOA and BSAI, and the passage of amendments setting groundfish retention standards and authorizing the formation of cooperatives for the H&G catcher/processor fleet operating in the BSAI. In recent years only about 20 percent of the BSAI arrowtooth flounder catch was discarded.

[2] The US Department of Commerce does not track export data specifically for arrowtooth flounder, and therefore unlike the other profiles in this document, this profile does not contain specific data on export volumes and prices.

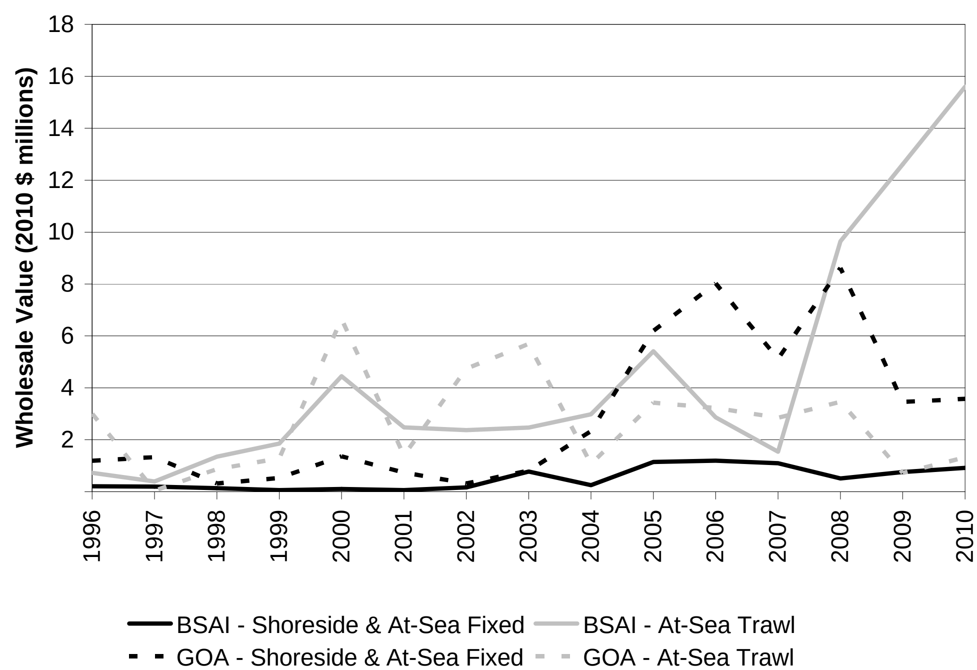
Alaska Groundfish Market Profiles

Figure 68. Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2010



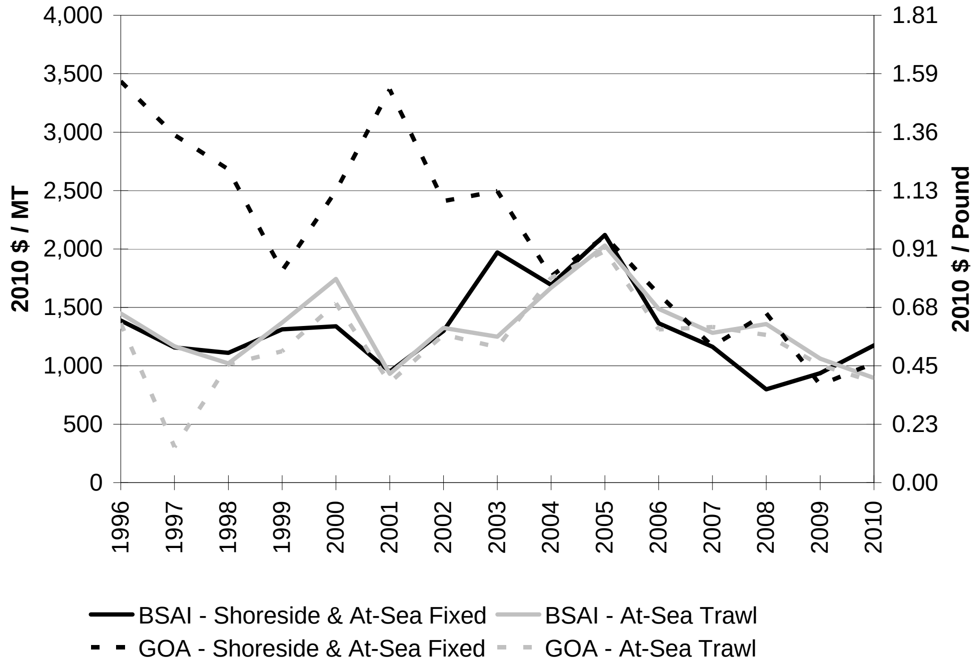
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 69. Wholesale Value of Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2010



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 70. Wholesale Prices for Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2010

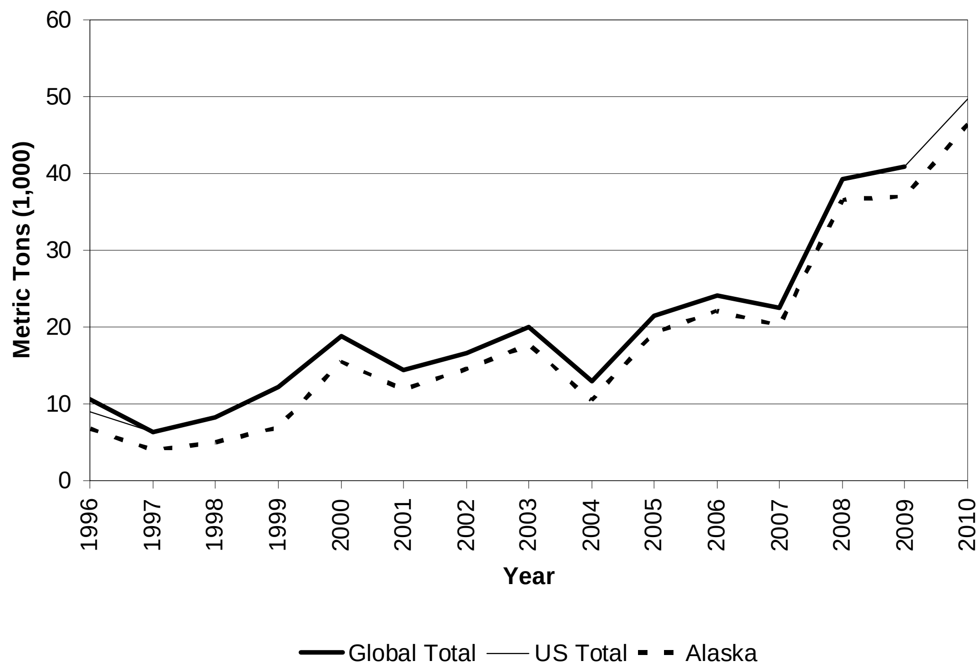


Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Production

Most of the total world catch of arrowtooth flounder comes from Alaska fisheries (Figure 71). Around 2,000-4,000 mt of arrowtooth flounder are annually harvested off the U.S. West Coast. In particular, it is an abundant and commercially important groundfish species off Washington; however, the catch is constrained by efforts to rebuild canary rockfish, an overfished species.

Figure 71. Alaska, Total U.S. and Global Production of Arrowtooth Flounder, 1996 – 2010



Note: The global harvest estimate may not be accurate because the fish landing statistics of some countries may not distinguish between arrowtooth flounder and other flatfish species. The global total in the figure is the higher of the FAO estimate or U.S. total. Data for 2010 were unavailable for the global total.

Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html. Global data from FAO, "FishStat" database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

Product Composition and Flow

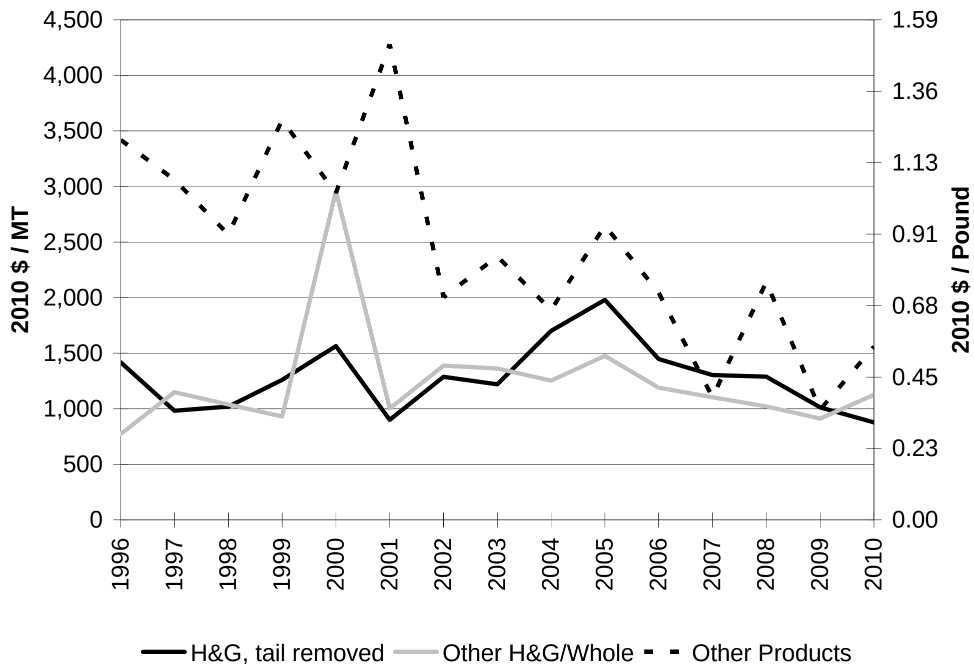
Arrowtooth flounder muscle rapidly degrades at cooking temperature resulting in a paste-like texture of the cooked product. This severe textural breakdown frustrated efforts to develop a market for this fish. Harvested arrowtooth flounder were either sent to a meal plant or discarded. Recently, several food grade additives have been successfully used that inhibit the enzymatic breakdown of the muscle tissue. These discoveries have enabled a targeted fishery in the Kodiak Island area for marketable products, including whole fish, surimi, headed and gutted (both with and without the tail on), fillets, frills (fleshy fins used for sashimi and soup stock), bait, and meal (NMFS 2007).

Most arrowtooth flounder are processed as headed and gutted (H&G) (Figure 73). NMFS trade records do not report U.S. exports of arrowtooth flounder. However, industry representatives indicate that all of the H&G fish are sent to China for re-processing. The primary product for arrowtooth flounder is the frill, which is the fleshy fins used for *engawa*, a type of sushi (NMFS 2007). *Engawa*, normally a premium sushi made from halibut or Greenland turbot, is more affordable using arrowtooth flounder. Unlike most other flatfish, the frill of the arrowtooth flounder is sufficiently sized to cover the rice on sushi, which is critical in sushi markets. The primary market for arrowtooth flounder *engawa* is Japan.

A secondary product for arrowtooth flounder is fillets (NMFS 2007). A large portion of the arrowtooth flounder exported to China are processed into fillets and re-imported to U.S. markets as inexpensive flounder. Some arrowtooth flounder processed in Japan is also sold as fillets in the Japanese market. Recently, some arrowtooth flounder fillets have shown up in European markets.

Arrowtooth Flounder Market Profile

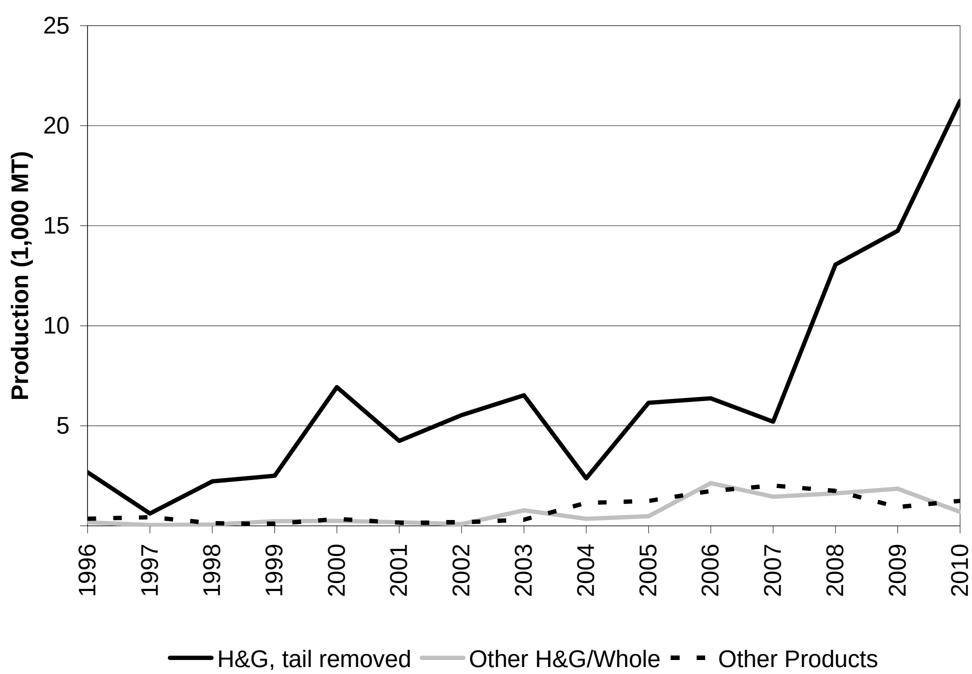
Figure 72. Wholesale Prices for Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

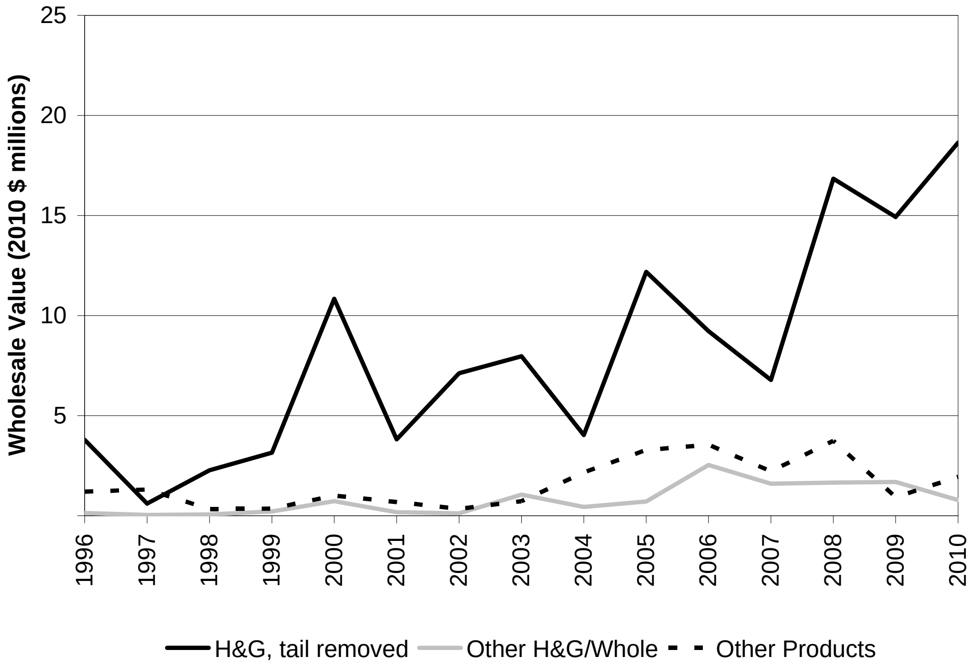
Figure 73. Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Figure 74. Wholesale Value of Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2010



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2010

Market Position

Since 1997, markets for arrowtooth flounder have been developed, although prices for this fish fluctuate widely (NMFS 2007). The absence of trade data for this species precludes reporting export quantities and prices.

A major hurdle in marketing arrowtooth flounder is its name. The fish was long associated with soft flesh that was unpalatable to many consumers. Different methods of processing have converted the fish into more marketable forms. However, there is a lingering stigma about the quality of the fish, and a name change, the use of a regionally recognized name and selling directly to secondary processors have all been tried as solutions to the problem. For example, to make it more marketable, arrowtooth is usually sold on the West Coast as turbot, although it is not related to the true turbot (*Psetta maxima*), a highly-valued fish caught off Europe.

The population of arrowtooth flounder in Alaska waters has increased substantially since the late 1970s, possibly due to warm ocean conditions caused by global warming (Kruse 2007), and efforts are being made to develop new marketable products from this abundant species. For example, researchers at the University of Alaska-Fairbanks have found that soluble and insoluble protein powder from arrowtooth flounder has desirable essential amino acid and mineral contents and functional properties that make it suitable as a nutrition supplement and emulsifier (Sathivel et al. 2004). Attempts have also been made to expand production levels of surimi from arrowtooth flounder (Wu et al. 1996), and some analysts foresee it becoming an important species to produce surimi (Fiorillo 2008). While the economic feasibility of large-scale commercial production of arrowtooth surimi is still uncertain, the current world-wide surimi supply shortage caused by reductions in the

U.S. pollock quota may make the abundant arrowtooth flounder an increasingly attractive alternative raw material in the production of surimi seafood products.

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Research and Data Collection Project Summaries and Updates
2010 Groundfish SAFE Report

Markets and Trade

Market-Based Size Selection in the Bering Sea Pollock Fishery

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For every fish species, future potential harvests are impacted by current catch levels and patterns. Traditionally, managers use regulations on gear (e.g., mesh size) to control so-called growth overfishing. Such regulations are likely economically inefficient due to increased search costs and lower catch rates. Bioeconomic models typically evaluate efficiency for the fleet as a whole. Here we propose that optimizing a fishery should focus instead on individual vessel operator behaviors. That is, vessels targeting young fish impose an "externality" on the rest of the fleet, meaning that the stock costs are borne by the fishery as a whole rather than the individual vessel. In a fishery with observer data on fish size, a fee or quota adjustment can eliminate the externality that vessels impose on other members of the fleet in choosing to fish on less-than-optimal aged fish. Unlike gear restrictions, this allows vessels to catch younger fish when the cost of avoiding them is larger than the future benefit to the fish population. Here we conduct a retrospective analysis to explore the potential impacts of providing quota and fee incentives to the pollock fishery to target fish of different age classes. Work on this project is ongoing; we expect to submit a manuscript on the research to a scientific journal this year.

North Pacific Fisheries and Global Trade

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International trade is an important component of North Pacific fisheries (see http://www.afsc.noaa.gov/Quarterly/ond2006/divrptsREFM5.htm). This project is aimed at integrating international trade data that are associated with North Pacific fisheries into a global economic growth model that represents international trade (see http://www.afsc.noaa.gov/Quarterly/jfm2007/divrptsREFM5.htm). In particular, this project involves the continued development of a global Population-Economy-Trade (PET) model for scenario-based (e.g., Intergovernmental Panel on Climate Change [IPCC]) analyses of trade, ocean acidification, and climate change. The PET model was used with a recently completed global data set to simulate 2 scenarios in the IPCC Special Report on Emissions (SRES A2 and B2). These emissions scenarios provide assumptions about future rates of technical change and other variables. An article describing these scenarios was recently accepted for publication in *Proceedings of the National Academy of Sciences*. Work on the PET model in 2011 will continue development of an Alaska component (based on the AFSC Alaska Computable General Equilibrium model) to simulate effects of global changes on a regional scale.

PET Model and Data
Work on the PET model is ongoing and currently involves an international and multidisciplinary team of economists, demographers, biophysical scientists, and a mathematician, from the U.S., China, India, Japan, Russia, and Slovakia. Collaborating institutions are NOAA, U.S. National Center for Atmospheric Research (NCAR), International Institute for Applied Systems Analysis

(IIASA), University of Illinois at Urbana-Champaign, Brown University, and Moscow State University.

The PET model has a dynamic computable general equilibrium structure. Its focus is on the effects of demographic change (e.g. population aging, urbanization, changes in household size) and economic growth on demand for food, energy, and emissions. The model is being developed further at NCAR and is described here (http://www.cgd.ucar.edu/ccr/iam/research/). In particular, the PET model is being coupled with the Integrated Science Assessment Model (ISAM), a global bio-geochemical cycles model, under a grant from the U.S. Department of Energy to the Department of Atmospheric Sciences at the University of Illinois. Trade and production data for the PET model are from the Global Trade Analysis Project (GTAP). Preparation of these data is a major task that was performed by researchers at NCAR and IIASA. The PET model can represent up to 24 different countries and regions:

1. USA
2. EU27+
3. Transition Countries (TCs)
   a. Russia
   b. Other Transition Countries (OTCs)
4. Other Industrialized Countries (OICs)
   a. Japan
   b. Rest of Other Industrialized Countries (ROICs)
      i. S. Korea
      ii. Canada
      iii. Australia & New Zealand (ANZ)
      iv. Other Pacific Industrialized Countries (OPICs) [Singapore, Taiwan]
      v. Israel & S. Africa (ISA)
5. China (incl. Hong Kong)
6. India
7. Latin America and Caribbean (LAC)
   a. Mexico
   b. Brazil
   c. Other LAC (OLAC)
      i. Pacific South America (PSA) [Chile, Ecuador, Peru]
      ii. Rest of Other LAC (ROLAC)
8. Sub-Saharan Africa (SSA)
9. Other Asia
   a. Turkey
   b. Middle East and North Africa (MENA)
   c. Southeast Asia
      i. Indonesia
      ii. Vietnam
      iii. Malaysia & Philippines (MP)
      iv. Other Southeast Asia (OSEA)

The GTAP input-output (IO) data were augmented with household consumption and income data from numerous national household surveys, and demographic projections with country/region-specific effects of changes in population age-structure, household-size, and urbanization. A rigorous energy-balancing procedure, developed by the U.S. Department of Energy (DOE), was applied to data from GTAP that reconciled its input-output (IO) accounts with energy statistics from the International Energy Agency (IEA) by computing energy-prices measured in physical units of energy (e.g., U.S.$/Joule). Energy prices for each country and region were combined with values from the IPCC that represent the energy content of various fossil-fuels (e.g., oil, natural gas, and coal) to derive emissions coefficients (in tons of carbon, tC) for each dollar of production or consumption in each.

Measuring Performance in the North Pacific Groundfish Fisheries: An Index Based Approach to Monitoring Changes

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Fisheries markets are complex; goods have many attributes such as the species, product form, and gear with which it was caught. The price that fisheries goods command and the products they compete against are both functions of these various attributes. For example, whitefish products of one species may compete with whitefish products of another species. Additionally, markets influence a processor's decision to convert their available catch into different product types. During any given year they are determining whether to produce fillets or surimi, or perhaps to adjusting gear-types to suit markets and consumer preferences. This myriad of market influences can make it difficult to disentangle the relative influence of different factors in monitoring aggregate performance in Alaska fisheries. This research employs a method that takes an aggregate index (e.g. wholesale-value index) and decomposes it into distinct component indices (e.g. a pollock wholesale-value index and a Pacific cod wholesale-value index). These indices provide management with a broad perspective on aggregate performance while simultaneously characterizing and simplifying the myriad of influencing factors into a digestible format that is useful for quickly analyzing changes in a fishery. The perspective provided by these indices is useful for considering both the retrospective impact of management decisions as well as informing future policy. Component indices are visually presented in a manner that facilitates the understanding of the relative influence that each of the components has in the aggregate.

Analyzing the Economic Impacts of MSC Certification in North Pacific Fisheries

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Consumers and retailers are increasingly looking for signals that fisheries are environmentally sound. Marine Stewardship Council's (MSC) certification is perhaps the most widely recognized and commonly accepted non-governmental indicator that a fishery has been independently evaluated and is engaging in sustainable fishing practices. Certification requires verification that the fishery is actively and sustainably managed in a manner that is enforceable and preserves ecosystem functions. The uniform and open standard of MSC certification in turn serves as a reliable signal to consumers and industry globally, that a fishery is soundly managed. Recognizing the demand for sustainably labeled fish, many retailers and restaurants throughout the U.S. have committed, or have plans, to shift their inventory to MSC certified fish.

From an economic perspective, MSC certification is a market mechanism that informs participants of the products that provide additional values (or the minimization of externalities) linked to sustainable management. Market participants should be willing to pay for the additional value created by sustainable management. At the consumer level, grocery stores and restaurants should be willing to pay a price premium for MSC certified goods. This higher price should, in turn, be conveyed to industry and harvesters. Additionally, wholesale level benefits could come from multiple other sources. Certification may signal and help create a secure and reliable supply stream for a wholesaler, thereby facilitating longer-term contracts and reducing uncertainty and transaction costs. Furthermore, processors and wholesalers that sell MSC certified fish have the advantage of being able to sell to retailers that stock only MSC certified fish, in contrast non-MSC fish that face a more constrained client base. The continued move to MSC certified products at all market levels suggests that there is value to market participant from the certification. However, to date, economic benefits of MSC certification are under-researched.

This research will attempt to identify the market impacts of certification and test for the presence of a price premium in federally managed North Pacific fisheries. Initial analysis will focus on identifying a wholesale market price premium for U.S. MSC certified fish. While price may not capture all of the benefits to market participants of MSC certification, price serves as a readily recognizable signal of supply and demand, which tertiary factors will likely influence. The initial analysis will be followed by an investigation of other benefits that may accrue to market participants at the wholesale level, such as supply and contracting security as previously discussed.

Spatial Competition with Changing Market Institutions

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A vital step in predicting how communities will be impacted by fishery rationalization is to understand how rationalization will affect the landing port selection decision of fishers. To accomplish this one must first know how the competitive balance between spatially differentiated processors will change under rationalization. While spatial impacts on competition have been examined in the economics literature from both theoretical and empirical perspectives for a variety of industries, the issue has remained largely untouched with respect to the fish processing industry.

This paper proposes a new framework which allows for the inclusion of any market-altering policy change in the spatial analysis of competitive behavior among economic agents. The paper fills a gap in the economics literature between the work which has focused on spatial price responsiveness of agents to one another and the literature that explores how policy changes in market regulations affect the competitive behavior of agents. Specifically, we account for how rationalization in the sablefish fishery has affected the spatial responsiveness of fish processors across a 21-year time period and we introduce a method that allows one to incorporate breaks of explanatory variables in spatial panel data sets. We apply the framework to a fishery to explore how a management change from aggregate to individual catch quotas affects the spatial price responsiveness of fish processors. We find that processors are significantly more price responsive to their neighboring competitors after rationalization. This manuscript is currently being revised for resubmission at a scientific journal.

Data Collection and Synthesis

Collecting Regional Economic Data for Southeast Alaska Fisheries

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Regional or community economic analysis of proposed fishery management policies is required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA), National Environmental Policy Act (NEPA), and Executive Order 12866, among others. For example, National Standard 8 (MSA Section 301[a][8]) explicitly requires that, to the extent practicable, fishery management actions minimize economic impacts on fishing communities. To satisfy these mandates and inform policymakers and the public of the likely regional economic impacts associated with fishery management policies, economists need appropriate economic models and data to be used for implementing the models.

While there exist many regional economic models that can be used for regional economic impact analysis for fisheries (Seung and Waters 2006), much of the data required for regional economic analysis of fisheries are either unavailable or unreliable. IMPLAN (IMpact analysis for PLANning) is widely used by economists for implementing various regional economic models. However, for several reasons, it is not advisable to use unrevised IMPLAN data for analyzing U.S. fishery industries in general and Alaska fishery industries in particular. First, IMPLAN applies national-level production functions to regional industries, including fisheries. While this assumption may not be problematic for many regional industries, use of average production relationships may not accurately depict regional harvesting and processing technologies. Therefore, to correctly specify industry production functions, it is necessary to obtain primary data on harvesting and processing sector expenditures through detailed surveys or other methods. Second, the employment and earnings of many crew members in the commercial fishing sector are not included in the IMPLAN data because IMPLAN is based on state unemployment insurance program data which excludes those who are self-employed and casual or part-time workers. Therefore, IMPLAN understates employment in the commercial fishing sectors. Processing sector data is also problematic because of the nature of the industry. Geographical separation between processing plants and company headquarters often leads to confusion as to the actual location of reported employment. Finally, fishery sector data in IMPLAN are highly aggregated. Models using aggregate data cannot estimate the potential impacts of fishery management actions on individual harvesting and processing sectors. To estimate these types of impacts, IMPLAN commercial fishery-related sectors must be disaggregated into sub-sectors by vessel and processor type. This requires data on employment, labor income, revenues and expenditures (intermediate inputs) by vessels and processors. An additional problem with IMPLAN data in small rural economies like Alaska fishing communities is that data are often inaccurate because of the nature of rural enterprises and populations. Much of rural Alaska operates on a cash or exchange basis; thus much economic activity is not accounted for in conventional data sources. Community surveys are to be used to correct this anomaly in rural Alaska fishing communities (Holland *et al*. 1997).

In sum, while regional economic models for analysis of fisheries do exist, reliable data on fisheries-related economic sectors necessary to implement the models are lacking. The absence and/or deficiencies of these data have severely limited development of viable regional economic models for fisheries.

In an effort to reduce these deficiencies, a data collection project has been completed for the Southeast region of Alaska. The project designed and administered a mailout survey to a stratified random sample of vessels operating in Southeast region fisheries and interviewed key informants including fishing vessel owners, regional processors and input suppliers. The fishing vessel sectors for which the contractors (The Research Group) conducted surveys include catcher-processors, trawlers, longliners, crabbers, salmon netters, and other harvesters. The data collected/estimated include employment, labor income, and cost information for fishery industries. Currently, the contractors are preparing a final report. Data collected are being used to derive statistically valid estimates of industry cost structures, which in turn will be suitable for incorporating into economic models of the industry and Southeast regional economy.

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Understanding the Usefulness of Logbook Data in Fisheries Management in Alaska

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Logbook reporting is a mandatory data reporting requirement when fishing in federal waters off of Alaska, and represents a potentially valuable source of self-reported at-sea catch and effort information. However, their utility to fishery scientists and managers is limited since the logbooks are neither verified for accuracy nor digitized to make them readily available. These shortcomings are important since information on at-sea fishing activities are otherwise available only through an at-sea observer program. While the National Marine Fisheries Service (NMFS) has implemented a substantial observer program in Alaska to monitor the activities of groundfish vessels > 60' length overall, there is no observer coverage for smaller vessels or vessels targeting halibut under Individual Fishing Quota (IFQ) management. Therefore, NMFS lacks information on the spatial distribution of hauls, haul specific weight estimates, daily discard estimates, days steaming to and from the fishing grounds, days inactive, and crew size information (prior to the implementation of eLandings midway through 2006) for trips that are not observed. In addition, because regulations governing observer coverage requirements are based on days per quarter, fishers of vessels 60-124 in total length decide which trips are observed, introducing considerable potential for observer information to be unrepresentative of fishing effort when unobserved.

This study explores the current logbook system and its reporting requirements, and uses digitized logbook data from catcher vessels participating in the 2005 GoA trawl fishery to analyze the utility of this data to fishery scientists and managers. We compare the digitized logbooks to both observer data and fish ticket data to analyze the relative attributes and deficiencies of each dataset. Logbooks provide a lot of information that is not available from other sources. This information includes the spatial distribution of hauls, haul specific weight estimates, daily discard estimates, days steaming to the fishing ground, days inactive, crew size (before midway through 2006), gear information for longline and pot vessels such as the number of pots/skates, hooks per skate, etc, for trips without an observer present. Some of this information, such as total trip length (including steaming time to and from port), days inactive in port, and crew size were not collected at all prior to 2007 when the observer program began collecting them for observed trips. There are a number of analyses that can be done using this data that would be impossible otherwise such as comparing the behavior of vessels on observed and unobserved trips to determine if having an observer on board is altering fishing behavior in a way that has management implications (such as applying bycatch rates from observed trips only). Self reported fishing locations can be verified on both observed and unobserved trips to determine how accurate these statistical area locations are, and if there are catches being attributed to a NMFS area when it was caught in a different NMFS area. This could have potential management implications, especially for species with location specific quotas and allowable catches.

Based on our analysis, we suggest the replacement of the current paper logbook program with an expansion of the electronic logbook program (eLogbook), currently used only in the catcher-processor pollock fleet, to other fisheries in conjunction with their current eLandings reporting.

Recreational Fisheries and Non-Market Valuation

Alaska Recreational Charter Boat Operator Research Development

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To assess the effect of current or potential regulatory restrictions on Alaska charter boat fishing operator behavior and welfare, it is necessary to obtain a better general understanding of the industry. Some information useful for this purpose is already collected from existing sources, such as from the Alaska Department of Fish and Game (ADFG) logbook program. However, information on vessel and crew characteristics, services offered to clients, and costs and earnings information are generally not available from existing data sources and thus must be collected directly from the industry through voluntary surveys. Initial scoping and design of the survey was based on consultation with NMFS Alaska Region, ADFG, North Pacific Fishery Management Council and International Pacific Halibut Commission staff members regarding analytical needs and associated data gaps, and experience with collecting data from the target population. In order to address the identified data gaps, AFSC researchers have begun development of a survey of Alaska charter business owners.

The survey is expected to collect annual costs and earnings information about charter businesses and the general business characteristics of Alaska charter boat operations. Types of data that will be gathered through the survey include information about costs and sources for services, equipment and supplies purchased by charter businesses, services offered to clients and associated sales revenues, crew employment and pay, vessel characteristics, and historical fishery participation. In order to refine the survey questions, AFSC researchers conducted focus groups with charter business owners in Homer and Seward in September 2011. This survey is expected to be implemented in 2012, pending available funding, completion of the survey development and testing process, and clearance for the data collection by the U.S. Office of Management and Budget under the Paperwork Reduction Act. Additionally, researchers from other NOAA Fisheries Science Centers have conducted, or are currently conducting, similar surveys of for-hire charter boat operations in other regions of the U.S.

Conservation Values in Marine Ecosystem-Based Management
By J.N. Sanchirico, **D.K. Lew, A.C. Haynie,** D. Kling, and D.F.Layton*
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Proactive ecosystem-based management represents a turning point in ocean management because it formally recognizes the need to balance the potentially competing uses of the ocean, including aquaculture, energy production, conservation, fishing, and recreation. A significant challenge in implementing this balancing act arises from explicitly incorporating conservation in a decision-making framework that facilitates trade-offs between benefits from conservation and conventional commercial uses. We foreshadow these challenges using empirical estimates of the benefits and costs of conservation actions for the endangered western stock of the Steller Sea Lion (wSSL) in Alaska. We show that the public's conservation values for wSSL can be much greater than the economic gains from commercial fisheries (e.g., up to ~8 times for one large fishery). The discrepancy highlights the forthcoming politically-contentious decisions on the allocation of ocean resources and our analysis highlights the critical research gaps needed to better inform these decisions. Our findings provide a starting point for a much needed conversation on how to incorporate conservation into ecosystem based management, and more specifically, coastal and marine spatial planning (CMSP). Without explicit consideration of these issues, it is unclear whether CMSP will better conserve ocean resources than the status quo. This work is under review at a scientific journal.

Cook Inlet Beluga Whale Economic Valuation Survey Development
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The purpose of this project is to develop and test survey materials that can be used to collect data to understand the public's preferences for protecting the Cook Inlet beluga whale (CIBW), a distinct population segment (stock) of beluga whale that resides solely in the Cook Inlet, Alaska. It is the smallest of the five U.S. beluga whale stocks. In October 2008, the CIBW was listed as an endangered species (73 FR 62919). It is believed that the population has declined from as many as 1,300 to about 321 animals (see http://www.fakr.noaa.gov/protectedresources/whales/beluga/management.htm#esa for more details).

Qualitative pretesting of survey materials is generally recognized as a key step in developing any high quality survey (e.g., Dillman, Smyth, Christian [2009]). Pretesting survey materials using focus groups and cognitive interviews is important for improving questions, information, and graphics presented in the survey instruments so they can be better understood and more consistently interpreted by respondents to maximize the likelihood of eliciting the desired information accurately. During 2009 and 2010, focus groups and cognitive interviews were undertaken to evaluate and refine the survey materials of a stated preference survey of the public's preferences for CIBW recovery. As a result of the input received from these qualitative testing activities, the survey materials were revised and then integrated into a Paperwork Reduction Act (PRA) clearance request package that was prepared and submitted to the Office of Management and Budget (OMB) for the pilot survey implementation, which precedes implementing the full survey. The pilot survey was administered during 2011, and a contractor was selected to administer the full survey. PRA clearance for the full survey implementation is being sought at present, and implementation will occur following OMB approval.

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Demand for Saltwater Sport Fishing Trips in Alaska

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The primary goal of this study is to estimate the demand for, and economic value of, saltwater sport fishing trips in Alaska using data collected from an economic survey of Alaska anglers. The survey instrument collects basic trip information on fishing trips taken during 2006 by both resident and non-resident anglers and uses a stated preference choice experiment framework to identify anglers' preferences for fish size, catch, and harvest regulations related to halibut, king (Chinook) salmon and silver (Coho) salmon. The survey also includes questions that provide detailed information on time and money constraints and characteristics of the most recent fishing trip, including detailed trip expenditures. Details on the survey implementation and data collected are provided in Lew, Lee, and Larson (2010).

Together, these data were used to estimate the demand for Alaskan saltwater sport fishing and to understand how attributes such as fish size and number caught and harvest regulations affect participation rates and the value of fishing experiences. Three papers describing models to estimate the net economic value of saltwater sport fishing trips by Southeast Alaska anglers were completed and submitted to peer-reviewed journals. The first paper (Lew and Larson 2011a) describes a model of fishing behavior that accounts for two decisions, participation and site choice, which is estimated using a repeated discrete choice modeling approach. The paper presents the results from estimating this model and the economic values suggested by the model results with a primary emphasis on Chinook and Coho salmon trip values. The second paper (Lew and Larson, 2010) analyzes the role of targeting behavior and the use of different sources of harvest rate information on saltwater sport fishing demand in Southeast Alaska. The third paper (Lew and Larson, 2011b) is primarily a methodological one, as it assesses different ways of estimating the opportunity cost of travel time in the recreational fishing demand model. In the latter two papers, economic values for saltwater species are presented, but the emphases of the papers are on addressing other issues. Additionally, another paper (Lew and Larson 2011c) used responses to stated preference choice experiment (SPCE) questions in the survey to estimate the economic value of charter boat fishing trips in Southeast Alaska and Southcentral Alaska by non-resident anglers, private boat fishing trips by Southeast Alaska resident anglers, and charter boat and private boat fishing trips by all other Alaska resident anglers. The paper also estimates the marginal value of relaxing species-specific bag limits for Pacific halibut, king salmon, and silver salmon and provides insights into the value anglers place on catching larger, and more, fish.

During 2010 and early 2011, the 2007 survey was updated and qualitatively tested with resident and non-resident anglers. The new survey aims to collect much of the same information collected by the 2007 survey, but also collects additional information needed to facilitate the data's application in a wider range of models. Office of Management and Budget (OMB) approval is currently being pursued under the Paperwork Reduction Act (PRA), and the survey will be fielded following OMB clearance.

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Economic Impacts of Alaska Saltwater Sport Fishing

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Saltwater sport fishing is an important economic activity in Alaska, generating jobs and sales of related industries throughout coastal regions and the state generally (Southwick Associates, 2007). Two recent NMFS surveys have collected data that can be used to understand to what extent saltwater sport fishing in Alaska contributes to the state's economy. A survey effort to collect saltwater fishing-related expenditures was recently completed by NMFS' Office of Science and Technology (Gentner and Steinback, 2008). The survey collected detailed information from anglers who fished in Alaska about their expenditures on trip-level and durable goods and services. Trip-related expenditures include items such as fuel, transportation expenses, guide fees, equipment rentals, bait, ice, food, and lodging that are accrued on the saltwater fishing trip. Durable expenditures relate to items that can be used and enjoyed for more than one trip, such as fishing gear and other equipment purchases, as well as large items like boats, vehicles, and vacation homes. The second survey of Alaska saltwater anglers procured trip-level expenditure data from Alaska resident anglers and non-resident anglers (NR) who saltwater fished in Southeast Alaska (SE) and/or Southcentral (SC) Alaska. In addition to trip expenditure information, the survey collected detailed information on fishing behavior that will be used to estimate the baseline demand for saltwater fishing trips in Alaska and is described in more detail elsewhere in this document ("Demand for Sport Fishing Trips in Alaska").

Using data from these surveys, the economic impact of saltwater fishing by non-residents, including the total expenditure for each expenditure category, on the Alaska economy was estimated. Non-resident anglers' expenditures for each expenditure category were split into expenditures made in SE, SC, and rest of Alaska, respectively. Next, each expenditure category was mapped to IMPLAN sectors. Then, a stated preference model of saltwater sport fishing participation was developed to generate estimates of changes in participation resulting from changes in harvest limits for three primary recreational target species in Alaska saltwater fisheries: Pacific halibut, king (Chinook) salmon, and silver (Coho) salmon. Finally, these estimates were used in a state-level computable general equilibrium (CGE) model to generate estimates of the economic impacts of the change in non-resident anglers' expenditures caused by changes in the harvest limits. The results from this analysis were published in Lew and Seung (2010). Overall, the analysis suggests that estimated regional economic impacts are modest relative to the overall size of the Alaska state economy, but may understate the impact on coastal regions, as they are likely to be geographically concentrated on the coastal communities which are most directly involved with these economic activities. Therefore, the next logical step would be to develop a "regional" level CGE model to investigate the localized effects on coastal areas.

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Models of Fishermen Behavior, Management and Economic Performance

The Impact of Catch Share Implementation on Catch and Bycatch in the Amendment 80 Fleet of the Bering Sea / Aleutian Island

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In 2008, participants in the non-pollock groundfish trawl fisheries were given exclusive harvesting quota privileges through their participation in cooperatives to a share of their primary target species – ending the previous common property system for all but a small number of vessels that opted out of the program.

They also received exclusive privileges within the cooperative structure to their share of catch of mandatory discard species such as halibut and red king crab. In the past, the TAC for these bycatch species was allocated to the fleet as a whole, often yielding a "race for bycatch" due to the costs of bycatch avoidance and the small likelihood of any individual vessel receiving significant benefit from its avoidance efforts. In many cases discard species, not target species, limited the extent of the fishery at substantial economic costs to fishermen.

Our study synthesizes extensive observer data, production and cost data (along with conversations with fishermen and industry representatives) to examine the early effects on bycatch outcomes, production efficiency and fleet behavior from the "rationalization" of this fleet. Preliminary analysis suggests that bycatch rates of halibut have declined substantially since 2008. We analyze our extensive observer data and find evidence of significant behavioral changes (e.g., alterations in the timing and location of fishing events) that help explain these findings – behavioral changes that are directly attributable to the creation of individual incentives for bycatch avoidance. This manuscript will be completed and submitted to a scientific journal this year.

What are We Protecting?
The Challenges of Marine Protected Areas for Multispecies Fisheries

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Spatial closures, like marine protected areas (MPAs), are prominent tools for ecosystem-based management in fisheries. However, the adaptive behavior of fishermen – the apex predator in the ecosystem – to MPAs may upset the balance of fishing impacts across species. While ecosystem-based management (EBM) emphasizes the protection of all species in the environment, the weakest stock often dominates management attention. We use data before and after the implementation of large spatial closures in a North Pacific trawl fishery to show how closures designed for red king crab protection spurred dramatic increases in Pacific halibut bycatch due to both direct displacement effects and indirect effects from adaptations in fishermen's targeting behavior. We identify aspects of the ecological and economic context of the fishery that contributed to these surprising behaviors, noting that many multispecies fisheries are likely to share these features. Our results highlight the need to either anticipate the behavioral adaptations of fishermen across multiple species in reserve design, a form of implementation error, or to design management systems that are robust to these adaptations. Failure to do so may yield patterns of fishing effort and mortality that undermine the broader objectives of multispecies management and potentially alter ecosystems in profound ways. This manuscript has been revised and resubmitted to *Ecological Applications*.

Evaluating the Effectiveness of Rolling Hotspot Closures for Salmon Bycatch Reduction in the Bering Sea Pollock Fishery

By Alan C. Haynie*
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Bycatch is commonly noted as a primary problem of fisheries management and has been a recurrent management concern in the North Pacific. Bycatch levels of chum and Chinook salmon rose substantially beginning early in the last decade, with chum bycatch peaking in 2005 and Chinook bycatch reaching a record high in 2007 before bycatch of both species declined. In the Bering Sea pollock fishery, Chinook and chum salmon bycatch reduction measures have consisted principally of area closures, although a Chinook salmon bycatch hard cap with individually bycatch allocations went into effect beginning 2011 which would close the fishery if the cap were reached.

Since the mid-1990s, area closures aimed at bycatch reduction have consisted of both large long-term Salmon Savings Area closures and short-term rolling hotspot (RHS) closures. Significant areas of the pollock fishing grounds have been closed at some point in all years between 1995 and 2011. Currently, the North Pacific Fishery Management Council (NPFMC) is considering several measures to reduce chum bycatch, including evaluating means to improve industry-imposed RHS closures. In this paper, we quantify the reduction in bycatch following the implementation of actually RHS closures. Additionally, we simulate the impacts of dynamic bycatch closures in historical periods when closures were not in place and compare the relative effectiveness of different dynamic closure system characteristics. We also briefly discuss the hard cap and incentive plan agreements that were put in place in 2011 to reduce Chinook salmon bycatch. This work is part of on-going NPFMC of chum bycatch measures and is also expected to be submitted this year as a manuscript to a scientific journal.

The Role of Economics in the Bering Sea Pollock Fishery's Adaptation to Climate Change

Alan Haynie and Lisa Pfeiffer *

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One component of the Bering Sea Integrated Ecosystem Research Project (BSIERP) is a spatial economic model that predicts changes in fishing activity in the Bering Sea pollock fishery that may result from climate change. Seasonal sea ice in the Bering Sea is predicted to decrease by 40% by 2050, resulting in more frequent warm years characterized by reduced winter ice cover and a smaller cold pool (<1.5ºC bottom temperature). Retrospective data from the pollock catcher/processer fishery were used to study the behavior of harvesters in past climate regimes to make inferences about future behavior in a warmer climate. We found that in the pollock fishery, large differences in the value of catch resulting from the pursuit of roe-bearing fish in the winter fishing season result in disparate behavior between the winter and summer fishing season. In the winter season, warm years and high abundances drive more intensive effort early in the season to harvest earlier-maturing roe. In the summer season, a smaller cold pool and high abundances are correlated with decreased effort in the northern reaches of the fishing grounds. Spatial price differences are associated with changes in the distribution of effort of approximately the same magnitude. Although biological evidence suggests that the predicted increased frequency of warmer regimes may result in decreasing abundances, the historical data is insufficient to predict behavior in warm, low abundance regimes. This paper provides insight into the economic drivers of the fishery, many of which are related to climate, and illustrates the difficulty in making predictions about the effects of climate change on fisheries with limited historical data. Over the past year, presentations on aspects of this work were presented at several forums, including the Alaska Marine Sciences Symposium, the North American Association of Fisheries Economists meetings, the Ecosystem Studies of Sub-Arctic Seas meetings, and the American Fisheries Society annual meetings. A manuscript on the work will soon be submitted to a scientific journal.

Why Economics Matters for Predicting the Effects of Climate Change on Fisheries

By Alan Haynie and Lisa Pfeiffer *

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Research attempting to predict the effect of climate change on fisheries often neglects to consider how harvesters respond to changing economic, institutional, and environmental conditions, which leads to the overly simplistic prediction of "fisheries follow fish". However, the climate effects on fisheries can be complex because they occur through physical, biological, and economic mechanisms that interact or may not be well understood. While most find it obvious to include physical and biological factors in predicting effects of climate change on fisheries, the behavior of fish harvesters also matters for these predictions. We present a general but succinct conceptual framework for investigating the effects of climate change on fisheries that incorporates the biological and economic factors that determine how fisheries operate. The use of this framework will result in more complete, reliable, and relevant investigations of the effect of climate change on fisheries. The uncertainty surrounding long-term projections, however, is inherent in the complexity of the system. This manuscript has been submitted to the *ICES Journal of Marine Science*.

Evaluating Management Strategies for Eastern Bering Sea Walleye Pollock (Theragra Chalcogramma) in a Changing Environment

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The impacts of climate change on fish and fisheries are expected to increase the demand for more accurate stock projections and harvest strategies that are robust to shifting production regimes. To address these concerns, we evaluate the performance of fishery management control rules for the eastern Bering Sea walleye pollock stock under climate change. We compared the status quo policy with six alternative management strategies under two types of recruitment pattern simulations: one that follows temperature-induced trends and the other that follows a stationary recruitment pattern similar to historical observations. A subset of 82 Intergovernmental Panel on Climate Change climate models provided temperature inputs from which an additional 100 stochastic simulated recruitments were generated to obtain the same overall recruitment variability as observed for the stationary recruitment simulations. Results indicate that status quo management with static reference points and current ecosystem considerations will result in much lower average catches and an increased likelihood of fishery closures, should reduced recruitment because of warming conditions hold. Alternative reference point calculations and control rules have similar performance under stationary recruitment relative to status quo, but may offer significant gains under the changing environmental conditions. This work was published in 2011 in *the ICES Journal of Marine Science.*

The Effect of Decreasing Seasonal Sea Ice Cover on the Bering Sea Pollock Fishery

By Lisa Pfeiffer and Alan C. Haynie
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The winter fishing season of the Bering Sea pollock fishery occurs during the period of maximum seasonal sea ice extent, but harvesters avoid fishing in ice-covered waters. Global climate models predict a 40% reduction in winter ice cover by 2050. This may have implications for the costs that vessels incur when traveling to and around their fishing grounds, or may open entirely new areas to fishing. Using retrospective data from 1999-2009, a time period of extensive annual climate variation, we analyzed variation in the distribution of the fishery. We compared the distribution of fishing in warm and cold years to estimate the degree to which fishing is displaced by ice cover. We used projections of average ice cover and bottom temperatures from Intergovernmental Panel on Climate Change model scenarios to characterize how the frequency of cold and warm years in the Bering Sea is projected to change through 2050 (IPCC, 2007). We simulated the predicted changes in ice conditions and compared the projected distribution of fishing to the observed distribution of fishing. The predicted redistribution of effort is small, largely because the winter fishery is driven by the pursuit of roe-bearing fish whose spawning location is stable. Some areas show a significant change in effort, however. This manuscript has been submitted to the *ICES Journal of Marine Science.*

Climate Change and Location Choice in the Pacific Cod Longline Fishery

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Pacific cod is an economically important groundfish that is targeted by trawl, pot, and longline gear in waters off Alaska. An important sector of the fishery is the "freezer longliner" segment of the Bering Sea which in 2008 accounted for $220 million of the Pacific cod first wholesale value of $435 million. These vessels are catcher/processors, meaning that fish caught are processed and frozen in a factory on board the ship.

A dramatic shift in the timing and location of winter season fishing has occurred since 2000. This shift is related to the extent of seasonal sea ice, as well as the timing of its descent and retreat. The presence of winter ice cover restricts access to a portion of the fishing grounds. Sea ice also affects relative spatial catch per unit effort by causing a cold pool (water less than 2°C that persists into the summer) that Pacific cod avoid. The cold pool is larger in years characterized by a large and persistent sea ice extent. Finally, climate conditions and sea ice may have lagged effects on harvesters' revenue through its effect on recruitment, survival, total biomass, and the distribution of size and age classes. Different sizes of cod are processed into products destined for distinct markets. The availability and location of different size classes of cod, as well as the demand for these products, affects harvesters' decisions about where to fish and their expected revenue.

Understanding the relationship between fishing location and climate variables is essential in predicting the effects of future warming on the pacific cod fishery. Seasonal sea ice is projected to decrease by 40% by 2050, which will have implications for the location and timing of fishing in the Bering Sea Pacific cod longline fishery. Over the past year, presentations on aspects of this work were presented at several forums, including the Ecosystem Studies of Sub-Arctic Seas meetings and the American Fisheries Society annual meetings. Work is on-going on a manuscript which will be submitted to a scientific journal this year.

Models with Interactions Across Species

Optimal Multispecies Harvesting Targets in Biologically, Technologically, and Temporally Interdependent Fisheries

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Single species management of multispecies fisheries ignores biological interactions in addition to important technological interactions resulting from the multiproduct nature of firms' production, often to the detriment of the health of the ecosystem, the stocks of fish species, and fishery profits. This study creates a multispecies bioeconomic model of groundfish in the Bering Sea which account for the biological interactions among species, technological interactions which results in catching multiple species as well as temporal interactions between species as fishermen allocate their effort across multiple fisheries over the course of a year. This dynamic optimization problem of maximizing the net present value from all species jointly is solved using numerical optimization techniques to determine the optimal harvest quota of each species given species biological, technological, and temporal interactions. This study shows that these species interactions can substantially alter the optimal harvest policies compared with a single species bioeconomic model.

This study uses the arrowtooth flounder, Pacific cod, and walleye pollock fisheries in the Bering Sea/Aleutian Islands region of Alaska as a case study and finds the net present value of the three-species fishery is over $20.7 billion dollars in the multispecies model, over $5 billion dollars more than the net present value of the single species model. This is a function of the interdependence among species that affects other species growth. Because arrowtooth negatively impacts the growth of cod and pollock, substantially increasing the harvest of arrowtooth to decrease its stock is optimal in the multispecies model as it leads to increased growth and therefore greater potential harvests of cod and pollock. The single species model does not incorporate these feedbacks among species, and therefore assumes each species is unaffected by the stock rise or collapse of the others. The vessels in this fishery are also shown to exhibit cost anti-complementarities among species, which implies that harvesting multiple species jointly is more costly than catching them independently. As approaches for ecosystem-based fisheries management are developed, the results demonstrate the importance of focusing not only on how the economically valuable species interact, but also on some non-harvested species, as they can affect the productivity and availability of higher value species.

Optimal Multispecies Harvesting in the Presence of a Nuisance Species

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The need for ecosystem based fisheries management is well recognized, but substantial obstacles remain toward implementing these approaches given our current understanding of the biological complexities of the ecosystem along with the economic complexities surrounding resource use. This study develops a multispecies bioeconomic model that incorporates biological and technological interactions to determine the optimal catch and stock size for each species in the presence of a nuisance species. The nuisance species lowers the value of the fishery by negatively affecting the growth of the other species in the ecosystem, and has little harvest value of its own. The populations of arrowtooth flounder (nuisance species), Pacific cod, and walleye pollock in the Bering Sea/Aleutian Islands region of Alaska are used as a case study. This study empirically estimates multispecies surplus production growth functions for each species and uses these parameters to explore the impact of a nuisance species on the management of this ecosystem. Using dual estimation methods, multiproduct cost functions are estimated for each gear type in addition to a count data model to predict the optimal number of trips each vessel takes. These functions are used, along with the estimated stock dynamics equations to determine the optimal multispecies quotas and subsidy on the harvest of the nuisance species to maximize the value of this three species fishery.

This study uses the arrowtooth flounder, Pacific cod, and walleye pollock fisheries in the Bering Sea/Aleutian Islands region of Alaska as a case study and finds the net present value of the fishery is decreased from $20.7 billion to $8.5 billion dollars by ignoring arrowtooth's role as a nuisance species on the growth of Pacific cod and walleye pollock. The optimal subsidy on the harvest of arrowtooth summed over all years is $35 million dollars, which increases the net present value by $273 million dollars, after accounting for the subsidy. As arrowtooth flounder is a low value species and has a large negative impact on the growth of cod and pollock, it is optimal to substantially increase the harvesting of arrowtooth, lowering its population resulting in increased growth and harvesting in the two profitable fisheries. Ignoring the role of the nuisance species results in a substantially less productive and lower value fishery than if all three species are managed optimally. This study highlights the role of both biological and technological interactions in multispecies or ecosystem approaches for management, as well as the importance of incorporating the impacts non-harvested species can have on the optimal harvesting policies in an ecosystem.

Regional Economic Modeling

Developing a Multi-regional Computable General Equilibrium Model (MRCGE) for Alaska and West Coast Fisheries

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Many of the vessels operating in Alaska fisheries are owned and crewed by residents of West Coast states, especially Washington and Oregon. Some of these vessels also tend to participate in West Coast fisheries during the year. Expenditures made by these vessels generate income in port and may also have multiplier and spillover effects in other regions. Assuming that all expenditures are made locally will significantly overestimate economic impacts in a region. Taking account of the regional distribution of expenditures made by Alaska fishing vessels in Alaska, West Coast states and elsewhere in the US, will enhance our ability to model the overall economic impacts of Alaska fisheries and West Coast fisheries. Starting from an Alaska single-region CGE model (e.g., Seung and Waters 2010) that we developed previously, we developed a multiregional CGE (MRCGE) model. We first constructed a three-region (Alaska, West Coast, and rest of the US) social accounting matrix (SAM) using (i) data that was previously used to develop a single-region Alaska CGE model, (ii) data developed by NWFSC for the IO-PAC model of West Coast fishery sectors, and (iii) data on interregional trade from IMPLAN. Using the SAM, we developed a multiregional CGE (MRCGE) for the three regions. Currently, we are conducting various simulation experiments which calculate the impacts from change in TAC, change in rest of world demand for Alaska seafood, and change in exchange rate. The model will be used to calculate the regional and interregional economic impacts of Alaska and West Coast fisheries. In the future, the MRCGE model will be fully integrated with Mike Dalton's global GTAP model, resulting in a full multiregional, multi-country CGE model, if funding is available.

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Economic Base Analysis of the Alaska Seafood Industry with Linkages to International Markets: Application to the Alaska Head and Gut Fleet

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The Alaska Head and Gut (H&G) Fleet was rationalized recently and it relies on global markets as a primary source of revenue. Thus, an economic assessment of rationalization should consider the effects of global market conditions on benefits and costs. This fleet has expressed an interest in quantifying its economic contribution. For example in 2006, an industry group commissioned a study that used input-output (IO) analysis to estimate the economic contribution of the H&G sector to a particular port (Dutch Harbor) and to the state of the Alaska. However for the Alaska seafood industry, Seung and Waters (2005) recommend the use of a regional social-accounting-matrix (SAM) model over IO analysis. These models can be used to quantify the contribution of an industry to the regional economic base, or to evaluate impacts of year-to-year changes in prices and quantities (e.g., TACs) on regional employment and income. Regional economic models do not usually explicitly distinguish between domestic and foreign markets that are outside the regional economic zone. But that distinction can be important for analyzing the regional impacts of price changes that are driven by global market conditions.

Seung and Waters (2005) developed a regional SAM model to estimate the total contribution of commercial fishing to the economic base of Alaska. In addition to the regional economy, that model contained a single ‘rest of world’ (ROW) region and did not explicitly distinguish between US domestic and foreign markets. This model and methodology will be extended and refined for application to the Alaska H&G sector in two ways. First, it will utilize an existing source of economic data for this sector, the Amendment 80 Non-AFS Trawl Gear Catcher Processor Economic Data Report (EDR) for 2009. Second, demand from the single ROW region in the Alaska regional SAM will be disaggregated based on export values and quantities that will be compiled from NMFS trade statistics (i.e., US Merchandise Trade Statistics) for select species and market categories.

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<u>Socioeconomic, Cultural and Community Analyses</u>

Collecting Data on Stakeholders’ Preferences to Develop Socioeconomic Indicators for Alaska Fisheries

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Ecosystem-based fisheries management has become an important topic within the fishery management literature. Both scientists and fishery managers have made efforts to better define ecosystem-based management, and have discussed how to implement ecosystem-based management in fisheries. Progress has also been made in developing useful approaches to planning, implementing, and assessing ecosystem-based fisheries management. In particular, fishery scientists have developed numerous indicators for measuring the improving or deteriorating status of fisheries. However, most of these indicators are non-economic indicators. While a number of previous studies have developed socioeconomic indicators, they were either (1) stand-alone indicators which were not aggregated to obtain an overall socioeconomic index or social welfare function (SWF) or (2) they were not based firmly on economic theory. To overcome these weaknesses we will use a multi-attribute utility function (MAUF) approach, which is firmly based on microeconomic theory, to develop a suite of socioeconomic indicators for an Alaska fishery, eastern Bering Sea (EBS) trawl fishery. The MAUF approach captures diminishing marginal utilities for attributes and allows trade-offs among attributes. The present study represents the first attempt to use this approach in developing socioeconomic indicators. Although a previous study (Seung and Zhang 2010) used an MAUF approach to develop socioeconomic indicators for EBS trawl fishery, the study did not conduct interview the stakeholders for eliciting their preferences. Instead, they just assumed that the analysts' opinions of the stakeholders' preferences reflect their actual preferences. The present project will conduct such interviews to develop MAUF-based indicators. Once the socioeconomic indicators are developed and aggregated into an overall index that measures the socioeconomic status of the fishery, they will be integrated with non-socioeconomic indicators such as biological and ecological indicators which are currently being developed by other scientists within the Alaska Fisheries Science Center through another project.

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Improving Community Profiles for the North Pacific Fisheries

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As in other public policy arenas, incorporating community voices into the fisheries management process in Alaska is difficult. Alaska contains difficult terrain that makes travel around the state difficult and expensive. Subsistence fishing and hunting and involvement in commercial fishing activities often take precedence over attending fisheries management meetings. Although state and federal fisheries managers are required to obtain public input on fishing regulations, Alaskan communities have conveyed a sense of disenfranchisement from the decision making process that ultimately affects their participation in commercial, sport, or subsistence fishing. In order to provide baseline information about a large number of Alaskan fishing communities to fisheries managers, the Economics and Social Science Research Program (ESSRP) compiled existing information about, and published community profiles for, 136 Alaskan fishing communities with baseline information from the year 2000.

Now that these data are over 10 years old, ESSRP is in the process of updating the community profiles. As a first step, the communities to be included in the updated document were reevaluated to ensure that communities with significant reliance on commercial, recreational and subsistence fishing are included. This resulted in a total of 195 communities that will be profiled, including the original 136 communities profiled in the 2005 *Community Profiles for North Pacific Fisheries – Alaska* (Community Profiles; Sepez et al. 2005) and an additional 59 communities that were not previously included. Second, through input from community representatives from around the state, we have developed a new template for the profiles and will be adding in a significant amount of new information to help provide a better understanding of each community's reliance on fishing. The community profiles will comprise additional information including, but not limited to, annual population fluctuation, fisheries-related infrastructure, community finances, natural resources, educational opportunities, fisheries revenue, shore-based processing plant narratives, landings and permits by species, and subsistence and recreational fishing participation. In addition, the profiles will provide information about the Western Alaska Community Development Program and regional profiles. A team of researchers will be assembled in late 2011 to start the process of revising the profiles. A draft of each community's profile will be sent to representatives of that community for input before they are finalized. Once finalized, the profiles will be posted on the Alaska Fisheries Science Center web site.

Comprehensive Data Collection on Fishing Dependence of Alaska Communities

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Much of the existing economic data about Alaskan fisheries is collected and organized around different units of analysis, such as counties (boroughs), fishing firms, vessels, sectors, and gear groups. It is often difficult to aggregate or disaggregate these data for analysis at the individual community or regional level. In addition, at present, some relevant community level economic data simply are not collected at all. As a result, the North Pacific Fisheries Management Council (NPFMC), the Alaska Fisheries Science Center (AFSC), and community stakeholder organizations have identified ongoing collection of community-level socio-economic information as a priority. The purpose of this project is to build on existing data and respond to this priority by gathering information about individual community involvement in fishing that is currently lacking and limits the ability of regulators to effectively analyze the potential impacts of fisheries management decisions at the community level. These data will aid scientists and NPFMC staff in better understanding Alaskan communities' social and economic ties to the fishing industry. These data also will facilitate the analysis of potential impacts of catch share programs and coastal and marine spatial planning efforts as they are more fully implemented as U.S. federal fisheries management tools.

To implement this project, the Alaska Community Survey was developed and implemented during summer 2011. Surveys were sent out to community leaders in 181 fishing communities. As of the end of September 2011, surveys for 111 communities have been returned, representing a response rate of 61.3%. The information collected in the survey included time series data, information on community revenues based in the fisheries economy, population fluctuations, fisheries infrastructure available in the community, support sector business operations in the community, community participation in fisheries management, and effects of fisheries management decisions on the community. Over the coming months, attempts will be made to retrieve completed surveys from the remaining 70 communities. The data received from the surveys will be used to update the *Community Profiles for North Pacific Fisheries – Alaska* (NOAA Tech Memo NMFS-AFSC-160) and to provide summary statistics on fishing communities throughout different regions of Alaska.

Processor Profiles of Fish Processing Plants in Alaska

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Workers come from many places inside and outside Alaska to work seasonally in its fish processing facilities. As a result, the population of an Alaska community with a fish processing plant can increase significantly during peak processing seasons. However, very limited information is available in a consolidated location or format about these fish processing facilities. The National Marine Fisheries Service's (NMFS) Alaska Fisheries Science Center completed a survey in 2011 designed to obtain such basic information.

The primary data collection tool for this project was a telephone administered questionnaire. The questionnaire collected social information about fish processing plants at the plant level. This information was collected from plant managers at each shore-based fish processing plant in Alaska. The questionnaire was designed after conducting secondary research to determine what needed data are not already available, consulting with experts in survey research design, and partnering extensively with members of industry to test the survey instrument and to ensure that all of the questions were clear and could be answered easily by the respondents. The questionnaire included nine questions that were designed to provide processing-plant-specific and community-specific information, including whether the plant is located within the community, the public infrastructure a plant relies on, the number of individuals employed at each processing facility during the months of operation, the ethnicity of processing workers, types of lodging and other accommodations and activities available for processing workers, whether or not the company provides meals for the processing workforce in a company galley, and the history of the fish processing facility in the community. The survey data collected was supplemented with internet sources, including the associated fish processing company websites and the Alaska Seafood Marketing Institute's website.

The potential respondent universe included plant managers from the 186 shore-based fish processing facilities (located in 64 Alaskan communities) which filed Intent to Operate paperwork with the Commercial Fisheries Entry Commission in the year 2010. These fish processing facilities include plants with the following Alaska Department of Fish and Game processor and buyer codes: SBPR (Shorebased Processor), EXBY (Buyer/Exporter), IBYO (Independent Buyer), and IFSP (Inshore Floating Stationary Processor). These codes were chosen in order to ensure that all fish processing facilities based in Alaskan communities were included in the respondent pool. The phone numbers and addresses of processing plants will be obtained from publicly available Intent to Operate listings from the Alaska Department of Fish and Game. The survey was implemented during the months of August and September 2011. A total of 101 plants completed the survey, giving an overall response rate of 72%.

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AFSC Economics and Social Sciences Research Program
Publication List for Full-Time Staff (names in bold), 2007-2011

2011

Fell, H. and **A. Haynie**. 2011. “Estimating Time-varying Bargaining Power: A Fishery Application.” *Economic Inquiry*, 49(3): 685-696.

We propose an unobserved-components-inspired approach to estimate time-varying bargaining power in bilateral bargaining frameworks. We apply the technique to an ex-vessel fish market that changed management systems from a regulated open-access system to an individual fishing quota (IFQ) system over the time span analyzed. We find that post-IFQ implementation fishers do improve their bargaining power and thus accrue more of the rents generated by the fishery. However, unlike previous studies, we find that fishers do not move to a point of complete rent extraction. Rather, fishers and processors appear to be in a near-symmetric bargaining situation post-IFQ implementation.

Fissel, B., N.C.H Lo, and S. Herrick. 2011. “Egg Production, Spawning Biomass and Recruitment for the Central Subpopulation of Northern Anchovy 1981-2009.” In press at *CalCOFI Reports*.

This paper updates estimates of critical stock assessment parameters for the central subpopulation of northern anchovy (*Engraulis mordax*). Ichthyoplankton data from the CalCOFI database were used to implement the historical egg production method and estimate annual mortality curves, from which daily egg production, and egg and larval mortality parameters were derived. Spawning biomass was estimated using historical data under the assumption of a constant daily specific fecundity. A Ricker recruitment model, augmented with environmental factors, was estimated based on historical data and used to predict recruitment using the new spawning biomass data. We found that egg densities were highly variable while larval densities have been persistently low since 1989. Recruitment estimation suggests that poor environmental conditions have potentially contributed to the low productivity. Mortality estimation reveals through an increasing egg mortality rate that low larval densities were primarily the result of high mortality during the pre-yolk-sac period.

Lazrus, H., **J. Sepez, R. Felthoven** and **J. Lee**. 2011. "Post-Rationalization Restructuring of Commercial Crew Member Opportunities in Bering Sea and Aleutian Island Crab Fisheries." *NOAA Technical Memorandum* NMFS-AFSC-217, United States Department of Commerce.

This report examines how employment opportunities for commercial fishing vessel crew members have changed in the BSAI crab fisheries following the implementation of a catch shares style of management system by the North Pacific Fishery Management Council. Based on hundreds of hours of ethnographic interviews with current and former crew members, captains, boat owners, processing plant employees, and other stakeholders, the analysis examines the effects of rationalization on many aspects of crew employment, including geographic distribution of jobs, the number of crew jobs available, the types of crew positions on a vessel, the decision making processes of potential crew job-seekers, the structure of compensation of crew, the effects of leased quota on crew compensation per unit of effort, the scheduling of deliveries to shore-based processing plants and the effects of local sources of alternative employment on crew.

The conclusions regarding these aspects of crew employment are followed by recommendations for further social science research on issues raised in this report.

Lew, D. and **A. Himes-Cornell**. 2011. "A Guide to Designing, Testing, and Implementing AFSC Economic and Social Surveys." U.S. Dept of Commerce, NOAA Technical Memorandum NMFS-AFSC-228, 43 pages.

Economic and social surveys are useful and powerful tools used to help better understand the characteristics, attitudes, opinions, and behavior of specific populations. However, it is not always clear to researchers how these surveys should be developed and implemented so that the most accurate information is obtained. This guide is intended to address this concern and to guide Alaska Fisheries Science Center (AFSC) researchers through the survey research and development process with the basic protocols and techniques developed in the survey research literature for maximizing item and unit response, minimizing biases, and generally producing surveys that will yield high quality information. The information presented is generally applicable to all voluntary economic and social surveys conducted by AFSC researchers and its contractors and provides a number of guidelines intended to ensure that economic and social surveys produced by the AFSC are developed and implemented according to the standards of the survey literature and required administrative and internal protocols.

Lew, D. and D.M. Larson. 2011. “A Repeated Mixed Logit Approach to Valuing a Local Sport Fishery: The Case of Southeast Alaska Salmon.” *Land Economics*, 87(4): 712-729.

We estimate the values of fishing opportunities and changes in harvest rates for single-day private boat saltwater fishing for king and silver salmon in Southeast Alaska, using a repeated mixed logit model of trip frequency and distribution estimated jointly with anglers’ shadow values of time. The standard assumption that the shadow value of time is a fixed fraction of the angler’s wage is rejected in favor of a more flexible model. The mean value of a fishing choice occasion is approximately $45 per angler and the mean marginal values of a king salmon and silver salmon are approximately $71 and $106.

Lew, D. and Kristy F. Wallmo. 2011. “External Tests of Embedding and Scope in Stated Preference Choice Experiments: An Application to Endangered Species Valuation.” *Environmental and Resource Economics*, 48(1): 1-23. DOI 10.1007/s10640-010-9394-1.

A criticism often levied against stated preference (SP) valuation results is that they sometimes do not display sensitivity to differences in the magnitude or scope of the good being valued. In this study, we test the sensitivity of preferences for several proposed expanded protection programs that would protect up to three U.S. Endangered Species Act-listed species: the Puget Sound Chinook salmon, the smalltooth sawfish, and the Hawaiian monk seal. An external scope test is employed via a split-sample SP choice experiment survey to evaluate whether there is a significant difference in willingness to pay (WTP) for protecting more species and/or achieving greater improvements in the status of the species. The majority of 46 scope tests indicate sensitivity to scope, and the pattern of scope test failures is consistent with diminishing marginal utility with respect to the amount of protection to each species. Further tests suggest WTP may be proportional to the number of species valued.

Schnier, K. and **R. Felthoven**. 2011. "Accounting for Spatial Heterogeneity and Autocorrelation in Spatial Discrete Choice Models: Implications for Behavioral Predictions." *Land Economics* 87(3): 382-402.

The random utility model (RUM) is commonly used in the land-use and fishery economics literature. This research investigates the effect that spatial heterogeneity and spatial autocorrelation have within the RUM framework using alternative specifications of the multinomial logit, multinomial probit and spatial multinomial probit models. Using data on the spatial decisions of fishermen, the results illustrate that ignoring spatial heterogeneity in the unobservable portion on the RUM dramatically effects model performance and welfare estimates. Furthermore, accounting for spatial autocorrelation in addition to spatial heterogeneity increases the performance of the RUM.

Sethi, S., M. **Dalton**, and R. Hilborn. 2011. Quantitative Risk Measures Applied to Alaskan Commercial Fisheries. In press at *Canadian Journal of Fisheries and Aquatic Sciences*.

Risk measures can summarize the complex variability inherent in fisheries management into simple metrics. We use quantitative risk measures from investment theory to analyze catch and revenue risks for 90 commercial fisheries in Alaska, nearly a complete census. We estimate the relationship between fishery characteristics and catch risk using nonparametric random forest regression to identify attributes associated with high or low risks. Catch and revenue risks for individual Alaskan fisheries are substantial and are higher than farmed food alternatives. Revenue risks are greater than catch risks for most fisheries, indicating that price variability is an additional source of risk to fishermen. Regression results indicate that higher productivity species tend to be higher risk, and there is an increasing gradient of risk moving North and West across Alaskan waters, with the remote Western Bering Sea fisheries tending to have the highest risks. Low risk fisheries generally have large catches, and support larger fleets. Finally, fisheries with greater catch history under some form of dedicated access privileges tend to have lower catch risks.

Seung, C., and C.I. Zhang. 2011. "Developing Socioeconomic Indicators for Fisheries off Alaska: a Multi-Attribute Utility Function Approach." In press at *Fisheries Research.* (Published online April 2011) doi:10.1016/j.fishres.2011.04.004

Ecosystem-based fisheries management requires a holistic assessment of fisheries status that integrates fishery ecosystem indicators for several major objectives such as sustainability, biodiversity, habitat quality, and socioeconomic status. Scientists have already paid much attention to the first three objectives and to the development of their indicators. Although there have been some efforts to develop socioeconomic indicators, relatively less attention has been paid to socioeconomic status and the development of its indicators. In addition, the socioeconomic indicators developed to date are not firmly based on economic theory. We (i) discuss the problems with previous approaches to developing socioeconomic indicators; (ii) present theoretical foundations of a multi-attribute utility function (MAUF) approach in developing socioeconomic indicators; (iii) discuss the issues associated with implementing the MAUF approach for fisheries in Alaska; (iv) present, as an example, several socioeconomic indicators developed using the MAUF approach for a fishery off Alaska; and (v) present results from some sensitivity analyses for the form of utility functions and weights. Future directions are also discussed.

Wallmo, K. and **D. Lew**. 2011. “Valuing Improvements to Threatened and Endangered Marine Species: An Application of Stated Preference Choice Experiments.” *Journal of Environmental Management*, 92: 1793-1801. DOI:10.1016/j.jenvman.2011.02.012.

Non-market valuation research has produced value estimates for over forty threatened and endangered (T&E) species, including mammals, fish, birds, and crustaceans. Increasingly, Stated Preference Choice Experiments (SPCE) are utilized for valuation, as the format offers flexibility for policy analysis and may reduce certain types of response biases relative to the more traditional Contingent Valuation method. Additionally, SPCE formats can allow respondents to make trade-offs among multiple species, providing information on the distinctiveness of preferences for different T&E species. In this paper we present results of a SPCE involving three U.S. Endangered Species Act (ESA)-listed species: the Puget Sound Chinook salmon, the Hawaiian monk seal, and the smalltooth sawfish. We estimate willingness to pay (WTP) values for improving each species’ ESA listing status and statistically compare these values between the three species using a method of convolutions approach. Our results suggest that respondents have distinct preferences for the three species, and that WTP estimates differ depending on the species and the level of improvement to their ESA-status. Our results should be of interest to researchers and policy-makers, as we provide value estimates for three species that have limited, if any, estimates available in the economics literature, as well as new information about the way respondents make trade-offs among three taxonomically different species.

Submitted for Publication in 2011:

Abbott, J.K. and **A.C. Haynie.** 2011. “What are we Protecting? The Challenges of Marine Protected Areas for Multispecies Fisheries." Revised and resubmitted to *Ecological Applications*.

Spatial closures like marine protected areas (MPAs) are prominent tools for ecosystem-based management in fisheries. However, the adaptive behavior of fishermen – the apex predator in the ecosystem – to MPAs may upset the balance of fishing impacts across species. While ecosystem-based management (EBM) emphasizes the protection of all species in the environment, the weakest stock often dominates management attention. We use data before and after the implementation of large spatial closures in a North Pacific trawl fishery to show how closures designed for red king crab protection spurred dramatic increases in Pacific halibut bycatch due to both direct displacement effects and indirect effects from adaptations in fishermen’s targeting behavior. We identify aspects of the ecological and economic context of the fishery that contributed to these surprising behaviors, noting that many multispecies fisheries are likely to share these features. Our results highlight the need to either anticipate the behavioral adaptations of fishermen across multiple species in reserve design, a form of implementation error, or to design management systems that are robust to these adaptations. Failure to do so may yield patterns of fishing effort and mortality that undermine the broader objectives of multispecies management and potentially alter ecosystems in profound ways.

Dalton, M. 2011. "Simulated Maximum Likelihood Estimation of the Panel Tobit Model with Dynamic Variables, Autocorrelation, and Fixed Effects." Under revision at *Journal of Econometrics*.

This paper analyzes a simulated maximum likelihood estimation procedure for censored panels using a Tobit model with lagged dependent variables, autocorrelation, and fixed effects.

Simulated variables provide valid instruments. A recursive filter, the principal methodological contribution of the procedure, removes autocorrelation from the residuals after differencing. Monte Carlo results show that estimates in the presence of fixed effects are accurate to within 5 percent for panels of at least 20 individuals, and 60 periods. Otherwise, estimates are accurate to within 1.5 percent with 40 individuals, and 25 periods. Accuracy is more sensitive to panel length if fixed effects are present.

Fell, H. and **A. Haynie**. 2011. "Spatial Competition with Changing Market Institutions." Revised and resubmitted at the *Journal of Applied Econometrics.*

Competition across space can be fundamentally altered by changes in market institutions. We propose a framework that integrates market-altering policy changes in the spatial analysis of competitive behavior. We also introduce a method that incorporates endogenous breaks in explanatory variables for spatial panel data sets. This paper fills a gap in the literature between work focusing on spatial price responsiveness of agents and work on changes in market regulations that affect competition. We apply the framework to a fisheries example to explore how a management change from aggregate to individual catch quotas affects the spatial price responsiveness of fish processors.

Fissel B. and B. Gilbert. 2011. "Exogenous Productivity Shocks and Capital Investment in Common-pool Resources." Submitted to *Rand Journal of Economics*

We model exogenous technology shocks in common-pool industries using a compound Poisson process for total factor productivity. Rapid diffusion of exogenous innovations is typical in the commons, but technology is rarely modeled this way. Technology shocks lower the equilibrium resource stock while causing capital buildup based on transitory profits with myopic expectations. The steady state changes from a stable node to a shifting focus with boom and bust cycles, even if only technology is uncertain. A fisheries application is developed, but the results apply to many settings with discontinuous changes in value and open access with costly exit.

Fissel B. and Y. Sun. 2011. "Threshold Selection in the Estimation of Realized Volatility for Jump Diffusion Processes." Submitted to the *Journal of Financial Econometrics.*

Accurate measurement of volatility is of paramount importance in the world of finance where volatility is risk. A popular method of measuring volatility is through realized volatility. In the presence of jumps, the quadratic variation estimator is inconsistent for the realized volatility of a diffusion process while the bipower variation estimator remains consistent. On days when jumps are absent, both are consistent but the quadratic variation estimator is asymptotically more efficient. Using a Hausman type testing statistic, we can "identify" the vast majority of jump days as days where the difference between the quadratic variation and bipower variation estimators exceeds some critical value or truncation threshold. In this paper, we cast the problem in a forecasting framework and show that a form of bias-variance tradeoff is present in the selection of the truncation threshold. We propose an optimal method for threshold selection that minimizes a consistent estimator of the out-of-sample forecasting loss. The use of a forecasting framework is fundamentally different from the test problem in the literature. We find that a priori large truncation thresholds may not be optimal from a forecasting perspective and smaller thresholds should be used. An extensive simulation study and an empirical application to S&P 500 futures demonstrate the effectiveness of the proposed method.

Hannesson, R., S. Herrick, **B. Fissel**. 2011. “Ecosystem Effects of the Collapse of the Pacific Sardine: an Error Correction Approach." Submitted to *Fish and Fisheries.*

In the 1950s the Pacific sardine collapsed, and the fishery declined from a historical peak of over 600,000 metric tons in 1936 to less than 100,000 tons after 1951 and was virtually nonexistent for 25 years (1965-90). Despite this, the landings of sardine predators increased after the sardine collapse and fell as the sardine stock recovered. This could have been caused by the increase in the stocks of other forage fish (mackerel and anchovy) which peaked while the sardine stock was down. We test for existence of cointegrating vectors between the landings of various potential predator species and the stocks of the three forage fish and estimate an error correction model for each individual potential predator and the forage fish stocks we find cointegrated with the predator. The majority of the results support a predator-prey relation with one or more forage fish, but some results are contrary to expectation or known predator-prey relations. It is hypothesized that variations in the sardine stock mainly affect non-commercial predators such as marine mammals and especially sea birds. This poses severe challenges to an ecosystem-based management of the sardine; ecological relationships need to be uncovered and estimated and non-commercial values of species assessed.

Haynie, A.C. and L. Pfeiffer. 2011. “Why Economics Matters for Predicting the Effects of Climate Change on Fisheries.” Submitted to the *ICES Journal of Marine Science*.

Research attempting to predict the effect of climate change on fisheries often neglects to consider how harvesters respond to changing economic, institutional, and environmental conditions, which leads to the overly simplistic prediction of “fisheries follow fish”. However, the climate effects on fisheries can be complex because they occur through physical, biological, and economic mechanisms that interact or may not be well understood. While most find it obvious to include physical and biological factors in predicting effects of climate change on fisheries, the behavior of fish harvesters also matters for these predictions. We present a general but succinct conceptual framework for investigating the effects of climate change on fisheries that incorporates the biological and economic factors that determine how fisheries operate. The use of this framework will result in more complete, reliable, and relevant investigations of the effect of climate change on fisheries. The uncertainty surrounding long-term projections, however, is inherent in the complexity of the system.

Himes-Cornell, A., C. Package, and A. Durland. 2011. “Improving Community Profiles for the North Pacific Fisheries.” U.S. Dept of Commerce, NOAA Technical Memorandum *in review*.

To provide baseline information about a large number of Alaskan fishing communities to fisheries managers, the Economic and Social Sciences Research Program (ESSRP) compiled existing information about, and published community profiles for, 136 Alaskan fishing communities in 2005. The Community Profiles have been widely used as the basis for fisheries management plans, social and economic impact assessments of proposed fishing regulations, and numerous discussions by natural resource agencies. However, it has become clear that the Community Profiles need to be updated with current information about communities’ dependence on fishing and additional categories of information that would be integral in determining the social and economic impacts of fishing regulations on local communities. In preparation for updating the Community Profiles, the ESSRP began the revision process by hosting conversations with community leaders and representatives around Alaska to engage them in how to revise the Community Profiles so that they better reflect their involvement in fishing. This effort represents a paradigm shift in how communities are engaged in fisheries management in Alaska by bringing them into the information gathering process that indirectly informs policymakers. The basic assumption of this approach is that communities are best equipped to describe their relationship to fisheries. To ensure that the new profiles reflect this knowledge, AFSC engaged with community representatives to ensure that local knowledge about their communities is incorporated. Meetings were hosted in six Alaskan regional hubs with over 100 community representatives ranging from tribal elders to community mayors to regional tribal consortiums. The meetings involved a group dialogue that provided an opportunity for ESSRP social scientists and Alaska community representatives to come together and discuss how to make these Community Profiles more informative and representative of Alaska communities. The discussion focused on an exchange of local stories and knowledge that best illustrate the way in which fishing shapes the fabric of Alaskan communities; information that fishery managers need to know about Alaska communities that is not currently represented in the Community Profiles; and discovering how to work with communities to best gather this new information for each community. Suggestions were also provided for improving the criteria for the selection of included communities. Throughout the meeting process, relationships and ties were built with community members, and it became evident that community input into this source of baseline information about Alaskan fishing communities is a crucial step forward for improving the involvement of communities in the fishery management process and getting their voices heard. The information gathered at the meetings is being used to restructure the format of the Community Profiles, compile and organize data that may need to be included in the Community Profiles, and generate new criteria for the selection of included communities.

Lew, D. and D. Larson. 2011. "How Do Harvest Rates Affect Angler Trip Patterns?" Submitted to *Marine Resource Economics*.

Incorporating catch or harvest rate information in repeated-choice recreation fishing demand models is challenging since multiple sources of information may be available and detail on how harvest rates change within a season is often lacking. This paper develops a framework for evaluating which source(s) of information should be used to improve predictions of the observed patterns of fishery participation and trip frequency. In an application to saltwater salmon fishing in Alaska, a repeated mixed logit model of trip frequency and distribution is estimated jointly with individual-specific angler shadow values of time, and we find that both of the two available harvest rate information sources contribute to better predictions and should be used. In addition, information on whether a species is being targeted makes a significant improvement to model performance. Model tests indicate that (a) non-targeted species have a significant marginal utility, and (b) it is different from the marginal utility of targeted species. The median value of a fishing choice occasion is approximately $50 per angler, which translates to a season of fishing being valued at approximately $2,500 on average.

Lew, D. and D. Larson. 2011. "The Consequences of Value of Time Assumptions in Recreation Demand Analysis: Some Empirical Evidence." Submitted to *Environmental and Resource Economics*.

In the recreation demand literature, few issues are more important to welfare estimates than the specification of the shadow value of time (*svt*), which sometimes is estimated jointly with the demand model, but more commonly takes on researcher-predetermined values, such as a fixed fraction of the wage rate. We advocate strongly for the first approach, demonstrating the feasibility of estimating a relatively simple *svt* specification (which is nonetheless sufficiently general to encompass most of the approaches in the literature) within a relatively sophisticated demand model, the repeated mixed logit model. There are two payoffs to this approach: much better fits econometrically and new insights about the relationship between the magnitude of welfare measures and the wage fraction.

Lew, D. and D. Larson. 2011. "Angler Preferences for Saltwater Fishing in Alaska: A Stated Preference Analysis." Under review at *North American Journal of Fisheries Management*.

Knowledge of how anglers value their fishing opportunities is a fundamental building block of a sound marine policy, especially for stocks where there is conflict over allocation between different sectors. This paper reports on how recreational saltwater anglers value their catches, and the regulations governing them, of Pacific halibut (*Hippoglossus stenolepis*), chinook salmon (*Oncorhynchus tshawytscha*), and coho salmon (*O. kisutch*) off the coast of Alaska using stated preference choice experiment data from 2007. For single-day trips where one species is caught with catches equaling the allowable bag (or take) limit, Alaska residents had total values ranging from $246 to $444 (U.S. dollars). Non-residents had much higher total values for the same fishing experiences (ranging from $2,007 to $2,639), likely due to the fact that the trips are both less common and considerably more expensive to participate in given the travel costs to Alaska. Non-residents generally had significant positive values for increases in number caught, bag limit, and fish size, while Alaska residents valued size and bag limit changes but not catch increases. The estimated mean net opportunity cost of a day spent fishing ranges from $0-27 for Alaska residents and $309 for non-residents.

Melnikov, N.B., B.C. O'Neill, and **M.G. Dalton**. 2011. "Accounting for Household Heterogeneity in General Equilibrium Economic Growth Models." Under review at *Energy Economics*.

Aggregation of heterogeneous households into one representative household is a popular approach in computable general equilibrium models. However, there is no standard way to construct the representative household. We extend the approach of calibrating the aggregate utility and labor productivity to the benchmark data by accounting for time-variations in the demographic heterogeneity. The new approach is applied to the Population-Energy-Economics (PET) model, which explicitly accounts for various types of the household heterogeneity.

O'Neill, B.C., X. Ren, L. Jiang, M. **Dalton**. 2011. "The Effect of Urbanization of Energy Use in India and China in the IPETS Model." Under review at *Energy Economics*.

Urbanization is one of the major demographic and economic trends occurring in developing countries, with important consequences for development, energy use, and well being. Yet it is only beginning to be explicitly incorporated in long-term scenario analyses of energy and emissions. We assess the implications of a plausible range of urbanization pathways for energy use and carbon emissions in India and China, using the iPETS model, a computable general equilibrium model of the global economy that captures heterogeneity in household types within world regions and into which we have introduced income effects on household consumption preferences. We find that changes in urbanization have a somewhat less than proportional effect on aggregate emissions and energy use. A decomposition analysis demonstrates that this effect is due primarily to an economic growth effect driven by the increased labor supply associated with faster urbanization. The influence of income on household consumption is strong, and indicates a potentially rapid transition away from traditional fuel use and toward modern fuels such as electricity and natural gas. Results also indicate important directions for future work, including the implications of alternative types of urbanization over time, a better understanding of possible changes in consumption preferences associated with income growth and the urbanization process, and modeling strategies that can produce disaggregated household consumption outcomes within a CGE framework.

O'Neill., B.C., M. **Dalton**, R. Fuchs, L. Jiang, B. Liddle, S. Pacauri, K. Smith, K. Zigova. 2011. "Demographic Change and Greenhouse Gas Emissions." Under review at *Lancet*.

Relationships between demographic change and carbon dioxide (CO2) emissions have been studied from different perspectives, but most projections of future emissions have a limited treatment of demographic influences, usually restricted to population size. We review two types of evidence for how emissions of CO2 and other gases from the energy sector are affected by demographic factors such as population growth or decline, aging, urbanization, and changes in living arrangements. First, empirical analyses of historical trends tend to show that CO2 emissions from energy use respond approximately proportionately to changes in population size, although with variations across countries. They also show statistically significant influences of changes in population composition such as age structure or urban/rural residence. Second, modeling of future emissions scenarios is rarely focused specifically on the sensitivity to population, and therefore conclusions about demographic effects on emissions of various gases based on them have been difficult to draw. However, we review recent scenario analyses explicitly focused on demographic effects that find that alternative population growth paths can have significant effects on global emissions of CO2 over the next 50-100 years, and that compositional changes in the population can also have important effects in particular world regions. Analyses with improved treatment of demographics are relevant to policy in two ways: population-related policies such as increased access to family planning services that tend to lead to slower population growth would likely have an environmental co-benefit. In addition, analyses that account for compositional change in populations offer the possibility of simultaneously assessing the implications of alternative development pathways for aggregate greenhouse gas emissions as well as for the well being of sub-groups of the population.

Pfeiffer, L. and A.C. Haynie. 2011. "The Effect of Decreasing Seasonal Sea Ice Cover on the Bering Sea Pollock Fishery." Under review at the *ICES Journal of Marine Science.*

The winter fishing season of the Bering Sea pollock fishery occurs during the period of maximum seasonal sea ice extent, but harvesters avoid fishing in ice-covered waters. Global climate models predict a 40% reduction in winter ice cover by 2050. This may have implications for the costs that vessels incur when traveling to and around their fishing grounds, or may open entirely new areas to fishing. Using retrospective data from 1999-2009, a time period of extensive annual climate variation, we analyzed variation in the distribution of the fishery. We compared the distribution of fishing in warm and cold years to estimate the degree to which fishing is displaced by ice cover. We used projections of average ice cover and bottom temperatures from Intergovernmental Panel on Climate Change model scenarios to characterize how the frequency of cold and warm years in the Bering Sea is projected to change through 2050 (IPCC, 2007). We simulated the predicted changes in ice conditions and compared the projected distribution of fishing to the observed distribution of fishing. The predicted redistribution of effort is small, largely because the winter fishery is driven by the pursuit of roe-bearing fish whose spawning location is stable. Some areas show a significant change in effort, however.

Pienaar, Elizabeth, **D.K. Lew**, and Kristy Wallmo. "An Examination of Context Dependence of General Environmental Attitudes." 2011. Under review at *Environment and Behavior*.

General environmental attitudes are often measured with questions added to surveys about specific environmental or non-environmental issues and not solely general attitudes about the environment. Using results from a large-scale national survey on the protection of threatened and endangered marine species, we examine whether the context of the survey in which New Ecological Paradigm (NEP) Scale questions are asked influence the measured environmental attitudes. Specifically, in this application the role that specific threatened or endangered species play in affecting responses to NEP Scale questions is explored using a combination of non-parametric and parametric approaches. The results in this case suggest that context does influence stated general environmental attitudes, though the effects of context differ across questions.

Punt, A.E., M.S.M Siddeek, **B. Garber-Yonts, M. Dalton**, L. Rugolo, D. Stram, B. Turnock, J. Zheng. 2011. Evaluating the impact of buffers to account for scientific uncertainty when setting TACs: Application to red king crab in Bristol Bay, Alaska. Under review at *ICES Journal of Marine Science*.

An approach based on simulation is outlined which can be used evaluate to the trade-offs among performance metrics for fisheries management of different 'buffers'; i.e. the differences between the limit catch level given perfect information and the set catch limit, when only a fraction of the uncertainty related to estimating the limit catch level is quantified through stock assessments. Specifically, the performance of different buffers is evaluated in terms of their impact on short- and long-term catches, discounted revenue, the probability of overfishing (i.e. the catch exceeding the true, but unknown, limit catch), and the stock becoming overfished (i.e. in the case of crab, mature male biomass, MMB, dropping below half of the MMB corresponding to MSY). The approach is applied to the fishery for red king crab, *Paralithodes camtschaticus*, in Bristol Bay, Alaska. The application, which formed the basis for actual management decision making for this stock, accounts for the complexities induced by joint State-federal management of the fishery and also for catches in fisheries other than the directed male-only pot fishery.

Schnier, K. W. Horrace, and **R. Felthoven**. 2011. "The Value of Statistical Life: Pursuing the Deadliest Catch." Under review at *The Review of Economics and Statistics.*

Few investigations have estimated the value of statistical life (VSL) within high-risk natural resource extraction industries. Furthermore, researchers have been unable to determine whether one's VSL is stable across multiple decision environments using revealed preference methods. This research directly investigates these topics using data from the Alaskan red king crab and snow crab fisheries. Using weather conditions and policy variables as instruments, our estimates of the VSL range from $4.00M to $4.76M. Furthermore, our intra-vessel comparisons of the VSL indicate that for roughly 92% of the fishermen observed in the data set their VSL estimates are stable across both fisheries.

Schnier, K. and **R. Felthoven**. 2011. Production Efficiency and Exit in Rights-based Fisheries. Revised and resubmitted to *Land Economics*.

Economic theory predicts that the least efficient vessels are more likely to exit a fishery following the transition from an open-access fishery to an individual transferable quota (ITQ) management regime. Tools are needed to help analysts predict the likely degree and distribution of consolidation prior to implementing ITQ programs. Previous research analyzing efficiency in ITQ fisheries has either relied upon data before and after the program was implemented and/or used a two-step procedure to model vessel efficiency, wherein the decision to be active following the transition is assumed to be independent from one's prior production practices. This research utilizes a one-stage estimation procedure to determine the degree to which one's technical inefficiency preceding an ITQ regime influences the likelihood of them exiting after the transition. Using pre-ITQ data on fishermen participating in the North Pacific crab fisheries, our results indicate that a vessel's measure of technical inefficiency is a significant and positive factor in explaining whether it remains in the fishery following the implementation of ITQs.

Seung, C. and E. Waters**.** 2011**. "**Calculating Impacts of Exogenous Output Changes: An Application of a Social Accounting Matrix (SAM) Model to Alaska Fisheries." Under Revision at *The Annals of Regional Science.*

Previous studies calculated the forward linkage effects of exogenous change in productive capacity using supply-driven input-output (SDIO) or supply-driven social accounting matrix (SDSAM) models. These models used the Ghosh (1958) approach to calculate the forward linkage effects. However, the approach has been criticized due to its problematic theoretical interpretation. This study uses an Alaska social accounting matrix (SAM) model to estimate the regional economic impacts of restricting catch of Aleutian Islands Pacific cod and Atka mackerel to protect Steller sea lions. This study overcomes the problem in calculating the forward linkage effects in the previous studies by running the SAM model with (i) changes in output treated as final demand shocks; and (ii) regional purchase coefficients (RPCs) for all the directly impacted industries (fish harvesting and processing industries) set equal to zero. The impacts of the shift in harvest opportunities in response to the Steller sea lion protection measures are displayed in terms of change in output, employment, value added, household income, and state and local government revenue.

Wallmo, K. and **D. Lew**. 2011. "The Value of Recovering Threatened and Endangered Marine Species: A Multi-Species Choice Experiment." Under review at *Conservation Biology*.

Nonmarket valuation research has produced economic value estimates for a variety of threatened, endangered, and rare species around the world. While over forty value estimates exist, it is often difficult to compare values from different studies due to variations in study design, implementation, and modeling specifications. In this paper we employ a Stated Preference Choice Experiment (SPCE) approach to estimate the value of recovering or downlisting eight different threatened and endangered marine species in the U.S. Our SPCE approach allows us to statistically compare species economic values and to determine whether the U.S. public maintains a preference ordering among the eight species. In a climate of limited resources, our results should be of interest to decision-makers charged with developing species recovery strategies and other actions focused on downlisting or delisting species. Additionally, as the U.S. focus on ocean policy increasingly shifts toward ecosystem-based management, economic values such as the ones we present can aid managers who are called on to consider the full suite of impacts on resources, biological diversity, and ecosystems when designing actions or policies that impact the ocean.

Completed in 2011 but not yet submitted for publication:

Dalton, M. 2011. "Metapopulation Maximum Economic Yield."

Metapopulation maximum economic yield (MMEY) includes search costs for fishing a spatially separated stock. For slowly growing stocks, MMEY is more conservative than maximum sustainable yield (MSY), but conventional MEY is not for some discount rates less than 5%. Numerically, MMEY is stable for intrinsic growth rates that are an order of magnitude smaller than those computable with conventional MEY. Conservation under MMEY increases for smaller growth rates, but conventional MEY is less conservative, which underestimates conservation benefits for slowly growing metapopulations.

Fissel B. 2011. "A Metapopulation Model with Regime Change"

Spatial heterogeneity is a characteristic of most physical processes such as winds, currents and temperature. Furthermore, many of these physical processes are cyclic in nature. This paper introduces an economic resource model that accounts for both these empirical facts. The optimal economic resource exploitation policy is derived, explicitly showing the impact of spatial connectedness. Through simulation alternative management policies are considered that ignore the spatial connectedness and the corresponding impacts on economic variables and resources stock are analyzed through simulation. In general, policies that ignore the connectedness and treat areas as distinct have small adverse economic impacts and larger adverse stock effects. Policies that ignore connectedness and heterogeneity by treating distinct spatial areas as one homogenous unit have a larger adverse economic impact and a smaller adverse stock effect. Results are amplified when the asynchronous variation between areas becomes less correlated and when dispersal is high.

Haynie, A.C. and L. Pfeiffer. 2011. "The Role of Economics in the Bering Sea Pollock Fishery's Adaptation to Climate Change."

One component of the Bering Sea Integrated Ecosystem Research Project (BSIERP) is a spatial economic model that predicts changes in fishing activity in the Bering Sea pollock fishery that may result from climate change. Seasonal sea ice in the Bering Sea is predicted to decrease by 40% by 2050, resulting in more frequent warm years characterized by reduced winter ice cover and a smaller cold pool (<1.5ºC bottom temperature). Retrospective data from the pollock catcher/processer fishery were used to study the behavior of harvesters in past climate regimes to make inferences about future behavior in a warmer climate. We found that in the pollock fishery, large differences in the value of catch resulting from the pursuit of roe-bearing fish in the winter fishing season result in disparate behavior between the winter and summer fishing season. In the winter season, warm years and high abundances drive more intensive effort early in the season to harvest earlier-maturing roe. In the summer season, a smaller cold pool and high abundances are correlated with decreased effort in the northern reaches of the fishing grounds. Spatial price differences are associated with changes in the distribution of effort of approximately the same magnitude. Although biological evidence suggests that the predicted increased frequency of warmer regimes may result in decreasing abundances, the historical data is insufficient to predict behavior in warm, low abundance regimes. This paper provides insight into the economic drivers of the fishery, many of which are related to climate, and illustrates the difficulty in making predictions about the effects of climate change on fisheries with limited historical data.

Kasperski, S. 2011. "Optimal Multispecies Harvesting in Biologically and Technologically Interdependent Fisheries."

Single species management of multispecies fisheries ignores biological interactions in addition to important technological interactions resulting from the multiproduct nature of firms' production often to the detriment of the health of the ecosystem, the stocks of fish species, and fishery profits. This dissertation solves a dynamic optimization problem of maximizing the net present value from a three species fishery and uses numerical optimization techniques to determine the optimal harvest quota of each species given the biological and technological interactions. The model is then extended to the case of a nuisance species, a species that lowers the value of the fishery by negatively affecting the growth of other species in the ecosystem, and has little harvest value of its own. As approaches for ecosystem-based fisheries management are developed, results demonstrate the importance of focusing not only on the economically valuable species interact, but also on some non-harvested species, as they can affect the productivity and availability of higher value species. This study uses the arrowtooth flounder, Pacific cod, and walleye pollock fisheries in the Bering Sea/Aleutian Islands region of Alaska as a case study and finds the net present value of the fishery is decreased from $20.7 billion to $8.5 billion dollars by ignoring arrowtooth’s role as a nuisance species on the growth of Pacific cod and walleye pollock. The optimal subsidy on the harvest of arrowtooth summed over all years is $35 million dollars, which increases the net present value by $273 million dollars, after accounting for the subsidy.

Kasperski, S. 2011. "The Impact of Trade on Biodiversity."

Economic activity has been cited as a leading threat to global biodiversity. International trade serves as a platform for the introduction of alien species and foreign diseases, which have the potential to outcompete and infect native species. This study uses a panel dataset to show that countries which trade more intensively have a statistically significantly lower number of endemic bird species (species whose natural range is contained within a single country). Countries with higher trade intensities also have statistically significantly more non-endemic mammal and plant, but not bird, species. If trade induced increases in non-endemic species cause the number of threatened species to increase, this could be viewed as a global bad. This study finds that trade intensity has a positive and statistically significant impact on the number of threatened bird species in a country. These effects are consistent with trade providing a platform for species introductions. These introduced non-endemic mammal and plant species result in a reduction in endemic bird species and an increase in the number of threatened bird species within a country. As many birds are “flagship taxa”, indicating a high level of biodiversity, this could be an indication of future declines in other taxa. These results suggest that countries devote additional resources to more effective prevention and removal of non-native species introduced via international trade.

Kasperski, S. 2011. "Optimal Multispecies Harvesting in the Presence of a Nuisance Species."

The need for ecosystem based fisheries management is well recognized, but substantial obstacles remain toward implementing these approaches given our current understanding of the biological complexities of the ecosystem along with the economic complexities surrounding resource use. This study develops a multispecies bioeconomic model that incorporates biological and technological interactions to determine the optimal catch and stock size for each species in the presence of a nuisance species. The nuisance species lowers the value of the fishery by negatively affecting the growth of the other species in the ecosystem, and has little harvest value of its own. The populations of arrowtooth flounder (nuisance species), Pacific cod, and walleye pollock in the Bering Sea/Aleutian Islands region of Alaska are used as a case study. This study empirically estimates multispecies surplus production growth functions for each species and uses these parameters to explore the impact of a nuisance species on the management of this ecosystem. Using dual estimation methods, multiproduct cost functions are estimated for each gear type in addition to a count data model to predict the optimal number of trips each vessel takes. These functions are used, along with the estimated stock dynamics equations to determine the optimal multispecies quotas and subsidy on the harvest of the nuisance species to maximize the value of this three species fishery.

Poole, A., **J. Sepez, A. Himes-Cornell**, and E. Connors. 2011. “Population Dynamics in a Changing Ecosystem: Demographic Trends in Bering Sea and Aleutian Island Fishing Communities.” To be submitted to *Population and Environment.*

In recent years, declines in population in rural Alaskan villages have raised concerns about community viability. What factors contribute to population movements and trends in Alaskan fishing communities? We argue that clustering Alaskan communities of the Bering Sea and Aleutian Island (BSAI) regions in terms of their participation in commercial fisheries provides an important way to meaningfully explore shifting demographic profiles in Alaskan fishing towns and villages – by accounting for the importance of environmental factors in shaping human population dynamics at community and household levels. Combining demographic, environmental, and economic variables provides a platform for creating an integrated model of community change and viability that can be incorporated into the social impact analyses for fishery managers. Ultimately, this model may be used to create predictions about the impacts of ecosystem change on the distribution and demographic profile of human populations in the large marine ecosystem.

Sanchirico, J., **D. Lew, A. Haynie,** D. Kling, and D. Layton. 2011. “Conservation Values in Marine Ecosystem-Based Management.”

Proactive ecosystem-based management represents a turning point in ocean management, because it formally recognizes the need to balance the potentially competing uses of the ocean, including aquaculture, energy production, conservation, fishing, and recreation. A significant challenge in implementing this balancing act arises from explicitly incorporating conservation in a decision-making framework that embraces assessments of trade-offs between benefits from conservation and conventional commercial uses. We foreshadow these challenges using empirical estimates of the benefits and costs of conservation actions for the endangered western stock of the Steller Sea Lion (wSSL) in Alaska. We show that the public's conservation values for wSSL can be much greater than the economic gains from commercial fisheries (e.g., up to ~8 times for one large fishery). The discrepancy highlights the forthcoming politically-contentious decisions on the allocation of ocean resources and our analysis highlights the critical research gaps needed to better inform these decisions. Our findings provide a starting point for a much needed and long overdue conversation on how to incorporate conservation into ecosystem based management, and more specifically, coastal and marine spatial planning (CMSP). Without explicit consideration of these issues, it is unclear whether CMSP will better conserve ocean resources than the status quo.

2010

Abbott, J., **B. Garber-Yonts**, and J. Wilen. 2010. "Employment and Remuneration Effects of IFQs in the Bering Sea/Aleutian Islands Crab Fisheries." *Marine Resource Economics* 25(4): 333-354.

This paper utilizes an unprecedented, quantitative census of vessels before and after the implementation of catch shares in the Bering Sea/Aleutian Island crab fisheries to examine the effects of catch shares on the employment and remuneration of crew in the catcher vessel sector. We find that the number of individuals employed in the fishery declined proportionately to the exit of vessels from the fishery following program implementation. Nevertheless, total crew-hours dedicated to fishing activities remained roughly constant while employment in redundant pre- and post-season activities declined due to the consolidation of harvest quota on fewer vessels. We find little evidence of substantial changes in the share contracts used to compensate fishermen. Finally, we explore a wide array of remuneration measures for crew and conclude that both seasonal and daily employment *increased* substantially for many crew in the post-rationalization fishery relative to previously while remuneration per unit of landings has declined as a result of a combination of increased crew productivity and the necessity of paying for fishing quota in the new system. By relying on quantitative, population-level data, our findings provide a strong empirical counterexample to prior studies that have questioned the fairness of employment and remuneration outcomes for crew in rationalized fisheries.

Carothers, C, **D.K. Lew, and J. Sepez**. 2010. "Fishing Rights and Small Communities: Community Size and Transfer Patterns in the North Pacific Halibut Quota Share Market." *Ocean and Coastal Management* 53: 518-523.

In the Alaska halibut quota fishery, small remote fishing communities (SRFCs) have disproportionately lost fishing rights. Our analysis of quota market participation from 1995 to 1999 confirms that SRFC residents are more likely to sell than buy quota. Alaska Native heritage is another important predictor of quota market behavior. Residents of Alaska Native villages have an increased likelihood of selling quota. Loss of fisheries participation in small indigenous communities can be an unintended consequence of quota systems. Mitigation measures should take into account the social factors that can lead to such a redistribution of fishing rights in privatized access fisheries.

A substantial theoretical and experimental literature has focused on the conditions under which cooperative behavior among actors providing public goods or extracting common-pool resources arises. The literature identifies the importance of coercion, small groups of actors, or the existence of social norms as conducive to cooperation. This research empirically investigates cooperative behavior in a natural resource extraction industry in which the provision of a public good (bycatch avoidance) in the Alaskan flatfish fishery is essential to the duration of the fishing season, and an information provision mechanism exists to relay information to all individuals. Using a model of spatial fishing behavior our results show that conditionally cooperative behavior is prevalent but deteriorates as bycatch constraints tighten.

Haynie, A. and D. Layton. 2010. "An Expected Profit Model for Monetizing Fishing Location Choices." *Journal of Environmental Economics and Management* 59(2): 165-176.

We develop and analyze the properties of a new type of discrete choice model which jointly estimates the expected value of catch and location choice. This model implicitly monetizes location choices and can be used to predict costs and effort redistribution of creating marine protected areas or of implementing other policy changes that either increase travel costs or alter expected revenue. We illustrate our approach by considering the closing of the Steller sea lion conservation area in the United States Bering Sea to pollock fishing.

Ianelli, J.N., A. Hollowed, **A. Haynie**, F. Mueter, and N. Bond. 2010. "Evaluating Management Strategies For Eastern Bering Sea Walleye Pollock (*Theragra Chalcogramma*) in a Changing Environment." *ICES Journal of Marine Science* 68 (6): 1297-1304. DOI:10.1093/icesjms/fsr010.

The impacts of climate change on fish and fisheries is expected to increase the demand for more accurate stock projections and harvest strategies that are robust to shifting production regimes. To address these concerns, we evaluate the performance of fishery management control rules for eastern Bering Sea walleye pollock stock under climate change. We compared the status quo policy with six alternative management strategies under two types of recruitment pattern simulations: one that follows temperature-induced trends and the other that follows a stationary recruitment pattern similar to historical observations. A subset of 82 Intergovernmental Panel on Climate Change climate models provided temperature inputs from which an additional 100 stochastic simulated recruitments were generated to obtain the same overall recruitment variability as observed for the stationary recruitment simulations. Results indicate that status quo management with static reference points and current ecosystem considerations will result in much lower average catches and an increased likelihood of fishery closures, should reduced recruitment because of warming conditions hold. Alternative reference point calculations and control rules have similar performance under stationary recruitment relative to status quo, but may offer significant gains under the changing environmental conditions.

Kasperski, S. and R. Weiland. 2010. "When Is It Optimal To Delay Harvesting? The Role of Ecological Services In The Northern Chesapeake Bay Oyster Fishery." *Marine Resource Economics 24(4): 361-385.*

Despite decades of rebuilding efforts, the population of oysters in the Chesapeake Bay has fallen to historically low levels. We develop a novel bioeconomic model which includes the value of ecological services provided by oysters *in situ* to determine the optimal length of a harvest moratorium and a subsequent harvest rate that will maximize the net present value of the oyster resource. Not surprisingly, steady state stocks and optimal harvest rates are increasing and decreasing in ecological service values, respectively. The results also suggest that instituting a harvest moratorium and limiting harvest effort in the fishery can increase the net present value of the resource more than effort limitation alone.

Lew, D., **Jean Lee**, and D. Larson. 2010. “Saltwater Sport Fishing In Alaska: A Summary and Description of the Alaska Saltwater Sport Fishing Economic Survey, 2007.” U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-214, 229 pages.

In early 2007, a survey of Alaska saltwater anglers was implemented to collect information on saltwater fishing participation, effort, and preferences of resident and non-resident anglers, focusing on their activities in the 2006 fishing season. The survey was administered to three distinct groups of anglers for which separate survey instruments were developed: non-residents, residents of Southeast Alaska, and all other Alaska residents. This report describes the development, content, and structure of the three survey versions, their implementation, and a summary of the data. The summary highlights several differences between the different angler groups and their saltwater fishing behavior, in particular with respect to where they fish, what species are harvested (caught and retained), trip expenditures, and modes of fishing.

Lew, D., D. Layton and R. Rowe**.** 2010. “Valuing Enhancements to Endangered Species Protection Under Alternative Baseline Futures: The Case Of The Steller Sea Lion.” *Marine Resource Economics,* 25(2): 133-154*.*

This article presents results from a stated preference survey of U.S. households intended to value the public’s preferences for enhancements to the protection of western stock of Steller sea lions, which is listed as endangered under the Endangered Species Act. To account for the uncertainty of future populations under current programs without additional protection efforts, three different survey versions were implemented that each present different, yet plausible, baseline futures for Steller sea lions. Stated preference choice experiment data from each survey are analyzed using repeated, rank ordered random parameters logit models, and welfare estimates are calculated and compared for each baseline. Results suggest willingness to pay is sensitive to projected future baselines and that public values for protecting Steller sea lions are positive and large, but level out for larger, non-incremental improvements.

Lew, D. and C. Seung. 2010. “The Economic Impact of Saltwater Sportfishing Harvest Restrictions in Alaska: An Empirical Analysis of Non-Resident Anglers.” *North American Journal of Fishery Management* 30: 538-551

Saltwater sportfishing is a popular tourist activity for visitors to Alaska. In this paper, a stated preference model of saltwater sportfishing participation is used to generate estimates of changes in participation resulting from changes in harvest limits for three primary recreational target species in Alaska saltwater fisheries: Pacific halibut, king (chinook) salmon, and silver (coho) salmon. These estimates are then used in a state-level computable general equilibrium (CGE) model to generate estimates of the economic impacts of harvest policies. We find that the impacts from the CGE model of changes in the number of non-resident anglers’ expenditures are smaller than those from a social accounting matrix model, and that much of the impacts from an increase in the expenditures leak out of the state due to the state’s heavy dependence on imports of goods and services from the rest of the United States. Moreover, changes to harvest limits appear to have a small effect on the Alaskan economy, at least in comparison to the overall size of the state economy.

Morrison Paul, C., **R. Felthoven** and M. Torres. 2010. "Economic Performance in Fisheries: Modeling, Measurement and Management." *Australian Journal of Agricultural and Resource Economics* 54(3): 343-360.

We overview the roles of production structure models in measuring fisheries' productive performance to provide policy-relevant guidance for fishery managers and analysts. In particular, we summarize the literature on the representation and estimation of production structure models to construct productive performance measures for fisheries, with a focus on parametric empirical applications. We also identify the management implications of these kinds of measures and some promising directions for future research.

O'Neill, B.C., **M. Dalton**, L. Jiang, S. Pachauri, R. Fuchs, and K. Zigova. 2010. "Influence of Demographic Change on Future Carbon Emissions from Energy Use." *Proceedings of the National Academy of Sciences* 107(41): 17521-17526.

Substantial changes in population size, age structure, and urbanization are expected in many parts of the world this century. Although such changes can affect energy use and greenhouse gas emissions, emissions scenario analyses have either left them out or treated them in a fragmentary or overly simplified manner. We carry out the first comprehensive assessment of the implications of demographic change for global emissions of carbon dioxide. Using a new energy-economic growth model that accounts for a range of demographic dynamics, we show that slowing population growth could provide 16-29% of the emissions reductions suggested to be necessary by 2050 to avoid dangerous climate change. We also find that aging and urbanization can substantially influence emissions in particular world regions.

Seung, C. 2010. "Estimating Regional Economic Information Using Unequal Probability Sampling for Alaska Fisheries." *Fisheries Research* 105 (2): 134-140.

This study provides detailed descriptions of procedures for conducting unequal probability sampling (UPS) and deriving the population parameters for important economic variables that are critical in regional economic analysis of fisheries. This study uses a Pareto sampling method and describes how the Horvitz-Thompson (HT) estimator is adjusted for non-response and how this adjustment is applied to the certainty units and non-certainty units separately. As an example, this study applies the UPS method without replacement to fisheries in the Southwest region of Alaska, to estimate the total employment and total labor income for each of three disaggregated harvesting sectors. This study shows that the suggested method is a useful approach that can be used to estimate similar regional economic information through surveys of fish harvesting and processing sectors.

Seung, C. and S. Ahn. 2010. "Forecasting Industry Employment for a Resource-based Economy Using Bayesian Vector Autoregressive Models." *The Review of Regional Studies 40 (2): 181-196.*

Bayesian vector autoregressive (BVAR) models are developed to forecast industry employment for a resource-based economy. Two different types of input-output (IO) information are used as priors – (i) reduced-form IO relationship and (ii) an economic-base version of the IO information.

Out-of-sample forecasts from these two IO-based BVAR models are compared with forecasts from an autoregressive model, an unconstrained VAR model, and a BVAR model with a Minnesota prior. Results indicate most importantly that overall the model version with economic base information performs the best in the long run.

Seung, C. and E. Waters. 2010. "Evaluating Supply-Side and Demand-Side Shocks for Fisheries: a Computable General Equilibrium (CGE) Model for Alaska." *Economic Systems Research 22(1): 87-109.*

This study used computable general equilibrium (CGE) models to investigate economic effects of three exogenous shocks to Alaska fisheries: (1) reduction in pollock allowable catch (TAC), (2) increase in fuel price, and (3) reduction in demand for seafood. Two different model versions, “Keynesian” and “neoclassical”, were used to estimate impacts on endogenous output, employment, value added, and household income. We also estimated change in household welfare, thereby overcoming a limitation of traditional fixed-price models. There are currently few examples of CGE studies addressing fisheries issues appearing in the literature. This study is unique in that it uses a relatively disaggregated sector scheme and examines both supply-side and demand-side shocks.

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Waters, E. and **C. Seung**. 2010. “Impacts of Recent Shocks to Alaska Fisheries: A Computable General Equilibrium (CGE) Model Analysis.” *Marine Resource Economics 25 (2): 155-183.*

We use a computable general equilibrium (CGE) model to investigate impacts of three exogenous shocks to Alaska fisheries: (1) a 31% reduction in walleye pollock allowable catch; (2) a 125% increase in fuel price; and (3) both shocks simultaneously. The latter scenario reflects actual industry trends between 2004 and 2008. Impacts on endogenous output, employment, factor income and household income are assessed. We also estimate changes in a measure of household welfare, and compare model results against actual change in pollock and seafood prices. Few examples of CGE studies addressing fisheries issues appear in the literature. This study is unique in that it includes more disaggregated industry sectors and examines supply-side shocks that are difficult to address using fixed-price models. This study also overcomes a serious deficiency in models that use unadjusted seafood sector data in IMPLAN (IMpact analysis for PLANning) by developing the fish harvesting and processing sectors independently from available data, supplemented by interviews with key informants to ground-truth industry cost estimates.

2009

Felthoven, R., K. Schnier and W. Horrace. 2009. "Estimating Heterogeneous Primal Capacity and Capacity Utilization Measures in a Multi-Species Fishery." *Journal of Productivity Analysis* 32: 173-189.

We use a stochastic production frontier model to investigate the presence of heterogeneous production and its impact on fleet capacity and capacity utilization in a multi-species fishery. We propose a new fleet capacity estimate that incorporates complete information on the stochastic differences between vessel-specific technical efficiency distributions. Results indicate that ignoring heterogeneity in production technologies within a multispecies fishery as well as the complete distribution of a vessel's technical efficiency score, may lead to erroneous fleet-wide production profiles and estimates of capacity. Our new estimate of capacity enables out-of-sample production predictions which may be useful to policy makers.

Felthoven, R., C. Morrison Paul, and M. Torres. 2009. "Measuring Productivity Change and its Components for Fisheries: The Case of the Alaskan Pollock Fishery, 1994-2002." *Natural Resource Modeling* 22(1): 105-136.

Traditional productivity measures have been much less prevalent in fisheries economics than other measures of economic and biological performance. It has been increasingly recognized, however, that modeling and measuring fisheries' production relationships is central to understanding and ultimately correcting the repercussions of externalities and poorly designed regulations. We use a transformation function production model to estimate productivity and its components for catcher processors in the Bering Sea and Aleutian Islands pollock fishery, before and after the introduction of cooperative system that grants exclusive harvesting privileges and allows quota exchange. We also recognize the roles of externalities from pollock harvesting by incorporating data on climate, bycatch, and fish biomass. We find that productivity has been increasing over time, that many productive contributions and interactions of climate, bycatch, and fishing strategies are statistically significant, and that regulatory changes have had both direct and indirect impacts on catch patterns and productivity.

Haynie, A., R. Hicks and K. Schnier. 2009. "Common Property, Information, and Cooperation: Commercial Fishing in the Bering Sea." *Ecological Economics* 69(2): 406-413.

A substantial theoretical and experimental literature has focused on the conditions under which cooperative behavior among actors providing public goods or extracting common-pool resources arises. The literature identifies the importance of coercion, small groups of actors, or the existence of social norms as conducive to cooperation. This research empirically investigates cooperative behavior in a natural resource extraction industry in which the provision of a public good (bycatch avoidance) in the Alaskan flatfish fishery is essential to the duration of the fishing season, and an information provision mechanism exists to relay information to all individuals. Using a model of spatial fishing behavior our results show that conditionally cooperative behavior is prevalent but deteriorates as bycatch constraints tighten.

Layton, D. and **A. Haynie**. 2009. "Specifying, Simulating, and Estimating Multivariate Extreme Value (GEV) Discrete Choice Models in Fisheries." Conference Proceedings for the 3rd World Conference of Spatial Econometrics, July 8-10, Barcelona, Spain.

In this paper, we explore estimable Generalized Extreme Value (GEV) spatial discrete choice models. In the statistics literature, GEV models are termed multivariate extreme value (MEV). Interestingly, most of the discrete choice literature aside from GEV models develops choice probabilities by focusing on the underlying error structure and then integrating to arrive at the choice probabilities. However, it seems fair to characterize the GEV literature as proceeding largely from the position of establishing how functions of random variables are consistent with the GEV requirements and then derives choice probabilities using a basic probability-generating relationship. We believe that understanding random component based interpretations of GEV models yields productive insights into the structure of the models just as it has in other discrete choice contexts such as with the mixed logit and the multinomial probit model. To accomplish this, we first provide the standard treatment of GEV models, then discuss a cross-nested version of these models and relate them to earlier statistical work. This method of conceptualizing the GEV discrete choice problem opens up avenues of incorporating spatial correlation that are better adapted to modeling spatial choice in economic activities such as fishing location choice. We explore various random effects structures that provide for correlation in zonal discrete choice models. These include pair-wise correlation models that are part of the cross-nested family, and new models that interact inter-zonal distances with the positive alpha-stable scale components, thus inducing correlated zonal utilities (profits) in an economical manner. In coming work, the model will be applied to the Bering Sea pollock fishery.

Morrison Paul, C.J., M. Torres, and **R. Felthoven**. 2009. "Fishing Revenue, Productivity, and Product Choice in the Alaskan Pollock Fishery." *Environmental and Resource Economics* 44: 457-474.

A key element in evaluating fishery management strategies is examining their effects on the economic performance of fishery participants, yet nearly all empirical studies of fisheries focus exclusively on the amount of fish harvested. The economic benefits derived from fish stocks involve the amount of revenue generated from fish processing, which is linked to both the way fish are harvested and the products produced from the fish. In this study we econometrically estimate a flexible revenue function for catcher-processor vessels operating in the Alaskan pollock fishery, recognizing potential endogeneity and a variety of fishing inputs and conditions. We find significant own-price supply responses and product substitutability, and enhanced revenues from increased fishing days and tow duration after a regulatory change introduced property rights through a new fishing cooperative. We also find significant growth in economic productivity, or higher revenues over time after controlling for observed productive factors and price changes, which exceeds that attributable to increased harvest. These patterns suggest that the move to rights-based management has contributed significantly to economic performance in the pollock fishery.

Sepez, J. 2009. "North Pacific Region." Pp. 7-12 in *Fishing Communities of the United States 2006.* Dept. Commerce, NOAA Tech. Memo. NMFS-F/SPO-98, 84 p. Available at: http://www.st.nmfs.noaa.gov/st5/publication/index.html

Fishing Communities of the U.S., 2006 is the first volume in the new periodic series. It reports descriptive demographic data on a subset of each coastal state's commercial fishing communities and ports, as well as descriptive geographic information and other social indicator data for each state. It is a companion to *Fisheries Economics of the U.S., 2006.* The purpose of the publication is to provide the public with easily accessible information about he Nation's fishing communities and the states where they are located. Up to ten communities and ports per state were selected by experts in each region primarily on the basis of commercial landings data for 2006. These communities are not necessarily “fishing communities” as defined by the Magnuson-Stevens Fishery Conservation and Management Act.

Seung, C and E. Waters. 2009. “Measuring the Economic Linkage of Alaska Fisheries: A Supply-Driven Social Accounting Matrix (SDSAM) Approach.” *Fisheries Research* 97: 17-23.

A supply-driven social accounting matrix (SDSAM) model is developed to examine backward and forward linkage effects of Alaska fisheries. The model includes five harvesting sectors (Trawlers, Longliners, Crabbers, Salmon Netters, and Other Harvesters), two processing sectors (Motherships and Shorebased processors), and a Catcher-processor sector, which both harvests and processes. The study shows that total backward linkage effects of the Other Harvesters sector are strongest, followed by Trawlers and Salmon Netters, while the strongest total forward linkage effects are from Salmon Netters, followed by Other Harvesters and Crabbers. Results of a policy simulation where the effect of a 10% reduction in pollock catch was investigated show that total output will decrease by $37.1 million via backward linkages while total output in forward-linked sectors falls by $16.6 million. When the direct impacts on the harvesting sectors ($73.6 million) are included, total output decreases by $110.7 million via the combined direct shock and backward linkage effects. Income to Alaska households falls by $17.6 million due to effects on backward-linked industries, and by $0.5 million due to forward-linked effects.

Vaccaro, I., L. Zanotti, and **J. Sepez**. 2009. Commons and Markets: Opportunities for Development of Local Sustainability. *Environmental Politics* 18(4): 522-538.

Development studies have often evolved amidst a bilateral tension, if not contradiction, between 1) the tendency to declare all forms of communal management archaic and in need of modernization via privatization and market integration, and 2) the temptation to essentialise indigenous management with nostalgia while vilifying market impacts. A closer examination suggests that common property systems will not simply collapse under market pressure, nor create defensive bulwarks to maintain market-free enclaves, but can strategically engage with market systems and global trade. In a world experiencing all sorts of environmental conflicts, this potential for articulation offers a serious managerial opportunity for the design of sustainable environmental policies. This paper presents ethnographic examples that open the field to discussion of an often dismissed possibility: sometimes the connection of small-scale societies to market systems has created a productive opportunity that has allowed these communities to actually survive as such.

<u>2008:</u>

Dalton, M., B. C. O'Neill, A. Prskawetz, L. Jiang, J. Pitkin. 2008. “Population Aging and Future Carbon Emissions in the United States.” *Energy Economics* 30(2): 642-675.

Changes in the age composition of U.S. households over the next several decades could affect energy use and carbon dioxide (CO2) emissions, the most important greenhouse gas. This article incorporates population age structure into an energy-economic growth model with multiple dynasties of heterogeneous households. The model is used to estimate and compare effects of population aging and technical change on baseline paths of U.S. energy use and CO2 emissions. Results show that population aging reduces long-term emissions, by almost 40% in a low population scenario, and effects of aging on emissions can be as large, or larger than, effects of technical change in some cases. These results are derived under standard assumptions and functional forms that are used in economic growth models. The model also assumes the economy is closed, that substitution elasticities are fixed and identical across age groups, and that labor supply patterns vary by age group but are fixed over time.

Etnier, M. and **Sepez, J**. 2008. "Changing Patterns of Sea Mammal Exploitation among the Makah" Pp. 143-158 in Time and Change: Archaeology and Anthropological Perspectives on the Long-Term in Hunter-Gatherer Societies. Robert Layton, Herb Maschner and Dimitra Papagianni (eds.). Oxbow Press, Woodbridge, CT.

The Makah Indians from the outer coast of Washington are renowned for their strong maritime orientation, and have maintained high levels of continuity in resource use over 500 years. However, marine mammal use has declined considerably. Today, the Makah consume less than 30% of the same taxa as their ancestors at Ozette. Comparison between the Ozette archaeofaunas and the modern ecological communities on the coast of Washington indicate major changes in this ecosystem within the past 200-300 years. In the past, northern fur seals (*Callorhinus ursinus*) appear to have been the dominant pinniped species, with a breeding population perhaps as close as 200 km from Ozette. Among cetaceans, gray whales (*Eschrichtius robustus*) and humpback whales (*Megaptera novaeangliae*) were equally abundant. Today, the dominant pinniped species is California sea lion (*Zalophus californianus*), while cetaceans are dominated by a single species, the gray whale. Thus, most of the differences in Makah consumptive use of marine mammals can be explained by examination of the modern ecological environment. However, the article discusses some case in which political and cultural motivations provide better explanations.

Lew, Daniel K. and Douglas M. Larson. 2008. "Valuing a Beach Day with a Repeated Nested Logit Model of Participation, Site Choice, and Stochastic Time Value." *Marine Resource Economics* 23(3): 233-252.

Beach recreation values are often needed by policy-makers and resource managers to efficiently manage coastal resources, especially in popular coastal areas like Southern California. This article presents welfare values derived from random utility maximization-based recreation demand models that explain an individual's decisions about whether or not to visit a beach and which beach to visit. The models utilize labor market decisions to reveal each individual's opportunity cost of recreation time. The value of having access to the beach in San Diego County is estimated to be between $21 and $23 per day.

Polasky, Stephen, E. Nelson, J. Camm, B. Csuti, P. Fackler, E. Lonsdorf, C. Montgomery, D. White, J. Arthur, **B. Garber-Yonts**, R. Haight, J. Kagan, A. Starfield, C. Tobalske. 2008. "Where to Put Things? Spatial Land Management to Sustain Biodiversity and Economic Returns." *Biological Conservation* 141(6): 1505-1524.

Expanding human population and economic growth have lead to large-scale conversion of natural habitat to human-dominated landscapes with consequent large-scale declines in biodiversity. Conserving biodiversity, while at the same time meeting expanding human needs, is an issue of utmost importance. In this paper we develop a spatially explicit landscape-level model for analyzing the biological and economic consequences of alternative land-use patterns. The spatially-explicit biological model incorporates habitat preferences, area requirements and dispersal ability between habitat patches for terrestrial vertebrate species to predict the likely number of species that will be sustained on the landscape. The spatially explicit economic model incorporates site characteristics and location to predict economic returns in a variety of potential land uses. We use the model to search for efficient land-use patterns that maximize biodiversity conservation objectives for a given level of economic returns, and vice-versa. We apply the model to the Willamette Basin, Oregon, USA. By thinking carefully about the arrangement of activities, we find land-use patterns that sustain high biodiversity and economic returns. Compared to the current land-use pattern, we show that both biodiversity conservation and the value of economic activity could be increased substantially.

Sepez, J. 2008. "Historical Ecology of Makah Subsistence Foraging Patterns." *Journal of Ethnobiology* Volume 28(1): 110-133.

The paper combines archaeological data with data from early ethnography and contemporary harvest surveys to examine consistency and change in Makah Tribe subsistence hunting and fishing practices between 1500 and today. The data indicate a significant shift in contribution of different resource groups to the animal protein diet between 1500 and today, with harvest of marine mammals dropping tremendously (from 92% to less than 1%), and the contemporary diet consisting primarily of fish (50%), shellfish (11%), land mammals (15%), and store-bought meats (24%). However, a high diversity of species used by tribal members prior to Euroamerican colonization are still in use today, from halibut and salmon to harbor seals and sea urchins. Several species no longer used, such as wolves and fur seals, can be explained by ecological factors. Other resources no longer used, such as many small birds and small shellfish, represent a general contraction of the subsistence diet breadth following the introduction of commercial foods. As predicted by optimal foraging theory, the resources most likely to be eliminated from the diet are those that rank low in terms of post-encounter caloric return. Tribal members made use of nearly all available resources in ancient times; additions to the tribe's subsistence base in modern times were due primarily to the introduction of exotic species such as the Pacific oyster, and local population growth of other species, such as the California sea lion. Road building and habitat changes in the forests increased access to land-based resources, such as deer and elk. Land-based resources in general (terrestrial mammals and commercial meats) increased from less than 1% of consumed animal protein prior to 1500 to close to 40% today. However, with over 60% of animal protein still stemming from marine resources, Makah tribal members remain oriented, both nutritionally and culturally, toward the ocean environment.

Seung, C. 2008. "Estimating Dynamic Impacts of Seafood Industry in Alaska." *Marine Resource Economics* 23(1): 87-104.

To date, regional economic impact analyses for fisheries have neglected use of time-series models. This study, for the first time in the literature of regional economic impacts of fisheries, address this weakness by employing a vector autoregressive error correction model (VECM). Based on economic base concept, this study develops a VECM to investigate multivariate relationships between basic sectors (including seafood sector) and nonbasic sectors for each of two fishery-dependent regions in Alaska. While structural models such as input-output model and computable general equilibrium model facilitate more detailed intersectoral long-run relationships in a regional economy, the present study shows that the VECMs have the advantage of properly attributing the impact of shocks, estimating directly the long-run relationships, and of identifying the process of adjustment by nonbasic sectors to the long-run equilibrium. Results show, first, that a nonbasic sector may increase or decrease in response to a shock to a basic sector – a result that would be obscured in a linear economic impact model such as an input-output model, which always predicts positive impacts. Second, the impacts of seafood processing employment are relatively small in the two study regions, where a significant number of seafood processing workers are nonresidents and a large portion of intermediate inputs used in seafood processing are imported from the rest of the United States.

Wolf, P., R. Gimblett, L. Kennedy, R. Itami, and **B. Garber-Yonts**. 2008. "Monitoring and Simulating Recreation and Subsistence Use in Prince William Sound, Alaska." In Randy Gimblett and Hans Skov-Petersen (eds.), *Monitoring, Simulation and Management of Visitor Landscapes*. University of Arizona Press: Tuscon, AZ.

This chapter outlines methods and results of a study that employs survey and simulation data to reveal patterns in the spatial and temporal distribution of visitors across the Prince William Sound (PWS), Alaska. This study employs simulation to analyze the potential interactions between humans and wildlife and directly relates to the recovery of the Sound from the Exxon Valdez Oil Spill. Five species were analyzed (Bald Eagles, Black Oyster Catchers, Harbor Seals, Cutthroat Trout & Pigeon Guillemot) to determine the interaction of recreational activities on known nesting sites of these species. To evaluate potential impacts, the number of visits and nesting sites per acre, duration of visit and the type of travel mode coinciding within these areas by season were combined to evaluate the potential impact from recreational use that is occurring in the Sound.

2007:

Ingles, P. and **Sepez, J**. 2007. "Anthropology's Contributions to Fisheries Management." *National Association of Practicing Anthropologists Bulletin* 28: 1-12.

The collection of articles in this volume of NAPA Bulletin describes various types of social science research currently conducted in support of federal and state fisheries management by anthropologists and sociologists studying fishing-dependent communities and fisheries participants. The contributors work for NOAA, National Marine Fisheries Service (NMFS); various state fisheries agencies; in academia; or as contract researchers. These articles represent a wide geographical range, employ a diverse set of methods, and demonstrate different research goals ranging from responding to specific statutory or management requirements to establishing broader baseline social information to exploring the theoretical constructs that constrain or advance the field of applied anthropology in fisheries. This introduction provides background to the recent expansion of anthropological capacity in U.S. fisheries management and the divergent methods employed by practitioners. The range of methods includes classic ethnography and survey methods, cultural modeling, participatory research, and quantitative indicators-based assessment. The compilation of articles presents an opportunity to think about standardizing some methodological approaches for certain types of tasks, while expanding the array of accepted methodologies available to anthropologists advising fisheries managers.

Norman, Karma, **J. Sepez**, H. Lazrus, N. Milne, C. Package, S. Russell, K. Grant, R. Petersen, J. Primo, M. Styles, B. Tilt, I. Vaccaro. 2007. Community Profiles for West Coast and North Pacific Fisheries - Washington, Oregon, California, and other U.S. States. NOAA Tech. Memor. NMFS-NWFSC-85. 602p.

This document profiles 125 fishing communities in Washington, Oregon, California, and other U.S. states, with basic information on social and economic characteristics. Various federal statutes, including the Magnuson-Stevens Fishery Conservation and Management Act and the National Environmental Policy Act, among others, require federal agencies to examine the social and economic impacts of policies and regulations. These profiles can serve as a consolidated source of baseline information for assessing community impacts in these states. The profiles are given in a narrative format that includes four sections: *People and Place, Infrastructure, Involvement in West Coast Fisheries,* and *Involvement in North Pacific Fisheries. People and Place* includes information on location, demographics (including age and gender structure of the population, racial and ethnic make up), education, housing, and local history. *Infrastructure* covers current economic activity, governance (including city classification, taxation, and proximity to fisheries management and immigration offices) and facilities (transportation options and connectivity, water, waste, electricity, schools, police, public accommodations, and ports). *Involvement in West Coast Fisheries* and *Involvement in North Pacific Fisheries* detail community activities in commercial fishing (processing, permit holdings, and aid receipts), recreational fishing, and subsistence fishing. To define communities, we relied on Census place-level geographies where possible, yielding 125 individual profiles.

The communities were selected by a process that assessed involvement in commercial fisheries using quantitative data from the year 2000, in order to coordinate with 2000 U.S. Census data. The quantitative indicators looked at communities that have commercial fisheries landings (indicators: weight and value of landings, number of unique vessels delivering fish to a community) and communities that are home to documented participants in the fisheries (indicators: state and federal permit holders and vessel owners). Indicators were assessed in two ways, once as a ratio to the community's population, and in another approach, as a ratio of involvement within a particular fishery. The ranked lists generated by these two processes were combined and communities with scores one standard deviation above the mean were selected for profiling.

The communities selected and profiled in this document are, in Washington: Aberdeen, Anacortes, Bay Center, Bellingham, Blaine, Bothell, Cathlamet, Chinook, Edmonds, Everett, Ferndale, Fox Island, Friday Harbor, Gig Harbor, Grayland, Ilwaco, La Conner, La Push, Lakewood, Long Beach, Lopez, Mount Vernon, Naselle, Neah Bay, Olympia, Port Angeles, Port Townsend, Raymond, Seattle, Seaview, Sedro-Woolley, Sequim, Shelton, Silvana, South Bend, Stanwood, Tacoma, Tokeland, Westport, and Woodinville; in Oregon: Astoria, Bandon, Beaver, Brookings, Charleston, Clatskanie, Cloverdale, Coos Bay, Depoe Bay, Florence, Garibaldi, Gold Beach, Hammond, Harbor, Logsdon, Monument, Newport, North Bend, Pacific City, Port Orford, Reedsport, Rockaway Beach, Roseburg, Seaside, Siletz, Sisters, South Beach, Tillamook, Toledo, Warrenton, and Winchester Bay; and in California: Albion, Arroyo Grande, Atascadero, Avila Beach, Bodega Bay, Corte Madera, Costa Mesa, Crescent City, Culver City, Dana Point, Dillon Beach, El Granada, El Sobrante, Eureka, Fields Landing, Fort Bragg, Half Moon Bay, Kneeland, Lafayette, Long Beach, Los Angeles, Los Osos, Marina, McKinleyville, Monterey, Morro Bay, Moss Landing, Novato, Oxnard, Pebble Beach, Point Arena, Port Hueneme, Princeton, San Diego, San Francisco, San Jose, San Pedro, Santa Ana, Santa Barbara, Santa Cruz, Santa Rosa, Sausalito, Seaside, Sebastopol, Sunset Beach, Tarzana, Terminal Island, Torrance, Trinidad, Ukiah, Valley Ford, and Ventura. Two selected communities were located in other states: Pleasantville, New Jersey, and Seaford, Virginia.

Sepez, J., K. Norman and **R. Felthoven**. 2007. "A Quantitative Model for Identifying and Ranking Communities Involved in Commercial Fisheries." *National Association of Practicing Anthropologists Bulletin* 28:43-56.

This article proposes a quantitative model for ranking commercial fisheries involvement by communities and describes our experience applying this model to North Pacific and West Coast fisheries. Analysis of recent fishing community profiling projects shows there have been four basic approaches to selecting a manageable number of communities, including focusing on major ports, aggregated regions, representative examples, and the top of a ranked list. Data envelopment analysis (DEA) is presented as a non-parametric, multi-dimensional modeling method appropriate for evaluating and ranking fishing communities based on an array of quantitative indicators of fisheries involvement. The results of applying this model to communities involved in West Coast and North Pacific fisheries are summarized. Nineteen indicators of fisheries dependence and 92 indicators of fisheries engagement were modeled yielding ranked lists of 1564 and 1760 U.S. communities respectively. Comparison of the DEA method's top-ranked communities in Alaska to those selected by an indicators-based threshold-trigger model for Alaska showed 71 percent overlap of selected communities. The strengths and weaknesses of the DEA modeling approach are discussed. DEA modeling is not a substitute for ethnographic analysis of communities based on field work, but it does present an enticing way to consider which communities might be selected for fieldwork or profiling, or as fishing communities, based on quantitative indicators.

Sepez, J., C. Package, P. Malcolm, and A. Poole. 2007. "Unalaska, Alaska: Memory and Denial in the Globalization of the Aleutian Landscape." *Polar Geography* 30(3):193-209.

This paper explores history and globalization as situated in the landscape of Unalaska, Alaska, an island in the Aleutian chain. The history of the area is characterized by successive waves of occupation and resource extraction by the geopolitical powers of Asia and North America that began with Russian colonization. Unalaska's landscape is littered with World War II debris that still echoes of Japanese attacks and the bitter memory of U.S.-ordered evacuation and relocation to distant interment camps of the entire indigenous Aleut population. Unalaska's adjacent Port of Dutch Harbor has grown to become the Nation's busiest commercial fishing port ironically due to the demand of the Japanese market for fishery products and substantial investment by Japanese companies. Applying post-colonial theory to Unalaska's history suggests that territorial acquisition has been succeeded by the dynamics of economic globalization in this American periphery. The Aleutian landscape is shaped by its history of foreign and domestic exploitation, wartime occupation and displacement, economic globalization, and the historical narratives and identities that structure the relationship of past and present through place.

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