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, 2008

by

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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 bycatch and bycatch 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 2004 through 2008 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 data on some of the external factors which, in part, determine the economic status of the fisheries. Such factors include foreign exchange rates, the prices and price indexes of products that compete with products from these fisheries, domestic per capita consumption of seafood products, and fishery imports.

This report also updates the set of market profiles for pollock, Pacific cod, sablefish, and flatfish published here in the last two years' reports. These analyses discuss the current state of the markets for these species in terms of pricing, volume, supply and demand. We also discuss trade patterns and market share. Forecasts of the prices and volume of future exports are not included in this year's report.

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 have also included 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 1.74 million metric tons (t), a retained catch of 1.65 million t, and an ex-vessel value of $880 million in 2008, it accounted for 46% of the weight and 20% of the ex-vessel value of total U.S. domestic landings as reported in Fisheries of the United States, 2008. The value of the 2008 groundfish catch after primary processing was $2.3 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 2008, other fisheries accounted for only about 20,400 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); federal FMPs often manage catch from inside state waters in addition to catch from the EEZ, and the state of Alaska maintains authority over some rockfish fisheries in the EEZ of the GOA. 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 prices, revenue, or other measures 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 and 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 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 NMFS 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., revenue), processed product value (i.e., revenue), exports, employment, and other measures of economic activity. However, the cost 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 use of the race for fish as a principal mechanism for allocating many of the groundfish quotas and prohibited species catch (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 and the factory trawler head and gut 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, bycatch, 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 NMFS to monitor groundfish and PSC quotas in those years. Catch data for 2003-08 come from NMFS's catch-accounting system, which replaces the blend as the primary tool for monitoring groundfish and PSC quotas.

A variety of external factors influence the economic status of the fisheries. Therefore, information concerning the following external factors is included in this report: foreign exchange rates, the prices and price indexes of products that compete with products from these fisheries, gross domestic product implicit price deflators, and fishery imports. This report updates last year's report (Hiatt et al. 2008) 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.

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 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. Furthermore, the industry input on market trends was obtained in 2008 (and earlier) and will need to be updated for next year's SAFE report.

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. 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 should be addressed through 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.

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 bycatch 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, 2008

The commercial groundfish catch off Alaska totaled 1.74 million t in 2008, down almost 15% from the 2007 catch (Fig. 1 and Table 1), but more than four times 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, increased from $821 million in 2007 to $880 million in 2008 (Fig. 3 and Table 16). The gross value of the 2008 catch after primary processing was approximately $2.3 billion (F.O.B. Alaska) (Table 25), an increase of 12% from 2007. The groundfish fisheries accounted for the largest share (51%) of the ex-vessel value of all commercial fisheries off Alaska in 2008 (Fig. 4, Tables 16 and 17), while the Pacific salmon (*Oncorhynchus spp*.) fishery was second with $368 million or 21% of the total Alaska ex-vessel value. The value of the shellfish fishery amounted to $252 million or 15% of the total for Alaska and exceeded the value of Pacific halibut (*Hippoglossus stenolepis*) by about $43 million.

Catch Data

During the last 11 years, estimated total catch in the commercial groundfish fisheries off Alaska varied between 1.7 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. The peak catch occurred in 1991, in part because blend estimates of catch and bycatch were not yet used to monitor most quotas within the season. If the estimates had been used, several fisheries would have been closed earlier in the year. Fortunately, this information was utilized in following years and allowed for more precision in realizing desired catch levels. Since this time, catch levels have varied annually, reflecting changes in the total allowable catch (TAC), area closures or restrictions, and bycatch restrictions.

As a note of caution, readers should be aware that the catch estimates have increasing levels of downward bias for the years 1984 through 1990. Prior to 1991, discards were not included in the reported estimates of domestic catch (only the foreign and joint venture totals were included)[2]. However, the catch (and thus discards) of the domestic fishery increased rapidly over this period and accounted for over one-third of total catch in 1988. In addition, when compared side-by-side, the industry catch reports (on which catch records were based for the domestic fishery prior to 1991) tend to be smaller than the blend data estimates for equivalent years, implying that the domestic component of catch was further biased downward relative to post-1991 periods.

Walleye (Alaska) pollock (*Theragra chalcogramma*) has been the dominant species in the commercial groundfish catch off Alaska. The 2008 pollock catch of 1.04 million t

[2] Based on estimates of the discard rates for 1992 through 1995, discards would have been about 16% of total catch.

accounted for 60% of the total groundfish catch of 1.7 million t (Table 1). The pollock catch decreased by about 26% from 2007 as a result of reductions in the TAC. The 2008 catch of flatfish, which includes yellowfin sole (*Pleuronectes asper*), rock sole (*Pleuronectes bilineatus*), and arrowtooth flounder (*Atheresthes stomias*), was 315,900 t or 18.1% of the total 2008 groundfish catch, an increase of about 23% from 2007. The Pacific cod (*Gadus macrocephalus*) catch in 2008 accounted for 229,400 t or 13.2% of the total 2008 groundfish catch, down less than 2% from a year earlier. Pollock, Pacific cod, and flatfish comprised just over 91% of the total 2008 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, ex-vessel value, 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 91% of the total catch, while the catch with hook and line gear accounted for 7.5%. 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, where in 2008, 35.1% (73,000 t) was taken by trawls, 50.4% (105,000 t) by hook-and-line gear, and 14.4% (30,000 t) by pots. In each of the years since 2004, catcher vessels took 43-47% 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 prohibited species catch (PSC), apportion PSC allowances by fishery, and monitor those allowances. The target fishery designations can also be used to provide estimates of catch and bycatch 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 (approximately 4% in 2003-06 and 2% in 2007) that comes from NMFS Weekly Production Reports (WPR) (none of the 2008 catch estimates come from 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 percent 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, 95% of the 2008 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 Gulf where Alaskan vessels accounted for the majority of the Pacific cod catch.

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 2004-08. 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 only be in 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 decreased from about 8% in 2004 to 5% in both 2005 and 2006, increased in 2007 to about 6%, and then decreased again to about 5% in 2008. The overall discard rate in

2004 represents a 47% reduction from the 1997 rate of 15% (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 44% from 1997 to 2004 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 2008, the overall discard rates were about 12% and 5%, 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 (12% in 2008) than for trawl gear (5% in 2008). 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 2008 discard rates were 13% and 4% for fixed and trawl gear, respectively. In the GOA, however, the corresponding discard rates were 8% and 15%. 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 Bycatch

The bycatch 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 more than twenty 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 bycatch of these “prohibited species” for 2005-08 are summarized by area and gear in Table 11. More detailed estimates of prohibited species bycatch and of bycatch rates for 2007 and 2008 are in Tables 12 - 15. The estimates for halibut are in terms of bycatch mortality because the bycatch limits for halibut are set and monitored using estimated discard mortality rates. The estimates for the other prohibited species are of total bycatch; 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 substantially lower.

Notice that Tables 11 – 15 show a very large increase in bycatch of other king crab 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 bycatch in 2007 was about 10 times the average annual bycatch for the years 1994-2006; other-king-crab bycatch declined in 2008, but still remained at roughly 4.5 times the long-term average. The increase in blue king crab bycatch in 2007 is partly explained by the expansion of effort in the Pacific cod pot fishery northward to 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 either 2006 or 2008). 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 hauls with large crab bycatch resulted in high calculated bycatch rates that were then applied to the rest of the fisheries. The decline of other-king-crab bycatch 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, compared with over 2,000 t in 2007), but also possibly due to a change in fishing patterns after managers informed the industry that high bycatch was occurring in certain areas. In 2008 there were no observed pot vessels in areas where bycatch had been high the previous year.

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 bycatch problem. First, by providing good estimates of total groundfish catch and non-groundfish bycatch 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 bycatch 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 bycatch and bycatch mortality. In summary, the observer program provided fishery managers with the information and tools necessary to prevent bycatch from adversely affecting the stocks of the bycatch species. Therefore, the bycatch 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 bycatch 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. The ex-vessel value of the domestic landings in the FMP fisheries, excluding the value added by at-sea processing, increased from $628 million in 2004 to $745 million in 2005, increased to $818 million in 2006 and then decreased to $799 million in 2007 before increasing again to $874 million in 2008. The distribution of ex-vessel value by type of vessel differed by area, gear and species. In 2008, catcher vessels accounted for 50% of the ex-vessel value of the groundfish landings compared to 43% of the total catch because catcher vessels take larger percentages of higher-priced species such as sablefish, which was $3.16 per pound in 2008. Similarly, trawl gear accounted for only 68% of the total ex-vessel value compared to 89% of the catch because much of the trawl catch is of low-priced species such as pollock, which was about $0.21 per pound in 2008.

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, 87% of the 2008 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 13% of the total. The vessels owned by residents of Alaska accounted for a much larger share of the ex-vessel value than of catch (13% compared to 5%) because these vessels accounted for relatively large shares of the higher-priced species such as sablefish.

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.

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.

Beginning in 2002, all processors (including previously-exempted groundfish catcher/processors that operate exclusively in the EEZ and process only their own catch) have been required to submit COAR data to the ADF&G. Even though complete at-sea production data are now available from the COAR, the estimates of groundfish gross product value (i.e., revenue) for at-sea processors in 2002 through 2008 are calculated the same as in previous years in order to provide a comparison of the estimates from year to year. These estimates are based on COAR product price data (submitted by shoreside processors in all years and, voluntarily, by at-sea processors for activity through 2001) and on product quantity data in the WPR. Beginning with the 2001 Economic SAFE report (Hiatt et al. 2001), the estimates of gross product value for shoreside processors are based on COAR product price and quantity data. Prior to that, the estimates for all processors were based on COAR price data and WPR product quantity data.

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, 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 net registered 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. Notice that Table 40, Table 45, and Figure 6 show an increase in the number of hook-and-line vessels (and, consequently, all vessels) in 2003 compared to the numbers reported in 2002. This increase is the result of improved source data, namely the availability in NMFS catch-accounting system data of the federal permit numbers of catcher vessels making deliveries in all processing sectors. This allows us to include vessels that were uncounted in earlier years. Notice also that the number of vessels participating in GOA hook-and-line fisheries decreased compared to the numbers reported last year; this decrease is the result of the availability of data maintained by the NMFS Alaska Region that allows us to positively identify catch from Alaska state-water fisheries, thus enabling us to exclude vessels that fished only in such fisheries.

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 2008, the crew weeks (defined as the number of crew aboard each vessel in a week summed over the entire year) totaled 97,036 with the majority of them (92,725) occurring in the BSAI groundfish fishery. In 2008, the maximum monthly employment (15,152) occurred in February. Much of this was accounted for by the BSAI pollock fishery.

Observer Coverage and Costs

The information provided by the FMA 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 bycatch 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. Estimates of the numbers of vessels and plants with observers, observer-deployment days, and estimated observer costs by year and type of operation for 2007-08 are presented in Table 51.

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 indexes, and foreign exchange rates. Such data are included in Tables 52 - 60. Notice that the Japanese Ministry of Agriculture, Forestry & Fisheries has discontinued reporting of landing market prices for all but one of the species in Table 52 and no longer reports wholesale prices for any of the species in Table 53. U.S. cold-storage holdings data, which were published in this report in previous years, have not been collected by NMFS since the end of 2002. The availability of cold-storage holdings data depends on the cooperation of industry in the form of voluntary reporting, which has declined to the extent that reports compiled from the data were deemed by NMFS management to lack sufficient accuracy. Consequently, the affected tables have been omitted from this report, but the pre-2003 levels may be found in Tables 48 and 49 of earlier reports.

Exchange rates and world supplies of fishery products play a major role in international trade. Exchange rates change rapidly and can significantly affect the economic status of the groundfish fisheries.

CITATIONS

Terry Hiatt, Ron Felthoven, Michael Dalton, Brian Garber-Yonts, Alan Haynie, Dan Lew, Jennifer Sepez, Chang Seung and the staff of Northern Economics, Inc. 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, 2008. http://www.afsc.noaa.gov/refm/docs/2008/economic.pdf

National Marine Fisheries Service, 2008. Fisheries of the United States, 2008. http://www.st.nmfs.noaa.gov/st1/fus/fus08/index.html

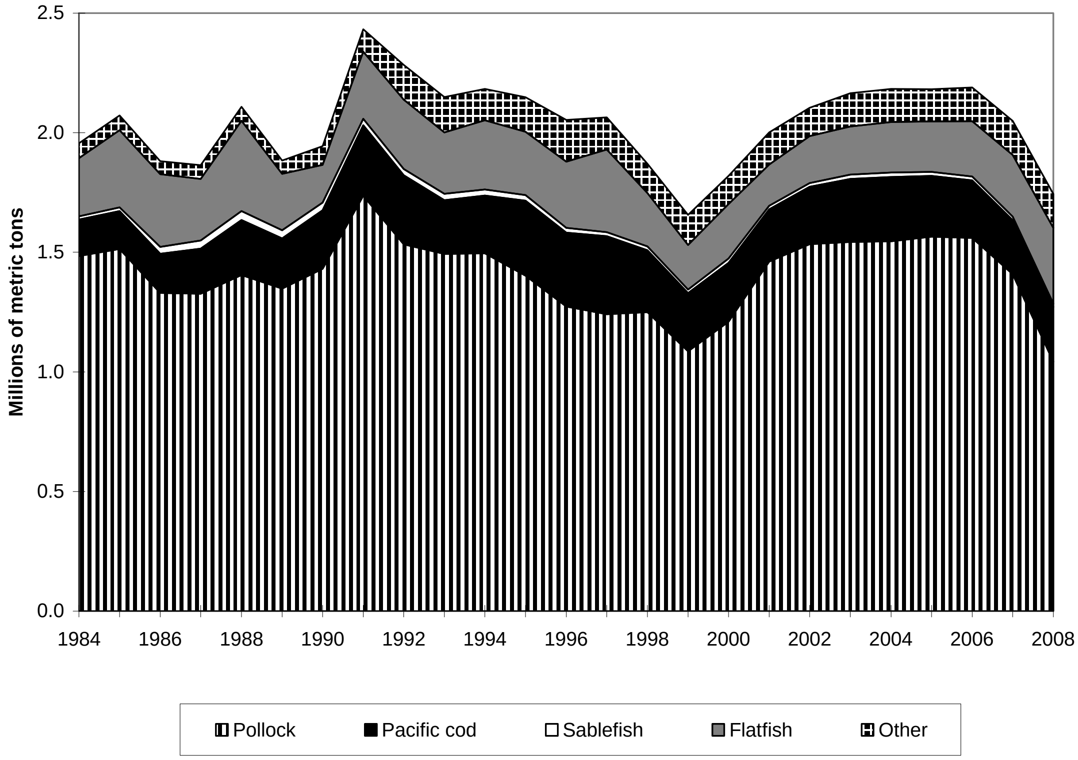

Figure 1. Groundfish catch in the commercial fisheries off Alaska by species, 1984-2008.

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

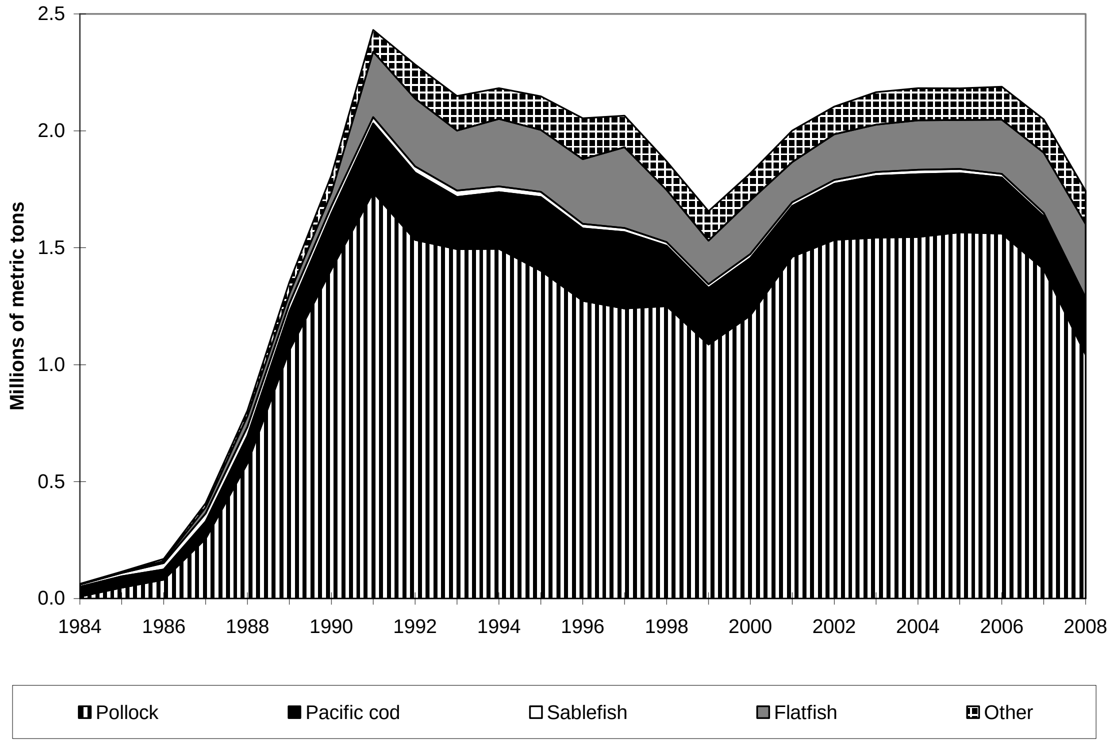

Figure 2. Groundfish catch in the domestic commercial fisheries off Alaska by species, 1984-2008.

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

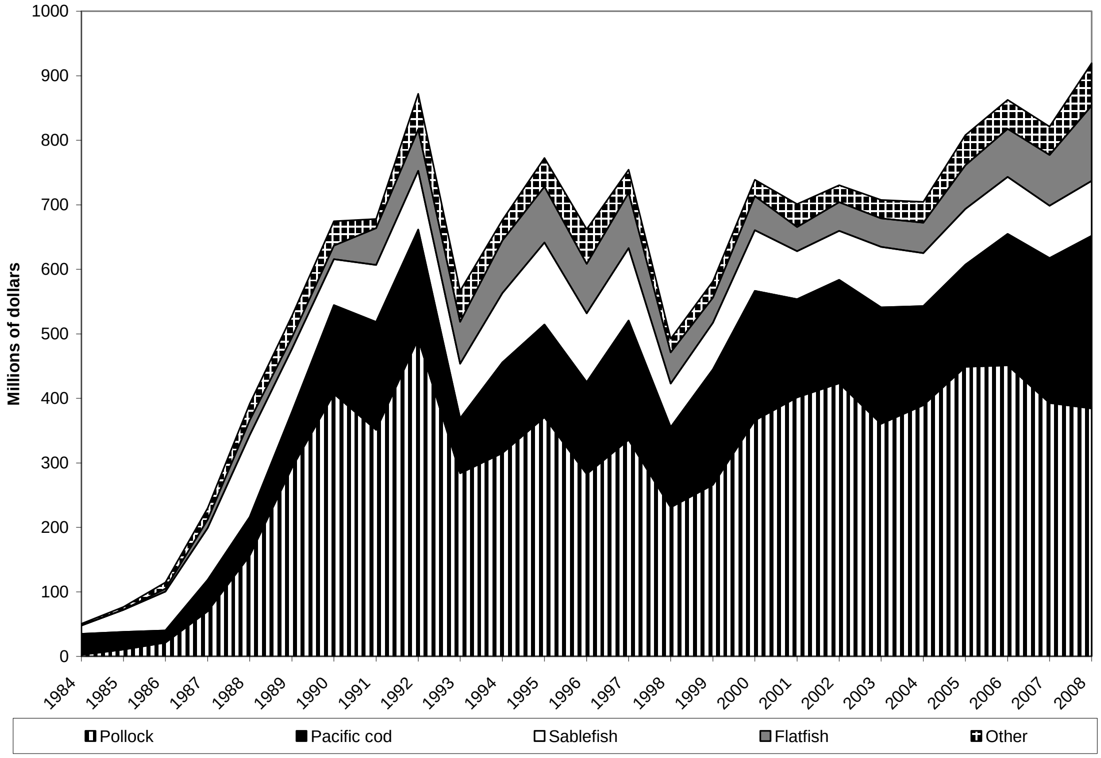

Figure 3. Real ex-vessel value of the groundfish catch in the domestic commercial fisheries off Alaska by species, 1984-2008 (base year = 2008).

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

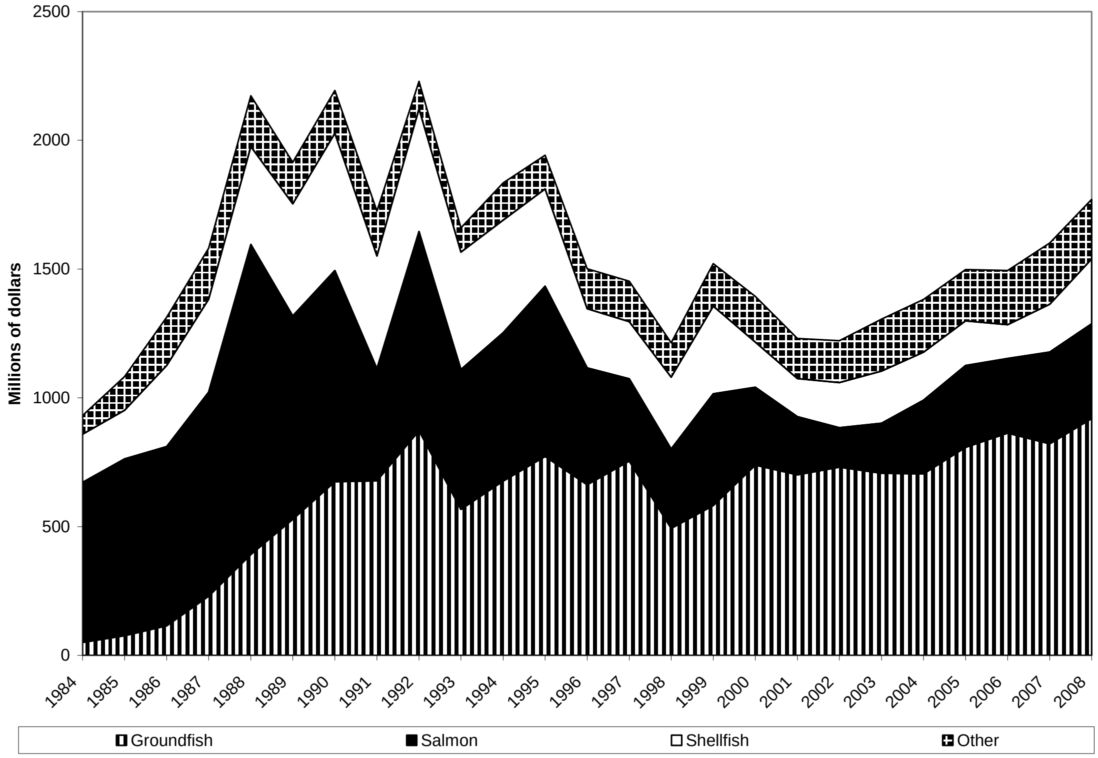

Figure 4. Real ex-vessel value of the domestic fish and shellfish catch off Alaska, 1984-2008 (base year = 2008).

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

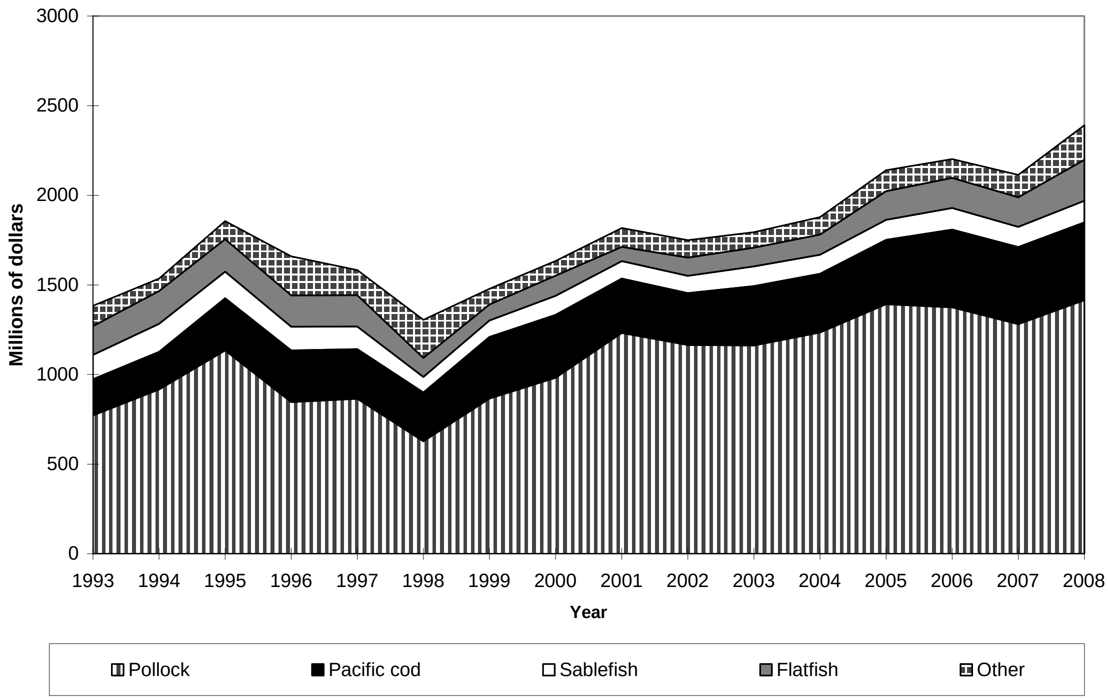

Figure 5. Real gross product value of the groundfish catch off Alaska, 1993-2008 (base year = 2008).

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

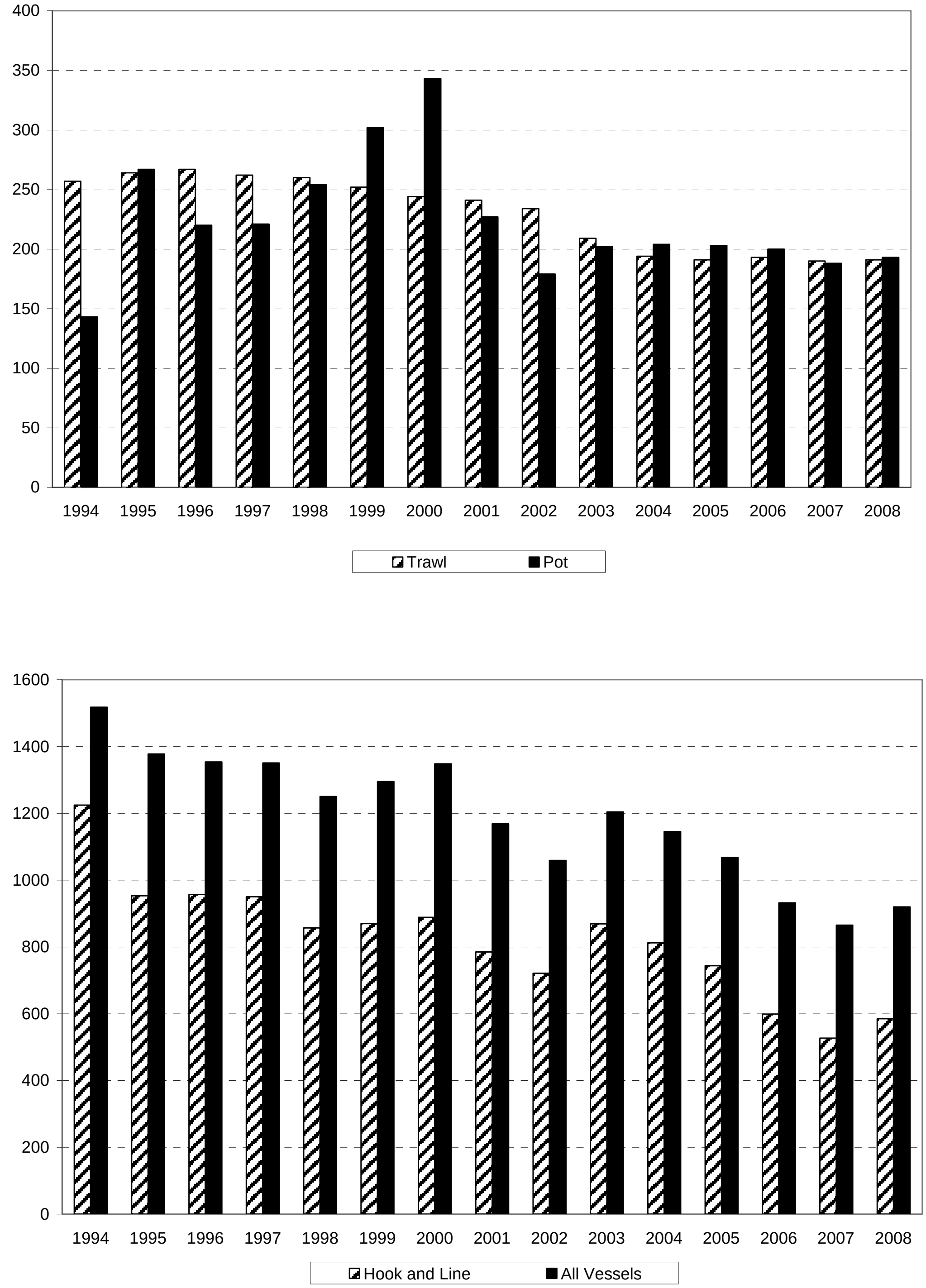

Figure 6. Number of vessels in the domestic groundfish fishery off Alaska by gear type, 1994-2008

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

Table 1. Groundfish catch in the commercial fisheries off Alaska by area and species, 1997-2008 (1,000 metric tons, round weight).

		Pollock	Sablefish	Pacific cod	Flatfish	Rockfish	Atka mackerel	Total
Gulf of Alaska	1997	90.1	15.7	68.5	33.6	19.8	.3	233.5
	1998	125.1	15.2	62.1	23.3	19.5	.3	249.3
	1999	95.6	13.9	68.6	24.9	24.5	.3	231.6
	2000	76.4	15.7	54.5	37.3	21.5	.2	211.1
	2001	72.6	13.2	41.6	31.8	21.5	.1	185.6
	2002	51.9	13.5	42.4	34.1	22.2	.1	168.4
	2003	50.7	15.5	52.6	42.0	23.7	.6	191.5
	2004	63.9	17.0	56.7	36.3	22.3	.8	203.5
	2005	80.8	15.0	47.6	30.0	20.6	.8	200.1
	2006	72.0	13.5	47.9	42.2	24.3	.9	208.8
	2007	51.9	12.8	51.5	40.6	23.4	1.5	188.8
	2008	52.1	12.4	58.8	45.7	22.9	2.1	200.1
Bering Sea and Aleutian Islands	1997	1,150.5	1.3	257.8	311.9	17.0	65.8	1,831.1
	1998	1,125.1	1.2	195.8	199.8	15.5	57.1	1,620.9
	1999	990.9	1.4	173.9	161.6	19.9	56.2	1,425.0
	2000	1,134.0	1.8	191.1	190.9	16.4	47.2	1,608.0
	2001	1,388.3	1.9	176.7	140.2	17.6	61.6	1,815.4
	2002	1,482.4	2.3	196.7	162.4	16.8	45.3	1,935.8
	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	1,979.1
	2005	1,484.9	2.5	205.6	180.5	15.1	62.0	1,981.4
	2006	1,488.4	2.2	192.5	189.4	17.7	61.9	1,980.3
	2007	1,356.8	2.3	174.1	216.8	23.6	58.8	1,860.4
	2008	990.2	2.0	170.5	270.1	21.7	58.1	1,543.4
All Alaska	1997	1,240.7	17.1	326.2	345.6	36.9	66.2	2,064.6
	1998	1,250.2	16.4	257.9	223.1	34.9	57.4	1,870.2
	1999	1,086.4	15.3	242.5	186.4	44.4	56.5	1,656.6
	2000	1,210.3	17.5	245.6	228.2	37.9	47.4	1,819.1
	2001	1,460.9	15.1	218.4	172.0	39.1	61.6	2,001.0
	2002	1,534.3	15.8	239.1	196.5	39.0	45.4	2,104.2
	2003	1,543.2	17.6	263.5	201.8	44.6	58.7	2,165.0
	2004	1,545.6	19.0	268.9	211.0	40.0	61.4	2,182.7
	2005	1,565.8	17.6	253.2	210.5	35.7	62.8	2,181.5
	2006	1,560.4	15.7	240.3	231.7	42.0	62.8	2,189.1
	2007	1,408.7	15.1	225.6	257.3	47.0	60.2	2,049.2
	2008	1,042.3	14.4	229.4	315.9	44.6	60.2	1,743.4

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

Source: Blend estimates for 1997-2002. Catch-accounting system estimates for 2003-08. 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, 1994-2008 (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	4.1	316.6	32.2	34.7	411.4
2005	26.0	3.2	395.7	38.9	33.5	497.3
2006	31.3	2.8	287.7	36.2	31.4	389.4
2007	32.1	2.4	390.7	30.5	30.5	486.1
2008	45.1	2.3	290.3	38.0	29.3	405.1

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, 2004-08 (1,000 metric tons, round weight).

			Gulf of Alaska			Bering Sea and Aleutian			All Alaska		
			Catcher vessels	Catcher processors	Total	Catcher vessels	Catcher processors	Total	Catcher vessels	Catcher processors	Total
All gear	All Groundfish	2004	155	32	187	860	1,120	1,979	1,015	1,151	2,166
		2005	154	31	186	860	1,118	1,978	1,014	1,149	2,164
		2006	156	41	197	863	1,113	1,977	1,019	1,154	2,173
		2007	139	38	176	788	1,068	1,856	927	1,106	2,033
		2008	147	38	185	590	949	1,539	737	987	1,723
Hook & Line	Sablefish	2004	13	2	14	0	0	1	13	2	15
		2005	11	2	13	0	1	1	11	2	14
		2006	11	1	12	0	1	1	11	2	13
		2007	10	1	12	0	0	1	10	2	12
		2008	10	1	11	0	0	1	11	2	12
	Pacific cod	2004	6	5	11	1	110	111	7	115	122
		2005	5	1	6	2	115	116	6	116	122
		2006	7	4	10	1	98	99	7	102	110
		2007	7	4	12	1	81	81	8	85	93
		2008	7	5	12	1	93	94	8	98	106
	Flatfish	2004	0	0	0	0	5	5	0	5	5
		2005	0	0	0	0	5	5	0	6	6
		2006	0	0	1	0	5	5	0	5	5
		2007	0	0	1	0	4	4	0	4	5
		2008	0	0	1	0	4	4	1	4	5
	Rockfish	2004	1	0	1	0	0	0	1	1	2
		2005	1	0	1	0	0	0	1	0	1
		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	0	2
	All Groundfish	2004	21	7	29	2	140	141	23	147	170
		2005	18	4	22	2	146	148	21	150	170
		2006	22	6	29	1	122	124	24	129	152
		2007	21	7	28	1	101	102	22	109	130
		2008	21	7	28	3	118	121	24	125	149
Pot	Pacific cod	2004	15	-	15	14	3	17	29	3	32
		2005	15	-	15	14	-	14	28	-	28
		2006	14	-	14	16	3	19	31	3	34
		2007	13	-	13	15	3	18	28	3	30
		2008	11	-	11	16	3	19	27	3	30

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	2004	62	0	63	792	685	1,476	854	685	1,539
		2005	80	0	80	798	683	1,481	877	683	1,561
		2006	70	0	70	798	687	1,485	868	688	1,556
		2007	51	1	52	722	632	1,353	773	632	1,405
		2008	51	1	52	523	462	985	574	462	1,037
	Sablefish	2004	1	1	1	0	0	0	1	1	2
		2005	1	1	1	0	0	0	1	1	2
		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
	Pacific cod	2004	16	1	18	41	42	84	57	44	101
		2005	13	1	15	36	36	72	49	38	87
		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
	Flatfish	2004	27	9	36	5	164	170	32	173	206
		2005	17	13	29	5	170	175	22	183	204
		2006	25	16	42	7	177	184	33	193	226
		2007	27	13	40	11	201	213	38	215	252
		2008	32	13	45	9	257	266	41	270	311
	Rockfish	2004	9	12	21	0	17	17	10	28	38
		2005	8	11	19	1	14	15	9	26	34
		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
	Atka mackerel	2004	0	1	1	1	59	60	1	60	61
		2005	0	1	1	1	61	62	1	62	63
		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
	All Groundfish	2004	119	24	143	842	976	1,819	961	1,001	1,962
		2005	121	28	149	842	972	1,814	963	1,000	1,963
		2006	119	34	153	843	988	1,831	963	1,022	1,985
		2007	104	30	135	770	964	1,735	875	995	1,869
		2008	114	31	145	570	828	1,397	684	858	1,542

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, 2007-08 (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
2007 Gear/ Target	Hook & line	Sablefish	.0	10.2	.1	.4	.0	.0	.0	.0	.8	.0	.7	12.2
		Pacific cod	.2	.0	11.0	.1	.0	.0	.0	.0	.0	.0	1.5	12.9
		Halibut	.0	1.4	.4	.1	.0	-	.0	.0	.5	.0	.8	3.2
		Total	.2	11.6	11.5	.6	.0	.0	.0	.0	1.3	.0	3.0	28.3
	Pot	Pacific cod	.0	-	13.5	.0	.0	-	-	.0	.0	.0	.4	14.0
		Total	.0	-	13.5	.0	.0	-	-	.0	.0	.0	.4	14.0
	Trawl	Pollock, bottom	12.4	.0	.2	1.2	.3	.0	.0	.2	.0	.0	.6	14.9
		Pollock, pelagic	37.4	.0	.1	.5	.1	.0	.0	.0	.1	.2	.2	38.5
		Sablefish	.0	.2	.0	.1	.0	.0	.0	.0	.0	-	.0	.4
		Pacific cod	.5	.0	10.4	1.3	.3	.1	.0	1.1	.1	.0	.3	14.1
		Arrowtooth	.5	.1	.9	14.9	1.5	.9	.1	.4	.5	.0	.9	20.8
		Flathead sole	.0	.0	.1	.7	.4	.1	.0	.0	.0	.0	.1	1.6
		Rex sole	.1	.0	.4	3.1	.3	1.6	.1	.0	.1	.0	.2	5.9
		Flatfish, shallow	.5	.0	2.4	2.4	.3	.0	.0	7.1	.1	.0	1.5	14.4
		Rockfish	.1	.6	.2	.7	.0	.1	.0	.0	20.9	1.1	.1	23.9
		Atka mackerel	-	-	.0	-	-	-	-	-	.0	.1	-	.1
		Total	51.7	1.1	14.8	24.9	3.2	2.9	.3	8.7	21.9	1.5	3.8	134.6
	All gear	Total	51.9	12.7	39.9	25.5	3.2	2.9	.3	8.8	23.2	1.5	7.2	176.9

Table 3. Continued.

2008 Gear/ Target			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
			Species											
	Hook & line	Sablefish	.0	9.7	.1	.5	-	.0	.0	.0	.7	-	.3	11.2
		Pacific cod	.2	.1	11.4	.1	.0	-	.0	.0	.0	.0	1.5	13.4
		Halibut	.0	1.6	.6	.1	.0	.0	.0	.0	.5	.0	.3	3.1
		Total	.2	11.4	12.1	.7	.0	.0	.0	.0	1.2	.0	2.1	27.7
	Pot	Pollock, bottom	.1	-	-	.0	.0	.0	-	.0	.0	-	.0	.1
		Pacific cod	.0	-	11.3	.0	.0	-	.0	.0	.0	.0	.5	11.9
		Total	.1	-	11.3	.0	.0	.0	.0	.0	.0	.0	.5	12.0
	Trawl	Pollock, bottom	14.3	.0	.7	1.2	.3	.1	.0	.2	.1	.0	.2	17.0
		Pollock, pelagic	32.3	.0	.1	.4	.1	.0	.0	.0	.1	.0	.1	33.1
		Sablefish	.0	.2	.0	.1	.0	.0	.0	.0	.1	.0	.0	.4
		Pacific cod	2.8	.1	13.9	2.8	.4	.1	.0	1.7	.2	.3	.6	22.9
		Arrowtooth	.6	.0	1.5	19.1	1.2	1.2	.1	.4	.4	.0	.6	25.3
		Flathead sole	.0	.0	.1	.8	.6	.1	.0	.0	.0	.0	.1	1.8
		Rex sole	.1	.0	.2	2.5	.3	1.1	.2	.0	.1	.0	.1	4.7
		Flatfish, deep	.0	.0	-	.0	-	.0	.1	-	.0	-	.0	.1
		Flatfish, shallow	1.2	.0	3.2	1.2	.5	.0	.0	7.3	.0	.0	1.5	14.9
		Rockfish	.5	.5	.5	.5	.0	.1	.0	.1	20.7	1.7	.1	24.7
		Total	51.8	.9	20.2	28.6	3.4	2.7	.6	9.7	21.7	2.1	3.4	144.9
	All gear	Total	52.1	12.3	43.6	29.3	3.4	2.7	.6	9.7	22.8	2.1	5.9	184.6

Notes: Totals may include additional categories. The target, determined by AFSC staff, is based on processor, week, 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, 2007-08 (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
2007 Gear/ Target	Hook & line	Sablefish	.0	.5	.0	.1	.0	.0	.1	-	.0	.1	-	.1	.8
		Pacific cod	3.4	.0	81.2	1.3	.4	.0	.1	.3	.1	.2	.0	12.0	99.0
		Arrowtooth	.0	.0	.0	.0	.0	.0	.0	-	.0	.0	.0	.0	.1
		Turbot	.0	.1	.1	.2	.0	-	1.2	-	.0	.1	.0	.2	1.9
		Halibut	.0	.1	.0	.0	.0	-	.0	-	-	.0	-	.0	.2
		Total	3.4	.7	81.4	1.7	.4	.0	1.5	.3	.1	.5	.0	12.3	102.1
	Pot	Sablefish	.0	1.5	.0	.1	-	-	.0	-	.0	.0	.0	.0	1.7
		Pacific cod	.0	-	17.5	.0	.0	.0	.0	.2	.0	.0	.1	.4	18.2
		Total	.0	1.5	17.5	.1	.0	.0	.0	.2	.0	.0	.1	.4	19.8
	Trawl	Pollock, bottom	26.8	.0	.3	.5	.5	.1	.0	.1	.2	.3	.2	.4	29.3
		Pollock, pelagic	1,296.7	.0	5.3	2.3	3.7	.4	.1	.0	.4	.7	.1	2.5	1,312.2
		Pacific cod	17.3	.0	55.9	2.1	4.1	4.5	.1	.6	.9	.2	.5	4.1	90.4
		Arrowtooth	.6	.0	.1	.8	.1	.1	.0	.0	.1	.0	.0	.1	1.8
		Flathead sole	3.4	.0	1.8	1.8	7.5	2.3	.1	2.5	.7	.1	.1	1.2	21.7
		Rock sole	3.2	.0	3.2	.2	1.1	21.2	.0	8.9	2.8	.0	.2	1.8	42.7
		Yellowfin	4.0	-	2.5	.2	1.7	8.2	.0	108.2	19.2	.0	.0	4.0	148.2
		Other flatfish	.3	.0	.1	1.2	.1	.1	.0	.1	.8	.1	.0	.2	3.1
		Rockfish	.5	.0	.1	.3	.0	.0	.0	.0	.0	14.1	.2	.1	15.4
		Atka mackerel	.3	.0	2.0	.8	.0	.2	.1	.0	.0	7.6	57.3	.8	69.2
		Total	1,353.4	.1	71.4	10.1	19.0	37.1	.5	120.6	25.4	23.1	58.7	15.4	1,734.8
	All gear	Total	1,356.8	2.3	170.3	11.9	19.3	37.1	2.0	121.0	25.4	23.6	58.8	28.0	1,856.6

Table 4. Continued.

2008 Gear/ Target			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
	Hook & line	Sablefish	.0	.6	.0	.0	.0	.0	.1	.0	.0	.1	-	.0	.9
		Pacific cod	5.2	.0	94.0	1.7	.3	.0	.1	.5	.0	.2	.0	15.1	117.2
		Turbot	.0	.0	.1	.2	.0	.0	.6	-	.0	.0	-	.1	.9
		Halibut	.0	.2	.2	.2	.0	-	.0	.0	.0	.1	.0	1.2	1.9
		Total	5.2	.8	94.3	2.1	.3	.0	.8	.5	.0	.4	.0	16.4	121.0
	Pot	Sablefish	.0	.9	.0	.0	-	-	.0	-	.0	.0	.0	.0	1.0
		Pacific cod	.0	-	19.0	.0	.0	.0	.0	.1	.0	.0	.1	.4	19.7
		Total	.0	.9	19.0	.1	.0	.0	.0	.1	.0	.0	.1	.4	20.6
	Trawl	Pollock, bottom	56.1	.0	.9	.3	1.0	.6	.0	.3	.1	.2	.0	1.6	61.0
		Pollock, pelagic	904.6	.0	5.8	1.0	3.2	1.4	.1	.1	.2	.2	.0	3.0	919.9
		Sablefish	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	-	.0	.1
		Pacific cod	2.9	.0	32.4	.6	.4	1.1	.0	.3	.1	.2	.2	.8	39.0
		Arrowtooth	1.1	.2	.2	11.7	.5	.3	1.2	.0	.6	.4	.1	.4	16.7
		Flathead sole	4.2	.0	1.9	2.5	11.5	1.8	.1	3.8	1.0	.0	.0	1.3	28.2
		Rock sole	5.3	.0	4.0	.6	2.0	35.3	.0	13.0	4.0	.0	.0	1.7	65.8
		Turbot	.0	.0	-	.2	-	.0	.2	-	.0	.2	.0	.0	.6
		Yellowfin	9.9	.0	5.8	2.0	5.6	10.5	.0	130.7	14.8	.0	.0	4.2	183.4
		Other flatfish	.0	.0	.0	.1	.0	.0	.0	.0	.1	.0	.0	.0	.2
		Rockfish	.6	.0	.4	.4	.0	.0	.1	.0	.0	12.8	2.2	.2	16.8
		Atka mackerel	.2	.0	1.4	.3	.0	.1	.2	.0	.0	7.3	55.4	.7	65.5
		Total	985.0	.3	52.8	19.7	24.2	51.1	1.9	148.3	21.0	21.3	58.0	13.8	1,397.4
	All gear	Total	990.2	2.0	166.1	21.8	24.5	51.2	2.7	148.9	21.0	21.7	58.1	30.7	1,538.9

Notes: Totals may include additional categories. The target, determined by AFSC staff, is based on processor, week, 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, 2004-08 (1,000 metric tons, round weight).

		Gulf of Alaska		Bering Sea and Aleutian		All Alaska	
		Alaska	Other	Alaska	Other	Alaska	Other
All groundfish	2004	77	110	46	1,933	123	2,043
	2005	70	116	27	1,954	97	2,070
	2006	71	126	21	1,956	92	2,081
	2007	65	112	20	1,836	85	1,948
	2008	65	120	22	1,517	86	1,637
Pollock	2004	23	39	16	1,466	39	1,506
	2005	30	50	12	1,472	42	1,523
	2006	26	44	7	1,482	33	1,526
	2007	20	32	8	1,349	27	1,381
	2008	19	33	5	985	25	1,017
Sablefish	2004	7	8	1	1	8	10
	2005	6	8	1	2	7	10
	2006	6	7	0	2	6	9
	2007	6	7	1	2	6	9
	2008	6	6	1	1	7	8
Pacific cod	2004	25	18	18	194	43	212
	2005	22	13	13	193	35	206
	2006	24	14	13	176	36	190
	2007	25	15	11	159	36	174
	2008	24	20	14	152	38	171
Flatfish	2004	13	24	7	168	19	192
	2005	6	24	0	180	6	204
	2006	8	34	0	189	8	224
	2007	9	32	0	217	9	249
	2008	10	36	0	270	10	306
Rockfish	2004	5	17	0	17	6	34
	2005	4	17	0	15	4	32
	2006	4	20	0	18	4	38
	2007	3	20	0	24	3	44
	2008	3	19	0	22	3	41
Atka mackerel	2004	0	1	3	57	3	58
	2005	0	1	0	62	0	63
	2006	0	1	0	62	0	63
	2007	0	1	0	59	0	60
	2008	0	2	0	58	0	60

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 less than 500 metric tons in all cases.

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, 2004-08 (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	2004	3.1	7%	30.3	21%	33.4	18%
		2005	2.7	7%	13.5	9%	16.2	9%
		2006	5.2	12%	20.1	13%	25.3	13%
		2007	4.3	10%	17.6	13%	21.9	12%
		2008	3.3	8%	21.2	15%	24.6	13%
	Pollock	2004	.0	34%	1.2	2%	1.2	2%
		2005	.0	14%	1.1	1%	1.1	1%
		2006	.0	20%	1.9	3%	1.9	3%
		2007	.0	8%	1.5	3%	1.5	3%
		2008	.1	17%	3.8	7%	3.8	7%
	Sablefish	2004	.5	3%	.2	16%	.7	4%
		2005	.3	2%	.2	15%	.4	3%
		2006	.3	2%	.3	25%	.6	4%
		2007	.2	2%	.2	16%	.4	3%
		2008	.4	4%	.1	8%	.5	4%
	Pacific cod	2004	.4	2%	.9	5%	1.3	3%
		2005	.2	1%	.8	5%	1.0	3%
		2006	.4	2%	1.4	11%	1.8	5%
		2007	.3	1%	1.2	8%	1.5	4%
		2008	.3	1%	2.9	14%	3.2	7%
	Flatfish	2004	.3	87%	22.8	63%	23.1	64%
		2005	.3	73%	8.8	30%	9.1	30%
		2006	.5	83%	12.4	30%	12.9	31%
		2007	.6	90%	11.0	28%	11.7	29%
		2008	.7	90%	10.1	22%	10.8	24%
	Rockfish	2004	.3	24%	2.1	10%	2.4	11%
		2005	.2	20%	1.2	6%	1.4	7%
		2006	.6	39%	2.3	10%	2.9	12%
		2007	.4	30%	.9	4%	1.3	6%
		2008	.2	18%	1.3	6%	1.5	7%
	Atka mackerel	2004	.0	97%	.3	39%	.3	40%
		2005	.0	99%	.1	17%	.2	20%
		2006	.0	94%	.4	43%	.4	43%
		2007	.0	100%	.6	38%	.6	39%
		2008	.0	99%	1.3	62%	1.3	63%

Table 6. Continued.

			Fixed		Trawl		All gear	
			Total Discards	Discard Rate	Total Discards	Discard Rate	Total Discards	Discard Rate
Bering Sea & Aleutians	All Groundfish	2004	20.6	13%	112.2	6%	132.9	7%
		2005	21.3	13%	77.1	4%	98.4	5%
		2006	16.5	11%	76.2	4%	92.7	5%
		2007	14.0	11%	88.4	5%	102.4	6%
		2008	17.8	13%	49.3	4%	67.1	4%
	Pollock	2004	.7	13%	22.8	2%	23.4	2%
		2005	.6	14%	17.2	1%	17.7	1%
		2006	.4	14%	15.4	1%	15.9	1%
		2007	.5	16%	16.0	1%	16.5	1%
		2008	.9	16%	5.2	1%	6.1	1%
	Sablefish	2004	.0	3%	.1	26%	.1	7%
		2005	.1	3%	.0	8%	.1	4%
		2006	.1	3%	.0	7%	.1	3%
		2007	.1	3%	.0	7%	.1	3%
		2008	.1	5%	.0	0%	.1	4%
	Pacific cod	2004	2.0	2%	.8	1%	2.7	1%
		2005	3.0	2%	.7	1%	3.7	2%
		2006	1.8	1%	1.0	1%	2.7	1%
		2007	1.6	2%	1.0	1%	2.5	1%
		2008	1.7	1%	.5	1%	2.2	1%
	Flatfish	2004	2.9	61%	62.1	37%	65.1	37%
		2005	2.7	49%	43.6	25%	46.3	26%
		2006	2.2	44%	42.7	23%	44.9	24%
		2007	2.2	52%	51.4	24%	53.6	25%
		2008	2.7	69%	30.5	11%	33.2	12%
	Rockfish	2004	.2	52%	6.3	36%	6.5	37%
		2005	.1	35%	4.8	32%	4.9	32%
		2006	.2	50%	5.1	30%	5.3	30%
		2007	.3	61%	6.2	27%	6.5	28%
		2008	.2	55%	2.3	11%	2.5	12%
	Atka mackerel	2004	.2	99%	11.7	19%	11.9	20%
		2005	.3	97%	3.8	6%	4.0	6%
		2006	.4	100%	2.7	4%	3.0	5%
		2007	.1	97%	2.0	3%	2.1	4%
		2008	.1	98%	1.1	2%	1.2	2%

Table 6. Continued.

			Fixed		Trawl		All gear	
			Total Discards	Discard Rate	Total Discards	Discard Rate	Total Discards	Discard Rate
All Alaska	All Groundfish	2004	23.8	12%	142.5	7%	166.2	8%
		2005	24.0	12%	90.6	5%	114.6	5%
		2006	21.8	12%	96.3	5%	118.1	5%
		2007	18.3	11%	106.0	6%	124.3	6%
		2008	21.1	12%	70.6	5%	91.7	5%
	Pollock	2004	.7	13%	24.0	2%	24.7	2%
		2005	.6	14%	18.3	1%	18.9	1%
		2006	.5	15%	17.3	1%	17.8	1%
		2007	.5	15%	17.5	1%	18.0	1%
		2008	.9	17%	9.0	1%	9.9	1%
	Sablefish	2004	.5	3%	.3	18%	.8	5%
		2005	.3	2%	.2	14%	.5	3%
		2006	.3	2%	.3	23%	.6	4%
		2007	.3	2%	.2	15%	.5	3%
		2008	.5	4%	.1	6%	.6	4%
	Pacific cod	2004	2.4	2%	1.7	2%	4.1	2%
		2005	3.2	2%	1.4	2%	4.7	2%
		2006	2.2	2%	2.4	3%	4.5	2%
		2007	1.9	2%	2.1	2%	4.0	2%
		2008	1.9	1%	3.4	5%	5.4	3%
	Flatfish	2004	3.3	63%	84.9	41%	88.2	42%
		2005	3.1	50%	52.4	26%	55.4	26%
		2006	2.7	48%	55.1	24%	57.8	25%
		2007	2.8	57%	62.4	25%	65.3	25%
		2008	3.4	72%	40.6	13%	44.0	14%
	Rockfish	2004	.5	30%	8.4	22%	8.9	22%
		2005	.3	23%	6.0	18%	6.3	18%
		2006	.8	41%	7.4	19%	8.2	20%
		2007	.7	38%	7.2	16%	7.9	17%
		2008	.4	27%	3.6	8%	4.0	9%
	Atka mackerel	2004	.2	99%	12.0	20%	12.2	20%
		2005	.3	97%	3.9	6%	4.2	7%
		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%

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, 2007-08 (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
2007 Gear/ Target	Hook & line	Sablefish	.0	.2	.0	.3	.0	.0	.0	.0	.3	.0	.7	1.6
		Pacific cod	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	1.1	1.4
		Halibut	.0	.0	.1	.1	.0	-	.0	.0	.1	.0	.7	1.1
		Total	.0	.2	.2	.5	.0	.0	.0	.0	.4	.0	2.5	4.0
	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	.4	.0	.0	.3	.0	.0	.0	.0	.0	.0	.2	1.0
		Pollock, pelagic	.4	.0	.0	.1	.0	.0	.0	.0	.0	.2	.1	.8
		Sablefish	.0	.0	.0	.1	.0	.0	.0	.0	.0	-	.0	.1
		Pacific cod	.2	.0	.1	.8	.1	.0	.0	.3	.0	.0	.2	1.7
		Arrowtooth	.1	.1	.1	2.6	.1	.0	.0	.0	.2	.0	.7	4.0
		Flathead sole	.0	.0	.0	.7	.0	.0	.0	.0	.0	.0	.1	.8
		Rex sole	.0	.0	.0	2.9	.0	.0	.1	.0	.1	.0	.1	3.2
		Flatfish, shallow	.3	.0	.9	1.9	.0	.0	.0	.3	.0	.0	.9	4.4
		Rockfish	.0	.1	.0	.5	.0	.0	.0	.0	.5	.3	.1	1.6
		Atka mackerel	-	-	.0	-	-	-	-	-	.0	.0	-	.0
		Total	1.5	.2	1.2	9.9	.3	.1	.1	.7	.9	.6	2.2	17.6
	All gear	Total	1.5	.4	1.5	10.4	.3	.1	.2	.7	1.3	.6	4.9	21.9

Table 7. Continued.

2008 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	.3	.0	.4	-	.0	.0	.0	.1	-	.3	1.1
		Pacific cod	.1	.1	.2	.1	.0	-	.0	.0	.0	.0	1.0	1.4
		Halibut	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.2	.5
		Total	.1	.4	.3	.6	.0	.0	.0	.0	.2	.0	1.4	3.1
	Pot	Pollock, bottom	.0	-	-	.0	.0	.0	-	.0	.0	-	.0	.0
		Pacific cod	.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	.1	.0	.2	.2	.0	.0	.0	.0	.0	.0	.1	.7
		Pollock, pelagic	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.7
		Sablefish	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1
		Pacific cod	2.1	.0	.1	1.9	.1	.0	.0	.8	.1	.3	.5	5.9
		Arrowtooth	.1	.0	.7	2.1	.1	.0	.1	.0	.2	.0	.3	3.7
		Flathead sole	.0	.0	.0	.6	.0	.0	.0	.0	.0	.0	.0	.7
		Rex sole	.0	.0	.0	2.2	.1	.0	.2	.0	.1	.0	.0	2.6
		Flatfish, deep	.0	.0	-	.0	-	.0	.0	-	.0	-	.0	.0
		Flatfish, shallow	.7	.0	1.8	.7	.0	.0	.0	.3	.0	.0	.9	4.3
		Rockfish	.2	.0	.1	.4	.0	.0	.0	.0	.8	1.0	.1	2.5
		Total	3.8	.1	2.9	8.2	.3	.1	.4	1.1	1.3	1.3	1.8	21.2
	All gear	Total	3.8	.5	3.2	8.8	.3	.1	.4	1.1	1.5	1.3	3.4	24.6

Notes: Totals may include additional categories. The target, determined by AFSC staff, is based on processor, week, 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, 2007-08 (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
2007 Gear/ Target	Hook & line	Sablefish	.0	.0	.0	.0	.0	.0	.0	-	.0	.0	-	.1	.2
		Pacific cod	.5	.0	1.5	1.1	.3	.0	.0	.2	.1	.1	.0	8.8	12.7
		Arrowtooth	.0	.0	.0	.0	.0	.0	.0	-	.0	.0	.0	.0	.0
		Turbot	.0	.0	.0	.0	.0	-	.0	-	.0	.1	.0	.1	.3
		Halibut	.0	.0	.0	.0	.0	-	.0	-	-	.0	-	.0	.1
		Total	.5	.0	1.5	1.1	.3	.0	.1	.2	.1	.3	.0	9.0	13.2
	Pot	Sablefish	.0	.0	.0	.1	-	-	.0	-	.0	.0	.0	.0	.2
		Pacific cod	.0	-	.0	.0	.0	.0	.0	.2	.0	.0	.1	.3	.6
		Total	.0	.0	.0	.1	.0	.0	.0	.2	.0	.0	.1	.3	.8
	Trawl	Pollock, bottom	.0	.0	.0	.1	.0	.0	.0	.0	.0	.2	.0	.2	.5
		Pollock, pelagic	.6	.0	.1	.5	1.0	.1	.0	.0	.0	.3	.1	1.2	4.0
		Pacific cod	12.4	.0	.6	1.6	2.4	2.7	.1	.3	.8	.2	.1	3.5	24.6
		Arrowtooth	.3	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1	.5
		Flathead sole	1.3	.0	.0	1.4	1.3	.9	.0	1.1	.6	.0	.0	.9	7.6
		Rock sole	.6	.0	.1	.2	.2	2.7	.0	.6	2.5	.0	.0	1.5	8.4
		Yellowfin	.4	-	.1	.2	.4	2.5	.0	9.4	15.7	.0	.0	3.4	32.0
		Other flatfish	.1	.0	.0	1.0	.0	.0	.0	.0	.2	.0	.0	.2	1.6
		Rockfish	.1	.0	.0	.1	.0	.0	.0	.0	.0	.7	.0	.1	1.1
		Atka mackerel	.1	.0	.1	.4	.0	.1	.0	.0	.0	4.8	1.7	.8	8.0
		Total	16.0	.0	1.0	5.6	5.3	9.1	.1	11.5	19.8	6.2	2.0	11.8	88.4
	All gear	Total	16.5	.1	2.5	6.8	5.6	9.1	.3	12.0	19.8	6.5	2.1	21.1	102.4

Table 8. Continued.

2008 Gear/ Target			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
			Species												
	Hook & line	Sablefish	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	-	.0	.2
		Pacific cod	.9	.0	1.4	1.3	.3	.0	.1	.5	.0	.2	.0	10.5	15.1
		Turbot	.0	.0	.0	.0	.0	.0	.0	-	.0	.0	-	.0	.1
		Halibut	.0	.1	.1	.2	.0	-	.0	.0	.0	.0	.0	1.2	1.6
		Total	.9	.1	1.5	1.5	.3	.0	.1	.5	.0	.2	.0	11.8	17.0
	Pot	Sablefish	.0	.0	.0	.0	-	-	.0	-	.0	.0	.0	.0	.1
		Pacific cod	.0	-	.2	.0	.0	.0	.0	.1	.0	.0	.1	.3	.7
		Total	.0	.0	.2	.0	.0	.0	.0	.1	.0	.0	.1	.3	.8
	Trawl	Pollock, bottom	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.5
		Pollock, pelagic	.2	.0	.0	.2	1.1	.6	.0	.1	.1	.1	.0	1.5	3.9
		Sablefish	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	-	.0	.0
		Pacific cod	1.7	.0	.0	.5	.2	.8	.0	.1	.1	.1	.0	.8	4.3
		Arrowtooth	.2	.0	.0	1.0	.0	.0	.4	.0	.0	.1	.0	.3	2.0
		Flathead sole	1.1	.0	.1	1.1	.2	.2	.0	.2	.3	.0	.0	.9	4.0
		Rock sole	.4	.0	.1	.3	.1	1.8	.0	.7	2.2	.0	.0	1.4	7.0
		Turbot	.0	.0	-	.0	-	.0	.0	-	.0	.0	.0	.0	.0
		Yellowfin	1.5	.0	.4	1.0	.4	1.7	.0	6.0	8.8	.0	.0	3.6	23.4
		Other flatfish	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
		Rockfish	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.1	.3
		Atka mackerel	.0	.0	.0	.0	.0	.0	.1	.0	.0	1.9	1.1	.6	3.7
		Total	5.2	.0	.5	4.3	2.0	5.2	.5	7.0	11.5	2.3	1.1	9.7	49.3
	All gear	Total	6.1	.1	2.2	5.8	2.3	5.2	.7	7.7	11.5	2.5	1.2	21.8	67.1

Notes: Totals may include additional categories. The target, determined by AFSC staff, is based on processor, week, 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, 2007-08 (percent).

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2007 Gear/ Target	Hook & line	Sablefish	32	2	23	84	100	92	100	99	35	100	99	13
		Pacific cod	4	45	1	99	100	100	87	96	49	100	73	11
		Halibut	100	3	25	97	100	-	98	100	19	100	95	33
		Total	6	2	2	89	100	93	98	98	29	100	85	14
	Pot	Pacific cod	22	-	1	95	29	-	-	91	99	99	39	2
		Total	22	-	1	95	29	-	-	91	99	99	39	2
	Trawl	Pollock, bottom	3	1	4	27	5	3	5	25	12	7	39	7
		Pollock, pelagic	1	3	0	12	3	2	0	7	21	98	43	2
		Sablefish	76	0	1	87	71	85	81	99	24	-	91	31
		Pacific cod	42	20	1	62	29	9	32	23	46	25	66	12
		Arrowtooth	26	71	7	18	9	3	36	6	38	9	75	19
		Flathead sole	1	0	10	90	10	2	100	5	57	29	58	49
		Rex sole	1	17	12	92	8	0	100	0	53	11	32	53
		Flatfish, shallow	50	23	38	77	4	7	18	5	61	82	61	30
		Rockfish	38	9	2	79	15	15	38	27	3	30	80	7
		Atka mackerel	-	-	0	-	-	-	-	-	0	40	-	28
		Total	3	16	8	40	10	2	56	7	4	38	59	13
	All gear	Total	3	3	4	41	10	2	60	8	6	39	69	12

Table 9. Continued.

2008 Gear/ Target			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
			Species											
	Hook & line	Sablefish	96	3	1	92	-	100	96	28	20	-	93	10
		Pacific cod	27	87	1	97	99	-	88	99	61	96	65	11
		Halibut	21	8	15	77	16	100	95	91	10	100	54	17
		Total	28	4	2	91	91	100	94	81	17	96	68	11
	Pot	Pollock, bottom	0	-	-	0	0	0	-	0	0	-	0	0
		Pacific cod	18	-	0	100	62	-	100	97	98	99	43	2
		Total	2	-	0	41	18	0	100	97	98	99	43	2
	Trawl	Pollock, bottom	1	20	33	17	4	2	0	5	1	0	55	4
		Pollock, pelagic	2	30	0	6	2	1	0	15	4	0	23	2
		Sablefish	36	0	29	73	36	52	69	100	22	100	35	24
		Pacific cod	74	3	1	68	16	23	63	47	56	100	76	26
		Arrowtooth	19	20	45	11	10	2	64	12	66	63	45	15
		Flathead sole	3	39	16	79	8	2	2	2	45	2	20	41
		Rex sole	4	24	4	88	19	2	97	18	69	100	16	56
		Flatfish, deep	0	0	-	0	-	0	0	-	0	-	0	0
		Flatfish, shallow	58	96	58	53	6	2	1	4	34	82	55	29
		Rockfish	40	10	11	66	20	17	72	7	4	56	82	10
		Total	7	8	14	29	10	3	63	12	6	62	54	15
	All gear	Total	7	4	7	30	10	3	64	12	7	63	58	13

Notes: Totals may include additional categories. The target, determined by AFSC staff, is based on processor, week, 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, 2007-08 (percent).

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2007 Gear/ Target	Hook & line	Sablefish	17	1	37	34	100	100	46	-	100	33	-	95	20
		Pacific cod	15	15	2	80	87	92	27	94	94	72	91	73	13
		Arrowtooth	77	1	28	8	100	100	1	-	100	74	100	77	35
		Turbot	11	8	2	7	98	-	2	-	100	61	100	70	13
		Halibut	0	3	23	98	100	-	76	-	-	42	-	100	33
		Total	15	2	2	66	87	92	8	94	94	61	91	73	13
	Pot	Sablefish	94	3	61	97	-	-	94	-	100	96	100	94	11
		Pacific cod	83	-	0	100	65	100	100	100	100	100	99	82	3
		Total	83	3	0	97	65	100	94	100	100	97	99	83	4
	Trawl	Pollock, bottom	0	10	0	12	3	34	7	0	2	63	22	42	2
		Pollock, pelagic	0	35	1	23	26	26	35	13	12	41	62	50	0
		Pacific cod	71	46	1	76	59	60	62	51	88	77	19	84	27
		Arrowtooth	45	8	0	17	30	17	12	33	13	18	9	64	29
		Flathead sole	39	0	0	76	17	42	27	44	82	31	8	71	35
		Rock sole	20	2	4	70	15	13	39	7	87	22	3	82	20
		Yellowfin	11	-	6	72	20	30	100	9	81	97	85	85	22
		Other flatfish	25	0	2	82	32	32	40	25	21	54	20	94	52
		Rockfish	19	7	3	53	11	43	27	100	48	5	15	97	7
		Atka mackerel	28	0	3	56	45	56	9	68	11	63	3	97	12
		Total	1	7	1	55	28	25	31	10	78	27	3	77	5
	All gear	Total	1	3	1	57	29	25	15	10	78	28	4	75	6

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
2008 Gear/ Target	Hook & line	Sablefish	100	1	38	64	100	100	66	100	17	8	-	98	18
		Pacific cod	16	22	1	78	96	99	81	98	88	74	95	69	13
		Turbot	26	10	3	8	100	100	1	-	16	1	-	80	7
		Halibut	0	36	54	98	100	-	91	0	100	70	100	100	87
		Total	16	10	2	73	96	99	19	98	64	54	95	72	14
	Pot	Sablefish	0	0	4	97	-	-	90	-	100	82	100	100	6
		Pacific cod	90	-	1	100	38	99	100	98	100	100	100	83	4
		Total	90	0	1	97	38	99	90	98	100	93	100	83	4
	Trawl	Pollock, bottom	0	0	0	1	2	3	14	3	0	25	1	27	1
		Pollock, pelagic	0	16	0	18	33	45	28	51	30	55	2	51	0
		Sablefish	0	0	0	18	3	2	5	6	24	0	-	49	8
		Pacific cod	59	0	0	74	65	71	81	19	85	48	11	93	11
		Arrowtooth	20	0	0	8	4	3	35	9	2	23	1	71	12
		Flathead sole	26	0	3	44	1	9	8	4	26	24	61	73	14
		Rock sole	7	7	2	59	6	5	52	5	56	58	72	83	11
		Turbot	0	0	-	0	-	0	0	-	1	0	0	95	2
		Yellowfin	15	100	6	53	7	16	35	5	59	72	73	85	13
		Other flatfish	49	0	5	64	4	1	65	6	2	74	100	72	42
		Rockfish	2	0	0	19	14	32	1	0	8	1	1	82	2
		Atka mackerel	15	1	0	12	1	20	41	57	40	26	2	89	6
		Total	1	0	1	22	8	10	28	5	55	11	2	70	4
	All gear	Total	1	4	1	27	9	10	26	5	55	12	2	71	4

Notes: Totals may include additional categories. The target, determined by AFSC staff, is based on processor, week, 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, 2005-08 (metric tons (t) or number in 1,000s)

Area	Gear	Year	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	2005	623	0	0	0	16	1	14	57
		2006	460	0	0	0	8	4	15	45
		2007	544	-	0	0	8	5	17	44
		2008	769	0	0	0	6	8	27	78
	Pot	2005	6	-	-	-	3	2	124	78
		2006	8	-	-	-	7	48	390	198
		2007	4	-	0	-	25	527	485	620
		2008	7	-	-	-	36	200	835	285
	Trawl	2005	3,546	692	74	709	116	5	1,579	3,292
		2006	3,493	485	87	325	107	11	921	1,010
		2007	3,496	409	129	97	101	9	744	1,836
		2008	2,839	216	23	17	90	31	677	794
	All gear	2005	4,175	692	74	709	135	9	1,716	3,427
		2006	3,961	485	87	325	122	63	1,326	1,253
		2007	4,044	409	130	97	134	541	1,246	2,500
		2008	3,615	216	23	17	132	239	1,539	1,157
Gulf of Alaska	Hook & Line	2005	-	-	-	0	0	0	2	-
		2006	-	-	-	0	-	0	0	0
		2007	-	-	0	0	-	0	0	0
		2008	-	-	-	0	0	0	2	0
	Pot	2005	33	-	-	-	-	-	116	-
		2006	19	-	-	-	-	-	103	0
		2007	19	-	-	-	-	-	292	5
		2008	30	-	-	-	-	-	240	0
	Trawl	2005	2,108	12	31	7	0	-	126	0
		2006	1,984	9	19	4	0	0	307	0
		2007	1,949	20	40	3	-	0	204	2
		2008	1,952	1	16	2	-	0	131	2
	All gear	2005	2,141	12	31	7	0	0	244	0
		2006	2,003	9	19	4	0	0	411	0
		2007	1,968	20	40	4	-	0	497	7
		2008	1,982	1	16	2	0	0	373	2
All Alaska	All gear	2005	6,315	704	106	716	135	9	1,961	3,427
		2006	5,963	494	106	330	123	63	1,737	1,253
		2007	6,012	429	170	101	134	541	1,743	2,507
		2008	5,597	217	39	19	132	239	1,912	1,159

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 bycatch in the Gulf of Alaska by species, gear, and groundfish target fishery, 2007-08 (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)
2007 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	.1	.2	.0	.0	.1
		Pacific cod	n.a.	.0	.0	.0	.1	.0	.0	.0
		Total	n.a.	.0	.0	.1	.3	.0	.0	.1
	Pot	Pacific cod	18.9	.0	.0	.0	292.4	5.0	.0	.0
		Total	18.9	.0	.0	.0	292.4	5.0	.0	.0
	Trawl	Pollock, bottom	79.3	9.3	.0	.0	19.4	.0	8.2	.2
		Pollock, pelagic	.6	10.2	.0	.0	.0	.0	26.8	.7
		Sablefish	4.3	.0	.0	.0	.2	.0	.0	.0
		Pacific cod	474.2	.0	.0	.0	15.8	.0	.6	.1
		Arrowtooth	442.3	.0	.0	.0	44.5	.0	1.5	.7
		Flathd. sole	16.5	.0	.0	.0	.3	.0	.0	.0
		Rex sole	132.2	.0	.0	.0	45.3	.0	.7	.7
		Flat deep	.3	.0	.0	.0	.0	.0	.0	.0
		Flat shallow	707.5	.1	.0	.0	78.8	2.0	.4	.2
		Rockfish	91.7	.0	.0	.1	.2	.0	2.0	.7
		Atka mack.	.0	.0	.0	.0	.0	.0	.0	.0
		Total	1,949.0	19.7	.0	.1	204.4	2.0	40.4	3.5
	All gear	Total	1,967.9	19.7	.0	.2	497.1	7.0	40.4	3.6

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)
2008 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	.1	.0	.0	.0	.2
		Pacific cod	n.a.	.0	.0	.0	1.6	.0	.0	.0
		Total	n.a.	.0	.0	.1	1.6	.0	.0	.2
	Pot	Pacific cod	30.1	.0	.0	.0	240.0	.3	.0	.0
		Total	30.1	.0	.0	.0	240.0	.3	.0	.0
	Trawl	Pollock, bottom	69.4	.0	.0	.0	.3	.0	5.2	.1
		Pollock, pelagic	1.9	.4	.0	.0	.1	.0	5.2	.7
		Sablefish	4.0	.0	.0	.0	.2	.0	.0	.0
		Pacific cod	576.9	.0	.0	.0	18.4	.0	.4	.0
		Arrowtooth	529.0	.0	.0	.0	34.4	.2	2.6	.0
		Flathd. sole	57.6	.0	.0	.0	6.8	.3	.0	.0
		Rex sole	109.3	.0	.0	.0	48.2	.0	.0	.1
		Flat shallow	496.7	.1	.0	.0	23.1	1.2	.2	.6
		Rockfish	107.1	.0	.0	.3	.1	.0	2.3	.5
		Total	1,951.9	.6	.0	.4	131.5	1.7	15.9	2.2
	All gear	Total	1,981.9	.6	.0	.4	373.1	2.0	15.9	2.4

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, calculated by AFSC staff, is based on processor, week, processing mode, NMFS area and gear. The estimates of halibut bycatch 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 bycatch numbers unavailable. 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 13. Prohibited species bycatch in the Bering Sea and Aleutian Islands by species, gear, and groundfish target fishery, 2007-08 (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)
2007 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	1.3	.0	.0	.0	.0
		Pacific cod	537.9	.0	7.6	.7	16.6	43.8	.1	.2
		Arrowtooth	1.1	.0	.0	.4	.0	.0	.0	.0
		Turbot	4.5	.0	.0	2.6	.0	.0	.0	.0
		Rockfish	.1	.0	.0	.0	.0	.0	.0	.0
		Total	544.2	.0	7.7	5.2	16.6	43.9	.1	.2
	Pot	Sablefish	2.9	.0	.0	307.0	.3	.1	.0	.0
		Pacific cod	.8	.0	24.9	220.1	485.1	619.9	.0	.0
		Total	3.7	.0	24.9	527.1	485.4	620.0	.0	.0
	Trawl	Pollock, bottom	29.6	6.7	.0	.0	.6	.3	12.6	3.9
		Pollock, pelagic	263.0	338.3	.0	.0	.9	2.9	109.2	89.7
		Sablefish	.1	.0	.0	.0	.0	.0	.0	.0
		Pacific cod	1,032.2	1.0	1.6	2.6	137.0	250.6	6.3	1.6
		Arrowtooth	24.6	.4	.0	.2	22.8	5.8	.1	.2
		Flathd. sole	306.6	1.9	.9	.0	144.2	267.2	.0	.0
		Rock sole	988.4	5.9	82.7	1.0	99.3	73.4	.9	.8
		Yellowfin	554.0	55.2	15.1	.4	332.4	1,221.7	.2	.1
		Flat, other	74.4	.0	.1	.0	4.6	.0	.0	.0
		Rockfish	17.4	.0	.2	3.0	.0	.1	.0	.0
		Atka mack.	201.0	.0	.4	1.5	.3	.0	.3	.7
		Total	3,497.7	409.4	100.9	8.7	743.7	1,836.5	129.5	97.0
	All gear	Total	4,044.4	409.4	133.5	541.0	1,245.6	2,500.2	129.5	97.2

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)
2008 Gear/ Target	Hook & Line	Pollock, bottom	.2	.0	.0	.0	.0	.0	.0	.0
		Sablefish	n.a.	.0	.0	.2	.0	.0	.0	.0
		Pacific cod	765.8	.3	5.6	7.6	27.1	77.8	.0	.1
		Turbot	1.7	.0	.0	.0	.0	.0	.0	.0
		Total	769.2	.3	5.6	7.8	27.3	77.8	.0	.1
	Pot	Sablefish	1.8	.0	.4	200.3	.0	.2	.0	.0
		Pacific cod	5.5	.0	35.6	.1	834.5	284.6	.0	.0
		Total	7.3	.0	36.0	200.4	834.6	284.8	.0	.0
	Trawl	Pollock, bottom	49.5	3.1	.0	.0	.1	.1	1.7	1.8
		Pollock, pelagic	241.9	127.1	.0	.0	.8	4.9	18.7	13.3
		Sablefish	2.8	.0	.0	.0	.1	.1	.0	.0
		Pacific cod	346.1	.4	1.4	.0	37.6	22.9	2.0	.2
		Arrowtooth	138.7	2.0	.2	3.4	36.0	7.5	.0	.3
		Flathd. sole	236.5	1.2	3.2	1.0	116.8	117.3	.1	.1
		Rock sole	676.9	.5	45.7	.0	104.2	26.0	.1	.7
		Turbot	2.0	.0	.0	.1	.0	.0	.0	.0
		Yellowfin	1,015.0	81.7	37.8	.9	379.8	606.8	.1	.0
		Flat, other	15.1	.0	.0	.1	.7	.1	.0	.0
		Rockfish	44.6	.0	.2	3.3	.0	.0	.0	.0
		Atka mack.	68.5	.0	1.6	21.7	.1	.0	.3	.3
		Total	2,840.2	216.2	90.3	30.6	677.3	803.1	23.0	16.7
	All gear	Total	3,615.3	216.4	131.9	238.8	1,538.7	1,157.0	23.0	16.8

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, calculated by AFSC staff, is based on processor, week, processing mode, NMFS area and gear. The estimates of halibut bycatch 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 bycatch numbers unavailable. This is particularly a problem in the Bering Sea and Aleutian Islands sablefish hook-and-line fishery. Therefore, estimates of halibut bycatch 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 bycatch rates in the Gulf of Alaska by species, gear, and groundfish target fishery, 2007-08 (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)
2007 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	.010	.028	.005	.007	.022
		Pacific cod	n.a.	.000	.000	.000	.019	.000	.000	.000
		Total	n.a.	.000	.000	.005	.023	.002	.003	.011
	Pot	Pacific cod	.001	.000	.000	.000	20.894	.355	.000	.000
		Total	.001	.000	.000	.000	20.894	.355	.000	.000
	Trawl	Pollock, bottom	.005	.001	.000	.000	1.305	.001	.553	.016
		Pollock, pelagic	.000	.000	.000	.000	.001	.000	.697	.019
		Sablefish	.010	.000	.000	.000	.389	.000	.000	.000
		Pacific cod	.034	.000	.000	.000	1.118	.000	.045	.011
		Arrowtooth	.021	.000	.000	.000	2.138	.000	.072	.034
		Flathd. sole	.010	.000	.000	.000	.160	.000	.000	.000
		Rex sole	.022	.000	.000	.000	7.639	.000	.120	.112
		Flat deep	.014	.000	.000	.000	.000	.000	.000	.000
		Flat shallow	.049	.000	.000	.000	5.475	.139	.030	.016
		Rockfish	.004	.000	.000	.005	.007	.000	.085	.030
		Atka mack.	.000	.000	.000	.000	.000	.000	.000	.000
		Total	.014	.000	.000	.001	1.518	.015	.300	.026
	All gear	Total	.012	.000	.000	.001	3.100	.044	.252	.022

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)
2008 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	.022	.002	.001	.000	.067
		Pacific cod	n.a.	.000	.001	.000	.193	.000	.000	.000
		Total	n.a.	.000	.001	.006	.139	.000	.000	.019
	Pot	Pacific cod	.002	.000	.000	.000	19.933	.021	.000	.000
		Total	.002	.000	.000	.000	19.933	.021	.000	.000
	Trawl	Pollock, bottom	.004	.000	.000	.000	.016	.000	.303	.006
		Pollock, pelagic	.000	.000	.000	.000	.002	.000	.158	.022
		Sablefish	.010	.000	.000	.057	.441	.000	.000	.000
		Pacific cod	.025	.000	.000	.000	.802	.000	.019	.001
		Arrowtooth	.021	.000	.000	.000	1.361	.009	.103	.000
		Flathd. sole	.032	.000	.000	.000	3.819	.151	.000	.000
		Rex sole	.023	.000	.000	.000	10.187	.000	.000	.030
		Flat shallow	.033	.000	.000	.000	1.547	.082	.014	.041
		Rockfish	.004	.000	.000	.014	.003	.000	.092	.021
		Total	.013	.000	.000	.003	.908	.012	.110	.015
	All gear	Total	.012	.000	.000	.003	2.213	.012	.094	.014

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, calculated by AFSC staff, is based on processor, week, processing mode, NMFS area and gear. The estimates of halibut bycatch 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 bycatch numbers unavailable. 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 15. Prohibited species bycatch rates in the Bering Sea and Aleutian Islands by species, gear, and groundfish target fishery, 2007-08 (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)
2007 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	2.036	.000	.005	.000	.006
		Pacific cod	.005	.000	.077	.007	.168	.443	.001	.002
		Arrowtooth	.010	.000	.000	3.178	.000	.265	.000	.000
		Turbot	.003	.000	.028	1.485	.005	.012	.000	.008
		Rockfish	.015	.000	.000	.000	.000	.000	.000	.000
		Total	.005	.000	.075	.051	.164	.432	.001	.002
	Pot	Sablefish	.002	.000	.002	185.070	.170	.051	.000	.000
		Pacific cod	.000	.000	1.372	12.109	26.690	34.107	.001	.000
		Total	.000	.000	1.258	26.575	24.472	31.259	.001	.000
	Trawl	Pollock, bottom	.001	.000	.000	.000	.021	.011	.429	.134
		Pollock, pelagic	.000	.000	.000	.000	.001	.002	.083	.068
		Sablefish	.022	.000	.000	.000	.000	.000	.000	.000
		Pacific cod	.011	.000	.018	.028	1.515	2.771	.070	.017
		Arrowtooth	.013	.000	.024	.108	12.330	3.143	.058	.091
		Flathd. sole	.014	.000	.039	.002	6.636	12.295	.000	.000
		Rock sole	.023	.000	1.933	.023	2.324	1.716	.020	.018
		Yellowfin	.004	.000	.102	.003	2.242	8.240	.001	.001
		Flat, other	.024	.000	.016	.000	1.504	.000	.000	.000
		Rockfish	.001	.000	.013	.198	.000	.004	.000	.000
		Atka mack.	.003	.000	.005	.022	.004	.000	.004	.011
		Total	.002	.000	.058	.005	.429	1.059	.075	.056
	All gear	Total	.002	.000	.072	.291	.671	1.347	.070	.052

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)
2008 Gear/ Target	Hook & Line	Pollock, bottom	.027	.000	.000	.000	1.030	.573	.000	.000
		Sablefish	n.a.	.000	.027	.237	.000	.000	.000	.000
		Pacific cod	.007	.000	.048	.065	.231	.664	.000	.001
		Turbot	.002	.000	.002	.003	.019	.020	.000	.025
		Total	.006	.000	.047	.066	.230	.655	.000	.001
	Pot	Sablefish	.002	.000	.377	202.737	.036	.210	.000	.000
		Pacific cod	.000	.000	1.807	.004	42.360	14.445	.000	.000
		Total	.000	.000	1.739	9.685	40.339	13.765	.000	.000
	Trawl	Pollock, bottom	.001	.000	.000	.000	.001	.001	.027	.030
		Pollock, pelagic	.000	.000	.000	.000	.001	.005	.020	.014
		Sablefish	.045	.000	.000	.419	1.646	.823	.000	.000
		Pacific cod	.009	.000	.036	.000	.965	.588	.052	.005
		Arrowtooth	.008	.000	.013	.206	2.156	.446	.000	.016
		Flathd. sole	.008	.000	.113	.037	4.136	4.157	.004	.005
		Rock sole	.010	.000	.694	.000	1.584	.395	.001	.010
		Turbot	.003	.000	.000	.219	.000	.000	.000	.000
		Yellowfin	.006	.000	.206	.005	2.069	3.305	.000	.000
		Flat, other	.061	.000	.193	.209	2.891	.302	.000	.000
		Rockfish	.003	.000	.014	.195	.001	.001	.001	.001
		Atka mack.	.001	.000	.025	.332	.001	.000	.005	.005
		Total	.002	.000	.065	.022	.485	.575	.016	.012
	All gear	Total	.002	.000	.086	.155	1.001	.753	.015	.011

Notes: These estimates include only catches counted against federal TACs. Totals may include additional categories. The target, calculated by AFSC staff, is based on processor, week, processing mode, NMFS area and gear. The estimates of halibut bycatch 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 bycatch numbers unavailable. This is particularly a problem in the Bering Sea and Aleutian Islands sablefish hook-and-line fishery. Therefore, estimates of halibut bycatch 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, 1984-2008 ($ millions, base year = 2008)

	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
1984	187.2	621.1	36.9	35.5	50.5	931.3
1985	188.4	686.5	65.0	66.1	76.5	1,082.4
1986	315.3	696.2	66.2	120.8	114.7	1,313.2
1987	360.7	792.7	69.9	127.9	229.8	1,580.9
1988	380.8	1,203.9	90.5	106.8	391.4	2,173.4
1989	435.6	790.5	29.2	131.7	527.8	1,914.7
1990	532.7	820.1	36.0	130.4	674.3	2,193.5
1991	437.1	435.7	41.5	133.0	678.0	1,725.3
1992	476.3	773.9	38.4	68.2	871.8	2,228.6
1993	456.4	543.4	19.6	74.5	566.4	1,660.3
1994	436.6	576.9	29.4	115.1	676.2	1,834.2
1995	377.2	661.2	52.1	79.3	772.4	1,942.3
1996	229.5	453.8	58.7	97.2	662.2	1,501.4
1997	221.7	319.2	20.5	137.2	754.4	1,453.0
1998	278.6	309.2	13.8	119.9	492.2	1,213.6
1999	340.5	434.0	17.8	146.8	581.6	1,520.7
2000	175.0	302.7	11.8	165.5	738.6	1,393.6
2001	148.0	225.9	12.5	143.0	701.1	1,230.5
2002	175.5	153.2	10.7	152.0	730.4	1,221.9
2003	202.5	194.0	10.3	191.5	707.4	1,305.7
2004	186.7	285.8	15.7	189.1	704.6	1,381.9
2005	172.9	318.4	14.5	184.5	807.7	1,498.0
2006	130.8	290.5	7.9	202.8	862.4	1,494.4
2007	185.5	356.5	15.2	222.9	820.9	1,601.0
2008	251.6	368.2	22.9	209.0	879.9	1,731.6

Note: The value added by at-sea processing is not included in these estimates of ex-vessel value. These estimates include the value of catch from both federal and state of Alaska fisheries. The data have been adjusted to 2008 dollars by applying the GDP implicit price deflators presented in Table 57.

Source: Blend and Catch-Accounting System estimates, CFEC fishtickets, Commercial Operators Annual Reports (COAR), weekly processor reports. 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, 1984-2008.

	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	21.4%	34.7%	1.7%	3.1%	39.1%
1993	27.5%	32.7%	1.2%	4.5%	34.1%
1994	23.8%	31.5%	1.6%	6.3%	36.9%
1995	19.4%	34.0%	2.7%	4.1%	39.8%
1996	15.3%	30.2%	3.9%	6.5%	44.1%
1997	15.3%	22.0%	1.4%	9.4%	51.9%
1998	23.0%	25.5%	1.1%	9.9%	40.6%
1999	22.4%	28.5%	1.2%	9.7%	38.2%
2000	12.6%	21.7%	.8%	11.9%	53.0%
2001	12.0%	18.4%	1.0%	11.6%	57.0%
2002	14.4%	12.5%	.9%	12.4%	59.8%
2003	15.5%	14.9%	.8%	14.7%	54.2%
2004	13.5%	20.7%	1.1%	13.7%	51.0%
2005	11.5%	21.3%	1.0%	12.3%	53.9%
2006	8.8%	19.4%	.5%	13.6%	57.7%
2007	11.6%	22.3%	.9%	13.9%	51.3%
2008	14.5%	21.3%	1.3%	12.1%	50.8%

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, CFEC fishtickets, Commercial Operators Annual Reports (COAR), weekly processor reports. 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, 2004-08 ($/lb, round weight).

		Gulf of Alaska		Bering Sea and Aleutians		All Alaska
		Fixed	Trawl	Fixed	Trawl	All gear
Pollock	2004	.060	.102	-	.106	.106
	2005	.086	.124	.074	.125	.125
	2006	.081	.135	-	.128	.129
	2007	.110	.145	-	.129	.130
	2008	.108	.181	.015	.208	.205
Sablefish	2004	2.123	1.691	1.827	.837	2.056
	2005	2.258	1.708	2.033	.900	2.183
	2006	2.702	2.048	2.302	1.070	2.616
	2007	2.818	1.858	2.236	1.082	2.692
	2008	3.281	2.020	2.934	1.320	3.163
Pacific cod	2004	.267	.251	.254	.219	.245
	2005	.297	.269	.294	.232	.269
	2006	.397	.369	.444	.346	.385
	2007	.487	.494	.463	.427	.464
	2008	.560	.429	.571	.543	.535
Flatfish	2004	-	.085	-	.165	.160
	2005	-	.117	-	.198	.192
	2006	-	.139	.106	.200	.193
	2007	-	.153	-	.189	.185
	2008	.279	.142	-	.173	.170
Rockfish	2004	.755	.159	.737	.153	.178
	2005	.691	.230	.738	.229	.246
	2006	.702	.238	.725	.266	.263
	2007	.713	.186	.626	.223	.214
	2008	.726	.174	.818	.175	.188
Atka mackerel	2004	-	.129	-	.115	.115
	2005	-	.155	-	.119	.120
	2006	-	.134	-	.125	.125
	2007	-	.125	-	.154	.154
	2008	-	.195	-	.170	.170

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 and flatfish in the BSAI and trawl-caught Atka mackerel and rockfish 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, CFEC fish tickets, 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, 2004-08, ($ 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	2004	106.6	17.5	124.2	214.4	289.8	504.3	321.1	307.3	628.4
		2005	120.2	18.6	138.8	245.8	360.0	605.8	366.0	378.6	744.6
		2006	133.1	22.8	155.9	269.1	393.4	662.4	402.1	416.2	818.3
		2007	134.5	24.3	158.9	250.7	389.5	640.1	385.2	413.8	799.0
		2008	156.0	23.9	179.9	282.9	411.4	694.3	438.9	435.3	874.2
	Pollock	2004	12.1	.0	12.2	185.6	149.7	335.3	197.7	149.8	347.5
		2005	21.5	.1	21.6	216.8	175.6	392.4	238.3	175.7	413.9
		2006	19.8	.1	19.9	223.9	185.8	409.6	243.7	185.8	429.5
		2007	13.6	.1	13.7	200.2	169.2	369.4	213.9	169.3	383.2
		2008	18.1	.2	18.3	222.1	144.0	366.1	240.2	144.2	384.4
	Sablefish	2004	60.2	9.1	69.3	1.9	1.9	3.8	62.1	11.0	73.1
		2005	63.4	9.9	73.3	3.6	2.8	6.4	67.0	12.7	79.6
		2006	68.3	9.1	77.4	3.1	3.1	6.2	71.4	12.2	83.6
		2007	64.4	9.9	74.3	1.7	3.2	4.9	66.1	13.1	79.2
		2008	70.5	8.6	79.2	1.2	3.7	4.9	71.8	12.3	84.1
	Pacific cod	2004	27.5	3.8	31.3	25.3	80.4	105.7	52.8	84.2	136.9
		2005	26.7	1.3	28.1	23.6	94.2	117.8	50.3	95.5	145.9
		2006	33.5	4.2	37.7	38.8	115.3	154.1	72.4	119.4	191.8
		2007	44.5	6.8	51.3	44.3	122.0	166.3	88.8	128.8	217.6
		2008	53.8	7.6	61.5	55.6	145.4	201.0	109.4	153.0	262.5
	Flatfish	2004	1.4	.6	2.0	.7	39.3	40.0	2.1	39.9	42.0
		2005	2.7	1.4	4.2	1.2	57.0	58.2	4.0	58.4	62.4
		2006	5.2	2.2	7.4	2.5	60.9	63.4	7.7	63.1	70.8
		2007	6.1	2.1	8.2	3.4	64.7	68.1	9.5	66.8	76.3
		2008	7.1	2.1	9.2	2.9	87.3	90.2	10.0	89.4	99.4
	Rockfish	2004	4.8	3.7	8.6	.2	3.8	4.0	5.0	7.5	12.5
		2005	5.3	5.6	10.9	.3	5.1	5.4	5.6	10.7	16.3
		2006	5.5	6.9	12.4	.4	7.1	7.5	5.9	14.0	19.9
		2007	5.0	5.1	10.1	.4	8.2	8.6	5.4	13.3	18.8
		2008	4.8	4.8	9.5	.5	7.1	7.6	5.3	11.9	17.2
	Atka mackerel	2004	.0	.1	.1	.2	12.2	12.3	.2	12.3	12.5
		2005	.0	.2	.2	.1	15.1	15.3	.1	15.3	15.5
		2006	.0	.1	.1	.2	16.1	16.2	.2	16.2	16.4
		2007	.0	.2	.2	.5	18.7	19.3	.5	19.0	19.5
		2008	.0	.3	.3	.4	20.8	21.3	.4	21.2	21.6

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	2004	27.7	6.7	34.3	203.5	221.1	424.5	231.1	227.7	458.8
		2005	36.4	9.3	45.7	233.1	265.5	498.6	269.6	274.7	544.3
		2006	40.8	11.4	52.3	248.7	287.6	536.4	289.6	299.1	588.6
		2007	40.6	10.2	50.8	232.8	291.6	524.3	273.3	301.8	575.1
		2008	46.7	10.0	56.7	258.5	279.4	537.9	305.2	289.4	594.5
	Pollock	2004	12.1	.0	12.2	185.6	148.7	334.2	197.7	148.7	346.4
		2005	21.5	.1	21.6	216.8	174.7	391.4	238.3	174.7	413.0
		2006	19.8	.1	19.8	223.9	185.1	408.9	243.6	185.1	428.8
		2007	13.6	.1	13.7	200.2	168.4	368.7	213.8	168.5	382.4
		2008	18.1	.1	18.2	222.1	142.7	364.8	240.2	142.8	383.0
	Sablefish	2004	2.6	1.6	4.1	.0	.4	.4	2.6	2.0	4.6
		2005	1.9	1.6	3.5	.0	.7	.7	1.9	2.3	4.2
		2006	2.6	1.5	4.1	.0	.3	.3	2.6	1.8	4.4
		2007	1.9	1.6	3.6	.0	.3	.3	1.9	1.9	3.9
		2008	1.8	1.6	3.3	.0	.7	.7	1.8	2.3	4.1
	Pacific cod	2004	8.3	.7	9.0	16.8	17.4	34.2	25.1	18.2	43.2
		2005	6.1	.5	6.7	14.7	14.0	28.7	20.8	14.5	35.3
		2006	8.9	.9	9.7	21.8	19.5	41.3	30.7	20.3	51.1
		2007	14.8	1.1	15.9	28.2	32.4	60.6	43.0	33.6	76.6
		2008	15.6	1.1	16.7	32.4	21.3	53.7	48.0	22.4	70.5
	Flatfish	2004	1.4	.6	2.0	.7	38.6	39.3	2.1	39.2	41.3
		2005	2.7	1.4	4.2	1.2	56.1	57.3	4.0	57.5	61.4
		2006	5.2	2.2	7.4	2.5	59.8	62.3	7.7	62.0	69.7
		2007	6.1	2.1	8.2	3.4	63.6	67.0	9.5	65.7	75.2
		2008	7.1	2.1	9.2	2.9	86.9	89.8	10.0	89.0	99.0
	Rockfish	2004	3.0	3.5	6.5	.1	3.6	3.7	3.1	7.1	10.3
		2005	3.8	5.3	9.2	.2	4.9	5.1	4.0	10.2	14.2
		2006	4.0	6.7	10.7	.3	6.8	7.1	4.3	13.5	17.8
		2007	3.6	4.9	8.6	.4	7.9	8.3	4.0	12.9	16.9
		2008	3.2	4.6	7.8	.5	6.8	7.3	3.7	11.4	15.1
	Atka mackerel	2004	.0	.1	.1	.2	12.2	12.3	.2	12.3	12.5
		2005	.0	.2	.2	.1	15.1	15.3	.1	15.3	15.5
		2006	.0	.1	.1	.2	16.1	16.2	.2	16.2	16.4
		2007	.0	.2	.2	.5	18.7	19.3	.5	19.0	19.5
		2008	.0	.3	.3	.4	20.8	21.3	.4	21.2	21.6

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	2004	65.0	10.7	75.7	2.4	66.9	69.3	67.4	77.6	145.1
		2005	68.0	9.2	77.2	4.2	92.3	96.5	72.2	101.5	173.7
		2006	73.3	11.4	84.7	4.0	102.6	106.6	77.3	114.0	191.3
		2007	70.9	13.5	84.4	2.6	94.5	97.1	73.5	108.0	181.5
		2008	79.0	13.8	92.8	3.3	127.5	130.8	82.3	141.3	223.6
	Sablefish	2004	57.6	7.5	65.1	1.9	1.5	3.4	59.5	9.0	68.5
		2005	61.5	8.3	69.7	3.6	2.1	5.7	65.0	10.3	75.4
		2006	65.7	7.7	73.3	3.1	2.6	5.7	68.8	10.3	79.0
		2007	62.5	8.2	70.7	1.7	2.5	4.2	64.2	10.7	74.9
		2008	68.8	7.1	75.9	1.2	2.8	4.0	70.0	9.8	79.9
	Pacific cod	2004	5.4	2.9	8.3	.5	61.1	61.6	5.8	64.1	69.9
		2005	4.9	.7	5.6	.5	78.0	78.5	5.4	78.7	84.2
		2006	5.8	3.3	9.1	.8	92.8	93.6	6.6	96.2	102.8
		2007	6.9	4.9	11.8	.8	86.6	87.4	7.7	91.5	99.2
		2008	8.1	6.4	14.5	2.0	119.8	121.8	10.1	126.2	136.3
	Flatfish	2004	-	.0	.0	-	.7	.7	-	.7	.7
		2005	-	.0	.0	-	.9	.9	-	1.0	1.0
		2006	-	.0	.0	-	1.1	1.1	-	1.1	1.1
		2007	-	.0	.0	-	1.1	1.1	-	1.1	1.1
		2008	.0	.0	.0	-	.4	.4	.0	.4	.5
	Rockfish	2004	1.8	.2	2.0	.1	.2	.3	1.9	.4	2.3
		2005	1.5	.2	1.7	.1	.2	.3	1.6	.5	2.0
		2006	1.5	.2	1.8	.1	.3	.4	1.6	.5	2.2
		2007	1.4	.2	1.5	.0	.3	.3	1.4	.5	1.8
		2008	1.5	.2	1.7	.1	.3	.3	1.6	.5	2.0
Pot	Pacific cod	2004	13.9	.2	14.0	8.0	1.8	9.8	21.9	2.0	23.8
		2005	15.7	.1	15.8	8.4	2.2	10.6	24.1	2.3	26.4
		2006	18.8	-	18.8	16.2	2.9	19.1	35.0	2.9	38.0
		2007	22.9	.7	23.5	15.3	3.0	18.3	38.2	3.6	41.8
		2008	30.1	.1	30.3	21.1	4.3	25.4	51.2	4.5	55.7

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, CFEC fish tickets, 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, 1998-2008. ($ millions)

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		<60	60-125	>=125	<60	60-125	>=125	<60	60-125	>=125
Fixed	1998	30.8	19.8	.1	1.0	3.6	.8	31.8	23.4	.9
	1999	40.3	21.8	-	1.0	5.9	2.1	41.2	27.6	2.1
	2000	49.0	27.9	.7	2.0	6.6	3.0	51.0	34.5	3.7
	2001	37.9	18.4	-	3.4	7.6	1.2	41.2	26.0	1.2
	2002	39.5	17.3	-	4.0	6.1	1.2	43.5	23.4	1.2
	2003	50.2	23.8	-	4.0	10.3	1.5	54.2	34.1	1.5
	2004	48.3	24.6	-	3.7	7.9	1.4	52.0	32.6	1.4
	2005	48.7	25.5	-	4.0	9.6	1.1	52.7	35.2	1.1
	2006	55.9	29.3	-	5.9	12.3	2.5	61.8	41.7	2.5
	2007	62.4	28.5	-	5.6	13.0	1.8	68.1	41.5	1.8
	2008	71.4	30.3	-	9.1	15.2	3.0	80.5	45.5	3.0
Trawl	1998	8.0	23.9	3.9	.2	26.2	38.0	8.2	50.1	41.9
	1999	8.5	32.1	2.0	.2	43.1	61.3	8.8	75.1	63.2
	2000	8.7	30.5	-	-	64.5	78.2	8.7	95.0	78.2
	2001	8.5	27.1	-	.3	59.7	82.3	8.8	86.8	82.3
	2002	4.2	18.9	-	1.6	67.3	88.8	5.8	86.2	88.8
	2003	2.6	20.3	-	1.3	59.2	73.3	3.9	79.5	73.3
	2004	4.0	23.1	-	.6	65.0	89.9	4.6	88.1	89.9
	2005	7.0	28.8	-	-	71.4	108.7	7.0	100.3	108.7
	2006	7.2	31.8	-	-	75.1	114.9	7.2	107.0	114.9
	2007	7.7	29.6	-	1.1	72.3	102.3	8.8	101.8	102.3
	2008	10.7	36.0	-	.6	68.1	85.9	11.2	104.0	85.9
All gear	1998	38.8	43.7	4.0	1.2	29.8	38.8	40.0	73.5	42.8
	1999	48.8	53.8	2.0	1.2	48.9	63.4	50.0	102.8	65.4
	2000	57.7	58.4	.7	2.0	71.0	81.2	59.7	129.4	81.9
	2001	46.4	45.5	-	3.6	67.3	83.5	50.0	112.8	83.5
	2002	43.7	36.1	-	5.6	73.5	89.9	49.3	109.6	89.9
	2003	52.7	44.1	-	5.4	69.4	74.8	58.1	113.6	74.8
	2004	52.3	47.8	-	4.3	72.9	91.3	56.6	120.7	91.3
	2005	55.7	54.4	-	4.0	81.1	109.8	59.7	135.5	109.8
	2006	63.2	61.1	-	5.9	87.5	117.4	69.0	148.6	117.4
	2007	70.2	58.0	-	6.8	85.3	104.1	76.9	143.3	104.1
	2008	82.1	66.3	-	9.7	83.3	88.9	91.8	149.6	88.9

Note: These estimates include only catch counted against federal TACs.

Source: CFEC Fishtickets, NMFS permits, CFEC permits. 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, 1998-2008. ($ thousands)

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		<60	60-124	>=125	<60	60-124	>=125	<60	60-124	>=125
Fixed	1998	39	134	16	21	44	39	40	133	40
	1999	51	126	-	26	64	92	52	135	92
	2000	60	170	73	39	73	125	61	175	124
	2001	53	166	-	48	101	82	56	168	82
	2002	62	160	-	62	108	84	67	171	84
	2003	78	231	-	61	146	113	82	235	113
	2004	76	220	-	65	124	98	80	218	98
	2005	83	243	-	69	179	115	88	255	115
	2006	111	282	-	113	242	310	118	318	310
	2007	124	309	-	103	283	228	131	334	228
	2008	128	345	141	145	304	374	138	392	391
Trawl	1998	143	265	177	29	403	1,187	141	451	1,308
	1999	174	396	75	62	567	1,915	175	696	1,976
	2000	178	462	-	-	859	2,443	178	863	2,443
	2001	184	392	-	39	807	2,839	190	796	2,839
	2002	110	331	-	148	922	3,061	142	845	3,061
	2003	85	350	-	103	811	2,618	126	803	2,618
	2004	181	428	-	156	916	3,100	201	938	3,100
	2005	279	554	-	-	1,051	3,881	279	1,102	3,881
	2006	268	636	-	-	1,121	4,105	268	1,175	4,105
	2007	297	616	-	160	1,063	3,653	340	1,184	3,653
	2008	368	818	176	141	1,001	2,961	387	1,196	2,967
All gear	1998	49	190	142	22	214	826	50	271	873
	1999	61	224	75	30	298	1,153	62	348	1,188
	2000	71	268	73	39	433	1,449	71	440	1,321
	2001	64	263	-	47	452	1,942	66	439	1,942
	2002	67	229	-	75	565	2,092	75	472	2,092
	2003	81	281	-	69	486	1,824	86	473	1,824
	2004	82	293	-	72	544	2,123	86	505	2,123
	2005	94	358	-	69	670	2,890	98	607	2,890
	2006	124	419	-	113	748	3,355	130	698	3,355
	2007	138	424	-	109	754	2,892	147	696	2,892
	2008	145	510	158	144	712	2,402	156	748	2,411

Note: These estimates include only catch counted against federal TACs.

Source: CFEC Fishtickets, NMFS permits, CFEC permits. 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, 2004-08, ($ millions).

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		Alaska	Other	Unknown	Alaska	Other	Unknown	Alaska	Other	Unknown
All groundfish	2004	61.9	62.3	.0	15.1	489.2	.0	76.9	551.5	.0
	2005	65.6	73.2	.0	12.3	593.5	.0	78.0	666.6	.0
	2006	73.9	81.9	.0	14.7	647.6	.1	88.6	729.5	.1
	2007	79.1	79.8	.0	14.8	625.3	.0	93.9	705.1	.0
	2008	87.7	92.1	.0	22.1	672.2	.0	109.8	764.4	.0
Pollock	2004	4.6	7.6	.0	3.1	332.1	.0	7.7	339.8	.0
	2005	8.1	13.5	.0	3.4	389.0	.0	11.5	402.4	.0
	2006	7.5	12.4	.0	1.8	407.8	.1	9.3	420.2	.1
	2007	5.2	8.5	.0	2.1	367.3	.0	7.3	375.8	.0
	2008	6.8	11.4	.0	2.4	363.8	.0	9.2	375.2	.0
Sablefish	2004	35.2	34.0	.0	1.3	2.6	.0	36.5	36.6	.0
	2005	35.6	37.6	.0	1.5	4.9	.0	37.2	42.5	.0
	2006	38.2	39.2	.0	1.5	4.7	.0	39.7	43.9	.0
	2007	36.9	37.3	.0	1.2	3.7	.0	38.1	41.0	.0
	2008	41.5	37.7	.0	1.8	3.1	.0	43.3	40.8	.0
Pacific cod	2004	18.7	12.6	.0	9.2	96.4	.0	27.9	109.1	.0
	2005	18.4	9.7	.0	7.3	110.5	.0	25.7	120.2	.0
	2006	23.8	13.9	.0	11.3	142.7	.1	35.2	156.6	.1
	2007	33.0	18.3	.0	11.4	154.9	.0	44.4	173.2	.0
	2008	34.8	26.6	.0	17.8	183.2	.0	52.6	209.8	.0
Flatfish	2004	.7	1.3	.0	1.0	38.9	.0	1.7	40.3	.0
	2005	.9	3.3	.0	.0	58.2	.0	.9	61.4	.0
	2006	1.6	5.8	.0	.0	63.4	.0	1.6	69.2	.0
	2007	1.9	6.3	.0	.0	68.0	.0	1.9	74.4	.0
	2008	2.1	7.1	.0	.0	90.2	.0	2.1	97.3	.0
Rockfish	2004	2.4	6.2	.0	.1	3.9	.0	2.5	10.0	.0
	2005	2.4	8.5	.0	.0	5.3	.0	2.5	13.8	.0
	2006	2.4	10.0	.0	.0	7.5	.0	2.5	17.4	.0
	2007	1.6	8.5	.0	.0	8.6	.0	1.7	17.1	.0
	2008	1.7	7.9	.0	.1	7.5	.0	1.7	15.4	.0
Atka mackerel	2004	.0	.1	.0	.2	12.1	.0	.2	12.2	.0
	2005	.0	.2	.0	.0	15.3	.0	.0	15.5	.0
	2006	.0	.1	.0	.0	16.2	.0	.0	16.3	.0
	2007	.0	.2	.0	.0	19.3	.0	.0	19.5	.0
	2008	.0	.3	.0	.0	21.3	.0	.0	21.6	.0

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. 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.

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, 2002-08. ($ millions)

	2002	2003	2004	2005	2006	2007	2008
Bering Sea Pollock	174.7	173.3	166.1	191.1	199.8	178.3	224.2
AK Peninsula/Aleutians	28.2	34.9	29.5	34.1	46.5	52.4	50.7
Kodiak	40.5	27.0	28.7	40.5	50.0	56.1	66.8
South Central	18.1	24.3	23.9	24.1	24.3	22.1	23.3
Southeastern	29.6	34.7	35.1	32.9	32.8	30.0	36.2
TOTAL	291.2	294.1	283.2	322.7	353.4	338.8	401.2

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, 2002-08. (percent)

	2002	2003	2004	2005	2006	2007	2008
Bering Sea Pollock	77.9	75.1	74.3	76.7	79.9	71.7	71.4
AK Peninsula/Aleutians	22.3	21.3	16.2	16.6	22.1	22.3	17.2
Kodiak	56.3	41.5	39.4	39.9	44.0	41.5	43.7
South Central	19.4	21.0	17.5	15.0	16.2	12.6	12.7
Southeastern	22.3	24.1	18.6	18.2	16.1	14.1	15.1
TOTAL	44.4	40.4	34.6	35.2	37.1	32.9	33.1

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, 2004-08 (1,000 metric tons product weight and million dollars).

		2004		2005		2006		2007		2008	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Pollock	Whole fish	3.79	$2.9	1.53	$1.3	1.06	$.7	1.18	$.7	.92	$.7
	Head & gut	18.28	$17.9	21.08	$23.4	22.42	$27.8	31.23	$45.3	24.34	$42.1
	Roe	26.37	$345.7	25.47	$346.2	30.17	$293.5	29.91	$258.5	20.46	$242.7
	Deep-skin fill.	46.87	$120.9	40.40	$111.0	53.96	$155.7	66.93	$203.8	48.06	$174.3
	Other fillets	115.60	$242.7	116.05	$287.5	120.01	$326.4	105.40	$288.1	77.82	$294.1
	Surimi	187.14	$290.5	200.35	$425.7	182.31	$372.0	161.11	$351.6	125.97	$567.9
	Minced fish	19.84	$25.8	17.41	$24.7	29.55	$52.4	26.33	$43.5	14.80	$29.5
	Fish meal	56.24	$43.4	65.46	$48.8	54.66	$58.5	39.16	$41.9	35.72	$45.4
	Other products	18.52	$11.3	25.64	$15.7	25.58	$21.2	15.79	$15.2	15.60	$16.8
	All products	492.65	$1,101.0	513.39	$1,284.3	519.72	$1,308.3	477.05	$1,248.7	363.68	$1,413.6
Pacific cod	Whole fish	2.34	$2.5	2.05	$2.6	1.12	$1.8	1.28	$2.5	2.15	$2.9
	Head & gut	92.54	$220.7	83.22	$242.6	81.06	$288.4	81.86	$326.9	80.27	$327.2
	Salted/split	-	-	-	-	.98	$3.9	-	-	-	-
	Fillets	9.13	$42.2	9.99	$57.7	12.59	$87.9	7.35	$59.0	8.09	$70.1
	Other products	12.46	$27.4	12.71	$28.6	13.54	$31.0	12.85	$31.1	16.48	$32.9
	All products	116.48	$292.7	107.97	$331.5	109.29	$413.1	103.33	$419.5	107.00	$433.1
Sablefish	Head & gut	11.05	$93.7	10.85	$98.1	10.69	$109.5	10.08	$106.4	9.03	$111.5
	Other products	.21	$1.1	.38	$3.6	.54	$4.4	.55	$3.4	.87	$7.2
	All products	11.27	$94.8	11.23	$101.7	11.22	$113.8	10.63	$109.9	9.90	$118.7

Table 25. Continued.

		2004		2005		2006		2007		2008	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Flatfish	Whole fish	14.08	$14.3	23.67	$30.5	25.74	$33.3	26.53	$34.9	18.36	$23.9
	Head & gut	56.29	$78.8	66.94	$112.1	73.35	$121.7	74.72	$119.8	118.03	$171.4
	Kirimi	1.81	$2.5	1.62	$1.7	-	-	-	-	-	-
	Fillets	.97	$2.8	.43	$2.3	.74	$3.6	.87	$4.2	1.10	$5.0
	Other products	1.43	$1.7	1.14	$1.5	1.54	$1.5	2.16	$3.1	1.66	$2.7
	All products	74.58	$100.1	93.80	$148.0	101.38	$160.2	104.28	$162.0	139.15	$202.9
Rockfish	Whole fish	2.37	$2.9	2.16	$4.2	2.82	$5.5	1.56	$4.6	1.57	$3.3
	Head & gut	10.77	$18.2	11.31	$27.2	14.79	$40.6	15.77	$34.5	18.06	$34.1
	Other products	1.40	$4.1	.83	$2.8	.50	$2.7	1.25	$6.6	.94	$4.5
	All products	14.53	$25.1	14.31	$34.2	18.12	$48.8	18.59	$45.8	20.57	$41.9
Atka mackerel	Whole fish	5.00	$3.1	.89	$.6	2.57	$2.1	-	-	2.89	$2.0
	Head & gut	24.90	$26.0	32.99	$36.0	32.74	$36.6	32.67	$44.9	30.04	$46.9
	All products	29.90	$29.1	33.88	$36.5	35.31	$38.8	32.68	$44.9	32.93	$48.9
All species	Total	762.60	$1,675.6	793.70	$1,972.8	804.31	$2,096.3	758.40	$2,062.1	688.37	$2,301.1

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, 2004-08 (dollars).

		2004		2005		2006		2007		2008	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Pollock	Whole fish	$.34	$.38	$.39	$.29	$.28	$.28	$.28	$.28	$.27	$.39
	H&G	$.45	$.44	$.53	$.44	$.58	$.54	$.67	$.62	$.78	$.79
	Roe	$6.68	$4.91	$6.77	$5.42	$5.09	$3.62	$4.61	$3.07	$6.16	$4.35
	Deep-skin	$1.21	$1.04	$1.25	-	$1.35	$1.22	$1.46	$1.25	$1.76	$1.50
	Other fillets	$.97	$.94	$1.12	$1.12	$1.25	$1.22	$1.25	$1.23	$1.78	$1.65
	Surimi	$.75	$.66	$1.03	$.90	$1.01	$.84	$1.08	$.88	$2.28	$1.79
	Minced fish	$.59	-	$.64	-	$.82	$.77	$.77	$.70	$.90	-
	Fish meal	$.37	$.33	$.38	$.32	$.52	$.46	$.53	$.44	$.65	$.52
	Other products	$.17	$.29	$.48	$.25	-	$.38	$.56	$.42	$.62	$.44
	All products	$1.16	$.87	$1.28	$1.00	$1.28	$1.00	$1.29	$1.06	$1.93	$1.56
Pacific cod	Whole fish	$.43	$.54	$.56	$.58	$.65	$.79	$.66	$.92	$.56	$.67
	H&G	$1.09	$1.04	$1.29	$1.50	$1.67	$1.38	$1.86	$1.64	$1.91	$1.65
	Salted/split	-	-	-	-	-	$1.82	-	-	-	-
	Roe	$.86	$1.03	$1.11	$1.10	$1.63	$1.58	$1.53	$1.52	$1.24	$1.43
	Fillets	$2.20	$2.13	$2.07	$2.72	$3.36	$3.12	$3.67	$3.63	$4.12	$3.88
	Other products	$1.11	$.74	$1.36	$.74	$.89	$.78	$1.06	$.82	$.98	$.65
	All products	$1.09	$1.26	$1.30	$1.65	$1.69	$1.76	$1.86	$1.81	$1.89	$1.73
Sablefish	H&G	$3.41	$3.93	$3.75	$4.18	$4.19	$4.72	$4.37	$4.87	$5.16	$5.68
	Other products	$1.63	$2.63	$1.70	$4.72	$1.52	$3.72	$1.39	$3.00	$1.58	$3.99
	All products	$3.35	$3.91	$3.68	$4.20	$4.18	$4.67	$4.26	$4.77	$4.98	$5.52
Deep-water flatfish	H&G	-	-	$.31	-	-	$.65	$.69	$.48	-	$.60
	Fillets	-	-	-	$1.97	-	-	-	-	-	-
	All products	-	-	$.31	$1.97	-	$.65	$.69	$.48	-	$.60

Table 26. Continued.

		2004		2005		2006		2007		2008	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Shallow-water flatfish	Whole fish	-	$.56	-	$.50	-	$.47	-	$.56	-	$.55
	H&G	$.54	-	$.75	-	$.78	$.63	$.66	$.69	$.60	$.58
	Fillets	-	$2.10	-	$2.46	-	$2.21	-	$2.19	-	$1.62
	Other products	$.88	-	$1.23	-	$1.41	-	$1.25	-	$1.29	-
	All products	$.55	$1.21	$.76	$.98	$.90	$1.01	$.77	$.75	$.64	$.79
Other flatfish	Whole fish	$.97	-	$1.15	-	$1.08	-	$.99	-	$1.05	-
	H&G	$.43	-	$.67	-	$.48	-	$.71	-	$.43	-
	Other products	$.32	-	$.26	-	$.29	-	$.42	-	$.11	-
	All products	$.92	-	$1.09	-	$.86	-	$.85	-	$.53	-
Arrowtooth	H&G	$.54	-	$.72	$.63	$.57	$.47	$.51	$.45	$.61	$.46
	Fillets	-	$.72	-	-	-	-	-	-	-	-
	Other products	$.32	$.48	$.25	-	$.29	-	$.37	-	$.15	-
	All products	$.54	$.60	$.72	$.63	$.57	$.47	$.51	$.45	$.61	$.46
Flathead sole	Whole fish	-	-	$.53	$.38	$.35	$.35	$.39	$.68	$.42	$.46
	H&G	$.68	-	$.87	$.49	$.87	-	$.89	$.55	$.79	$.63
	Fillets	-	$2.16	-	$2.56	-	-	-	$2.36	-	$2.59
	Other products	$.83	-	$.99	-	$1.25	-	$.83	-	$.96	-
	All products	$.73	$2.16	$.87	$.91	$.99	$.35	$.88	$1.22	$.80	$1.23
Rock sole	Whole fish	-	-	$.50	-	$.45	-	$.42	-	$.41	-
	H&G	$.52	-	$.76	-	$.72	-	$.74	-	$.62	-
	H&G with roe	$1.04	-	$1.19	-	$1.53	-	$1.24	-	$1.23	-
	Other products	$.46	-	$.25	-	$.29	-	$.27	-	$.05	-
	All products	$.84	-	$.95	-	$.96	-	$.86	-	$.76	-

Table 26. Continued.

		2004		2005		2006		2007		2008	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Rex sole	Whole fish	$1.03	$.50	$1.19	$.75	$1.06	$1.07	$.99	$1.24	$1.01	$.94
	H&G	-	-	-	-	-	-	$.80	-	-	-
	All products	$1.03	$.50	$1.19	$.75	$1.06	$1.07	$.99	$1.24	$1.01	$.94
Yellowfin sole	Whole fish	$.35	-	$.49	-	$.51	-	$.51	-	$.51	-
	H&G	$.47	-	$.65	-	$.66	-	$.69	-	$.61	-
	Kirimi	$.63	-	$.48	-	-	-	-	-	-	-
	Other products	$.35	-	$.35	-	$.39	-	$.56	-	$.70	-
	All products	$.45	-	$.59	-	$.61	-	$.63	-	$.59	-
Greenland turbot	H&G	$1.46	-	$1.83	-	$1.74	-	$1.34	-	$1.44	-
	Other products	$.77	-	$.99	-	$1.05	-	$1.32	-	$1.51	-
	All products	$1.29	-	$1.60	-	$1.71	-	$1.34	-	$1.46	-
Rockfish	Whole fish	$.69	$.47	$1.24	$.72	$1.02	$.84	$1.31	$1.37	$1.53	$.76
	H&G	$.75	$.88	$1.11	$.96	$1.24	$1.27	$1.00	$.91	$.85	$.93
	Other products	$.75	$1.33	$.84	$1.55	$.37	$2.56	$.55	$2.56	$1.12	$2.17
	All products	$.75	$.88	$1.12	$.99	$1.22	$1.22	$1.01	$1.48	$.86	$1.13
Atka mackerel	Whole fish	$.28	-	$.29	-	$.38	-	-	-	$.32	-
	H&G	$.47	-	$.49	-	$.51	-	$.62	-	$.71	-
	Other products	$.32	-	$.16	-	$.29	-	$.37	-	$.05	-
	All products	$.44	-	$.49	-	$.50	-	$.62	-	$.67	-

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, 2004-08, (dollars).

		Bering Sea and Aleutians					Gulf of Alaska				
		2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
Motherships	Pacific cod	1,046	1,142	1,741	1,947	1,930	-	-	-	-	-
	Pollock	594	443	711	776	1,380	-	-	-	-	-
Catcher/ processors	Atka mackerel	603	630	657	805	848	370	558	908	402	919
	Flatfish	844	986	981	897	788	1,364	1,263	1,202	1,076	1,004
	Other species	364	334	321	498	408	484	576	449	1,023	1,184
	Pacific cod	1,172	1,388	1,755	2,044	2,061	1,202	1,277	1,762	1,945	2,298
	Pollock	816	961	916	1,007	1,533	346	396	394	607	650
	Rockfish	795	1,213	1,472	1,174	966	869	1,263	1,342	1,055	989
	Sablefish	5,091	4,618	5,605	6,338	6,984	4,944	5,117	5,795	6,064	7,308
Shoreside processors	Flatfish	-	141	-	-	-	521	684	703	771	745
	Other species	1,534	401	753	606	335	584	619	549	1,283	1,272
	Pacific cod	959	1,332	1,412	1,663	1,765	1,247	1,371	2,083	2,001	2,073
	Pollock	681	815	798	792	1,214	752	866	1,011	1,164	1,346
	Rockfish	664	1,082	1,435	822	765	768	988	1,580	1,356	1,244
	Sablefish	5,881	5,298	7,346	7,311	9,646	5,231	6,315	8,003	7,888	8,840

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, 2004-08 (1,000 metric tons product weight).

		Bering Sea and Aleutians					Gulf of Alaska				
		2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
Pollock	Whole fish	3.54	1.41	.59	.54	.19	.25	.13	.47	.64	.74
	Head & gut	11.07	14.40	15.05	23.54	18.56	7.21	6.68	7.37	7.69	5.78
	Roe	25.37	23.90	28.41	27.88	19.29	1.00	1.56	1.76	2.04	1.17
	Fillets	156.52	148.56	164.97	166.28	121.73	5.94	7.89	8.99	6.04	4.15
	Surimi	179.97	191.45	174.37	154.83	120.37	7.17	8.91	7.94	6.29	5.60
	Minced fish	19.84	17.41	29.55	26.33	14.80	-	-	-	-	-
	Fish meal	56.24	65.46	54.66	39.16	35.72	-	-	-	-	-
	Other products	17.72	23.85	23.38	14.76	14.15	.81	1.79	2.20	1.03	1.45
Pacific cod	Whole fish	1.54	1.15	.56	.23	1.14	.80	.90	.56	1.04	1.01
	Head & gut	82.28	76.85	73.59	71.87	68.25	10.26	6.38	7.46	9.98	12.02
	Fillets	3.74	4.28	4.48	1.64	1.65	6.52	5.89	8.13	6.00	6.45
	Other products	6.27	7.51	7.24	6.91	9.48	5.06	5.02	6.28	5.65	6.76
Sablefish	Head & gut	1.30	1.50	1.53	1.54	1.34	9.76	9.35	9.16	8.54	7.69
	Other products	.01	.01	.01	.02	.02	.21	.38	.53	.53	.85
Flatfish	Whole fish	12.02	20.60	20.78	21.45	14.03	2.05	3.08	4.96	5.09	4.33
	Head & gut	54.93	60.72	64.12	66.35	108.99	1.37	6.22	9.23	8.37	9.04
	Kirimi	1.81	1.62	-	-	-	-	-	-	-	-
	Fillets	-	-	-	-	-	1.01	.43	.74	.92	1.10
	Other products	.83	1.14	1.28	1.92	1.66	.55	-	.26	-	-
Rockfish	Whole fish	.33	.40	.43	.26	.14	2.04	1.76	2.39	1.30	1.43
	Head & gut	5.00	4.63	6.01	7.69	9.55	5.76	6.68	8.78	8.08	8.51
	Other products	.02	.02	.03	.09	.01	1.38	.82	.48	1.16	.93
Atka mackerel	Whole fish	5.00	.89	2.57	-	2.89	-	-	-	-	-
	Head & gut	24.75	32.74	32.39	32.38	29.63	.15	.25	.35	.30	.41

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 report and commercial operators annual report. 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, 2004-08 (1,000 metric tons product weight).

		At-sea					On-shore				
		2004	2005	2006	2007	2008	2004	2005	2006	2007	2008
Pollock	Whole fish	3.55	1.41	.59	.54	.19	.24	.13	.47	.64	.74
	Head & gut	11.18	14.48	15.16	22.21	17.42	7.10	6.59	7.26	9.02	6.92
	Roe	15.43	13.99	16.34	16.52	11.65	10.95	11.47	13.83	13.40	8.81
	Fillets	82.10	82.71	89.71	89.25	68.00	80.37	73.74	84.26	83.07	57.88
	Surimi	93.33	98.56	92.99	89.87	64.93	93.81	101.79	89.32	71.24	61.04
	Minced fish	19.84	17.41	20.45	19.62	14.80	-	-	9.10	6.71	-
	Fish meal	22.10	21.36	21.43	19.70	15.35	34.13	44.10	33.24	19.46	20.37
	Other products	2.00	2.56	-	2.00	4.30	16.52	23.08	25.58	13.78	11.30
Pacific cod	Whole fish	1.23	.85	.56	.23	1.14	1.11	1.20	.56	1.04	1.01
	Head & gut	76.13	70.85	65.81	62.93	61.00	16.41	12.37	15.24	18.93	19.27
	Fillets	1.46	1.59	2.54	1.64	1.65	8.80	8.58	10.07	6.00	6.45
	Other products	4.17	5.24	4.25	4.70	4.37	7.16	7.29	9.28	7.86	11.88
Sablefish	Head & gut	1.87	1.88	1.58	1.65	1.40	9.18	8.97	9.11	8.43	7.63
	Other products	.06	.07	.01	.06	.07	.15	.32	.53	.49	.80
Flatfish	Whole fish	13.11	22.31	23.26	23.52	16.01	.97	1.37	2.49	3.02	2.35
	Head & gut	56.29	63.35	67.37	69.22	112.31	-	3.60	5.98	5.50	5.72
	Kirimi	1.81	1.62	-	-	-	-	-	-	-	-
	Fillets	-	-	-	-	-	1.01	.43	.74	.92	1.10
	Other products	.83	1.14	1.28	1.92	1.66	.55	-	.26	-	-
Rockfish	Whole fish	.90	.67	.72	.64	.38	1.47	1.50	2.10	.92	1.19
	Head & gut	9.67	9.59	12.09	13.79	15.49	1.09	1.71	2.70	1.99	2.57
	Other products	.03	.03	.03	.10	.01	1.37	.81	.48	1.15	.93
Atka mackerel	Whole fish	5.00	.89	2.57	-	2.89	-	-	-	-	-
	Head & gut	24.90	32.99	32.74	32.67	30.04	-	-	-	-	-
	Other products	.00	.00	.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 report and commercial operators annual report. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 30. Production and gross value of non-groundfish products in the commercial fisheries of Alaska by species group and area of processing, 2003-08 (1,000 metric tons product weight and millions of dollars).

		Bering Sea & Aleutians		Gulf of Alaska		All Alaska	
		Quantity	Value	Quantity	Value	Quantity	Value
2003	Salmon	46.0	135.6	175.8	441.8	221.8	577.4
	Halibut	4.3	31.2	15.0	123.9	19.3	155.1
	Herring	19.9	21.0	6.7	11.4	26.6	32.4
	Crab	12.3	174.2	3.7	48.1	16.0	222.3
	Other	.1	.8	3.7	14.0	3.9	14.8
	Total	82.6	362.7	204.9	639.2	287.6	1,001.9
2004	Salmon	50.1	202.7	181.0	524.4	231.1	727.1
	Halibut	3.4	27.8	17.8	148.7	21.2	176.5
	Herring	16.9	18.7	11.5	19.5	28.4	38.2
	Crab	11.4	158.4	4.0	50.1	15.4	208.5
	Other	11.7	16.3	3.5	16.8	15.1	33.2
	Total	93.5	423.9	217.7	759.6	311.2	1,183.5
2005	Salmon	57.4	256.9	194.7	584.6	252.1	841.5
	Halibut	3.0	29.2	18.7	171.1	21.8	200.3
	Herring	19.8	23.0	12.6	19.6	32.5	42.6
	Crab	12.6	158.3	4.2	46.1	16.9	204.3
	Other	1.2	.4	2.2	19.4	3.5	19.8
	Total	94.1	467.8	232.6	840.8	326.7	1,308.5
2006	Salmon	61.1	280.3	159.3	587.1	220.3	867.3
	Halibut	2.5	29.8	16.6	185.5	19.1	215.3
	Herring	21.2	19.8	11.8	13.9	33.0	33.7
	Crab	15.0	131.1	6.6	65.7	21.6	196.8
	Other	.2	1.0	1.9	20.0	2.0	21.0
	Total	99.9	462.0	196.2	872.1	296.1	1,334.1
2007	Salmon	64.1	310.9	207.6	739.0	271.7	1,049.9
	Halibut	2.9	36.8	15.5	193.5	18.3	230.2
	Herring	10.8	14.2	14.4	24.8	25.2	39.0
	Crab	15.6	193.9	4.3	51.8	19.9	245.7
	Other	.1	.5	1.4	17.9	1.6	18.4
	Total	93.5	556.3	243.2	1,026.9	336.7	1,583.2
2008	Salmon	54.8	315.8	154.6	756.5	209.4	1,072.3
	Halibut	2.9	33.5	16.2	199.5	19.1	233.0
	Herring	17.5	19.7	16.8	33.4	34.3	53.1
	Crab	20.0	252.9	4.7	58.3	24.8	311.2
	Other	.2	.8	2.9	16.1	3.1	16.9
	Total	95.4	622.7	195.3	1,063.7	290.6	1,686.5

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

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, 2001-08 ($ millions).

	Gulf of Alaska		Bering Sea and Aleutians			All Alaska
	At-sea	Shoreside	Motherships	Catcher/ processors	Shoreside	Total
2001	31.0	176.9	101.8	774.9	432.6	1,517.2
2002	36.5	170.4	99.0	711.2	466.5	1,483.7
2003	39.5	180.5	90.1	773.6	471.5	1,555.2
2004	32.2	195.1	99.0	863.5	485.7	1,675.6
2005	37.6	225.2	119.2	998.8	592.0	1,972.8
2006	47.7	274.4	126.1	1,063.9	584.2	2,096.3
2007	46.8	259.1	127.8	1,096.2	532.2	2,062.1
2008	47.7	290.1	143.6	1,220.8	599.0	2,301.1

Note: These estimates include the product value of catch from both federal and state of Alaska fisheries. Catcher/processors that at times during a year act like motherships are classified as catcher/processors for the entire year. For shoreside processors the area represents the location of the plant, not necessarily the area of the catch.

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, 2002-08 ($ millions).

		Gulf of Alaska		Bering Sea and Aleutians		
		Vessel length		Vessel length		
		<125	>=125	<125	125-165	>165
Fixed Gear	2002	11.3	5.5	20.1	51.7	38.4
	2003	9.2	6.0	27.0	69.0	45.4
	2004	9.4	5.6	27.8	70.9	43.6
	2005	7.9	4.0	33.4	87.7	54.2
	2006	9.6	6.0	43.6	88.4	58.5
	2007	15.6	4.5	47.3	84.2	55.1
	2008	12.3	8.1	65.4	92.0	60.6
Fillet Trawl	2002	-	-	-	-	97.6
	2003	-	-	-	-	82.7
	2004	-	-	-	-	122.2
	2005	-	-	-	-	133.2
	2006	-	-	-	-	115.3
H&G Trawl	2002	5.6	14.1	26.3	25.8	93.8
	2003	7.9	16.2	27.9	25.0	96.0
	2004	4.1	13.0	28.4	36.4	117.3
	2005	8.0	17.7	30.0	41.6	153.4
	2006	9.7	22.0	45.0	39.1	158.6
	2007	8.2	17.6	52.5	43.3	173.9
	2008	9.4	17.1	53.5	50.2	187.3
Surimi Trawl	2002	-	-	-	-	357.5
	2003	-	-	-	-	400.6
	2004	-	-	-	-	417.1
	2005	-	-	-	-	465.4
	2006	-	-	-	-	515.6
	2007	-	-	-	-	634.6
	2008	-	-	-	-	655.8
All Trawl	2002	5.6	14.1	26.3	25.8	549.0
	2003	7.9	16.2	27.9	25.0	579.3
	2004	4.1	13.0	28.4	36.4	656.5
	2005	8.0	17.7	30.0	41.6	752.0
	2006	9.7	22.0	45.0	39.1	789.5
	2007	8.2	17.6	52.5	43.3	808.5
	2008	9.4	17.1	53.5	50.2	843.0

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 2002-08 ($ millions).

		Gulf of Alaska		Bering Sea and Aleutians		
		<125	>=125	<125	125-165	>165
Fixed Gear	2002	.9	.5	1.4	2.6	3.0
	2003	.8	.4	2.1	3.6	4.1
	2004	.9	.6	2.5	3.5	4.0
	2005	.8	.4	3.0	4.4	4.9
	2006	1.0	.5	3.6	4.7	4.9
	2007	1.2	.5	3.6	5.0	5.0
	2008	.9	.7	3.8	5.7	5.5
Fillet Trawl	2002	-	-	-	-	19.5
	2003	-	-	-	-	20.7
	2004	-	-	-	-	24.4
	2005	-	-	-	-	26.6
	2006	-	-	-	-	28.8
H&G Trawl	2002	1.4	1.2	3.8	6.5	8.5
	2003	1.1	1.2	4.0	6.2	8.7
	2004	1.0	1.1	4.1	7.3	10.7
	2005	2.0	1.6	5.0	8.3	13.9
	2006	1.6	2.2	6.4	9.8	14.4
	2007	1.6	1.8	7.5	10.8	15.8
	2008	2.4	1.7	7.6	12.5	17.0
Surimi Trawl	2002	-	-	-	-	29.8
	2003	-	-	-	-	30.8
	2004	-	-	-	-	34.8
	2005	-	-	-	-	38.8
	2006	-	-	-	-	39.7
	2007	-	-	-	-	39.7
	2008	-	-	-	-	43.7
All Trawl	2002	1.4	1.2	3.8	6.5	19.6
	2003	1.1	1.2	4.0	6.2	20.7
	2004	1.0	1.1	4.1	7.3	23.4
	2005	2.0	1.6	5.0	8.3	26.9
	2006	1.6	2.2	6.4	9.8	28.2
	2007	1.6	1.8	7.5	10.8	29.9
	2008	2.4	1.7	7.6	12.5	32.4

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 34. Gross product value of groundfish processed by shoreside processors by processor group, 2002-08. ($ millions)

	2002	2003	2004	2005	2006	2007	2008
Bering Sea Pollock	450.5	454.3	468.0	557.8	553.8	490.8	573.4
AK Peninsula/Aleutians	61.8	67.9	65.6	90.8	115.6	111.8	102.6
Kodiak	58.9	53.4	67.0	88.9	109.1	118.0	131.1
South Central	24.4	29.8	27.7	33.8	41.2	33.6	37.8
Southeastern	41.0	46.6	52.6	45.9	38.9	37.2	44.2
TOTAL	636.5	652.0	680.9	817.2	858.6	791.3	889.1

Table 35. Groundfish gross product value as a percentage of all-species gross product value by shoreside processor group, 2002-08. (percent)

	2002	2003	2004	2005	2006	2007	2008
Bering Sea Pollock	87.3	86.0	86.3	88.3	89.3	83.7	83.9
AK Peninsula/Aleutians	25.6	22.4	18.6	20.8	24.8	22.0	19.3
Kodiak	48.1	40.1	41.5	39.9	43.4	40.9	45.5
South Central	12.2	15.2	12.1	11.8	15.3	9.4	10.0
Southeastern	14.5	16.2	14.6	14.2	10.5	9.2	10.6
TOTAL	46.1	44.3	40.4	42.0	42.3	36.0	37.8

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, 2004-08.

		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
2004	All gear	0	26	26	7	66	73	7	66	73
	Hook & line	0	13	13	0	28	28	0	28	28
	Pot	0	0	0	0	2	2	0	2	2
	Trawl	0	13	13	7	37	44	7	37	44
2005	All gear	0	27	27	12	70	82	12	70	82
	Hook & line	0	14	14	0	32	32	0	32	32
	Pot	0	0	0	0	2	2	0	2	2
	Trawl	0	13	13	12	37	49	12	37	49
2006	All gear	0	34	34	15	73	88	15	74	89
	Hook & line	0	19	19	0	34	34	0	34	34
	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	74	86	12	75	87
	Hook & line	0	20	20	0	34	34	0	34	34
	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	10	73	83	11	74	85
	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	6	38	44	6	39	45

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, 2004-08.

		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
2004	All gear	919	9	928	233	16	249	1,055	17	1,072
	Hook & line	748	5	753	50	12	62	771	13	784
	Pot	149	1	150	79	2	81	200	2	202
	Trawl	77	3	80	109	3	112	147	3	150
2005	All gear	847	8	855	215	11	226	973	13	986
	Hook & line	679	4	683	56	8	64	703	9	712
	Pot	151	1	152	71	1	72	200	1	201
	Trawl	78	3	81	97	2	99	139	3	142
2006	All gear	710	5	715	199	9	208	833	10	843
	Hook & line	538	4	542	46	6	52	558	7	565
	Pot	145	0	145	69	2	71	194	2	196
	Trawl	74	1	75	93	1	94	138	1	139
2007	All gear	649	3	652	206	6	212	770	8	778
	Hook & line	474	2	476	36	4	40	488	5	493
	Pot	137	1	138	69	2	71	183	3	186
	Trawl	75	0	75	103	0	103	139	0	139
2008	All gear	697	5	702	204	11	215	823	12	835
	Hook & line	520	4	524	46	7	53	544	8	552
	Pot	142	0	142	62	3	65	181	3	184
	Trawl	73	1	74	103	2	105	144	2	146

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 $4.0 million ex-vessel value or product value of groundfish and other species, by area, vessel type, and gear, 2004-08. ($ 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
2004	All gear	-	7.87	7.87	5.24	14.11	13.25	5.24	14.11	13.25
	Hook & line	-	5.24	5.24	-	5.05	5.05	-	5.05	5.05
	Trawl	-	10.49	10.49	5.24	20.97	18.47	5.24	20.97	18.47
2005	All gear	-	9.46	9.46	5.79	15.31	13.90	5.79	15.31	13.90
	Hook & line	-	5.79	5.79	-	5.54	5.54	-	5.54	5.54
	Trawl	-	13.43	13.43	5.79	23.76	19.36	5.79	23.76	19.36
2006	All gear	-	8.31	8.31	5.39	15.73	13.95	5.39	15.57	13.84
	Hook & line	-	5.92	5.92	-	5.93	5.93	-	5.93	5.93
	Trawl	-	11.35	11.35	5.39	24.50	19.09	5.39	23.98	18.81
2007	All gear	-	8.66	8.66	5.05	16.04	14.60	5.05	15.89	14.49
	Hook & line	-	6.36	6.36	-	6.04	6.04	-	6.04	6.04
	Trawl	-	11.73	11.73	5.05	24.76	20.42	5.05	24.26	20.12
2008	All gear	4.36	11.31	10.52	4.84	18.17	16.53	4.79	17.98	16.23
	Hook & line	-	7.41	7.41	-	6.98	6.98	-	6.98	6.98
	Pot	4.36	-	4.36	4.36	-	4.36	4.35	-	4.35
	Trawl	-	16.71	16.71	5.17	27.89	24.79	5.17	27.29	24.34

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 $4.0 million ex-vessel value or product value of groundfish and other species, by area, vessel type and gear, 2004-08. ($ 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
2004	All gear	.37	2.67	.38	1.17	2.75	1.25	.50	2.68	.52
	Hook & line	.33	2.67	.34	.56	2.75	.99	.32	2.68	.36
	Pot	.46	-	.46	.83	-	.83	.56	-	.56
	Trawl	.86	-	.86	1.69	-	1.69	1.42	-	1.42
2005	All gear	.42	2.38	.43	1.31	2.96	1.37	.56	2.86	.58
	Hook & line	.35	2.38	.36	.52	2.96	.82	.34	2.86	.38
	Pot	.53	-	.53	1.08	-	1.08	.69	-	.69
	Trawl	1.00	-	1.00	1.88	-	1.88	1.56	-	1.56
2006	All gear	.53	2.93	.54	1.44	3.34	1.50	.67	3.14	.70
	Hook & line	.45	2.93	.47	.78	3.34	1.07	.45	3.14	.48
	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	.64	-	.64	1.53	2.27	1.55	.81	2.27	.81
	Hook & line	.54	-	.54	.70	2.27	.86	.53	2.27	.54
	Pot	.76	-	.76	1.41	-	1.41	.95	-	.95
	Trawl	1.27	-	1.27	1.91	-	1.91	1.68	-	1.68
2008	All gear	.60	1.52	.60	1.49	2.65	1.53	.75	2.60	.77
	Hook & line	.49	1.52	.49	.58	2.65	.85	.48	2.60	.51
	Pot	.85	-	.85	1.70	-	1.70	1.04	-	1.04
	Trawl	1.27	-	1.27	1.71	-	1.71	1.55	-	1.55

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, 2002-08.

		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	2002	685	24,997	122	16,167	721	33,245
	2003	825	29,903	109	14,441	869	36,102
	2004	766	27,128	90	13,896	812	34,603
	2005	697	25,805	96	14,032	744	33,217
	2006	561	24,040	86	13,951	599	30,663
	2007	496	21,283	74	12,513	527	27,060
	2008	542	21,653	86	13,073	585	28,068
Pot	2002	134	7,986	68	9,214	179	14,578
	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	9,532	203	16,586
	2006	145	8,870	75	9,038	200	15,676
	2007	138	8,311	73	8,545	188	15,128
	2008	147	8,903	72	8,621	193	14,966
Trawl	2002	125	16,657	166	52,648	234	57,189
	2003	114	17,617	161	52,291	209	55,840
	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	90	12,811	153	51,836	190	54,712
	2008	87	13,937	149	51,877	191	55,203
All gear	2002	872	45,508	352	77,837	1,059	100,775
	2003	1,014	51,686	346	76,939	1,204	103,180
	2004	954	47,714	322	76,922	1,145	103,050
	2005	882	46,031	308	74,608	1,068	100,330
	2006	749	43,343	296	73,103	932	96,995
	2007	687	40,048	298	72,710	865	94,263
	2008	738	42,047	298	72,782	920	94,762

Note: These estimates include only vessels fishing federal TACs. Registered net tons totals exclude mainly smaller vessels for which data were unavailable. The percent of vessels missing are: 2002 - 4%, 2003 - 3%, 2004 - 2%, 2005 - 2%, 2006 - 2%, 2007 - 1%, 2008 - 2%.

Source: Blend estimates, Catch Accounting System, fish tickets, Norpac 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, 2004-08.

			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	2004	919	35	954	240	82	322	1,062	83	1,145
		2005	847	35	882	227	81	308	985	83	1,068
		2006	710	39	749	214	82	296	848	84	932
		2007	649	38	687	218	80	298	782	83	865
		2008	701	37	738	214	84	298	834	86	920
Hook & Line	Sablefish	2004	347	13	360	26	6	32	359	15	374
		2005	344	16	360	26	11	37	353	18	371
		2006	354	12	366	23	10	33	361	15	376
		2007	312	14	326	20	10	30	319	17	336
		2008	299	11	310	17	10	27	308	16	324
	Pacific cod	2004	296	11	307	27	39	66	310	39	349
		2005	255	6	261	35	39	74	278	39	317
		2006	174	15	189	29	39	68	195	39	234
		2007	185	14	199	23	38	61	198	38	236
		2008	255	18	273	36	39	75	275	41	316
	Flatfish	2004	2	0	2	0	13	13	2	13	15
		2005	0	2	2	0	12	12	0	14	14
		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	6	6	0	6	6
	Rockfish	2004	239	1	240	2	2	4	241	3	244
		2005	183	0	183	1	3	4	183	3	186
		2006	98	1	99	1	3	4	98	4	102
		2007	38	0	38	1	2	3	39	2	41
		2008	29	1	30	0	0	0	29	1	30
	All groundfish	2004	748	18	766	50	40	90	771	41	812
		2005	679	18	697	56	40	96	703	41	744
		2006	538	23	561	46	40	86	558	41	599
		2007	474	22	496	36	38	74	488	39	527
		2008	520	22	542	46	40	86	544	41	585
Pot	Pacific cod	2004	149	1	150	72	3	75	193	3	196
		2005	151	1	152	60	2	62	190	2	192
		2006	143	0	143	65	4	69	188	4	192
		2007	137	1	138	64	3	67	179	4	183
		2008	145	1	146	58	6	64	177	7	184

Table 41. 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
Trawl	Pollock	2004	68	0	68	93	19	112	139	19	158
		2005	66	0	66	90	22	112	135	22	157
		2006	65	0	65	90	19	109	136	19	155
		2007	62	0	62	91	20	111	131	20	151
		2008	61	0	61	89	17	106	130	17	147
	Sablefish	2004	0	2	2	0	3	3	0	5	5
		2005	1	0	1	0	1	1	1	1	2
		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
	Pacific cod	2004	62	6	68	78	21	99	118	21	139
		2005	66	4	70	64	19	83	111	20	131
		2006	58	3	61	57	19	76	107	19	126
		2007	60	2	62	64	24	88	109	24	133
		2008	64	3	67	66	14	80	113	14	127
	Flatfish	2004	29	8	37	2	27	29	31	27	58
		2005	27	8	35	1	27	28	27	28	55
		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
	Rockfish	2004	32	13	45	1	10	11	32	16	48
		2005	25	10	35	0	6	6	25	13	38
		2006	25	11	36	0	8	8	25	16	41
		2007	27	7	34	2	8	10	29	13	42
		2008	28	11	39	4	12	16	31	15	46
	Atka mackerel	2004	0	0	0	1	19	20	1	19	20
		2005	0	0	0	0	19	19	0	19	19
		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
	All groundfish	2004	77	16	93	116	40	156	154	40	194
		2005	78	16	94	109	39	148	151	40	191
		2006	74	16	90	108	39	147	153	40	193
		2007	75	15	90	114	39	153	150	40	190
		2008	73	14	87	109	40	149	150	41	191

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, Norpac 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, 2004-08 (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	2004	658	90	0	40	10	0	677	94	0
		2005	600	79	0	47	9	0	620	83	0
		2006	465	73	0	39	7	0	481	77	0
		2007	415	59	0	31	5	0	428	60	0
		2008	461	59	0	42	4	0	484	60	0
	Pot	2004	105	43	1	11	51	17	108	75	17
		2005	108	41	2	15	43	13	113	74	13
		2006	103	40	2	18	42	10	117	68	10
		2007	100	36	1	19	40	11	105	68	11
		2008	109	33	4	18	38	10	116	60	10
	Trawl	2004	23	54	0	8	82	26	25	103	26
		2005	27	51	0	6	78	25	27	99	25
		2006	26	48	0	5	78	25	28	100	25
		2007	26	49	0	8	80	26	27	97	26
		2008	27	44	2	5	77	27	27	96	27

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	2004	45	75	-	48	78	-	45	75	-
		2005	45	75	-	48	78	-	45	75	-
		2006	46	74	-	50	77	-	46	74	-
		2007	46	72	-	47	72	-	46	72	-
		2008	45	72	-	47	76	-	45	72	-
	Pot	2004	52	95	126	57	102	134	52	99	134
		2005	53	95	127	53	104	132	52	98	132
		2006	53	94	134	53	103	131	53	98	131
		2007	54	92	133	53	104	128	53	97	128
		2008	53	92	131	55	105	129	53	97	129
	Trawl	2004	58	91	-	58	106	158	58	101	158
		2005	58	91	-	58	106	158	58	101	158
		2006	57	92	-	49	106	158	56	101	158
		2007	58	95	-	58	106	158	58	102	158
		2008	58	92	137	58	106	157	58	102	157

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	2004	24	68	-	31	87	-	24	69	-
		2005	25	71	-	30	89	-	25	71	-
		2006	27	72	-	30	95	-	26	74	-
		2007	28	64	-	28	77	-	27	65	-
		2008	26	63	-	28	91	-	26	64	-
	Pot	2004	39	105	134	53	124	160	39	117	160
		2005	40	110	133	46	125	164	39	117	164
		2006	39	113	147	45	120	159	39	116	159
		2007	43	104	97	46	127	135	43	117	135
		2008	44	103	140	53	125	135	44	114	135
	Trawl	2004	66	96	-	68	119	241	66	114	241
		2005	62	98	-	64	118	238	62	113	238
		2006	60	100	-	41	119	238	58	113	238
		2007	62	100	-	64	118	233	62	114	233
		2008	64	103	204	68	119	235	64	115	235

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

Source: Catch Accounting System, ADFG fish tickets, Norpac, 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), 2004-08 (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	2004	14	7	89	74	151	117	70	136
		2005	13	3	78	70	127	111	64	134
		2006	11	2	56	48	98	75	58	117
		2007	7	4	45	35	91	72	48	113
		2008	15	5	53	55	91	77	54	111
	Bering Sea and Aleutian Islands	2004	2	0	7	3	3	4	3	18
		2005	2	0	7	2	7	3	5	21
		2006	0	0	6	1	4	2	5	21
		2007	0	1	4	2	8	2	3	11
		2008	1	0	7	6	3	3	5	17
	All Alaska	2004	16	7	94	76	152	119	72	141
		2005	15	3	84	72	128	114	66	138
		2006	11	2	62	49	99	76	60	122
		2007	7	5	47	37	93	73	50	116
		2008	15	5	58	60	93	77	56	120

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, Norpac, 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, 2004-08.

			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	2004	9	2	7	0	0	10	19	11	0	0	11	19	11	0	0
		2005	9	4	5	0	0	10	19	11	0	0	11	19	11	0	0
		2006	10	7	6	0	0	11	18	11	0	0	12	18	11	0	0
		2007	12	4	6	0	0	12	16	10	0	0	13	16	10	0	0
		2008	13	4	5	0	0	15	15	10	0	0	16	15	10	0	0
	Pot	2004	1	0	0	0	0	1	2	1	0	0	1	2	1	0	0
		2005	1	0	0	0	0	1	1	1	0	0	1	1	1	0	0
		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
	Trawl	2004	4	2	8	1	1	7	5	10	3	15	7	5	10	3	15
		2005	4	2	8	1	1	6	5	10	3	15	7	5	10	3	15
		2006	6	2	7	1	0	7	4	10	3	15	8	4	10	3	15
		2007	5	3	6	1	0	7	4	10	3	15	8	4	10	3	15
		2008	4	1	7	1	1	8	4	10	3	15	9	4	10	3	15

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	2004	103	162	175	-	-	112	145	178	-	-	107	145	178	-	-
		2005	103	154	175	-	-	112	145	178	-	-	107	145	178	-	-
		2006	112	145	180	-	-	119	146	178	-	-	114	146	178	-	-
		2007	114	145	176	-	-	119	145	178	-	-	114	145	178	-	-
		2008	106	146	176	-	-	112	146	178	-	-	108	146	178	-	-
	Pot	2004	76	-	-	-	-	76	165	174	-	-	76	165	174	-	-
		2005	76	-	-	-	-	76	165	174	-	-	76	165	174	-	-
		2006	-	-	-	-	-	104	165	170	-	-	104	165	170	-	-
		2007	76	-	-	-	-	104	165	166	-	-	90	165	166	-	-
		2008	-	165	-	-	-	107	165	166	-	-	107	165	166	-	-
	Trawl	2004	111	146	207	238	295	116	148	207	245	303	116	148	207	245	303
		2005	111	146	207	238	295	118	148	207	245	303	116	148	207	245	303
		2006	115	150	203	238	-	117	152	207	245	303	116	152	207	245	303
		2007	112	150	204	238	-	117	152	207	245	303	116	152	207	245	303
		2008	109	160	212	238	295	115	152	207	245	303	114	152	207	245	303

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	2004	133	263	513	-	-	134	296	442	-	-	136	296	442	-	-
		2005	140	269	583	-	-	134	296	442	-	-	136	296	442	-	-
		2006	146	295	476	-	-	145	314	440	-	-	146	314	440	-	-
		2007	146	285	526	-	-	141	319	446	-	-	142	319	446	-	-
		2008	129	358	562	-	-	138	333	446	-	-	139	333	446	-	-
	Pot	2004	134	-	-	-	-	134	464	414	-	-	134	464	414	-	-
		2005	134	-	-	-	-	134	793	414	-	-	134	793	414	-	-
		2006	-	-	-	-	-	111	464	303	-	-	111	464	303	-	-
		2007	134	-	-	-	-	111	793	192	-	-	123	793	192	-	-
		2008	-	135	-	-	-	145	793	192	-	-	145	464	192	-	-
	Trawl	2004	125	256	702	611	1085	144	181	724	1156	1590	144	181	724	1156	1590
		2005	125	256	702	611	1085	153	181	724	1156	1590	144	181	724	1156	1590
		2006	146	255	718	611	-	150	194	724	985	1590	143	194	724	985	1590
		2007	126	214	733	611	-	150	194	724	985	1590	143	194	724	985	1590
		2008	129	380	670	611	1085	151	194	724	985	1590	144	194	724	985	1590

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, 2002-08.

		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	2002	150	301	234	24	37	61	150	305	266
	2003	310	291	224	22	28	59	311	303	255
	2004	270	272	224	12	26	52	277	278	257
	2005	239	255	203	17	25	54	249	259	236
	2006	156	206	199	11	23	52	161	213	225
	2007	107	176	213	11	19	44	112	180	235
	2008	138	204	200	9	24	53	141	217	227
Pot	2002	7	19	108	2	5	61	8	22	149
	2003	41	19	81	3	11	74	41	27	134
	2004	35	18	97	1	10	72	31	24	149
	2005	40	22	90	6	5	63	43	27	133
	2006	41	14	90	4	13	58	45	25	130
	2007	23	21	94	3	4	66	20	22	146
	2008	23	32	92	3	5	64	24	28	141
Trawl	2002	1	11	113	0	3	163	1	9	224
	2003	4	3	107	0	1	160	1	3	205
	2004	0	0	93	2	2	152	0	2	192
	2005	0	4	90	0	1	147	0	2	189
	2006	0	0	90	0	2	145	0	0	193
	2007	0	2	88	0	1	152	0	0	190
	2008	0	1	86	0	3	146	0	0	191
All gear	2002	146	309	417	24	44	284	145	314	600
	2003	327	292	395	21	37	288	324	310	570
	2004	283	281	390	14	35	273	285	290	570
	2005	255	264	363	17	29	262	265	268	535
	2006	177	209	363	12	32	252	183	222	527
	2007	120	190	377	14	24	260	122	193	550
	2008	155	228	355	10	28	260	160	231	529

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

Source: Blend estimates, Catch Accounting System, fish tickets, Norpac 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, 2004-08.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Alaska	Other	Unk.	Alaska	Other	Unk.	Alaska	Other	Unk.
All Gear	All groundfish	2004	749	204	1	90	230	2	784	358	3
		2005	698	184	0	97	211	0	734	334	0
		2006	574	172	3	83	209	4	613	312	7
		2007	530	156	1	87	210	1	564	299	2
		2008	576	159	3	90	208	0	611	306	3
Hook & Line	Sablefish	2004	270	90	0	20	12	0	282	92	0
		2005	270	90	0	21	16	0	279	92	0
		2006	276	87	3	14	19	0	282	91	3
		2007	245	80	1	13	17	0	252	83	1
		2008	238	72	0	14	13	0	246	78	0
	Pacific cod	2004	266	41	0	25	39	2	281	66	2
		2005	231	30	0	38	36	0	258	59	0
		2006	158	31	0	34	34	0	183	51	0
		2007	175	24	0	28	33	0	190	46	0
		2008	237	33	3	36	39	0	256	57	3
	Flatfish	2004	1	1	0	4	9	0	5	10	0
		2005	1	1	0	2	10	0	3	11	0
		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	6	0	0	6	0
	Rockfish	2004	204	36	0	3	1	0	207	37	0
		2005	158	25	0	1	3	0	159	27	0
		2006	87	12	0	0	4	0	87	15	0
		2007	34	4	0	1	2	0	35	6	0
		2008	25	5	0	0	0	0	25	5	0
	All groundfish	2004	629	137	0	42	46	2	652	158	2
		2005	573	124	0	51	45	0	597	147	0
		2006	447	111	3	43	43	0	470	126	3
		2007	399	96	1	35	39	0	415	111	1
		2008	442	97	3	45	41	0	465	117	3
Pot	Pacific cod	2004	129	20	1	31	44	0	139	56	1
		2005	139	13	0	29	33	0	149	43	0
		2006	127	16	0	33	35	1	146	45	1
		2007	126	12	0	29	38	0	139	44	0
		2008	126	20	0	26	38	0	136	48	0
	All groundfish	2004	129	20	1	34	49	0	142	61	1
		2005	139	13	0	35	39	0	154	49	0
		2006	129	16	0	36	38	1	151	48	1
		2007	126	12	0	33	40	0	142	46	0
		2008	126	21	0	31	41	0	141	52	0

Table 46. Continued.

			Gulf of Alaska		Bering Sea and Aleutians			All Alaska		
			Alaska	Other	Alaska	Other	Unk.	Alaska	Other	Unk.
Trawl	Pollock	2004	33	35	9	103	0	35	123	0
		2005	31	35	9	103	0	33	124	0
		2006	28	37	8	98	3	30	122	3
		2007	27	35	8	102	1	28	122	1
		2008	28	33	8	98	0	29	118	0
	Sablefish	2004	0	2	1	2	0	1	4	0
		2005	0	1	0	1	0	0	2	0
		2006	0	1	0	0	0	0	1	0
		2007	6	8	1	0	0	7	8	0
		2008	5	8	1	2	0	6	10	0
	Pacific cod	2004	35	33	15	84	0	40	99	0
		2005	37	33	15	68	0	42	89	0
		2006	33	28	7	69	0	38	88	0
		2007	35	27	12	76	0	41	92	0
		2008	36	31	14	66	0	40	87	0
	Flatfish	2004	15	22	3	26	0	16	42	0
		2005	12	23	3	25	0	12	43	0
		2006	14	25	3	29	0	15	46	0
		2007	13	28	4	30	0	13	48	0
		2008	16	23	4	33	0	18	52	0
	Rockfish	2004	17	28	1	10	0	17	31	0
		2005	14	21	0	6	0	14	24	0
		2006	14	22	0	8	0	14	27	0
		2007	13	21	2	8	0	15	27	0
		2008	14	25	5	11	0	18	28	0
	Atka mackerel	2004	0	0	3	17	0	3	17	0
		2005	0	0	2	17	0	2	17	0
		2006	0	0	2	19	0	2	19	0
		2007	0	1	2	16	0	2	16	0
		2008	0	0	2	9	0	2	9	0
	All groundfish	2004	41	52	19	137	0	46	148	0
		2005	43	51	19	129	0	47	144	0
		2006	38	52	14	130	3	43	147	3
		2007	39	51	20	132	1	43	146	1
		2008	38	49	19	130	0	43	148	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, Norpac 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, 2004-08.

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Gulf of Alaska	Catcher-vessels (excluding C/Ps)	Hook & line	2004	124	64	168	240	250	134	163	114	150	130	49	5	748
			2005	93	45	132	262	185	140	123	112	143	121	45	25	679
			2006	67	67	72	162	199	154	118	88	157	110	39	37	538
			2007	61	77	94	99	179	159	77	79	125	91	72	50	474
			2008	75	79	115	137	188	145	102	102	141	73	34	9	520
		Pot	2004	86	114	58	5	5	0	0	0	29	23	21	6	149
			2005	57	110	54	10	6	0	0	0	40	29	13	15	151
			2006	57	84	112	78	3	0	1	0	15	16	22	27	145
			2007	71	89	84	57	9	0	0	0	20	25	19	26	137
			2008	85	89	98	30	0	0	0	0	25	28	26	5	146
		Trawl	2004	60	42	52	27	10	9	32	51	56	45	0	0	77
			2005	58	53	55	22	10	5	25	31	53	45	0	0	78
			2006	57	54	68	27	9	5	25	26	44	44	8	0	74
			2007	51	51	61	22	20	17	21	26	36	35	16	2	75
			2008	40	50	61	37	22	11	19	34	40	42	21	4	73
		All gear	2004	256	211	270	272	264	143	195	165	232	194	70	11	919
			2005	201	196	232	294	201	145	147	143	235	190	56	37	847
			2006	169	196	232	264	211	159	142	114	215	168	69	64	710
			2007	174	205	227	178	208	176	98	105	181	149	106	78	649
			2008	197	212	264	201	210	156	121	136	205	142	81	18	701
	Catcher/ Processors	Hook & line	2004	8	2	9	10	9	5	3	2	5	5	1	0	18
			2005	2	2	10	14	4	3	3	2	5	2	1	2	18
			2006	1	8	10	10	7	2	3	2	2	13	13	0	23
			2007	0	9	12	9	5	4	3	2	2	5	1	4	22
			2008	1	14	15	9	4	2	2	3	4	4	0	0	22
		Pot	2004	1	1	0	0	0	0	0	0	0	0	1	1	1
			2005	1	1	0	0	0	0	0	0	0	0	0	0	1
			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
		Trawl	2004	1	1	4	6	4	2	15	2	6	0	0	0	16
			2005	0	2	7	5	4	2	15	2	5	0	0	0	16
			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
		All gear	2004	10	4	13	16	13	7	18	4	11	5	2	1	35
			2005	3	5	17	19	8	5	18	4	10	2	1	2	35
			2006	1	11	12	15	10	3	15	7	9	17	13	0	39
			2007	2	14	19	11	13	5	11	13	6	8	2	4	38
			2008	3	18	20	15	6	2	15	6	6	8	1	0	37

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	2004	0	8	10	14	17	20	19	12	7	6	5	2	50
			2005	3	5	10	17	12	14	24	6	13	8	9	5	56
			2006	4	6	8	11	18	14	17	12	12	9	7	5	46
			2007	3	6	6	3	8	9	14	10	8	6	3	1	36
			2008	5	8	10	2	10	14	11	22	12	6	2	1	46
		Pot	2004	22	55	8	16	18	7	7	5	29	24	8	0	79
			2005	23	44	9	15	6	2	5	5	21	24	6	3	71
			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	8	14	7	14	7	7	4	25	28	9	1	66
		Trawl	2004	77	101	106	44	1	41	72	83	79	55	7	0	116
			2005	81	101	96	39	1	50	73	71	59	49	0	0	109
			2006	83	100	98	44	1	50	67	68	66	57	5	0	108
			2007	89	102	105	49	3	52	69	78	73	60	36	0	114
			2008	87	101	104	50	3	59	68	62	61	30	5	0	109
		All gear	2004	99	163	123	74	36	68	98	100	115	85	20	2	240
			2005	106	149	115	70	19	66	101	81	93	81	14	6	227
			2006	124	142	114	65	29	67	87	85	103	96	23	13	214
			2007	141	116	126	56	24	70	90	94	108	79	43	1	218
			2008	135	116	128	59	27	80	86	87	98	64	16	2	214
	Catcher/ Processors	Hook & line	2004	34	37	37	13	11	8	16	38	38	39	38	37	40
			2005	38	39	14	7	5	7	17	38	39	38	38	38	40
			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	7	13	38	38	37	34	17	40
		Pot	2004	2	2	3	0	1	0	0	0	1	1	1	0	4
			2005	1	1	2	2	1	0	0	0	1	1	1	0	3
			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
		Trawl	2004	38	39	39	24	23	32	37	31	32	18	3	0	40
			2005	38	39	38	25	22	27	37	36	24	18	3	0	39
			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
		All gear	2004	74	78	78	37	34	40	53	69	71	58	42	37	82
			2005	77	79	54	34	27	34	54	74	64	57	42	38	81
			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	31	45	73	76	69	54	20	84

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	2004	124	71	177	252	265	152	178	125	157	133	53	7	771
			2005	96	47	141	276	196	153	143	117	154	126	53	27	703
			2006	71	71	78	171	212	165	128	98	165	115	45	40	558
			2007	63	82	96	102	187	166	88	88	131	94	73	51	488
			2008	80	83	124	139	195	159	112	123	150	79	36	10	544
		Pot	2004	107	157	66	21	23	7	7	5	54	43	29	6	200
			2005	80	148	63	24	12	2	5	5	57	51	19	18	200
			2006	93	114	120	92	14	4	6	5	39	46	33	35	195
			2007	116	95	95	62	22	9	7	6	45	37	23	26	184
			2008	115	94	107	37	14	7	7	4	50	55	34	6	186
		Trawl	2004	136	139	141	70	11	49	91	122	126	97	7	0	154
			2005	137	146	137	61	11	55	90	102	111	94	0	0	151
			2006	136	147	148	68	10	55	85	94	109	100	13	0	153
			2007	139	149	148	69	23	64	84	103	105	93	52	2	150
			2008	127	145	147	83	25	69	83	95	97	72	26	4	150
		All gear	2004	353	357	375	343	297	208	276	252	334	269	89	13	1,062
			2005	305	328	332	360	219	210	236	223	321	265	69	40	985
			2006	287	322	325	322	235	223	215	197	312	259	91	75	848
			2007	309	314	327	232	232	239	179	197	281	222	147	79	782
			2008	319	315	368	255	234	235	202	221	296	205	96	20	834
	Catcher/ Processors	Hook & line	2004	36	37	38	19	16	13	18	38	39	40	39	37	41
			2005	39	39	21	17	9	10	19	39	40	40	39	38	41
			2006	38	39	22	14	11	7	21	39	41	40	16	14	41
			2007	36	36	20	12	8	14	15	36	39	36	4	19	39
			2008	37	37	23	13	6	9	15	39	41	40	34	17	41
		Pot	2004	2	2	3	0	1	0	0	0	1	1	2	1	4
			2005	2	2	2	2	1	0	0	0	1	1	1	0	3
			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
		Trawl	2004	39	39	39	26	23	32	38	32	34	18	3	0	40
			2005	38	40	40	26	23	28	38	38	28	18	3	0	40
			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
		All gear	2004	77	78	79	45	39	45	56	70	74	59	44	38	83
			2005	79	81	63	45	32	38	57	77	69	59	43	38	83
			2006	76	80	63	46	32	36	59	79	80	64	20	15	84
			2007	78	80	62	43	31	51	53	74	70	56	16	20	83
			2008	78	77	66	41	29	33	51	76	80	73	54	20	86

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

Source: Catch Accounting System, fish tickets, Norpac 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, 2004-08.

			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	2004	863	238	-	59	13	-	922	250	-
		2005	859	229	2	55	21	-	914	250	2
		2006	881	253	-	44	6	-	926	259	-
		2007	722	221	-	27	9	-	749	230	-
		2008	659	214	-	42	5	-	701	219	-
	Pacific cod	2004	955	62	-	136	4	-	1092	66	-
		2005	918	44	-	137	3	-	1055	47	-
		2006	788	44	-	132	2	-	920	46	-
		2007	979	30	-	102	0	-	1081	31	-
		2008	1050	44	-	142	0	-	1192	44	-
	Rockfish	2004	491	32	-	1	-	-	492	32	-
		2005	345	10	-	1	-	-	346	10	-
		2006	145	7	-	0	-	-	145	7	-
		2007	60	2	-	1	-	-	61	2	-
		2008	47	1	-	-	-	-	47	1	-
	All groundfish	2004	2378	337	-	197	16	-	2575	353	-
		2005	2140	284	2	193	24	-	2334	307	2
		2006	1823	304	-	177	11	-	2000	315	-
		2007	1763	254	-	130	9	-	1893	263	-
		2008	1756	259	-	185	5	-	1941	264	-
Pot	Pacific cod	2004	659	219	5	81	186	62	740	405	67
		2005	533	292	2	48	160	53	581	453	55
		2006	714	292	7	84	229	64	798	522	71
		2007	722	294	2	99	192	56	821	486	58
		2008	740	235	6	98	179	55	838	415	61
	All groundfish	2004	660	220	5	81	280	70	741	500	75
		2005	533	294	2	61	237	53	594	531	55
		2006	718	293	7	102	299	64	820	592	71
		2007	722	294	2	119	276	56	841	570	58
		2008	741	235	6	118	246	55	859	482	61

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	2004	92	288	-	-	999	518	92	1287	518
		2005	137	355	-	-	995	598	137	1350	598
		2006	139	396	-	1	973	624	140	1370	624
		2007	96	239	-	-	1118	637	96	1357	637
		2008	92	224	1	-	872	507	92	1096	508
	Pacific cod	2004	42	139	-	31	310	32	73	450	32
		2005	54	89	-	10	247	23	64	336	23
		2006	104	106	-	10	292	22	114	398	22
		2007	92	143	-	21	298	23	113	441	23
		2008	119	166	1	15	300	42	134	465	43
	Flatfish	2004	4	155	-	-	3	-	4	158	-
		2005	1	150	-	-	6	-	1	157	-
		2006	0	205	-	-	11	-	0	216	-
		2007	17	232	-	-	12	6	17	244	6
		2008	19	267	4	-	5	16	19	272	19
	Rockfish	2004	2	78	-	-	0	-	2	78	-
		2005	-	67	-	-	-	-	-	67	-
		2006	-	71	-	-	-	-	-	71	-
		2007	4	96	-	-	1	2	4	97	2
		2008	1	86	1	-	7	5	1	93	6
	All groundfish	2004	139	667	-	31	1315	550	170	1982	550
		2005	192	662	-	10	1248	621	202	1911	621
		2006	243	778	-	11	1277	646	254	2055	646
		2007	209	719	-	21	1430	677	230	2149	677
		2008	230	756	7	15	1183	576	245	1939	583
All gear	All groundfish	2004	3177	1224	5	309	1611	620	3486	2835	625
		2005	2865	1240	4	265	1509	674	3130	2749	678
		2006	2784	1375	7	290	1587	710	3074	2962	717
		2007	2694	1267	2	270	1715	733	2964	2982	735
		2008	2728	1250	13	317	1435	631	3045	2685	644

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, Norpac 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, 2004-08.

			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	2004	7	53	21	-	30	6	7	83	27
		2005	7	46	24	-	23	11	7	68	36
		2006	4	41	21	-	26	8	4	67	29
		2007	9	52	19	-	24	12	9	76	31
		2008	7	36	14	1	30	9	8	66	23
	Pacific cod	2004	4	24	16	7	229	840	11	253	856
		2005	3	6	4	4	244	858	7	250	862
		2006	-	32	22	-	211	574	-	242	595
		2007	-	33	10	-	190	458	-	223	468
		2008	9	38	15	5	273	550	14	311	565
	Flatfish	2004	-	-	-	-	22	31	-	22	31
		2005	-	0	2	-	23	34	-	23	36
		2006	-	-	2	-	14	43	-	14	45
		2007	-	-	-	-	9	39	-	9	39
		2008	-	-	-	-	11	12	-	11	12
	All groundfish	2004	12	77	37	7	281	883	19	358	919
		2005	10	52	30	4	290	907	14	342	937
		2006	4	74	47	-	252	628	4	326	676
		2007	9	86	30	-	224	513	9	310	543
		2008	17	74	29	7	315	571	24	389	600
Pot	Pacific cod	2004	-	10	-	-	6	20	-	16	20
		2005	-	6	-	-	2	22	-	8	22
		2006	-	-	-	-	4	29	-	4	29
		2007	-	15	-	-	8	24	-	23	24
		2008	-	-	2	-	34	21	-	34	23
	All groundfish	2004	-	10	-	-	6	21	-	16	21
		2005	-	6	-	-	2	22	-	8	22
		2006	-	-	-	-	12	33	-	12	33
		2007	-	15	-	-	15	25	-	30	25
		2008	-	-	2	-	40	22	-	40	24

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	2004	-	-	-	0	27	335	0	27	335
		2005	-	-	-	2	27	325	2	27	325
		2006	-	-	-	1	28	347	1	28	347
		2007	-	-	-	1	31	358	1	31	358
		2008	-	-	-	-	32	288	-	32	288
	Pacific cod	2004	8	4	-	89	101	13	97	104	13
		2005	3	-	-	56	71	12	60	71	12
		2006	2	-	-	65	66	15	68	66	15
		2007	3	-	-	60	80	13	63	80	13
		2008	6	0	-	5	9	8	11	9	8
	Flatfish	2004	29	8	0	87	256	45	116	264	45
		2005	56	10	2	79	276	55	135	286	57
		2006	59	12	-	113	212	66	172	224	66
		2007	47	15	-	129	217	65	176	233	65
		2008	53	8	-	234	349	74	287	357	74
	Rockfish	2004	3	20	1	-	8	4	3	28	5
		2005	2	21	1	-	6	5	2	27	5
		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	10
	Atka mackerel.	2004	-	-	-	4	75	23	4	75	23
		2005	-	-	-	6	84	23	6	84	23
		2006	-	-	-	5	81	24	5	81	24
		2007	-	0	-	10	72	27	10	72	27
		2008	-	-	-	2	62	23	2	62	23
	All groundfish	2004	41	31	1	180	467	421	221	498	422
		2005	61	31	3	144	465	419	205	496	422
		2006	62	39	1	186	400	456	248	439	457
		2007	53	40	1	202	412	467	255	452	468
		2008	67	31	2	241	466	401	308	497	403

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	2004	12	128	68	1	7	467	1370	421	19	595	1438	422
		2005	10	119	61	3	4	436	1394	419	14	555	1455	422
		2006	4	136	86	1	-	450	1061	456	4	586	1147	457
		2007	9	154	69	1	-	441	951	467	9	595	1020	468
		2008	17	141	62	2	7	596	1059	401	24	737	1121	403

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, Norpac 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, 2003-08.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Gulf of Alaska	2003	470	352	502	991	1,023	101	922	417	279	631	-	-	5,687
	2004	452	155	348	629	366	95	1,097	96	304	33	-	-	3,599
	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
Bering Sea and Aleutian Islands	2003	5,830	16,533	19,434	3,935	2,255	5,263	10,492	15,824	12,277	5,579	4,236	1,778	103,436
	2004	9,596	16,032	12,849	3,855	4,393	5,098	13,020	11,495	11,468	6,877	3,450	1,446	99,577
	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	13,537	4,771	2,016	6,372	11,144	11,796	14,338	6,620	1,593	751	97,544
	2008	6,228	14,457	12,359	3,260	3,536	3,424	8,577	13,835	12,677	9,357	3,990	1,026	92,725
All Alaska	2003	6,300	16,885	19,935	4,926	3,278	5,364	11,413	16,241	12,556	6,210	4,236	1,778	109,123
	2004	10,047	16,187	13,196	4,484	4,758	5,192	14,117	11,590	11,772	6,910	3,465	1,458	103,175
	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	14,215	5,137	2,491	6,592	12,009	12,131	14,681	7,040	1,628	817	101,745
	2008	6,312	15,152	13,065	4,110	3,652	3,458	9,810	14,067	12,802	9,583	4,001	1,026	97,036

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: 2003 - 90%, 2004 - 91%, 2005 - 92%, 2006 - 92%, 2007 - 90%, 2008 - 91%.

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, 2007-08.

			2007			2008		
			Count	Obs. days	Cost	Count	Obs. days	Cost
Catcher vessels	Hook & line	60-125	37	601	210	39	392	137
	Pot	60-125	50	984	344	45	571	200
		>=125	10	135	47	9	92	32
		Total	60	1,119	392	54	663	232
	Trawl	60-125	88	4,334	1,517	88	2,377	832
		>=125	26	4,955	1,734	28	2,120	742
		Total	114	9,289	3,251	116	4,497	1,574
CV Total			211	11,009	3,853	209	5,552	1,943
Catcher/ processors	Hook & line	60-125	11	1,413	495	11	1,560	546
		>=125	27	3,969	1,389	27	4,079	1,428
		Total	38	5,382	1,884	38	5,639	1,974
	Pot	>60	4	181	63	4	88	31
	Surimi trawler	>=125	16	5,774	2,021	15	3,600	1,260
	H&G trawler	60-125	7	832	291	8	2,475	866
		>=125	16	4,956	1,735	16	6,457	2,260
		Total	23	5,788	2,026	24	8,932	3,126
	Trawl Total		39	11,562	4,047	39	12,532	4,386
C/P Total			81	17,125	5,994	81	18,259	6,391
Motherships			3	1,267	443	3	651	228
All vessels			295	29,401	10,290	293	24,462	8,562
Shore plants			22	5,190	1,817	21	3,667	1,283
Grand totals			317	34,591	12,107	314	28,129	9,845

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.

Table 52. Monthly Japanese landing market price of selected groundfish by species, 1994-2008, in yen/kilogram (weighted average).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flatfish, fresh	1994	603	592	534	573	585	467	541	542	508	474	454	505
	1995	499	510	485	540	478	473	523	511	464	362	415	424
	1996	501	556	543	472	431	385	477	550	419	403	418	490
	1997	473	500	424	417	472	405	445	605	438	476	387	474
	1998	434	482	403	337	391	432	505	567	451	397	404	486
	1999	433	446	427	397	372	394	417	506	366	346	365	467
	2000	447	469	474	391	335	323	446	497	436	464	441	490
	2001	567	587	565	459	398	401	452	506	466	495	483	572
	2002	596	531	523	477	417	441	541	526	405	532	547	499
	2003	643	562	508	420	335	314	379	349	327	366	395	445
	2004	484	573	451	346	344	268	265	373	316	359	465	459
	2005	439	498	446	403	326	247	332	374	373	410	535	572
	2006	429	440	452	454	328	268	336	427	457	406	502	467
Cod, fresh	1994	261	272	170	132	98	129	117	115	204	311	288	287
	1995	244	185	188	103	64	110	146	146	197	257	401	315
	1996	296	235	153	83	68	72	176	149	205	273	304	289
	1997	235	174	157	111	105	82	192	177	134	330	269	311
	1998	234	167	150	104	88	94	173	172	115	211	289	368
	1999	284	276	180	153	109	115	148	154	103	225	315	352
	2000	299	256	205	146	104	103	169	162	143	238	329	370
	2001	418	246	176	134	96	91	124	254	195	305	387	499
	2002	453	398	253	156	135	142	216	185	223	434	542	476
	2003	407	335	293	203	126	166	218	180	232	309	306	462
	2004	402	261	200	151	130	95	215	247	202	341	358	447
	2005	257	169	165	185	130	110	192	178	175	300	347	458
	2006	297	246	249	229	165	201	249	271	186	365	365	362
Cod, frozen	1994	309	258	112	245	264	124	217	258	258	246	264	228
	1995	232	182	154	177	196	109	135	184	138	134	259	249
	1996	265	220	183	211	146	201	247	326	213	292	299	262
	1997	199	210	200	184	131	211	223	133	214	225	195	148
	1998	185	137	137	217	138	231	239	401	333	296	266	249
	1999	298	257	215	302	220	237	218	266	315	266	283	243
	2000	241	202	179	203	199	211	208	283	247	298	273	212

Note: Prices for frozen cod are not reported after year 2000. Prices for fresh cod and fresh flatfish are not reported after 2006.

Table 52. Continued.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alaska pollock, fresh	1994	76	125	118	88	45	46	52	51	44	55	67	74
	1995	104	132	131	101	40	38	66	59	40	47	74	72
	1996	90	120	110	77	33	27	63	46	42	41	54	91
	1997	126	122	110	97	69	65	55	48	33	45	51	70
	1998	80	85	91	86	35	26	37	35	26	33	56	52
	1999	73	86	76	78	42	36	40	24	21	31	46	53
	2000	96	79	96	87	51	51	81	55	27	46	109	129
	2001	109	127	91	90	60	46	60	80	34	62	105	111
	2002	93	108	104	64	56	56	100	106	36	60	93	105
	2003	114	99	71	61	59	69	116	82	35	46	55	79
	2004	91	112	64	48	46	48	141	119	36	49	76	95
	2005	142	112	76	79	71	64	159	121	47	60	86	121
	2006	128	109	87	94	83	85	144	75	49	69	98	127
Atka mackerel, fresh	1994	25	28	21	20	28	30	49	50	42	49	35	30
	1995	35	31	29	29	37	49	109	98	39	36	27	19
	1996	21	22	29	40	51	40	95	69	40	46	69	28
	1997	36	40	40	44	55	59	114	79	48	44	27	30
	1998	23	31	23	22	26	26	25	28	23	32	35	27
	1999	43	44	32	36	38	57	78	88	40	35	29	17
	2000	26	23	22	20	27	34	52	44	42	43	47	49
	2001	44	38	32	32	51	58	106	75	54	35	34	31
	2002	28	28	29	38	57	60	67	66	32	30	36	28
	2003	30	28	28	26	40	47	55	32	20	21	20	15
	2004	16	21	20	26	37	33	26	28	33	17	25	27
	2005	47	29	33	38	70	105	133	80	39	35	36	35
	2006	37	41	41	47	69	80	111	115	61	73	43	40
	2007	37	37	45	57	65	72	104	76	51	32	29	22
	2008	31	35	49	65	93	83	126	90	69	43	53	31
Rockfish, fresh	1994	2687	2861	1944	2363	2205	2433	2230	2118	2069	2075	2323	2778
	1995	3214	2725	2360	2545	2142	1993	2234	2189	2149	2373	3179	3119
	1996	3471	3586	3510	2630	2321	2188	2234	2374	2419	3012	3073	3414
	1997	3770	4240	3281	2699	2760	2384	2472	2475	2873	3117	2943	3433
	1998	3348	3753	3365	2721	2729	2790	2675	2574	2636	2831	2238	2181
	1999	4518	3750	3872	2935	2992	3041	3324	2634	2951	2512	1736	3035
	2000	4049	3932	2934	3061	2645	2620	3292	2419	2734	2777	3112	3270

Note: Prices for fresh rockish are not reported after year 2000. Prices for fresh Alaska pollock are not reported after 2006.

Source: Monthly Statistics of Agriculture, Forestry & Fisheries, Stat. and Info. Dept., Ministry of Agriculture, Forestry & Fisheries, Government of Japan. Available from Alaska Fisheries Science Center P.O. Box 15700, Seattle, WA 98115-0070.

Table 53. Monthly Tokyo wholesale prices of selected products, 1994-2006, in yen/kilogram (weighted average).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flatfish, frozen	1994	423	426	403	450	460	433	470	394	414	433	422	455
	1995	446	435	450	455	427	443	447	464	440	466	475	500
	1996	478	478	467	520	532	544	575	550	562	550	565	580
	1997	538	535	535	536	506	533	512	530	509	508	528	540
	1998	482	473	511	505	519	514	509	544	524	518	457	447
	1999	471	460	475	516	516	490	524	533	469	484	507	514
	2000	468	467	456	491	483	483	522	448	492	470	476	509
	2001	464	466	470	486	478	477	505	530	513	499	509	521
	2002	467	493	516	521	527	531	507	547	546	504	521	530
	2003	544	522	563	551	580	606	603	607	610	600	626	632
	2004	579	593	567	604	610	586	585	612	596	578	602	599
	2005	586	598	595	596	598	604	648	653	670	691	684	677
	2006	604	625	643	689	704	693	716	748	704	731	683	757
Cod, frozen	1994	610	612	635	648	625	614	665	700	633	652	656	656
	1995	644	646	628	649	623	583	571	605	614	527	458	567
	1996	586	603	636	689	657	677	715	561	584	624	545	590
	1997	484	539	598	613	651	560	610	638	609	555	484	503
	1998	452	469	508	532	578	596	589	616	598	571	520	565
	1999	603	574	624	678	691	751	728	667	567	559	520	542
	2000	477	545	616	629	610	621	628	555	641	516	508	512
	2001	489	501	582	609	634	573	606	627	619	573	618	530
	2002	579	589	641	756	674	625	761	806	814	714	671	710
	2003	670	679	591	599	657	620	706	796	717	684	669	719
	2004	216	442	558	719	252	314	712	737	733	655	515	603
	2005	620	576	733	837	872	972	984	925	810	826	814	727
	2006	731	708	762	702	689	792	812	767	872	886	914	943
Surimi	1994	322	315	309	302	311	320	309	316	310	319	333	350
	1995	340	337	332	335	338	341	356	343	368	353	348	335
	1996	334	319	314	330	303	342	334	286	308	309	347	321
	1997	356	345	340	351	374	388	383	381	402	391	401	402
	1998	389	339	354	337	329	339	333	328	313	313	319	334
	1999	315	331	328	339	340	346	337	323	339	351	339	330
	2000	321	312	298	307	303	297	304	275	289	276	286	294
	2001	276	281	282	273	271	272	275	267	268	290	297	298
	2002	301	299	303	299	311	317	303	316	302	318	324	339
	2003	313	294	295	296	285	272	276	274	272	272	282	271
	2004	275	275	262	258	269	266	278	262	257	275	273	297
	2005	282	291	295	303	310	297	300	310	319	345	381	357
	2006	343	331	311	337	325	317	325	323	316	327	330	339

Note: From 1994-95 prices are for six large cities wholesale market, and from 1996-2006 prices are for ten large cities wholesale market. Prices are not reported after year 2006.

Source: Monthly Statistics of Agriculture, Forestry & Fisheries, Stat. and Info. Dept., Ministry of Agriculture, Forestry & Fisheries, Government of Japan. Available from Alaska Fisheries Science Center P.O. Box 15700, Seattle, WA 98115-0070.

Table 54. U.S. imports of groundfish fillets, steaks and blocks, 1976-2008, quantity in million lb. product weight, and value in million dollars.

Year	Fillets & Steaks		Blocks		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1976	337	$273	379	$211	716	$484
1977	321	305	385	292	706	597
1978	333	341	406	325	739	666
1979	340	385	408	337	748	722
1980	297	341	336	289	633	630
1981	346	415	344	301	690	716
1982	371	458	319	274	690	732
1983	355	449	384	339	739	788
1984	373	459	316	263	689	722
1985	388	500	334	275	722	775
1986	366	542	364	380	730	922
1987	408	759	403	539	812	1,298
1988	323	568	303	382	626	950
1989	333	578	282	325	616	903
1990	262	482	264	373	526	856
1991	255	526	290	444	545	970
1992	221	437	229	304	450	741
1993	236	452	212	219	447	671
1994	229	433	200	184	428	617
1995	232	437	210	213	442	650
1996	223	407	234	213	457	620
1997	219	426	234	231	453	657
1998	236	460	233	271	469	731
1999	272	550	214	250	486	801
2000	284	545	204	209	488	753
2001	243	462	147	159	389	621
2002	283	531	147	165	430	695
2003	292	531	129	139	422	670
2004	326	571	135	153	462	724
2005	341	615	139	169	480	784
2006	327	635	117	145	444	780
2007	276	603	169	221	446	824
2008	257	583	142	197	399	780

Source: National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics Division. http://www.st.nmfs.noaa.gov/st1/fus/fus08/06_trade2008.pdf

Table 55. U.S. per capita consumption of fish and shellfish, 1977-2008, population in millions and consumption in pounds, edible weight.

Year	Total civilian population	Per capita consumption			
		Fresh and Frozen	Canned	Cured	Total
1977	218.1	7.7	4.6	.4	12.7
1978	220.5	8.1	5.0	.3	13.4
1979	223.0	7.8	4.8	.4	13.0
1980	225.6	7.9	4.3	.3	12.5
1981	227.8	7.8	4.6	.3	12.7
1982	230.0	7.9	4.3	.3	12.5
1983	232.1	8.4	4.7	.3	13.4
1984	234.1	9.0	4.9	.3	14.2
1985	236.2	9.8	5.0	.3	15.1
1986	238.4	9.8	5.4	.3	15.5
1987	240.6	10.7	5.2	.3	16.2
1988	242.8	10.0	4.9	.3	15.2
1989	245.1	10.2	5.1	.3	15.6
1990	247.8	9.6	5.1	.3	15.0
1991	250.5	9.7	4.9	.3	14.9
1992	253.5	9.9	4.6	.3	14.8
1993	256.4	10.2	4.5	.3	15.0
1994	259.2	10.4	4.5	.3	15.2
1995	261.4	10.0	4.7	.3	15.0
1996	264.0	10.0	4.5	.3	14.8
1997	266.4	9.9	4.4	.3	14.6
1998	269.1	10.2	4.4	.3	14.9
1999	271.5	10.4	4.7	.3	15.4
2000	280.9	10.2	4.7	.3	15.2
2001	283.6	10.3	4.2	.3	14.8
2002	287.1	11.0	4.3	.3	15.6
2003	289.6	11.4	4.6	.3	16.3
2004	292.4	11.8	4.5	.3	16.6
2005	295.3	11.6	4.3	.3	16.2
2006	298.2	12.3	3.9	.3	16.5
2007	300.5	12.1	3.9	.3	16.3
2008	302.9	11.8	3.9	.3	16.0

Note: Per capita consumption represents pounds of edible meat consumed from domestically caught and imported fish and shellfish adjusted for beginning and ending inventories (through 2002) and exports, divided by the civilian resident population of the United States as of 1 July of each year. Population estimates for 1980-91 were revised to reflect changes from the 1990 decennial population enumeration. Changes did not significantly alter pounds per capita.

Source: U.S. Department of Commerce, Bureau of the Census, Washington, D.C. 20233; and Fisheries of the United States, National Marine Fisheries Service, Fisheries Statistics Division, 1315 East-West Highway, Silver Spring, MD 20910, various issues.

Table 56. U.S. consumption of all fillets and steaks, and fish sticks and portions, total in 1,000 lb. and per capita in pounds, product weight, 1980-2008.

Year	Fillets and steaks[1]		Fish sticks and portions	
	Total[2]	Per capita	Total[2]	Per capita
1980	541,440	2.4	451,200	2.0
1981	546,720	2.4	410,040	1.8
1982	575,000	2.5	391,000	1.7
1983	626,670	2.7	417,780	1.8
1984	702,300	3.0	421,380	1.8
1985	755,840	3.2	425,160	1.8
1986	810,560	3.4	429,120	1.8
1987	866,160	3.6	409,020	1.7
1988	776,960	3.2	364,200	1.5
1989	759,810	3.1	367,650	1.5
1990	768,180	3.1	371,700	1.5
1991	751,500	3.0	300,600	1.2
1992	735,150	2.9	228,150	0.9
1993	743,560	2.9	256,400	1.0
1994	803,520	3.1	233,280	0.9
1995	758,060	2.9	313,680	1.2
1996	792,000	3.0	264,000	1.0
1997	799,200	3.0	266,400	1.0
1998	861,120	3.2	242,190	0.9
1999	868,800	3.2	271,500	1.0
2000	1,011,240	3.6	252,810	0.9
2001	1,049,320	3.7	226,880	0.8
2002	1,177,110	4.1	229,680	0.8
2003	1,245,280	4.3	202,720	0.7
2004	1,345,040	4.6	204,680	0.7
2005	1,476,500	5.0	265,770	0.9
2006	1,550,640	5.2	268,380	0.9
2007	1,502,500	5.0	270,450	0.9
2008	1,453,920	4.8	302,900	1.0

[1]Series revised in 1993 to reflect deduction of fillet production used to produce blocks, exports of foreign fillets and steaks, and changes in population estimates from 1990 decennial population enumeration.

[2]Per capita multiplied by total U.S. population.

Source: Computed from data from U.S. Department of Commerce, Bureau of the Census; and Fisheries of the United States, National Marine Fisheries Service, Fisheries Statistics Division, 1315 East-West Highway, Silver Spring, MD 20910, various issues.

Table 57. Annual U.S. economic indicators: Selected producer and consumer price indexes and gross domestic product implicit price deflator, 1977-2008.

Year	Producer Price Index[1]					Consumer Price Index[2]				GDP Deflator[3]
	All items	Meat	Poultry	Fish	Petrol. Products	All Items	Meat	Poultry	Fish	
1977	64.9	68.1	97.0	69.7	40.5	60.6	64.9	76.9	66.6	42.92
1978	69.9	83.6	108.6	74.1	42.2	65.2	77.0	84.9	73.0	46.07
1979	78.7	93.3	105.6	90.9	58.4	72.6	90.1	89.1	80.1	50.12
1980	89.8	94.1	108.2	87.8	88.6	82.4	92.7	93.7	87.5	54.56
1981	98.0	95.4	108.2	89.4	105.9	90.9	96.0	97.5	94.8	59.64
1982	100.0	100.0	100.0	100.0	100.0	96.5	100.7	95.8	98.2	63.18
1983	101.3	94.3	103.7	105.4	89.9	99.6	99.5	97.0	99.3	65.52
1984	103.7	94.5	115.3	112.7	87.4	103.9	99.8	107.3	102.5	67.95
1985	103.2	90.9	110.4	114.6	83.2	107.6	98.9	106.2	107.5	69.84
1986	100.2	93.9	116.8	124.9	53.2	109.6	102.0	114.2	117.4	71.43
1987	102.8	100.4	103.5	140.0	56.8	113.6	109.6	112.6	129.9	73.43
1988	106.9	99.9	111.6	148.7	53.9	118.3	112.2	120.7	139.4	76.14
1989	112.2	104.8	120.4	142.9	61.2	124.0	116.7	132.7	143.6	78.88
1990	116.3	117.0	113.6	147.2	74.8	130.7	128.5	132.5	146.7	82.03
1991	116.5	113.5	109.9	149.5	67.2	136.2	132.5	131.5	148.3	84.76
1992	117.2	106.7	109.0	156.1	64.7	140.3	130.7	131.4	151.7	86.58
1993	118.9	110.6	111.7	156.5	62.0	144.5	134.6	136.9	156.6	88.57
1994	120.4	104.7	114.7	161.4	59.1	148.2	135.4	141.5	163.7	90.53
1995	124.7	102.9	114.2	170.8	60.8	152.4	135.5	143.5	171.6	92.29
1996	127.7	109.0	119.7	165.9	70.1	156.9	140.2	152.4	173.1	93.95
1997	127.6	111.6	117.4	178.1	68.0	160.5	144.4	156.6	177.1	95.53
1998	124.4	101.3	120.8	183.2	51.3	163.0	141.6	157.1	181.7	96.60
1999	125.5	104.6	114.0	190.9	60.9	166.6	142.3	157.9	185.3	98.01
2000	132.7	114.3	112.9	198.1	91.3	172.2	150.7	159.8	190.4	100.26
2001	134.2	120.3	116.8	190.8	85.3	177.1	159.3	164.9	191.1	102.68
2002	131.1	113.4	111.3	191.2	79.5	179.9	160.3	167.0	188.1	104.33
2003	138.1	128.2	116.6	195.3	97.7	184.0	169.0	169.1	190.0	106.61
2004	146.7	134.9	130.2	206.3	119.9	188.9	183.2	181.7	194.3	109.79
2005	157.4	139.0	128.6	222.6	165.0	195.3	187.5	185.3	200.1	113.47
2006	164.7	135.3	118.1	237.4	193.2	201.6	188.8	182.0	209.5	117.11
2007	172.6	138.9	133.2	242.8	214.2	207.3	195.0	191.4	219.1	120.00
2008	189.6	143.7	138.4	255.4	271.7	215.3	201.8	200.9	232.1	123.06

[1]Index 1982 = 100.
[2]Index 1982-84 = 100.
[3]Index 2000 = 100. GDP deflators are the values published for 1 July (second quarter) of each year.

Source: Producer prices and price indexes, and consumer price indexes: U.S. Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/data/sa.htm; GDP deflators: U.S. Department of Commerce, Bureau of Economic Analysis, http://research.stlouisfed.org/fred2/series/GDPDEF

Table 58. Monthly U.S. economic indicators: Selected producer and consumer price indexes, 2006-08.

	Producer Price Index[1]					Consumer Price Index[2]			
Month	All Items	Meat	Poultry	Fish	Petrol. Products	All Items	Meat	Poultry	Fish
2006									
Jan	164.3	138.2	117.1	229.4	177.2	198.3	187.9	181.5	206.3
Feb	161.8	133.7	115.0	249.5	169.3	198.7	188.2	181.4	206.1
Mar	162.2	135.3	112.6	244.3	184.6	199.8	188.6	182.1	205.2
Apr	164.3	131.4	109.7	278.9	207.4	201.5	188.4	180.5	206.4
May	165.8	134.3	111.2	253.1	215.5	202.5	187.5	180.1	208.1
Jun	166.1	135.9	118.9	254.0	220.4	202.9	187.9	182.4	210.2
Jul	166.8	139.5	120.6	228.0	219.7	203.5	187.8	180.9	208.7
Aug	167.9	137.4	123.7	208.9	219.0	203.9	189.0	183.8	212.3
Sep	165.4	137.7	124.7	222.9	185.1	202.9	190.0	183.9	213.7
Oct	162.2	134.7	120.7	224.7	172.3	201.8	190.5	182.9	213.7
Nov	164.6	133.7	120.1	221.7	172.2	201.5	190.7	181.8	211.8
Dec	165.6	131.4	122.9	233.3	175.2	201.8	189.4	182.5	211.6
2007									
Jan	164.0	133.0	126.2	249.2	163.2	202.4	190.6	181.8	214.6
Feb	166.8	138.0	129.2	253.3	171.1	203.5	190.3	183.2	215.4
Mar	169.3	141.7	133.0	256.4	194.1	205.4	193.3	186.0	214.9
Apr	171.4	144.0	134.0	250.6	214.4	206.7	194.1	188.8	218.3
May	173.3	147.7	137.3	238.0	227.3	207.9	196.3	190.4	220.7
Jun	173.8	146.5	136.1	231.5	221.3	208.4	197.7	194.4	221.3
Jul	175.1	138.1	137.8	238.4	234.2	208.3	196.2	194.9	219.3
Aug	172.4	138.8	135.7	236.3	213.0	207.9	196.1	195.4	219.9
Sep	173.5	138.6	136.4	235.5	220.2	208.5	196.2	197.1	219.6
Oct	174.7	136.0	131.8	237.1	219.5	208.9	196.6	195.6	222.1
Nov	179.0	131.6	130.7	241.9	253.2	210.2	196.8	194.6	221.3
Dec	178.6	132.9	130.1	245.5	238.8	210.0	195.6	194.0	221.6
2008									
Jan	181.0	135.2	131.5	251.7	244.0	211.1	196.0	196.9	223.5
Feb	182.7	135.2	133.3	255.0	246.9	211.7	195.6	195.8	223.7
Mar	187.9	138.1	135.8	262.9	282.6	213.5	195.9	196.1	222.2
Apr	190.9	137.3	136.3	262.4	291.1	214.8	196.5	197.5	228.1
May	196.6	143.2	139.6	259.9	321.7	216.6	197.3	199.1	230.1
Jun	200.5	145.0	141.4	246.2	340.6	218.8	199.7	199.8	232.4
Jul	205.5	152.3	142.2	253.3	357.7	220.0	202.3	201.8	233.6
Aug	199.0	157.1	141.9	258.0	313.3	219.1	205.8	203.5	236.8
Sep	196.9	154.5	141.8	265.0	312.3	218.8	208.1	205.1	238.3
Oct	186.4	145.8	141.6	254.1	244.8	216.6	209.7	204.4	239.9
Nov	176.8	141.2	138.4	247.1	175.1	212.4	208.0	205.6	238.1
Dec	170.9	139.3	136.8	249.1	130.0	210.2	206.9	205.2	238.8

[1]Index 1982 = 100.
[2]Index 1982-84 = 100.

Source: U.S. Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/data/sa.htm

Table 59. Annual foreign exchange rates for selected countries, 1976-2008, in national currency units per U.S.dollar.

Year	Canada (dollar)	Denmark (kroner)	Japan (yen)	ROK (won)	New Zealand (dollar)	Iceland (kronur)	Norway (kroner)	U.K. (pound)
1976	0.9860	6.0450	296.55	484.00	1.0036	1.822	5.4565	0.5536
1977	1.0635	6.0032	268.51	484.00	1.0301	1.989	5.3235	.5729
1978	1.1407	5.5146	210.44	484.00	.9636	2.711	5.2423	.5210
1979	1.1714	5.2610	219.14	484.00	.9776	3.526	5.0641	.4713
1980	1.1692	5.6359	226.74	607.43	1.0265	4.798	4.9392	.4299
1981	1.1989	7.1234	220.54	681.03	1.4194	7.224	5.7395	.4931
1982	1.2337	8.3324	249.08	731.08	1.3300	12.352	6.4540	.5713
1983	1.2324	9.1450	237.51	775.75	1.4952	24.843	7.2964	.6592
1984	1.2951	10.3566	237.52	805.98	1.7286	31.694	8.1615	.7483
1985	1.3655	10.5964	238.54	870.02	2.0064	41.508	8.5970	.7714
1986	1.3895	8.0910	168.52	881.45	1.9088	41.104	7.3947	.6971
1987	1.3260	6.8400	144.64	822.57	1.6886	38.677	6.7375	.6102
1988	1.2307	6.7320	128.15	731.47	1.5244	43.104	6.5170	.5614
1989	1.1840	7.3100	137.96	671.46	1.6708	57.042	6.9045	.6099
1990	1.1668	6.1890	144.79	707.76	1.6750	58.284	6.2597	.5603
1991	1.1457	6.3960	134.71	733.35	1.7265	58.996	6.4829	.5652
1992	1.2087	6.0360	126.65	780.65	1.8580	57.546	6.2145	.5664
1993	1.2901	6.4840	111.20	802.67	1.8494	67.603	7.0941	.6658
1994	1.3656	6.3610	102.21	803.44	1.6844	69.944	7.0576	.6529
1995	1.3724	5.6020	94.06	771.27	1.5235	64.692	6.3352	.6335
1996	1.3635	5.7990	108.78	804.45	1.4540	66.500	6.4498	.6400
1997	1.3849	6.6092	121.06	950.77	1.5094	70.904	7.0857	.6106
1998	1.4835	6.7008	130.91	1401.44	1.8683	70.958	7.5451	.6038
1999	1.4858	6.9900	113.73	1189.84	1.8889	72.474	7.8071	.6184
2000	1.4855	8.0953	107.80	1130.90	2.1805	78.896	8.8131	.6598
2001	1.5487	8.3323	121.57	1292.01	2.3798	97.690	8.9964	.6946
2002	1.5704	7.8862	125.22	1250.31	2.1529	91.669	7.9839	.6656
2003	1.4013	6.5800	115.97	1192.08	1.7185	76.780	7.0819	.6120
2004	1.3017	5.9891	108.15	1145.24	1.5053	70.261	6.7399	.5456
2005	1.2115	5.9953	110.11	1023.75	1.4186	62.919	6.4412	.5493
2006	1.1340	5.9422	116.31	954.32	1.5404	70.102	6.4095	.5425
2007	1.0734	5.4413	117.76	928.97	1.3578	64.229	5.8557	.4995
2008	1.0660	5.0885	103.39	1098.71	1.3984	88.590	5.6365	.5392

ROK – Republic of Korea; U.K. – United Kingdom.

Source: Through 1998: International Financial Statistics, International Monetary Fund, Washington, D.C.; 1999-2006 (except Iceland): U.S. Federal Reserve Board, www.federalreserve.gov; Iceland, 1999-2006: www.oanda.com

Table 60. Monthly foreign exchange rates for selected countries, 2006-08, in national currency units per U.S. dollar.

Month	Canada (dollar)	Denmark (kroner)	Japan (yen)	ROK (won)	New Zealand (dollar)	Iceland (kronur)	Norway (kroner)	U.K. (pound)
2006								
Jan	1.1572	6.1530	115.48	981.44	1.455	61.82	6.63	.565
Feb	1.1489	6.2514	117.86	969.84	1.485	64.26	6.75	.572
Mar	1.1573	6.2025	117.28	974.71	1.577	69.64	6.63	.573
Apr	1.1441	6.0798	117.07	952.60	1.608	74.97	6.39	.566
May	1.1100	5.8398	111.73	940.82	1.585	72.22	6.10	.535
Jun	1.1137	5.8897	114.63	954.45	1.616	74.40	6.21	.542
Jul	1.1294	5.8826	115.77	950.81	1.619	74.73	6.26	.542
Aug	1.1182	5.8236	115.92	960.95	1.575	70.62	6.24	.528
Sep	1.1161	5.8633	117.21	952.29	1.526	70.40	6.50	.531
Oct	1.1285	5.9085	118.61	952.64	1.510	68.79	6.66	.533
Nov	1.1359	5.7858	117.32	935.41	1.494	69.31	6.40	.523
Dec	1.1532	5.6452	117.32	924.98	1.442	69.80	6.18	.509
2007								
Jan	1.1763	5.7364	120.45	936.76	1.439	70.38	6.3656	.511
Feb	1.1710	5.6981	120.50	936.90	1.442	67.71	6.1860	.510
Mar	1.1682	5.6232	117.26	942.88	1.430	67.16	6.1401	.514
Apr	1.1350	5.5155	118.93	930.69	1.361	65.70	6.0098	.503
May	1.0951	5.5120	120.77	927.56	1.364	63.28	6.0220	.504
Jun	1.0651	5.5463	122.69	927.87	1.321	62.79	5.9980	.503
Jul	1.0502	5.4199	121.41	918.12	1.272	60.81	5.7807	.491
Aug	1.0579	5.4621	116.73	934.48	1.378	65.15	5.8492	.497
Sep	1.0267	5.3563	115.04	928.60	1.391	63.80	5.6256	.495
Oct	0.9754	5.2363	115.87	914.94	1.315	60.83	5.4023	.489
Nov	0.9672	5.0766	111.07	918.81	1.310	60.89	5.4156	.483
Dec	1.0021	5.1235	112.45	931.10	1.300	62.48	5.5000	.496
2008								
Jan	1.0099	5.0575	107.82	942.06	1.292	64.08	5.3993	.508
Feb	0.9986	5.0507	107.03	944.01	1.255	66.67	5.3851	.509
Mar	1.0029	4.8043	100.76	981.73	1.249	72.35	5.1495	.500
Apr	1.0137	4.7354	102.68	986.86	1.266	74.28	5.0541	.505
May	0.9993	4.7963	104.36	1034.13	1.286	75.78	5.0571	.509
Jun	1.0166	4.7926	106.92	1031.49	1.313	79.07	5.1351	.509
Jul	1.0130	4.7335	106.85	1015.05	1.325	78.74	5.1058	.503
Aug	1.0535	4.9894	109.36	1046.11	1.410	81.70	5.3331	.530
Sep	1.0582	5.2020	106.57	1134.87	1.484	90.58	5.6958	.556
Oct	1.1847	5.6253	99.97	1329.19	1.646	113.73	6.4973	.593
Nov	1.2171	5.8448	96.97	1398.70	1.766	137.92	6.9290	.652
Dec	1.2337	5.5239	91.28	1361.57	1.787	127.64	7.0159	.673

ROK – Republic of Korea; U.K. – United Kingdom.

Source: U.S. Federal Reserve Board, www.federalreserve.gov, except that exchange rates for Iceland are from www.oanda.com

Alaska Groundfish Market Profiles

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Preface

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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

Rick Kruger, Summit Seafood Company

Joe Plesha, Trident Seafoods Corporation

John Gauvin, independent consultant

John Hendershedt, Premier Pacific Seafoods

Jan Jacobs, American Seafoods, Inc.

Nancy Kercheval and Todd Loomis, Cascade Fishing, Inc.

Torunn Halhjem, Trident Seafoods Corporation

George Souza, Endeavor Seafood, Inc.

William Guo, Qingdao Fortune Seafoods, Inc.

Merle Knapp, Glacier Fish Company

Bill Orr, Best Use Cooperative

Sources of Market Information

For the most recent updates on seafood markets, the following online sources were regularly 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 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).

[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.

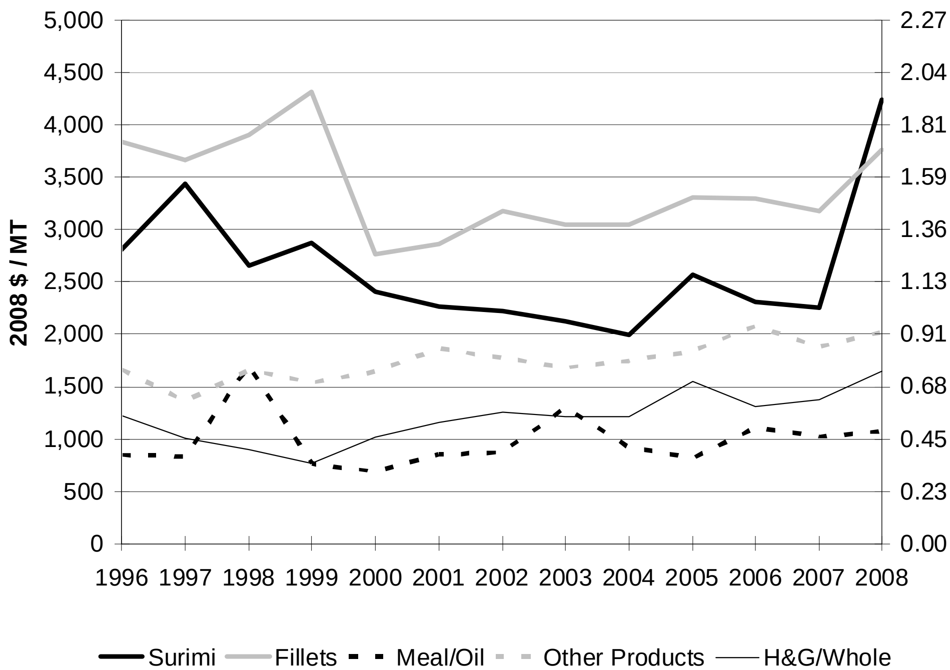
The Alaska pollock fishery in the waters off Alaska is among the world's largest fisheries. Under U.S. federal law, the fishery is subject to total allowable catch (TAC) limitations, quota allocations among the different sectors of participants in the fishery, and rules that give exclusive harvesting 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 $13,000 per mt in 2005, for example, and $9,400 per mt in 2008.

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.

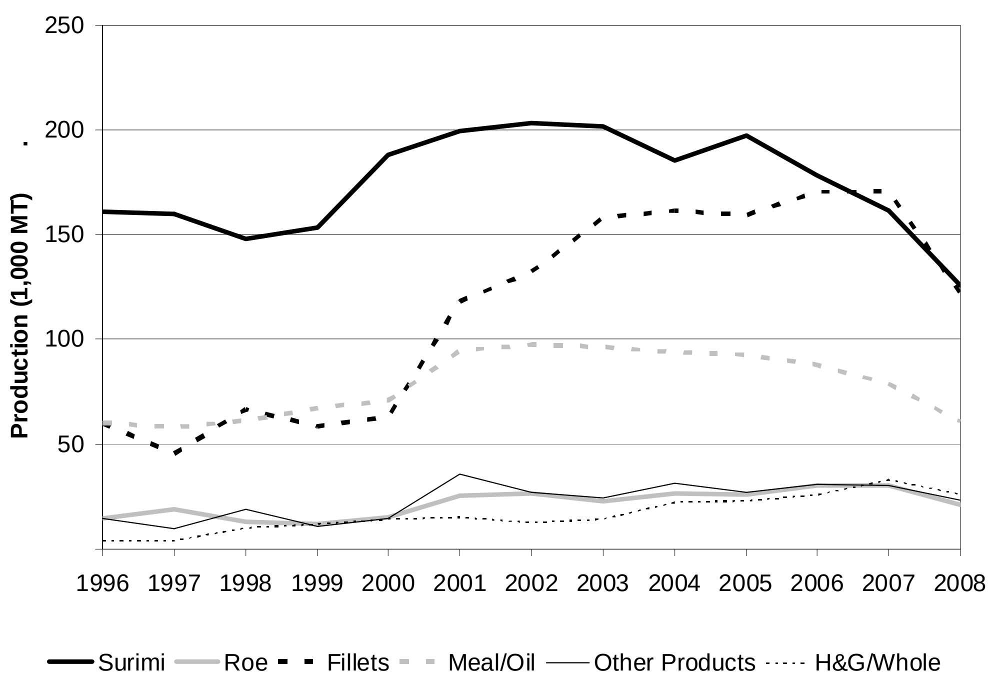
Figure 1. Wholesale Prices for Alaska Primary Production of Alaska Pollock Products (excluding Roe) by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 2. Alaska Primary Production of Alaska Pollock by Product Type, 1996 – 2008

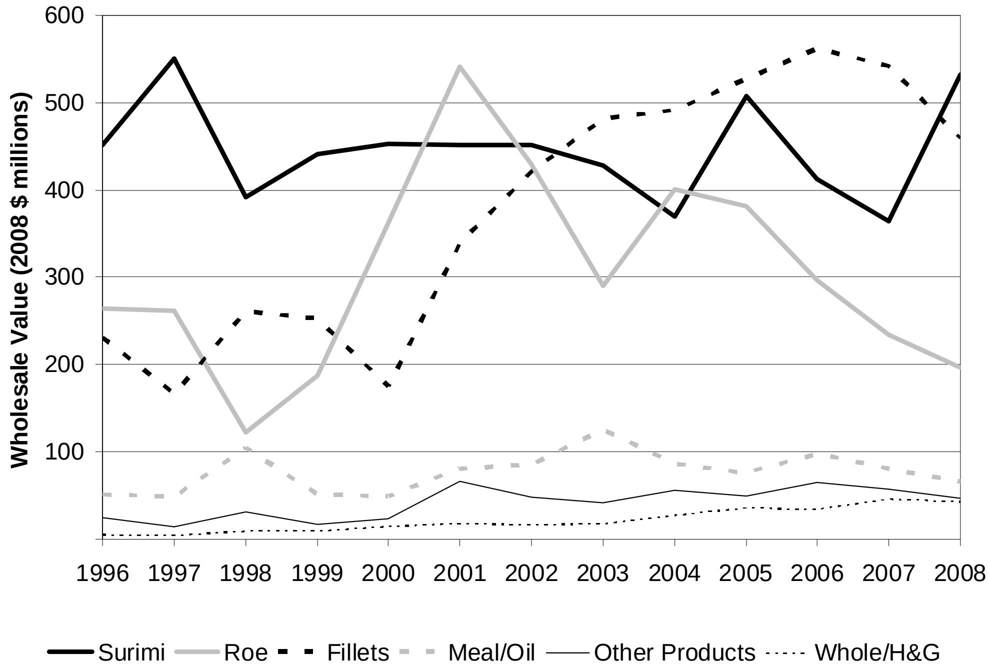


Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008.

Alaska Pollock Fillets Market Profile

Figure 3. Wholesale Value of Alaska Primary Alaska Pollock Production by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

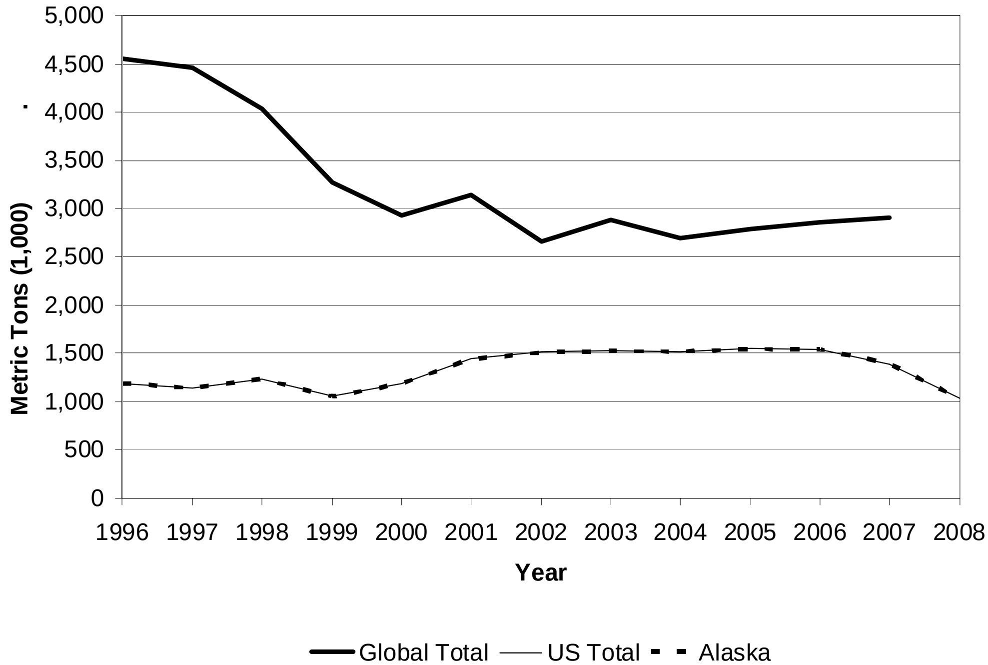
Production

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 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. Preliminary results of NMFS's 2009 bottom trawl and mid-water acoustic surveys of pollock in the Bering Sea confirm that the population is low and indicate that the number of incoming young fish may be down also (NMFS 2009), which suggests continued low stock estimates for at least the 2010 fishing year.

Figure 4. Alaska, Total U.S. and Global Retained Harvests of Alaska Pollock, 1996 – 2008



Note: Data for 2008 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.

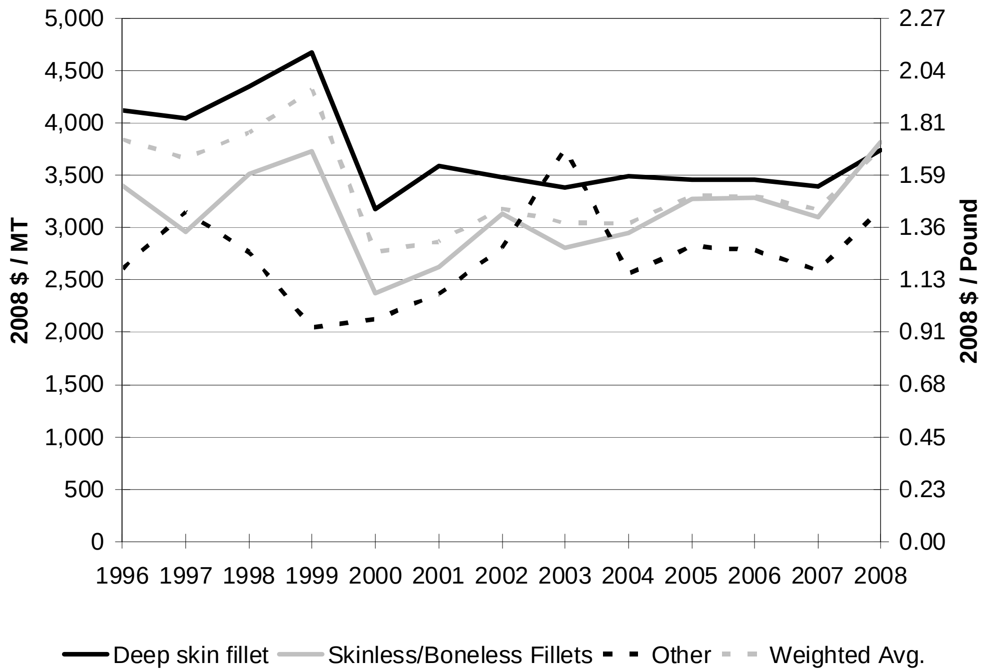
Product Composition and Flow

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 note that the acceptability of twice-frozen fillets is increasing in many markets, and the quality of this product is now 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).

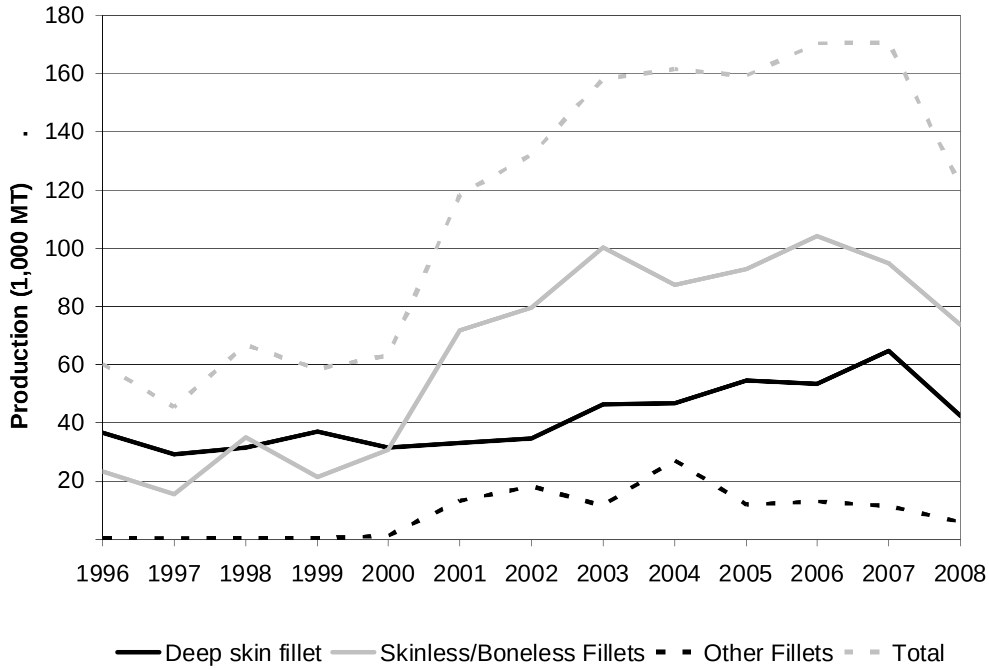
Historically, the primary market for pollock fillets has been the domestic market. Fillets made into deep-skin blocks were destined primarily for U.S. foodservice industry, including fast food restaurants such as McDonald's, Long John Silver's, and Burger King. (NMFS 2001). According to an industry representative, these high-volume buyers utilize enough product that they can 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. In the past five years, groundfish block imports were cut by half, while fillet imports expanded by 30% during the same period. The market is 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 – 2008



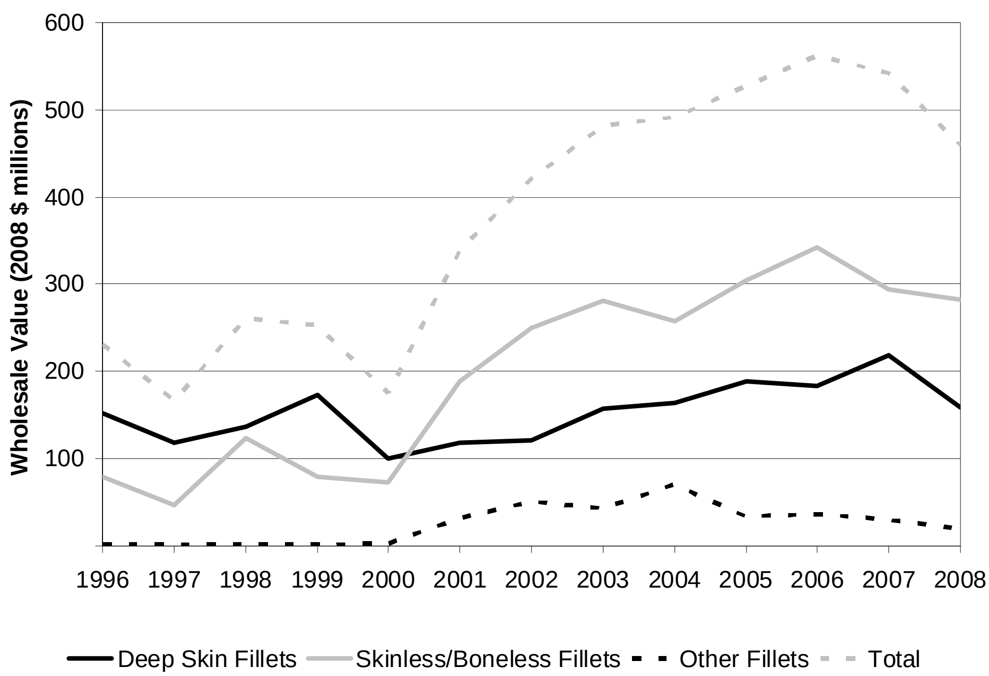
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 6. Alaska Primary Production of Alaska Pollock Fillets by Fillet Type, 1996 – 2008



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 7. Wholesale Value of Alaska Primary Production of Alaska Pollock Fillets by Fillet Type, 1996 – 2008



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008.

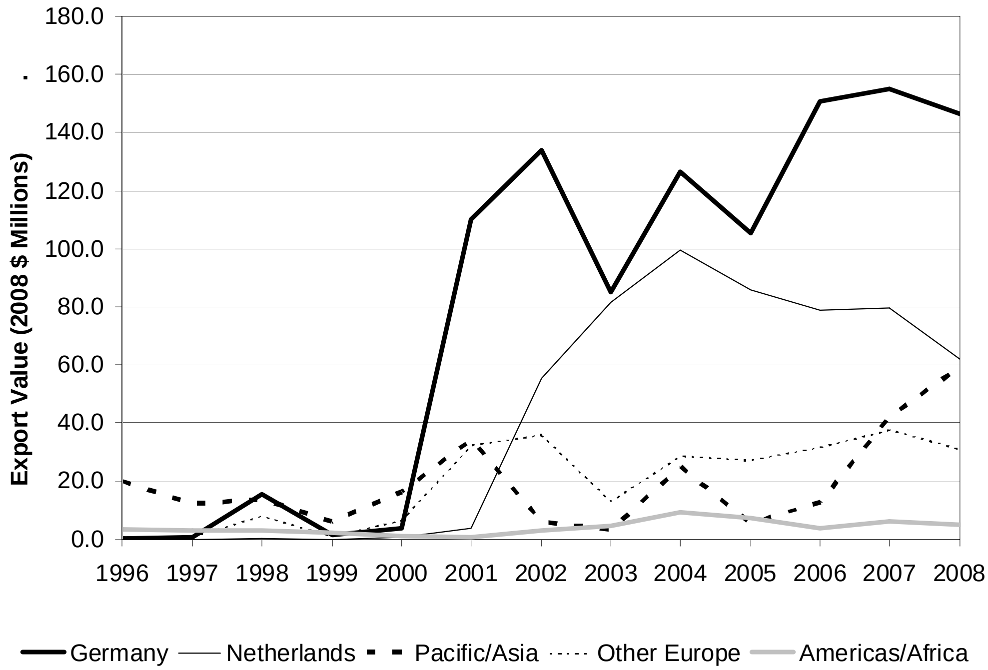
International Trade

As Russian pollock stocks and harvests decreased, 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 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.

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. Exports of Alaska Pollock Fillets to Leading Importing Countries, 1996 - 2008



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 be slipping however, due to the falling stock levels seen since 2006.

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 enables restaurants to maintain consistent menu pricing throughout the year (NMFS 2001).

European and United Kingdom whitefish supplies are tight, strengthening demand for Alaska whitefish such as pollock. In addition, the dollar is depreciating against the euro, making it less expensive for Europeans to buy U.S. seafood (Hedlund 2007). This cost advantage is driving increased European purchases of whitefish from Alaska and is one of the reasons for the growth of whitefish consumption in Europe despite the increasing prices. On a currency weighted basis, the cost of pollock fillets are not increasing in Europe (SeafoodNews.com 2007a). The continued devaluation of the dollar in 2008 has meant that the overseas markets can sustain higher U.S. dollar prices for pollock products (Seafood.com News 2008a). These price increases have helped producers offset 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.

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; these products currently include “wild Alaskan pollock fillets” (Marine Stewardship Council 2006; Wal-Mart Stores, Inc. 2006).

With Russian pollock in short supply due to declining catches, twice-frozen fillets from China have become more expensive and imports have dropped. However, trade press reports point to an increased Russian Alaska pollock quota (GLOBEFISH 2007), while the U.S. quota has shown a downward trend. 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. These quota adjustments, together with a surge in surimi prices, 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).

The high prices for pollock harvested in Alaska are generally expected to hold due to U.S. pollock quota cutbacks and continuing questions about the health of Russia’s pollock resource, together with the growing demand from Europe and strength of the euro relative to the dollar (GLOBEFISH 2007).

As shown in Figure 9, export prices of Alaska pollock fillets continued their increasing trend through most of 2008. Figure 10 shows that the volume of Alaska pollock fillet exports has been flat to slightly declining since a peak in early 2007. Germany is expected to remain a strong market for U.S. pollock fillets because of consumer preferences shifting toward healthy, low-fat foods (Figure 11 and Figure 12). 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 also 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.

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).

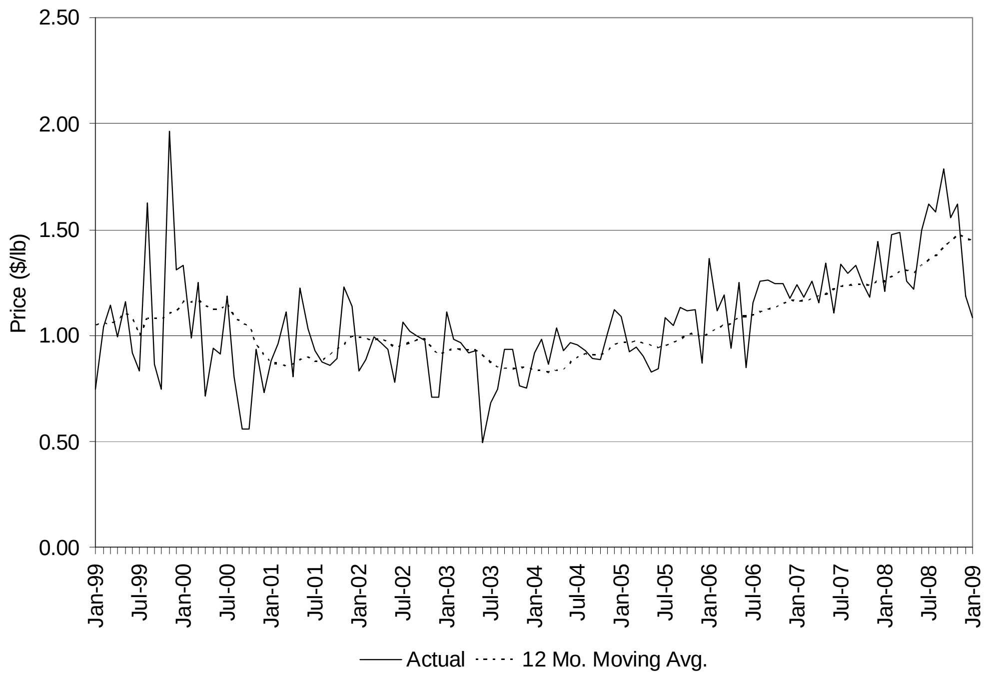
Although U.S.-caught fish sent to China for processing are not covered by FDA's import alert, the concern within the seafood industry is that customers will tend to lump all China seafood products together (Schmit 2007). Consumer market research indicates that the FDA's action, together with media attention 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 recent 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.

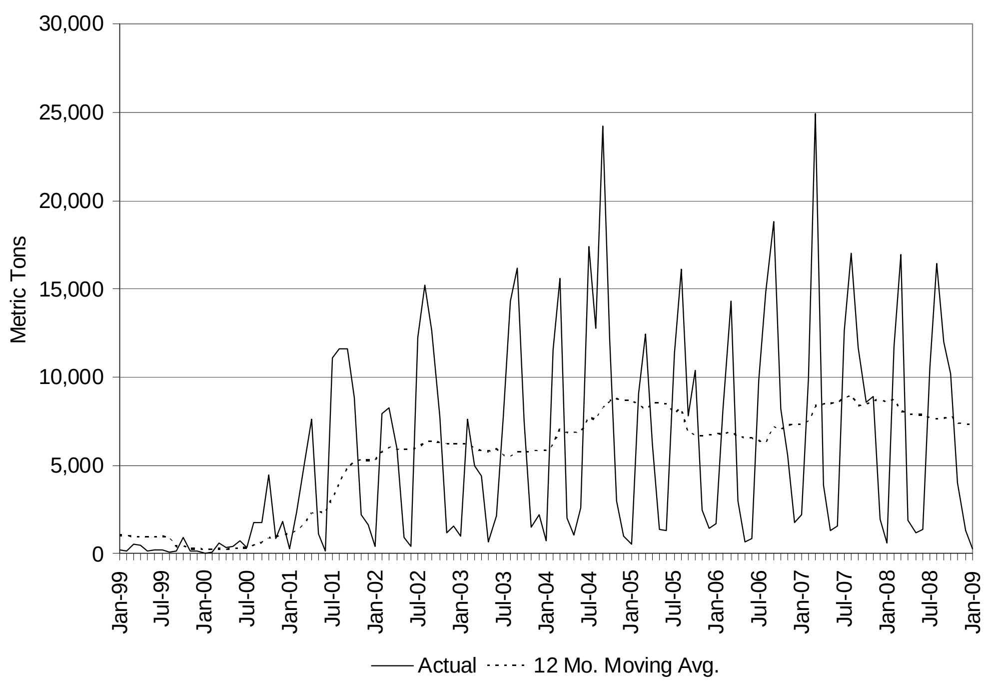
Alaska Groundfish Market Profiles

Figure 9. Nominal U.S. Export Prices of Alaska Pollock Fillets to All Countries, 1999 - 2008



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

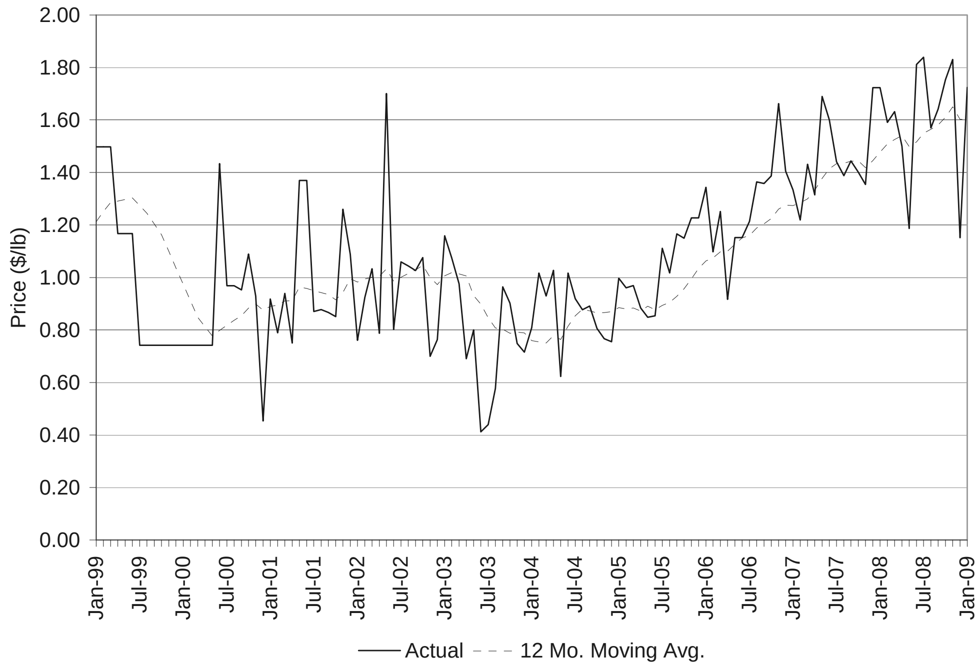
Figure 10. U.S. Export Volumes of Alaska Pollock Fillets to All Countries, 1999 - 2008



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

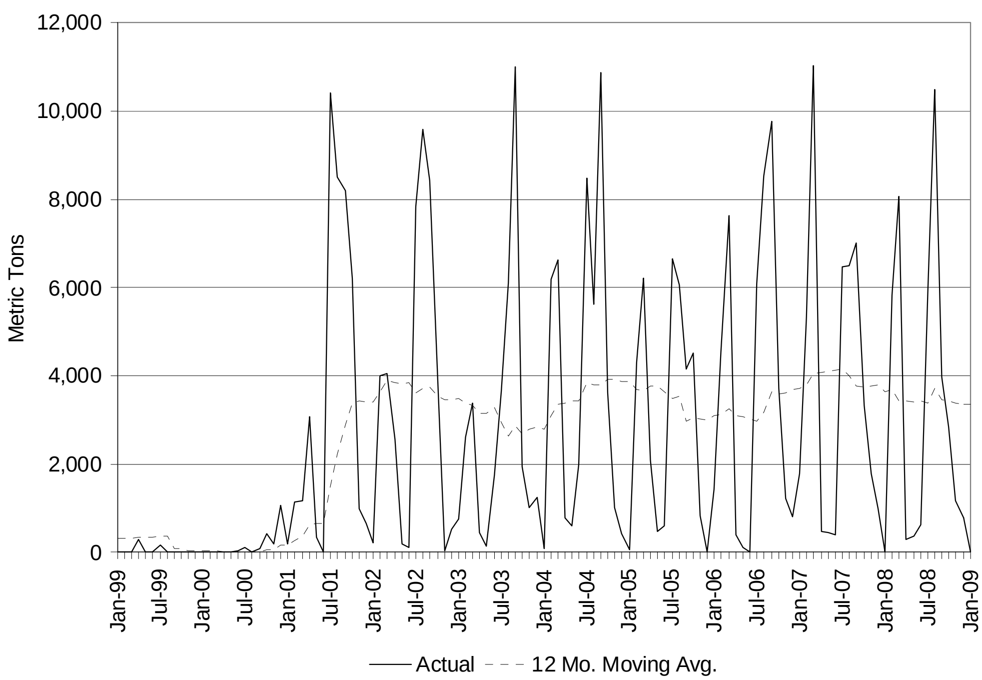
Alaska Pollock Fillets Market Profile

Figure 11. Nominal U.S. Export Prices of Alaska Pollock Fillets to Germany, 1999-2008



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, 1999-2008



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

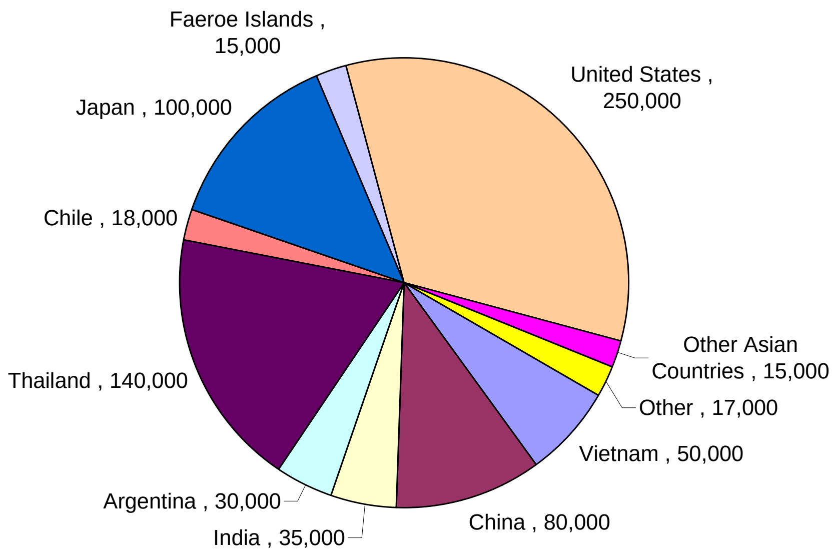
Description of the Fishery

See *Alaska Pollock Fillets Market Profile*

Production

Surimi production has almost doubled in the last 10 years (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



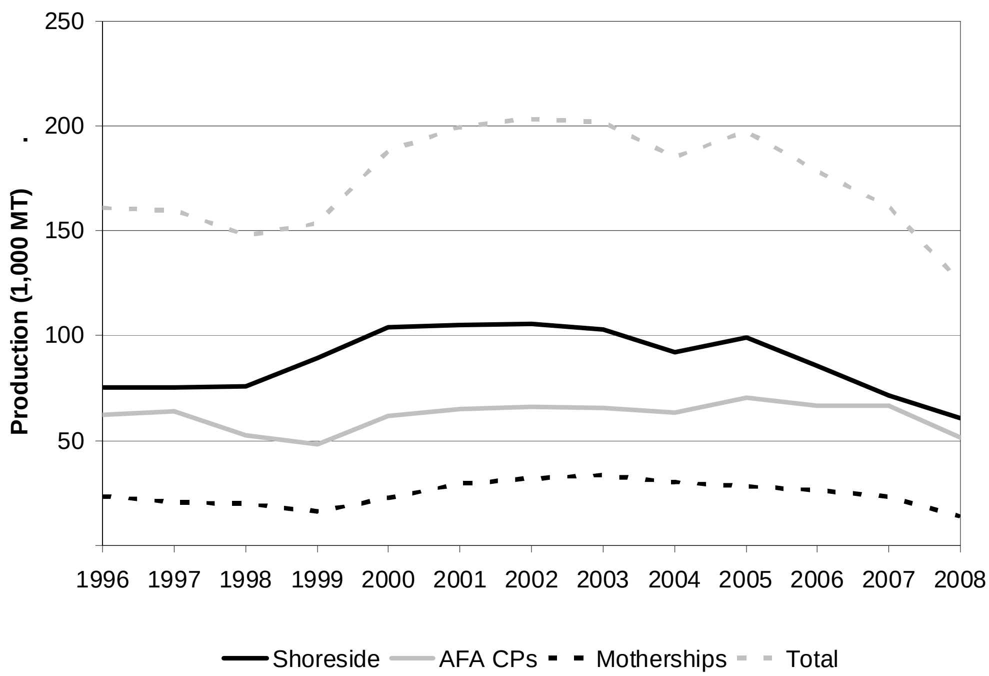
Source: GLOBEFISH (2006)

Most of the surimi is produced for Asian markets, with Japan being the single largest market. The United States is by far the leading country providing Alaska pollock surimi to the Japanese market. 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 now represents 25% of the total volume of surimi production (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, and then, in 2008, production volume continued its decline while the value rebounded sharply due to a large increase in the wholesale price Alaska pollock surimi wholesale prices spiked in 1999, declined in 2000, remained relatively stable through 2007, and increased dramatically in 2008 (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.

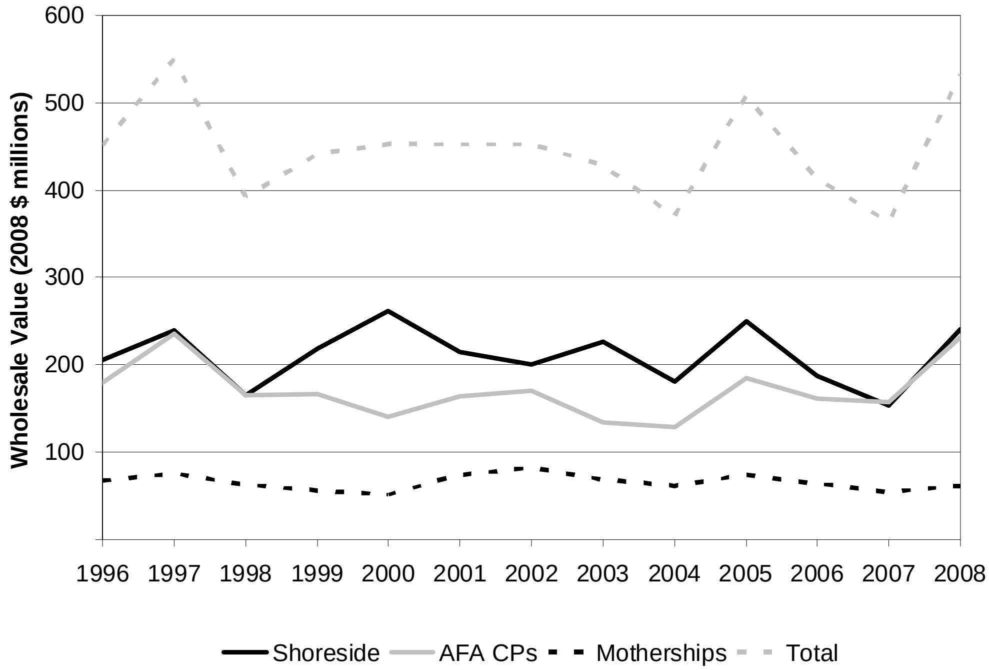
Figure 14. Alaska Primary Production of Alaska Pollock Surimi by Sector, 1996 – 2008



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 1996-2008

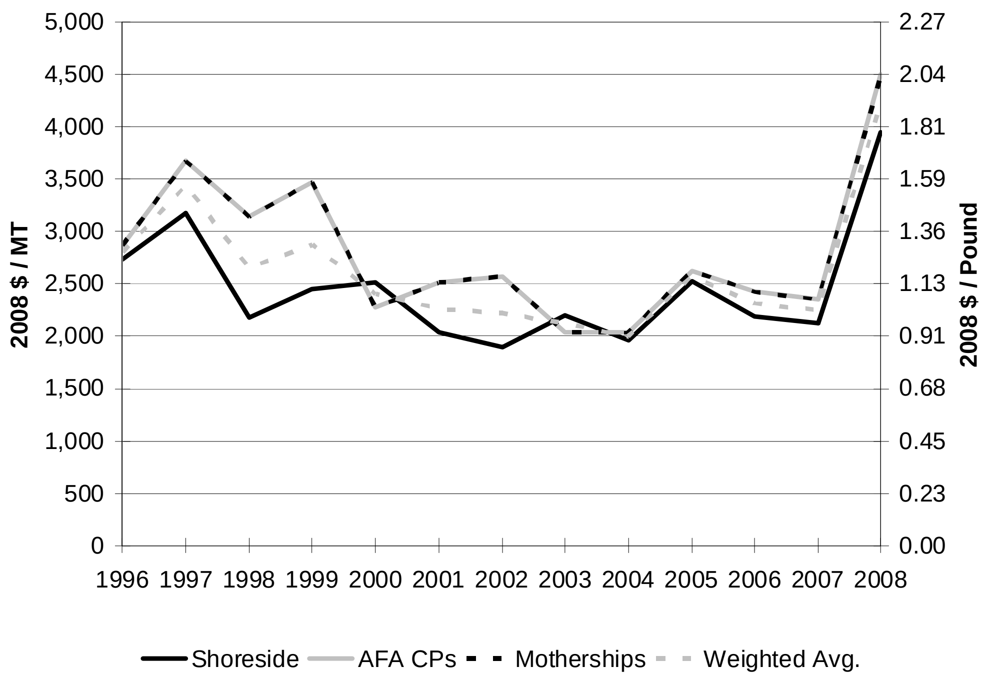
Figure 15. Wholesale Value of Alaska Primary Production of Alaska Pollock Surimi by Sector, 1996 – 2008



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 1996-2008

Figure 16. Average Wholesale Prices for US Primary Production of Pollock Surimi by Sector, 1996 – 2008



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 1996-2008

Product Composition and Flow

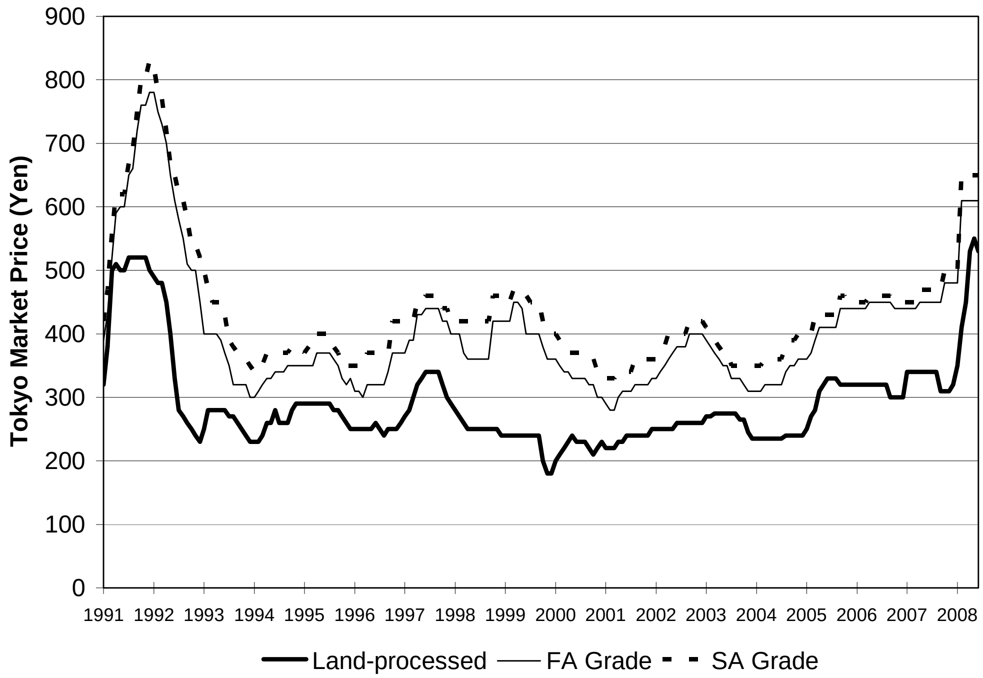
Surimi is the generic name for a processed white paste made from whitefish. In the case of Alaska pollock surimi, the fish are first filleted and then minced. Fat, blood, pigments and odorous substances are removed through repeated washing and dewatering. As washings continue, lower-quality product is 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 simmer 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 since 2005 were declining, 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 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.

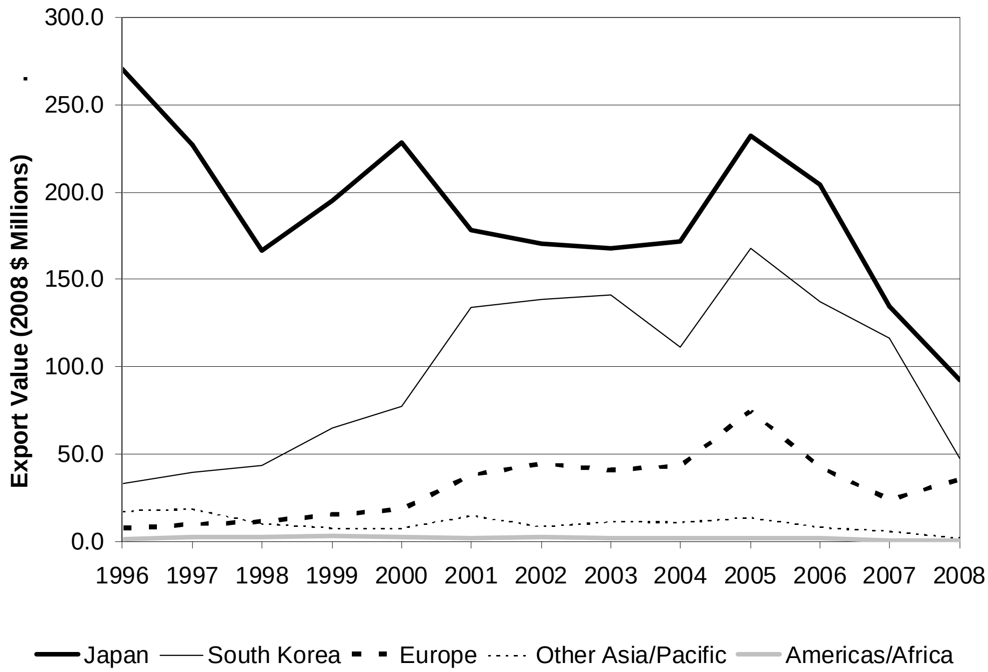
International Trade

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 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 early part of this decade, 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, except for a slight increase in exports to the EU in 2008 from their level in 2007. The decline in exports 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).

Alaska Pollock Surimi Market Profile

Figure 18. U.S. Exports of Alaska Pollock Surimi to Leading Importing Countries, 1996 - 2008



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). The high demand for pollock as whitefish fillets in Europe, cuts in the

U.S. pollock quota 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).

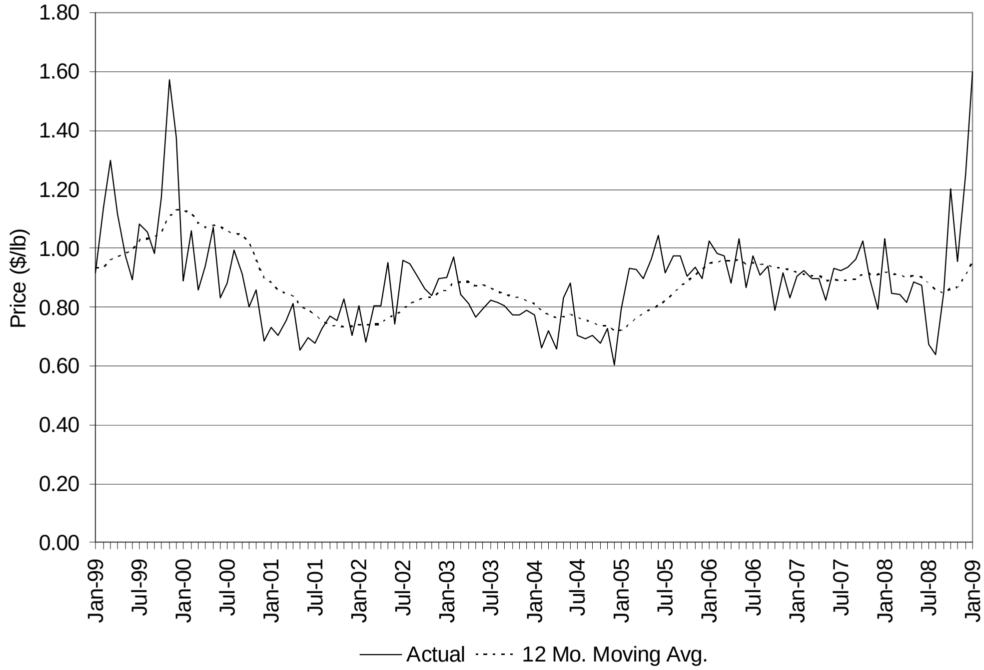
A seafood market report summarized the current market situation for surimi made from Alaska-caught pollock by stating that, with the increasing demand for surimi-based products in many markets and the reduction in the supply of Alaska pollock for these products, there appear to be good reasons for U.S. 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 (Seafood.com News 2008). In previous years, fillet prices were higher than those for surimi, but this price difference was reversed in the 2008 BSAI pollock fishery “A” season, with surimi prices exceeding those of fillets (Seafood.com News 2008b). These higher values are reflected in the very high average prices received in 2008 by US producers (as shown in Figure 16).

The three fold increase in surimi raw material prices 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 increase in prices for surimi raw material based on Alaska pollock has 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. Currently, over 50% of global production is based on non-Alaska pollock fish species that are 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 is constantly working to adapt surimi production technologies to new aquatic species, including to cephalopods, like squid (GLOBEFISH

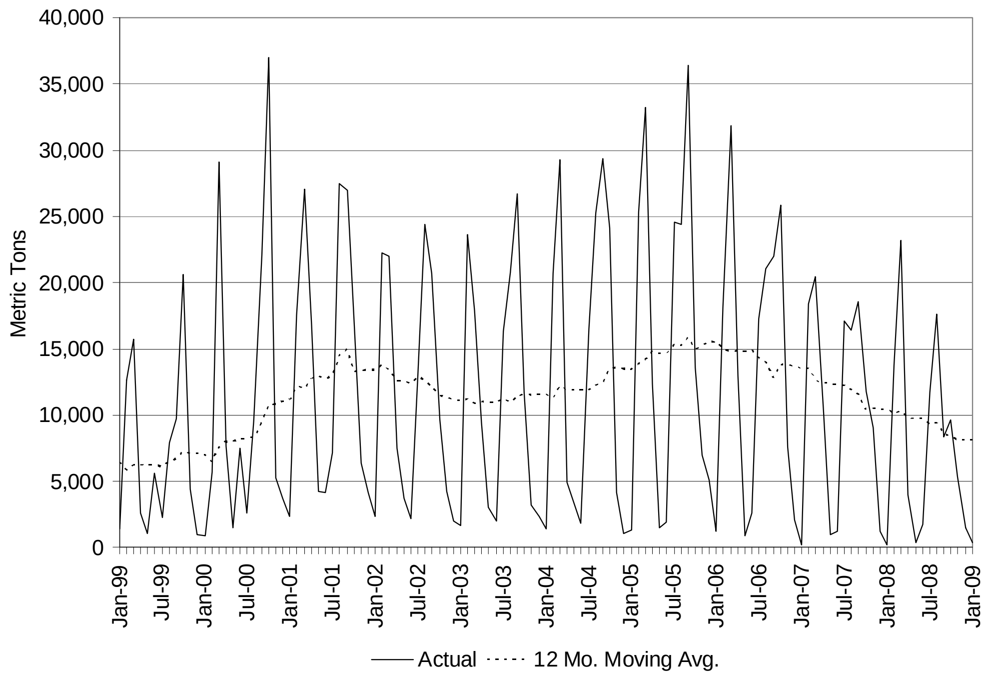
2006). The search for surimi raw material is already a strategic issue for large multinational firms producing either surimi or surimi-based items. Numerous investments and joint ventures in countries with such resources are being actively carried out for that purpose (GLOBEFISH 2006).

Figure 19. Nominal U.S. Export Prices of Alaska Pollock Surimi to All Countries, 1999 - 2008



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, 1999 - 2008



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

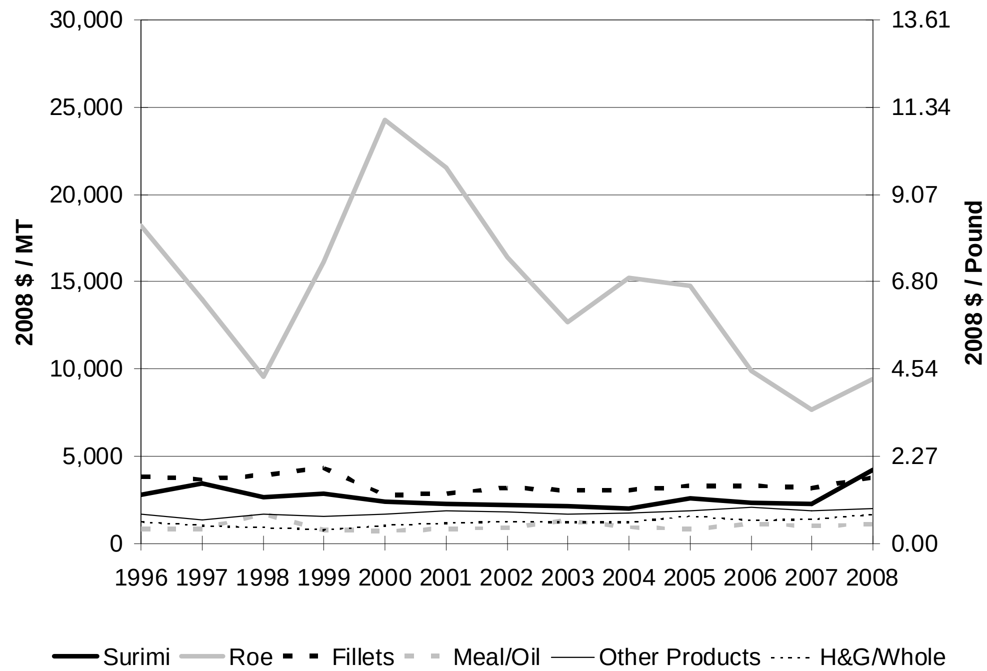
The two major sources of Alaska pollock roe are the United States and Russia. U.S. pollock roe production between 1999 and 2006 was significantly higher than in prior years, reflecting both an increase in pollock harvests as well as an increase in pollock roe yields—the latter a result of the AFA according 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 since 2001 have been 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.

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.

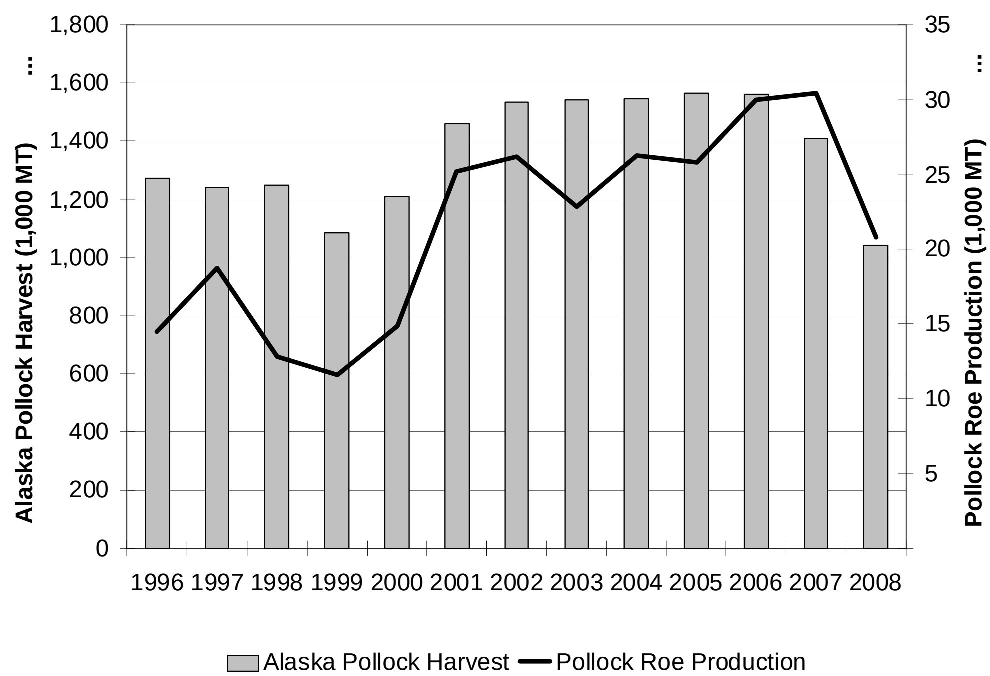
Figure 21. Wholesale Prices for Alaska Primary Production of Pollock by Product Types, 1996 – 2008



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

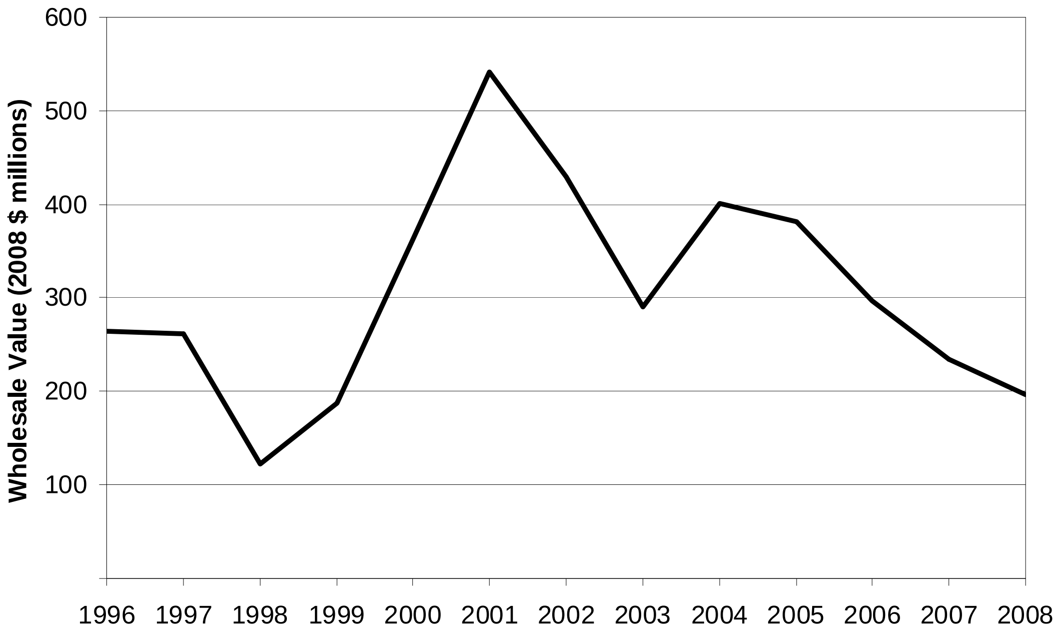
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 22. Alaska Pollock Harvest and Primary Production of Pollock Roe, 1996 – 2008



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 23. Wholesale Value of Alaska Primary Production of Pollock Roe, 1996 – 2008



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 1996-2008

Product Composition and Flow

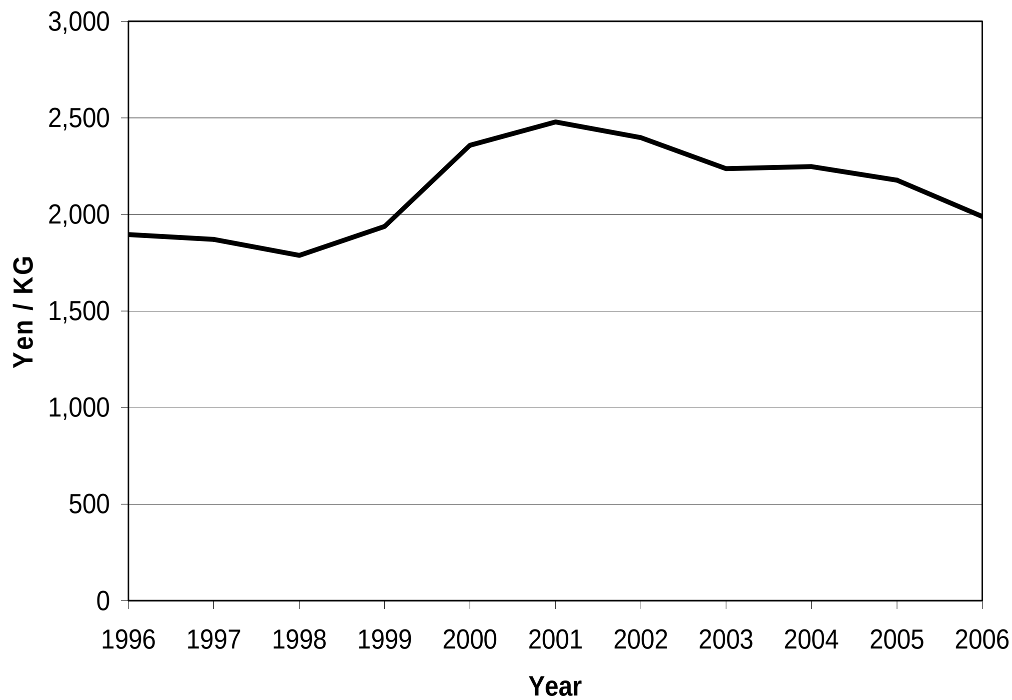
The roe is extracted from the fish after heading, separated from the other viscera, washed, sorted, and frozen. After the roe is stripped from the pollock, the fish can be further processed into surimi or fillets (NMFS 2001). There are dozens of different grades of pollock roe, which command widely varying 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.

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

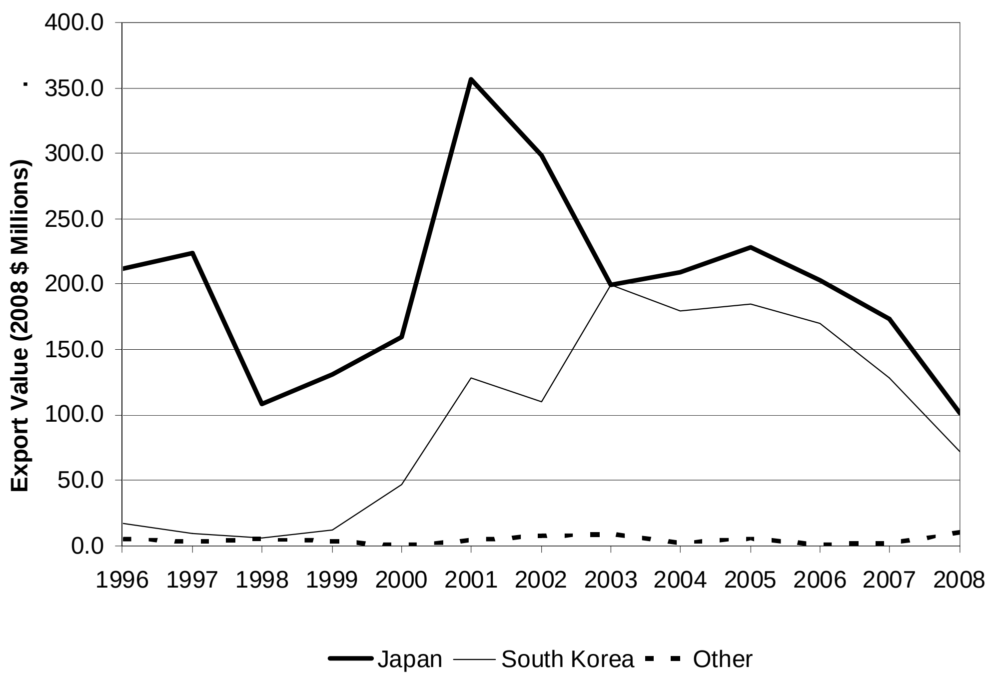


Source: U.S. Census Bureau Foreign Trade Data available at http://swr.nmfs.noaa.gov/fmd/sunee/salesvol/svw.htm

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 May and April (Knapp 2005).

Figure 25. U.S. Exports of Alaska Pollock Roe to Leading Importing Countries, 1996 - 2008



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/.

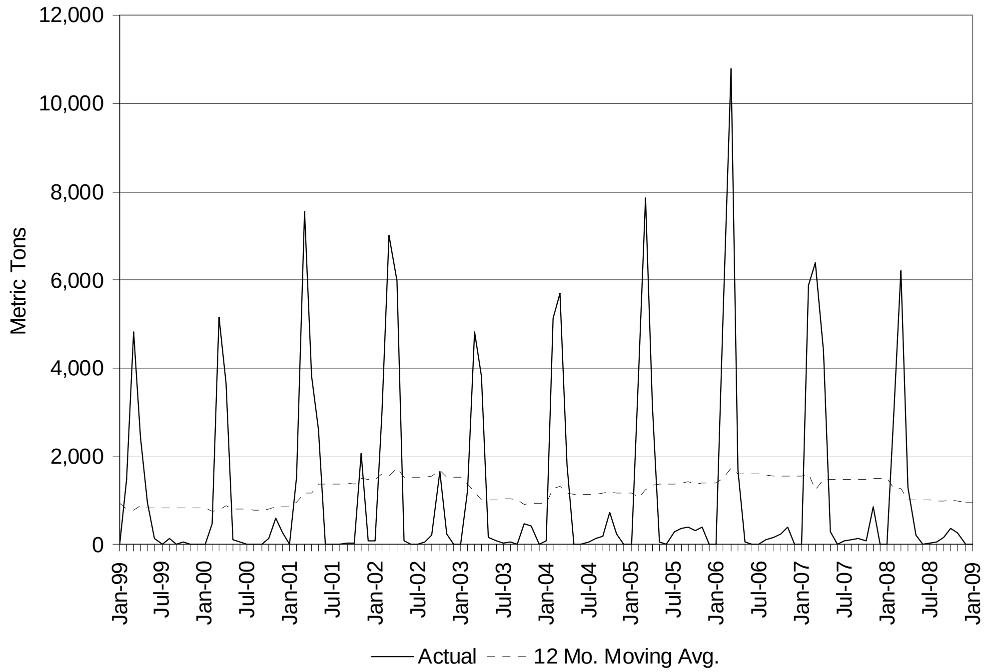
Market Position

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 has generally 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.

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 experienced significant volatility in recent years (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).

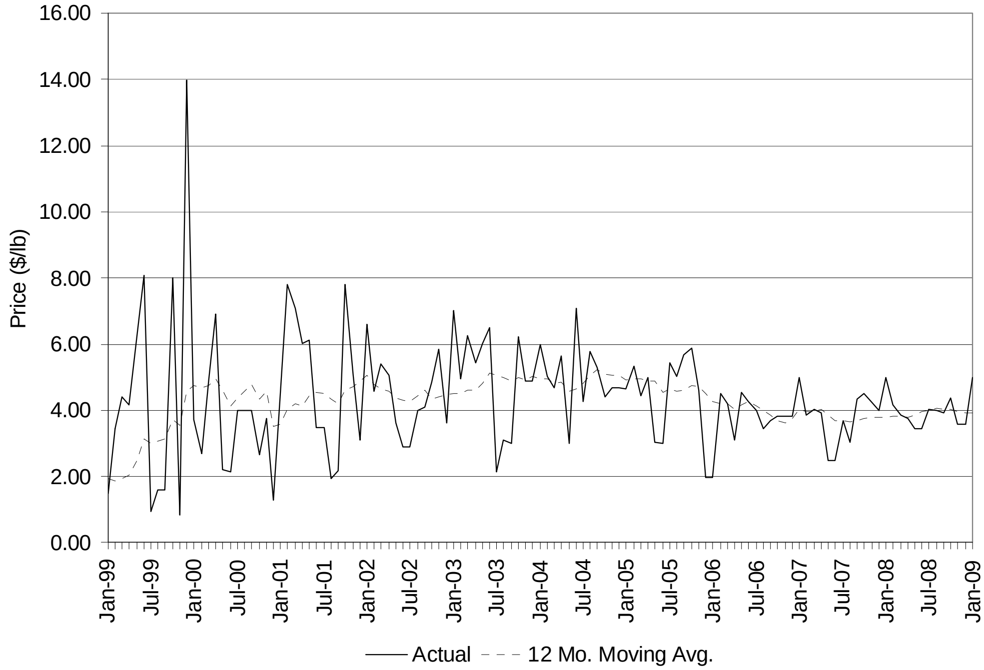
Figure 26. U.S. Export Volumes of Pollock Roe to Japan, 1999-2008



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

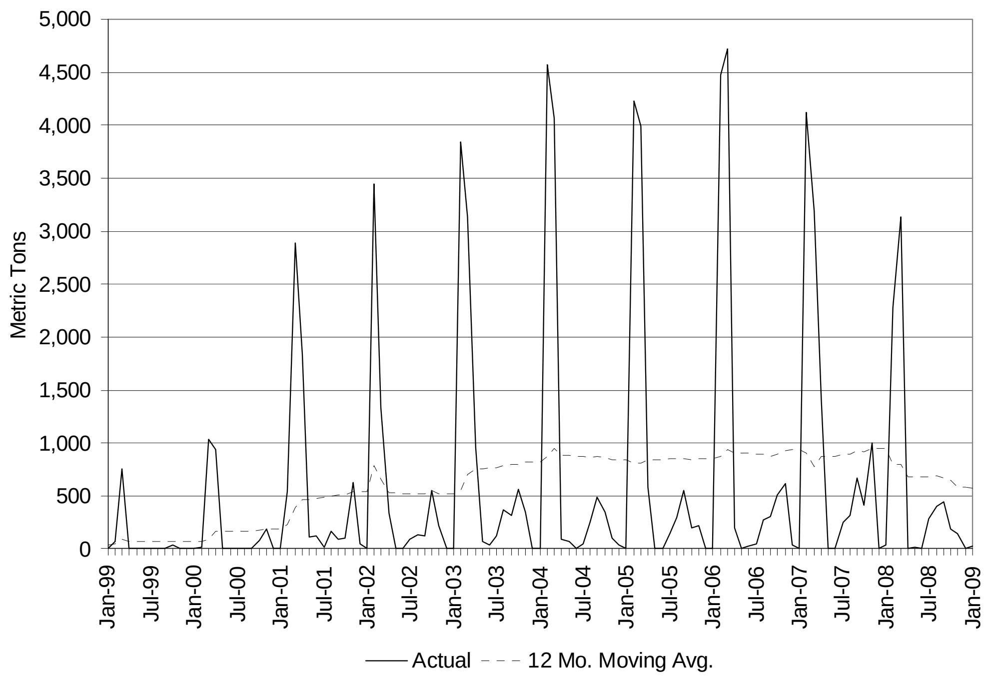
Alaska Pollock Roe Market Profile

Figure 27. Nominal U.S. Export Prices of Pollock Roe to Japan, 1999-2008



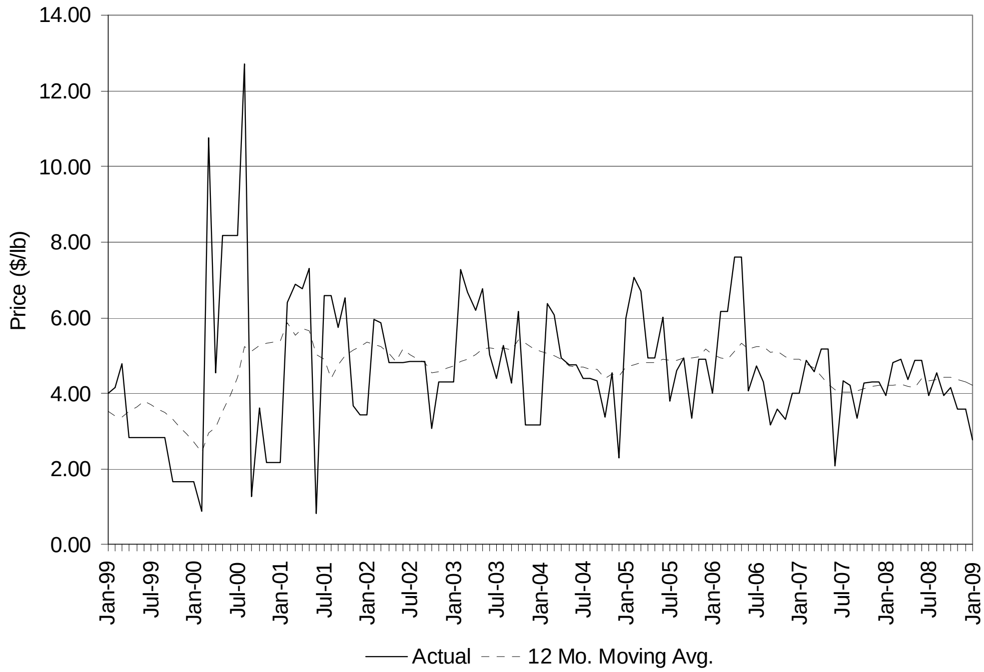
Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 28. U.S. Export Volumes of Pollock Roe to Korea, 1999-2008



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, 1999-2008



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

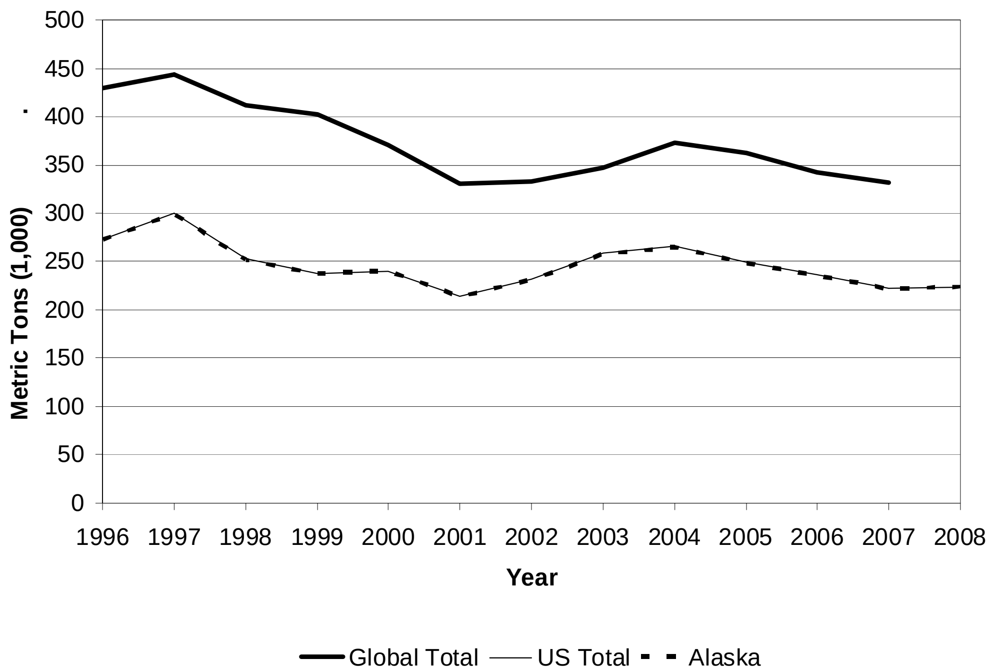
Pacific cod (*Gadus macrocephalus*) is widely distributed over the eastern Bering Sea and Aleutian Islands (BSAI) areas. Behind Alaska pollock, Pacific cod is the second most dominant species in the commercial groundfish catch off Alaska. The BSAI Pacific cod fishery is targeted by multiple gear types, primarily trawl gear and hook-and-line catcher/processors, and 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 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, the United States now accounts for more than two-thirds of the world Pacific cod supply (Knapp 2006). 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 – 2008



Note: Data for 2008 were unavailable for global total. The fish landing statistics of some countries may not distinguish between Pacific cod and other cod species.

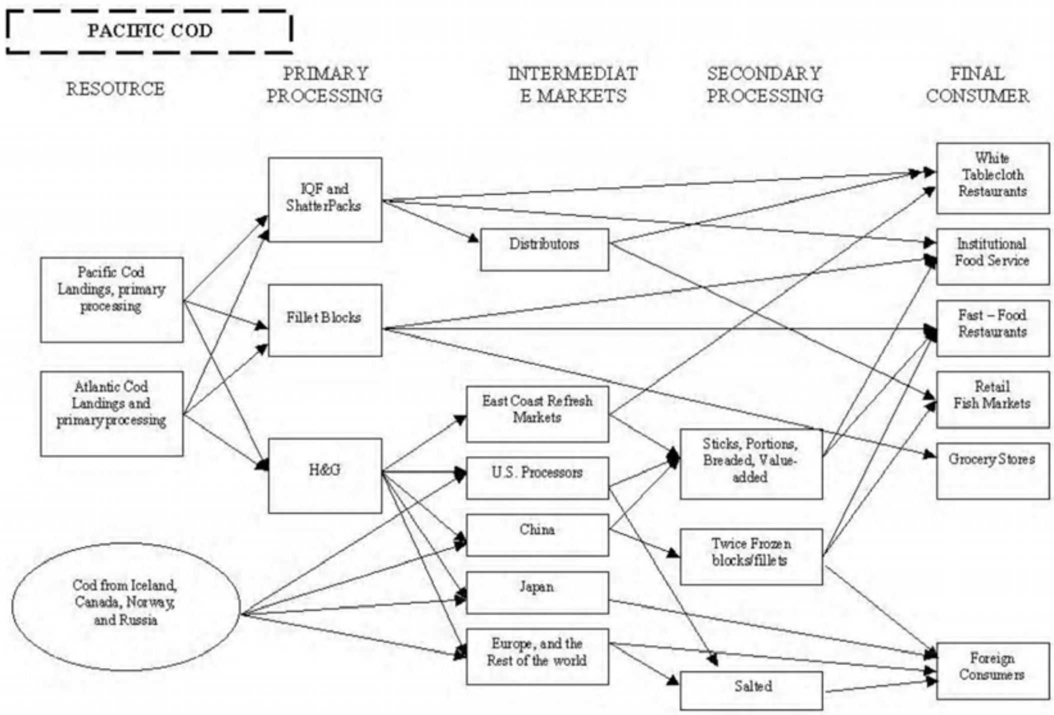
Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html; Global data from FAO, "FishStat" database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

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.

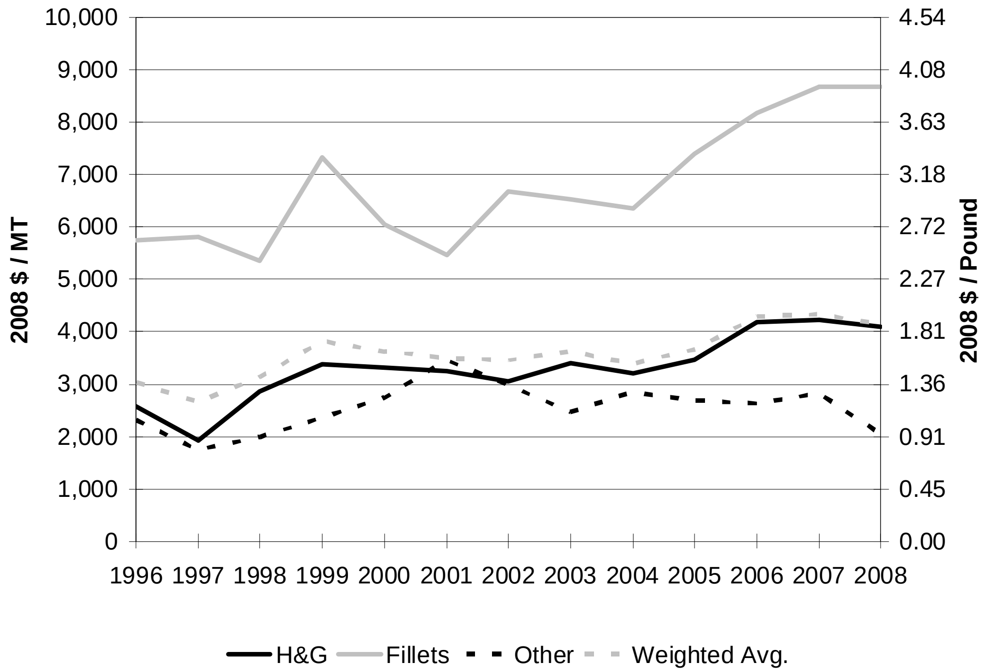


Source: NMFS (2001)

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 74% in 2008 Over the same period, the product share of skinless-boneless fillets has declined from approximately 17% to about 8%. 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.

Alaska Groundfish Market Profiles

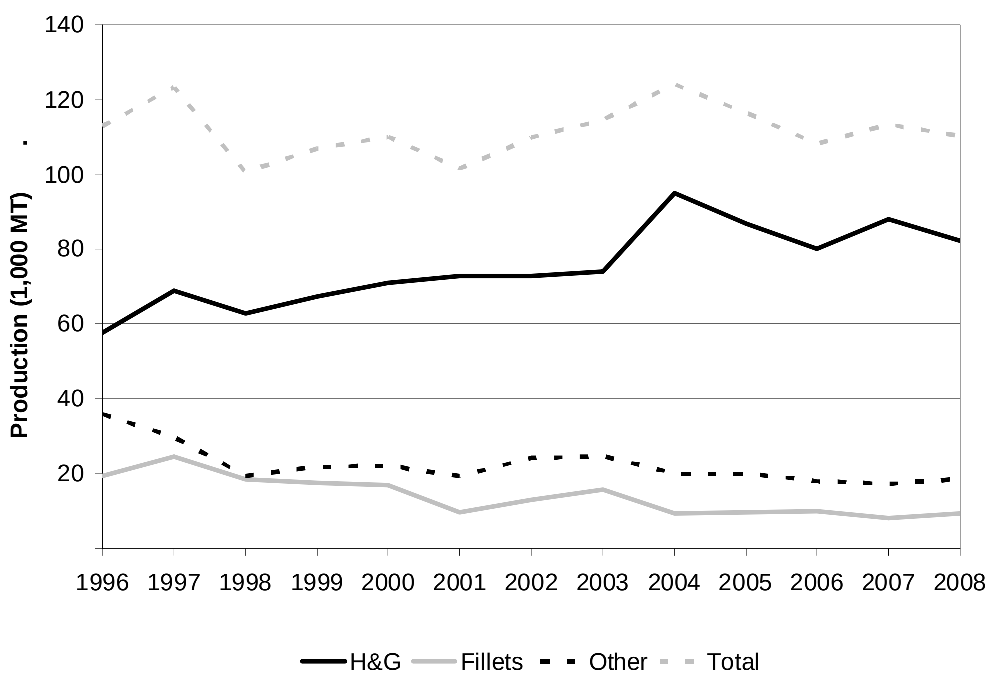
Figure 32. Wholesale Prices for Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2008



Notes: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

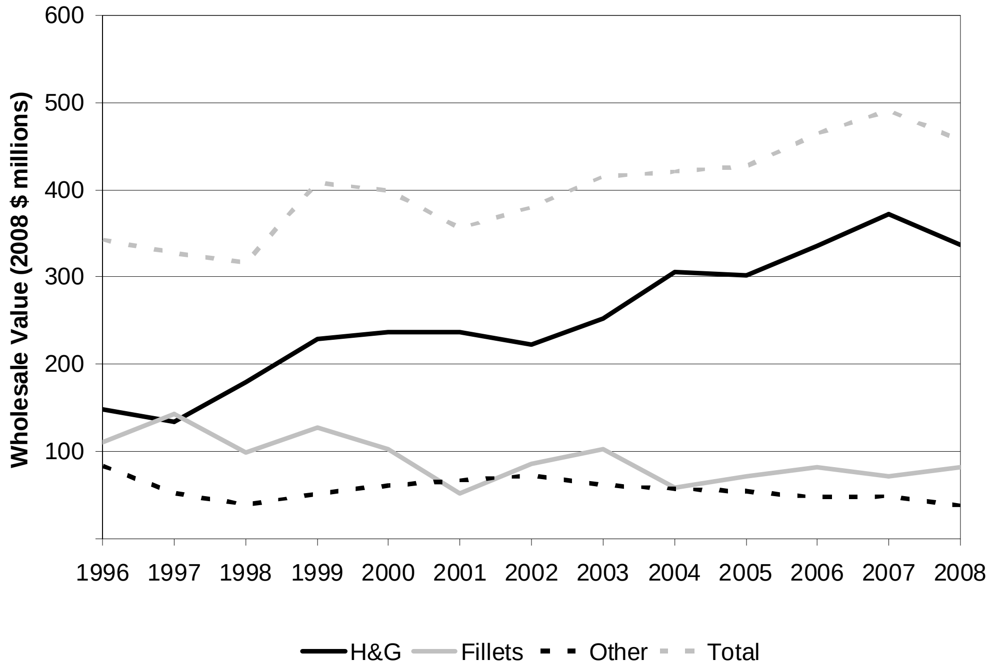
Figure 33. Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 34. Wholesale Value of Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

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).

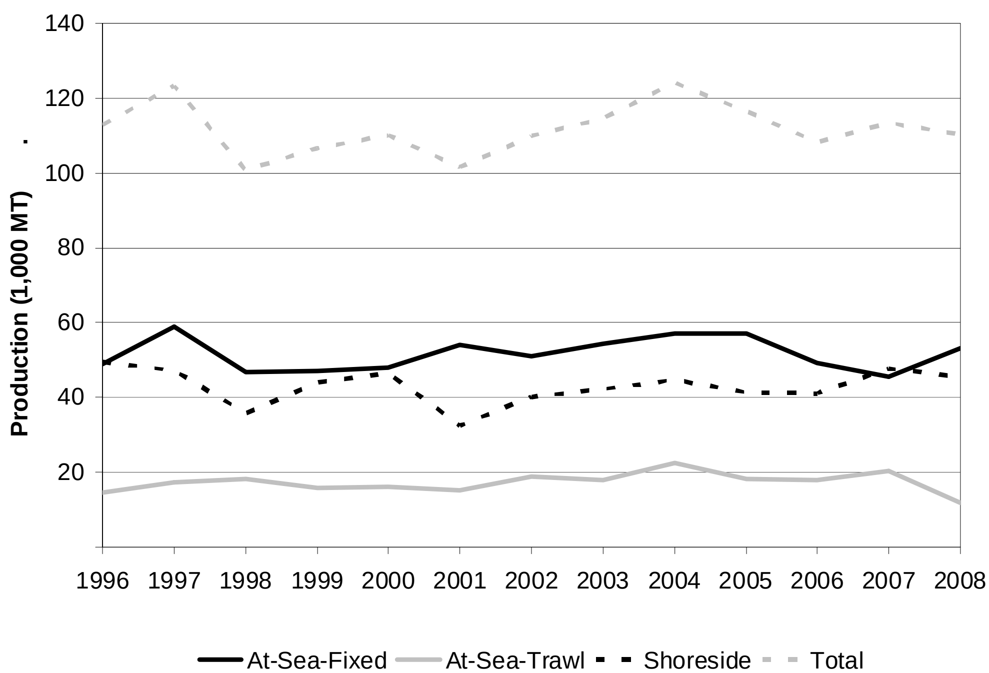
Figure 35 shows that wholesale prices for H&G Pacific cod caught and processed by fixed gear (freezer longline) vessels have been consistently higher than the prices received by trawl vessels. According to an industry representative, this price difference occurs because fish caught by longline gear can 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 Type, 1996 – 2008

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 1996-2008

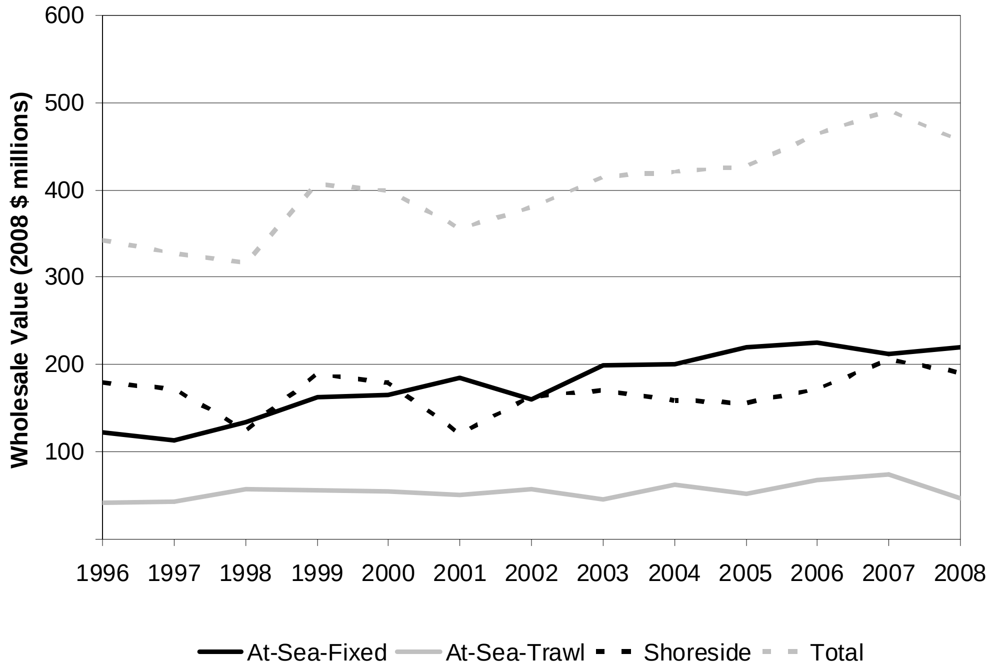
Figure 36. Alaska Primary Production of H&G Pacific Cod by Sector, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 37. Wholesale Value of Alaska Primary Production of H&G Pacific Cod by Sector, 1996 – 2008



Note: Product type may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

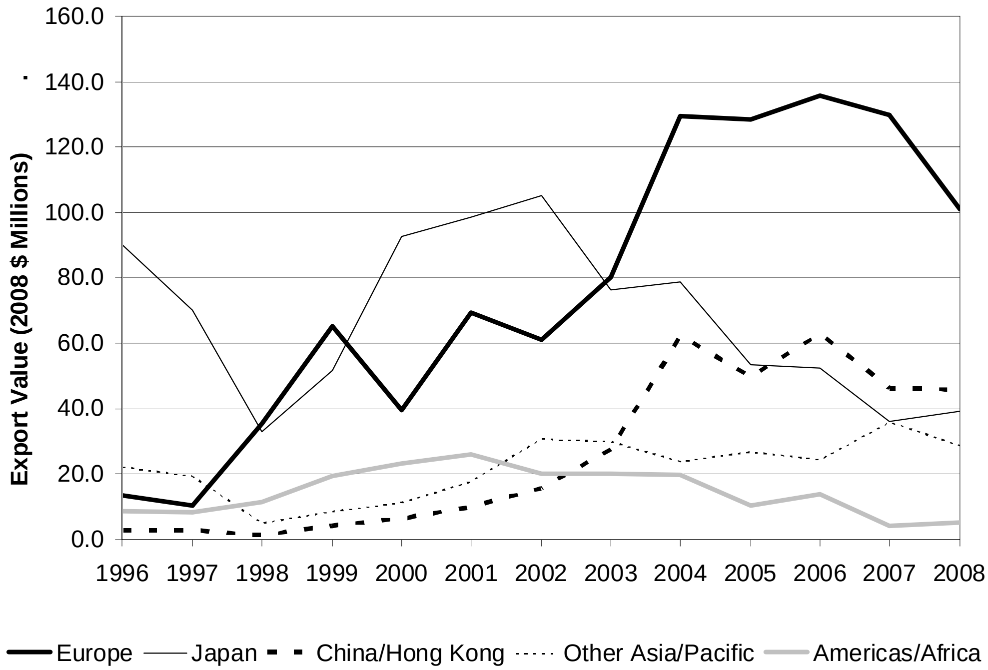
International Trade

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. In Figure 38, H&G product is included in "frozen cod (not fillets)."

The value of Pacific cod moving into European markets increased steadily from 2002 through 2007, and then declined in 2008. (Figure 38 and Figure 39). 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 (excluding fillets)" exports has substantially declined (SeafoodNews.com. 2008), though data are not available to assess the re-export destinations of China's processed product.

Exports of Pacific cod fillets to Japan have also fallen (Figure 39). In contrast, tighter European cod quotas and the increasing strength of the euro over the dollar have resulted in a sharp rise in exports of Pacific cod fillets to Germany and other European markets.

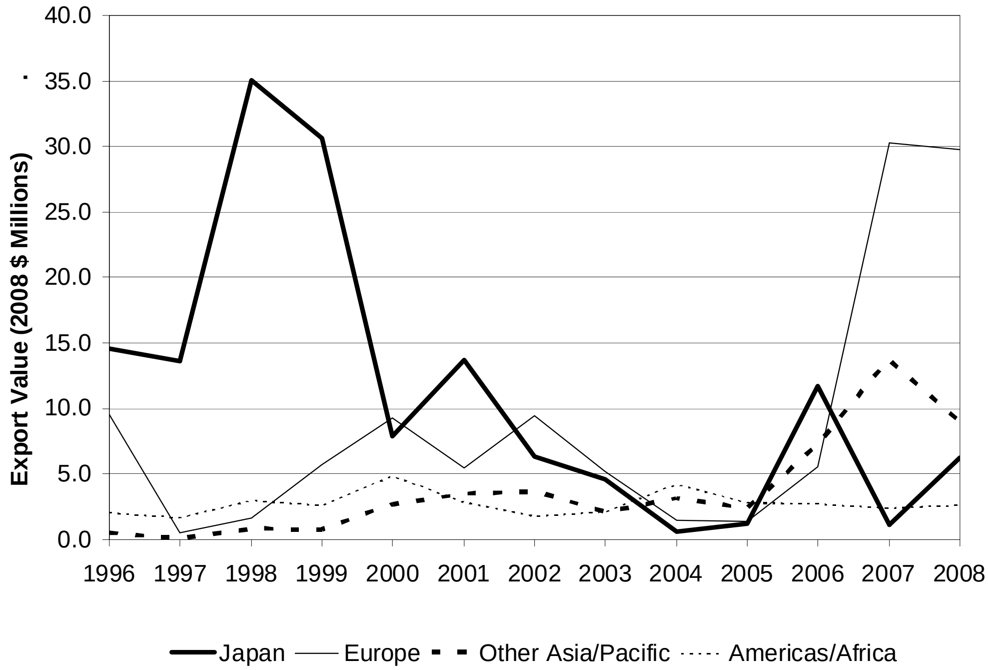
Figure 38. U.S. Exports of Frozen Pacific Cod (excluding Fillets) to Leading Importing Countries, 1996 - 2008



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 39. U.S. Exports of Pacific Cod Fillets to Leading Importing Countries, 1996 – 2008



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: "Monthly Trade Data by Product through U.S. Customs Districts," 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 (excluding fillets)" are shown in Figure 42 and Figure 43, with much of the product destined for re-processors in China and Europe (Figure 44 through Figure 47). The demand for Pacific cod fillets processed from H&G product is especially increasing in EU markets, as the dollar is depreciating against the euro, making it less expensive for Europeans to buy U.S. seafood (Hedlund 2007). In addition, European whitefish supplies are tight due to declining stocks—for example, Iceland has 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 market for Alaska-caught Pacific cod is expected to receive an additional boost 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). Currently, members of the Alaska Fisheries Development Foundation Inc., a non-profit organization supporting Alaska's seafood industry, are seeking certification of sustainability from the MSC for all Pacific cod fisheries in Alaska (Alaska Fisheries Development Foundation Inc. 2008).

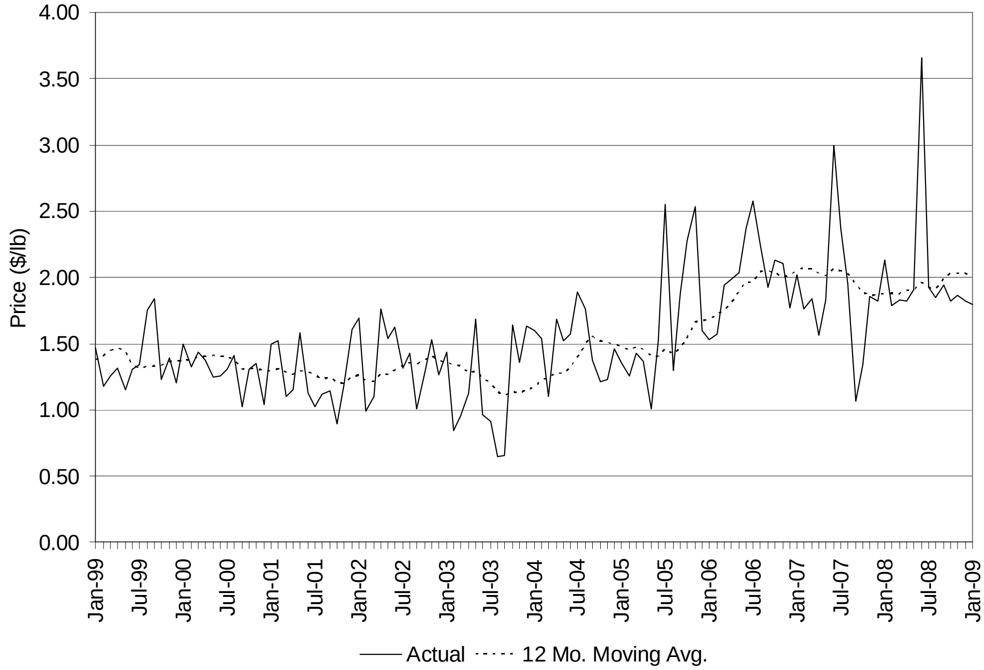
Marketing seafood from well-managed fisheries, such as Pacific cod, is especially important to EU seafood processors (Chetrick 2005). Some U.S. companies have also begun to shift their seafood purchases toward species caught in fisheries considered sustainable. In 2006, for example, Compass Group USA, 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).

The continuing strong demand for whitefish, particularly in the United States and Europe because of consumers' preference for healthy food, is anticipated to maintain the upward pressure on Pacific cod prices. As Pacific cod prices rise, some species substitution is inevitable. Alaska Pacific cod also 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).

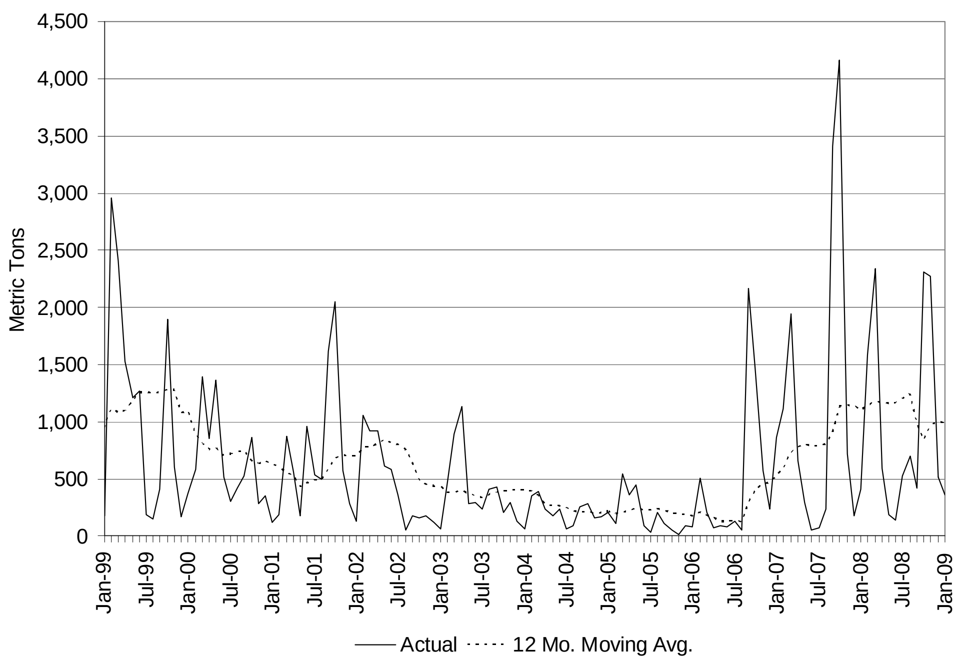
Figure 40. Nominal U.S. Export Prices of Cod Fillets to All Countries, 1999 – 2008



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. U.S. Export Volumes of Cod Fillets to All Countries, 1999 – 2008

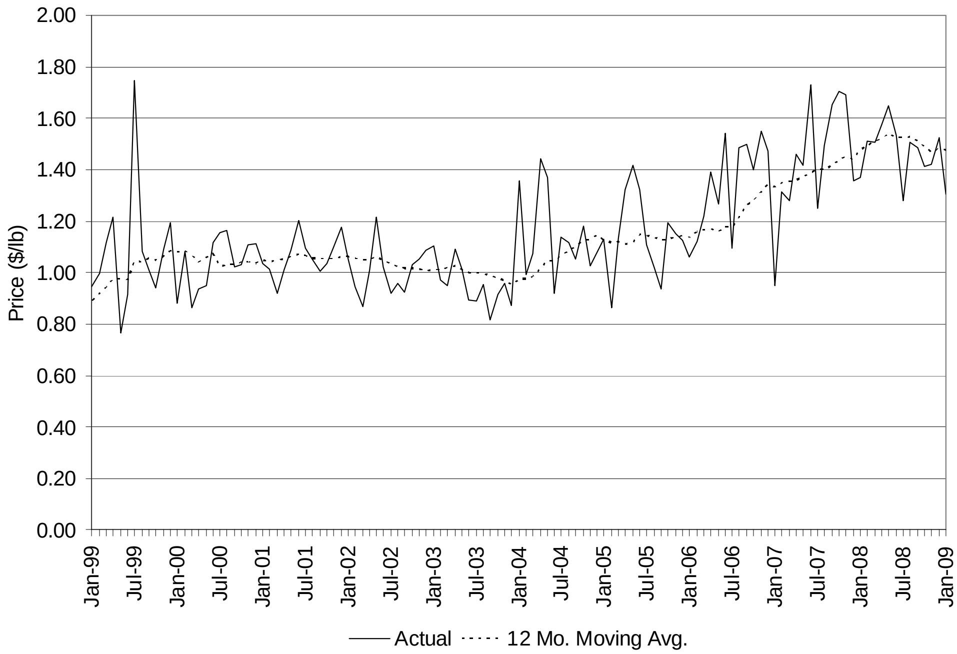


Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

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

Pacific Cod Market Profile

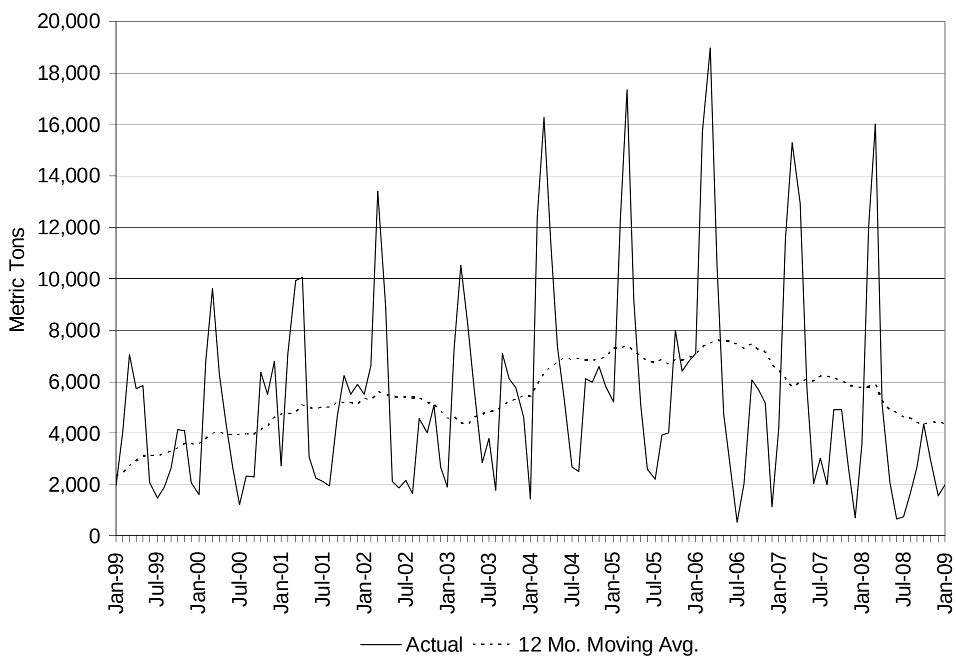
Figure 42. U.S. Export Prices of Frozen Cod (Not Fillets) to All Countries, 1999 – 2008



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/.

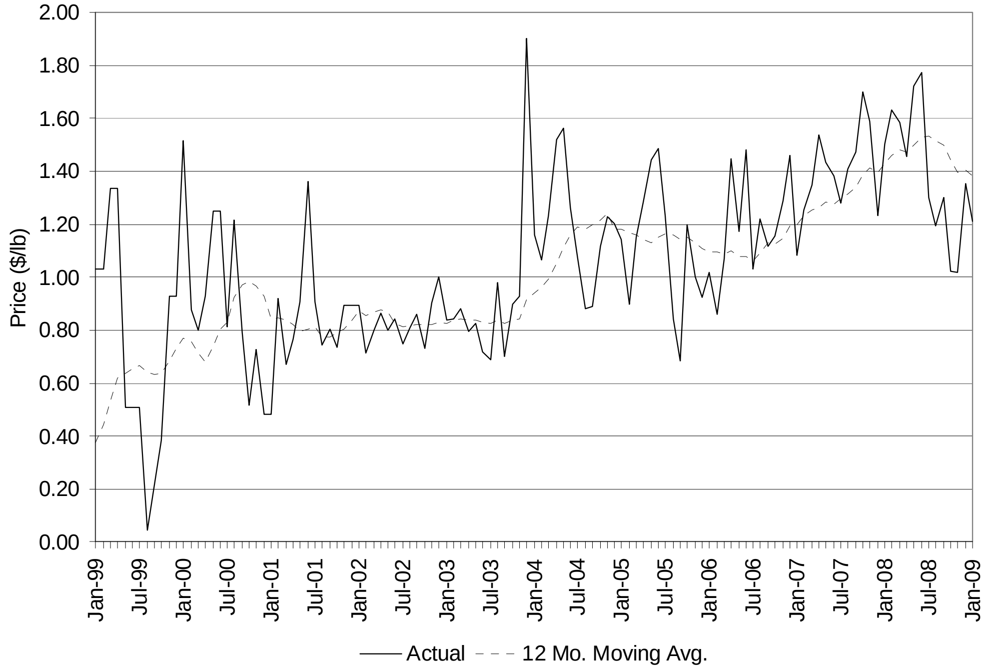
Figure 43. U.S. Export Volumes of Frozen Cod (Not Fillets) to All Countries, 1999 – 2008



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/.

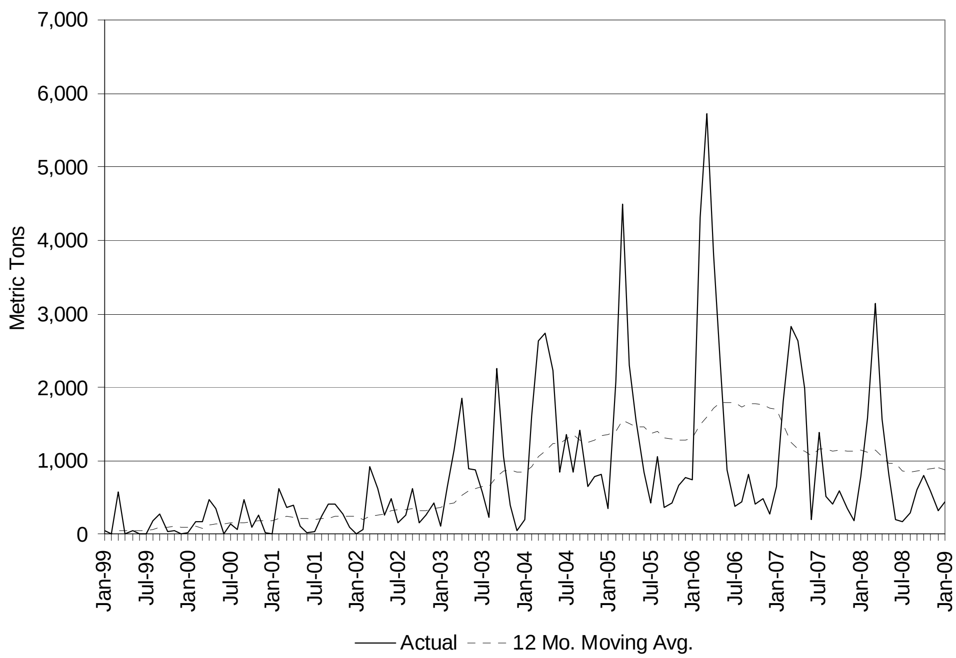
Figure 44. Nominal U.S. Export Prices of Frozen Cod (Not Fillets) to China, 1999 – 2008



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/.

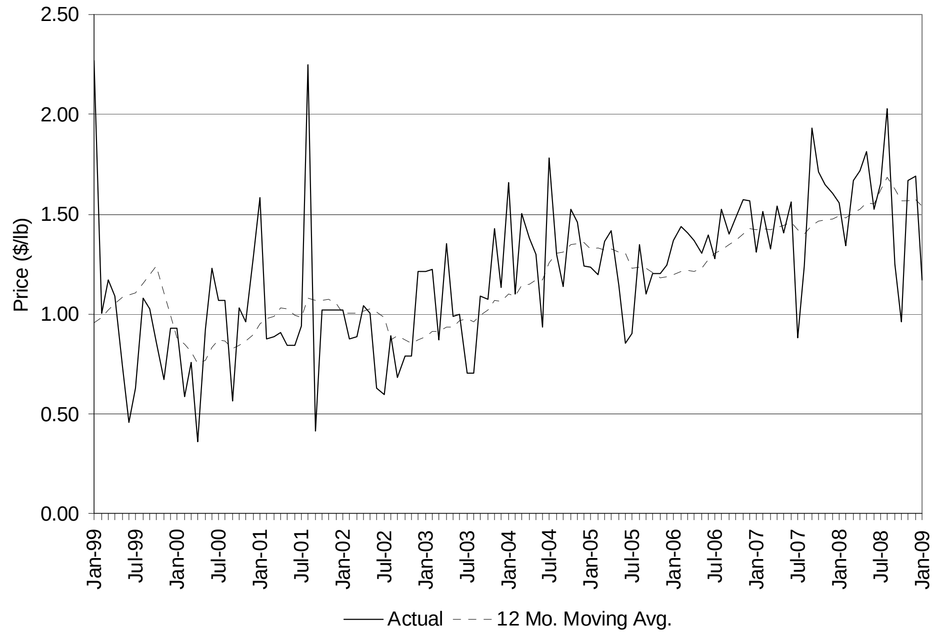
Figure 45. U.S. Export Volumes of Frozen Cod (Not Fillets) to China, 1999 – 2008



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/.

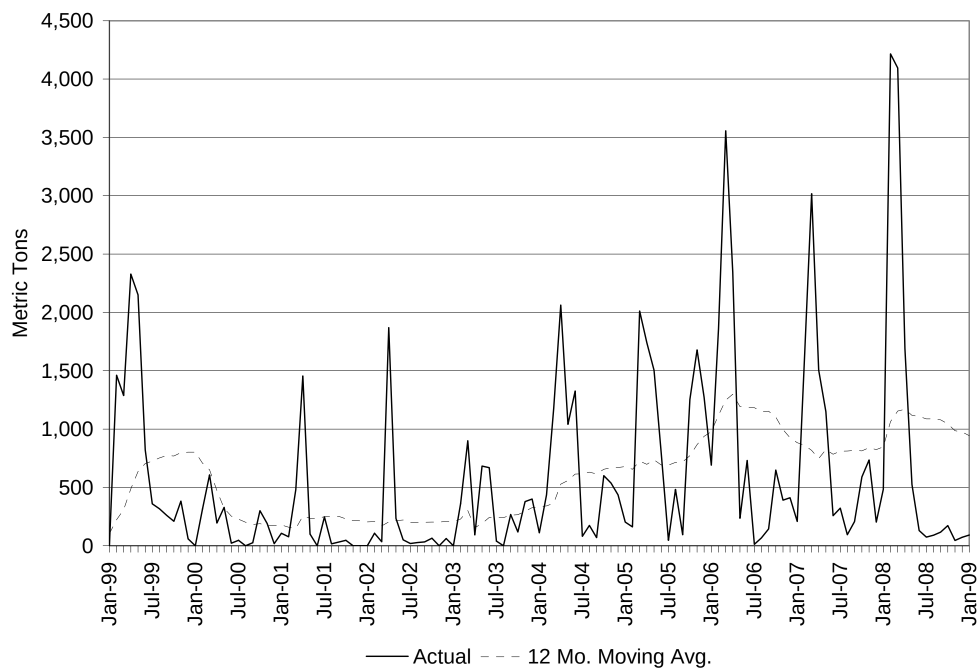
Figure 46. Nominal U.S. Export Prices of Frozen Cod (Not Fillets) to Portugal, 1999 – 2008



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 47. U.S. Export Volumes of Frozen Cod (Excluding Fillets) to Portugal, 1999 – 2008



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.

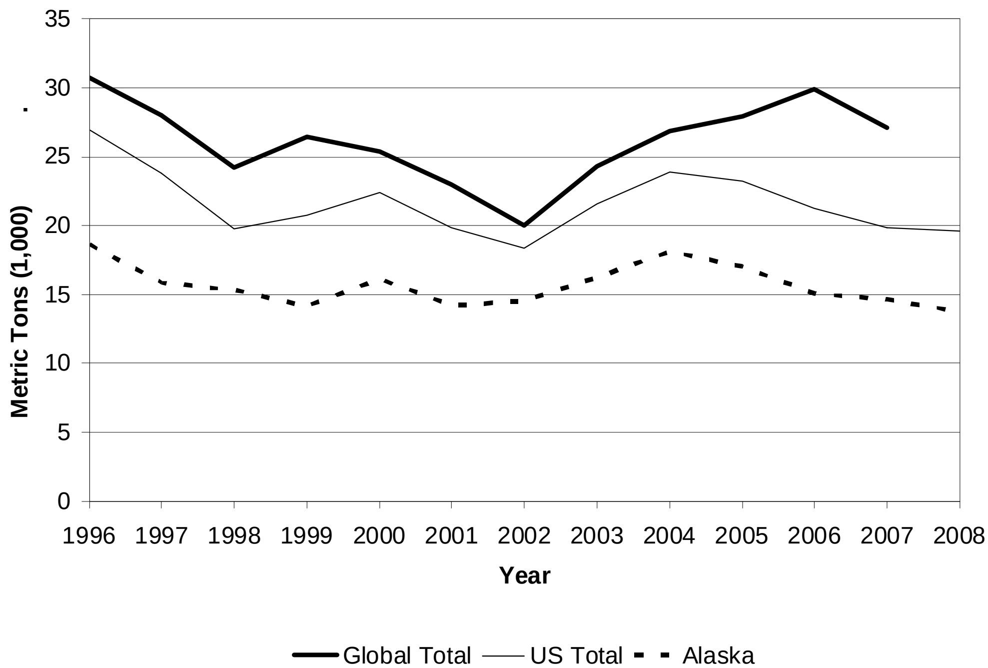
The fishing fleet for sablefish is primarily composed of owner-operated vessels that use hook-and-line or pot (fish trap) gear. An IFQ program for the Alaska sablefish and halibut fisheries was developed by the North Pacific Fishery Management Council and implemented by NMFS in 1995. The program was 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 48). Oregon, Washington and California generally account for less than one-third of the U.S. harvest. 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 48. Alaska, Total U.S. and Global Production of Sablefish, 1996 – 2008



Note: Data for 2008 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

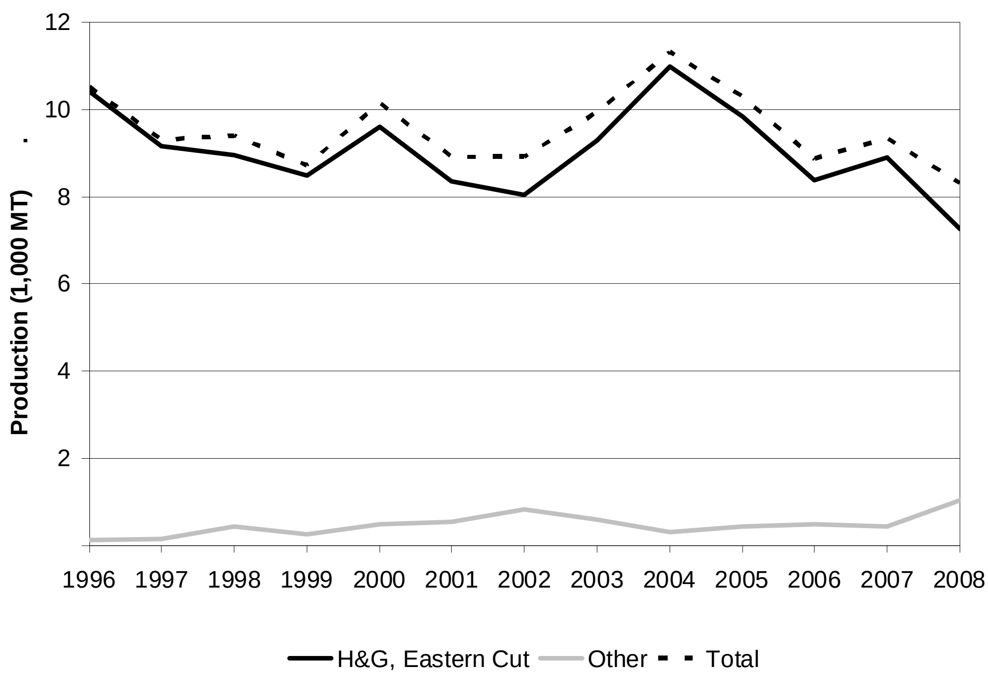
Until recently, about 90 percent of sablefish delivered by catcher vessels to shoreside processors was already headed and gutted (H&G) in an eastern cut—head removed just behind the collar bone (pers. comm., Jeannie Heltzel, Fisheries Analyst, North Pacific Fishery Management Council, September 19, 2007). 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). 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). As shown in Figure 49, 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).

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).

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 51).

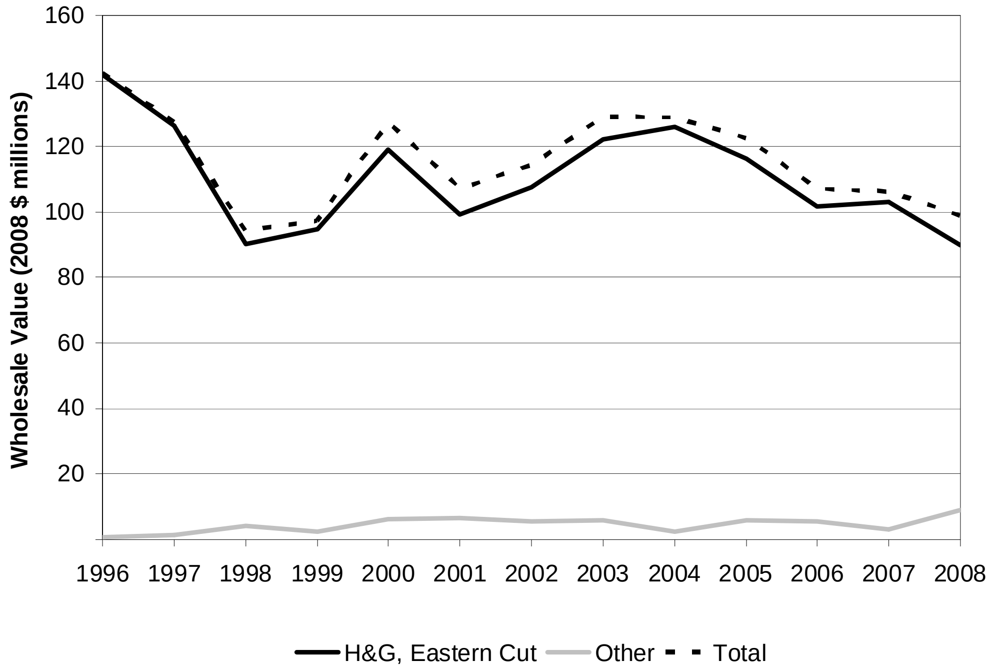
Figure 49. Alaska Primary Production of Sablefish by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

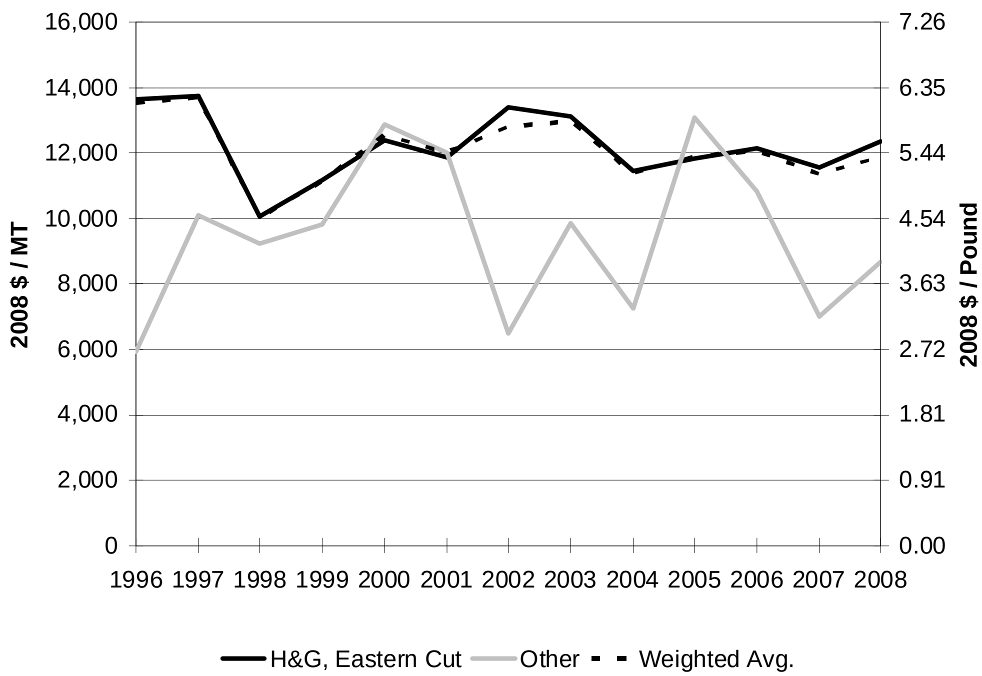
Figure 50. Wholesale Value of Alaska Primary Production of Sablefish by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 51. Wholesale Prices for Alaska Primary Production of Sablefish by Product Type, 1996 – 2008



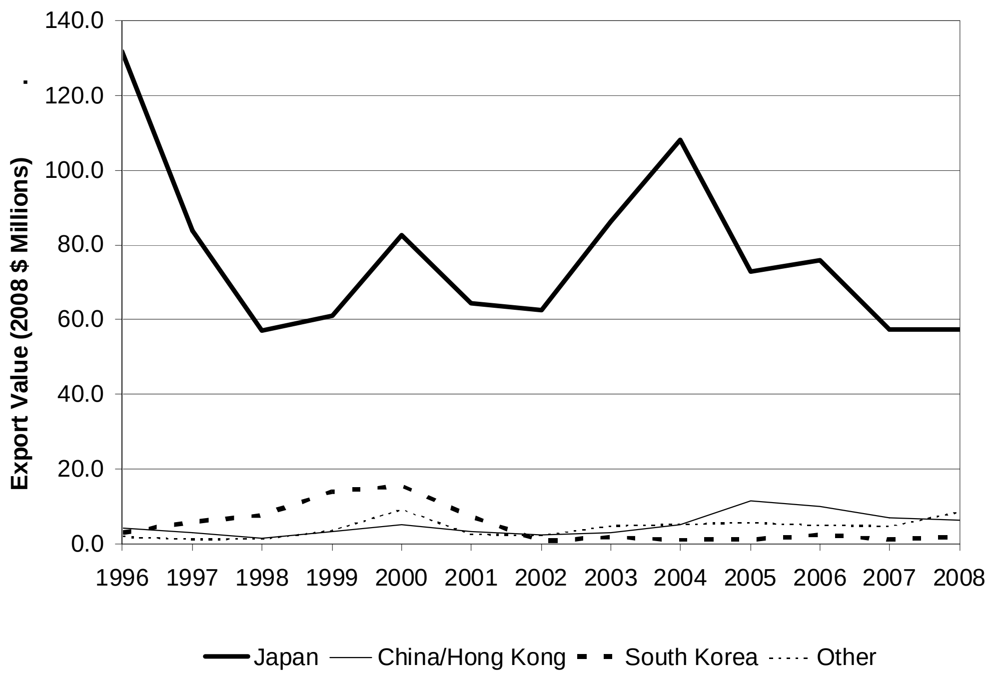
Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

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). While Japan continues to be the major market, the product has gained considerable popularity in other markets over the past several years, as is evident from U.S. export data (Figure 52). With the increased interest from other markets Japan's share of the sablefish supply has declined. In particular, export sales to other Asian markets have increased in recent years. While there was a dramatic increase in the amount of sablefish shipped to China, it is believed that the majority of this product was re-exported to Japan, rather than for domestic Chinese consumption. Product shipped to other Asian (e.g., South Korea) and European markets was largely for local consumption.

Figure 52. U.S. Exports of Frozen Sablefish to Leading Importing Countries, 1996 – 2008



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

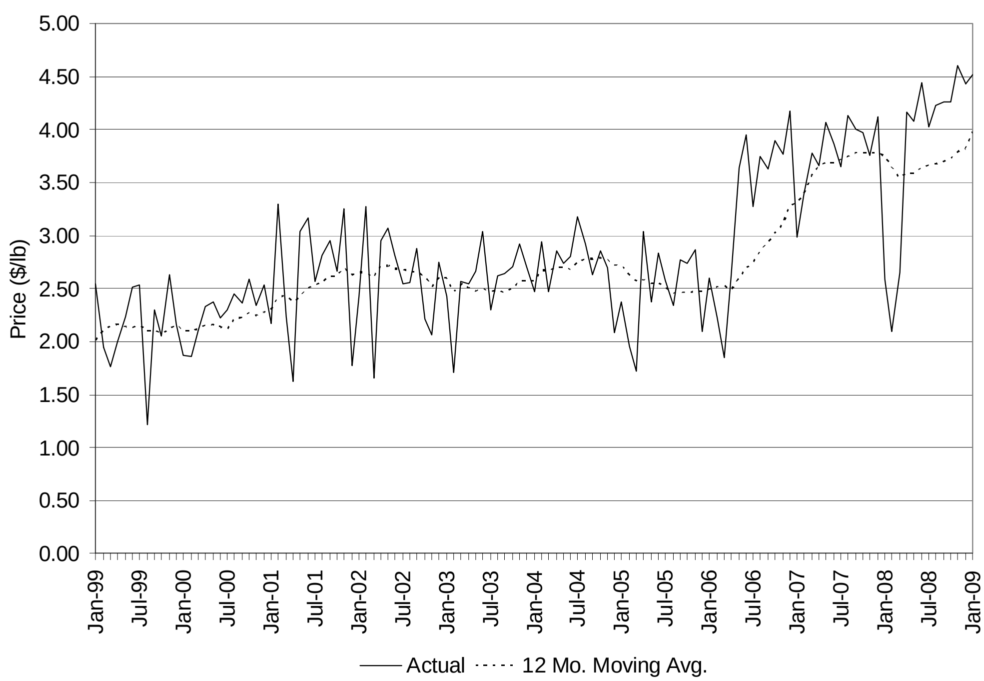
Historically, sablefish has competed with species such as rockfish and turbot, which have similar seasons and prices, and has sometimes substituted for salmon when salmon prices are high (Niemeier 1989). In addition, sablefish has been marketed as a substitute for Chilean sea bass (*Dissostichus eleginoides*) 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 decreasing TAC (from 33 million pounds in 2007 to 30 million pounds in 2008), combined with growing demand for sablefish in alternative markets, is expected to create upward pressure for sablefish prices (Seafood Market Bulletin 2008), a trend depicted in Figure 53.

Marine Stewardship Council certification of the Alaska sablefish longline fishery as a “well managed and sustainable fishery” in 2006 is expected to further expand the demand for Alaska sablefish. 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). The MSC certification may also bolster sales in Japan—Alaska sablefish products with the MSC’s distinctive blue logo have already appeared in Japanese retail outlets (Inoue 2007).

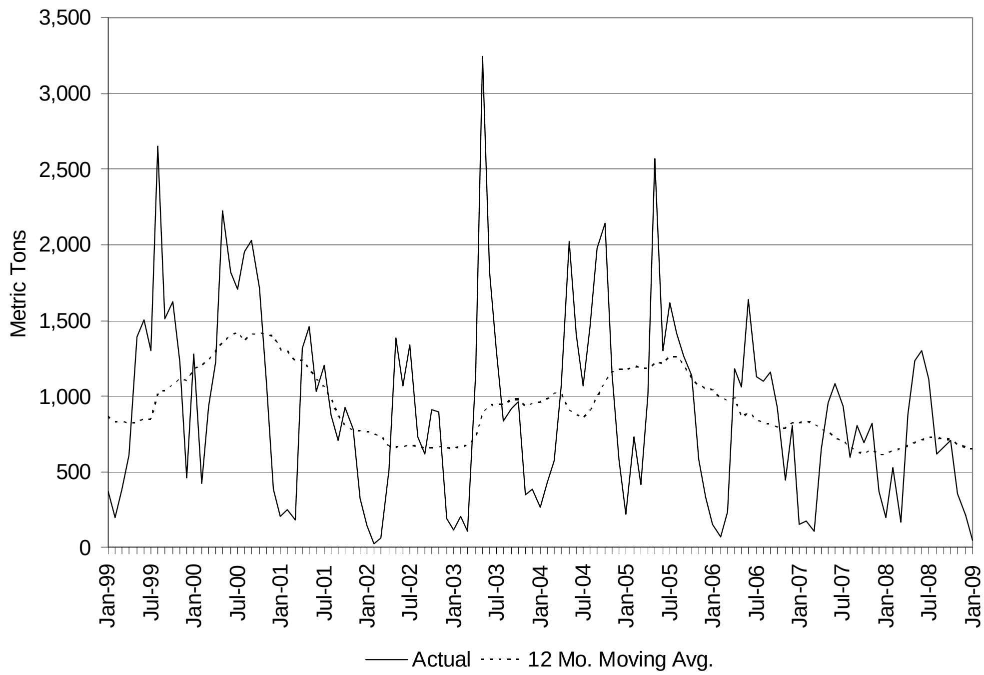
In the near future, Alaska sablefish may face competition from farmed sablefish. Over the past several years, a number of firms have developed hatchery technology for the production of sablefish juveniles, with the goal of commercially raising sablefish in large-scale, ocean or onshore farms. Currently, however, there is only one sablefish hatchery in North America, Sablefin Hatcheries Ltd. located on Salt Spring Island, British Columbia; this facility produces juvenile sablefish for various grow-out farms within British Columbia (DiPietro 2005). Recently, Sablefish Canada Ltd. began selling fish from its Vancouver Island farms, enabling fresh fish to reach the market on a regular basis. The company expects to produce 500 mt of sablefish in 2008 and hopes that production will increase to 5,000 mt in the next five years (Gill 2008).

Figure 53. Nominal U.S. Export Prices of Sablefish to All Countries, 1999 – 2008



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

Figure 54. U.S. Export Volumes of Sablefish to All Countries, 1999 – 2008



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.

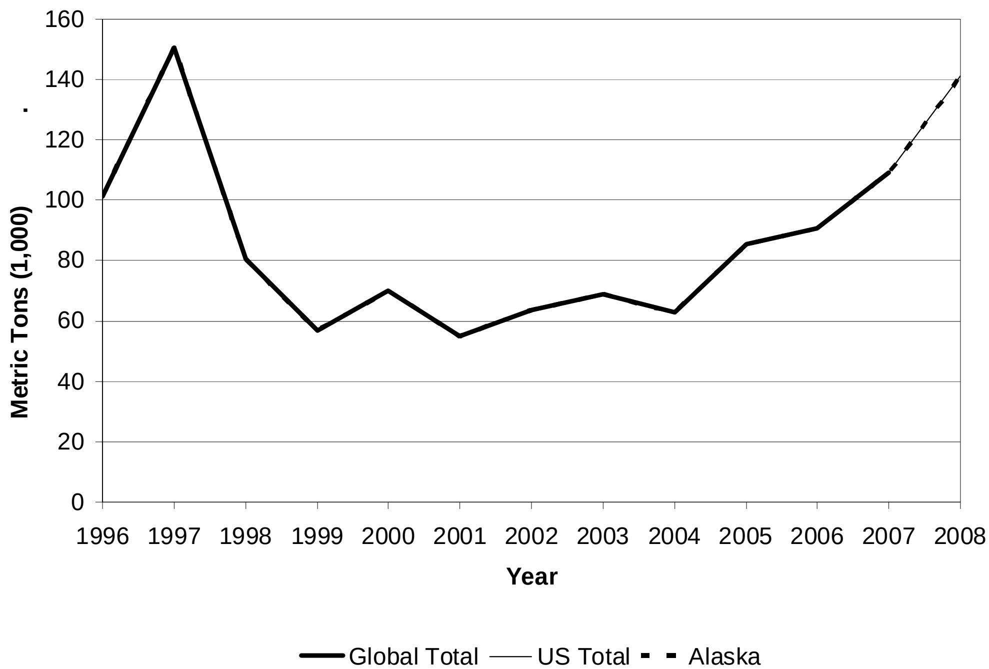
Production

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 55 and Figure 56). 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 55 and Figure 56). 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.

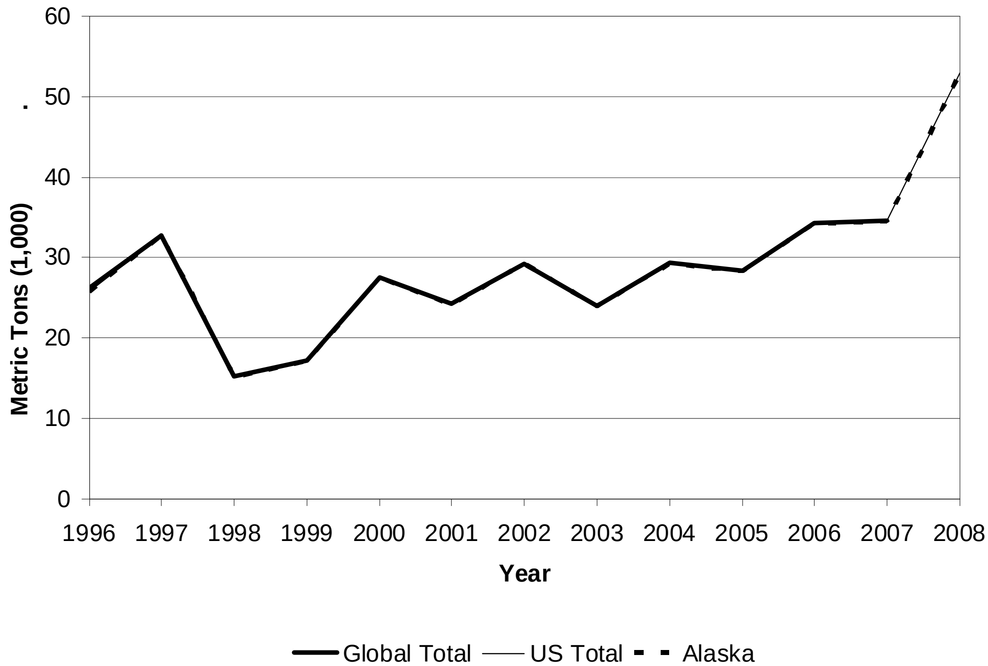
Figure 55. Alaska, Total U.S. and Global Retained Harvest of Yellowfin Sole, 1996 – 2008



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 2008 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 56 Alaska, Total U.S. and Global Production of Rock Sole, 1996 – 2008



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 2008 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.

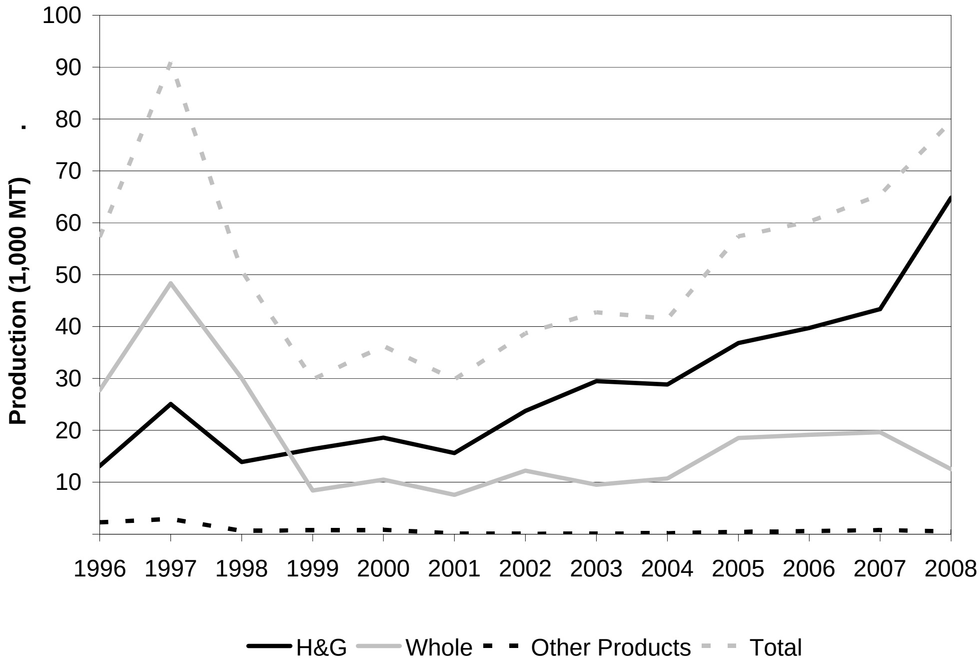
Product Composition and Flow

Yellowfin sole products processed offshore are sold as whole fish and headed and gutted (H&G) fish (Figure 57). 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 59 and Figure 62). The wholesale market price of rock sole with roe shows a decreasing trend (Figure 62). 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.

Alaska Groundfish Market Profiles

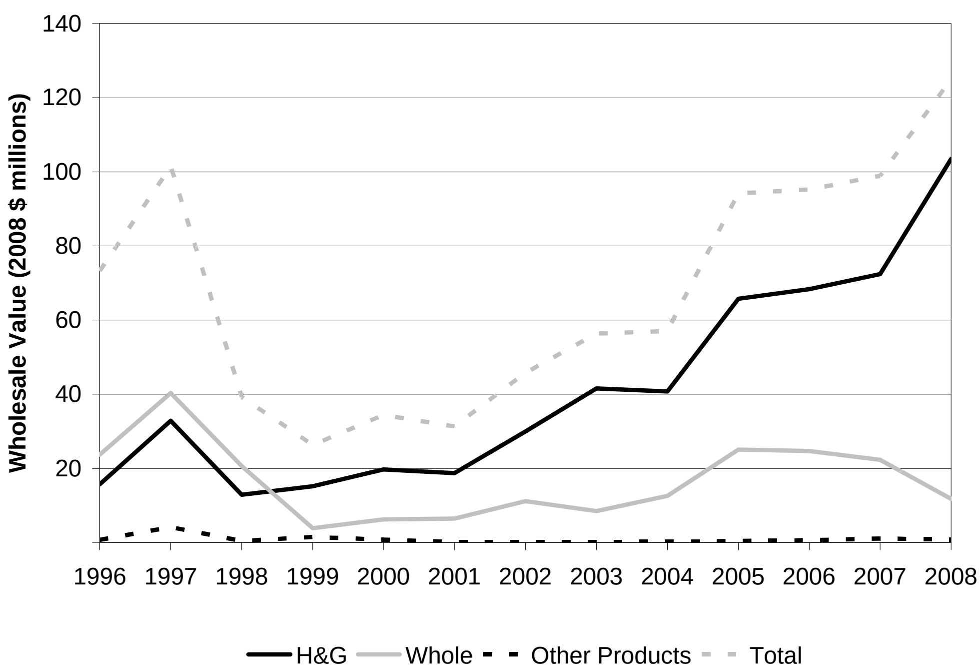
Figure 57. Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 58. Wholesale Value of Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

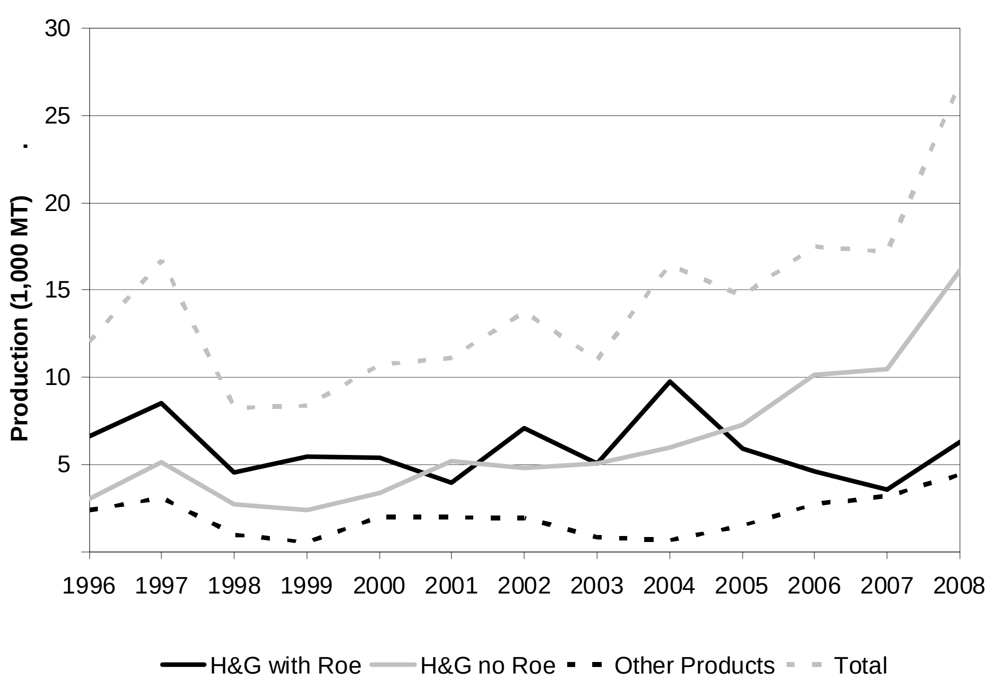
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Yellowfin and Rock Sole Market Profile

Figure 59. Wholesale Prices for Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2008

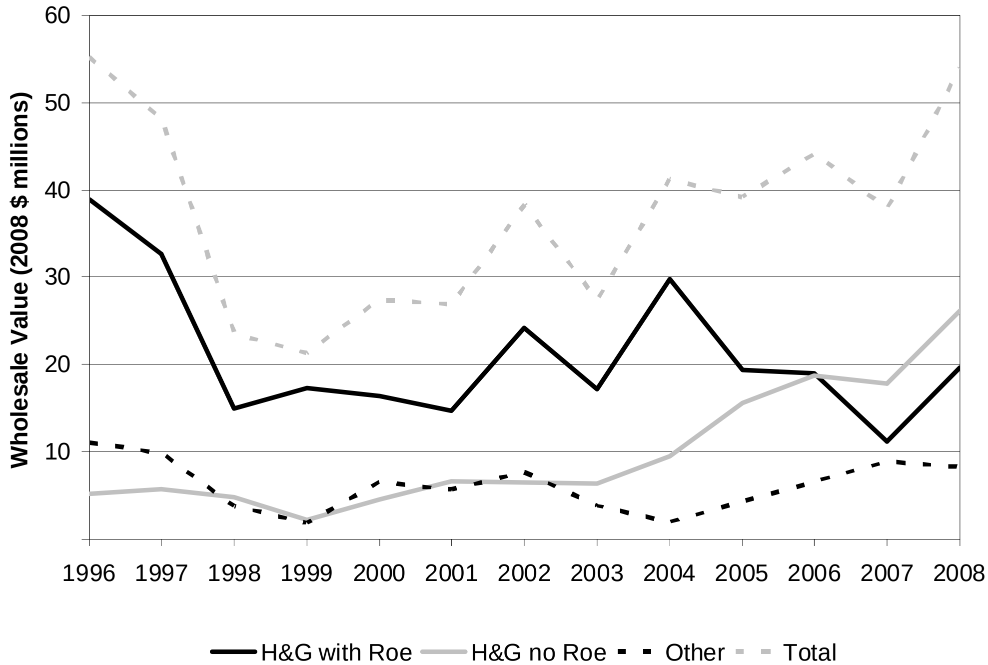
Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 60. Alaska Primary Production of Rock Sole by Product Type, 1996 – 2008



Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

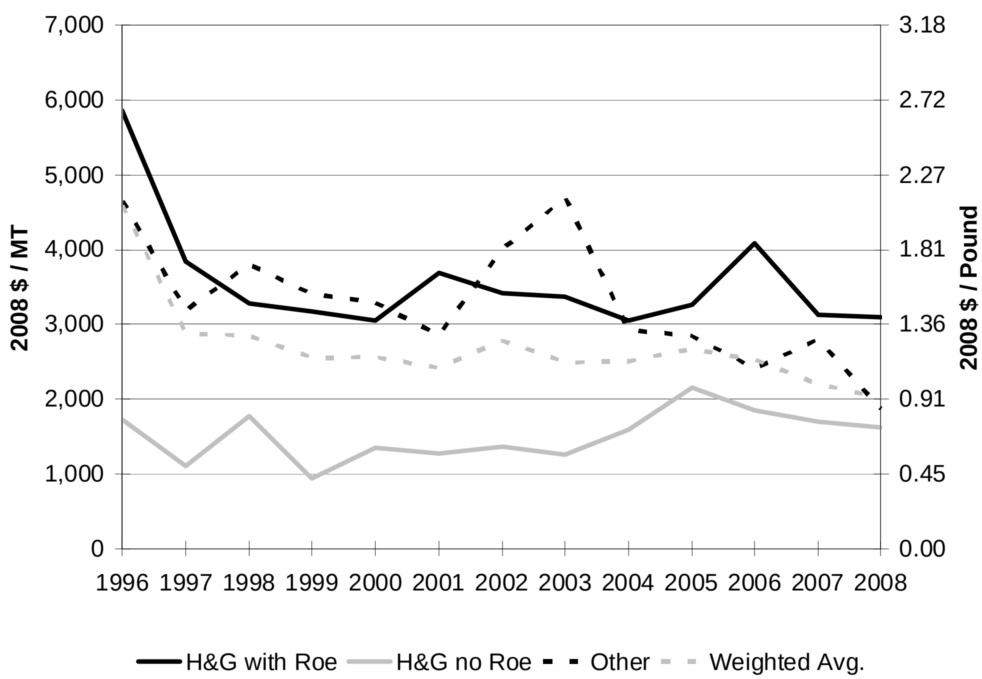
Figure 61. Wholesale Value of Alaska Primary Production of Rock Sole by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 62. Wholesale Prices for Alaska Primary Production of Rock Sole by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

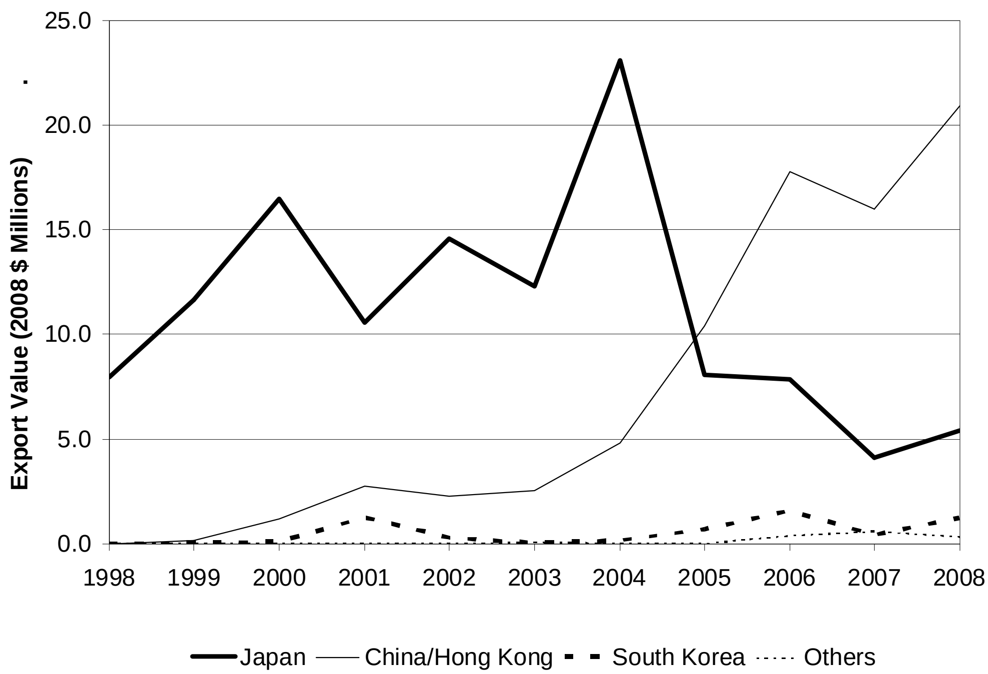
International Trade

Approximately 80 to 90% of the sole harvested in the Alaska groundfish fisheries is shipped to Asia. As discussed previously, rock sole females are exported to Japan, while males are increasingly exported to China, where they are filleted and exported back to the United States (Figure 63). In recent years exports of rock sole with roe to Japan have been declining due to decreasing demand for this product.

Whole and H&G yellowfin sole have separate and distinct markets (Figure 64). Whole round fish is generally sold to South Korea for domestic consumption (American Seafoods Group LLC 2002). As noted above, headed and gutted fish is 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). However, an increasing portion of the China-processed fillets is exported to Europe or is 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 tend to be relatively low for secondary processing (NMFS 2001). Yellowfin sole processed into *kirimi* is exported to Japan.

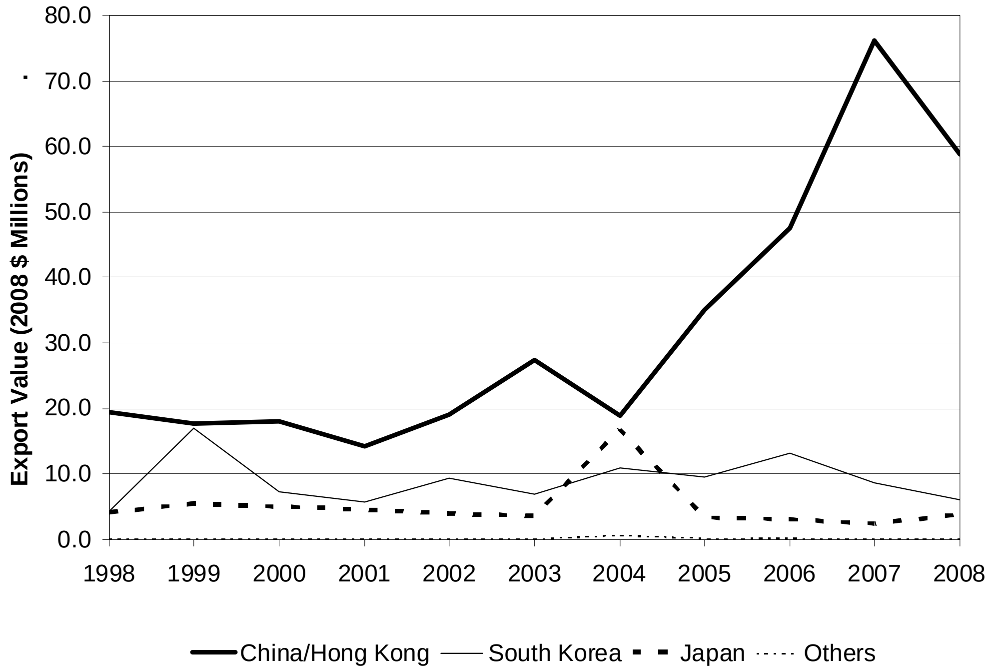
Figure 63. U.S. Exports of Rock Sole to Leading Importing Countries, 1998 – 2008



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 64. U.S. Exports of Yellowfin Sole to Leading Importing Countries, 1998 – 2008



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, are increasing their purchases of frozen skinless, boneless yellowfin sole fillets from re-processors in China (Saulnier 2005).

As indicated above, the Japanese market for rock sole with roe has been gradually decreasing, and this decrease is expected to continue (Figure 69). The declining demand is likely due to changing food preferences, especially among the younger generation in Japan. 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).

Landings of yellowfin sole increased in 2008 due to a TAC increase in the BSAI from 136,000 mt in 2007 to 225,000 mt in 2008 and also possibly due to the ability of the trawl "head-and-gut" fleet to operate collectively to avoid seasonal closures associated with Pacific halibut bycatch. Industry representatives are uncertain what effect an increase in supply would have on markets for yellowfin sole. 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).

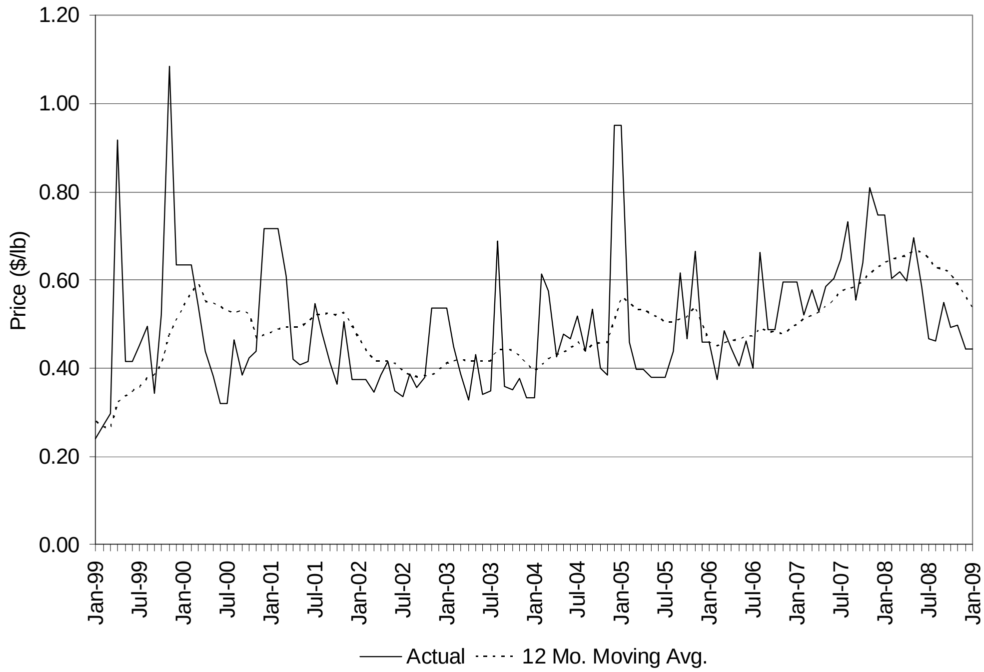
Landings of rock sole also increased in 2008 following an increase in the TAC from 55,000 to 75,000 mt and again possibly because of the fleet's ability to act collectively and avoid halibut bycatch when fishing for rock sole. Indeed, Tables 13 and 15 in the *SAFE Economic Status of the Groundfish Fisheries off Alaska, 2008*, to which this report is attached, show that both total halibut bycatch mortality and halibut bycatch rates declined in the BSAI trawl rock sole fishery in 2008 compared to 2007. In last year's report, we expressed concerns that, because of the relatively low value received for rock sole after the roe season, the fleet might not choose to target rock sole during the fall fishery and concentrate instead on higher value flatfish such as flathead sole. It turned out, however, that catch of rock sole, as well as of both yellowfin sole and flathead sole, was much higher in September and October of 2008 than in the same months of either 2006 or 2007 (NMFS, 2008).

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 have 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 are seeking MSC certification concurrent with the Bering Sea flatfish MSC certification process (Best Use Cooperative 2007).

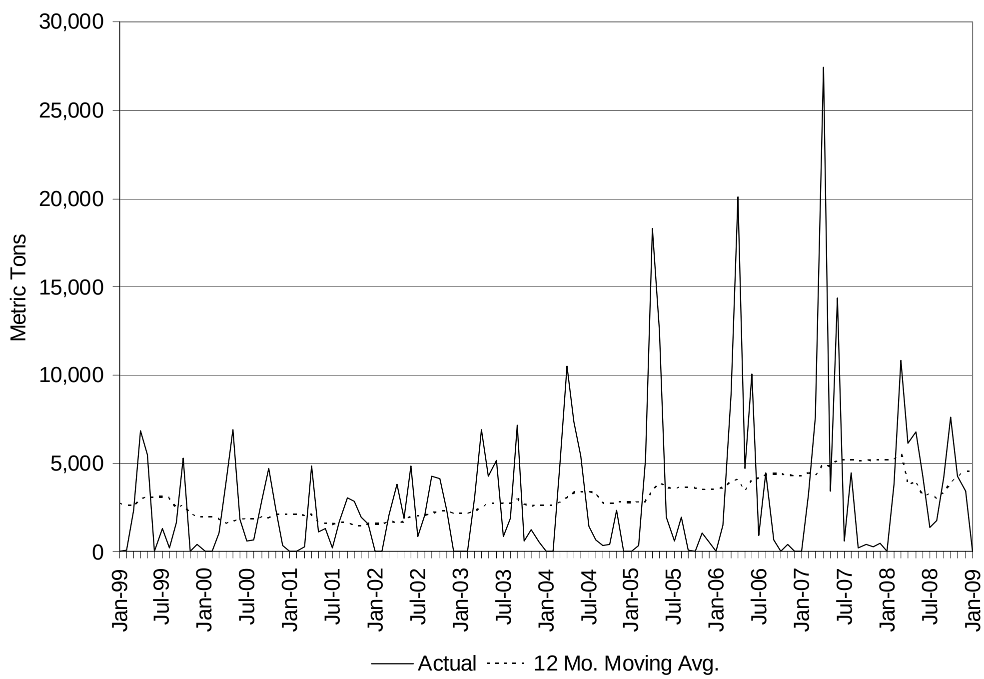
Alaska-harvested yellowfin and rock sole compete in domestic and foreign markets with farmed flatfish as well as other wild-caught flatfish species. At present, fish farms account for a small percentage of the worldwide flatfish production. However, that percentage is expected to steadily increase because of the declining trends in wild catches, and because of the high prices paid for many flatfish species (Sjøholt 2000). For example, European turbot is currently farmed extensively in France, Spain, Portugal and Chile, and significantly the farmed tonnage now exceeds 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 is farmed commercially in Massachusetts and New Hampshire, and experimental work is being conducted into commercial production of Southern flounder (Brown 2002).

Figure 65. Nominal U.S. Export Prices of Yellowfin Sole to All Countries, 1999 – 2008



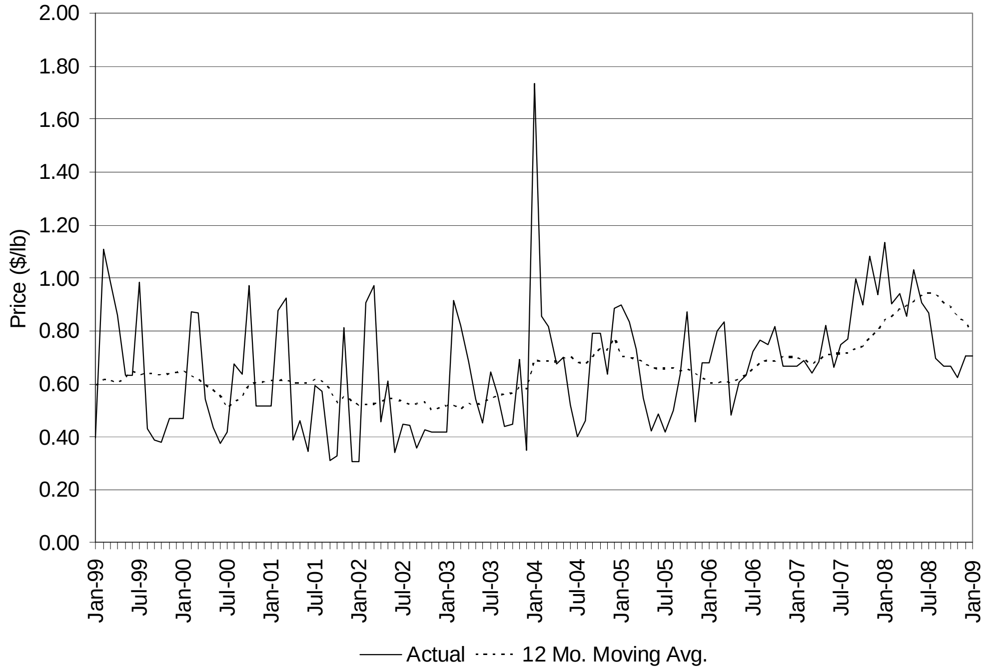
Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 66. U.S. Export Volumes of Yellowfin Sole to All Countries, 1999 – 2008



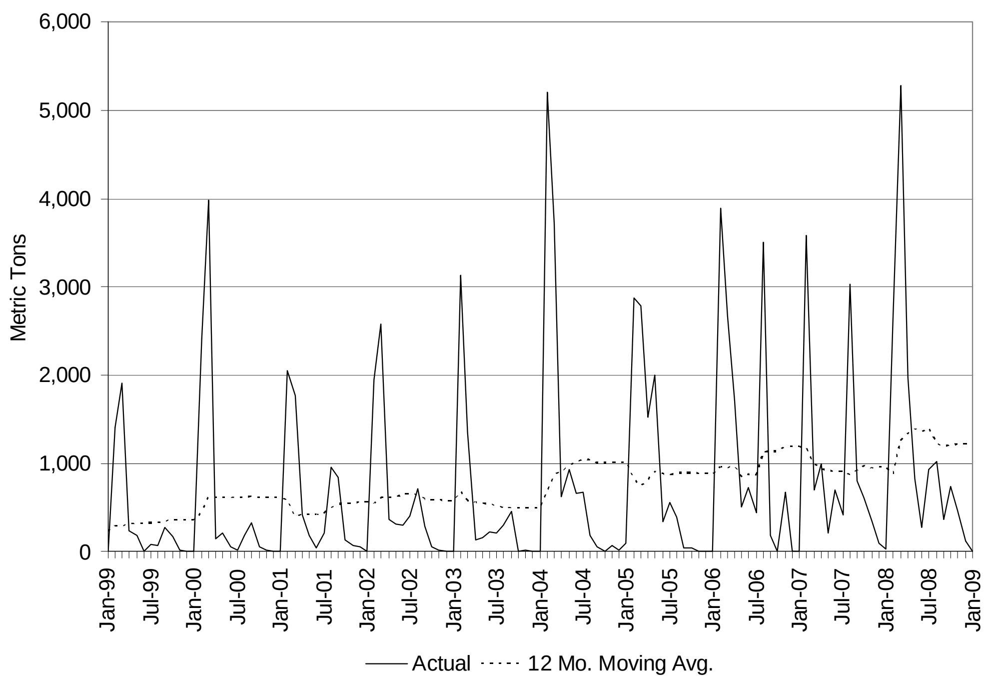
Source: U.S. Census Bureau Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 67. Nominal U.S. Export Prices of Rock Sole to All Countries, 1999 – 2008



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

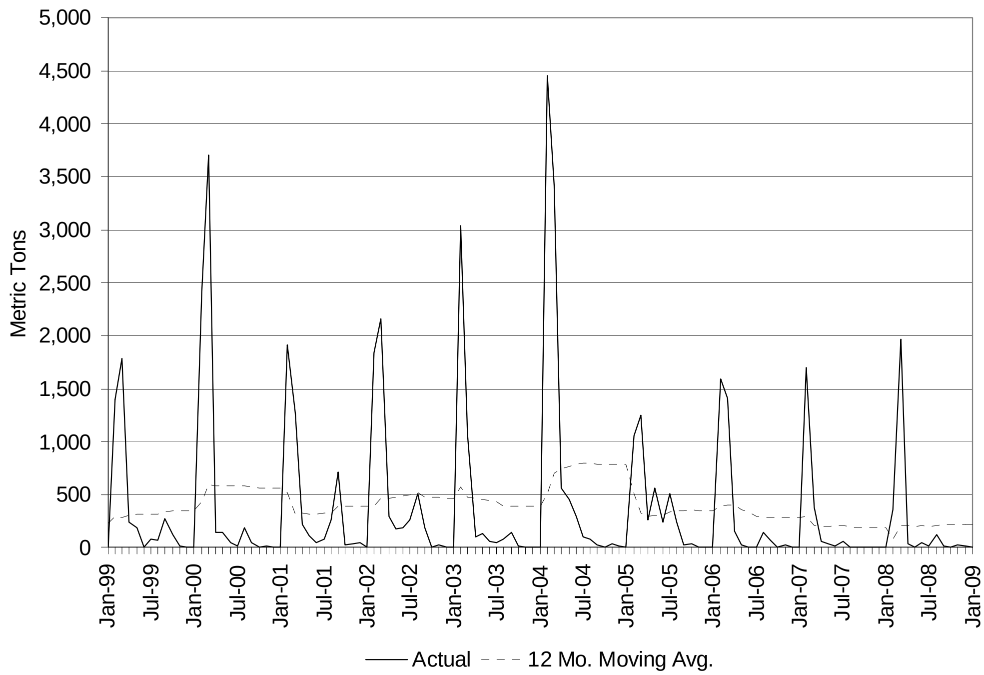
Figure 68. U.S. Export Volumes of Rock Sole to All Countries, 1999 – 2008



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

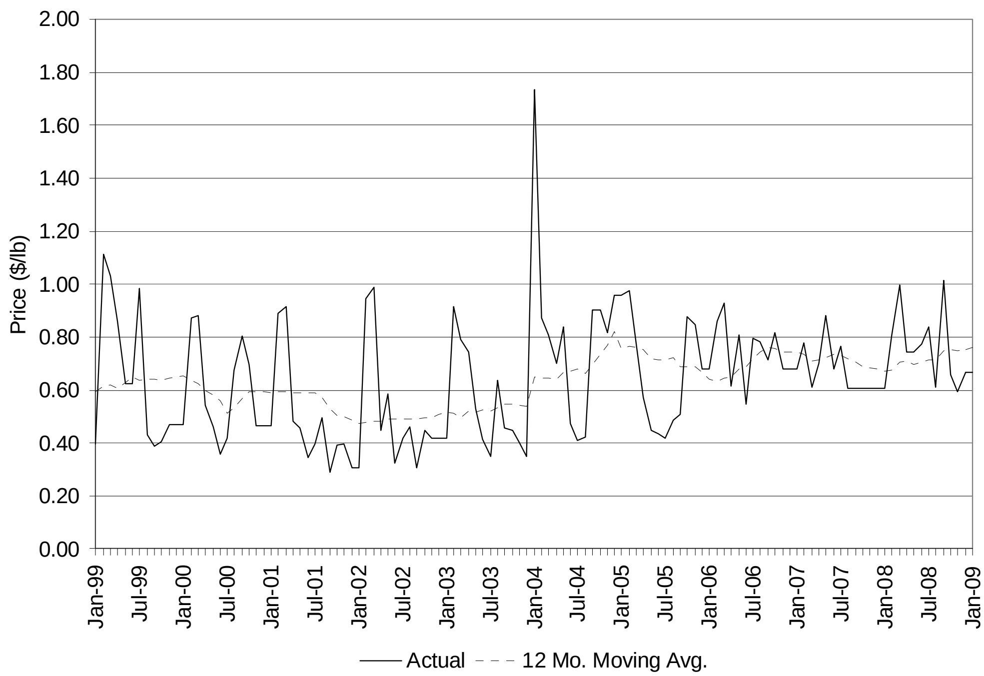
Alaska Groundfish Market Profiles

Figure 69. U.S. Exports Volumes of Rock Sole to Japan, 1999 – 2008



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

Figure 70. Nominal U.S. Export Prices of Rock Sole to Japan, 1999 – 2008



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

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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).

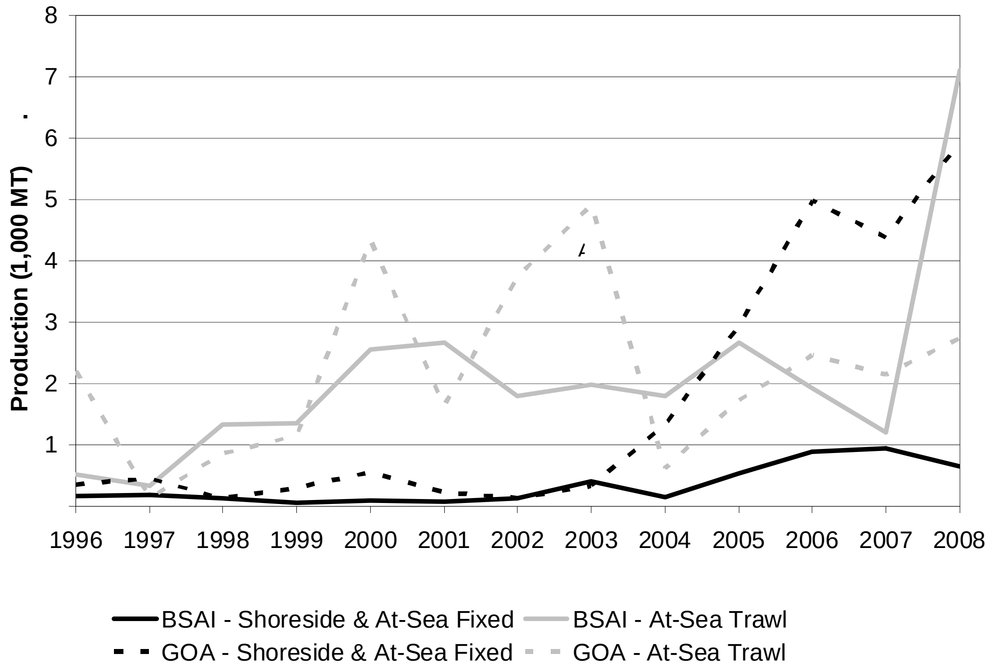
In the GOA the arrowtooth flounder fishery is almost exclusively prosecuted by catcher vessels and catcher/processors using bottom trawl gear (NMFS 2007). Although the arrowtooth flounder fishery is open to other vessel categories and gear types, very small amounts of arrowtooth flounder are harvested by other gear types and then only as incidental catch (Figure 71). 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 bycatch 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 prohibited species catch 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).

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 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.

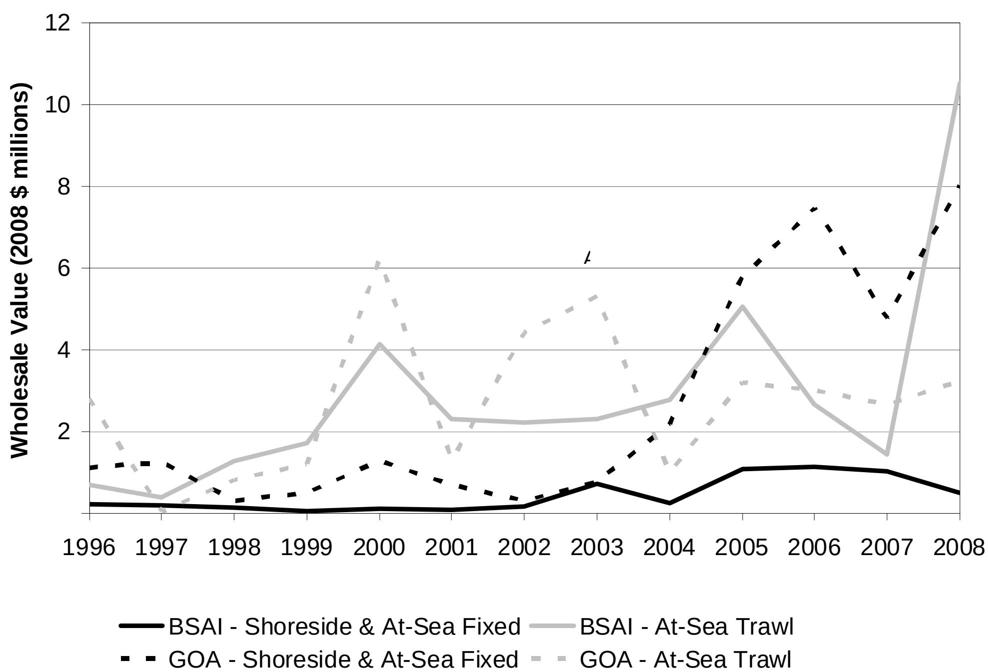
[2] The US Department of Commerce does not track export data specifically for arrowtooth flounder, and therefore unlike the other profiles in this document, this profile does not contain specific data on export volumes and prices.

Figure 71. Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2008



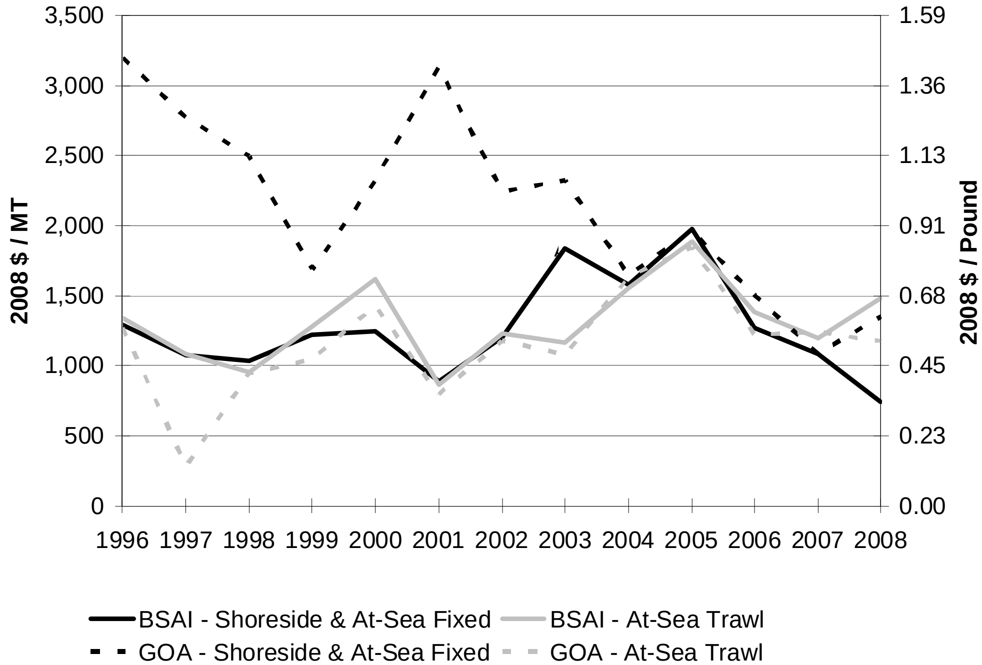
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 72. Wholesale Value of Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2008



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 73. Wholesale Prices for Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2008

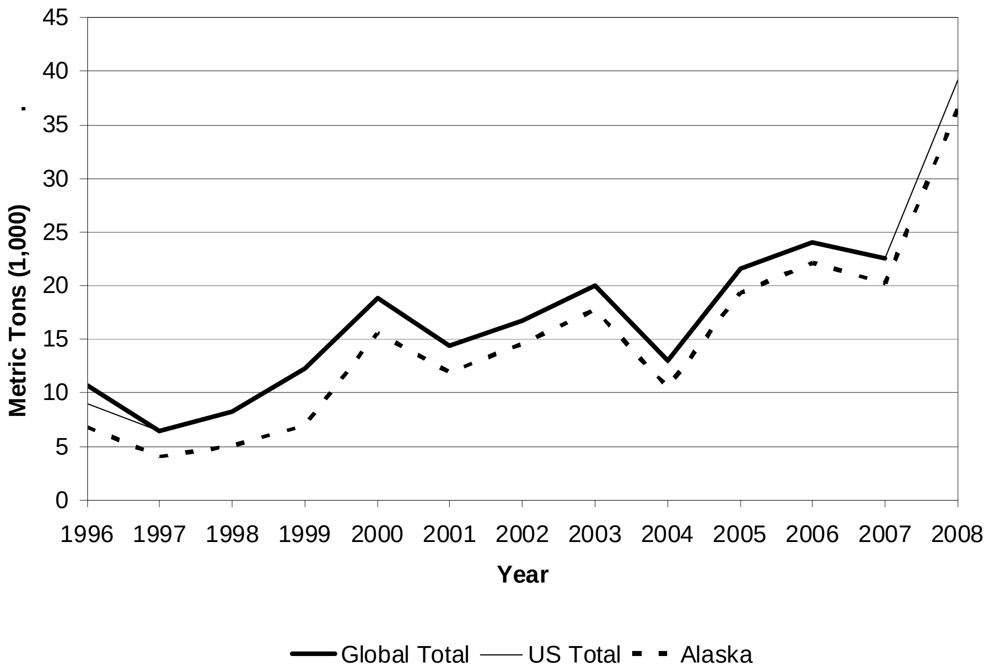


Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Production

Most of the total world catch of arrowtooth flounder comes from Alaska fisheries (Figure 74). 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 74. Alaska, Total U.S. and Global Production of Arrowtooth Flounder, 1996 – 2008



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.

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

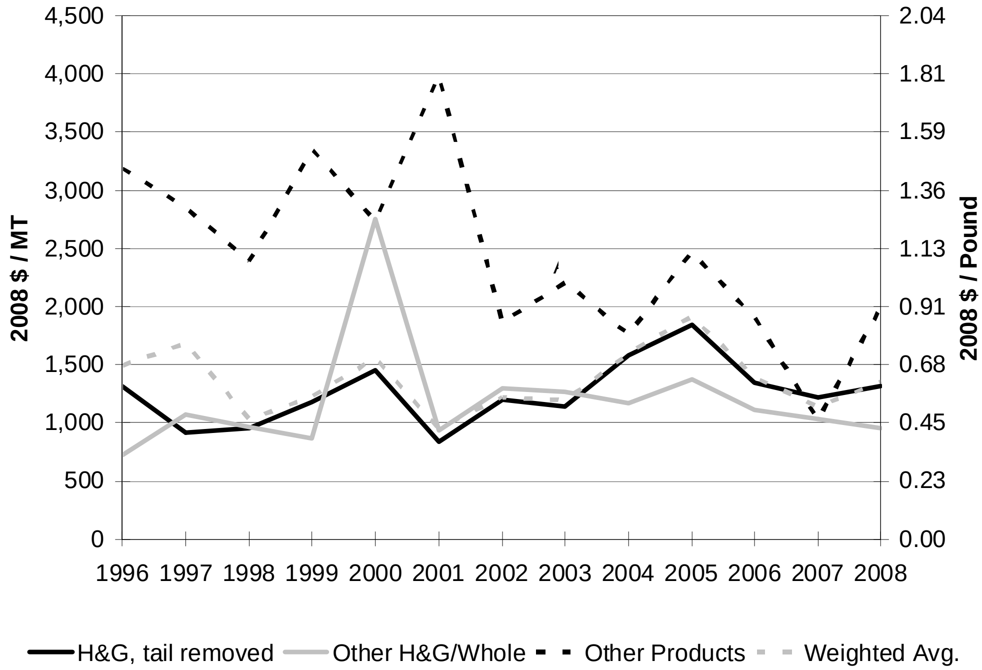
Arrowtooth flounder muscle rapidly degrades at cooking temperature resulting in a paste-like texture of the cooked product. This severe textural breakdown frustrated efforts to develop a market for this fish. Harvested arrowtooth flounder were either sent to a meal plant or discarded. Recently, several 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 76). 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

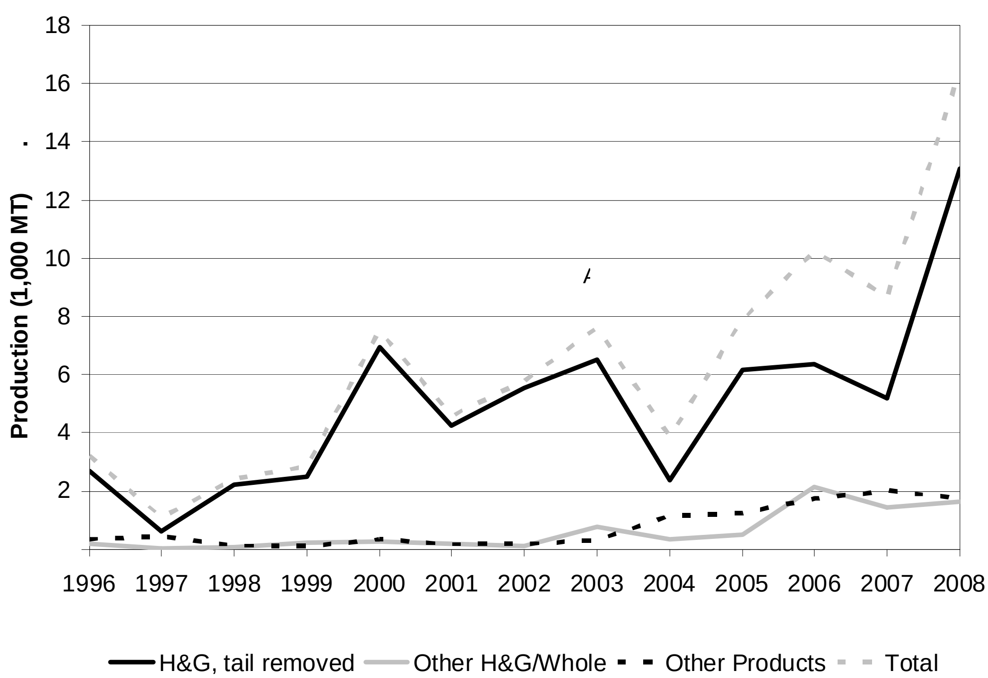
Figure 75. Wholesale Prices for Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

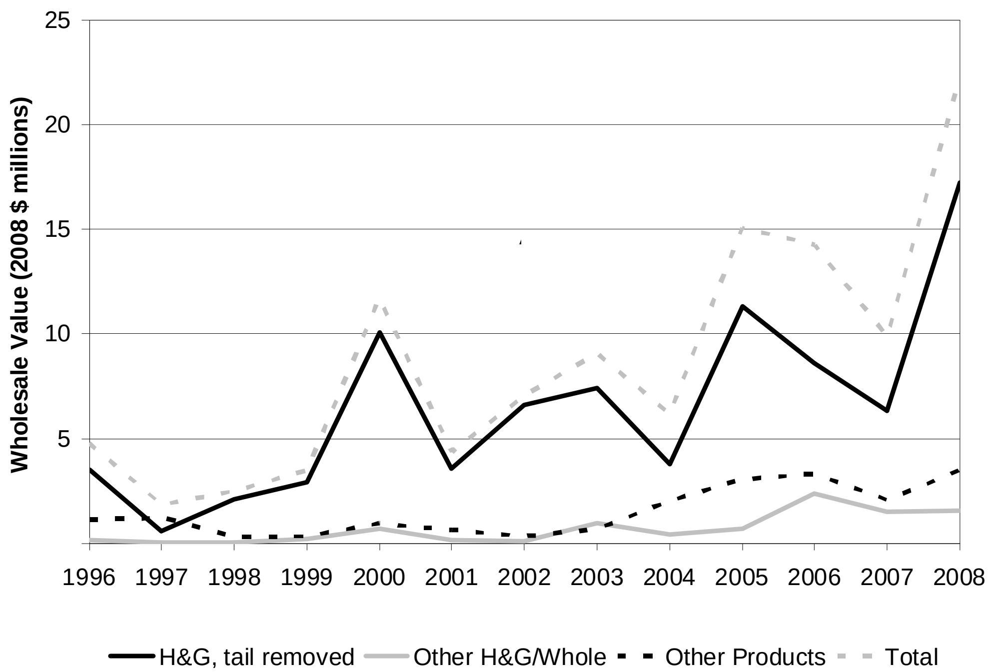
Figure 76. Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

Figure 77. Wholesale Value of Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2008



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2008

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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Groundfish SAFE Report

Markets and Trade

Alaska Fisheries and Global Trade

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International trade is an important component of several Alaska fisheries (see http://www.afsc.noaa.gov/Quarterly/ond2006/divrptsREFM5.htm). This project is aimed at integrating international trade data that are associated with Alaska 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. IPCC) analyses of trade, ocean acidification, and climate change. Work on the PET model in 2010 will include the 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. Two versions of the PET model, pertaining to the effects of demographic trends on future demand in the U.S. and China under the Intergovernmental Panel on Climate Change (IPCC) scenarios, were cited in a feature article “The Population Problem” that appeared in the June 2008 issue of *Nature Reports Climate Change* (http://www.nature.com/climate/2008/0806/full/climate.2008.44.html).

In addition, the PET model is being coupled with the Integrated Science Assessment Model (ISAM), a global biogeochemical cycles model of moderate complexity, under a grant from the U.S. Department of Energy to the Department of Atmospheric Sciences at the University of Illinois. The coupled PET-ISAM will be used to analyze effects of emissions scenarios on climate change and ocean acidification. In particular, the AFSC Ocean Acidification Research Plan proposes to extend these scenarios to use as boundary conditions for experiments and impacts in a crab bioeconomic model which is under development in the ESSR Program.

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 Intergovernmental Panel on Climate Change (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. This global dataset was used with the PET model, using a novel model tuning procedure, to simulate 2 scenarios (A2 and B2) from the IPCC Special Report on

Emissions (SRES). These emissions scenarios provide assumptions about future rates of technical change and other variables.

Estimating Global Trade from Pacific Fisheries for Regional Economic Models
Products from Alaska fisheries are consumed around the world. Global demand for these products is an important source of income to Alaska fishermen, processors, and traders. The U.S. regional economic accounts (i.e., IMPLAN) distinguish between domestic versus foreign trade, but do not identify bilateral trade flows between partners. However, information about the volume and value of trade between partners is important for understanding the current, and historic, economic status of a fishery, and thus, for making reasonable projections about future economic conditions. A case in point is the recent surge in U.S. imports of Russian king crab. A weakness of GTAP data, which do include bilateral trade flows, is a lack of detail in the fisheries sectors. The goal in this part of the project is to fill gaps in the U.S. regional economic accounts with a set of consistent benchmark data on bilateral trade in select fish products among countries along the North Pacific Rim, including the U.S., Canada, Mexico, Japan, China, South Korea, Russia, and Vietnam. Estimating these benchmark, bilateral trade flows is a necessary step in linking a regional economic model for Alaska to the PET model. These benchmark data were obtained or estimated using international trade data from 3 sources: i) U.S. Merchandise Trade Statistics, ii) U.N. Merchandise Trade Statistics, and iii) U.N. FAO Fisheries Statistics for Commodity Production and Trade.

The U.S. and U.N. merchandise trade accounts are classified according to the Harmonized Commodity Description and Coding System (HS), administered by the World Customs Organization in Brussels. The U.S. data are managed by the Foreign Trade Statistics Division of the U.S. Census Bureau. The U.S. data subdivide the 4 and 6 digit HS codes into 10-digit statistical reporting categories. The 10-digit categories (http://www.census.gov/foreign-trade/reference/codes/index.html#concordance) contain many specific categories for U.S. and Alaska fisheries, such as pollock roe and fillets; frozen king, snow, and other crabs; yellowfin sole, Pacific Ocean perch, sablefish, lingcod, several types of salmon, and others. In particular, the U.S. data have the volume and value of exports and imports, over time, from each U.S. customs district to each country that is a U.S. trade partner. The FAO data have a similar, or in some instances, a more refined level of detail for fish commodities, and contain information on production and trade for all of the world's fisheries over time. However, the FAO data only give volume and value of aggregate exports and imports for each country, and thus, do not identify bilateral trade flows.

The U.N. Merchandise data are the global source for identifying bilateral trade flows, but these are available only at the HS 6-digit level. For example, an HS 6-digit code identifies frozen crabs, but not the species composition that is identified in the U.S. In addition, while the FAO and U.S. trade data appear to be fairly consistent, the U.N. Merchandise data do not always match well with the other sources. They also appear in some cases to be internally inconsistent, with large differences between exports reported by one country and corresponding imports reported by another. This type of consistency problem is almost always encountered with input-output (IO) data, and resolving inconsistencies in the international trade data was the primary analytical task in this project.

This part of the project used HS 10-digit U.S. Merchandise data to quantify trade volume and value between the U.S. and each of its trade partners, with emphasis given to other countries along the North Pacific Rim: Canada, China, Japan, South Korea, Mexico, Russia, and the emerging markets of Vietnam. The 6-digit U.N. Merchandise data was used to construct a set of initial IO matrices of trade flows (with columns of exporting countries and rows of importing countries). A tested and appropriate numerical procedure was then applied to 'balance' these matrices, thus estimating a set of consistent bilateral trade flows from the initial IO matrices using the FAO export/import data as constraints.

A set of benchmark tables with estimates of the bilateral trade flows for a subset of the species listed above was completed in 2008. These tables are based on the United Nations Commercial Trade Statistics Database (http://comtrade.un.org) and were adjusted to U.S. exports and imports using an estimation procedure for updating a transaction matrix. This adjustment procedure is an example of a bi-proportional technique in input-output analysis that has some desirable properties. In particular, it minimizes the sum of squared residuals in bilateral trade flows for a certain metric. Adjustments are necessary to reconcile the U.N. trade data with data from the U.S. Merchandise Trade Statistics. For example, U.N. data reported by Russia for its exports of King Crab to the United States are severely underestimated in 2005. U.S. trade data provides detailed information on the amount, in both kilograms and dollars, of important commodity groups that are directly related to Alaska fisheries. Trade statistics that were used to produce the bilateral trade flow estimates are available to AFSC economists through the U.S. Department of Commerce International Trade Administration's Trade Policy Information System (http://trade.gov).

Estimating Time-varying Bargaining Power: A Fishery Application

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In this paper we propose an unobserved components inspired approach to estimate time-varying bargaining power in bilateral bargaining frameworks. We apply the technique to the ex-vessel fish market for Alaska sablefish 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. This paper is in press at *Economic Inquiry*.

Model Bioeconomic Effects of Climatic and Market Variability

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Uncertainty is a fundamental feature of the environment in which fishermen and processors make decisions. Fisheries and climate data (e.g., landings, revenues, sea surface temperatures) provide an empirical basis for estimating and testing bioeconomic models of decision-making with uncertainty that consider both dynamic and spatial dimensions of fisher behavior. In this research bioeconomic models were estimated and tested to quantify the effects of uncertainty in prices and climate on fleet and processor behavior in various groundfish, crab, and salmon fisheries.

A paper on the theory of bioeconomics under uncertainty, with an empirical application to groundfish, has undergone internal review and is ready for submission to a peer-reviewed journal. Another paper that analyzes statistical tests of some key assumptions in the bioeconomic model about the significance of heterogeneity among fishery participants is in review at the *Journal of Econometrics*. The analytical framework that was originally developed within this project was based on a surplus-production model for stock dynamics in which population age/size-structure is not explicit. This year, the framework was extended to incorporate age/size-structured stock dynamics explicitly using a generalized von Bertalanffy growth equation. A project is now in place to link this extended model with the AFSC size-structured stock assessment model for snow crab.

Data Collection and Synthesis

Amendment 80 Head and Gut Catcher/Processor Sector Economic Data Collection

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Beginning in 2008, the non-AFA trawl catcher/processing (CP) sector has been rationalized under a fishery cooperative program. Under the terms of the June 2006 Council motion, a mandatory socioeconomic data collection program is required for the entire sector. Key elements of the Amendment 80 problem statement are the reduction of bycatch and improved utilization of groundfish. Socioeconomic data are needed to assess whether the cooperative formation addresses the goal of mitigating the costs associated with bycatch reduction, to understand the economic effects of the Amendment 80 program on vessels or entities regulated by this action, and to inform future management actions. The program collects cost, revenue, ownership, and employment data on an annual basis. During 2nd Quarter, 2009, ESSRP staff held a series of workshops with representatives of companies holding licenses in the Amendment 80 to refine the data collection instrument and improve clarity of instructions for each data element included in the form. These improvements were incorporated into the final version, which was distributed to the owners of the Amendment 80 vessels in March 2009 for completion and filing by June 1, 2009. All vessel owners completed the EDR requirement by the deadline and data has been entered into an electronic database. These data are currently undergoing the validation audit. A workshop with vessel owners is planned for 1st Quarter 2010 to review the EDR process and identify any changes necessary to minimize reporting burden and improve data quality.

Collecting Regional Economic Data for Alaska Fisheries

Hans Geier, Edward Waters, and Chang Seung*
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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 subsectors 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, two data collection projects were conducted and completed for Southwest and Gulf Coast regions of Alaska. In the two projects, we collected data on employment, labor income, and costs for fishery industries. For information on employment and labor income, we used mailout surveys to the fleet. To estimate information on vessel purchase of inputs from local businesses, interview and telephone calls were made to suppliers of inputs to vessels (i.e., local businesses).

More specifically, the following tasks were completed for the two data collection projects. First, mailout survey questions for three different classes of vessels were developed. Also, the phone interview scripts for vessel owners were developed. Second, the procedures for sampling (unequal probability sampling and determining sample size) were constructed; using the sampling procedures, the optimal sample sizes for the three different vessel classes for each region were derived using Poisson variance. Pareto sampling was conducted to determine the vessels to which the surveys would be sent. Third, the Paperwork Reduction Act (PRA) packets (which include supporting statement) were prepared and submitted to OMB. The PRA packets for the two data collection projects were approved by OMB. Fourth, the mailout surveys were sent out to the vessel owners and the vessel owners' returns of the surveys were received and tabulated in spreadsheets ready for analysis. The contractor (Hans Geier at Univ. of Alaska, Fairbanks) contacted those vessel owners who did not respond to the mail surveys and tried to conduct phone interviews to increase the response rate. Fifth, the phone interview scripts for local businesses and fish processors were developed. Interviews and telephone calls to suppliers of inputs (local businesses and fish processors) were conducted. Sixth, interviews were made with, or telephone calls were made to, boat builders/dealers. Visits to processing plants (headquarters) were made to maintain the relationships that are important for data collection. Community visits were also made to groundtruth the IMPLAN information.

It should be emphasized that a good deal of effort has gone into developing an appropriate sampling methodology for the regional economic data collection projects. Since the majority of gross revenue within each harvesting sector comes from a small number of boats, a simple random sampling (SRS) of boats would include only a small portion of the total ex-vessel values, and therefore, would be misleading. Therefore, an unequal probability sampling (UPS) method without replacement was used. The objective of implementing the sampling task is to estimate the employment and labor income information for each of three disaggregated harvesting sectors using the ex-vessel revenue information provided by CFEC earnings data. For each harvesting sector, we conducted a UPS without replacement. Many methods exist in the literature for conducting UPS without replacement. One critical weakness with most of these methods is that the variance estimation is very difficult because the structure of the 2nd order inclusion probabilities is complicated. One method that overcomes this problem is Poisson sampling. However, the problem with Poisson sampling is that the sample size is a random variable, which increases the variability of the estimates produced. An alternative method that is similar to Poisson sampling but overcomes its weaknesses is Pareto sampling (which yields a fixed sample size).

Within this approach there are two tasks that must be undertaken to obtain estimates of the population parameters. First, the information on optimal sample size needs to be determined.

Second, once the optimal sample size is determined, the population parameters and confidence intervals need to be estimated. For the first task, we used the Poisson *variance* (not Poisson sampling). For the second task, we used a Pareto sampling method. In determining the optimal sample size, we used information on an auxiliary variable (ex-vessel revenue). To estimate the population parameters, we used actual response sample information on the variables of interest (employment and labor income). With inputs from experts in UPS sampling, a document detailing these sampling procedures was completed and an Excel program was developed to show these procedures using actual data (2006 ex-vessel value data for the three boat sectors).

The two data collection projects were completed. The surveys of vessel owners for gathering employment and labor income information were relatively successful given that the voluntary nature of the surveys. The contractor sent out a total of 1,504 mail surveys, and received 349 responses for a response rate of about 23%. Among the three different vessel classes (small, medium, and large vessel classes), the response rates for the small vessel classes were the highest (25% for Southwest and Gulf Coast regions) while the response rates for the large vessel classes were the lowest (18% and 22% for Southwest and Gulf Coast regions, respectively). There is no significant difference in total response rate between the two regions (Southwest region – 23%, Gulf Coast region – 24%). Compared to surveys of vessel owners, the effort to collect vessel cost information was not very successful. When attempting to collect information on vessels' purchases from local businesses, the respondents were not very cooperative, being reluctant to provide the purchase information. At the beginning of the projects we had also planned to gather information on the operating and ownership costs for vessels using a "cost-engineering" approach. Although the approach is novel in fisheries, it was very difficult to estimate the vessel operating costs due to lack of cooperation by the respondents and unanticipated complexity of implementing the approach. Based on data collected for Southwest and Gulf Coast regions, population parameters (total employment and total labor earnings) were estimated. A paper on the sampling methods and some of the results from the surveys was completed and submitted to a journal (Seung 2009).

A new data collection project for the Southeast region has been funded and initiated. The project will design and administer a mailout survey to a stratified random sample of vessels operating in Southeast region fisheries, and interview a sample of regional processors and input suppliers. Data collected will be 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. The project will follow a track similar to the Southwest and Gulf Coast region data collection projects. The first step is to submit the survey instrument for OMB approval, after which the data collection phase will commence. Data collection will be conducted during the summer of 2010 and the final project documentation, including a database Southeast Alaska "regional fishing industry service centers", will be completed by the end of 2010.

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Comprehensive Socioeconomic Data Collection for Fisheries off Alaska

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Many of the fishery management actions taken by the NPFMC require various types of socioeconomic analyses before they can be implemented. Typically these analyses must examine a range of alternatives, and the associated nature, magnitude, and distribution of the economic, welfare, and sociocultural impacts of the proposed action(s). Specifically, economic analyses, including "benefit/cost" analysis, as well as regional and/or community impact analysis of proposed fishery management policies are required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Endangered Species Act, the Marine Mammal Protection Act, the National Environmental Policy Act (NEPA), Executive Order 12866, and other applicable Federal laws.

In addition, the 2006 reauthorization of the Magnuson-Stevens Fishery Management and Conservation Act (MSA) includes heightened requirements for the analysis of socioeconomic impacts and the collection of economic and social data. These changes eliminate the previous restrictions on collecting economic data, clarify and expand the economic and social information that is required, and make it explicit that the Councils *and* the Secretary of Commerce have the authority and/or responsibility to collect the economic and social information necessary to meet requirements of the MSA (and that either the Councils or the Secretary can initiate the collection of said socioeconomic data).

This suggests that all fisheries under our jurisdiction should be examined for the adequacy of socioeconomic data. It is clear that, without access to the information needed to support many of the aforementioned analyses, the associated legal documents may fail to meet established standards. In order to better address these concerns, as well as others pertaining to community impacts, the NPFMC passed an October 2006 motion to draft a comprehensive program for collecting revenue, ownership, employment, cost, and expenditure data for all fisheries in and off Alaska (excluding those already covered, including BSAI crab and Amendment 80 fisheries).

Specifically, NPFMC directed the AFSC staff to coordinate a workgroup of social and economic analysts and researchers from the NMFS, ADF&G, and Council staff to

> "further develop the discussion paper on the structure of a comprehensive social and economic data collection program and survey formats for the collection of this data. The draft survey formats should be tailored to the sector specific data needs for

> revenue, ownership, employment, cost, and expenditure data. The discussion paper will include the collection of economic data from shoreside processors and motherships in the event statute authority is established for collection of this information in the future. The workgroup will work with the draft problem statement as initial guidance and relevant experience garnered to date with existing and past collections and surveys of social and economic data to develop a practicable and reasonable approach for resolving issues identified for a comprehensive program. Additionally, the discussion paper will respond to the issues raised by the AP and SSC, particularly confidentiality issues."

In response, the Economic and Social Sciences Research Program (ESSRP) at the AFSC coordinated a working group to propose a core set of data that is currently unavailable yet important for answering many of the questions raised when evaluating past and future management decisions, and conducting regulatory and legally mandated analyses. The working group was comprised of individuals representing the National Marine Fisheries Service (NMFS), Alaska Department of Fish and Game (ADF&G) and Commercial Fisheries Entry Commission (CFEC), NPFMC, NOAA GC, and Alaska Department of Commerce (ADOC). The result was a white paper that was presented to the Council and should eventually be published in a peer-reviewed fishery management journal.

Since the presentation of the paper the NPFMC has developed a workgroup to define the specific elements to be included in the program. The workgroup is comprised of a broad set of stakeholders including industry, agency, and community members. This workgroup has conducted several meetings and has developed a set of tables which specifies potential data elements to be collected and potential mechanisms through which the data may be collected. During the following year we hope to prioritize and develop detailed protocols for a comprehensive economic data collection program spanning all fisheries under NPFMC authority; develop and pretest survey instruments for selected fisheries; and initiate preparation of necessary regulatory language and Paperwork Reduction Act (PRA) clearance for implementation of mandatory economic reporting requirements.

Crew Participation Data Collection System for Commercial Fisheries off Alaska

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The need for crew member participation data in state and federal commercial fisheries in Alaska is regularly voiced by crew members, communities in which crew members live and work, policy makers, and analysts. Crew member information is important to the North Pacific Fishery Management Council (Council), Alaska Board of Fisheries (Board), National Marine Fisheries Service (NMFS), Pacific States Marine Fisheries Commission (PSMFC) and coastal communities interested in understanding how proposed changes to current fishery management regimes will likely influence participation in commercial fisheries and social and economic impacts to fishery dependent coastal communities. Information on crew member fishing activities is also important for local communities when applying to state and federal programs. Crew members themselves are interested in developing a record of their participation in fisheries at a standard similar to data collection systems for permit and quota holders.

A person is required by Alaska Department of Fish and Game (ADF&G) regulations to obtain a commercial crewmember license in order to participate in commercial fishing in waters off Alaska, if they do not already hold a valid Commercial Fisheries Entry Commission (CFEC) interim-use or limited entry permit card. Currently, basic identification and contact information is collected from the crew member license purchaser at the time of purchase, but no system exists for collecting information on commercial crew member fishing activities and the extent to which crew members are dependent on earnings from commercial fishing. Collection of crew member participation data is a necessary step in estimating the full economic contribution of commercial fisheries to Alaska and in estimating economic effects of any impact to the industry. It is important to have information on commercial crew members when planning how to respond to the changes in the economic conditions affecting commercial fishing in Alaska. For example, restructuring of fisheries, especially programs that restrict, limit or reduce participation opportunities can have unanticipated and unintended effects on Alaska's fishing dependent communities and individual crew members.

At present ADF&G has hired a contractor to do scoping study for the program. The contractor will identify legal barriers and solutions; potential enforcement measures; data elements to be captured (with a priority ranking for each); expected uses of the data; appropriate reporting parties; potential audit measures; general system specifications; and expected costs, equipment requirements, and personnel needs for ADF&G. A report detailing the findings of the scoping study will be released by ADF&G in early 2010.

Data Management and Reporting Tools

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In the past, the analysts working in the Economic and Social Sciences Research Program (ESSRP) at the Alaska Fisheries Science Center (AFSC) have relied upon a programmer to generate datasets and reports from state and federal databases in order to conduct applied research. The purpose of this project is to provide a user friendly data management and reporting interface for all socioeconomists and others at the AFSC to facilitate data queries and retrieval and in turn to broaden current capabilities. The specific goals of this project are to 1) expand the availability of a data-access utility (Oracle Answers) held by the Alaska Fisheries Information Network (AKFIN), a subsidiary of the Pacific States Marine Fisheries Commission, for use by AFSC analysts; and 2) add additional data sources to the Oracle framework so that all datasets currently utilized by AFSC staff will be contained.

Late in 2008, AKFIN and ESSRP staff chose Oracle Answers as the data-access utility to be used for this project. Oracle Answers, a component of Oracle Business Intelligence Standard Edition, is a web-based ad-hoc query, reporting, and data analysis tool that allows users to gain secure access to Oracle databases. With Oracle Answers, query results can be viewed or analyzed online or exported to a number of standard file formats. Oracle Answers also has the functionality to process existing SQL queries directly.

AKFIN subsequently purchased the Oracle Answers software, and the hardware to run it, and hired a contractor (Zirous, Inc.) to configure and administer the system. In February, 2009, ESSRP staff organized an Oracle Answers training session at the AFSC that was attended by about 30 ESSRP, Status of Stocks & Multispecies Assessment (SSMA), and Fisheries Monitoring & Analysis Division analysts, as well as Alaska Regional Office (AKR), North Pacific Fishery Management Council (NPFMC), and Alaska State Commercial Fisheries Entry Commission (CFEC) staff.

AKFIN, Zirous, and ESSRP collaborated to create several "dashboards" in the Answers system (dashboards are virtual sub-areas intended for various user groups with a shared research focus). Dashboards supply space where members of the various user groups can create prepared reports to share with their colleagues or post articles and links of common interest. Dashboards now exist for NPFMC staff, for analysts focusing on crab-rationalization and Amendment 80 Economic Data Reporting (EDR) data, for ESSRP staff, and for SSMA analysts. The same AKFIN, Zirous, and ESSRP collaborators also created and posted on the dashboards a number of prepared reports designed to provide quick answers to common questions. The prepared reports can be easily modified by users to focus on specific subsets of the data, such as different time periods or individual species.

The Oracle Answers system accesses data from a group of "comprehensive" datasets developed over the last year or so by AKFIN in collaboration with ESSRP, AKR, and NPFMC staff. The comprehensive datasets enhance raw data from AKR, Alaska Department of Fish & Game (ADF&G), and CFEC sources with additional information, such as processor ownership and location data from ADF&G Intent to Operate listings, vessel ownership and vessel characteristics data from AKR and CFEC datasets, and translations or descriptions of the various system codes found in the raw data. These additional fields make it unnecessary for a user to join these sorts of data from separate sources, making the datasets much more user-friendly. At present, the following comprehensive datasets are available through AKFIN's Oracle Answers system:

- AKR Blend & Catch-Accounting System
- AKR Weekly Production Reports for the at-sea sector
- AKR Prohibited-Species Bycatch
- AKR Non-Target Species Bycatch
- AKR Federal Fisheries Permit listings (which include vessel-characteristics data)
- ADF&G Commercial Operators' Annual Report (COAR) Buying data
- ADF&G COAR Production data
- ADF&G Intent to Operate listings
- CFEC Fish Tickets
- CFEC Vessel Characteristics data
- FMA Observer-Program data

In the future, the AKR intends to develop a set of Weekly Production Reports for the shoreside sector, which will be enhanced and added to the system as a new comprehensive dataset.

At this time, the goals for the project have largely been achieved. Future work on the project will consist of maintenance of the comprehensive datasets and the Oracle Answers system, for which mostly AKFIN and Zirous will be responsible, and increased support and training of users, which will involve both AKFIN and ESSRP staff. Additional prepared reports will be created for the various dashboards to increase the usefulness and value of the system and to help enlist additional users.

Predicting Fishing with Vessel Monitoring System Data

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The National Marine Fisheries Service (NMFS) has expanded requirements that vessels fishing in the Pacific cod, Atka mackerel, pollock, and other fisheries own and operate a vessel monitoring system (VMS). The system sends each vessel's location to NMFS every 20-30 minutes while the transmitter is operating. The VMS consists of two parts. A transmitter/receiver, installed on the vessel, which queries GPS satellites and downloads vessel position, as well as estimates the heading and speed. The transmitter then sends these data to NMFS via the Argos system of polar orbiting satellites.

VMS equipment has been employed on vessels in many fisheries around the world and VMS data has been used in enforcement, but a limited amount of work has been done utilizing VMS data to improve estimates of fishing activity. This paper integrates VMS and observer data from the Bering Sea pollock fishery to predict whether or not fishing is occurring on unobserved fishing trips, using observed vessels as a control. We employ a variety of techniques and specifications to improve model performance and out-of-sample prediction and find a generalized additive model (GAM) to be the best formulation for predicting fishing. We assess spatial correlation in the residuals of the chosen model, but find no correlation after taking into consideration interactions of other VMS predictors. We compare fishing effort to predictions for vessels with full observer coverage for 2003-2006 and compare predicted and observed activity for vessels without full observer coverage. We conclude with a discussion of policy considerations.

Preliminary results from this work were presented at the Fourth International GIS/ Spatial Analysis Symposium. AFSC peer reviews suggested several avenues for improving the paper and these steps are being taken before submitting the manuscript for review at a scientific journal. In subsequent research, this work will be extended to make predictions of fishing in other Bering Sea fisheries.

Recreational Fisheries and Non-Market Valuation

Alaska Recreational Charter Boat Operator Research Development

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In August 2003, a guideline harvest limit (GHL) policy was implemented to regulate the Pacific halibut guided (charter) recreational fishery in Alaska, which accounts for a substantial portion of the overall recreational halibut catch in Alaska. This policy sets an acceptable limit on the amount of halibut that can be harvested by the recreational charter fishery during a year and establishes a process for the North Pacific Fishery Management Council (Council) to initiate harvest restrictions in the event that the limit is met or exceeded. At present, numerous harvest restrictions may be adopted by the Council in the event the GHL is surpassed, including several that would affect the charter boat industry, such as restrictions on client or crew fishing behavior (e.g., bag and size limits). Another regulatory change that is currently being proposed is a limited entry program that would limit new entrants into the fishery.

To assess the effect of potential regulatory restrictions on charter operator behavior and welfare, it is necessary to first obtain a better general understanding of the charter industry, such as vessel and crew characteristics, services offered to clients, spatial and temporal aspects of their operations, and costs and earnings information. Since much of this information is not readily available from existing sources, it must be collected directly from the industry through voluntary interviews and/or a survey. However, past debates over management of the halibut charter fishery were very divisive and created a political climate that was not conducive for a study like this one that depends upon voluntary responses.

Meetings with representatives of the charter boat industry were held in September 2008 in Homer and Sitka. Attendees expressed some concern about the amount of information they might be asked to provide, and the time costs to them, associated with possible data collections, but also were supportive of the idea of collecting information necessary for NMFS to better understand the charter boat harvest sector. At this time, further progress to develop potential data collection elements has been halted to investigate the feasibility of collecting information from charter boat operators as part of more comprehensive data collection initiatives being developed for the North Pacific Fishery Management Council.

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).

During 2009, preliminary materials were developed with the aid of several focus groups held in Washington State, Colorado, and California. Qualitative pretesting will continue in 2010, and it is expected that during the year a Paperwork Reduction Act (PRA) clearance request package will be prepared for the pilot survey implementation, which precedes implementing the full survey (that may itself require a separate Office of Management and Budget approval under the PRA).

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.

Together, these data were used to estimate the demand for Alaskan sport halibut 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. A manuscript describing the model used to estimate the net economic value of saltwater sportfishing trips by Southeast Alaska anglers was completed in 2009. In 2010 a second manuscript will be produced that analyzes the role of targeting behavior on saltwater sport fishing demand in Alaska. Additional analysis of the survey data and modeling of angler behavior and preferences will also be undertaken during 2010.

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. The survey collects 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 on the Alaska economy was estimated. To this end, the total expenditure for each expenditure category 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 sportfishing 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 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. A manuscript (Lew and Seung, 2009) which summarizes the methodology and the results was completed and will be submitted to a journal soon.

<u>Reference</u>

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Nonconsumptive Value of Steller Sea Lion Protection

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The objective of this multi-year project is to use state-of-the-art survey, sampling, and econometric techniques to measure economic values that U.S. residents place on providing additional protection to the western population of Steller sea lions, which is listed as endangered under the Endangered Species Act of 1973. Since different management options are available to protect this endangered species, but have varying impacts on local economies, fisheries, and sea lion populations in Alaska, it is important to understand the public's preferences toward the protection measures and their associated impacts to contribute to the efficient management of Alaskan fisheries and protection of Steller sea lions.

A manuscript was completed that details the econometric modeling approach, estimation results, and welfare estimates of the analysis of the data collected for this project. It has been submitted for publication and is currently being revised for resubmission. Additional work has been done to analyze other aspects of the data, including an analysis of the differences in attitudes between Alaskans and non-Alaskans with respect to the Endangered Species Act, threatened and endangered species, and Steller sea lions in particular.

Protected Marine Species Economic Valuation Survey

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Estimates of the economic benefits of protecting threatened and endangered marine species are often needed by resource managers and policy makers to assess the impacts of alternative management measures and policies that may affect these species. However, few estimates of the benefits of protecting marine species exist, and none exist for many species protected by NMFS. To begin filling this information gap, Dan Lew is working with Kristy Wallmo (NMFS, Office of Science and Technology) on a non-market valuation survey research project to estimate the value of protecting several protected marine species.

Numerous cetacean, pinniped, sea turtle, and fish species have been selected for inclusion in the study. The survey employs stated preference questions to gather information on public preferences for protecting these species. Several sets of focus groups to test preliminary survey materials were conducted over the last few years. During 2007 and 2008, changes to the survey and related materials were made based on the results of these groups and input from biologists providing review of the scientific information being presented. Due to the complexity of the issues and the number of species covered in the survey, the project has been divided into two phases, each involving the implementation of an Internet-based survey intended to collect stated preference information about a subset of the total species being studied. In the initial phase, the set of 8 species in the survey includes the endangered North Pacific right whale and two threatened Chinook salmon. Focus group and other qualitative pretest activities for the first phase species continued through 2008 and 2009. After the survey materials were peer reviewed by an expert in stated preference methods, a Center for

Independent Experts (CIE) review was conducted with other experts in non-market valuation and economic surveys. Following the CIE review and a small formal pretest, the first phase survey instrument was implemented using an Internet-based panel and completed in the spring of 2009. Some preliminary results were presented at two conferences during the summer, and a manuscript presenting some economic values for providing enhanced protection to a subset of the eight species was completed. During 2010, the full dataset will be analyzed and economic values associated with providing enhanced protection to each of the eight threatened and endangered Phase 1 marine species will be estimated.

Models of Fishermen Behavior, Management and Economic Performance

Assessing Voluntary and Involuntary Methods of Red King Crab Bycatch Reduction in the Bering Sea Flatfish Fishery

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A common proposed solution to the bycatch problem has been to implement spatial closures to ban fishermen from grounds with high concentrations of bycatch species. While potentially effective in reducing bycatch, such measures typically ignore the fundamental incentive problems at the heart of the bycatch problem and may be quite costly to fishermen if the closures are coincidental with productive fishing grounds. An alternative approach has been for fishermen to pool information on the catch of bycatch species with the aim of facilitating voluntary spatial avoidance measures. This milestone utilizes high resolution observer data from the Bering Sea rock sole roe fishery to examine the relative effectiveness of involuntary spatial closures and voluntary avoidance behavior in the reduction of red king crab bycatch. The bycatch of crab is strictly limited but is allocated as common property quota to the fleet so incentives to engage in free riding behavior in bycatch avoidance are present. In 1995, managers prohibited fishing in a productive part of the rock sole fishing grounds, the Red King Crab Savings Area (RKCSA). However, fishermen simultaneously began pooling their bycatch data across vessels on a regular basis in order to illuminate patterns in the bycatch distribution and facilitate the avoidance of red king crab bycatch. Here we investigate the impact the impact of spatial closures and voluntary information sharing on the Bering Sea rock sole fishery in the late 1990s.

A Method for the Design of Fixed Time-Area Closures to Reduce Salmon Bycatch

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Salmon bycatch in the Bering Sea pollock fishery has reached record levels in recent years and the North Pacific Fishery Management Council (NPFMC) recently considered implementing a variety of time-area closures that would attempt to reduce salmon bycatch. To assist in this process, Alan Haynie wrote a paper that offers a discussion of important issues for consideration in marine closure design and develops and implements a methodology to identify potential candidate closures.

The starting point for the design of closures in this analysis was to determine whether or not there are any time and area combinations that, if closed, would have reduced bycatch. A fundamental assumption of this methodology is that vessels reallocate effort from closed areas to open areas *proportional to other effort*. For example, if there were only three areas with one third of the catch caught in each area, closing one area would lead to half of the catch being caught in each of the two areas that remain open. This is very different from assuming that the pollock effort vanishes with a closure and it means that in order for closures to be effective, there must be clean fishing areas available at the time of the closure. Of course, depending on which areas are closed, the proportional reallocation assumption may be limiting. We discuss this assumption in greater detail in the paper but believe that it is a good first approximation. Temporally, we consider closures lasting 2-8 weeks and spatially from 1-10 ADF&G statistical areas.

The results of this method may be considered "optimal" in the sense that it considers all of the potential area closures that could be created (using data from 2001-2006) and then presents the costs of salmon avoidance, in terms of both the size of the closure (in number of areas) and in the proportion of pollock catch reallocated by the closure. We use ArcGIS to identify neighboring areas and Matlab to systematically explore the bycatch reduction from different closures. "Inferior" closures, where fewer salmon are avoided for the same or greater relocation cost, can be eliminated from consideration and policy makers are offered a range of closures that represent different policy trade-offs of salmon reduction and avoidance costs. The most effective of the closures here reduced bycatch by approximately 10 percent per year, on average. Given the significant size of the most effective closure (9 statistical areas) this is a small reduction, which demonstrates the limitations of static time-area closures in the context of dynamic target and bycatch populations. This work was presented at the Fourth International GIS/ Spatial Analysis Symposium. In 2010, we expect to revise the methodology by which effort is spatially reallocated and compare the results to the work already completed.

From Mobile Closures to Individual Incentives: Chinook Salmon Bycatch Reduction Efforts in the Bering Sea Pollock Fishery

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Bycatch is repeatedly noted as a primary problem in fisheries management and as the foremost negative impact of commercial fishing. In the Bering Sea pollock fishery salmon bycatch reduction measures have included gear modifications but have principally consisted of area closures. Bycatch levels of chum and Chinook salmon rose substantially since the beginning of the decade and significant areas of the pollock fishery have been closed at some points between 2002 and 2007. These closures have consisted of both large long-term Salmon Savings Area closures and short-term voluntary rolling hotspot (VRHS) closures. More recently, the North Pacific Fishery Management Council acted to impose a hard cap on the pollock fishery which would close the fishery if it were reached. In this project, we consider the effectiveness of different management actions taken to manage salmon bycatch.

We examine the effectiveness of spatial closures designed to reduce salmon bycatch in the Bering Sea pollock fishery. We compare the relative effectiveness of spatial management measures that have been implemented with tradable salmon bycatch programs that will be implemented in 2011. We demonstrate the importance of having individual bycatch quota under a hard cap which could otherwise erode benefits in the rationalized fishery. Additionally, we examine industry-proposed incentive plans and consider how to best develop a mechanism that limits bycatch in both high and low stock conditions.

Over the last several years, we have been active in various research efforts related to salmon bycatch in the Bering Sea pollock fishery. This year, in addition to the research described above, we provided analysis of industry-proposed incentive plans to industry and to the Council's SSC. We also wrote a discussion paper on data collection to assess the effectiveness of the Council's recent action and contributed to the analysis of a currently proposed data collection plan.

Climate Change and Changing Fisher Behavior in the Bering Sea Pollock Fishery

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One component of the recently initiated Bering Sea Integrated Ecosystem Research Project (BSIERP) is a spatial economic model that will predict changes in fishing activity in the Bering Sea pollock fishery that may result from climate change. Random utility models such as the model employed here have been used in the Bering Sea and elsewhere to model how fishers make decisions about where to fish. Commercial fishers choose different areas to fish based on myriad observable and unobservable characteristics of the area and the fisher. We commonly model location choice as a function of the expected catch (or revenue) in an area, fuel and fish prices, distance to an area, vessel characteristics, and to a more limited degree, institutional and environmental conditions. In the Bering Sea pollock fishery, climate variables affect many aspects of the fishing decision. Key among these impacts is the role that climate has on fish location and abundance and the impact that weather plays in daily participation choices for smaller vessels. In this project, we are working to expand a robust spatial economic model to include climate data (e.g. ice cover, sea surface temperatures, wind). Including this information in the model will allow us to determine the relative impact of observable contemporaneous environmental conditions on location choices. We will also develop a framework to include predictions of changing pollock abundance in the model, which will allow us to estimate fisher response to scenarios developed by oceanographic and ecosystem modelers involved in the BSIERP project. An overview of the model and data to be utilized in this paper was presented in Gijon, Spain in May 2008 at the PICES/ICES Conference on the Effects of Climate Change on the World's Oceans.

In 2010, work will be focused on the creation of a model for the catcher-processor and mothership sectors of the Bering Seal pollock fishery. As well as examining which models best explain and predict the behavior of the pollock fleets, the impact of environmental variables (e.g., ice cover, sea surface temperature) will also be included in the model. In the future, this will allow the model to incorporate predictions on climate change in the Bering Sea that come from other aspects of the BSIERP project.

Exploring New Research on Economic Aspects of Marine Protected Areas

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This project involves summarizing the findings in the economics literature that relate to the impact of marine protected areas (MPAs) on commercial fisheries and the non-market benefits of MPAs. The results of this literature review will be incorporated into a NOAA technical memorandum that is being written by Dr. Haynie and Dr. Kristy Wallmo of NMFS Office of Science and Technology in Silver Spring, MD.

Examining the Economic Linkages between Fisheries in Alaska and along the West Coast of the U.S.

Steve Kasperski*

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Incidental bycatch is just one way in which the harvesting sector impacts multiple species. Harvesters adjust the timing and location of effort to target species to maximize their profit, thus affecting the amount of each species that is harvested both intentionally and unintentionally. These interactions which occur among species in the harvest process can have a substantial impact on the optimal management policy. However, the economic system in which harvesters operate encompasses multiple ecosystems in the Bering Sea and Gulf of Alaska, as well as along the West Coast of the U.S. As a result, changes in management policy affecting one ecosystem can affect how the harvesting sector allocates effort across ecosystems in multiple regional fisheries. This study will develop a model of the fishing behavior of these vessels to explore how they allocate their effort among the fisheries as a function of abundance, relative prices, fuel costs, regulatory changes, and other factors. As these two regions are managed by different management councils, policies enacted by one council can have implications on the other council's fisheries. The goal of this study is to gain insight into fisher's behavior which could help minimize the unintended consequences of management policies.

Modeling Spatial Location Choice with a Generalized Extreme Value Model

Alan Haynie* and David Layton

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A significant challenge in discrete choice modeling is developing high dimensional choice models that embed spatial correlation structure in the unobservables yet remain computationally tractable. In the economics literature two main points of departure in lower dimensional non-spatial choice models have been explored – Multinomial Probit models based on the multivariate normal distribution and mixed logit (or random parameters logit) which uses a basic conditional logit model and adds in random parameters that induce correlation across the alternatives. A third route exists that is based on McFadden's GEV model. This approach has seen relatively little research in economics beyond the family of nested logit models. In recent years there has been a resurgence in research activity in the transportation area, culminating in a variety of generalized nested logit (GNL) models in which the dependence of the unobservables can be modeled by allowing the nests to overlap each other. While there has been little work in modeling high dimensional spatial correlation, it turns out GEV models based on particular kinds of overlapping nesting structures are well-suited to capturing the type of spatial correlation structure commonly used in linear spatial models. Importantly, this model is tractable for a larger number of alternatives and can be run on available software packages. Here we develop a GEV model with spatial correlation and we will apply the model to fisher location choice in the Alaska Bering Sea pollock fishery. A draft of this paper was presented this year at the World Conference of Spatial Econometrics and at the biannual meeting of North American Association of Fisheries Economists (NAAFE). The manuscript is currently being revised and expanded and will be submitted to a scientific journal in 2010.

Optimal Harvesting Targets in Biologically and Technologically 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 paper solves a dynamic optimization problem of maximizing the net present value from a three-species fishery and determines the optimal harvest quota of each species given the biological and technological interactions. Using this framework, I derive the multispecies Euler equation, a modified multispecies golden rule, and a multispecies version of the fundamental equation of renewable resources. The theoretical results highlight the need for including both biological and technological interactions when determining quota in a multispecies or ecosystem-based management regime. The model will be applied to the Alaska Bering Sea pollock, Pacific cod, and arrowtooth flounder fisheries, and the populations of each species will be simulated into the future. The goal of this study is to examine the magnitude of the biological and technological interactions in these fisheries and their implications for single versus multispecies management.

Spatial Competition with Changing Market Institutions

Harrison Fell and Alan Haynie*

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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 affects the spatial responsiveness of fish processors across a 21-year time period and we introduce a method that allows for the incorporation of breaks of explanatory variables in spatial panel data sets. We find that processors are significantly more price responsive to their neighboring competitors after rationalization.

A manuscript is currently being revised for submission to a scientific journal. In 2010, we intend to extend this work to consider other modeling approaches to better understand how processor competition changes with rationalization.

Regional Economic Modeling

Estimating Economic Impacts of Alaska Fisheries Using a Computable General Equilibrium Model

Edward Waters and Chang Seung*
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Fixed-price models such as input-output (IO) and social accounting matrix (SAM) models are often used for analysis of fisheries. However, these models have several important limitations. In these models, prices are assumed to be fixed, and no substitution is allowed between factors in production or commodities in consumption. As a result, in cases where the fixed-price assumption may not be realistic, these models tend to overestimate impacts. Computable General Equilibrium (CGE) models overcome these limitations. In CGE models, prices are allowed to vary, triggering substitution effects in production and consumption. The CGE model therefore enables analysts to more readily examine the economic welfare implications of a policy change. Furthermore, the CGE approach is generally more appropriate than other regional economic models for analyzing the impacts of a change in the productive capacity of resource-based industries.

This project built a CGE model of the Alaska economy with explicit recognition of the fishery sectors. The investigators used IMPLAN and other available data. The CGE model was used to estimate the distribution and magnitude of economic impacts associated with harvesting, processing and support activities related to Alaska fisheries.

Specifically, the following tasks were completed:

1. Recent annual catch levels for Alaska fisheries from PacFIN, AKFIN, NORPAC and

related data systems were compiled.

2. Summary data on the residence of owners and crews of vessels operating in Alaska fisheries and labor employed by Alaska seafood processors was gathered. Data sources include NOAA permits databases, Alaska Department of Labor reports, and other sources. (This information is important for determining “leakage” of factor income paid to non-residents working in the Alaska economy.)
3. Information on cost structures and the locus of input purchases by vessels and processors involved in Alaska fisheries was estimated. Major sources of data include review of relevant literature, and interviews with researchers and key industry informants.
4. A Social Accounting Matrix (SAM) of the Alaska economy was created using IMPLAN, REIS data, and the information gathered in tasks 1–3. The SAM incorporated the latest comprehensive economic data available, and was updated and built on earlier work by Seung and Waters (2006).
5. Estimates of the values of key parameters and elasticities governing economic relationships in the Alaska economy were obtained. These include aggregate industry supply functions, aggregate household demand functions, and aggregate commodity import and export propensities. The focus was on those factors, commodities and services of particular importance to commercial fisheries-related economic activity. Sources of information include review of relevant literature and interviews with researchers.
6. A CGE model of the Alaska economy was constructed using data assembled in tasks 1–5.
7. The CGE model was used to estimate economic impacts of selected, relevant policy issues affecting commercial fishing and related activities in Alaska.

The sub-contractors (Shannon Davis and Dr. Hans Radtke) prepared a final report which documents data sources, summarizes the fishery-related data, and describes the procedures used for preparing the data. This report was reviewed by the two PIs (Edward Waters and Chang Seung). Edward Waters developed an “import-purged” and “import-ridden” SAMs. Based on these SAMs, the PIs developed a supply-driven SAM (SDSAM) model to estimate the impacts of a hypothetical, 10% reduction of pollock TAC, and wrote a manuscript based on the results from SDSAM, which was published in a scientific journal (Seung and Waters 2009a). The PIs also developed a state level CGE model for Alaska fisheries. Using the Alaska CGE model, the effects of changes in (1) the pollock TAC, (2) fuel prices, and (3) rest of the world demand for Alaska seafood were investigated. Based on the results from Alaska CGE model, the PIs wrote two additional manuscripts (Seung and Waters 2009b; Waters and Seung 2009) which are now under review at two journals.

Many of the vessels operating in Alaska fisheries are owned and crewed by residents of Washington and Oregon. These vessels also tend to participate in West Coast fisheries during the year. Expenditures made by these vessels generate income in port and also have multiplier and spillover effects elsewhere. A new project is underway to construct a multi-regional CGE model to examine cross-regional impacts of Alaska fisheries on West Coast economies and vice versa. The project will utilize experience with the Alaska CGE model project described above combined with findings from the Northwest Fisheries Science

Center's IO-PAC model of West Coast fishing economies. A SAM consisting of the cores of the two regional economic models plus estimated trade and factor flow linkages between the two regions will be produced. Ultimately this multi-regional SAM will be used as the data set for an integrated multi-regional CGE model of the two regions. The project is currently acquiring information and data from NWFSC's IO-PAC model and awaiting release of IMPLAN v3 software which will greatly facilitate estimation of interregional trade flows (IMPLAN v3 is currently scheduled to be released in late 2009). SAM construction and CGE modeling will then commence, with the final model scheduled for completion by September 2010. Taking account of the regional distribution of expenditures made by Alaska fishing vessels, in Alaska, West Coast states, and elsewhere, shall enhance the ability to model the overall economic impacts of Alaska fisheries and West Coast fisheries.

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Seung, C. and E. Waters. 2009b. "Evaluating Supply-Side and Demand-Side Shocks for Fisheries: A Computable General Equilibrium (CGE) Model for Alaska. Submitted to *Economic Systems Research.*

Waters, E. and C. Seung. 2009. "Impacts of Recent Shocks to Alaska Fisheries: A Computable General Equilibrium (CGE) Model Analysis." Submitted to *Marine Resource Economics.*

Socioeconomic, Cultural and Community Analyses

Trophic Level Analysis of Subsistence Fisheries Harvests in the Bering Sea

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Alaska Native communities in the Bering Sea are heavily dependent on subsistence resource harvesting and these communities are expected to bear some of the greatest impacts from climate change. Applying trophic level analysis and other marine food web modeling techniques to community subsistence harvesting allows for the analysis of human foraging patterns and the prediction of change under different climate scenarios. Information about the analysis has been presented to the Bering Sea Integrated Ecosystem Research Program (BSIERP) Regional LTK Advisory Board comprised of representatives of Alaska Native communities in the Bering Sea. Their comments and feedback will be incorporated. The trophic level analysis results will also be presented at scholarly conferences in the coming year. The trophic level of subsistence analysis is a collaboration between the AFSC's

Economic and Social Sciences Research and Ecosystem Modeling programs, five Bering Sea Alaska Native communities (which are regional partners with the North Pacific Research Board in the BSIERP project), and the Alaska Department of Fish and Game, Division of Subsistence.

Bering Sea and Aleutian Island Communities: Demography in a Changing Ecosystem

Jennifer Sepez* and Amanda Poole
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Fishery managers sometimes find social impact analysis difficult to incorporate into their decision-making processes in part because it does not come in the quantitative and predictive formats they are accustomed to receiving for stock assessments and economic impacts. This project seeks to improve the reception of social information by taking many of the usual concerns of social scientists – population, race and ethnicity, gender, community size and viability (resilience) – and presenting them in predictive models that assess the demographic impacts of fisheries on communities. Where possible, these predictions will indicate a quantitative range of the likely impacts of ecosystem changes such as fisheries harvest levels, climate change, and protected resources regulations. In other cases it will only be possible to characterize the direction and intensity of likely impacts. Regardless, this project will allow us to inform fishery managers of the way in which ecosystem changes may affect the overall human population levels in the large marine ecosystem and the distribution of those populations in terms of factors such as large and small communities, Alaska Native populations, immigrants, gender, and age.

This is a three phase project. Phase 1 (completed in 2006) compiled and analyzed existing population information for communities in the Bering Sea and Aleutian Island Large Marine Ecosystem, resulting in a report published in the 2006 SAFE and a paper presented at Population Association of America Conference in March 2007. Conclusions from phase 1 include:

1. The region shows overall population growth since early 1900s.
2. The region shows overall growth recently (1990- 2005).
3. Military and fisheries are major drivers of population changes.
4. Growth is not distributed evenly, nor do all 94 communities show growth.
5. Recent negative growth communities may possibly be characterized as salmon dependent or military dependent (subjected to falling prices and base closures).
6. Recent positive growth communities may possibly be characterized as hub communities, subsistence communities, and non-salmon dependent fishing communities.

Phase 2 (completed summer 2008) compiled and analyzed population structure information including age, gender, and ethnicity/race, and examined mechanisms of change tied to ecosystem factors such as fish landings and prices. Some recent ethnographic work in Bristol Bay indicates connections between fisheries and social factors, e.g., in-migration for labor, out-migration for educational opportunities, and Alaska Native birth rates in small villages (connected to educational opportunities for women, or lack thereof). In Phase 2 we created a typology of BSAI communities that reflects similarities in recent demographic trends, using several different types of cluster analysis to create the following clusters, named for the dominant characteristic: Salmon Dependent, Low and No Commercial Participation, Herring Dependent, Large Processor Cluster, Halibut Cluster, Small with No Processor Cluster, and Military Cluster. A comparative analysis of demographic trends and fisheries trends over the period 1990-2007 was completed, and a regression analysis was conducted on demographic, fishery, and ecosystem indicators in order to understand the factors that most effect population growth and decline at the community level. In a third phase that is as yet unfunded, we will construct models that can be coupled with bioeconomic model outputs to predict community-level demographic changes in response to fishery management decisions.

Cultural Accommodations by Seafood Processors for a Global Multi-cultural Workforce

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Individuals come from all over the world to work in the Alaska seafood processing industry. They live, work, and eat together, often in remote locations near to the fishing grounds. In the not too distant past, cultural differences among ethnic groups represented in the workforce were dealt with by race-based segregation in bunk-housing and cafeteria meals. In today's multi-cultural world, seafood processing companies in Alaska have embraced cultural difference by adapting their practices to accommodate the multi-cultural needs of the global workforce. Examples of these "welcoming workplace" practices include specially-timed cafeteria hours for Muslim workers observing day-time fasting obligations during Ramadan, foods prepared in the cafeteria that serve the cultural expectations of people from many different parts of the world, processing plant signage in multiple languages, and enabling Alaska Native mothers to provide traditional subsistence foods to their adult children working at the plant. As long as people who come to Alaska from all around the world persist in carrying cultural identities with them, seafood processing plants that provide food and housing to their employees (most plants in Alaska) will bear an important responsibility in creating social conditions that encourage the continued migration of a global workforce. Most plant managers frame their multi-cultural accommodations in terms of "just plain old good business" and see a direct link between these practices and enhanced productivity. In 2010, AFSC social scientists will observe and analyze information relevant to understanding multiculturalism in the Alaska seafood processing industry. We will present findings at conferences and prepare manuscripts for publication.

The ethnicities of seafood processing crews are not well described in the literature, in part because the subject is difficult to approach due to industry concerns about how various types of information disclosures might impact the company through immigration-related issues. To our knowledge, a large-scale survey (or even a small scale one) asking processing companies to report on the ethnicities or nationalities of their workers has never been attempted because such a survey would almost certainly fail to generate a significant response. Companies are not comfortable reporting nationality statistics and they do not keep records of ethnic identification. The Census provides some useful information. In some unique communities such as Akutan that have a very small resident population separated from a large transient labor population, it is possible to assume that the population residing in group housing is roughly comprised of the seafood processing labor force. However, for the majority of communities, Census information about ethnic identity and nationality of processing crews cannot be discerned in this way. For most places, the Census provides only a hint of the ethnic distribution of the seafood labor market.

We suspect, based on field experience and Census data from communities with seafood processors, that processing crews come from all over the world. For example, in the hub community of Dutch Harbor/Unalaska, with several of Alaska's largest seafood processors and numerous support services, about 26% of the population reported being foreign-born, including persons from 24 different countries in Africa, Asia, Central and South America, Europe, Mexico, Canada and the Pacific Islands. However, we know nothing about how this diversity is related to the processing workforce, as opposed to other sectors of the community. By contrast to Dutch Harbor, Akutan is a community which has essentially no other labor-drawing economic activity besides the seafood processor (no airport, no roads, no shipping, no stores, no restaurants, no hotels). In Census data for Akutan, the only country-of-origin for the foreign-born population is the Philippines, although identification by ethnicity also shows a significant population of Hispanics. We understand even less about the off-shore processing sector, in which foreign-national crews are sometimes reported to be ethnically homogenous as organized and managed by a single bilingual crew boss.

Language, culture, country-of-origin, and ethnic identity are all relevant to food and eating practices, but are not necessarily relevant to citizenship or immigration status. By documenting the food practices of seafood processing company cafeterias, this project will attempt to analyze ethnic and cultural identities and national origins within the labor force in a way that is more likely to be embraced by industry. This project will not investigate immigration policy, worker visa status or documentation, citizenship, or other issues that would be perceived by industry as problematic. In fact it is our explicit assumption that every worker in his project is properly documented for working in Alaska and we will collect no information on this subject. As well as providing a unique lens through which ethnicity, multiculturalism, and globalization in the Alaska seafood industry can be viewed, the discussion generated by this work will be relevant to theories of transnational labor migration, the internal peripheries of post-industrial nation-states, culture and globalization, and the anthropology of food and identity.

This research began in January 2009. Interviews with processing company management and ethnographic work in communities where seafood processing companies provide food and housing to workers form the methodological backbone of this project. Emphasis has been on remote communities with shore-based processors where large numbers of processing workers depend entirely or almost entirely on company cafeteria food. The at-sea processing sector will also be interviewed through their Seattle offices. Information sources will include management, cafeteria workers, processing workers, and supply companies. These field data will be combined with available demographic data to flesh out a broad and rich characterization of the labor force, changing demographics, and the efforts of the seafood processing industry to accommodate a multi-cultural workforce.

Following the first four field-site visits in 2009, an article was prepared for the Alaska Fisheries Science Center Quarterly Report that summarized the project findings to date. A second report framing this research in terms of factors and trends in the multicultural workforce is included in the Ecosystem Considerations chapter of the 2009 SAFE report.

Developing Socioeconomic Indicators for the Eastern Bering Sea Trawl Fishery

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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, the indicators developed in the previous studies were not synthesized, and therefore, it is difficult for policy makers to make a holistic assessment of the status of a management unit (species, fisheries, or ecosystem) using the indicators.

One exception is Zhang et al. (2009), in which three different management objectives (sustainability, diversity, and habitat quality) are defined. For each objective, the study developed several attributes to characterize the objective. For each attribute, the study developed indicators and identified reference points. Finally, based on this information, the study developed pragmatic risk indices that can be used to assess the status of a management unit. The study represents significant progress in developing methods to evaluate the status of fisheries within an ecosystem-based management framework. However, there is one important type of consideration that is missing in the study – socioeconomic considerations.

To this end, the present study begins to fill the void using an application to Alaska's Eastern Bering Sea Bottom Trawl Fishery. While a number of previous studies have developed socioeconomic indicators, they were stand-alone indicators which were neither aggregated to obtain an overall socioeconomic index or social welfare function (SWF) nor integrated with non-socioeconomic indicators such as biological and ecological indicators. For these reasons, the socioeconomic indicators in the previous studies were not as useful as desired. Therefore, in the present project, two major tasks will be accomplished. First, for developing socioeconomic indicators and overall socioeconomic index, the PIs will use multi-attribute utility function (MAUF) approach to development of the indicators since MAUF is firmly based on microeconomic utility theory, taking into account diminishing marginal utility of an attribute and the tradeoffs among attributes. Second, once the socioeconomic indicators are developed using MAUF, these indicators will be integrated with non-socioeconomic indicators to come up with overall ecosystem index in order to facilitate a more holistic assessment of fisheries. The non-socioeconomic indicators to be combined with socioeconomic indicators will be developed by Chang Ik Zhang and Anne Hollowed (and possibly others). In the long run, it is expected that this project will result in concrete numbers or indices that will serve as a useful tool to aid in fishery policy decisions. To date, following the MAUF approach, the PIs have developed preliminary socioeconomic indicators for Easter Bering Sea trawl fishery using currently available data, and presented the methods and results at 2009 PICES meetings, Korea (Seung and Zhang, 2009). The next steps are (1) to find more reliable data for important indicators such as the vessel profit indicator, (2) to devise methods to elicit preferences of decision makers / stakeholders via surveys or interviews, and (3) to integrate socioeconomic indicators with non-socioeconomic indicators.

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Seung, C. and Chang-Ik Zhang. 2009. "Developing Socio-economic Indicators for Fisheries off Alaska: A Multi-attribute Utility Function Approach." Paper presented at 2009 PICES meetings, Oct 23-Nov 1, 2009, Jeju, Korea.

Ecosystem-Based Fisheries Management and Local and Traditional Knowledge

Jennifer Sepez*

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Part of NOAA's Strategic Plan is to "protect, restore, and manage the use of coastal and ocean resources through an ecosystem-based approach to management." Social science is widely recognized as an integral part of ecosystem based fisheries management. Research on local and traditional knowledge is one aspect of social science that has generated growing interest as a significant source of information and collaboration for ecosystem-based management. The goal of this research is to increase NOAA's ability to meet its goal of implementing ecosystem-based management.

During the past year, information about local and traditional knowledge of the Aleutian Islands Ecosystem was presented to the North Pacific Fishery Management Council's Ecosystem Committee as a section of the Aleutian Islands Fishery Ecosystem Plan (AIFEP). The section was prepared by the Jennifer Sepez as a member of the AIFEP Team. In 2009, additional preparation for the collection of local and traditional knowledge in five Bering Sea Alaska Native communities began. Community partnerships were established, including the appointment of community advisory boards in each of the five communities and several meetings of a region-wide Advisory Board were held in Alaska, which AFSC Economic and Social Sciences Research Program (ESSRP) staff attended. ESSRP staff visited the Native village of Emmonak in July of 2009 and were given an orientation to the Yupik community at the mouth of the Yukon River by the Community LTK Advisory Board liaison. An interview was completed with the oldest living Yupik Eskimo member of the community. In addition, human subjects review clearance was obtained from the University of Washington, one of our university partners in this LTK collection. Comprehensive subsistence harvest surveys were completed in four of the five communities and this quantitative data is being incorporated into analyses and predictions of how local and traditional knowledge holders will adapt local practices to ecosystem changes and impacts on subsistence resources under different climate change scenarios.

Shore-based Seafood Processor Profiles

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In 2009 the AFSC Economic and Social Sciences Research Program began to compile information for profiles of shore-based seafood processing plants in Alaska. Short narrative profiles of plants in more than 30 communities have been completed to date. These profiles will be incorporated into the updated community profiles document for North Pacific fisheries (to be completed after the release of 2010 U.S. Census data) and will be available to the Alaska Regional Office and the North Pacific Fishery Management Council for cut and paste into the descriptive socio-economics sections of NEPA documents.

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AFSC Economics and Social Sciences Research Program
Publication List for Full-Time Staff (names in bold), 2002-2008

2009

Fell, H. and **A. Haynie**. 2009. "Estimating Time-varying Bargaining Power: A Fishery Application." In Press at *Economic Inquiry*.

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.

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.” In Press at *Ecological Economics*.

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. 2009. “An Expected Profit Model for Monetizing Fishing Location Choices.” In Press at *Journal of Environmental Economics and Management.*

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.

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.

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.

Morrison Paul, C.J., M. Torres, and **R. Felthoven**. 2009. "Fishing Revenue, Productivity, and Product Choice in the Alaskan Pollock Fishery." In Press at *Environmental and Resource Economics* (published online June 21, 2009).

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.

Submitted for Publication at Scientific Journals in 2009:

Carothers, C, **D.K. Lew, and J. Sepez**. 2008. "Fishing Rights and Small Communities: Community Size and Transfer Patterns in the North Pacific Halibut Quota Share Market." Submitted to *Ocean and Coastal Management*.

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.

Dalton, M. 2009. "Simulated Maximum Likelihood Estimation of the Panel Tobit Model with Dynamic Variables, Autocorrelation, and Fixed Effects." Submitted to *Journal of Econometrics*.

Spatial management is currently an important issue in fisheries, and a central question for managers is how fishing effort will respond to marine reserves and other types of closures. This paper develops a panel Tobit model to analyze the influence of spatial and dynamic factors on decisions about where and when to fish and accounts for autocorrelation. A simulated maximum likelihood approach is developed for computing parameter estimates and conducting hypothesis tests, including an analysis of covariance to detect sources of individual heterogeneity.

Felthoven, R., B. Garber-Yonts and J. Sepez. 2009. "Socioeconomic Data Collection for Fisheries in and off Alaska: Current Status and Needs." Under revision at *North American Journal of Fisheries Management.*

Management actions considered by regional fishery management councils can generate significant impacts on the magnitude and distribution of the economic and sociocultural well-being of stakeholders. It is therefore important that policy analysts be able to account for the relevant parties whose economic well-being is affected by fisheries and derive estimates of the elements that comprise each party's net economic benefits derived from utilization of resources. We survey the primary state and federal socioeconomic data that are systematically collected for analyzing fishery management actions in and off Alaska and note the critical areas in which data collection should be enhanced to improve socioeconomic analyses. By designing data collections to better encompass the appropriate group of stakeholders for whom impacts should be considered and to capture the relevant costs and revenues in fisheries, analysts can provide fishery managers with a significantly heightened ability to evaluate the trade-offs associated with different policies and management actions. Many of the lessons learned in analyzing data capabilities and needs in this region can be of use to analysts elsewhere, whether they are trying to best utilize existing data or implement new data collection programs.

Kasperski, S and R. Wieland. 2009. “When is it Optimal to Delay Harvesting: The role of Ecological Services in the Chesapeake Bay Oyster Fishery.” Under revision at *Marine Resource Economics.*

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.

Kasperski, S. 2009. "The Impact of Trade on Biodiversity." Submitted to *Journal of Environmental Economics and Management.*

Economic activity has been cited as a leading threat to global biodiversity. International trade impacts the profitability of different land use choices in a country potentially resulting in habitat degradation/loss. International trade also serves as a platform for the introduction of alien species and foreign diseases. This study shows that holding climatic and geographic variables in addition to land use patterns constant, international trade intensity has a statistically significant impact on the level of biodiversity within a country. In particular, it is shown that increased levels of trade intensity results in a statistically significant reduction in the number of endemic (or unique) biodiversity within a country, but has a statistically insignificant effect on non-endemic biodiversity.

Lew, D., D. Layton and R. Rowe. 2009. “Valuing Enhancements to Endangered Species Protection under Alternative Baseline Futures: The Case of the Steller Sea Lion.” Submitted to *Marine Resource Economics.*

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.

Morrison Paul, C., **R. Felthoven** and M. Torres. 2009. "Economic Performance in Fisheries: Modeling, Measurement and Management." Under revision at the *Australian Journal of Agricultural and Resource Economics.*

We overview the roles of production structure models in measuring fisheries' economic performance to provide policy-relevant guidance for fishery managers and analysts. In particular, we summarize the state of the literature on the representation and estimation of production structure models to construct economic performance measures for fisheries, with a focus on parametric empirical applications. We also identify some promising directions for future research and discuss the management implications of measures reported in the literature.

Schnier, K. and **R. Felthoven**. 2009. "Accounting for Spatial Heterogeneity and Autocorrelation in Spatial Discrete Choice Models: Implications for Behavioral Predictions." Under revision at *Land Economics.*

The environmental economics literature has utilized McFadden's (1974, 1978) random utility model to estimate parameters which define the discrete choices of agent micro-decisions. One area where these methods have been extensively used is in the land-use and fishery economics literature where the multinomial logit (MNL) model has been the econometric standard for nearly twenty years. This research investigates the implications of assuming that there does not exist any spatial heterogeneity or spatial autocorrelation in the unobservable portion of utility. A spatial multinomial probit (SMNP) model is developed that accounts for both dimensions of variation and it is estimated by simulated maximum likelihood using the GHK simulator. Using a data set on the spatial decisions of fishermen within the Bering Sea, the results illustrate that the multinomial probit (MNP) and SMNP models provide a more reliable profile of spatial behavior when the definition of "space" is small, whereas the MNL model performs well when the definition of "space" is large thereby preserving the spatial independence assumption. In some cases the predictive accuracy of these model is over 50% greater than the conventional MNL model.

Seung, C. and E. Waters. 2009. "Evaluating Supply-Side and Demand-Side Shocks for Fisheries: A Computable General Equilibrium (CGE) Model for Alaska. Submitted to *Economic Systems Research.*

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.

Seung, C. 2009. "Forecasting Industry Employment for a Resource-based Economy Using Bayesian Vector Autoregressive Models." Submitted to *Journal of Regional Science.*

Bayesian vector autoregressive (BVAR) models are used for forecasting industry employment in Alaska. This study uses as priors input-output (IO) information that is based on non-IMPLAN data for seafood industry as well as IMPLAN data for non-seafood industries. This study uses two different types of IO information as priors – (1) reduced-form inter-industry employment relationships and, alternatively, (2) an economic-base version of the IO information for a resource-dependent Alaska economy. This study represents the first attempt in the literature to develop an economic-base version BVAR model for analyzing an economy which depends to a large extent on natural resource as an economic base. This study finds that, for Alaska economy, the model version that has reduced-form IO information performs worse than the models without IO information in terms of the number of most accurate forecasts. However, this study finds that, for Alaska economy, overall the model version with economic base information as priors performs the best in the long run, which means that the economic base information significantly improves forecasting accuracy in the long run.

Seung, C. 2009. "Estimating Regional Economic Information Using Unequal Probability Sampling for Alaska Fisheries." Submitted to *North American Journal of Fisheries Management.*

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.

Waters, E. and **C. Seung**. 2009. "Impacts of Recent Shocks to Alaska Fisheries: A Computable General Equilibrium (CGE) Model Analysis." Submitted to *Marine Resource Economics.*

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.

Completed in 2009 but not yet submitted for publication:

Dalton, M. 2009. "Spatial Rational Expectations and Renewable Resources."

This paper develops a microeconomic model of groundfish trawlers that is both dynamic and spatial, which is based on a rational expectations competitive equilibrium. Advantages of a rational expectations model for the work in this paper include an explicit representation of information sets held by individuals at each point in time. In addition, this model has an operational, and thus testable, mechanism for translating information sets held by individuals into predictions about the future that can affect aggregate outcomes. Uncertainty is a fundamental part of many fisheries that can affect decisions about fishing effort. In addition, open access is sometimes used to justify an assumption in fisheries models that current decisions do not depend on expectations about future conditions, thus profit maximization for individuals is a static decision. While the assumption of open access is plausible in many fisheries, groundfish trawlers on the West Coast are part of a limited entry program, and ignoring information about future conditions for regulations, stock abundance, or climate would not be optimal. In addition, Rosenman (1986) showed that a type of open access equilibrium can occur with behavior that is forward looking, and the dynamic policy implications for fishery managers in this case are different from those of a static model. Therefore, assumptions about dynamic behavior should be tested. Practical experience supports this type of testing: Fishermen on the West Coast are known to modify behavior based on expectations of future conditions. Therefore, forward looking behavior is a plausible response to uncertainty about future regulations, price changes, climate fluctuations, or other events. The model in this paper is identical to the spatial model of fishing effort and dynamic adjustment costs under rational expectations described in Dalton and Ralston (2004), except that adjustment costs in this paper include a term for dynamically interrelated variables, which is the underlying mechanism for shifts in fishing effort that are analyzed in the paper.

Fell, H. and **A. Haynie**. 2009. "Spatial Competition with Changing Market Institutions."

This paper proposes a new framework which allows for the inclusion of market-altering policy changes in the spatial analysis of competitive behavior. The paper fills a gap in the 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 a change in fisheries management affects the spatial responsiveness of fish processors across a 21-year time period and we introduce a method that allows for the incorporation of breaks of explanatory variables in spatial panel data sets.

Haynie, A. 2009. "Estimating the Value of a Fishing Right: An Analysis of Changing Usage and Value in the Western Alaska Community Development Program Program."

An important element of fishery management in the United States North Pacific is the existence of community development quotas (CDQs) which provide community development corporations with the right to fish in a number of fisheries in and off Alaska. The Eastern Bering Sea (EBS) pollock fishery is the largest of these fisheries, for which 10 percent of total allowable catch is set aside as CDQs. This is a unique limited access privilege program (LAPP) story because it involves a transition from a partial LAPP within a limited-entry fishery to a LAPP with separate spatial rights in a fully rationalized fishery. The primary purpose of this paper is to examine the temporal and spatial uses of CDQ rights and how these uses have changed since the American Fisheries Act (AFA) rationalized the EBS pollock fishery. We provide a brief overview of the CDQ program and discuss the growth and dispersion of CDQ royalties since the program's inception and examine the observed prices of CDQ fishing rights from 1992-2005. We compare prices to observable information about pollock fishing conditions and the changing use of the CDQ right. We see how the CDQ right has changed from a right that allowed for the extension of the season by a variety of vessels, to a right that allows for fishing in otherwise-closed areas during the season after the implementation of the AFA. The number of vessels fishing with CDQ rights has declined substantially during this period, with all fishing now done by at-sea processing vessels.

Haynie, A. and P.J. Sullivan. 2009. "Predicting Fishing with Vessel Monitoring System Data."

Vessel monitoring system (VMS) technology records the time, location, bearing, and speed for vessels. VMS equipment has been employed on vessels in many fisheries around the world and VMS data has been used in enforcement, but a limited amount of work has been done utilizing VMS data to improve estimates of fishing activity. This paper integrates VMS and observer data from the United States Eastern Bering Sea pollock fishery to predict whether or not fishing is occurring on unobserved fishing trips, using observed vessels as a control. We employ a variety of techniques and specifications to improve model performance and out-of-sample prediction and find a generalized additive model (GAM) to be the best formulation for predicting fishing. We assess spatial correlation in the residuals of the chosen model, but find no correlation after taking into consideration interactions of other VMS predictors. We compare fishing effort to predictions for vessels with full observer coverage for 2003-2006 and compare predicted and observed activity for vessels without full observer coverage. We conclude with a discussion of policy considerations.

Lew, D. and D.M. Larson. 2009. "A Repeated Mixed Logit Approach to Valuing a Local Sport Fishery: The Case of Southeast Alaska Salmon."

This paper develops estimates of the values of fishing opportunities and changes in catch rates for single-day private boat saltwater fishing for king and silver salmon in Southeast Alaska, using a combination of state-of-the-art modeling of recreation demand and routinely collected data on catch rates. The advantage of this approach is that it allows routine updating of model predictions about the distribution and frequency of trip-taking along with the net economic values of fish and fishing. A repeated mixed logit model of trip frequency and distribution is estimated jointly with anglers' shadow values of time, and we find that 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 consisting of a fixed fraction and a random constant. We estimate that the mean value of a fishing choice occasion is approximately $45 per angler, a season of fishing is valued at approximately $2,250 on average, and the mean marginal values of a king salmon and silver salmon are approximately $71 and $106. We also explore alternative ways of representing anglers' catch expectations in the model.

Lew, D. and C. Seung. 2009. "The Economic Impact of Saltwater Sportfishing Harvest Restrictions in Alaska: An Empirical Analysis of Non-Resident Anglers."

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.

Lew, D. and K. Wallmo. 2009. "External Tests of Scope and Embedding in Stated Preference Choice Experiments: An Application to Endangered Species Valuation."

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 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 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 number of species protected and the amount of protection to each species.

Schnier, K., Horrace, W. and **R. Felthoven**. 2009. "The Value of Statistical Life: Pursuing the Deadliest Catch."

Observed tradeoffs between monetary returns and fatality risk identify estimates of the value of a statistical life (VSL), which inform public policy and quantify preferences for environmental quality, health and safety. To date, few investigations have estimated the VSL associated with tradeoffs between returns from natural resource extraction activities and the fatality risks they involve. Furthermore researchers have been unable to determine whether or not one's VSL is stable across multiple decision environments using revealed preference methods. Understanding these tradeoffs (and the VSL that they imply) may be used to inform resource management policy and safety regulations, as well as our general understanding of the value of life. By modeling a commercial fishing captain's choice to fish or not, conditional on the observed risk, this research 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 mean VSL range from $4.00M to $4.76M (depending on the modeling assumption and fishery analyzed) and are robust to the incorporation of heterogeneous preferences. Furthermore, given the unique nature of the data we are able to conduct an intra-vessel comparison of the VSL and conclude that for roughly 92% of the fishermen observed in the data set their VSL estimates are stable across both fisheries.

Sepez, J., H. Lazrus, **and R. Felthoven**. 2009. "Post-Rationalization Restructuring of Commercial Crew Member Opportunities in Bering Sea and Aleutian Island Crab Fisheries."

The purpose of this research is to understand how employment opportunities for commercial fishing vessel crew members have changed in the Bering Sea and Aleutian Island crab fisheries following the implementation of a quota-based management system by the North Pacific Fisheries Management Council (NPFMC). The objectives of the Crab Rationalization Program are to address conservation and management issues associated with the previous open access fishery, reduce bycatch and associated discard mortality, and increase the safety of crab fishermen by ending the race for fish. This report transmits preliminary information to the NPFMC, its committees, stakeholders, and the public, about the findings of the research thus far in concert with the NPFMC 3-year review of the program. However, the research and this report are not officially part of the 3-year review as directed by the NPFMC.

2008:

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.

Felthoven, R.G., C. Morrison Paul, and M. Torres. 2008. "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.

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, such as post-colonial extifrpation. 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 that 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 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.

<u>2006:</u>

Branch, T., R. Hilborn, **A.C. Haynie**, G. Fay, L. Flynn, J. Griffiths, K. Marshall, J.K. Randall, J.M. Scheuerell, E.J. Ward, and M. Young. 2006. "Fleet dynamics and Fishermen Behavior: Lessons for Fisheries Managers." *Canadian Journal of Fisheries & Aquatic Sciences* 63(7): 1647-1668.

We review fleet dynamics and fishermen behavior from an economic and sociological basis in developing fisheries, in mature fisheries near full exploitation, and in senescent fisheries that are overexploited and overcapitalized. In all cases, fishing fleets behave rationally within the imposed regulatory structures. Successful, generalist fishermen who take risks often pioneer developing fisheries. At this stage, regulations and subsidies tend to encourage excessive entry and investments, creating the potential for serial depletion. In mature fisheries, regulations often restrict season length, vessel and gear types, fishing areas, and fleet size, causing or exacerbating the race for fish and excessive investment, and are typically unsuccessful except when combined with dedicated access privileges (e.g., territorial rights, individual quotas). In senescent fisheries, vessel buyback programs must account for the fishing power of individuals and their vessels. Subsidies should be avoided as they prolong the transition towards alternative employment. Fisheries managers need to create individual incentives that align fleet dynamics and fishermen behavior with the intended societal goals. These incentives can be created both through management systems like dedicated access privileges and through market forces.

Johnson, K.N., P. Bettinger, J. Kline, T. A. Spies, M. Lennette, G. Lettman, **B. Garber-Yonts**, and T. Larsen. 2006. "Simulating Forest Structure, Timber Production, and Socio-Economic Effects in a Multi-Owner Province." *Ecological Applications* 17(1): 34-47.

Protecting biodiversity has become a major goal in managing coastal forests in the Pacific Northwest—an area in which human activities have had a significant influence on landscape change. A complex pattern of public and private forest ownership, combined with new regulations for each owner group, raises questions about how well and how efficiently these policies achieve their biodiversity goals. To develop a deeper understanding of the aggregate effect of forest policies, we simulated forest structures, timber production, and socio-economic conditions over time for the mixture of private and public lands in the 2.5-million-ha Coast Range Physiographic Province of Oregon. To make these projections, we recognized both vegetative complexity at the stand level and spatial complexity at the landscape level. We focused on the two major factors influencing landscape change in the forests of the Coast Range: 1) land use, especially development for houses and cities, and 2) forest management, especially clearcutting. Our simulations of current policy suggest major changes in land use on the margins of the Coast Range, a divergence in forest structure among the different owners, an increase in old-growth forests, and a continuing loss of the structural elements associated with diverse young forests. Our simulations also suggest that current harvest levels can be approximately maintained, with the harvest coming almost entirely from private lands. A policy alternative that increased requirements for retention of live trees for wildlife at final harvest on private lands would be relatively costly (5-7% reduction in timber production) to landowners. Another alternative that precluded thinning of plantations on federal land would significantly reduce the area of very large diameter (>75 cm dbh) conifer forests at 100 years.

Poole A. and **Sepez J**. 2006. "Distribution and Abundance of Human Populations in the Bering Sea and Aleutian Islands." Pp. 255-276 in *2005 North Pacific Groundfish Stock*

Assessment and Fishery Evaluation Reports for 2006, Economic Status of the Groundfish Fisheries Off Alaska, 2006, Terry Hiatt (ed.), Alaska Fisheries Science Center, Seattle

This article describes the temporal distribution and abundance of human populations in Bering Sea/Aleutian Island (BSAI) fishing communities, reporting on the status and trends for 94 BSAI fishing communities grouped into regions. It reports decadal Census data from 1920 -2000 and annual population estimates and trends from 1990 – 2005. Seventy-nine BSAI fishing communities (or 84%) had a positive average annual percent change during the period between 1990 and 2005. The 14 communities with a negative annual percent change during this time period appear to be concentrated in the Aleutians East and West regions along with Lake and Peninsula and Bristol Bay Boroughs.

Poole A. and **Sepez J**. 2006. “Historic and Current Human Population Trends in the Bering Sea and Aleutian Islands.” Pp. 323-326 in *2005 North Pacific Groundfish Stock Assessment and Fishery Evaluation Reports for 2006***,** *Appendix C. Ecosystem Considerations for 2006,* Jennifer Boldt (ed.), Alaska Fisheries Science Center, Seattle.

This article analyzes and discusses the distribution and abundance over time of human populations in Bering Sea/Aleutian Island (BSAI) fishing communities. This report examines birth rates, migration, indigeneity, boom-bust economic cycles, and seasonality as factors in understanding population trends in the region. Two communities, Cherfornak and Egegik, are examined in greater depth, selected as the closest to the average of those communities showing positive growth rates in the last 15 years, and those showing negative growth rates, respectively. The research suggests that military activity and fisheries economics have the most noticeable affects on recent BSAI demographics.

Sepez, J. 2006. Communities Research at the Alaska Fisheries Science Center. Pp. 31-36 in *Managing Fisheries Empowering Communities Conference Proceedings,* Alaska Sea Grant, Anchorage.

This paper describes the Alaska Fisheries Science Center's large-scale approach to conducting social science research on fishing communities. It discusses details of compiling large amounts of pre-existing quantitative data on involvement in fisheries by community, using indicators to assess the relative importance of participation of communities in fisheries. Data have been compiled for fishing communities in Alaska, Washington, Oregon, California, and other US States that participate in North Pacific Fisheries. The paper also describes using key data to select communities for narrative profiling, 136 in Alaska, 129 in other states. It gives the outline of the narrative profiles and describes the process followed for obtaining community feedback. The paper ends with a discussion of the benefits and drawbacks of using such a large-scale approach to study fishing communities, concluding that despite acknowledged limitations, the method is very useful. It provides a consolidated source of information to policy makers, analysts, and community members, attends to a wide range of communities, including many that have never before been explicitly mentioned in fisheries impact analysis, creates a uniform approach to fisheries participation assessment that allows for comparisons between fishing communities and eventually (when other NMFS regions complete their profiles) will allow for comparisons of fisheries participation between regions.

Seung, C. and E. Waters. 2006. "A Review of Regional Economic Models for Fisheries Management in the U.S." *Marine Resource Economics* 21(1): 101-124.

In 1986 Andrews and Rossi reviewed input-output (IO) studies of U.S. fisheries. Since then many more fisheries studies have appeared using IO and other types of regional economic models, such as Fishery Economic Assessment Models, Social Accounting Matrices, and Computable General Equilibrium models. However no updated summary of these studies or models has appeared since 1986. This paper attempts to fill this gap by briefly reviewing the types of regional economic models that have been applied to fisheries; reviewing studies using these models that have been conducted for U.S. fisheries; and identifying data and modeling issues associated with regional economic analysis of fisheries in the U.S. The authors conclude that although economic impact analysis of fisheries policy is required under federal law, development of more representative regional economic models for this purpose is not likely to be forthcoming without increased information obtained through some type of comprehensive data collection program.

Seung, Chang and Edward Waters. 2006. "The Role of the Alaska Seafood Industry: A Social Accounting Matrix (SAM) Model Approach to Economic Base Analysis." *The Annals of Regional Science* 40(2): 335-360.

A social accounting matrix (SAM) model for Alaska is constructed to investigate the role of the state's seafood processing industry. The SAM model enables incorporation of the unique features of Alaska economy such as (i) the existence of a large nontraditional economic base, (ii) a large leakage of labor income, and (iii) a very large share of intermediate inputs imported from outside the state. The role of an industry in an economy with these features can not be examined correctly within an input-output framework, which is the method most often used for examining the importance of an industry to a region. Taking an export base view of the economy, we found seafood processing to be an important industry, generating 4.5% of the state's total employment. While an important driver of the state's economy, the industry has the smallest SAM multiplier mainly due to a large leakage of labor earnings and a large share of imported intermediate inputs. We also found that non-traditional economic base components such as (i) federal transfers to state and local governments, and (ii) federal transfers, permanent fund dividend (PFD) payments, and other extra-regional income received by households generate about 26 % of the state's total employment and earnings.

Spies, T.A., K.N. Johnson, K.M. Burnett, J.L. Ohmann, B.C. Mccomb, G.H. Reeves, P. Bettinger, J.D. Kline, **B. Garber-Yonts.** 2006. "Cumulative Ecological and Socio-Economic Effects of Forest Policies in Coastal Oregon." *Ecological Applications* 17(1): 5-17.

Forest biodiversity policies in multi-ownership landscapes are typically developed in an uncoordinated fashion with little consideration of their interactions or possible unintended cumulative effects. We conducted an assessment of some of the ecological and socio-economic effects of recently-enacted forest management policies in the 2.5-million-ha Coast Range Physiographic Province of Oregon. This mountainous area of conifer and hardwood forests includes a mosaic of landowners with a wide range of goals, from wilderness protection to high-yield timber production. We projected forest changes over 100 years in response to logging and development using models that integrate land use change and forest stand and landscape processes. We then assessed responses to those management activities using GIS models of stand structure and composition, landscape structure, habitat models for focal terrestrial and aquatic species, timber production, employment, and willingness to pay for biodiversity protection. Many of the potential outcomes of recently enacted policies are consistent with intended goals. For example, we project the area of structurally diverse older conifer forest and habitat for late successional wildlife species to strongly increase. Other outcomes might not be consistent with current policies-- for example, hardwoods and vegetation diversity strongly decline within and across owners. Some elements of biodiversity, including streams with high potential habitat for coho salmon (*Oncorhynchus kisutch*) and sites of potential oak woodland, occur predominately outside federal lands and thus were not affected by the strongest biodiversity policies. Except for federal lands, biodiversity policies were not generally characterized in sufficient detail to provide clear benchmarks against which to measure the progress or success. We conclude that land management institutions and policies are not well configured to deal effectively with ecological issues that span broad spatial and temporal scales and that alternative policies could be constructed that more effectively provide for a mix of forest values from this region.

2005:

Carothers, C. and **Sepez, J**. 2005. “Commercial Fishing Crew Demographics and Trends in the North Pacific: 1993-2003.” Pp. 37-40 in *Managing Fisheries Empowering Communities Conference Proceedings*, Alaska Sea Grant, Anchorage.

This report examines demographic change in Bering Sea and Aleutian Island (BSAI) fishing communities since 1920. We undertook this research in an attempt to begin introducing human population dynamics as an indicator for regional ecosystem analyses. We focus here on human inhabitants of the Bering Sea coast, using total population by community and by Census area as the primary indicator, with some analysis of other population characteristics such as ethnicity. This approach is concordant with research on arctic communities that uses crude population growth or loss as a general measure to determine community viability, as this indicator is easy to understand, locally meaningful, and points to the capacity of people in these places to “dwell and prosper for some period, finding sources of income and meaningful lives” (Aarsaether et al. 2004). An understanding of recent and historic demographic data in the region is a preliminary step to developing models that will attempt to predict demographic effects of changes in fish populations, fisheries management, industry conditions and markets, and climate characteristics. This research project examined birth rates, migration, indigeneity, boom-bust economic cycles, and seasonality as factors in understanding population trends in the region. This report discusses community selection methodology and challenges, describes and analyzes the causes of demographic trends in BSAI fishing communities since 1920, points to the impacts of population decline or growth on local communities, and finally, suggests opportunities for including demographic indicators in future research on fisheries science and policy.

Garber-Yonts, B.E. 2005. "Conceptualizing and Measuring Demand for Recreation on National Forests: a Review and Synthesis." U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-645.40.

This analysis examines the problem of measuring demand for recreation on national forests and other public lands. Current measures of recreation demand in Forest Service resource assessments and planning emphasize population-level participation rates and activity-based economic values for visitor days. Alternative measures and definitions of recreation demand are presented, including formal economic demand and multi-attribute preferences. Recreation assessments from national-level Renewable Resources Planning Act Assessments to site-level demand studies are reviewed to identify methods used for demand analysis at different spatial scales. A finding throughout the multiple scales of analysis, with the exception of site-level studies, is that demand measures are not integrated with supply measures. Supply analyses, in the context of resource assessments, have taken the form of mapped spatial inventories of recreation resources on the national forests, based on the classification of recreational settings according to the opportunities they produce (e.g., the Recreation Opportunity Spectrum). As such, integration of demand analysis with these measures of supply requires measuring the demand for recreational settings. To support management and planning decisions, recreation demand analysis must also permit projection of changes in visitation at multiple scales as changes in management and policy alter recreational settings, and as the demographics and behavior of the user base changes through time. Although this is currently being done through many formal economic studies of site demand, methods are needed that scale up to higher levels of spatial aggregation. Several areas for research, development and application of improved methods for demand analysis are identified, and improved methods for spatially explicit models of recreation visitation and demand are identified as a priority area for research.

Haynie, A.C. 2005. "The Expected Profit Model: A New Method to Measure the Welfare Impacts of Marine Protected Areas," Ph.D. dissertation, University of Washington.

This dissertation develops, tests, and applies a new type of discrete/continuous model, the expected profit model (EPM), that allows one to make ex-ante welfare estimates of area closures such as marine protected areas, even when the only information that we have about costs is travel distance. Traditionally, the literature has predicted fisher location choice in a two-stage process. In the first stage the average revenue is calculated, and in the second stage average revenue is a predictor of location choice. Here expected catch is endogenously estimated simultaneously with location choice, which, among other benefits, enables one to observe how actors trade off revenue and travel costs. A series of Monte Carlo experiments are conducted to test the efficacy of the EPM and results indicate that the EPM shows a slight increase in performance over the standard approach. Using the EPM the welfare impacts of an emergency closure of the Steller Sea Lion Conservation area (SCA) are assessed using summer, 2000, data on the Bering Sea pollock catcher vessel fishery. A series of EPM models which incorporate the impact of vessel characteristics and functional forms are considered in the welfare calculations.

Larson, D.M. and **D.K. Lew**. 2005. "Measuring the Utility of Ancillary Travel: Results from a Study of Recreation Demand." *Transportation Research Part A* 39(2-3): 237-255.

The issues involved in determining economic values of travel as a component of away-from-home trips are discussed. Four distinct concepts are relevant and useful depending on circumstances: marginal and total values of travel, and gross versus net values. A utility-theoretic inverse demand systems approach is implemented to estimate the separate demands for recreation trips and time onsite at the destination, and implemented using data on pink salmon fishing in Alaska. The distance function underlying the demand system is used to determine the net values of travel ancillary to fishing. Some 64% of fishermen had positive net values of travel, and the value of travel per hour traveled averaged $1.64/hour with a median of $3.18/hour.

Lazrus, H. and **Sepez, J**., 2005. "The NOAA Fisheries Alaska Native Traditional Knowledge Database," *Practicing Anthropology* 27(1): 33-37.

Applications of the Alaska Native Traditional Environmental Knowledge Database were critically examined by Lazrus and Sepez based on interviews with intended users at the AFSC and elsewhere. Comprised of information from pre-existing sources in the literature, the database was a partial response to public comments about the lack of TEK in the Draft Groundfish Programmatic Supplemental Environmental Impact Statement (PSEIS). Lazrus and Sepez review ways in which authors of the revised PSEIS found the database helpful and the challenges they faced using the information. Lazrus and Sepez discuss several issues surrounding how TEK is compiled and cited in agency documents. Because it is passed from one generation to another, TEK can lend a great deal of place-specific temporal depth to scientific investigations that may only have data for a short period of time. Such temporal depth lends historical perspective to environmental phenomena and can facilitate the construction of baselines or indicate rates of change. It can also point to issues that may not have been considered by the agency. However, TEK offers very localized information that does not always correspond to the geographic scope of regional agency interests. Additionally, the Alaska Native Traditional Environmental Knowledge Database does not offer users an easy way to assess the authority of the information source, so it may be difficult to judge the validity of a claim. The article discusses the ways in which TEK and scientific investigation have different paradigms that entail different ways of observing and drawing conclusions about how the world works. This disparity may at times complicate applying information from both paradigms to a single issue. On the other hand, this may also lead to a more multidimensional examination of an issue and a more robust analysis. Of course, ethical issues arise when expert information is taken from a community without addressing issues of compensation and co-management of resources. Lazrus and Sepez also discuss the problem of treating TEK as a series of facts or observations that can be extracted from cultural context. Without the context in which they are developed and understood, fragments of information may be misinterpreted or misapplied. Despite the challenges, NOAA scientists were generally very interested in understanding and incorporating TEK in agency efforts to analyze and manage North Pacific marine resources.

Lew, D.K. and D.M. Larson. 2005. "Accounting for Stochastic Shadow Values of Time in Discrete-Choice Recreation Demand Models." *Journal of Environmental Economics and Management* 50(2): 341-361.

In this paper, a discrete-choice recreation demand model that explicitly accounts for a stochastic shadow value of time function is proposed. Using data from a survey of San Diego beach users, the stochastic shadow value of time, labor supply, and beach choice are jointly estimated. Results from this joint estimation approach are compared with the familiar two-step approach that estimates labor supply first and uses predicted values of time in the recreational site choice model. The approaches produce markedly different welfare measures, with the two-step model, which does not account for unobserved variability of time values, predicting significantly higher values. A Monte Carlo simulation illustrates how ignoring the stochastic nature of shadow value of time in discrete-choice recreation demand models can bias model parameters, and hence, welfare estimates.

Lew, D.K. and D.M. Larson. 2005. "Valuing Recreation and Amenities at San Diego County Beaches." *Coastal Management* 33(1): 71-86.

Policymakers and analysts concerned with coastal issues often need economic value information to evaluate policies that affect beach recreation. This paper presents economic values associated with beach recreation in San Diego County generated from a recreation demand model that explains a beach user's choice of which beach to visit. These include estimates of the economic values of a beach day, beach closures, and beach amenities.

Sepez, J. 2005. "Introduction to Traditional Environmental Knowledge in Federal Natural Resource Management Agencies," *Practicing Anthropology* 27(1): 2-5.

This introduction summarizes the articles and issues in the special theme issue on traditional environmental knowledge in Federal natural resource management agencies (see issue abstract).

Sepez, J. and Lazrus, H. 2005. "Traditional Environmental Knowledge in Federal Natural Resource Management Agencies." *Practicing Anthropology* 27(1): 1-48.

"Traditional Environmental Knowledge (TEK) in Federal Natural Resource Management Agencies" is the theme of this special issue of the journal Practicing Anthropology. The issue features articles from NOAA/NMFS contributors, as well as articles by (or about) other federal agencies, including the Bureau of Land Management, Environmental Protection Agency (EPA), National Park Service, and the U.S. Fish and Wildlife Service. The issue includes two important articles by NMFS authors. Lazrus and Sepez critically examine the application of the Alaska Native Traditional Environmental Knowledge Database developed at the Alaska Fisheries Science Center. They conclude that agency scientists are interested in using traditional environmental knowledge in their work, but that both practical and theoretical issues present serious challenges to meaningful incorporation (see article abstract). The issue also includes an article by Jennifer Isé and Susan Abbott-Jamieson of NMFS describing the Local Fisheries Knowledge Pilot Project http://www.st.nmfs.noaa.gov/lfkproject/, which takes place in two lobstering communities in Maine, and may be expanding to Alaska in the coming years. The project involves high school students in collecting cultural, environmental, and historical knowledge from local fishing families. Other articles in the issue discuss understanding Huna Tlingit traditional harvest management techniques for gull eggs in Glacier Bay National Park, incorporating Swinomish cultural values into wetland valuations, integrating TEK into subsistence fisheries management in Alaska, considering traditional tribal lifeways in EPA decision making, conserving wild medicinal plants that have commercial value, and including TEK in planning processes for the National Petroleum Reserve. The compilation concludes with a cautionary commentary from Preston Hardison of the Indigenous Biodiversity Information Network about international protocols, government-to-government relationships, rules of disclosure for tribal proprietary information, and the spiritual contexts of knowledge production and knowledge sharing. The issue is an important source of information on TEK program possibilities and lessons learned for federal resource scientists and managers interested in incorporating traditional environmental knowledge into their work.

Sepez, J., K. Norman, A. Poole, and B. Tilt. 2005. "Fish Scales: Scale and Method in Social Science Research for North Pacific and West Coast Fishing Communities." *Human Organization* 65(3): 280-293.

Driven by the requirements of the Magnuson-Stevens Fishery Conservation and Management Act and the demand among stakeholders for social science to inform fisheries policy, the need for NMFS to conduct social science research is widely accepted. But how such research should be carried out is not at all well established. This article describes the development of a research program at NMFS--led by anthropologists--designed to understand the interaction between fisheries and communities in the North Pacific and West Coast regions. Specific conceptual and methodological challenges are discussed, including the vast number of communities involved in fishing in these regions, limited government resources, competing definitions of what constitutes a community, and the need for indicators which are comparable across communities and regions. The research program described here takes a multi-method, multi-scale approach, combining social indicators research with ethnographic fieldwork and Rapid Assessment Procedures (RAP). We argue that such an approach is necessary to understand the social and economic aspects of fishery management. As fishery managers and policy makers increasingly recognize that humans play an important role in natural resource issues, the experiences of this research program will influence the course of social science research at NMFS in the years to come.

Sepez, J. A., B. Tilt, C. Package, H. Lazarus, and I. Vaccaro. 2005. Community Profiles for North Pacific Fisheries - Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-160, 552 p.

This document profiles 136 fishing communities in Alaska 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 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 Alaska. The profiles are given in a narrative format that includes three sections: People and Place, Infrastructure, 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. Community Infrastructure covers current economic activity, governance (including city classification, taxation, Native organizations, and proximity to fisheries management and immigration offices) and facilities (transportation options and connectivity, water, waste, electricity, schools, police, and public accommodations). Involvement in North Pacific Fisheries details 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, grouping communities only when constrained by fisheries data, yielding 128 individual profiles. Regional characteristics and issues are briefly described in regional introductions. The communities were selected by a process which assessed involvement in commercial fisheries using quantitative data from the year 2000, in order to coordinate with 2000 Census data. The quantitative indicators looked at communities that have commercial fisheries landings (indicators: landings, number of processors, number of vessels delivering to a community), communities that are the registered homeports of vessels participating in the fisheries, and communities that are home to documented participants in the fisheries (indicators: crew license holders, state and federal permit holders, and vessel owners). Where appropriate, the indicators were assessed as a ratio to the community's population. Selection of a community was triggered by its surpassing a certain threshold in any one of the indicator categories, or in an aggregated category made up of the individual indicators. The Alaska communities selected and profiled in this document are: Adak, Akhiok, Akiachak, Akutan, Aleknagik, Alitak Bay, Anchor Point, Anchorage/Chugiak/Eagle River/Girdwood, Angoon, Atka, Bethel, Chefornak, Chignik (Bay), Chignik Lagoon, Chignik Lake, Clam Gulch, Clark's Point, Cordova, Craig, Dillingham, Edna Bay, Eek, Egegik, Ekuk, Ekwok, Elfin Cove, Elim, Emmonak, Excursion Inlet, Fairbanks, False Pass, Fritz Creek, Galena, Goodnews Bay, Gustavus, Haines, Halibut Cove, Hobart Bay, Homer, Hoonah, Hooper Bay, Hydaburg, Igiugig, Iliamna, Ivanof Bay, Juneau/Douglas/Auke Bay, Kake, Karluk, Kasilof, Kenai, Ketchikan/Ward Cove, King Cove, King Salmon, Kipnuk, Klawock, Kodiak, Kokhanok, Koliganek, Kongiganak, Kotlik, Kwillingok, Larsen Bay, Levelock, Manokotak, Marshall, Mekoryuk, Metlakatla, Meyers Chuck, Naknek, Napakiak, Nelson Lagoon, New Stuyahok, Newhalen, Newtok, Nightmute, Nikiski, Nikolaevsk, Ninilchik, Nome, Old Harbor, Ouzinkie, Palmer, Pedro Bay, Pelican, Perryville, Petersburg, Pilot Point, Pilot Station, Platinum, Point Baker, Port Alexander, Port Alsworth, Port Graham, Port Heiden, Port Lions, Port Moller, Port Protection, Portage Creek, Prudhoe Bay, Quinhagak, Saint George, Saint Mary's, Saint Paul, Sand Point, Scammon Bay, Seldovia, Seward, Shaktoolik, Sitka, Skwentna, Soldotna, South Naknek, Sterling, Tenakee Springs, Thorne Bay, Togiak, Toksook Bay, Tuntutuliak, Tununak, Twin Hills, Ugashik, Unalakleet, Unalaska/Dutch Harbor, Valdez, Wasilla, Whale Pass, Whittier, Willow, Wrangell, and Yakutat.

Seung, C. and E. Waters. 2005. "A Review of Regional Economic Models for Alaska fisheries." *Alaska Fisheries Science Center Processed Rep. 2005-01*.

There are many regional economic models in the literature, and a limited number have been used to investigate the impacts of fishery management policies on communities. However, there is no formal study in the literature that provides a thorough, comparative evaluation of the regional economic models that have been, or can be, used for regional impact analysis for fisheries. In Part I, we describe the Alaska seafood industry, discuss the importance of the industry to the state economy, and indicate the importance of regional economic analysis for the Alaska seafood industry. Next a theoretical overview of regional economic models is provided. Specifically, we discuss major features of each type of regional economic model – economic base model (EB), input-output model (IO), social accounting matrix model (SAM), supplied-determined model, and computable general equilibrium model (CGE). Finally, a comparative discussion of these models is also provided. While Part I focuses on a theoretical review of regional economic models, Part II discusses applications of those regional economic models to fisheries. These include input-output (IO) models, which have been used in many previous studies of regional economic impacts for fisheries, the Fisheries Economic Assessment Model (FEAM), which has been one of the major analytical tools used to examine the impacts of fisheries on the West Coast and in Alaska, and the first regional computable general equilibrium (CGE) model used for fisheries in a U.S. region. In addition, some issues related to specifying such models for Alaska fisheries, data needs and availability for modeling regional economic impacts for Alaska fisheries, and perspectives on regional economic modeling for Alaska fisheries are discussed.

2004:

Dalton, M. and S. Ralston. 2004. "The California Rockfish Conservation Area and Groundfish Trawlers at Moss Landing Harbor." *Marine Resource Economics* 18: 67-83.

This article uses a bioeconomic model and data for groundfish trawlers at Moss Landing Harbor in Central California to analyze effects of spatial closures that were implemented recently by West Coast fishery managers to reduce bycatch of overfished groundfish stocks. The model has a dynamic linear rational expectations structure, and estimates of its parameters exhibit spatial variation in microeconomic and ecological factors that affect decisions about where and when to fish. Test results show that variation in marginal costs of crowding externalities and biological rates of stock productivity are the most significant factors to consider in the spatial management of groundfish trawlers at Moss Landing.

Felthoven, R.G. 2004. "Methods for Estimating Fishing Capacity with Routinely Collected Data: A Comparison." *Review of International Fisheries Law and Policy* 1(2): 125-137.

In the past three years, the National Marine Fisheries Service (NMFS) has assembled both an internal task force and an external expert panel to suggest methods for computing fishing capacity in U.S. fisheries. The primary difficulty in choosing a suggested methodology has been the lack of economic data required for many of the capacity models developed in the economic literature. In most U.S. fisheries, the available data are limited to catch records, vessel numbers and characteristics, and some indicators of fishing effort, necessitating the use of "primal" models, and measures of "technical" fishing capacity. This paper describes two of the suggested frontier methods for measuring capacity: data envelopment analysis (DEA) and the stochastic production frontier (SPF). We discuss how to implement these models, and various notions of "capacity" that can be computed, depending on the assumptions made regarding potential increases in effort.

Felthoven, R.G., T. Hiatt, and J.M. Terry. 2004. "Measuring Fishing Capacity and Utilization with Commonly Available Data: An Application to Alaskan Fisheries." *Marine Fisheries Review* 64(4): 29-39.

Due to a lack of data on vessel costs, earnings, and input use, many of the capacity assessment models developed in the economics literature cannot be applied in U.S. fisheries. This incongruity between available data and model requirements underscores the need for developing applicable methodologies. This paper presents a means of assessing fishing capacity and utilization (for both vessels and fish stocks) with commonly available data, while avoiding some of the shortcomings associated with competing "frontier" approaches (such as data envelopment analysis).

Felthoven, R.G. and C.J. Morrison Paul. 2004. "Directions for Productivity Measurement in Fisheries." *Marine Policy* 28: 161-169.

Fisheries policy is often aimed at sustaining and improving economic performance, but the use of traditional productivity measurement to assess performance over time has been quite limited. In this paper we review the currently sparse literature on productivity in fisheries, and suggest ways to better account for many of the relevant issues unique to the industry. Specifically, we discuss the need to incorporate bycatch levels, to better account for environmental and stock fluctuations, and to relax some of the restrictive economic assumptions that have been imposed in the research to date. A methodological framework that may be used to incorporate these factors is proposed.

Felthoven, R.G. and C.J. Morrison Paul. 2004. "Multi-Output, Non-Frontier Primal Measures of Capacity and Capacity Utilization." *American Journal of Agricultural Economics* 86(3): 615-629.

This paper offers and implements an econometric approach for generating primal capacity output and utilization measures for fisheries. In situations where regulatory, environmental, and resource conditions affect catch levels but are not independently identified in the data, frontier-based capacity models may interpret such impacts as production inefficiency. However, if such inefficiencies are unlikely to be eliminated, the implied potential output increases may be unrealistic. We develop a multi-output, multi-input stochastic transformation function framework that permits various assumptions about how output composition may change when operating at full capacity. We apply our model to catcher-processor vessels in the Alaskan pollock fishery.

Garber-Yonts, B.**E**. 2004. "The Economics of Amenities and Migration in the Pacific Northwest: Review of Selected Literature with Implications for National Forest Management." U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-617. 48 p.

This paper reviews literature on the influence of non-market amenity resources on population migration. Literature reviewed includes migration and demographic studies; urban and regional economics studies of amenities in labor markets, retirement migration, and firm location decisions; non-market valuation studies using hedonic price analysis of amenity resource values; land use change studies; and studies of the economic development influence of forest preservation. A synthesis of the literature finds that the influence of amenities is consistently shown to be a positive factor contributing to population growth in urban and rural areas characterized by proximity to public forest lands. Beyond this broad finding, however, little research has been conducted at an appropriate scale to be directly useful in forest management and planning decisions. Areas for further research are identified.

Garber-Yonts, B.E., J. Kerkvliet, R. Johnson. 2004. "Public Values for Biodiversity Conservation Policies in the Oregon Coast Range." *Forest Science* 50(5): 589-602.

This study uses a choice experiment framework to estimate Oregonians' willingness to pay (WTP) for changes in levels of biodiversity protection under different conservation programs in the Oregon Coast Range. We present biodiversity policy as an amalgam of four different conservation programs: salmon and aquatic habitat conservation, forest age-class management, endangered species protection, and large-scale conservation reserves. The results indicate substantial support for biodiversity protection, but significant differences in WTP across programs. Oregonians indicate the highest WTP for increasing the amount of forest devoted to achieving old-growth characteristics. On average, respondents indicate an annual household WTP of $380 to increase old-growth forests from 5% to 35% of the age-class distribution. Conversely, WTP for increasing conservation reserves peaks at $45 annually to double the current level to 20% of the landscape, whereas WTP is negative for any increase over 32%. We also find resistance to any change in conservation policy, which substantially offsets WTP for increases in all four conservation programs.

Kline J.D., R.J. Alig, **B. Garber-Yonts**. 2004. “Forestland Social Values and Open Space Preservation.” *Journal of Forestry* 102(8): 39-45.

Concerns have grown about the loss of forestland to development, leading to both public and private efforts to preserve forestland as open space. These lands comprise social values-ecological, scenic, recreation, and resource protection values-not typically reflected in market prices for land. When these values are present, it is up to public and private agencies to provide them in sufficient quantity. We discuss non-market social values in the context of forestland market values, to explain the economic rationale for public and private efforts to protect forestland as open space.

Package, C. **and Sepez, J**. 2004. “Fishing Communities of the North Pacific: Social Science Research at the Alaska Fisheries Science Center.” *AFSC Quarterly Report* April-May-June 2004, available online at http://www.afsc.noaa.gov/Quarterly/amj2004/amj04featurelead.htm

NOAA Fisheries is involved in a nationwide effort to profile fishing communities for the purpose of expanding baseline knowledge of people who may be affected by changes in fishery regulations. In 2003 a team of graduate students at the Alaska Fisheries Science Center (AFSC) completed draft short-form profiles for 130 communities located in the state of Alaska. These profiles have been compiled in the upcoming publication Fishing Communities of the North Pacific, Volume I: Alaska. Longer profiles based on in-depth research also are being developed at the AFSC for a more select group of Alaska fishing communities. In mid-2004, the AFSC team joined with a team from the Northwest Fisheries Science Center to begin developing short-form profiles for West Coast communities, many of which are very involved in Alaska fisheries.

2003:

Sepez, J. 2003. "Makah." In *Dictionary of American History, 3rd Edition.* Charles Scribner's Sons, New York.

This dictionary article briefly describes the history of the Makah Indian Tribe of northwest Washington State, including population history, early contact with European explorers, cultural and subsistence patterns, the excavation of the Ozette archaeological site, and the modern resumption of subsistence whaling.

Vaccaro, I. and **Sepez, J**. 2003. "Understanding Fishing Communities: Three Faces of North Pacific Fisheries," pp. 220-221 in Witherall, D. (Ed.) *Managing Our Nation's Fisheries: Past, Present, and Future*. Proceedings of a Conference on Fisheries Management in the United States Held in Washington, DC.

Understanding and managing the impacts of fisheries means understanding fishing, and fishing communities, as much as understanding fish. Fishing communities are human settlements with a substantial level of dependence on or engagement in extraction of living marine resources. In the North Pacific, these communities are shaped by the interaction of productive and consumptive practices, resource availability, markets, and regulatory policies. The protection of these communities and their way of life depends on a careful appraisal of multi-faceted relationships with marine resources. At the Alaska Fisheries Science Center, this means developing techniques for social analyses that recognize how fishing is articulated around three different types of activities: commercial, subsistence, and recreational. Public policy and science have often considered fisheries management to be almost exclusively concerned with commercial fishing. This perspective is understandable if we consider that commercial fishing accounts for 95% of the catch in Alaska, while subsistence accounts for just 4% and recreational 1%. The implications of this distribution for concerns such as biomass, ecological dynamics, and production of wealth are unambiguous. However, in the terrain of the social landscape, the much smaller catch percentages of subsistence and recreational fishing do not necessarily translate into insignificant social impacts. For example, in some communities, 100% of local households are participating in subsistence fishing, while only a small portion of residents are connected to the commercial fishing industry. In fact, leakage of wealth produced by the commercial fishing industry – through both imported labor forces and externalized corporate functions – is a significant factor attenuating the local impact of the commercial sector. Our analysis of the fishing communities of Alaska, their social context and the productive implications of marine natural resources, indicates that an approach which prioritizes commercial fishing to the exclusion of these other sectors is insufficient, and potentially misleading as to the social dynamics of both the complementary and conflicting interests which make up human communities. Subsistence and recreational fishing are fundamental parts of the social structure, and also the economy of many Alaskan communities, often supplying different segments of the population than commercial fisheries. At the Alaska Fisheries Science Center, anthropologists in the Economics and Social Sciences Research Program are involved in compiling profiles of North Pacific Fishing Communities. For communities located in Alaska, we have endeavored to describe and analyze the triadic relationship between commercial, subsistence and recreational fishing sectors. This is accomplished by characterizing the participation by community members in each type of fishery, and where possible, indicating the kinds of interrelationships that make the triad a dynamic and evolving social framework: competition for fisheries allocation; economic diversification of rural communities; joint production efficiencies; seasonal complementarities and conflicts; ethnicity and immigration issues; and local responses to the forces of globalization. Fisheries management or public policy impact assessment that does not take into account this multiple and complex nature of the relation between fishing communities and marine resources may create substantial unintended impacts on the very same communities they are intending to protect.

2002:

Felthoven, R.G. 2002. "Effects of the American Fisheries Act on Capacity, Utilization and Technical Efficiency." *Marine Resource Economics* 17(3): 181-205.

The American Fisheries Act (AFA) of 1998 significantly altered the Bering Sea and Aleutian Islands pollock fishery by allowing the formation of harvesting and processing cooperatives and defining exclusive fishing rights. This paper uses data envelopment analysis and stochastic production frontier models to examine effects of the AFA on the fishing capacity, technical harvesting efficiency (TE), and capacity utilization (CU) of pollock catcher-processors. Results from multi-input, multi-output models indicate that fishing capacity fell by more than 30% and that harvesting TE and CU measures increased relative to past years. This work provides examples of how existing data, which is currently devoid of operator costs and provides only general indicators of earnings, may be used to analyze changes in elements of fleet and vessel performance in response to management actions.

Harris, T., **C. Seung**, T. Darden, and W. Riggs. 2002. "Rangeland Fires in Northern Nevada: An Application of Computable General Equilibrium Modeling." *Western Economics Forum* 1(2): 3-10.

A dynamic computable general equilibrium model of a five county Northern Nevada economy is used to estimate the business losses and recovery efforts of a 1.6 million acre rangeland fire. In comparison to input-output or social accounting models, the dynamic computable general equilibrium model incorporates the roles of markets and prices in the estimation of this natural catastrophe. Results indicate that fire suppression and rehabilitation expenditures were not enough to offset the losses in public land grazing activities.

Morrison Paul, C.J., V. Ball, **R. Felthoven**, A. Grube, and R. Nehring. 2002. "Effective Costs and Chemicals Use in US Agricultural Production: Benefits of Using the Environment as a "Free Input." *American Journal of Agricultural Economics* 84(4): 897-901.

A cost-function-based production model is used to represent patterns of input use and output production in U.S. agriculture, and the implied costs of induced reductions in risk from agricultural chemicals (“bad outputs”). We estimate and evaluate shadow values for these harmful outputs, and the implied input- and output-specific substitution patterns, with a focus on the impacts on pesticide demand and its quality and quantity components. Using state-level data we find these measures to be statistically significant, vary substantively by region, and imply increased demand for effective pesticides associated with improvements in quality from embodied technology.

Sepez, J. 2002. "Treaty Rights and the Right to Culture: Native American Subsistence Issues in US Law." *Cultural Dynamics* 14(2): 143-159.

The interplay of treaty rights with the right to culture has produced a variety of results for Native American subsistence hunting and fishing rights in the United States. Where allocation and conservation measures fail to account for cultural considerations, conflict ensues. This paper discusses three examples: waterfowl hunting in Alaska, Northwest salmon fishing, and Inuit and Makah whaling. Each demonstrates that treaty rights are a more powerful force than cultural rights in the law, but that both play important roles in actual policy outcomes. A more detailed examination of whaling indicates how the insertion of needs-based criteria into a framework of cultural rights shifts the benefit of presumption away from indigenous groups. The cultural revival issues and conflicting paradigms involved in Makah whaling policy debates indicate how notions of tradition, authenticity, and self-determination complicate the process of producing resource policies that recognize cultural diversity.