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, 2007

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 analyses for the most commercially valuable species (to be published in the final version of this report), 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 their recent publications.

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 Alaska groundfish fisheries, vessel activity, and employment on at-sea processors. Generally, the data presented in this report cover the years 2003 through 2007 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 analyses for pollock, Pacific cod, sablefish, and flatfish first published here in last year's report. These analyses discuss the current state of the markets for these species in terms of pricing, volume, supply, and demand. We discuss trade patterns, market share, and provide forecasts of future prices.

We also provide project descriptions and updates for ongoing 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 2.0 million metric tons (t), a retained catch of 1.9 million t, and an ex-vessel value of $792 million in 2007, it accounted for 49% of the weight and 19% of the ex-vessel value of total U.S. domestic landings as reported in Fisheries of the United States, 2007. The value of the 2007 catch after primary processing was just over $2.0 billion (F.O.B. Alaska).

All but a small part of the commercial groundfish catch off Alaska occurs in the groundfish fisheries managed under the Fishery Management Plans (FMP) for the Gulf of Alaska (GOA) and the Bering Sea/Aleutian Islands area (BSAI) groundfish fisheries. In 2007, other fisheries accounted for only about 12,000 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 federal TACs or if they also include other Alaska groundfish fisheries.

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. However, the use of the race for fish as a principal mechanism for allocating a majority 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 a market-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. However, it is unclear at this time how such benefits will be distributed; as with most management measures, there may be winners and losers.

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 the National Marine Fisheries Service (NMFS) to monitor groundfish and PSC quotas in those years. Catch data for 2003-07 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. 2007) 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 to this report is a set of market analyses for pollock, Pacific cod, sablefish, and flatfish (yellowfin and rock sole, and arrowtooth flounder). The goal of these analyses is to discuss and, where possible, explain the market fundamentals underlying observed changes in pricing, volume, supply, and demand for each of these groundfish species.

Specifically, the market reports provide information on the trends in ex-vessel prices of a given species, as well as the pricing and product choices for first-wholesale production. For example, some groundfish caught off of 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 AK product may be growing or declining).

One fact that became evident when conducting these analyses is that the type of information available for explaining the historical trends in a market and the likely outlook for the coming year (such as how might prices change, and whether changes will be driven by supply or demand) 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.

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, 2007

The commercial groundfish catch off Alaska totaled 2.0 million t in 2007, down slightly from the 2006 catch (Fig. 1 and Table 1). The real ex-vessel value of the catch, including the imputed value of fish caught almost exclusively by catcher/processors, decreased from $830 million in 2006 to $792 million in 2007 (Fig. 3 and Table 16). The gross value of the 2007 catch after primary processing was approximately $2.0 billion (F.O.B. Alaska) (Table 25). The groundfish fisheries accounted for the largest share (51%) of the ex-vessel value of all commercial fisheries off Alaska in 2007 (Fig. 4, Tables 16 and 17), while the Pacific salmon (*Oncorhynchus spp*.) fishery was second with $348 million or 22% of the total Alaska ex-vessel value. The value of the Pacific halibut (*Hippoglossus stenolepis*) catch amounted to $217 million or 14% of the total for Alaska, and exceeded the ex-vessel value of the shellfish fishery by about $37 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 2007 pollock catch of 1.41 million t accounted for 69% of the total groundfish catch of 2.0 million t (Table 1). The pollock catch decreased by almost 10% from 2006. For the first time since 1997, the 2007 catch of flatfish, which includes yellowfin sole (*Pleuronectes asper*), rock sole (*Pleuronectes bilineatus*), and arrowtooth flounder (*Atheresthes stomias*), exceeded the catch of Pacific cod (*Gadus macrocephalus*); the total flatfish catch was 255,800 t or 13% of the total 2007 groundfish catch, an increase of about 10.5% from 2006. The Pacific cod catch in 2007 accounted for 225,000 t or 11.0% of the total 2007 groundfish catch, down about 6.3% from a year earlier. Pollock, Pacific cod, and flatfish comprised just over 92% of the total 2007 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 7.4%. 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 2007, 41.8% (89,000 t) was taken by trawls, 43.7% (93,000 t) by hook-and-line gear, and 14.5% (31,000 t) by pots. In each of

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

the years since 2003, catcher vessels took 45-47% 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). 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, 96% of the 2007 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 2003-07. 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 increased slightly from 6.7% in 2003 to 7.0% in 2004, decreased to 5.2% in 2005, increased slightly to 5.3% in 2006, and then increased again in 2007 to 6.0%. The overall discard rate in 2003 represents a 54% reduction from the 1997 rate of 14.5% (not shown in Table 6), a result of prohibiting pollock and Pacific cod discards in all BSAI and GOA groundfish fisheries beginning in 1998. Total discards decreased by about 59% from 1997 to 2003 due to the reduction in the discard rate, while the total catch decreased by about 1%. 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 2007, the overall discard rates were 11.9% and 5.4%, respectively, for the GOA and the BSAI compared to 16.2% and 14.3% in 1997.

Although the fixed gear fisheries accounted for a small part of both total catch or total discards, in 1998 and later years, the overall discard *rates* were substantially higher for fixed gear (10.8% in 2007) than for trawl gear (5.6% in 2007). 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 2007 discard rates were 11.4% and 5.0% for fixed and trawl gear, respectively. In the GOA, however, the corresponding discard rates were 9.1% and 12.8%. 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, crab, Pacific salmon, 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 2004-07 are summarized by area and gear in Table 11. More detailed estimates of prohibited species bycatch and of bycatch rates for 2006 and 2007 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 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 is more than 10 times the average annual bycatch for the years 1994-2006, but at the time of this publication, it is not clear whether this increase is real. The NMFS Alaska Regional Office (AKR), which produces the estimates of prohibited species bycatch from which the data in Tables 11 – 15 are extracted, suggests that the increase in blue king crab bycatch may be partly explained by an expansion of effort in the Pacific cod pot fishery northward to the vicinity of St. Matthew Island. The increase in golden king crab bycatch, which has occurred mostly in the sablefish pot fishery, may result from a lack of observer data (pot vessels over 60 feet in length are required to have observer coverage only 30% of the time), so that a few very large observed hauls of tiny crab would have an inordinate effect on the calculated bycatch rate that is applied to the rest of the fishery. We intend, with the AKR's assistance, to either verify or correct these estimates in next year's report.

An extensive 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 $606 million in 2003 to $624 million in 2004, increased to $740 million in 2005 and then to $810 million in 2006 before decreasing to $791 million in 2007. The distribution of ex-vessel value by type of vessel differed by area, gear and species. In 2007, catcher vessels accounted for 47% of the ex-vessel value of the groundfish landings compared to 45% of the total catch because catcher vessels take larger percentages of higher-priced species such as sablefish, which was $2.69 per pound in 2007. Similarly, trawl gear accounted for only 72% of the total ex-vessel value compared to 92% of the catch because much of the trawl catch is of low-priced species such as pollock, which was about $0.13 per pound in 2007.

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, 88% of the 2007 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 12% of the total. The vessels owned by residents of Alaska accounted for a much larger share of the ex-vessel value than of catch (12% compared to 4.3%) 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 the Alaska Department of Fish and Game (ADF&G) Commercial Operators Annual Report (COAR). Even though complete at-sea production data are now available from the COAR, however, the estimates of groundfish gross product value (i.e., revenue) for at-sea processors in 2002 through 2007 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.

The requirement that all processors now report their production in the COAR enables us to present Table 30, which gives estimates of the weight and value of processed products from catch in the non-groundfish commercial fisheries of Alaska.

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. However, by using estimates of vessels' revenue from the catch or processing of Alaska groundfish and other species, 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 these tables and Figure 6 show a significant increase in the number of hook-and-line vessels (and, consequently, all vessels) in 2003. This increase is the result of improved source data, namely the recent 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.

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 2007, the crew weeks (defined as the number of crew aboard each vessel in a week summed over the entire year) totaled 101,716 with the majority of them

(97,525) occurring in the BSAI groundfish fishery. In 2007, the maximum monthly employment (15,557) 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 and AFA 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 2006-07 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, Kathleen Herrmann, Dan Lew, Jennifer Sepez, Chang Seung, Leila Sievanen. 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, October 2007.
http://www.afsc.noaa.gov/refm/docs/2007/economic.pdf

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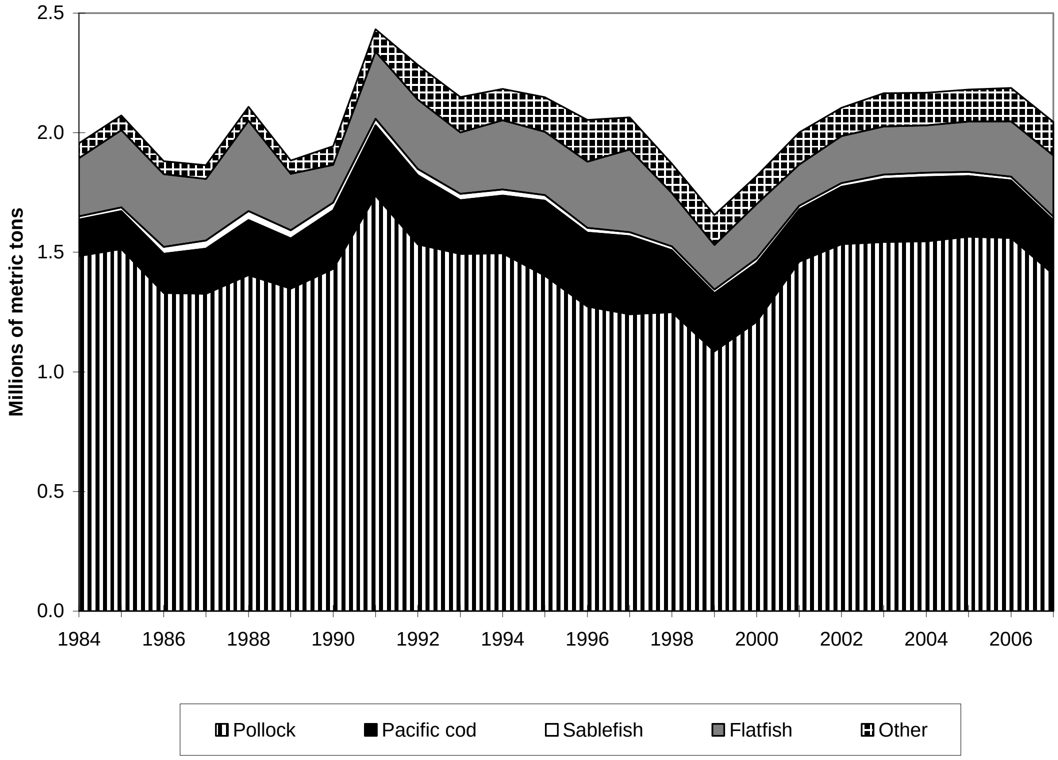

Figure 1. Groundfish catch in the commercial fisheries off Alaska by species, 1984-2007.

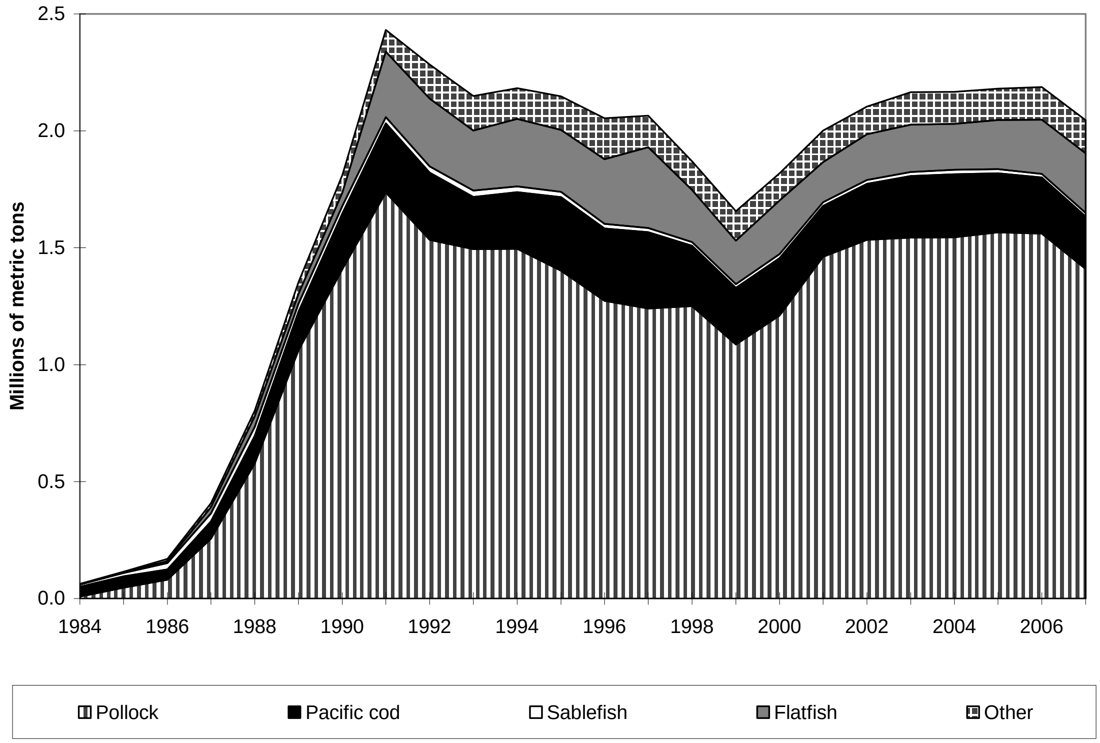

Figure 2. Groundfish catch in the domestic commercial fisheries off Alaska by species, 1984-2007.

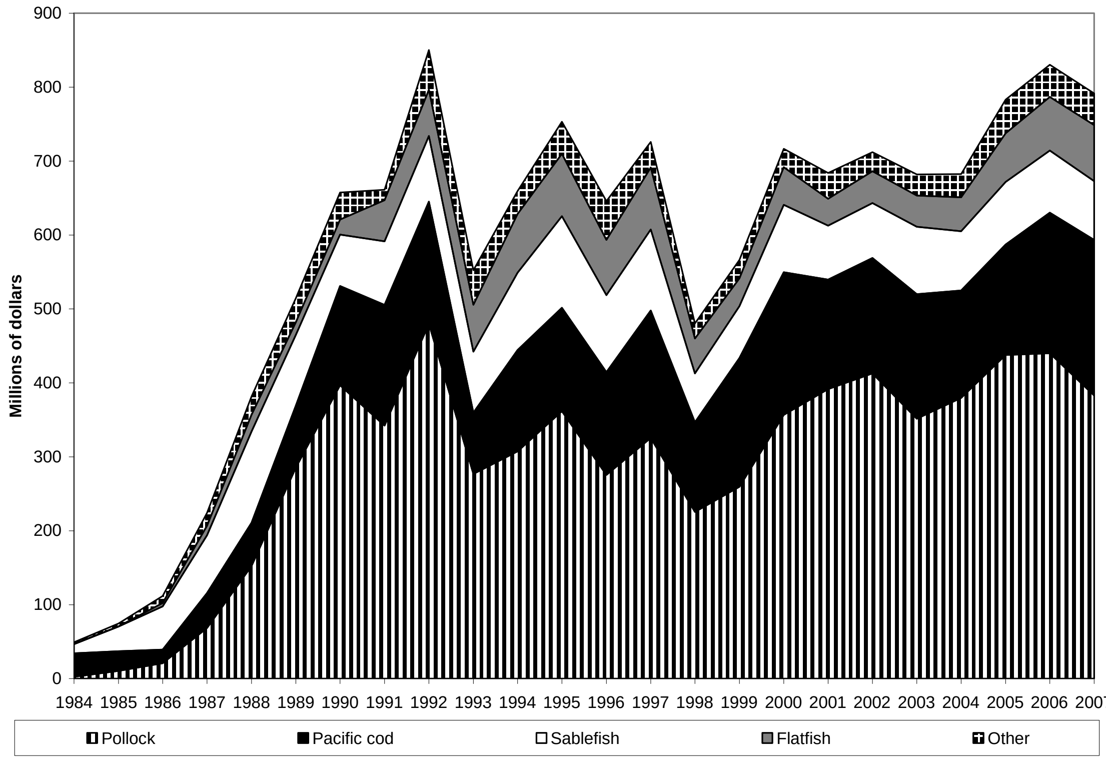

Figure 3. Real ex-vessel value of the groundfish catch in the domestic commercial fisheries off Alaska by species, 1984-2007 (base year = 2007).

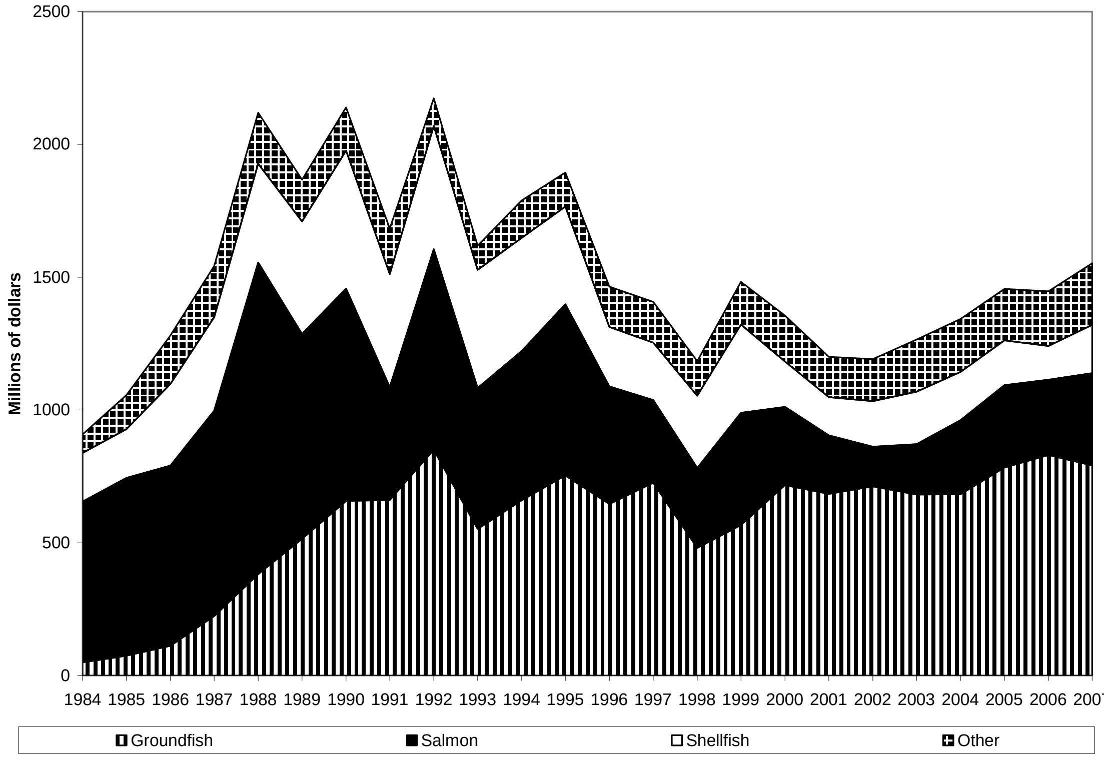

Figure 4. Real ex-vessel value of the domestic fish and shellfish catch off Alaska, 1984-2007 (base year = 2007).

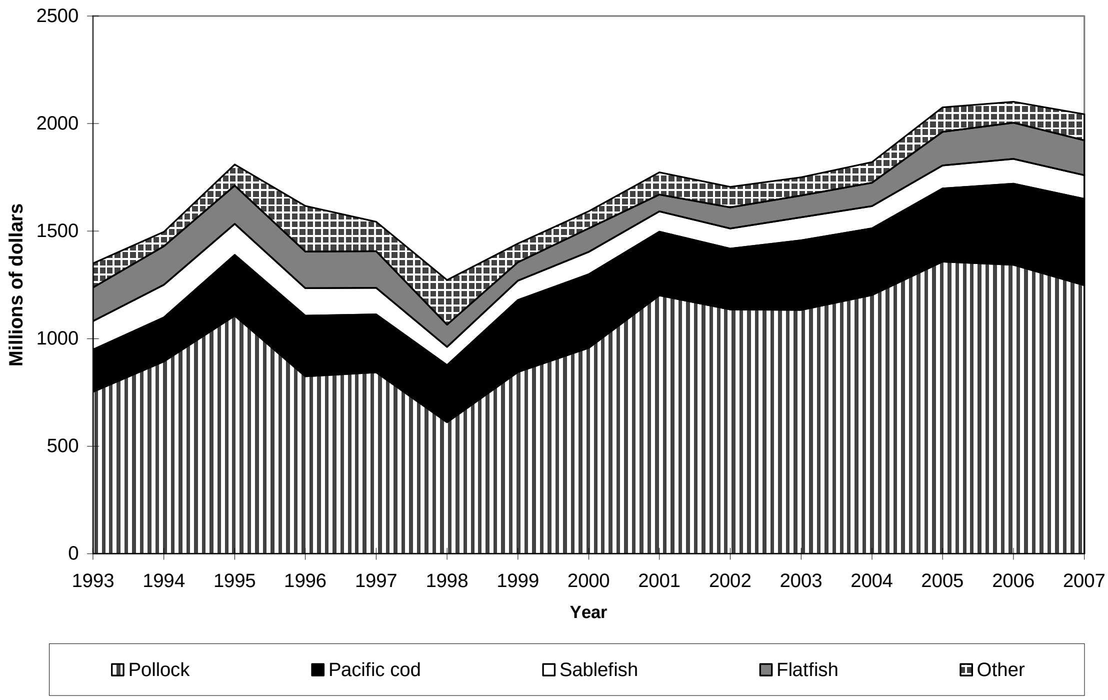

Figure 5. Real gross product value of the groundfish catch off Alaska, 1993-2007 (base year = 2007).

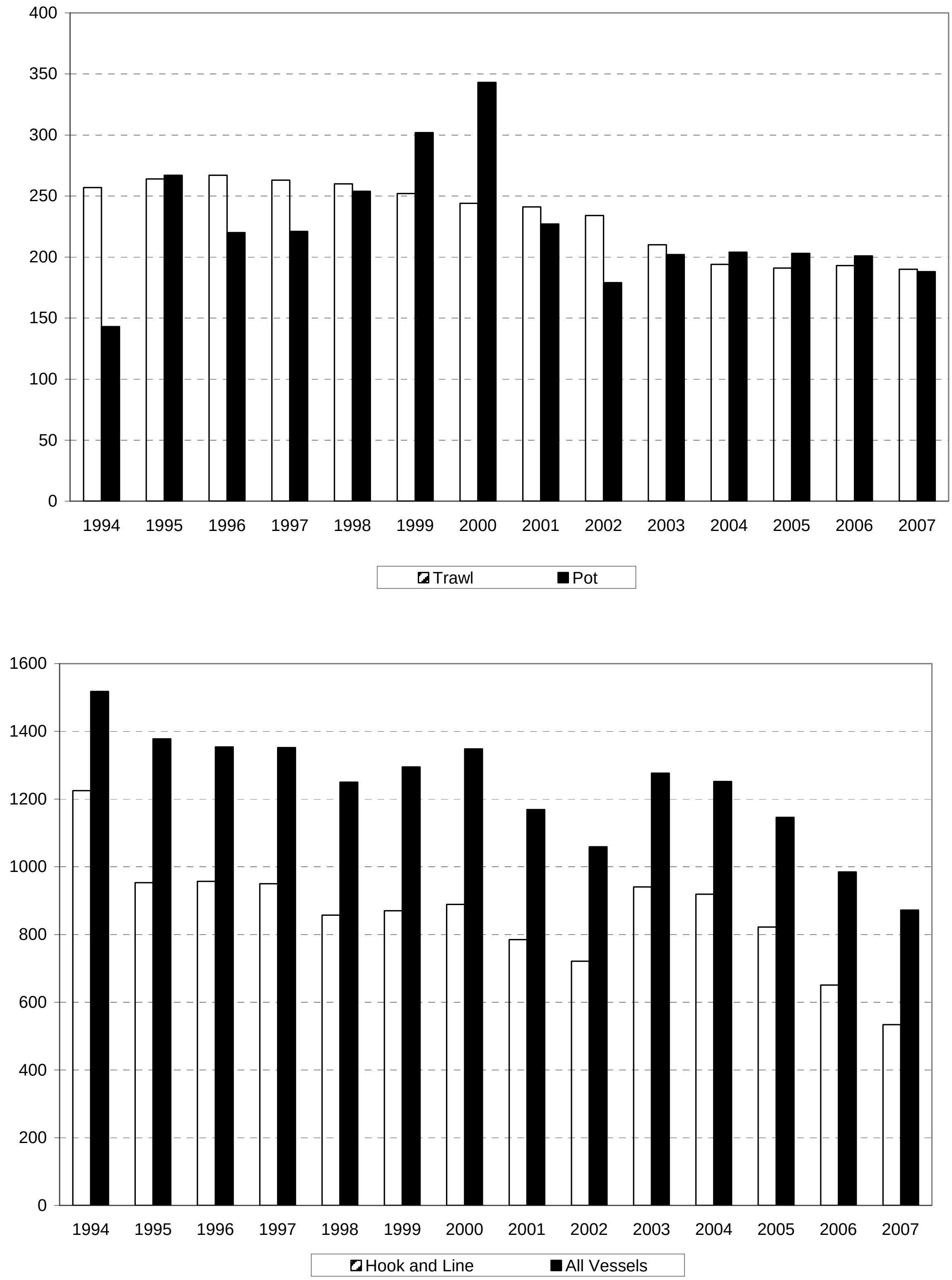

Figure 6. Number of vessels in the domestic groundfish fishery off Alaska by gear type, 1994-2007

Table 1. Groundfish catch in the commercial fisheries off Alaska by area and species, 1997-2007 (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	63.7	16.9	56.6	22.9	22.2	.8	187.7
	2005	80.8	15.0	47.5	29.7	20.5	.8	199.4
	2006	72.0	13.5	47.8	42.1	24.0	.9	207.3
	2007	52.1	12.8	51.4	40.5	23.3	1.5	188.2
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	174.6	17.7	60.6	1,979.1
	2005	1,484.9	2.6	205.5	180.4	15.1	62.0	1,981.2
	2006	1,488.2	2.2	192.4	189.3	17.7	61.9	1,979.9
	2007	1,356.6	2.3	173.6	215.3	23.6	58.8	1,857.8
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	263.6	201.8	44.5	58.7	2,165.0
	2004	1,545.4	18.9	268.7	197.6	39.9	61.4	2,166.7
	2005	1,565.7	17.5	253.1	210.1	35.7	62.8	2,180.6
	2006	1,560.1	15.7	240.2	231.4	41.7	62.8	2,187.2
	2007	1,408.7	15.1	225.0	255.8	46.9	60.2	2,046.0

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 2003-07. National Marine Fisheries Service, P.O. Box 15700, Seattle, WA 98115-0070.

Table 2. Groundfish catch off Alaska by area, vessel type, gear and species, 2003-07 (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	2003	125	53	179	894	1,079	1,974	1,020	1,132	2,152
		2004	141	32	173	857	1,122	1,979	998	1,154	2,152
		2005	155	31	186	858	1,120	1,978	1,012	1,151	2,164
		2006	156	41	197	862	1,118	1,980	1,018	1,158	2,177
		2007	138	38	176	784	1,074	1,858	922	1,111	2,034
Hook & Line	Sablefish	2003	11	2	13	1	1	1	12	2	14
		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
	Pacific cod	2003	4	6	10	1	109	110	4	115	119
		2004	6	5	11	1	110	111	7	115	122
		2005	5	1	6	1	115	116	6	116	122
		2006	7	4	10	1	99	100	7	103	110
		2007	7	4	11	1	81	82	8	85	93
	Flatfish	2003	0	0	0	1	5	5	1	5	6
		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	4
	Rockfish	2003	1	0	2	0	0	0	2	1	2
		2004	1	0	1	0	0	0	1	1	2
		2005	1	0	1	0	0	0	1	0	2
		2006	1	0	1	0	0	0	1	1	2
		2007	1	0	1	0	0	0	1	1	2
	All Groundfish	2003	18	9	27	2	139	142	21	148	169
		2004	21	7	29	2	140	141	23	147	170
		2005	18	4	22	2	146	148	20	150	170
		2006	21	6	28	1	123	124	23	129	152
		2007	21	7	28	1	101	102	22	108	130
Pot	Pacific cod	2003	13	-	13	20	2	22	33	2	35
		2004	15	-	15	14	3	17	29	3	32
		2005	15	-	15	14	-	14	28	-	28
		2006	14	-	14	16	3	20	30	3	34
		2007	13	-	13	15	3	18	28	3	31

Table 2. Continued.

			Gulf of Alaska			Bering Sea and Aleutian			All Alaska		
			Catcher vessels	Catcher processors	Total	Catcher vessels	Catcher processors	Total	Catcher vessels	Catcher processors	Total
Trawl	Pollock	2003	50	1	51	808	678	1,485	858	678	1,536
		2004	63	0	64	792	685	1,476	855	685	1,540
		2005	80	0	81	797	683	1,481	878	684	1,562
		2006	71	0	72	798	688	1,485	869	688	1,557
		2007	51	1	52	722	631	1,353	773	632	1,405
	Sablefish	2003	1	1	2	0	0	0	1	1	2
		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
	Pacific cod	2003	17	2	19	47	32	79	64	35	98
		2004	16	1	17	38	45	84	54	47	101
		2005	13	1	15	35	38	72	48	39	87
		2006	12	1	13	34	39	73	46	40	86
		2007	14	1	15	32	42	74	45	43	89
	Flatfish	2003	14	27	42	7	147	154	21	174	196
		2004	14	9	23	5	164	170	19	174	192
		2005	16	13	29	4	170	175	21	183	204
		2006	25	16	42	6	178	184	31	194	226
		2007	27	13	40	9	202	211	35	216	251
	Rockfish	2003	10	12	22	1	19	20	12	31	42
		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	23	23	10	35	45
	Atka mackerel	2003	0	1	1	5	53	58	5	54	58
		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	0	58	59	0	60	60
	All Groundfish	2003	94	45	139	870	938	1,808	964	983	1,947
		2004	104	24	129	839	979	1,819	944	1,004	1,947
		2005	121	28	149	840	974	1,814	961	1,002	1,963
		2006	120	34	155	842	992	1,834	963	1,026	1,989
		2007	104	30	135	766	970	1,735	870	1,000	1,870

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, 2006-07 (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
2006 Gear/ Target	Hook & line	Sablefish	.0	10.9	.1	.3	.0	-	.0	.0	.8	-	.6	12.9
		Pacific cod	.1	.0	9.9	.1	.0	.0	.0	.0	.1	.0	1.4	11.6
		Halibut	.0	1.1	.2	.0	.0	-	.0	.0	.5	-	1.1	3.0
		Total	.1	12.1	10.3	.5	.0	.0	.0	.0	1.4	.0	3.1	27.6
	Pot	Pacific cod	.0	-	14.4	.0	.0	.0	.0	.0	.0	.0	.3	14.7
		Total	.0	-	14.4	.0	.0	.0	.0	.0	.0	.0	.3	14.8
	Trawl	Pollock, bottom	29.4	.0	.6	2.5	.5	.2	.0	.4	.0	.0	1.7	35.4
		Pollock, pelagic	40.3	.0	.1	.2	.1	.0	.0	.0	.2	.0	.2	41.0
		Pacific cod	.2	.0	9.4	.9	.2	.1	.0	.4	.2	.0	.1	11.5
		Arrowtooth	.8	.2	.9	15.3	1.3	1.1	.1	.5	.5	.0	.5	21.3
		Flathead sole	.0	.0	.0	.8	.5	.1	.0	.0	.0	.0	.1	1.6
		Rex sole	.1	.0	.3	4.3	.3	1.7	.0	.0	.2	.0	.3	7.2
		Flatfish, deep	-	.0	.0	.0	-	-	.1	.0	.0	-	.0	.1
		Flatfish, shallow	.7	.0	1.3	1.9	.3	.1	.0	6.2	.0	.0	.7	11.2
		Rockfish	.4	.9	.5	1.1	.0	.1	.1	.0	21.4	.8	.1	25.4
		Total	71.8	1.1	13.1	27.1	3.1	3.3	.4	7.6	22.6	.9	3.6	154.7
	All gear	Total	72.0	13.2	37.8	27.7	3.1	3.3	.4	7.6	24.0	.9	7.1	197.0

Table 3. Continued.

2007 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	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	12.8
		Halibut	.0	1.4	.4	.1	.0	-	.0	.0	.5	.0	.5	2.9
		Total	.2	11.6	11.5	.5	.0	.0	.0	.0	1.4	.0	2.7	27.9
	Pot	Pacific cod	.0	-	13.5	.0	.0	-	-	.0	.0	.0	.4	13.9
		Total	.0	-	13.5	.0	.0	-	-	.0	.0	.0	.4	13.9
	Trawl	Pollock, bottom	12.4	.0	.2	1.2	.3	.0	.0	.2	.0	.0	.5	14.8
		Pollock, pelagic	37.7	.0	.1	.5	.1	.0	.0	.0	.1	.2	.2	38.7
		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	1.3	14.2
		Rockfish	.1	.6	.2	.7	.0	.1	.0	.0	20.9	1.1	.1	23.9
		Atka mackerel	-	-	.0	-	-	-	-	-	.0	.1	-	.1
		Total	51.9	1.1	14.7	24.8	3.2	2.9	.3	8.7	21.9	1.4	3.6	134.6
	All gear	Total	52.1	12.7	39.8	25.4	3.2	2.9	.3	8.8	23.3	1.5	6.7	176.4

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.

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, 2006-07 (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
2006 Gear/ Target	Hook & line	Sablefish	.0	.7	.0	.1	.0	-	.1	-	.0	.1	-	.1	1.0
		Pacific cod	3.0	.1	99.5	1.3	.5	.0	.1	.5	.1	.1	.0	14.5	119.7
		Arrowtooth	.0	.0	.0	.5	-	.0	.1	-	.0	.2	.0	.1	1.0
		Turbot	.0	.1	.1	.2	.0	.0	1.2	.0	.0	.1	.0	.1	1.8
		Halibut	.0	.2	.1	.0	.0	.0	.1	-	.0	.0	.0	.1	.5
		Total	3.0	1.0	99.7	2.1	.5	.0	1.6	.5	.2	.4	.0	15.1	124.1
	Pot	Sablefish	.0	1.1	.0	.1	.0	-	.0	-	.0	.0	.0	.0	1.2
		Pacific cod	.0	.0	19.5	.0	.0	.0	.0	.0	.0	.0	.4	.5	20.5
		Total	.0	1.1	19.5	.1	.0	.0	.0	.0	.0	.0	.4	.6	21.7
	Trawl	Pollock, bottom	25.5	.0	.4	.1	.2	.2	.0	.1	.1	.4	.6	.6	28.2
		Pollock, pelagic	1,429.9	.0	6.9	1.0	2.6	1.2	.1	.1	.4	.6	.2	2.8	1,445.7
		Pacific cod	12.2	.0	54.3	4.5	2.9	5.0	.0	1.4	.9	.4	.8	2.9	85.3
		Arrowtooth	1.1	.1	.4	2.0	.1	.1	.0	.1	.2	.0	.0	.2	4.5
		Flathead sole	2.6	.0	2.0	1.6	7.7	1.5	.0	2.6	1.0	.0	.0	1.4	20.4
		Rock sole	6.9	.0	4.9	.5	1.7	20.1	.0	9.9	2.4	.0	.1	1.6	48.2
		Yellowfin	6.1	-	2.6	.4	2.0	8.1	.0	84.2	14.9	.0	.0	2.3	120.7
		Other flatfish	.1	.0	.0	.2	.0	.0	.0	.0	.1	.0	.0	.0	.5
		Rockfish	.3	.1	.1	.4	.0	.0	.1	-	.0	9.0	.1	.1	10.2
		Atka mackerel	.3	.0	1.7	.4	.0	.1	.1	.0	.0	6.8	59.6	.7	69.8
		Total	1,485.1	.1	73.3	11.1	17.4	36.4	.4	98.8	20.5	17.2	61.5	12.6	1,834.5
	All gear	Total	1,488.2	2.2	192.4	13.3	18.0	36.5	2.0	99.1	20.5	17.7	61.9	28.2	1,979.8

Table 4. Continued.

2007 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	.5	.0	.1	.0	-	.1	-	.0	.1	-	.1	.8
		Pacific cod	3.4	.0	81.8	1.3	.4	.0	.1	.3	.1	.2	.0	12.0	99.5
		Arrowtooth	.0	.0	.0	.0	.0	.0	.0	-	.0	.0	.0	.0	.1
		Turbot	.0	.1	.1	.2	.0	-	1.1	-	.0	.1	.0	.2	1.7
		Halibut	.0	.1	.0	.0	.0	-	.0	-	-	.0	-	.0	.1
		Total	3.4	.7	81.9	1.6	.4	.0	1.4	.3	.1	.5	.0	12.2	102.4
	Pot	Sablefish	.0	1.5	.0	.1	-	-	.0	-	.0	.0	.0	.0	1.6
		Pacific cod	.0	-	17.9	.0	.0	.0	.0	.2	.0	.0	.1	.4	18.6
		Total	.0	1.5	17.9	.1	.0	.0	.0	.2	.0	.0	.1	.4	20.2
	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	17.0	.0	58.4	1.9	3.9	4.3	.1	.6	.9	.2	.5	3.9	91.7
		Arrowtooth	.6	.0	.1	.8	.1	.1	.0	.0	.1	.0	.0	.1	1.8
		Flathead sole	3.6	.0	1.7	1.7	7.2	2.1	.0	2.5	.7	.1	.1	1.1	21.1
		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	108.3	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	1,353.2	.1	73.8	9.9	18.4	36.8	.4	120.6	25.3	23.1	58.7	15.0	1,735.4
	All gear	Total	1,356.6	2.3	173.6	11.7	18.7	36.8	1.8	121.0	25.3	23.6	58.8	27.6	1,857.8

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, 2003-07 (1,000 metric tons, round weight).

		Gulf of Alaska		Bering Sea and Aleutian		All Alaska	
		Alaska	Other	Alaska	Other	Alaska	Other
All groundfish	2003	65	114	43	1,931	108	2,044
	2004	72	101	47	1,932	119	2,033
	2005	71	115	28	1,953	99	2,069
	2006	71	126	23	1,957	94	2,083
	2007	65	112	22	1,836	87	1,947
Pollock	2003	18	33	15	1,478	33	1,511
	2004	24	40	16	1,466	39	1,506
	2005	30	51	12	1,472	43	1,523
	2006	27	45	7	1,482	34	1,527
	2007	20	32	8	1,349	27	1,381
Sablefish	2003	7	8	1	1	7	9
	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
Pacific cod	2003	23	18	18	193	41	211
	2004	25	18	19	193	44	211
	2005	23	12	14	192	37	204
	2006	23	14	15	178	38	192
	2007	25	15	13	161	38	176
Flatfish	2003	8	34	6	154	15	187
	2004	8	15	7	168	15	183
	2005	6	24	0	180	6	204
	2006	8	34	0	189	8	223
	2007	9	32	0	215	9	247
Rockfish	2003	6	18	0	21	6	38
	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
Atka mackerel	2003	0	0	1	57	2	57
	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

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, 2003-07 (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	2003	3.1	7.7%	26.9	19.4%	30.0	16.8%
		2004	3.0	6.9%	14.6	11.4%	17.6	10.2%
		2005	2.4	6.5%	13.1	8.8%	15.5	8.4%
		2006	4.1	9.6%	19.9	12.9%	24.0	12.2%
		2007	3.8	9.1%	17.2	12.8%	21.0	11.9%
	Pollock	2003	.0	15.6%	1.1	2.1%	1.1	2.1%
		2004	.0	34.4%	1.1	1.7%	1.1	1.7%
		2005	.0	13.5%	1.1	1.4%	1.1	1.4%
		2006	.0	13.8%	1.9	2.6%	1.9	2.6%
		2007	.0	6.4%	1.4	2.8%	1.5	2.8%
	Sablefish	2003	.4	3.5%	.7	38.2%	1.1	7.9%
		2004	.4	3.0%	.2	14.9%	.6	4.0%
		2005	.2	1.7%	.2	15.4%	.4	2.9%
		2006	.3	2.2%	.3	24.6%	.5	4.0%
		2007	.2	1.9%	.2	15.7%	.4	3.1%
	Pacific cod	2003	.4	1.7%	2.1	10.9%	2.4	5.9%
		2004	.4	1.6%	.8	4.5%	1.2	2.8%
		2005	.2	1.1%	.7	4.9%	.9	2.7%
		2006	.4	1.4%	1.4	10.6%	1.7	4.6%
		2007	.3	1.1%	1.1	7.5%	1.4	3.5%
	Flatfish	2003	.3	86.8%	18.5	44.4%	18.8	44.8%
		2004	.3	86.5%	9.4	41.8%	9.8	42.5%
		2005	.3	69.7%	8.6	29.3%	8.8	29.8%
		2006	.5	82.7%	12.4	29.7%	12.8	30.4%
		2007	.6	89.4%	11.0	27.5%	11.5	28.5%
	Rockfish	2003	.4	22.1%	3.1	14.2%	3.5	14.8%
		2004	.3	21.8%	2.0	9.7%	2.3	10.5%
		2005	.2	16.9%	1.2	6.2%	1.4	6.8%
		2006	.4	25.8%	2.3	10.1%	2.6	11.0%
		2007	.4	25.8%	.9	4.2%	1.3	5.5%
	Atka mackerel	2003	.0	98.8%	.2	42.7%	.3	43.6%
		2004	.0	96.9%	.3	38.6%	.3	40.1%
		2005	.0	99.4%	.1	17.5%	.2	19.4%
		2006	.0	93.1%	.4	42.5%	.4	43.1%
		2007	.0	99.5%	.6	38.1%	.6	38.4%

Table 6. Continued.

			Fixed		Trawl		All gear	
			Total Discards	Discard Rate	Total Discards	Discard Rate	Total Discards	Discard Rate
Bering Sea & Aleutians	All Groundfish	2003	17.6	10.6%	95.7	5.3%	113.3	5.7%
		2004	20.6	12.8%	112.2	6.2%	132.8	6.7%
		2005	21.1	12.6%	77.1	4.3%	98.2	5.0%
		2006	16.4	11.3%	75.9	4.1%	92.3	4.7%
		2007	13.9	11.4%	87.2	5.0%	101.1	5.4%
	Pollock	2003	.8	11.1%	16.6	1.1%	17.4	1.2%
		2004	.7	13.0%	22.8	1.5%	23.4	1.6%
		2005	.6	13.9%	17.2	1.2%	17.7	1.2%
		2006	.4	14.4%	15.2	1.0%	15.6	1.1%
		2007	.5	15.6%	15.8	1.2%	16.3	1.2%
	Sablefish	2003	.1	7.4%	.1	36.4%	.2	11.1%
		2004	.0	2.7%	.1	26.5%	.1	6.6%
		2005	.1	2.5%	.0	8.2%	.1	3.4%
		2006	.1	2.5%	.0	7.1%	.1	2.8%
		2007	.0	1.7%	.0	6.5%	.0	2.0%
	Pacific cod	2003	1.2	.9%	1.1	1.4%	2.3	1.1%
		2004	2.0	1.5%	.8	.9%	2.7	1.3%
		2005	2.9	2.2%	.7	1.0%	3.6	1.7%
		2006	1.7	1.5%	1.0	1.3%	2.7	1.4%
		2007	1.5	1.6%	1.0	1.4%	2.5	1.5%
	Flatfish	2003	3.3	58.4%	48.9	31.8%	52.3	32.7%
		2004	2.9	60.6%	62.1	36.6%	65.0	37.2%
		2005	2.7	48.1%	43.6	24.9%	46.3	25.6%
		2006	2.2	43.2%	42.6	23.1%	44.8	23.7%
		2007	2.2	54.1%	50.7	24.0%	52.9	24.6%
	Rockfish	2003	.2	47.0%	7.5	36.7%	7.7	36.9%
		2004	.2	51.5%	6.3	36.4%	6.5	36.8%
		2005	.1	34.5%	4.8	32.3%	4.9	32.4%
		2006	.2	49.2%	5.1	29.6%	5.3	30.1%
		2007	.3	60.8%	6.2	27.0%	6.5	27.6%
	Atka mackerel	2003	.2	96.2%	13.1	22.7%	13.4	23.0%
		2004	.2	98.8%	11.7	19.4%	11.9	19.6%
		2005	.3	96.7%	3.8	6.1%	4.0	6.5%
		2006	.4	100.0%	2.7	4.4%	3.0	4.9%
		2007	.1	96.6%	2.0	3.4%	2.1	3.5%

Table 6. Continued.

			Fixed		Trawl		All gear	
			Total Discards	Discard Rate	Total Discards	Discard Rate	Total Discards	Discard Rate
All Alaska	All Groundfish	2003	20.7	10.1%	122.6	6.3%	143.3	6.7%
		2004	23.6	11.5%	126.8	6.5%	150.4	7.0%
		2005	23.5	11.5%	90.3	4.6%	113.8	5.2%
		2006	20.5	10.9%	95.8	4.8%	116.3	5.3%
		2007	17.7	10.8%	104.4	5.6%	122.2	6.0%
	Pollock	2003	.8	11.1%	17.7	1.1%	18.5	1.2%
		2004	.7	13.1%	23.8	1.5%	24.5	1.6%
		2005	.6	13.9%	18.3	1.2%	18.9	1.2%
		2006	.5	14.4%	17.1	1.1%	17.5	1.1%
		2007	.5	15.1%	17.2	1.2%	17.7	1.3%
	Sablefish	2003	.6	4.0%	.8	38.0%	1.4	8.3%
		2004	.5	2.9%	.3	17.2%	.7	4.3%
		2005	.3	1.8%	.2	13.7%	.5	2.9%
		2006	.3	2.2%	.3	22.5%	.6	3.9%
		2007	.3	1.9%	.2	14.8%	.4	3.0%
	Pacific cod	2003	1.6	1.0%	3.1	3.2%	4.7	1.9%
		2004	2.4	1.5%	1.6	1.5%	3.9	1.5%
		2005	3.1	2.0%	1.4	1.6%	4.5	1.9%
		2006	2.1	1.4%	2.3	2.7%	4.4	1.9%
		2007	1.8	1.5%	2.1	2.4%	3.9	1.8%
	Flatfish	2003	3.7	60.3%	67.4	34.4%	71.1	35.2%
		2004	3.2	62.5%	71.6	37.2%	74.8	37.9%
		2005	3.0	49.6%	52.1	25.5%	55.1	26.2%
		2006	2.6	47.2%	55.0	24.3%	57.6	24.9%
		2007	2.7	58.8%	61.7	24.6%	64.4	25.2%
	Rockfish	2003	.6	26.9%	10.6	25.0%	11.2	25.1%
		2004	.5	27.8%	8.3	21.9%	8.8	22.1%
		2005	.3	20.1%	6.0	17.6%	6.3	17.7%
		2006	.6	31.2%	7.4	18.5%	8.0	19.1%
		2007	.6	34.4%	7.2	15.9%	7.8	16.6%
	Atka mackerel	2003	.2	96.3%	13.4	22.9%	13.6	23.2%
		2004	.2	98.6%	12.0	19.6%	12.2	19.9%
		2005	.3	96.9%	3.9	6.2%	4.2	6.6%
		2006	.4	99.8%	3.0	4.9%	3.4	5.5%
		2007	.1	96.8%	2.5	4.2%	2.6	4.4%

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, 2006-07 (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
2006 Gear/ Target	Hook & line	Sablefish	.0	.2	.0	.3	.0	-	.0	.0	.2	-	.6	1.4
		Pacific cod	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.7	.9
		Halibut	.0	.0	.0	.0	.0	-	.0	.0	.1	-	1.1	1.3
		Total	.0	.3	.1	.4	.0	.0	.0	.0	.3	.0	2.4	3.6
	Pot	Pacific cod	.0	-	.2	.0	.0	.0	.0	.0	.0	.0	.1	.4
		Total	.0	-	.2	.0	.0	.0	.0	.0	.0	.0	.1	.4
	Trawl	Pollock, bottom	.6	.0	.0	.5	.0	.0	.0	.0	.0	.0	.4	1.5
		Pollock, pelagic	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	1.0
		Pacific cod	.0	.0	.8	.7	.1	.0	.0	.1	.2	.0	.1	2.1
		Arrowtooth	.1	.1	.2	2.7	.1	.0	.1	.0	.3	.0	.3	3.9
		Flathead sole	.0	.0	.0	.8	.1	.0	.0	.0	.0	.0	.0	.9
		Rex sole	.0	.0	.0	4.2	.0	.0	.0	.0	.1	.0	.1	4.6
		Flatfish, deep	-	.0	.0	.0	-	-	.0	.0	.0	-	.0	.0
		Flatfish, shallow	.1	.0	.4	1.4	.0	.0	.0	.2	.0	.0	.2	2.4
		Rockfish	.1	.2	.1	1.0	.0	.1	.1	.0	1.6	.3	.1	3.6
		Total	1.9	.3	1.4	11.2	.3	.2	.2	.5	2.3	.4	1.4	19.9
	All gear	Total	1.9	.5	1.7	11.6	.3	.2	.2	.5	2.6	.4	4.0	24.0

Table 7. Continued.

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2007 Gear/ Target	Hook & line	Sablefish	.0	.2	.0	.3	.0	.0	.0	.0	.3	.0	.7	1.5
		Pacific cod	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	1.0	1.3
		Halibut	.0	.0	.1	.1	.0	-	.0	.0	.1	.0	.5	.7
		Total	.0	.2	.2	.5	.0	.0	.0	.0	.4	.0	2.2	3.5
	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	.9
		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	.6	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	1.8	.0	.0	.0	.3	.0	.0	.8	4.1
		Rockfish	.0	.1	.0	.5	.0	.0	.0	.0	.5	.3	.1	1.6
		Atka mackerel	-	-	.0	-	-	-	-	-	.0	.0	-	.0
		Total	1.4	.2	1.1	9.8	.3	.1	.1	.6	.9	.6	2.1	17.2
	All gear	Total	1.5	.4	1.4	10.3	.3	.1	.2	.7	1.3	.6	4.4	21.0

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, 2006-07 (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
2006 Gear/ Target	Hook & line	Sablefish	.0	.0	.0	.0	.0	-	.0	-	.0	.0	-	.1	.2
		Pacific cod	.4	.0	1.6	.8	.5	.0	.0	.4	.1	.0	.0	10.7	14.7
		Arrowtooth	.0	.0	.0	.0	-	.0	.0	-	.0	.1	.0	.1	.2
		Turbot	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2
		Halibut	.0	.0	.0	.0	.0	.0	.0	-	.0	.0	.0	.1	.1
		Total	.4	.0	1.7	.9	.5	.0	.1	.4	.1	.2	.0	11.1	15.5
	Pot	Sablefish	.0	.0	.0	.0	.0	-	.0	-	.0	.0	.0	.0	.1
		Pacific cod	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.4	.4	.9
		Total	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.4	.4	1.0
	Trawl	Pollock, bottom	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.2	.1	.5
		Pollock, pelagic	.6	.0	.1	.2	.7	.4	.0	.1	.0	.2	.0	1.6	4.0
		Pacific cod	8.3	.0	.3	3.2	1.8	2.9	.0	.7	.7	.3	.5	2.4	21.0
		Arrowtooth	.7	.0	.0	1.1	.1	.1	.0	.0	.0	.0	.0	.2	2.2
		Flathead sole	1.1	.0	.2	.7	.7	.2	.0	.4	.7	.0	.0	1.0	4.9
		Rock sole	2.8	.0	.1	.3	.2	2.2	.0	1.0	2.3	.0	.1	1.3	10.3
		Yellowfin	1.5	-	.2	.2	.3	1.9	.0	5.7	12.7	.0	.0	2.1	24.6
		Other flatfish	.0	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.2
		Rockfish	.0	.0	.0	.2	.0	.0	.0	-	.0	.1	.0	.1	.5
		Atka mackerel	.1	.0	.1	.2	.0	.1	.0	.0	.0	4.4	1.8	.6	7.4
		Total	15.2	.0	1.0	6.3	3.9	7.8	.1	8.1	16.6	5.1	2.7	9.3	76.1
	All gear	Total	15.6	.1	2.7	7.2	4.4	7.8	.2	8.5	16.6	5.3	3.0	20.8	92.3

Table 8. Continued.

2007 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	-	.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	.2
		Halibut	.0	.0	.0	.0	.0	-	.0	-	-	.0	-	.0	.0
		Total	.5	.0	1.5	1.1	.3	.0	.1	.2	.1	.3	.0	8.9	13.1
	Pot	Sablefish	.0	.0	.0	.1	-	-	.0	-	.0	.0	.0	.0	.1
		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	12.2	.0	.6	1.5	2.3	2.5	.1	.3	.7	.2	.1	3.2	23.7
		Arrowtooth	.3	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1	.5
		Flathead sole	1.3	.0	.0	1.3	1.2	.9	.0	1.1	.5	.0	.0	.8	7.3
		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	15.8	.0	1.0	5.4	5.1	8.9	.1	11.5	19.7	6.2	2.0	11.5	87.2
	All gear	Total	16.3	.0	2.5	6.6	5.4	8.9	.3	11.9	19.7	6.5	2.1	20.7	101.1

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, 2006-07 (percent).

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2006 Gear/ Target	Hook & line	Sablefish	61.7	2.0	27.6	86.9	100.0	-	98.5	100.0	22.3	-	98.7	10.6
		Pacific cod	10.1	70.5	.7	62.8	97.1	100.0	97.1	99.5	49.4	84.2	53.1	8.2
		Halibut	.0	2.7	9.2	94.4	100.0	-	99.1	100.0	26.9	-	98.6	43.2
		Total	10.3	2.2	1.3	81.0	97.2	100.0	98.3	99.7	24.2	84.2	77.3	13.2
	Pot	Pacific cod	47.4	-	1.5	99.6	80.9	.0	100.0	100.0	96.7	99.8	50.6	2.8
		Total	32.3	-	1.5	83.0	80.9	.0	100.0	100.0	96.7	99.8	50.6	2.8
	Trawl	Pollock, bottom	2.2	14.5	.6	18.2	2.8	2.3	18.8	1.7	9.5	61.4	22.6	4.3
		Pollock, pelagic	2.0	25.4	.4	10.8	3.0	16.7	.0	.5	24.0	.8	51.8	2.4
		Pacific cod	21.1	.0	8.2	81.6	44.1	9.8	78.8	39.6	97.3	36.5	87.2	18.4
		Arrowtooth	11.1	57.9	16.7	17.4	4.8	3.9	57.5	6.6	60.8	40.4	60.8	18.2
		Flathead sole	6.5	12.9	8.5	90.2	17.9	7.0	20.1	72.6	33.2	16.3	54.9	56.6
		Rex sole	.4	10.6	5.4	97.5	17.2	2.0	100.0	.0	42.7	12.4	51.5	63.6
		Flatfish, deep	-	.0	.0	16.0	-	-	.0	.0	.0	-	100.0	.3
		Flatfish, shallow	18.8	73.9	29.2	72.1	4.7	3.6	14.8	3.4	69.3	66.3	32.0	21.4
		Rockfish	39.0	18.0	13.9	90.2	43.7	57.8	88.9	68.0	7.4	43.3	94.9	14.1
		Total	2.6	24.6	10.6	41.3	10.3	4.6	57.4	5.9	10.1	42.5	38.8	12.9
	All gear	Total	2.6	4.0	4.6	42.0	10.5	4.6	59.9	6.2	11.0	43.1	56.4	12.2

Table 9. Continued.

			Species											
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rex sole	Flat deep	Flat shallow	Rock-fish	Atka mack.	Other	Total
2007 Gear/ Target	Hook & line	Sablefish	46.8	1.9	23.2	83.8	100.0	92.4	99.6	98.6	34.6	100.0	99.2	12.7
		Pacific cod	3.3	37.8	.9	99.0	100.0	100.0	84.4	95.5	34.0	100.0	71.4	10.1
		Halibut	100.0	1.6	17.1	96.3	100.0	-	96.0	100.0	12.1	100.0	92.5	24.0
		Total	5.2	1.9	1.7	88.3	100.0	92.8	97.6	97.8	25.2	100.0	82.8	12.6
	Pot	Pacific cod	18.6	-	.6	93.7	29.1	-	-	90.8	98.4	99.4	38.2	1.9
		Total	18.6	-	.6	93.7	29.1	-	-	90.8	98.4	99.4	38.2	1.9
	Trawl	Pollock, bottom	2.9	1.0	3.8	27.3	5.2	3.0	4.8	25.1	12.0	7.0	34.2	6.2
		Pollock, pelagic	1.1	2.9	.3	12.1	2.7	2.5	.0	7.2	20.0	97.8	43.1	1.9
		Sablefish	76.3	.3	1.2	87.1	71.1	85.2	81.0	99.4	23.7	-	91.1	30.8
		Pacific cod	41.6	20.4	.8	62.4	29.4	8.8	32.0	23.3	45.8	25.1	66.0	12.0
		Arrowtooth	23.3	70.6	6.2	17.6	8.8	3.3	36.3	6.1	37.1	8.6	74.1	19.1
		Flathead sole	.8	.0	10.4	89.9	10.4	2.0	100.0	4.9	57.1	29.0	58.2	49.4
		Rex sole	1.5	17.4	11.6	92.3	7.7	.4	100.0	.0	53.5	11.1	31.6	53.4
		Flatfish, shallow	48.6	21.8	37.2	76.8	3.7	7.0	17.6	4.5	60.7	81.9	57.2	29.2
		Rockfish	38.4	8.9	2.3	79.4	14.7	15.4	38.3	27.4	2.6	30.5	79.7	6.8
		Atka mackerel	-	-	.0	-	-	-	-	-	.0	40.0	-	28.1
		Total	2.8	15.7	7.5	39.4	10.1	2.4	55.9	7.4	4.2	38.1	57.0	12.8
	All gear	Total	2.8	3.1	3.5	40.5	10.2	2.4	59.5	7.9	5.5	38.4	66.3	11.9

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. 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, 2006-07 (percent).

			Species												
			Pollock	Sable-fish	Pacific cod	Arrow-tooth	Flathd. sole	Rock sole	Turbot	Yellow fin	Flat other	Rock-fish	Atka mack.	Other	Total
2006 Gear/ Target	Hook & line	Sablefish	94.4	.8	36.5	39.4	100.0	-	32.3	-	100.0	11.4	-	97.6	19.0
		Pacific cod	14.4	20.7	1.6	61.6	92.5	97.3	22.1	90.1	95.1	72.7	100.0	73.4	12.3
		Arrowtooth	5.5	13.5	7.8	4.7	-	100.0	10.0	-	71.7	64.8	100.0	65.9	22.6
		Turbot	15.2	27.5	15.7	3.4	99.1	100.0	1.1	100.0	67.7	33.8	100.0	79.5	10.6
		Halibut	72.8	.4	4.0	39.8	85.8	31.4	9.5	-	46.0	40.0	100.0	57.3	20.2
		Total	14.4	4.6	1.7	41.3	92.5	95.8	4.9	90.0	94.0	47.8	100.0	73.6	12.5
	Pot	Sablefish	94.7	.2	93.1	81.8	2.1	-	87.0	-	100.0	87.3	86.3	95.4	7.1
		Pacific cod	14.8	90.5	.4	99.7	24.8	99.1	100.0	99.1	100.0	99.8	100.0	66.9	4.3
		Total	15.5	.6	.4	85.1	20.9	99.1	87.4	99.1	100.0	94.6	100.0	65.8	4.4
	Trawl	Pollock, bottom	.1	32.1	.0	4.6	1.1	24.5	.0	47.9	19.0	8.7	31.4	21.9	1.8
		Pollock, pelagic	.0	30.8	.8	16.9	25.9	36.7	21.7	84.8	11.0	42.1	16.5	57.1	.3
		Pacific cod	68.3	22.6	.5	70.7	61.2	58.3	66.6	47.8	74.1	59.1	66.4	83.4	24.7
		Arrowtooth	64.0	1.0	.6	53.1	39.1	53.3	24.1	54.2	18.3	13.4	6.2	69.4	48.2
		Flathead sole	41.4	100.0	8.5	41.4	9.6	16.1	5.4	13.7	70.7	46.8	12.1	71.4	24.1
		Rock sole	39.9	35.5	2.7	61.9	14.1	10.8	11.1	10.2	93.0	4.3	69.6	80.0	21.3
		Yellowfin	24.9	-	9.6	67.2	14.6	23.0	100.0	6.8	84.8	97.0	1.2	88.7	20.4
		Other flatfish	73.6	.0	1.5	73.4	56.0	11.5	7.7	19.0	4.3	62.2	54.7	84.4	50.5
		Rockfish	3.1	8.6	9.8	53.7	76.6	66.7	10.6	-	27.8	1.3	41.5	93.3	5.1
		Atka mackerel	34.5	5.7	3.0	61.4	31.7	40.8	27.5	54.4	25.7	65.2	3.0	95.0	10.6
		Total	1.0	7.1	1.3	56.4	22.2	21.5	23.5	8.2	80.9	29.6	4.4	74.4	4.1
	All gear	Total	1.1	2.8	1.4	54.2	24.2	21.5	9.5	8.6	81.3	30.1	4.9	73.8	4.7

Table 10. Continued.

2007 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	17.0	.6	35.3	34.0	100.0	-	45.1	-	100.0	32.9	-	94.0	19.5
		Pacific cod	15.4	14.7	1.8	79.9	87.3	92.0	27.4	93.7	94.4	71.7	91.0	73.2	12.7
		Arrowtooth	77.1	1.2	26.8	7.6	100.0	100.0	.8	-	100.0	74.4	100.0	77.4	34.5
		Turbot	11.9	8.1	2.6	7.7	97.8	-	2.5	-	100.0	62.1	100.0	66.6	13.9
		Halibut	.0	.8	3.0	96.7	100.0	-	69.7	-	-	7.4	-	100.0	14.6
		Total	15.4	2.1	1.8	67.5	87.4	92.0	8.9	93.7	94.5	60.4	91.1	73.1	12.8
	Pot	Sablefish	93.9	1.5	57.7	96.8	-	-	92.6	-	100.0	95.1	100.0	92.0	9.1
		Pacific cod	82.8	-	.3	99.6	65.2	100.0	100.0	99.7	100.0	99.6	99.3	82.5	3.4
		Total	82.8	1.5	.3	96.9	65.2	100.0	92.7	99.7	100.0	96.6	99.3	82.5	3.8
	Trawl	Pollock, bottom	.1	10.3	.3	12.4	2.5	34.5	7.3	.1	2.3	62.9	22.4	41.9	1.9
		Pollock, pelagic	.0	35.5	1.0	23.3	25.7	25.8	34.7	12.5	11.6	41.1	61.6	49.5	.3
		Pacific cod	71.5	45.7	1.0	75.6	58.6	59.5	62.8	50.7	86.8	76.5	18.7	83.9	25.8
		Arrowtooth	44.9	8.0	.0	17.2	29.5	17.4	11.7	32.6	12.8	18.5	8.6	64.2	28.5
		Flathead sole	37.0	.0	.4	76.1	17.0	41.5	52.9	43.9	81.4	30.9	8.0	70.8	34.6
		Rock sole	19.8	2.2	4.5	69.6	14.6	12.9	38.7	6.6	87.4	21.6	3.0	82.1	19.6
		Yellowfin	10.6	-	5.7	72.4	20.2	29.9	100.0	8.7	81.5	96.8	85.2	84.6	21.6
		Other flatfish	25.3	.0	1.8	82.0	32.0	32.2	40.0	24.9	21.5	53.6	20.4	94.4	51.7
		Rockfish	19.1	7.4	9.0	53.5	10.8	42.5	26.9	100.0	47.7	4.9	15.1	97.5	7.4
		Atka mackerel	27.8	.3	2.6	56.0	45.2	55.7	9.2	68.4	11.2	63.3	3.0	96.6	11.6
		Total	1.2	6.5	1.4	54.4	27.6	24.3	33.1	9.5	77.7	27.0	3.4	76.5	5.0
	All gear	Total	1.2	2.0	1.5	56.6	28.8	24.3	15.7	9.9	78.1	27.6	3.5	75.1	5.4

Notes: Totals may include additional categories. The target, determined by AFSC staff, is based on processor, week, processing mode, NMFS area, an 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, 2004-07 (metric tons (t) or number in 1,000s)

			Halibut mort. (t)	Herring (t)	Chinook (1,000s)	Other salmon (1,000s)	Red king crab (1,000s)	Other k. crab (1,000s)	Bairdi (1,000s)	Other tanner (1,000s)
Bering Sea & Aleutians	Hook & Line	2004	513	0	0	0	15	1	11	46
		2005	608	0	0	0	16	1	13	51
		2006	452	0	0	0	8	4	14	43
		2007	540	-	0	0	6	5	15	37
	Pot	2004	4	-	-	-	0	60	32	75
		2005	3	-	-	-	3	2	124	78
		2006	5	-	-	-	7	47	390	198
		2007	2	-	0	-	25	532	482	642
	Trawl	2004	3,444	1,208	60	441	84	5	846	1,825
		2005	3,542	692	74	701	114	5	1,579	3,292
		2006	3,490	485	87	323	106	11	921	1,010
		2007	3,494	409	129	90	97	9	724	1,833
	All gear	2004	3,960	1,208	60	441	99	67	889	1,947
		2005	4,154	692	74	701	133	9	1,716	3,421
		2006	3,948	485	87	324	121	62	1,325	1,251
		2007	4,036	409	129	90	128	546	1,221	2,513
Gulf of Alaska	Hook & Line	2004	-	-	0	0	-	0	0	0
		2005	-	-	-	0	0	0	2	-
		2006	-	-	-	0	-	0	0	0
		2007	-	-	0	0	-	0	0	0
	Pot	2004	16	-	-	-	0	-	17	-
		2005	33	-	-	-	-	-	116	-
		2006	19	-	-	-	-	-	103	0
		2007	19	-	-	-	-	-	290	4
	Trawl	2004	2,413	267	18	6	0	0	62	-
		2005	2,084	12	31	7	0	-	126	0
		2006	1,974	9	19	4	0	0	306	0
		2007	1,928	17	40	3	-	0	203	2
	All gear	2004	2,430	267	18	6	0	0	79	0
		2005	2,117	12	31	7	0	0	244	0
		2006	1,992	9	19	4	0	0	410	0
		2007	1,947	17	40	3	-	0	493	6
All Alaska	All gear	2004	6,390	1,475	78	447	100	67	968	1,947
		2005	6,271	704	105	708	134	9	1,960	3,421
		2006	5,940	494	106	328	121	62	1,735	1,251
		2007	5,983	426	169	94	128	546	1,714	2,518

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, 2006-07 (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)
2006 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	.1	.0	.0	.0	.2
		Pacific cod	n.a.	.0	.0	.0	.4	.0	.0	.0
		Arrowtooth	n.a.	.0	.0	.0	.0	.0	.0	.0
		Total	n.a.	.0	.0	.1	.4	.0	.0	.2
	Pot	Pacific cod	18.5	.0	.0	.0	103.4	.4	.0	.0
		Total	18.5	.0	.0	.0	103.4	.4	.0	.0
	Trawl	Pollock, bottom	67.9	3.6	.0	.0	8.1	.0	10.1	.6
		Pollock, pelagic	.4	5.2	.0	.0	75.9	.0	5.8	.8
		Pacific cod	344.8	.0	.0	.0	.7	.0	.9	.0
		Arrowtooth	612.7	.1	.0	.0	88.4	.1	.4	.4
		Flathd. sole	22.6	.0	.0	.0	25.9	.0	.1	.0
		Rex sole	129.2	.0	.0	.0	73.5	.0	1.4	.6
		Flat shallow	625.7	.0	.3	.0	32.5	.0	.0	.0
		Rockfish	170.5	.0	.0	.1	1.0	.0	.3	1.8
		Total	1,973.8	8.9	.3	.1	306.1	.1	19.0	4.2
	All gear	Total	1,992.3	8.9	.3	.1	409.8	.5	19.0	4.4

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)
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	18.8	.0	.0	.0	290.4	3.6	.0	.0
		Total	18.8	.0	.0	.0	290.4	3.6	.0	.0
	Trawl	Pollock, bottom	78.4	6.4	.0	.0	19.3	.0	7.6	.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	479.1	.0	.0	.0	15.5	.0	.6	.1
		Arrowtooth	440.8	.0	.0	.0	43.6	.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	683.9	.1	.0	.0	78.4	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	1,927.8	16.7	.0	.1	202.7	2.0	39.7	3.4
	All gear	Total	1,946.6	16.7	.0	.2	493.4	5.6	39.8	3.5

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, 2006-07 (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)
2006 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	.4	.0	.0	.0	.0
		Pacific cod	435.0	.0	7.8	2.3	13.7	42.6	.0	.4
		Arrowtooth	1.5	.0	.0	.7	.0	.0	.0	.0
		Turbot	11.7	.0	.0	.4	.0	.0	.0	.0
		Total	452.4	.0	7.8	3.8	13.8	42.6	.0	.5
	Pot	Sablefish	.8	.0	1.7	46.7	.0	.1	.0	.0
		Pacific cod	4.3	.0	5.3	.3	390.4	197.5	.0	.0
		Total	5.1	.0	6.9	46.9	390.4	197.7	.0	.0
	Trawl	Pollock, bottom	10.6	213.9	.2	.0	.6	.0	3.1	14.8
		Pollock, pelagic	111.6	221.3	.0	.0	1.1	2.9	79.6	293.6
		Pacific cod	1,445.9	7.8	6.0	1.9	189.0	101.5	3.6	7.5
		Arrowtooth	122.9	.1	.8	.0	25.4	6.1	.3	5.4
		Flathd. sole	350.9	1.9	.8	.0	230.7	114.9	.3	.8
		Rock sole	812.5	14.0	60.8	.3	131.8	73.9	.1	.7
		Yellowfin	496.7	25.0	37.5	1.5	339.2	710.0	.0	.1
		Flat, other	14.7	.1	.0	.0	2.3	.4	.0	.0
		Rockfish	28.8	.0	.1	2.7	.0	.0	.0	.0
		Atka mack.	89.6	1.3	.0	4.5	.0	.1	.0	.4
		Total	3,491.0	485.4	106.2	10.9	921.5	1,010.4	87.0	323.3
	All gear	Total	3,947.9	485.4	120.9	61.7	1,325.0	1,250.6	87.0	323.8

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 (1,000 s)
2007 Gear/ Target	Hook & Line	Sablefish	n.a.	.0	.0	1.3	.0	.0	.0	.0
		Pacific cod	532.5	.0	6.0	.7	14.9	37.1	.1	.2
		Arrowtooth	1.1	.0	.0	.4	.0	.0	.0	.0
		Turbot	6.0	.0	.0	2.6	.0	.0	.0	.0
		Rockfish	.1	.0	.0	.0	.0	.0	.0	.0
		Total	540.0	.0	6.0	5.2	14.9	37.2	.1	.2
	Pot	Sablefish	1.1	.0	.0	299.6	.3	.1	.0	.0
		Pacific cod	.8	.0	25.0	232.8	481.6	642.1	.0	.0
		Total	1.9	.0	25.0	532.4	481.9	642.2	.0	.0
	Trawl	Pollock, bottom	29.0	6.7	.0	.0	.6	.3	12.6	3.9
		Pollock, pelagic	263.8	338.3	.0	.0	.9	2.9	109.1	83.3
		Pacific cod	1,030.6	1.0	1.6	2.6	135.7	250.0	6.3	1.6
		Arrowtooth	16.6	.4	.0	.2	21.9	4.8	.1	.0
		Flathd. sole	323.4	1.9	.9	.0	144.7	265.4	.0	.1
		Rock sole	946.9	5.9	79.9	1.0	87.2	70.4	.8	.3
		Yellowfin	589.1	55.2	14.2	.4	326.3	1,224.9	.2	.1
		Flat, other	74.4	.0	.1	.0	4.6	.0	.0	.0
		Rockfish	17.0	.0	.2	3.0	.0	.0	.0	.0
		Atka mack.	198.2	.0	.3	1.5	.4	.2	.3	.7
		Total	3,495.4	409.4	97.2	8.7	723.9	1,833.5	129.4	89.9
	All gear	Total	4,036.1	409.4	128.3	546.3	1,220.5	2,512.7	129.5	90.1

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, 2006-07 (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)
2006 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	.027	.004	.000	.000	.109
		Pacific cod	n.a.	.000	.000	.000	.057	.003	.000	.000
		Arrowtooth	n.a.	.000	.000	.000	.585	.000	.000	.000
		Total	n.a.	.000	.000	.006	.046	.003	.000	.024
	Pot	Pacific cod	.001	.000	.000	.000	6.660	.024	.000	.000
		Total	.001	.000	.000	.000	6.660	.024	.000	.000
	Trawl	Pollock, bottom	.002	.000	.000	.000	.230	.000	.286	.017
		Pollock, pelagic	.000	.000	.000	.000	1.849	.000	.142	.020
		Pacific cod	.030	.000	.000	.000	.064	.000	.077	.000
		Arrowtooth	.029	.000	.000	.000	4.162	.004	.019	.020
		Flathd. sole	.014	.000	.000	.000	15.746	.000	.034	.000
		Rex sole	.018	.000	.000	.000	10.260	.000	.202	.078
		Flat shallow	.056	.000	.031	.000	2.933	.000	.000	.000
		Rockfish	.007	.000	.000	.003	.038	.000	.010	.072
		Total	.013	.000	.002	.000	1.982	.000	.123	.027
	All gear	Total	.011	.000	.002	.001	2.289	.003	.106	.025

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)
2006 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	.027	.004	.000	.000	.109
		Pacific cod	n.a.	.000	.000	.000	.057	.003	.000	.000
		Arrowtooth	n.a.	.000	.000	.000	.585	.000	.000	.000
		Total	n.a.	.000	.000	.006	.046	.003	.000	.024
	Pot	Pacific cod	.001	.000	.000	.000	6.660	.024	.000	.000
		Total	.001	.000	.000	.000	6.660	.024	.000	.000
	Trawl	Pollock, bottom	.002	.000	.000	.000	.230	.000	.286	.017
		Pollock, pelagic	.000	.000	.000	.000	1.849	.000	.142	.020
		Pacific cod	.030	.000	.000	.000	.064	.000	.077	.000
		Arrowtooth	.029	.000	.000	.000	4.162	.004	.019	.020
		Flathd. sole	.014	.000	.000	.000	15.746	.000	.034	.000
		Rex sole	.018	.000	.000	.000	10.260	.000	.202	.078
		Flat shallow	.056	.000	.031	.000	2.933	.000	.000	.000
		Rockfish	.007	.000	.000	.003	.038	.000	.010	.072
		Total	.013	.000	.002	.000	1.982	.000	.123	.027
	All gear	Total	.011	.000	.002	.001	2.289	.003	.106	.025

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, 2006-07 (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)
2006 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	.798	.000	.000	.000	.024
		Pacific cod	.004	.000	.065	.019	.115	.357	.000	.004
		Arrowtooth	.002	.000	.005	.716	.000	.000	.000	.000
		Turbot	.007	.000	.009	.213	.015	.000	.005	.014
		Total	.004	.000	.063	.031	.112	.348	.000	.004
	Pot	Sablefish	.001	.000	1.444	40.417	.000	.122	.000	.000
		Pacific cod	.000	.000	.258	.012	19.164	9.697	.000	.000
		Total	.000	.000	.322	2.180	18.132	9.182	.000	.000
	Trawl	Pollock, bottom	.000	.008	.006	.000	.021	.001	.108	.524
		Pollock, pelagic	.000	.000	.000	.000	.001	.002	.052	.193
		Pacific cod	.017	.000	.070	.022	2.215	1.189	.042	.088
		Arrowtooth	.032	.000	.205	.010	6.556	1.576	.067	1.385
		Flathd. sole	.017	.000	.037	.000	10.914	5.437	.014	.038
		Rock sole	.017	.000	1.251	.005	2.711	1.519	.003	.015
		Yellowfin	.004	.000	.301	.012	2.719	5.691	.000	.000
		Flat, other	.030	.000	.000	.000	4.635	.864	.000	.000
		Rockfish	.003	.000	.006	.269	.000	.000	.000	.000
		Atka mack.	.001	.000	.000	.065	.000	.002	.000	.006
		Total	.002	.000	.055	.006	.481	.527	.045	.169
	All gear	Total	.002	.000	.059	.030	.643	.607	.042	.157

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)
2007 Gear/ Target	Hook & Line	Sablefish	n.a.	.000	.000	2.584	.000	.006	.000	.007
		Pacific cod	.006	.000	.062	.007	.154	.384	.001	.002
		Arrowtooth	.010	.000	.000	3.156	.000	.263	.000	.000
		Turbot	.003	.000	.026	1.381	.004	.011	.000	.008
		Rockfish	.015	.000	.000	.000	.000	.000	.000	.000
		Total	.005	.000	.061	.052	.150	.374	.001	.002
	Pot	Sablefish	.001	.000	.000	183.410	.169	.050	.000	.000
		Pacific cod	.000	.000	1.348	12.544	25.948	34.598	.001	.000
		Total	.000	.000	1.238	26.342	23.843	31.777	.001	.000
	Trawl	Pollock, bottom	.001	.000	.000	.000	.021	.011	.430	.134
		Pollock, pelagic	.000	.000	.000	.000	.001	.002	.078	.060
		Pacific cod	.011	.000	.018	.028	1.482	2.731	.069	.017
		Arrowtooth	.011	.000	.000	.126	13.909	3.056	.069	.000
		Flathd. sole	.015	.000	.040	.002	6.552	12.019	.000	.003
		Rock sole	.023	.000	1.949	.024	2.127	1.718	.020	.006
		Yellowfin	.004	.000	.093	.002	2.122	7.967	.001	.000
		Flat, other	.024	.000	.016	.000	1.504	.000	.000	.000
		Rockfish	.001	.000	.013	.199	.000	.000	.000	.000
		Atka mack.	.003	.000	.005	.022	.006	.003	.004	.010
		Total	.002	.000	.053	.005	.397	1.007	.071	.049
	All gear	Total	.002	.000	.066	.281	.629	1.295	.067	.046

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, 1984-2007 ($ millions, base year = 2007)

	Shellfish	Salmon	Herring	Halibut	Groundfish	Total
1984	182.6	605.7	36.0	34.6	49.3	908.2
1985	183.7	669.4	63.4	64.4	74.6	1,055.5
1986	307.4	678.9	64.5	117.8	111.9	1,280.5
1987	351.7	773.0	68.1	124.7	224.1	1,541.6
1988	371.3	1,174.0	88.3	104.2	381.7	2,119.4
1989	424.7	770.8	28.4	128.4	514.6	1,867.1
1990	519.4	799.7	35.1	127.1	657.5	2,138.9
1991	426.3	424.8	40.5	129.7	661.1	1,682.4
1992	464.4	754.7	37.4	66.5	850.2	2,173.2
1993	445.1	529.9	19.1	72.6	552.4	1,619.0
1994	425.7	562.5	28.6	112.3	659.4	1,788.6
1995	367.8	644.8	50.8	77.4	753.2	1,894.0
1996	223.8	442.6	57.2	94.8	645.8	1,464.1
1997	216.2	311.3	20.0	133.8	726.1	1,407.3
1998	271.7	301.5	13.4	116.9	480.4	1,183.8
1999	332.0	423.2	17.4	143.1	566.4	1,482.1
2000	170.7	295.1	11.5	161.3	716.7	1,355.3
2001	144.3	220.3	12.2	139.4	683.7	1,199.9
2002	171.1	149.4	10.5	148.3	712.2	1,191.5
2003	197.4	189.2	10.0	186.7	681.9	1,265.2
2004	182.1	278.7	15.3	184.4	682.5	1,343.0
2005	168.6	310.5	14.2	179.9	782.9	1,456.0
2006	127.6	283.3	7.7	197.8	830.3	1,446.6
2007	180.9	347.6	14.8	217.4	791.5	1,552.2

Note: The value added by at-sea processing is not included in these estimates of ex-vessel value. The data have been adjusted to 2007 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, 1984-2007.

	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	15.4%	22.1%	1.4%	9.5%	51.6%
1998	22.9%	25.5%	1.1%	9.9%	40.6%
1999	22.4%	28.6%	1.2%	9.7%	38.2%
2000	12.6%	21.8%	.8%	11.9%	52.9%
2001	12.0%	18.4%	1.0%	11.6%	57.0%
2002	14.4%	12.5%	.9%	12.4%	59.8%
2003	15.6%	15.0%	.8%	14.8%	53.9%
2004	13.6%	20.8%	1.1%	13.7%	50.8%
2005	11.6%	21.3%	1.0%	12.4%	53.8%
2006	8.8%	19.6%	.5%	13.7%	57.4%
2007	11.7%	22.4%	1.0%	14.0%	51.0%

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, 2003-07 ($/lb, round weight).

		Gulf of Alaska		Bering Sea and Aleutians		All Alaska
		Fixed	Trawl	Fixed	Trawl	All gear
Pollock	2003	.081	.095	.049	.107	.106
	2004	.060	.102	-	.106	.106
	2005	.086	.124	.074	.125	.125
	2006	.081	.135	-	.128	.129
	2007	.110	.145	-	.129	.130
Sablefish	2003	2.435	1.749	2.229	.951	2.369
	2004	2.122	1.691	1.827	.837	2.056
	2005	2.258	1.708	2.033	.900	2.183
	2006	2.710	2.048	2.302	1.070	2.620
	2007	2.818	1.858	2.236	1.082	2.692
Pacific cod	2003	.307	.283	.292	.268	.283
	2004	.267	.251	.254	.219	.245
	2005	.297	.269	.294	.232	.269
	2006	.396	.369	.444	.346	.384
	2007	.487	.494	.463	.427	.464
Flatfish	2003	-	.116	.188	.143	.142
	2004	-	.085	-	.165	.160
	2005	-	.117	-	.198	.192
	2006	-	.139	.106	.200	.193
	2007	-	.153	-	.188	.185
Rockfish	2003	.707	.145	.614	.128	.156
	2004	.746	.159	.737	.153	.178
	2005	.693	.230	.738	.229	.246
	2006	.703	.238	.725	.266	.263
	2007	.713	.186	.626	.223	.214
Atka mackerel	2003	-	.169	-	.105	.106
	2004	-	.129	-	.115	.115
	2005	-	.155	-	.119	.120
	2006	-	.134	-	.125	.125
	2007	-	.125	-	.154	.154

Notes: 1) Prices do not include the value added by at-sea processing; therefore they reflect prices prior to processing. Prices do reflect the value added by dressing fish at sea, where the fish have not been frozen. Except where noted, unfrozen landings price is calculated as landed value divided by estimated or actual round weight.
2) 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.
3) 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, 2003-07, ($ millions).

			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 species	2003	107.0	20.7	127.7	220.4	257.4	477.8	327.4	278.1	605.6
		2004	106.5	17.5	124.0	209.1	291.1	500.2	315.6	308.7	624.3
		2005	119.8	18.6	138.4	240.9	360.8	601.7	360.7	379.4	740.1
		2006	130.6	23.0	153.6	260.2	396.2	656.4	390.9	419.2	810.1
		2007	134.3	24.3	158.7	239.3	393.3	632.6	373.6	417.7	791.3
	Pollock	2003	10.3	.1	10.4	181.3	120.7	302.0	191.6	120.8	312.3
		2004	12.1	.0	12.2	185.5	149.7	335.2	197.7	149.8	347.4
		2005	21.5	.1	21.6	216.8	175.6	392.4	238.2	175.7	413.9
		2006	19.8	.1	19.9	223.8	185.8	409.6	243.6	185.9	429.5
		2007	13.6	.1	13.7	200.1	169.2	369.4	213.7	169.3	383.1
	Sablefish	2003	62.0	9.8	71.8	6.4	2.6	9.0	68.4	12.4	80.8
		2004	60.2	9.1	69.2	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	66.9	12.7	79.6
		2006	66.3	9.1	75.4	3.1	3.1	6.2	69.4	12.2	81.6
		2007	64.4	9.9	74.3	1.7	3.2	4.9	66.1	13.1	79.2
	Pacific cod	2003	26.7	5.1	31.8	30.8	87.0	117.8	57.5	92.1	149.6
		2004	27.4	3.8	31.2	20.0	81.7	101.7	47.4	85.5	132.9
		2005	26.3	1.3	27.6	18.9	94.8	113.7	45.2	96.1	141.4
		2006	33.1	4.4	37.5	30.4	117.7	148.2	63.5	122.1	185.6
		2007	44.3	6.8	51.1	34.6	124.7	159.3	78.9	131.4	210.3
	Flatfish	2003	1.4	2.2	3.6	.9	33.2	34.1	2.3	35.4	37.6
		2004	1.4	.6	2.0	.7	39.3	40.0	2.1	39.9	42.0
		2005	2.7	1.4	4.2	1.0	57.2	58.2	3.8	58.6	62.4
		2006	5.2	2.2	7.4	2.1	61.3	63.4	7.4	63.5	70.8
		2007	6.1	2.1	8.2	2.5	65.2	67.7	8.6	67.3	75.9
	Rockfish	2003	4.5	3.2	7.7	.3	3.7	4.0	4.9	6.9	11.7
		2004	4.8	3.7	8.5	.2	3.8	4.0	4.9	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	.2	8.4	8.6	5.2	13.5	18.8
	Atka mackerel	2003	.0	.1	.1	.7	9.7	10.4	.7	9.8	10.5
		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	.1	19.2	19.3	.1	19.4	19.5

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	2003	31.9	8.1	40.0	204.3	183.1	387.4	236.2	191.2	427.4
		2004	27.6	6.7	34.3	198.5	222.4	420.9	226.1	229.0	455.2
		2005	36.4	9.3	45.7	229.1	266.3	495.4	265.6	275.5	541.1
		2006	40.8	11.4	52.3	240.5	290.0	530.5	281.3	301.4	582.7
		2007	40.5	10.2	50.7	221.9	295.4	517.4	262.5	305.6	568.1
	Pollock	2003	10.3	.1	10.3	181.3	119.5	300.8	191.6	119.6	311.2
		2004	12.1	.0	12.2	185.5	148.7	334.2	197.6	148.7	346.4
		2005	21.5	.1	21.6	216.8	174.7	391.4	238.2	174.7	413.0
		2006	19.8	.1	19.8	223.8	185.1	408.9	243.6	185.1	428.7
		2007	13.6	.1	13.7	200.1	168.4	368.6	213.7	168.5	382.3
	Sablefish	2003	1.9	1.8	3.7	.0	.3	.4	1.9	2.1	4.1
		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
	Pacific cod	2003	14.6	.9	15.5	21.1	17.6	38.7	35.8	18.5	54.2
		2004	8.2	.7	9.0	11.9	18.7	30.7	20.2	19.5	39.6
		2005	6.1	.5	6.7	10.9	14.6	25.5	17.1	15.1	32.1
		2006	8.9	.9	9.7	14.0	21.5	35.5	22.9	22.3	45.2
		2007	14.7	1.1	15.9	19.0	35.0	54.1	33.8	36.2	69.9
	Flatfish	2003	1.4	2.2	3.6	.9	32.3	33.2	2.3	34.5	36.8
		2004	1.4	.6	2.0	.7	38.6	39.3	2.1	39.2	41.3
		2005	2.7	1.4	4.2	1.0	56.3	57.3	3.8	57.7	61.4
		2006	5.2	2.2	7.4	2.1	60.2	62.3	7.4	62.4	69.7
		2007	6.1	2.1	8.2	2.5	64.2	66.7	8.6	66.3	74.9
	Rockfish	2003	3.2	2.8	6.0	.2	3.4	3.6	3.4	6.3	9.7
		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	3.7	4.9	8.6	.2	8.1	8.3	3.8	13.1	16.9
	Atka mackerel	2003	.0	.1	.1	.7	9.7	10.4	.7	9.8	10.5
		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	.1	19.2	19.3	.1	19.4	19.5

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	2003	66.9	12.6	79.5	3.9	73.3	77.2	70.8	85.9	156.7
		2004	65.0	10.7	75.7	2.4	66.9	69.3	67.4	77.6	145.0
		2005	68.0	9.2	77.2	4.2	92.3	96.5	72.1	101.6	173.7
		2006	71.1	11.4	82.5	4.0	103.0	107.0	75.1	114.4	189.5
		2007	70.9	13.5	84.4	2.8	94.5	97.3	73.7	108.0	181.7
	Sablefish	2003	60.1	8.0	68.0	3.4	2.3	5.7	63.4	10.3	73.7
		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	63.7	7.7	71.4	3.1	2.6	5.7	66.8	10.3	77.0
		2007	62.5	8.2	70.7	1.7	2.5	4.2	64.2	10.7	74.9
	Pacific cod	2003	4.7	4.1	8.8	.4	68.4	68.8	5.1	72.6	77.6
		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	5.6	3.3	9.0	.8	93.2	94.0	6.4	96.6	103.0
		2007	6.9	4.9	11.8	1.0	86.7	87.7	7.9	91.6	99.5
	Flatfish	2003	-	.0	.0	-	.9	.9	-	.9	.9
		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	-	1.0	1.0	-	1.0	1.0
	Rockfish	2003	1.4	.4	1.7	.1	.2	.3	1.5	.6	2.1
		2004	1.7	.2	2.0	.1	.2	.3	1.8	.4	2.2
		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	2.1
		2007	1.4	.2	1.6	.0	.3	.3	1.4	.5	1.9
Pot	Pacific cod	2003	7.5	.1	7.5	9.2	1.0	10.2	16.7	1.0	17.7
		2004	13.9	.2	14.0	7.6	1.8	9.4	21.4	2.0	23.4
		2005	15.3	.1	15.4	7.5	2.2	9.7	22.8	2.3	25.1
		2006	18.6	.2	18.8	15.6	3.0	18.6	34.2	3.2	37.4
		2007	22.7	.7	23.4	14.5	3.0	17.5	37.3	3.6	40.9

Note: These estimates include only catch counted against federal TACs. 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, 1997-2007. ($ millions)

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		<60	60-125	>=125	<60	60-125	>=125	<60	60-125	>=125
Fixed	1997	42.6	27.5	.1	.9	5.8	1.3	43.5	33.2	1.4
	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
Trawl	1997	11.5	28.1	4.2	-	42.1	56.6	11.5	70.2	60.8
	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
All gear	1997	54.0	55.6	4.3	.9	47.8	57.9	54.9	103.4	62.2
	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

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, 1997-2007. ($ thousands)

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		<60	60-124	>=125	<60	60-124	>=125	<60	60-124	>=125
Fixed	1997	49	186	16	19	61	88	50	184	74
	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
Trawl	1997	191	319	167	-	592	1,825	191	638	1,960
	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
All gear	1997	60	245	142	19	290	1,259	61	368	1,243
	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

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, 2003-07, ($ millions).

		Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
		Alaska	Other	Unknown	Alaska	Other	Unknown	Alaska	Other	Unknown
All groundfish	2003	63.2	64.5	.0	17.1	460.7	.0	80.4	525.2	.0
	2004	61.9	62.2	.0	15.1	485.2	.0	76.9	547.3	.0
	2005	65.6	72.7	.0	12.3	589.4	.0	78.0	662.1	.0
	2006	72.7	81.0	.0	14.7	641.6	.1	87.4	722.5	.1
	2007	79.1	79.6	.0	15.1	617.5	.0	94.2	697.1	.0
Pollock	2003	3.7	6.6	.0	3.0	299.0	.0	6.7	305.7	.0
	2004	4.6	7.6	.0	3.1	332.1	.0	7.7	339.7	.0
	2005	8.1	13.5	.0	3.4	388.9	.0	11.5	402.4	.0
	2006	7.5	12.4	.0	1.8	407.7	.1	9.3	420.1	.1
	2007	5.2	8.5	.0	2.1	367.2	.0	7.3	375.7	.0
Sablefish	2003	36.4	35.4	.0	2.9	6.2	.0	39.2	41.6	.0
	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	37.1	38.3	.0	1.5	4.7	.0	38.6	43.0	.0
	2007	36.9	37.3	.0	1.2	3.7	.0	38.1	41.0	.0
Pacific cod	2003	18.4	13.4	.0	9.8	108.0	.0	28.2	121.4	.0
	2004	18.7	12.6	.0	9.2	92.5	.0	27.9	105.0	.0
	2005	18.4	9.3	.0	7.3	106.4	.0	25.7	115.7	.0
	2006	23.7	13.8	.0	11.3	136.8	.1	35.0	150.6	.1
	2007	33.0	18.1	.0	11.7	147.5	.0	44.7	165.6	.0
Flatfish	2003	.8	2.8	.0	1.2	32.8	.0	2.0	35.6	.0
	2004	.7	1.3	.0	1.0	38.9	.0	1.7	40.2	.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	67.7	.0	1.9	74.0	.0
Rockfish	2003	2.3	5.5	.0	.1	3.9	.0	2.4	9.3	.0
	2004	2.4	6.1	.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
Atka mackerel	2003	.0	.1	.0	.1	10.2	.0	.2	10.3	.0
	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

Note: These estimates include only catches counted against federal TACs. 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, 2001-07. ($ millions)

	2001	2002	2003	2004	2005	2006	2007
Bering Sea Pollock	157.6	174.7	173.3	166.1	191.1	199.8	178.3
AK Peninsula/Aleutians	25.7	28.2	34.9	29.5	34.1	46.5	52.4
Kodiak	30.9	40.5	27.0	28.7	40.5	50.0	56.1
South Central	18.1	18.1	23.8	23.9	24.1	22.1	22.1
Southeastern	30.9	29.6	34.6	35.0	32.9	32.8	30.0
TOTAL	263.2	291.2	293.6	283.1	322.7	351.2	338.8

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, 2001-07. (percent)

	2001	2002	2003	2004	2005	2006	2007
Bering Sea Pollock	81.5	77.9	75.1	74.3	76.7	80.0	71.7
AK Peninsula/Aleutians	22.6	23.8	21.8	16.2	16.6	21.9	22.3
Kodiak	45.3	55.8	41.6	39.9	40.0	44.0	41.5
South Central	19.7	18.9	22.4	17.5	15.0	16.7	12.6
Southeastern	18.9	22.5	23.9	18.7	18.5	16.2	14.1
TOTAL	41.0	44.9	41.1	34.7	35.3	37.6	32.9

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 the EEZ and State waters.
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, 2003-07 (1,000 metric tons product weight and million dollars).

		2003		2004		2005		2006		2007	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Pollock	Whole fish	4.30	$2.9	3.58	$2.7	1.45	$1.2	.85	$.5	.77	$.5
	Head & gut	8.35	$9.8	18.27	$17.9	21.08	$23.4	22.42	$27.8	31.23	$45.3
	Roe	22.80	$270.1	26.37	$345.7	25.47	$346.2	30.17	$293.5	29.91	$258.5
	Deep-skin fill.	47.08	$118.1	46.87	$120.9	40.40	$111.0	53.96	$155.7	66.93	$203.8
	Other fillets	112.53	$223.4	115.60	$242.7	116.05	$287.5	120.01	$326.4	105.40	$288.1
	Surimi	203.56	$317.8	187.14	$290.5	200.35	$425.7	182.31	$372.0	161.11	$351.6
	Minced fish	15.53	$18.6	19.84	$25.8	17.41	$24.7	29.55	$52.4	26.33	$43.5
	Fish meal	47.24	$36.1	56.24	$43.4	65.46	$48.8	54.66	$58.5	39.16	$41.9
	Other products	20.49	$10.2	18.52	$11.3	25.64	$15.7	25.58	$21.2	15.79	$15.2
	All products	481.88	$1,007.0	492.43	$1,100.9	513.31	$1,284.2	519.51	$1,308.2	476.63	$1,248.4
Pacific cod	Whole fish	4.13	$4.8	2.34	$2.5	2.05	$2.6	1.11	$1.8	1.28	$2.5
	Head & gut	72.33	$177.6	90.58	$215.9	81.67	$238.1	79.87	$283.9	80.25	$320.3
	Salted/split	-	-	-	-	-	-	.98	$3.9	-	-
	Fillets	16.61	$80.4	9.44	$44.3	9.34	$54.9	10.95	$75.9	6.64	$51.9
	Other products	16.49	$24.4	10.62	$20.3	11.66	$25.8	12.08	$26.6	11.45	$27.0
	All products	109.56	$287.1	112.98	$283.1	104.72	$321.4	104.99	$392.1	99.62	$401.7
Sablefish	Head & gut	9.80	$89.7	11.05	$93.7	10.85	$98.1	10.69	$109.5	10.08	$106.4
	Other products	.89	$5.5	.21	$1.1	.38	$3.6	.54	$4.4	.55	$3.4
	All products	10.68	$95.1	11.27	$94.8	11.23	$101.7	11.22	$113.8	10.63	$109.9

Table 25. Continued.

		2003		2004		2005		2006		2007	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Flatfish	Whole fish	14.27	$15.2	14.08	$14.3	23.67	$30.5	25.74	$33.3	26.53	$34.9
	Head & gut	54.67	$65.4	56.29	$78.8	66.94	$112.1	73.35	$121.7	74.72	$119.8
	Kirimi	3.68	$4.3	1.81	$2.5	1.62	$1.7	-	-	-	-
	Fillets	1.02	$4.0	1.01	$2.8	.43	$2.3	.74	$3.6	.92	$4.4
	Other products	.74	$1.0	1.39	$1.6	1.14	$1.5	1.54	$1.5	1.92	$2.6
	All products	74.39	$89.9	74.58	$100.1	93.80	$148.0	101.38	$160.2	104.09	$161.7
Rockfish	Whole fish	1.65	$4.0	2.37	$2.9	2.16	$4.2	2.82	$5.5	1.56	$4.6
	Head & gut	11.09	$15.4	10.77	$18.2	11.31	$27.2	14.79	$40.6	15.77	$34.5
	Other products	2.06	$5.9	1.40	$4.1	.83	$2.8	.50	$2.7	1.25	$6.6
	All products	14.81	$25.2	14.53	$25.1	14.31	$34.2	18.12	$48.8	18.59	$45.8
Atka mackerel	Whole fish	7.13	$4.0	5.00	$3.1	.89	$.6	2.57	$2.1	-	-
	Head & gut	20.89	$20.1	24.90	$26.0	32.99	$36.0	32.74	$36.6	32.67	$44.9
	All products	28.02	$24.1	29.90	$29.1	33.88	$36.5	35.31	$38.8	32.68	$44.9
All species	Total	735.65	$1,555.2	758.89	$1,665.8	790.36	$1,962.6	799.80	$2,075.2	754.24	$2,043.8

Notes: Total includes additional species not listed in the production details as well as confidential data from Tables 28 and 29. For shoreside processors, these estimates include production resulting from catch from federal and state of Alaska fisheries. For at-sea processors, they include production only from catch counted against federal TACs.

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, 2003-07 (dollars).

		2003		2004		2005		2006		2007	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Pollock	Whole fish	$.33	$.26	$.34	$.38	$.39	$.29	$.28	$.28	$.28	$.28
	H&G	$.53	-	$.45	$.44	$.53	$.44	$.58	$.54	$.67	$.62
	Roe	$6.12	$4.31	$6.68	$4.91	$6.77	$5.42	$5.09	$3.62	$4.61	$3.07
	Deep-skin	$1.15	$1.11	$1.21	$1.04	$1.25	-	$1.35	$1.22	$1.46	$1.25
	Other fillets	$.85	$.94	$.97	$.94	$1.12	$1.12	$1.25	$1.22	$1.25	$1.23
	Surimi	$.71	$.70	$.75	$.66	$1.03	$.90	$1.01	$.84	$1.08	$.88
	Minced fish	$.54	-	$.59	-	$.64	-	$.82	$.77	$.77	$.70
	Fish meal	$.35	$.34	$.37	$.33	$.38	$.32	$.52	$.46	$.53	$.44
	Other products	$.31	$.22	$.17	$.29	$.48	$.25	-	$.38	$.56	$.42
	All products	$1.03	$.86	$1.16	$.87	$1.28	$1.00	$1.28	$1.00	$1.29	$1.06
Pacific cod	Whole fish	$.41	$.56	$.43	$.54	$.56	$.58	$.65	$.79	$.66	$.92
	H&G	$1.13	$.97	$1.09	$1.04	$1.29	$1.50	$1.67	$1.38	$1.86	$1.64
	Salted/split	-	-	-	-	-	-	-	$1.82	-	-
	Fillets	$2.29	$2.18	$2.20	$2.13	$2.07	$2.72	$3.35	$3.12	$2.74	$3.63
	Other products	$.89	$.59	$1.02	$.80	$1.32	$.81	$1.21	$.94	$1.30	$.96
	All products	$1.14	$1.29	$1.09	$1.26	$1.29	$1.65	$1.66	$1.76	$1.84	$1.81
Sablefish	H&G	$3.67	$4.25	$3.41	$3.93	$3.75	$4.18	$4.19	$4.72	$4.37	$4.87
	Other products	$1.30	$2.91	$1.63	$2.63	$1.70	$4.72	$1.52	$3.72	$1.39	$3.00
	All products	$3.58	$4.13	$3.35	$3.91	$3.68	$4.20	$4.18	$4.67	$4.26	$4.77
Deep-water flatfish	Whole fish	$.19	-	-	-	-	-	-	-	-	-
	H&G	$.32	-	-	-	$.31	-	-	$.65	$.69	$.48
	Fillets	-	$1.52	-	-	-	$1.97	-	-	-	-
	All products	$.32	$1.52	-	-	$.31	$1.97	-	$.65	$.69	$.48

Table 26. Continued.

		2003		2004		2005		2006		2007	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Shallow-water flatfish	Whole fish	-	$.36	-	$.56	-	$.50	-	$.47	-	$.56
	H&G	$.30	-	$.54	-	$.75	-	$.78	$.63	$.66	$.69
	Fillets	-	$2.02	-	$2.10	-	$2.46	-	$2.21	-	$2.19
	Other products	$1.10	-	$.88	-	$1.23	-	$1.41	-	$1.25	-
	All products	$.33	$1.82	$.55	$1.21	$.76	$.98	$.90	$1.01	$.77	$.75
Other flatfish	Whole fish	$.96	-	$.97	-	$1.15	-	$1.08	-	$.99	-
	H&G	$.23	-	$.43	-	$.67	-	$.48	-	$.71	-
	Other products	$.30	-	$.32	-	$.26	-	$.29	-	$.42	-
	All products	$.90	-	$.92	-	$1.09	-	$.86	-	$.85	-
Arrowtooth	Whole fish	$.25	-	-	-	-	-	-	-	-	-
	H&G	$.39	-	$.54	-	$.72	$.63	$.57	$.47	$.51	$.45
	Fillets	-	-	-	$.72	-	-	-	-	-	-
	Other products	$.15	-	$.32	$.48	$.25	-	$.29	-	$.37	-
	All products	$.38	-	$.54	$.60	$.72	$.63	$.57	$.47	$.51	$.45
Flathead sole	Whole fish	-	$.44	-	-	$.53	$.38	$.35	$.35	$.39	$.68
	H&G	$.57	-	$.68	-	$.87	$.49	$.87	-	$.89	$.55
	Fillets	-	$2.00	-	$2.16	-	$2.56	-	-	-	$2.36
	Other products	$.89	-	$.83	-	$.99	-	$1.25	-	$.83	-
	All products	$.62	$1.58	$.73	$2.16	$.87	$.91	$.99	$.35	$.88	$1.22
Rock sole	Whole fish	-	-	-	-	$.50	-	$.45	-	$.42	-
	H&G	$.43	-	$.52	-	$.76	-	$.72	-	$.74	-
	H&G with roe	$1.09	-	$1.04	-	$1.19	-	$1.53	-	$1.24	-
	Other products	$.30	-	$.46	-	$.25	-	$.29	-	$.27	-
	All products	$.76	-	$.84	-	$.95	-	$.96	-	$.86	-

Table 26. Continued.

		2003		2004		2005		2006		2007	
		At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside	At-sea	Shoreside
Rex sole	Whole fish	$.92	-	$1.03	$.50	$1.19	$.75	$1.06	$1.07	$.99	$1.24
	H&G	$.42	-	-	-	-	-	-	-	$.80	-
	All products	$.92	-	$1.03	$.50	$1.19	$.75	$1.06	$1.07	$.99	$1.24
Yellowfin sole	Whole fish	$.30	-	$.35	-	$.49	-	$.51	-	$.51	-
	H&G	$.46	-	$.47	-	$.65	-	$.66	-	$.69	-
	Kirimi	$.53	-	$.63	-	$.48	-	-	-	-	-
	Other products	$.36	-	$.35	-	$.35	-	$.39	-	$.56	-
	All products	$.43	-	$.45	-	$.59	-	$.61	-	$.63	-
Greenland turbot	H&G	$1.29	-	$1.46	-	$1.83	-	$1.74	-	$1.34	-
	Other products	$.86	-	$.77	-	$.99	-	$1.05	-	$1.32	-
	All products	$1.19	-	$1.29	-	$1.60	-	$1.71	-	$1.34	-
Rockfish	Whole fish	$1.02	$1.33	$.69	$.47	$1.24	$.72	$1.02	$.84	$1.31	$1.37
	H&G	$.60	$1.22	$.75	$.88	$1.11	$.96	$1.24	$1.27	$1.00	$.91
	Other products	$1.00	$1.30	$.75	$1.32	$.84	$1.55	$.37	$2.56	$.55	$2.56
	All products	$.64	$1.29	$.75	$.88	$1.12	$.99	$1.22	$1.22	$1.01	$1.48
Atka mackerel	Whole fish	$.25	-	$.28	-	$.29	-	$.38	-	-	-
	H&G	$.44	-	$.47	-	$.49	-	$.51	-	$.62	-
	Other products	$.30	-	$.32	-	$.16	-	$.29	-	$.37	-
	All products	$.39	-	$.44	-	$.49	-	$.50	-	$.62	-

Note: 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, 2003-07, (dollars).

		Bering Sea and Aleutians					Gulf of Alaska				
		2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Motherships	Pacific cod	828	1,046	1,142	1,758	1,947	-	-	-	-	-
	Pollock	531	594	443	711	776	-	-	-	-	-
Catcher/ processors	Atka mackerel	537	603	630	657	805	850	370	558	908	402
	Flatfish	701	844	986	981	901	742	1,364	1,263	1,202	1,076
	Other species	470	364	334	321	502	558	484	576	448	1,023
	Pacific cod	1,159	1,172	1,388	1,753	2,053	1,169	1,202	1,277	1,693	1,959
	Pollock	730	816	961	916	1,007	358	346	396	394	607
	Rockfish	696	795	1,213	1,472	1,174	845	869	1,263	1,342	1,055
	Sablefish	4,731	5,099	4,618	5,605	6,338	4,948	4,944	5,117	5,795	6,064
Shoreside processors	Flatfish	100	-	141	-	-	619	521	684	703	771
	Other species	2,070	1,535	401	754	606	805	584	619	549	1,283
	Pacific cod	1,058	959	1,332	1,412	1,663	1,254	1,247	1,371	2,083	1,999
	Pollock	624	681	815	798	792	794	752	866	1,011	1,157
	Rockfish	1,236	664	1,082	1,438	822	735	768	988	1,580	1,355
	Sablefish	6,810	5,870	5,262	7,246	7,311	5,987	5,231	6,315	8,003	7,890

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, 2003-07 (1,000 metric tons product weight).

		Bering Sea and Aleutians					Gulf of Alaska				
		2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Pollock	Whole fish	3.37	3.33	1.32	.38	.13	.92	.25	.13	.47	.64
	Head & gut	8.17	11.06	14.40	15.05	23.54	.18	7.21	6.68	7.37	7.69
	Roe	21.73	25.37	23.90	28.41	27.88	1.08	1.00	1.56	1.76	2.04
	Fillets	154.71	156.52	148.56	164.97	166.28	4.90	5.94	7.89	8.99	6.04
	Surimi	194.89	179.97	191.45	174.37	154.83	8.67	7.17	8.91	7.94	6.29
	Minced fish	15.53	19.84	17.41	29.55	26.33	-	-	-	-	-
	Fish meal	47.24	56.24	65.46	54.66	39.16	-	-	-	-	-
	Other products	19.43	17.72	23.85	23.38	14.76	1.06	.81	1.79	2.20	1.03
Pacific cod	Whole fish	1.96	1.54	1.15	.55	.23	2.18	.80	.90	.56	1.04
	Head & gut	67.98	80.32	75.29	72.41	70.29	4.35	10.26	6.38	7.46	9.96
	Fillets	8.03	2.92	3.45	2.82	.64	8.58	6.52	5.89	8.13	6.00
	Other products	10.30	5.56	6.65	5.80	5.83	6.19	5.06	5.02	6.28	5.63
Sablefish	Head & gut	1.14	1.30	1.50	1.53	1.54	8.66	9.76	9.35	9.16	8.54
	Other products	.37	.01	.01	.01	.02	.52	.21	.38	.53	.53
Flatfish	Whole fish	10.41	12.02	20.60	20.78	21.45	3.86	2.05	3.08	4.96	5.09
	Head & gut	49.27	54.93	60.72	64.12	66.35	5.41	1.37	6.22	9.23	8.37
	Kirimi	3.68	1.81	1.62	-	-	-	-	-	-	-
	Fillets	.00	-	-	-	-	1.02	1.01	.43	.74	.92
	Other products	.74	.83	1.14	1.28	1.92	-	.55	-	.26	-
Rockfish	Whole fish	.67	.33	.40	.43	.26	.98	2.04	1.76	2.39	1.30
	Head & gut	6.02	5.00	4.63	6.01	7.69	5.08	5.76	6.68	8.78	8.08
	Other products	.04	.02	.02	.03	.09	2.02	1.38	.82	.48	1.16
Atka mackerel	Whole fish	7.13	5.00	.89	2.57	-	-	-	-	-	-
	Head & gut	20.72	24.75	32.74	32.39	32.38	.18	.15	.25	.35	.30

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, 2003-07 (1,000 metric tons product weight).

		At-sea					On-shore				
		2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Pollock	Whole fish	2.90	3.34	1.32	.38	.13	1.40	.24	.13	.47	.64
	Head & gut	8.35	11.17	14.48	15.16	22.21	-	7.10	6.59	7.26	9.02
	Roe	13.41	15.43	13.99	16.34	16.52	9.40	10.95	11.47	13.83	13.40
	Fillets	86.48	82.10	82.71	89.71	89.25	73.13	80.37	73.74	84.26	83.07
	Surimi	99.04	93.33	98.56	92.99	89.87	104.53	93.81	101.79	89.32	71.24
	Minced fish	15.53	19.84	17.41	20.45	19.62	-	-	-	9.10	6.71
	Fish meal	22.84	22.10	21.36	21.43	19.70	24.40	34.13	44.10	33.24	19.46
	Other products	1.82	2.00	2.56	-	2.00	18.67	16.52	23.08	25.58	13.78
Pacific cod	Whole fish	1.09	1.23	.85	.55	.23	3.04	1.11	1.20	.56	1.04
	Head & gut	66.37	74.17	69.30	64.63	61.32	5.96	16.41	12.37	15.24	18.93
	Fillets	2.56	.64	.76	.88	.64	14.05	8.80	8.58	10.07	6.00
	Other products	4.75	3.47	4.37	2.80	3.59	11.74	7.16	7.29	9.28	7.86
Sablefish	Head & gut	1.67	1.87	1.88	1.58	1.65	8.13	9.18	8.97	9.11	8.43
	Other products	.07	.06	.07	.01	.06	.82	.15	.32	.53	.49
Flatfish	Whole fish	13.93	13.11	22.31	23.26	23.52	.34	.97	1.37	2.49	3.02
	Head & gut	54.67	56.29	63.35	67.37	69.22	-	-	3.60	5.98	5.50
	Kirimi	3.68	1.81	1.62	-	-	-	-	-	-	-
	Fillets	.00	-	-	-	-	1.02	1.01	.43	.74	.92
	Other products	.74	.83	1.14	1.28	1.92	-	.55	-	.26	-
Rockfish	Whole fish	1.26	.90	.67	.72	.64	.39	1.47	1.50	2.10	.92
	Head & gut	10.48	9.67	9.59	12.09	13.79	.61	1.09	1.71	2.70	1.99
	Other products	.09	.03	.03	.03	.10	1.97	1.37	.81	.48	1.15
Atka mackerel	Whole fish	7.13	5.00	.89	2.57	-	-	-	-	-	-
	Head & gut	20.89	24.90	32.99	32.74	32.67	-	-	-	-	-
	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, 2003-07 (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

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, 2001-07 ($ 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	170.0	99.0	711.2	466.5	1,483.3
2003	39.5	180.5	90.1	773.6	471.5	1,555.2
2004	32.2	195.1	89.3	863.5	485.7	1,665.8
2005	37.6	225.2	109.0	998.8	592.0	1,962.6
2006	47.7	274.4	105.0	1,063.9	584.2	2,075.2
2007	46.5	259.1	109.8	1,096.2	532.2	2,043.8

Note: For shoreside processors, these estimates include production resulting from catch from federal and state of Alaska fisheries. For at-sea processors, they include production only from catch counted against federal TACs. 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, 2001-07 ($ millions).

		Gulf of Alaska		Bering Sea and Aleutians		
		Vessel length		Vessel length		
		<125	>=125	<125	125-165	>165
Fixed Gear	2001	9.7	3.9	23.5	57.3	51.1
	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	52.5	79.0	55.1
Fillet Trawl	2001	-	-	-	-	86.7
	2002	-	-	-	-	97.6
	2003	-	-	-	-	82.7
	2004	-	-	-	-	122.2
	2005	-	-	-	-	133.2
	2006	-	-	-	-	115.3
H&G Trawl	2001	6.7	10.7	19.4	22.0	103.5
	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
Surimi Trawl	2001	-	-	-	-	411.3
	2002	-	-	-	-	357.5
	2003	-	-	-	-	400.6
	2004	-	-	-	-	417.1
	2005	-	-	-	-	465.4
	2006	-	-	-	-	515.6
	2007	-	-	-	-	634.6
All Trawl	2001	6.7	10.7	19.4	22.0	601.6
	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

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

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 2001-07 ($ millions).

		Gulf of Alaska		Bering Sea and Aleutians		
		<125	>=125	<125	125-165	>165
Fixed Gear	2001	.8	.4	1.5	3.0	3.4
	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	3.8	4.9	5.0
Fillet Trawl	2001	-	-	-	-	21.7
	2002	-	-	-	-	19.5
	2003	-	-	-	-	20.7
	2004	-	-	-	-	24.4
	2005	-	-	-	-	26.6
	2006	-	-	-	-	28.8
H&G Trawl	2001	1.1	.9	2.8	5.5	9.4
	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
Surimi Trawl	2001	-	-	-	-	34.3
	2002	-	-	-	-	29.8
	2003	-	-	-	-	30.8
	2004	-	-	-	-	34.8
	2005	-	-	-	-	38.8
	2006	-	-	-	-	39.7
	2007	-	-	-	-	39.7
All Trawl	2001	1.1	.9	2.8	5.5	22.3
	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

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

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, 2001-07. ($ millions)

	2001	2002	2003	2004	2005	2006	2007
Bering Sea Pollock	421.8	450.5	454.3	468.0	557.8	553.8	490.8
AK Peninsula/Aleutians	49.6	61.8	67.9	65.6	90.8	115.6	111.8
Kodiak	69.1	58.9	53.4	67.0	88.9	109.1	118.0
South Central	28.0	24.4	29.8	27.7	33.8	41.2	33.6
Southeastern	41.1	41.0	46.6	52.6	45.9	38.9	37.2
TOTAL	609.5	636.5	652.0	680.9	817.2	858.6	791.3

Table 35. Groundfish gross product value as a percentage of all-species gross product value by shoreside processor group, 2001-07. (percent)

	2001	2002	2003	2004	2005	2006	2007
Bering Sea Pollock	89.0	87.3	86.0	86.3	88.3	89.3	83.7
AK Peninsula/Aleutians	21.4	25.6	22.4	18.6	20.8	24.8	22.0
Kodiak	44.6	48.1	40.1	41.5	39.9	43.4	40.9
South Central	15.3	12.2	15.2	12.1	11.8	15.3	9.4
Southeastern	12.8	14.5	16.2	14.6	14.2	10.5	9.2
TOTAL	43.7	46.1	44.3	40.4	42.0	42.3	36.0

Note: The data are for catch from the EEZ and State waters. 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, 2003-07.

		Gulf of Alaska		Bering Sea and Aleutians			All Alaska		
		Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels
2003	All gear	33	33	5	64	69	5	64	69
	Hook & line	15	15	0	27	27	0	27	27
	Trawl	18	18	5	37	42	5	37	42
2004	All gear	26	26	7	66	73	7	66	73
	Hook & line	13	13	0	28	28	0	28	28
	Pot	0	0	0	2	2	0	2	2
	Trawl	13	13	7	37	44	7	37	44
2005	All gear	27	27	12	70	82	12	70	82
	Hook & line	14	14	0	32	32	0	32	32
	Pot	0	0	0	2	2	0	2	2
	Trawl	13	13	12	37	49	12	37	49
2006	All gear	34	34	15	73	88	15	74	89
	Hook & line	19	19	0	34	34	0	34	34
	Pot	0	0	1	3	4	1	3	4
	Trawl	15	15	15	38	53	15	39	54
2007	All gear	35	35	12	74	86	12	75	87
	Hook & line	20	20	0	34	34	0	34	34
	Pot	0	0	1	1	2	1	1	2
	Trawl	15	15	11	39	50	11	40	51

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, 2003-07.

		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
2003	All gear	1,039	14	1,053	260	18	278	1,187	21	1,208
	Hook & line	872	10	882	69	13	82	899	15	914
	Pot	140	1	141	85	3	88	199	3	202
	Trawl	93	3	96	118	2	120	165	3	168
2004	All gear	1,026	9	1,035	233	16	249	1,162	17	1,179
	Hook & line	855	5	860	50	12	62	878	13	891
	Pot	149	1	150	79	2	81	200	2	202
	Trawl	77	3	80	109	3	112	147	3	150
2005	All gear	925	8	933	215	11	226	1,051	13	1,064
	Hook & line	757	4	761	56	8	64	781	9	790
	Pot	151	1	152	71	1	72	200	1	201
	Trawl	78	3	81	97	2	99	139	3	142
2006	All gear	762	6	768	199	10	209	885	11	896
	Hook & line	590	4	594	46	6	52	610	7	617
	Pot	145	1	146	69	3	72	194	3	197
	Trawl	74	1	75	93	1	94	138	1	139
2007	All gear	656	3	659	206	6	212	777	8	785
	Hook & line	481	2	483	36	4	40	495	5	500
	Pot	137	1	138	69	2	71	183	3	186
	Trawl	75	0	75	103	0	103	139	0	139

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

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

Table 38. Average revenue of groundfish vessels that caught or caught and processed more than $4.0 million ex-vessel value or product value of groundfish and other species, by area, vessel type, and gear, 2003-07. ($ millions)

		Gulf of Alaska		Bering Sea & Aleutians			All Alaska		
		Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels	Catcher Vessels	Catcher/ Process	All Vessels
2003	All gear	7.16	7.16	4.65	13.14	12.52	4.65	13.14	12.52
	Hook & line	5.16	5.16	-	5.42	5.42	-	5.42	5.42
	Trawl	8.82	8.82	4.65	18.77	17.09	4.65	18.77	17.09
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

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 $4.0 million ex-vessel value or product value of groundfish and other species, by area, vessel type and gear, 2003-07. ($ 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
2003	All gear	.32	2.30	.33	1.07	2.69	1.15	.43	2.46	.45
	Hook & line	.28	2.30	.30	.65	2.69	.97	.28	2.46	.32
	Pot	.42	-	.42	.87	-	.87	.56	-	.56
	Trawl	.69	-	.69	1.42	-	1.42	1.15	-	1.15
2004	All gear	.34	2.67	.35	1.17	2.75	1.25	.46	2.68	.49
	Hook & line	.30	2.67	.31	.56	2.75	.99	.30	2.68	.33
	Pot	.46	-	.46	.83	-	.83	.56	-	.56
	Trawl	.86	-	.86	1.69	-	1.69	1.42	-	1.42
2005	All gear	.39	2.38	.40	1.31	2.96	1.37	.53	2.86	.55
	Hook & line	.33	2.38	.34	.52	2.96	.82	.32	2.86	.35
	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	.50	2.93	.51	1.44	3.34	1.50	.64	3.14	.66
	Hook & line	.43	2.93	.44	.78	3.34	1.07	.42	3.14	.45
	Pot	.61	-	.61	1.05	-	1.05	.69	-	.69
	Trawl	1.12	-	1.12	2.00	-	2.00	1.62	-	1.62
2007	All gear	.62	-	.62	1.53	2.27	1.54	.79	2.27	.80
	Hook & line	.52	-	.52	.67	2.27	.83	.51	2.27	.52
	Pot	.76	-	.76	1.40	-	1.40	.94	-	.94
	Trawl	1.27	-	1.27	1.91	-	1.91	1.68	-	1.68

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, 2001-07.

		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	2001	727	24,826	137	16,215	785	33,716
	2002	685	24,997	122	16,167	721	33,245
	2003	897	30,997	109	14,441	941	37,196
	2004	873	28,957	90	13,896	919	36,432
	2005	775	26,744	96	14,032	822	34,156
	2006	613	24,781	86	13,951	651	31,404
	2007	503	21,375	74	12,577	534	27,212
Pot	2001	164	9,364	85	12,032	227	18,819
	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	146	8,940	76	9,108	201	15,746
	2007	138	8,385	73	8,616	188	15,201
Trawl	2001	137	18,537	163	52,147	241	57,622
	2002	125	16,657	166	52,648	234	57,189
	2003	114	17,617	162	54,005	210	57,554
	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	52,010	190	54,886
All gear	2001	950	48,109	380	79,837	1,169	104,857
	2002	872	45,508	352	77,837	1,059	100,775
	2003	1,086	52,780	347	78,653	1,277	105,988
	2004	1,061	49,543	322	76,922	1,252	104,879
	2005	960	46,970	308	74,608	1,146	101,269
	2006	802	44,154	297	73,173	985	97,806
	2007	694	40,214	298	73,019	872	94,662

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: 2001 - 4%, 2002 - 4%, 2003 - 3%, 2004 - 2%, 2005 - 2%, 2006 - 2%, 2007 - 1%.

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, 2003-07.

			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	2003	1,039	47	1,086	265	82	347	1,192	85	1,277
		2004	1,026	35	1,061	240	82	322	1,169	83	1,252
		2005	925	35	960	227	81	308	1,063	83	1,146
		2006	762	40	802	214	83	297	900	85	985
		2007	656	38	694	218	80	298	789	83	872
Hook & Line	Sablefish	2003	375	15	390	42	8	50	394	17	411
		2004	381	13	394	26	6	32	393	15	408
		2005	344	16	360	27	11	38	354	18	372
		2006	356	12	368	23	10	33	363	15	378
		2007	316	14	330	21	10	31	324	17	341
	Pacific cod	2003	285	17	302	31	39	70	304	40	344
		2004	310	11	321	27	39	66	324	39	363
		2005	279	6	285	35	39	74	302	39	341
		2006	190	15	205	29	39	68	211	39	250
		2007	188	14	202	23	38	61	201	38	239
	Flatfish	2003	1	1	2	6	13	19	6	13	19
		2004	5	0	5	0	13	13	5	13	18
		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	11	11	0	11	11
	Rockfish	2003	377	2	379	2	2	4	379	4	383
		2004	332	1	333	2	2	4	334	3	337
		2005	247	0	247	1	3	4	247	3	250
		2006	127	1	128	1	3	4	127	4	131
		2007	43	0	43	1	2	3	44	2	46
	All groundfish	2003	872	25	897	69	40	109	899	42	941
		2004	855	18	873	50	40	90	878	41	919
		2005	757	18	775	56	40	96	781	41	822
		2006	590	23	613	46	40	86	610	41	651
		2007	481	22	503	36	38	74	495	39	534
Pot	Pacific cod	2003	140	1	141	72	3	75	186	3	189
		2004	149	1	150	72	3	75	193	3	196
		2005	151	1	152	60	2	62	190	2	192
		2006	143	1	144	65	5	70	188	5	193
		2007	137	1	138	64	3	67	179	4	183

Table 41. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Catcher vessels	Catcher/ process ors	Total	Catcher vessels	Catcher/ process ors	Total	Catcher vessels	Catcher/ process ors	Total
Trawl	Pollock	2003	73	0	73	91	18	109	141	18	159
		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
	Sablefish	2003	1	1	2	0	0	0	1	1	2
		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
	Pacific cod	2003	68	6	74	86	19	105	127	20	147
		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
	Flatfish	2003	31	16	47	1	26	27	32	27	59
		2004	29	8	37	4	27	31	33	27	60
		2005	27	8	35	2	27	29	28	28	56
		2006	30	10	40	5	28	33	34	29	63
		2007	29	12	41	6	30	36	32	31	63
	Rockfish	2003	35	13	48	0	11	11	35	17	52
		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
	Atka mackerel	2003	0	0	0	0	15	15	0	15	15
		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	2	17	19	2	17	19
	All groundfish	2003	93	21	114	123	39	162	170	40	210
		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

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, 2003-07 (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	2003	777	94	1	56	13	0	801	97	1
		2004	763	92	0	40	10	0	782	96	0
		2005	677	80	0	47	9	0	697	84	0
		2006	517	73	0	39	7	0	533	77	0
		2007	422	59	0	31	5	0	435	60	0
	Pot	2003	106	31	3	12	57	16	112	71	16
		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
	Trawl	2003	33	60	0	16	82	25	36	109	25
		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

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	2003	44	75	134	47	80	-	44	75	134
		2004	44	75	-	48	78	-	44	75	-
		2005	44	75	-	48	78	-	44	75	-
		2006	45	74	-	50	77	-	45	74	-
		2007	46	72	-	47	72	-	46	72	-
	Pot	2003	53	92	132	50	102	133	53	98	133
		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
	Trawl	2003	55	92	-	58	105	158	56	100	158
		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	105	158	58	102	158

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	2003	22	69	119	29	86	-	22	70	119
		2004	23	67	-	31	87	-	23	69	-
		2005	23	71	-	30	89	-	23	71	-
		2006	25	72	-	30	95	-	25	74	-
		2007	28	63	-	28	77	-	27	64	-
	Pot	2003	39	108	178	41	122	164	39	115	164
		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	106	97	46	129	135	43	118	135
	Trawl	2003	58	96	-	64	117	238	58	110	238
		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	239	62	114	239

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), 2003-07 (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	2003	21	16	97	104	180	144	77	138
		2004	15	9	116	94	173	132	81	143
		2005	17	6	102	86	145	118	68	135
		2006	13	4	66	61	111	78	64	120
		2007	7	3	47	37	92	74	50	112
	Bering Sea and Aleutian Islands	2003	1	0	12	4	8	3	4	24
		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	0	4	3	8	2	3	11
	All Alaska	2003	22	16	104	107	185	146	77	144
		2004	17	9	121	96	174	134	83	148
		2005	19	6	108	88	146	121	70	139
		2006	13	4	72	62	112	79	66	125
		2007	7	3	49	40	94	75	52	115

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, 2003-07.

			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	2003	11	6	8	0	0	11	18	11	0	0	13	18	11	0	0
		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	13	15	10	0	0	14	15	10	0	0
	Pot	2003	1	0	0	0	0	2	1	0	0	0	2	1	0	0	0
		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	1	0	0	0	0	2	2	2	0	0	2	2	2	0	0
		2007	1	0	0	0	0	1	1	1	0	0	2	1	1	0	0
	Trawl	2003	7	3	9	1	1	7	4	10	3	15	8	4	10	3	15
		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

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	2003	104	146	176	-	-	111	145	178	-	-	107	145	178	-	-
		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	-	-	118	146	178	-	-	114	146	178	-	-
	Pot	2003	76	-	-	-	-	96	165	-	-	-	96	165	-	-	-
		2004	76	-	-	-	-	76	165	174	-	-	76	165	174	-	-
		2005	76	-	-	-	-	76	165	174	-	-	76	165	174	-	-
		2006	103	-	-	-	-	104	165	170	-	-	104	165	170	-	-
		2007	76	-	-	-	-	104	165	166	-	-	90	165	166	-	-
	Trawl	2003	115	150	208	238	295	117	152	207	245	307	116	152	207	245	307
		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

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	2003	159	233	481	-	-	128	302	442	-	-	153	302	442	-	-
		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	-	-	144	333	446	-	-	145	333	446	-	-
	Pot	2003	134	-	-	-	-	132	793	-	-	-	132	793	-	-	-
		2004	134	-	-	-	-	134	464	414	-	-	134	464	414	-	-
		2005	134	-	-	-	-	134	793	414	-	-	134	793	414	-	-
		2006	70	-	-	-	-	91	464	303	-	-	91	464	303	-	-
		2007	134	-	-	-	-	111	793	192	-	-	123	793	192	-	-
	Trawl	2003	144	214	735	611	1085	150	194	724	1156	1658	143	194	724	1156	1658
		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

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, 2001-07.

		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	2001	169	306	252	27	44	66	179	318	288
	2002	150	301	234	24	37	61	150	305	266
	2003	381	291	225	22	28	59	383	303	255
	2004	370	278	225	12	26	52	377	284	258
	2005	315	256	204	17	25	54	325	260	237
	2006	206	207	200	11	23	52	211	213	227
	2007	115	176	212	11	15	48	120	177	237
Pot	2001	10	37	117	3	10	72	10	41	176
	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	41	22	89	6	5	63	43	27	133
	2006	41	14	91	4	13	59	45	25	131
	2007	23	21	94	3	3	67	20	21	147
Trawl	2001	0	7	130	0	3	160	0	5	236
	2002	1	11	113	0	3	163	1	9	224
	2003	4	3	107	0	1	161	1	3	206
	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	0	147	0	0	193
	2007	0	2	88	0	0	153	0	0	190
All gear	2001	164	325	461	28	55	297	173	337	659
	2002	146	309	417	24	44	284	145	314	600
	2003	398	292	396	21	37	289	396	310	571
	2004	383	287	391	14	35	273	385	296	571
	2005	332	265	363	17	29	262	341	269	536
	2006	227	210	365	12	30	255	233	222	530
	2007	128	190	376	14	18	266	130	189	553

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, 2003-07.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Alaska	Other	Unk.	Alaska	Other	Unk.	Alaska	Other	Unk.
All Gear	All groundfish	2003	857	229	0	116	231	0	905	372	0
		2004	844	215	2	90	230	2	879	369	4
		2005	771	189	0	97	211	0	807	339	0
		2006	621	178	3	84	209	4	660	318	7
		2007	537	156	1	86	211	1	570	300	2
Hook & Line	Sablefish	2003	289	101	0	31	19	0	305	106	0
		2004	297	96	1	20	12	0	309	98	1
		2005	270	90	0	22	16	0	280	92	0
		2006	278	87	3	14	19	0	284	91	3
		2007	249	80	1	14	17	0	257	83	1
	Pacific cod	2003	251	51	0	33	37	0	272	72	0
		2004	279	42	0	25	39	2	294	67	2
		2005	253	32	0	38	36	0	280	61	0
		2006	169	36	0	34	34	0	194	56	0
		2007	178	24	0	28	33	0	193	46	0
	Flatfish	2003	1	1	0	6	13	0	6	13	0
		2004	4	1	0	4	9	0	8	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	0	11	0	0	11	0
	Rockfish	2003	339	40	0	2	2	0	341	42	0
		2004	290	43	0	3	1	0	293	44	0
		2005	218	29	0	1	3	0	219	31	0
		2006	114	14	0	0	4	0	114	17	0
		2007	40	3	0	1	2	0	41	5	0
	All groundfish	2003	737	160	0	59	50	0	763	178	0
		2004	724	148	1	42	46	2	747	169	3
		2005	646	129	0	51	45	0	670	152	0
		2006	493	117	3	43	43	0	516	132	3
		2007	406	96	1	35	39	0	422	111	1
Pot	Pacific cod	2003	126	15	0	31	44	0	140	49	0
		2004	129	20	1	31	44	0	139	56	1
		2005	139	13	0	29	33	0	149	43	0
		2006	128	16	0	34	35	1	147	45	1
		2007	126	12	0	28	39	0	138	45	0
	All groundfish	2003	126	15	0	37	51	0	146	56	0
		2004	129	20	1	34	49	0	142	61	1
		2005	139	13	0	35	39	0	154	49	0
		2006	130	16	0	37	38	1	152	48	1
		2007	126	12	0	32	41	0	141	47	0

Table 46. Continued.

			Gulf of Alaska		Bering Sea and Aleutians			All Alaska		
			Alaska	Other	Alaska	Other	Unk.	Alaska	Other	Unk.
Trawl	Pollock	2003	35	38	10	99	0	38	121	0
		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
	Sablefish	2003	0	2	0	0	0	0	2	0
		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
	Pacific cod	2003	37	37	25	80	0	49	98	0
		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
	Flatfish	2003	18	29	3	24	0	19	40	0
		2004	15	22	4	27	0	17	43	0
		2005	12	23	4	25	0	13	43	0
		2006	14	26	3	30	0	15	48	0
		2007	13	28	4	32	0	13	50	0
	Rockfish	2003	20	28	0	11	0	20	32	0
		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
	Atka mackerel	2003	0	0	2	13	0	2	13	0
		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	3	16	0	3	16	0
	All groundfish	2003	52	62	28	134	0	60	150	0
		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

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, 2003-07.

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Gulf of Alaska	Catcher-vessels (excluding C/Ps)	Hook & line	2003	95	89	179	305	325	209	164	213	180	86	85	4	872
			2004	124	62	174	247	296	180	195	171	183	165	61	5	855
			2005	94	47	148	282	214	163	154	134	164	131	48	26	757
			2006	67	67	88	183	212	164	124	101	164	116	39	37	590
			2007	61	78	99	101	179	160	78	85	130	96	75	56	481
		Pot	2003	54	93	103	6	0	0	0	0	44	4	0	0	140
			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	14	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
		Trawl	2003	64	60	38	36	15	8	34	48	36	47	0	0	93
			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	55	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
		All gear	2003	205	235	308	346	340	217	198	259	258	136	85	4	1,039
			2004	256	209	276	279	310	189	227	222	265	228	82	11	1,026
			2005	202	198	248	314	230	168	178	165	256	200	59	37	925
			2006	169	197	248	285	224	169	148	127	222	174	69	64	762
			2007	174	206	232	180	208	177	99	111	186	154	109	84	656
	Catcher/ Processors	Hook & line	2003	9	7	18	8	9	4	5	5	4	1	0	0	25
			2004	8	2	9	10	9	5	3	3	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	3	2	13	13	0	23
			2007	0	9	12	9	5	4	3	3	2	5	1	4	22
		Pot	2003	1	1	1	1	0	0	0	0	1	0	0	0	1
			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
			2006	0	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
		Trawl	2003	0	3	2	10	9	0	13	6	7	13	0	0	21
			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
		All gear	2003	10	11	21	19	18	4	18	11	12	14	0	0	47
			2004	10	4	13	16	13	7	18	5	11	5	2	1	35
			2005	3	5	17	19	8	5	18	4	10	2	1	2	35
			2006	1	12	12	15	10	3	15	8	9	17	13	0	40
			2007	2	14	19	11	13	5	11	14	6	8	2	4	38

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	2003	0	1	6	9	24	25	24	22	23	6	5	0	69
			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	19	15	18	12	12	9	7	5	46
			2007	3	6	6	3	8	11	18	14	9	7	3	1	36
		Pot	2003	6	54	50	9	6	6	8	8	31	35	21	4	85
			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	16	5	13	9	7	6	27	13	4	0	70
		Trawl	2003	74	112	115	59	9	32	76	90	75	47	0	0	123
			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	46	67	68	66	57	5	0	108
			2007	89	102	105	49	3	52	69	78	73	60	36	0	114
		All gear	2003	80	166	171	75	39	63	106	119	127	86	26	4	265
			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	30	65	88	85	103	96	23	13	214
			2007	141	116	127	56	24	72	94	98	109	80	43	1	218
	Catcher/ Processors	Hook & line	2003	32	39	39	13	9	11	15	36	38	38	37	31	40
			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	10	12	36	38	36	3	18	38
		Pot	2003	0	2	2	0	0	0	0	0	3	2	2	1	3
			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	3	3	0	1	1	1	4	4	1	1	6
			2007	3	3	1	1	0	1	0	0	3	0	0	0	3
		Trawl	2003	36	37	37	23	16	29	34	37	37	15	3	1	39
			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
		All gear	2003	68	78	78	36	25	40	49	73	78	55	42	33	82
			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	57	40	26	34	54	76	77	63	9	16	83
			2007	77	78	53	37	25	47	47	71	67	53	14	19	80

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	2003	95	89	185	312	348	232	183	229	199	92	90	4	899
			2004	124	69	183	259	311	198	210	182	190	168	65	7	878
			2005	97	49	157	296	225	176	174	139	175	136	56	28	781
			2006	71	71	94	192	226	176	135	111	172	121	45	40	610
			2007	63	83	101	104	187	168	93	98	137	100	76	57	495
		Pot	2003	60	138	147	15	6	6	8	8	67	37	21	4	199
			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	17	200
			2006	93	114	120	92	14	4	6	5	39	46	33	35	195
			2007	116	95	96	62	22	9	7	6	45	37	23	26	184
		Trawl	2003	137	151	140	92	24	40	101	123	105	90	0	0	170
			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	51	85	94	109	100	13	0	153
			2007	139	149	148	69	23	64	84	103	105	93	52	2	150
		All gear	2003	284	370	459	416	378	278	290	357	367	216	111	8	1,192
			2004	353	355	381	350	343	254	308	309	367	303	101	13	1,169
			2005	306	330	348	380	248	233	267	245	342	275	72	40	1,063
			2006	287	322	341	343	249	231	222	210	319	265	91	75	900
			2007	309	315	333	234	232	241	184	207	287	228	150	85	789
	Catcher/ Processors	Hook & line	2003	40	40	42	19	15	14	18	38	39	39	37	31	42
			2004	36	37	38	19	16	13	18	39	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	40	41	40	16	14	41
			2007	36	36	20	12	8	13	14	37	39	36	4	19	39
		Pot	2003	1	3	3	1	0	0	0	0	3	2	2	1	3
			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	2	3	3	0	1	1	1	4	4	1	1	6
			2007	4	4	2	1	0	1	0	0	3	1	1	0	4
		Trawl	2003	36	38	38	27	19	29	37	38	38	27	3	1	40
			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
		All gear	2003	77	81	83	47	34	43	55	76	80	68	42	33	85
			2004	77	78	79	45	39	45	56	71	74	59	44	38	83
			2005	79	81	63	45	32	38	57	77	69	59	43	38	83
			2006	76	81	64	46	32	36	59	80	81	65	20	16	85
			2007	78	80	62	43	31	50	52	75	70	56	16	20	83

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, 2003-07.

			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	2003	973	238	-	112	15	-	1085	254	-
		2004	1044	261	-	59	12	-	1102	273	-
		2005	861	229	2	55	21	-	916	250	2
		2006	893	254	-	49	6	-	942	260	-
		2007	736	223	-	29	9	-	765	232	-
	Pacific cod	2003	811	38	3	88	17	-	899	54	3
		2004	958	62	-	136	4	-	1095	66	-
		2005	953	45	-	137	3	-	1090	48	-
		2006	803	45	-	134	2	-	937	47	-
		2007	1019	30	-	132	1	-	1151	31	-
	Rockfish	2003	899	29	-	1	1	-	900	30	-
		2004	711	35	-	1	-	-	712	35	-
		2005	486	14	-	1	-	-	487	14	-
		2006	197	4	-	0	-	-	198	4	-
		2007	75	2	-	1	-	-	76	2	-
	All groundfish	2003	2840	319	4	207	36	-	3048	355	4
		2004	2784	363	-	197	16	-	2981	379	-
		2005	2400	291	2	193	24	-	2594	314	2
		2006	1949	305	-	183	11	-	2132	316	-
		2007	1832	256	-	162	9	-	1994	265	-
Pot	Pacific cod	2003	573	126	11	42	253	72	615	379	83
		2004	659	219	5	81	186	62	740	405	67
		2005	528	292	2	48	160	53	576	453	55
		2006	714	291	7	84	229	64	798	521	71
		2007	722	294	2	102	192	57	824	486	59
	All groundfish	2003	573	126	11	56	338	72	629	464	83
		2004	660	220	5	81	281	70	741	501	75
		2005	528	294	2	61	237	53	589	531	55
		2006	718	292	7	102	300	64	820	592	71
		2007	722	294	2	122	276	57	844	570	59

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	2003	56	254	-	-	1013	510	56	1267	510
		2004	92	289	-	-	999	518	92	1287	518
		2005	137	356	-	-	993	598	137	1349	598
		2006	139	401	-	1	973	624	140	1374	624
		2007	96	240	-	-	1117	637	96	1357	637
	Pacific cod	2003	51	137	-	88	446	39	139	584	39
		2004	42	140	-	31	310	32	73	450	32
		2005	54	89	-	10	248	23	64	337	23
		2006	104	106	-	10	292	22	114	398	22
		2007	92	143	-	21	298	23	113	441	23
	Flatfish	2003	4	158	-	1	1	-	5	158	-
		2004	4	154	-	-	4	-	4	158	-
		2005	1	150	-	-	7	-	1	157	-
		2006	0	205	-	-	11	-	0	216	-
		2007	17	232	-	-	12	6	17	244	6
	Rockfish	2003	2	91	-	-	-	-	2	91	-
		2004	2	78	-	-	0	-	2	78	-
		2005	-	67	-	-	-	-	-	67	-
		2006	-	71	-	-	-	-	-	71	-
		2007	4	96	-	-	1	2	4	97	2
	All groundfish	2003	116	658	-	89	1460	549	206	2118	549
		2004	139	668	-	31	1315	550	170	1983	550
		2005	192	662	-	10	1248	621	202	1911	621
		2006	243	783	-	11	1276	646	254	2059	646
		2007	209	720	-	21	1430	677	230	2150	677
All gear	All groundfish	2003	3530	1102	15	352	1834	621	3882	2937	636
		2004	3583	1251	5	309	1612	620	3892	2863	625
		2005	3120	1248	4	265	1508	674	3385	2756	678
		2006	2910	1380	7	296	1587	710	3206	2967	717
		2007	2763	1270	2	305	1715	734	3068	2985	736

Notes: 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, 2003-07.

			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	2003	7	44	24	-	28	8	7	72	33
		2004	11	53	21	-	30	6	11	83	27
		2005	10	46	24	-	23	11	10	68	36
		2006	8	41	21	-	26	8	8	67	29
		2007	12	52	19	-	24	12	12	76	31
	Pacific cod	2003	7	32	23	5	241	867	12	273	890
		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	-	205	443	-	238	453
	Flatfish	2003	-	0	-	-	11	46	-	11	46
		2004	-	-	-	-	22	31	-	22	31
		2005	-	0	2	-	23	34	-	23	36
		2006	-	-	2	-	14	43	-	14	45
		2007	-	-	-	-	9	34	-	9	34
	All groundfish	2003	14	80	48	5	280	924	19	360	972
		2004	16	77	37	7	281	882	23	358	919
		2005	13	52	30	4	290	907	17	342	937
		2006	8	74	47	-	252	628	8	326	676
		2007	12	86	30	-	239	493	12	325	523
Pot	Pacific cod	2003	-	8	-	-	12	13	-	20	13
		2004	-	10	-	-	6	20	-	16	20
		2005	-	6	-	-	2	22	-	8	22
		2006	-	3	-	-	11	29	-	14	29
		2007	-	15	-	-	8	24	-	23	24
	All groundfish	2003	-	8	-	-	12	13	-	20	13
		2004	-	10	-	-	6	21	-	16	21
		2005	-	6	-	-	2	22	-	8	22
		2006	-	3	-	-	19	33	-	22	33
		2007	-	15	-	-	15	25	-	30	25

Table 49. Continued.

			Gulf of Alaska			Bering Sea and Aleutians			All Alaska		
			Vessel length class			Vessel length class			Vessel length class		
			60-124	125-230	>230	60-124	125-230	>230	60-124	125-230	>230
Trawl	Pollock	2003	-	-	-	0	30	353	0	30	353
		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
	Pacific cod	2003	5	1	-	61	55	6	66	56	6
		2004	8	4	-	89	101	14	97	104	14
		2005	3	-	-	56	71	12	60	71	12
		2006	2	-	-	65	66	15	68	66	15
		2007	3	-	-	60	76	14	63	76	14
	Flatfish	2003	72	38	4	103	243	41	175	281	45
		2004	29	8	0	87	256	44	116	264	44
		2005	56	10	2	79	276	55	135	286	57
		2006	59	12	-	113	212	66	172	224	66
		2007	47	15	-	129	216	64	176	232	64
	Rockfish	2003	3	22	0	0	14	8	3	36	8
		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
	Atka mackerel.	2003	-	-	-	2	67	21	2	67	21
		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
	All groundfish	2003	83	61	4	168	411	430	251	472	434
		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	407	468	255	447	469

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	2003	14	171	109	4	5	460	1348	430	19	631	1457	434
		2004	16	128	68	1	7	467	1370	421	23	595	1438	422
		2005	13	119	61	3	4	436	1394	419	17	555	1455	422
		2006	8	139	86	1	-	457	1061	456	8	596	1147	457
		2007	12	154	69	1	-	456	926	468	12	610	995	469

Notes: 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, 2002-07.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Gulf of Alaska	2002	234	431	582	783	790	-	1,425	311	88	426	189	-	5,287
	2003	470	265	493	991	1,023	101	922	417	279	631	-	-	5,591
	2004	452	155	348	629	366	95	1,097	96	304	33	-	-	3,599
	2005	76	72	618	919	144	77	1,306	68	264	-	-	-	3,580
	2006	-	267	429	629	293	62	1,372	345	234	371	418	-	4,429
	2007	-	366	668	367	476	221	866	336	344	420	-	67	4,191
Bering Sea and Aleutian Islands	2002	5,639	16,502	16,514	3,634	1,785	3,593	9,680	15,570	12,997	7,028	3,607	894	97,440
	2003	5,830	16,110	18,259	3,771	2,255	5,263	10,479	15,807	12,408	5,579	4,236	1,778	101,775
	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	3,377	2,602	98,835
	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	11,777	14,338	6,620	1,593	751	97,525
All Alaska	2002	5,872	16,933	17,095	4,417	2,575	3,606	11,104	15,880	13,085	7,453	3,795	912	102,727
	2003	6,300	16,375	18,751	4,761	3,278	5,364	11,400	16,224	12,687	6,210	4,236	1,778	107,365
	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	14,353	12,169	11,124	7,175	3,377	2,639	102,414
	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	14,205	5,137	2,491	6,592	12,009	12,112	14,681	7,040	1,628	817	101,716

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: 2002 - 89%, 2003 - 92%, 2004 - 91%, 2005 - 92%, 2006 - 92%, 2007 - 90%.

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, 2006-07.

			2006			2007		
			Count	Obs. days	Cost	Count	Obs. days	Cost
Catcher vessels	Hook & line	60-125	42	679	238	37	601	210
	Pot	60-125	50	1,240	434	50	984	344
		>=125	9	127	44	10	135	47
		Total	59	1,367	478	60	1,119	392
	Trawl	60-125	90	3,782	1,324	88	4,334	1,517
		>=125	26	4,833	1,692	26	4,955	1,734
		Total	116	8,615	3,015	114	9,289	3,251
CV Total			217	10,661	3,731	211	11,009	3,853
Catcher/ processors	Hook & line	60-125	10	1,580	553	11	1,413	495
		>=125	30	5,461	1,911	27	3,969	1,389
		Total	40	7,041	2,464	38	5,382	1,884
	Pot	>60	3	196	69	4	181	63
	Surimi trawler	>=125	13	4,470	1,565	16	5,774	2,021
	Fillet trawler	>=125	4	1,198	419	-	-	-
	H&G trawler	60-125	7	718	251	7	832	291
		>=125	16	4,354	1,524	16	4,956	1,735
		Total	23	5,072	1,775	23	5,788	2,026
	Trawl Total		40	10,740	3,759	39	11,562	4,047
C/P Total			83	17,977	6,292	81	17,125	5,994
Motherships			3	1,017	356	3	1,267	443
All vessels			303	29,655	10,379	295	29,401	10,290
Shore plants			24	5,000	1,750	22	5,190	1,817
Grand totals			327	34,655	12,129	317	34,591	12,107

Note: 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, 1993-2007, in yen/kilogram (weighted average).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flatfish, fresh	1993	638	746	681	611	487	515	475	651	486	576	512	490
	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	1993	281	285	207	167	118	128	154	215	175	305	319	366
	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	1993	278	148	171	164	206	288	259	148	329	387	260	278
	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	1993	107	157	141	91	54	56	51	51	37	60	62	72
	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
Rockfish, fresh	1993	2847	2987	2452	2480	2053	2004	2050	2140	1783	2010	2445	2633
	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, 1976-2007, 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

Source: National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics Division. http://www.st.nmfs.noaa.gov/st1/fus/fus07/06_trade2007.pdf

Table 55. U.S. per capita consumption of fish and shellfish, 1976-2007, population in millions and consumption in pounds, edible weight.

Year	Total civilian population	Per capita consumption			
		Fresh and Frozen	Canned	Cured	Total
1976	215.9	8.2	4.2	.5	12.9
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

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, 1980-2007.

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

[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, 1976-2006.

	Producer Price Index[1]					Consumer Price Index[2]				
Year	All items	Meat	Poultry	Fish	Petrol. Products	All Items	Meat	Poultry	Fish	GDP Deflator[3]
1976	61.1	69.3	93.0	64.5	36.3	56.9	66.4	76.4	60.2	40.39
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

[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, 2005-07.

Month	Producer Price Index[1]					Consumer Price Index[2]			
	All Items	Meat	Poultry	Fish	Petrol. Products	All Items	Meat	Poultry	Fish
2005									
Jan	150.9	139.5	124.0	209.1	126.2	190.7	185.9	183.8	199.4
Feb	151.6	141.5	128.6	226.2	133.0	191.8	187.2	182.0	196.9
Mar	153.7	143.0	128.4	236.1	148.6	193.3	187.6	185.0	196.2
Apr	155.0	141.9	127.9	221.3	155.3	194.6	188.3	184.1	199.4
May	154.3	145.5	130.0	222.9	151.3	194.4	189.1	183.7	198.6
Jun	154.3	139.9	129.5	200.3	156.9	194.5	189.2	184.9	199.5
Jul	156.3	135.4	131.5	210.1	169.6	195.4	187.7	185.9	199.7
Aug	157.6	134.2	131.4	212.1	179.5	196.4	187.0	186.9	200.4
Sep	162.2	135.0	132.7	220.4	200.7	198.8	186.8	188.9	200.4
Oct	166.2	137.3	131.5	241.8	214.9	199.2	186.6	186.5	202.0
Nov	163.7	136.6	126.2	229.1	171.5	197.6	187.3	187.6	204.1
Dec	163.0	138.2	121.5	242.3	172.1	196.8	187.8	183.8	204.4
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

[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, 1976-2007, 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

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, 2005-07, 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)
2005								
Jan	1.2248	5.6699	103.34	1038.0	1.415	62.56	6.27	.532
Feb	1.2401	5.7195	104.94	1023.1	1.398	62.16	6.40	.530
Mar	1.2160	5.6488	105.25	1007.8	1.370	60.07	6.21	.525
Apr	1.2359	5.7554	107.19	1010.1	1.387	62.24	6.31	.527
May	1.2555	5.8628	106.60	1001.8	1.391	64.90	6.37	.539
Jun	1.2402	6.1247	108.75	1012.5	1.412	65.26	6.49	.550
Jul	1.2229	6.1943	111.95	1036.6	1.473	65.21	6.58	.571
Aug	1.2043	6.0665	110.61	1021.7	1.438	63.82	6.44	.557
Sep	1.1777	6.0973	111.24	1029.8	1.431	62.20	6.38	.554
Oct	1.1774	6.2064	114.87	1045.9	1.432	60.98	6.51	.567
Nov	1.1815	6.3277	118.45	1040.8	1.450	61.87	6.64	.576
Dec	1.1615	6.2844	118.46	1022.4	1.439	63.68	6.72	.573
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

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

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Alaska Groundfish Market Profiles

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Alaska Fisheries Science Center

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Preface

Contributors

The primary author of this document was Donald M. Schug of Northern Economics, Inc. Other contributors from Northern Economics were Marcus L. Hartley and Anne Bunger. James L. Anderson of J.L. Anderson & Associates provided export data summaries and forecasts of U.S. export prices and volumes of selected groundfish products. Quentin Fong of the Fishery Information and Technology Center, University of Alaska Fairbanks assisted with gathering information on seafood processors in the People's Republic of China.

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

Dave Little and Paul Gilliland, Bering Select Seafoods Company

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), and U.N. Food and Agriculture Organization (FAO).

Forecasts

As noted above, James L. Anderson of J.L. Anderson & Associates provided export market forecasts for selected Alaska groundfish products. Appendix A describes the forecast methodology, including the underlying features of the technical model used in forecasting groundfish export quantities and prices. Appendix A-1 compares the forecasts made in September 2007 for *Alaska Groundfish Market Profiles* with actual data through August 2008.

[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.

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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.

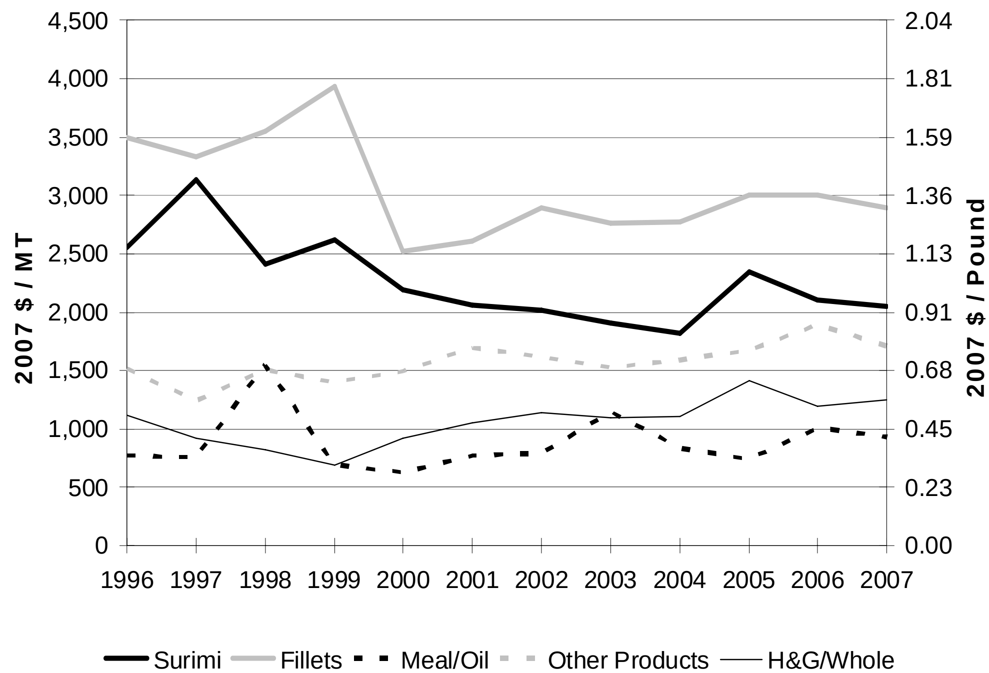
The Alaska pollock fishery in the waters off Alaska is among the world's largest fisheries. Under U.S. federal law, the fishery is subject to total allowable catch (TAC) limitations, quota allocations among the different sectors of participants in the fishery, and rules that give exclusive harvesting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

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 increase in the quantity and wholesale value of fillet production is shown in Figure 2 and Figure 3.

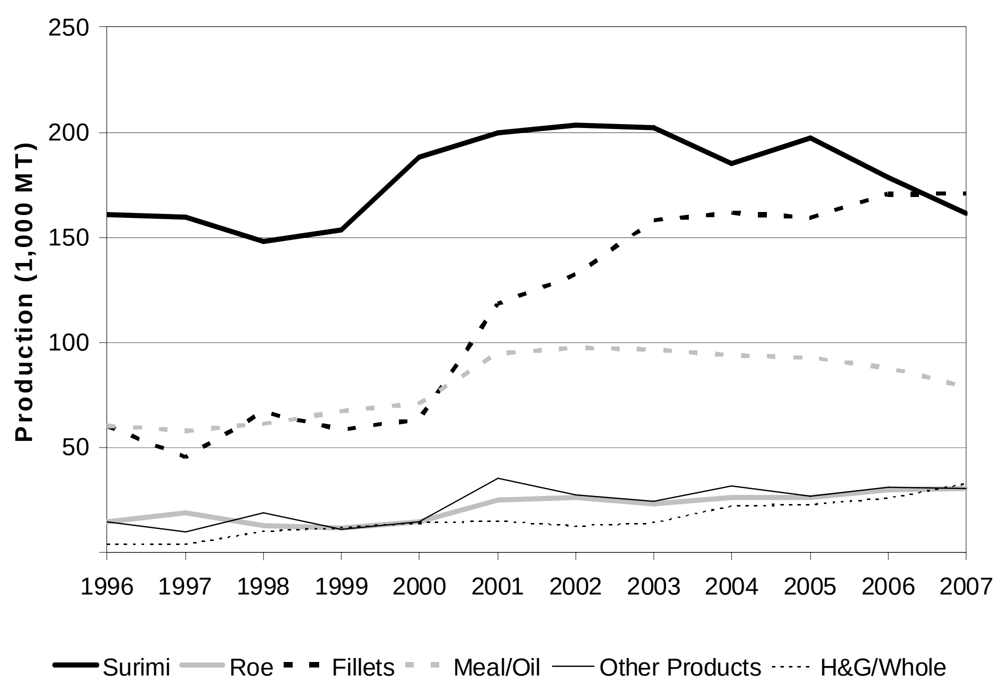
Figure 1. Wholesale Prices for Alaska Primary Production of Alaska Pollock Products (excluding Roe) by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 2. Alaska Primary Production of Alaska Pollock by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007.

Figure 3. Wholesale Value of Alaska Primary Alaska Pollock Production by Product Type, 1996 – 2007

Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

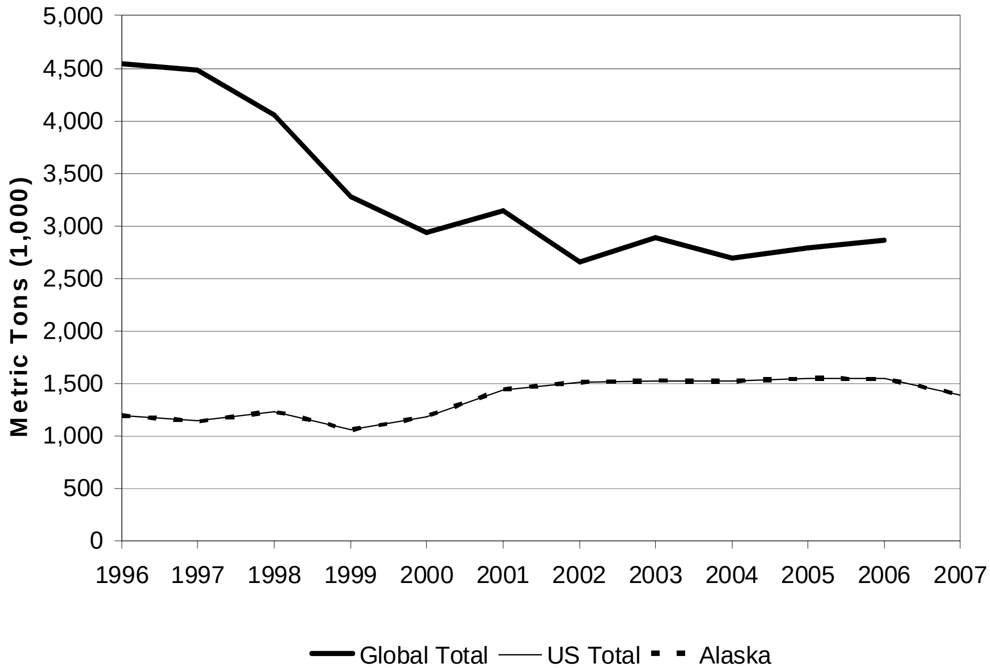
Production

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 has increased particularly rapidly 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 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. In 2008, the BSAI pollock TAC dropped again to 1.0 million mt. While pollock harvest specifications for 2009 have not yet been set, many in the industry feel that the BSAI pollock TAC will drop below 0.9 million mt. Industry sources also say that there appears to be a strong year class of young fish that will be recruiting into the fishery, and this could boost stock estimates for the 2010 fishing year and beyond.

Figure 4. Alaska, Total U.S. and Global Retained Harvests of Alaska Pollock, 1996 – 2007



Note: Data for 2007 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.

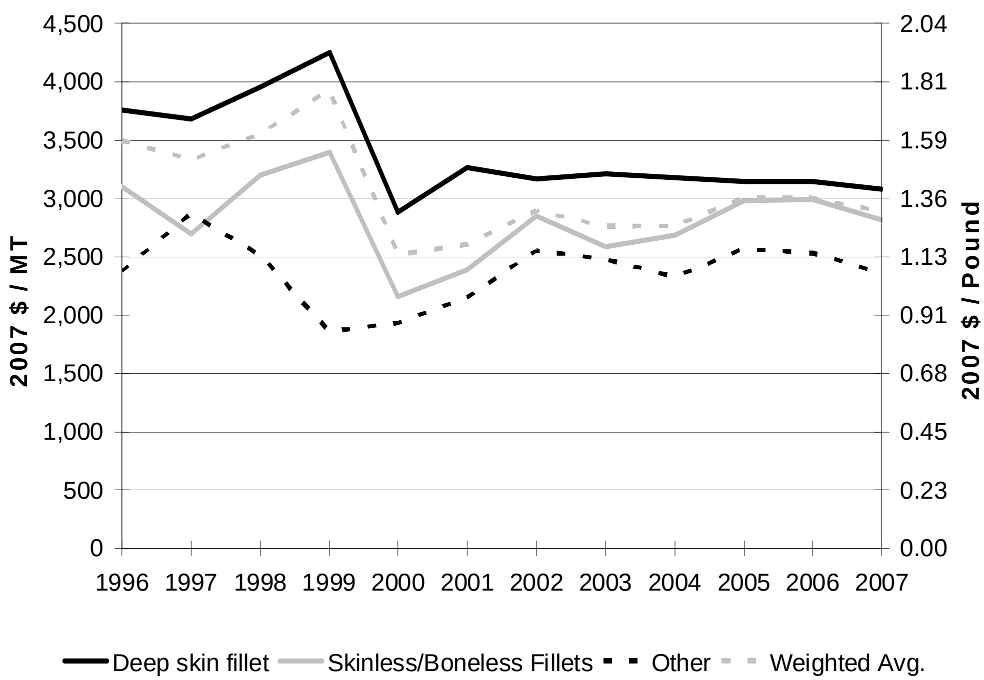
Product Composition and Flow

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).

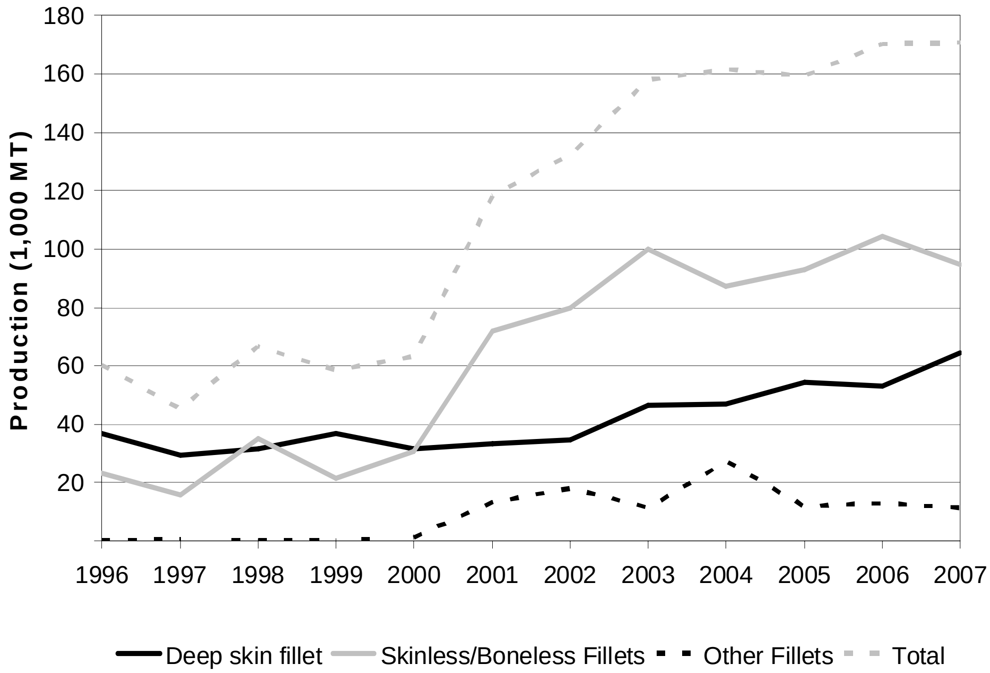
Historically, the primary market for pollock fillets has been the domestic market. Fillets made into deep-skin blocks were destined primarily for U.S. foodservice industry, including fast food restaurants such as McDonald's, Long John Silver's, and Burger King. (NMFS 2001). According to an industry representative, 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 – 2007



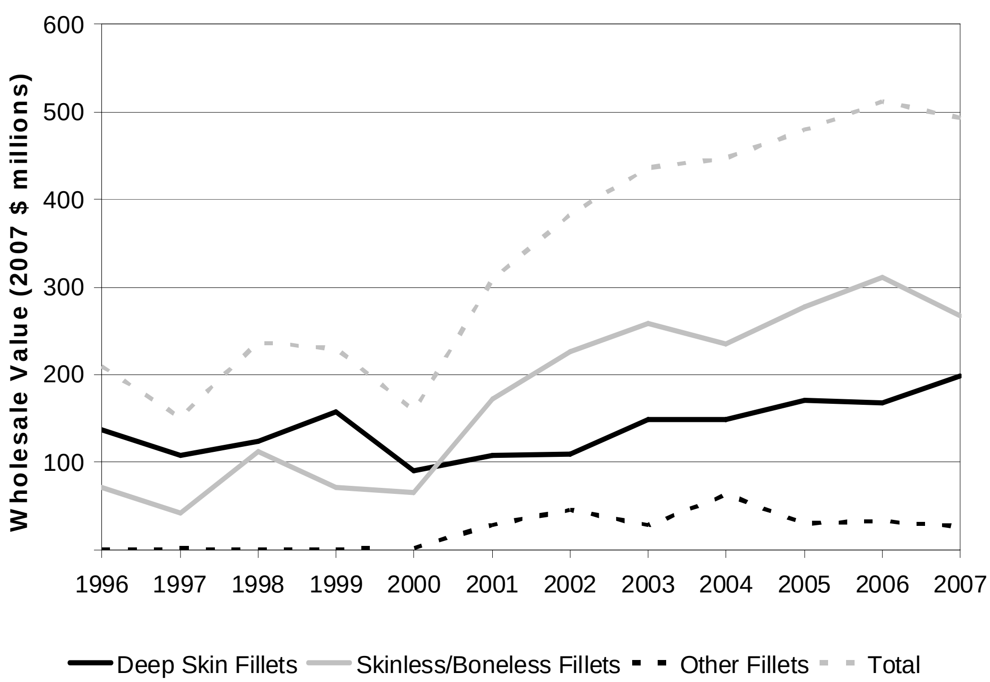
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 6. Alaska Primary Production of Alaska Pollock Fillets by Fillet Type, 1996 – 2007



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 7. Wholesale Value of Alaska Primary Production of Alaska Pollock Fillets by Fillet Type, 1996 – 2007



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007.

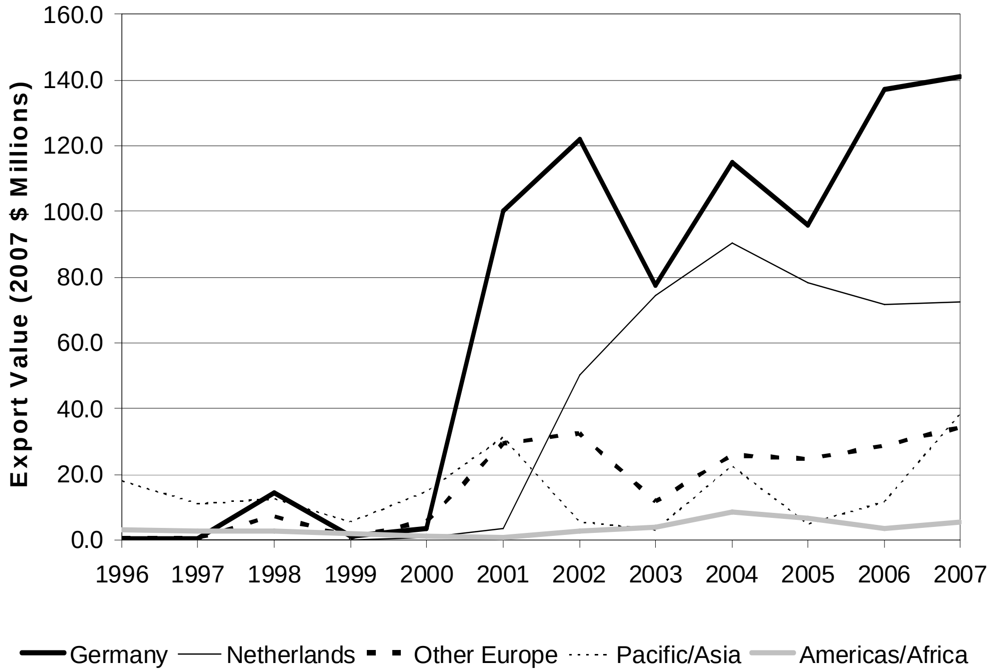
International Trade

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. It is estimated that American at-sea processors require 69% more fish to produce the same quantity of pollock fillets as compared to Chinese processors (Ng 2007). 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 - 2007



Note: Data include all exports of Alaska pollock from all U.S. Customs Districts
Source: NMFS 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 in 2007 and 2008.

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 offest 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.

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 TAC was even lower—1.0 million mt 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 and Figure 10, export prices and volumes of Alaska pollock fillets are predicted to continue to show an increasing trend.[2] Germany is expected to remain a growing 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

[2] The methodology used to develop forecasts shown in Figure 9 through Figure 12 is described in Appendix A.

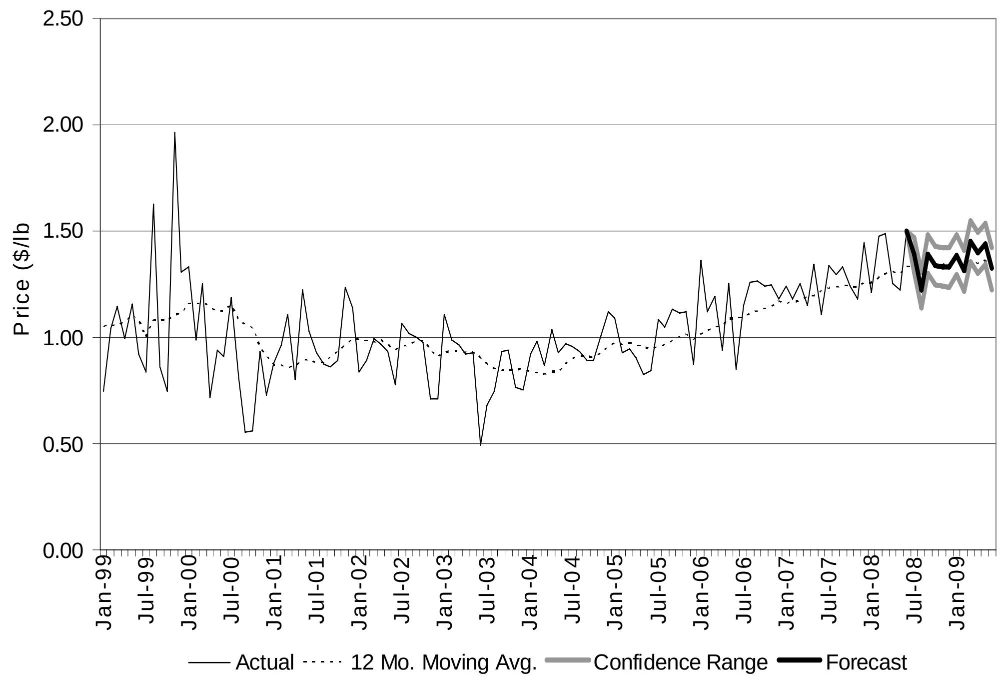
animal origin from China in 2002 over similar concerns about the safety of Chinese aquaculture and fishery products; this embargo was gradually lifted after the Chinese government agreed to implement stricter testing (EUROPA 2002).

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).

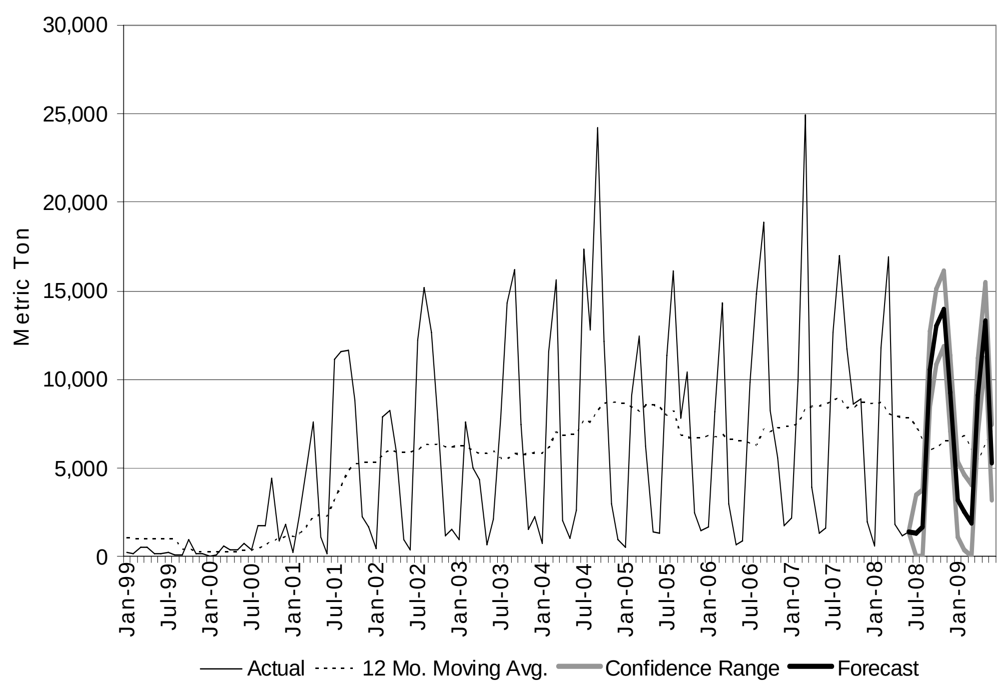
In response to concerns raised about the quality of seafood imported from China, spokesmen for Ocean Beauty Seafoods LLC and Trident Seafoods Corporation, two major Seattle-based processors of Alaska seafood, have publicly stated that no matter where their companies process fish, the processing is done 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.

Figure 9. Actual and Forecast Nominal U.S. Export Prices of Alaska Pollock Fillets to All Countries, 1999 - 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

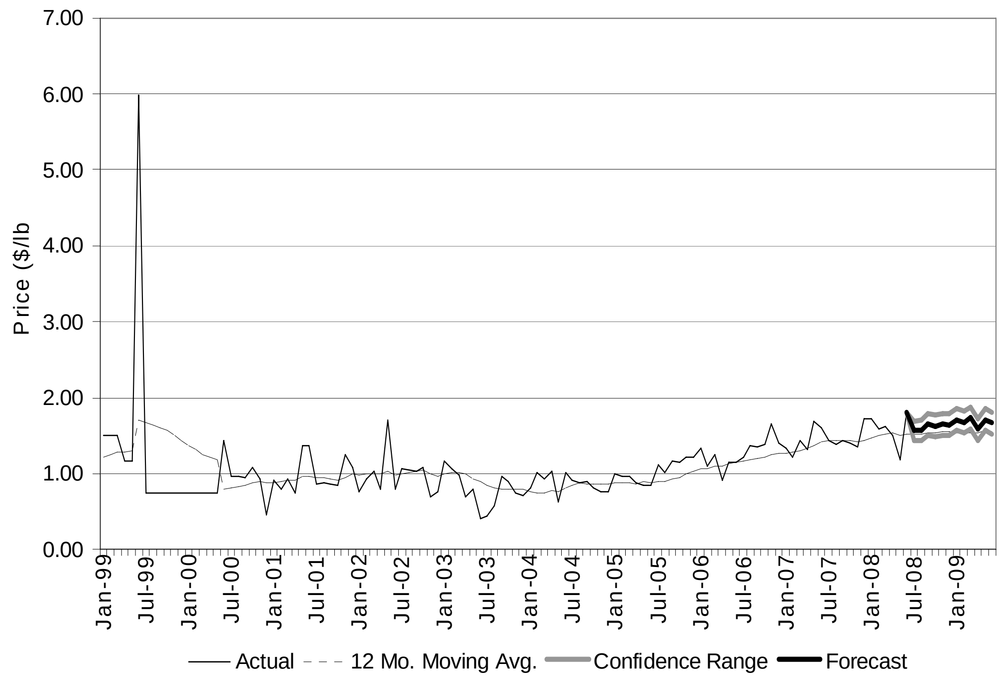
Figure 10. Actual and Forecast U.S. Export Volumes of Alaska Pollock Fillets to All Countries, 1999 - 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

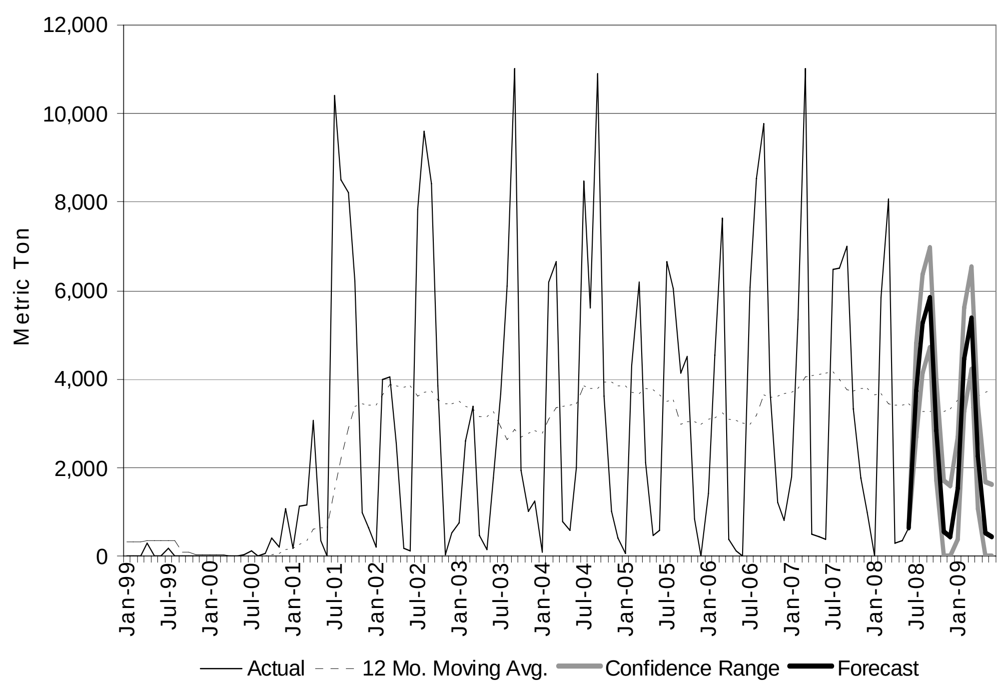
Alaska Pollock Fillets Market Profile

Figure 11. Actual and Forecast Nominal U.S. Export Prices of Alaska Pollock Fillets to Germany, 1999-2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 12. Actual and Forecast U.S. Exports Volumes of Alaska Pollock Fillets to Germany, 1999-2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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Alaska Pollock Surimi Market Profile

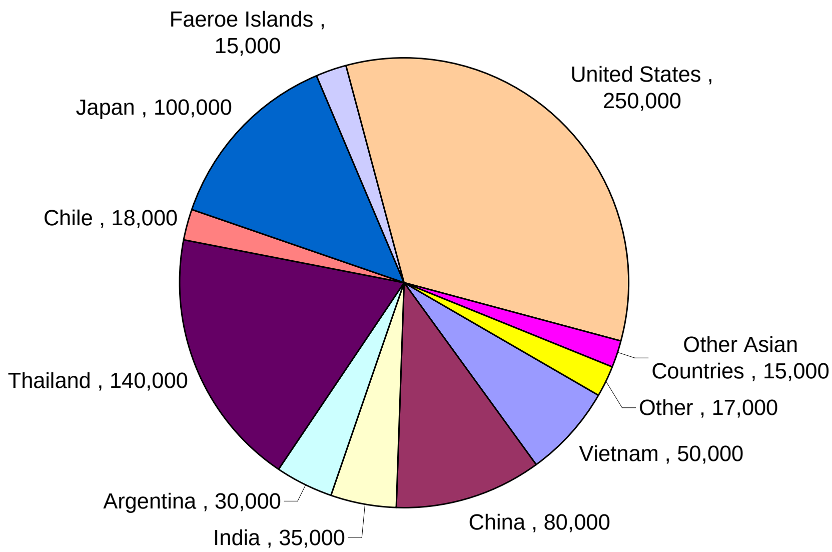
Description of the Fishery

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



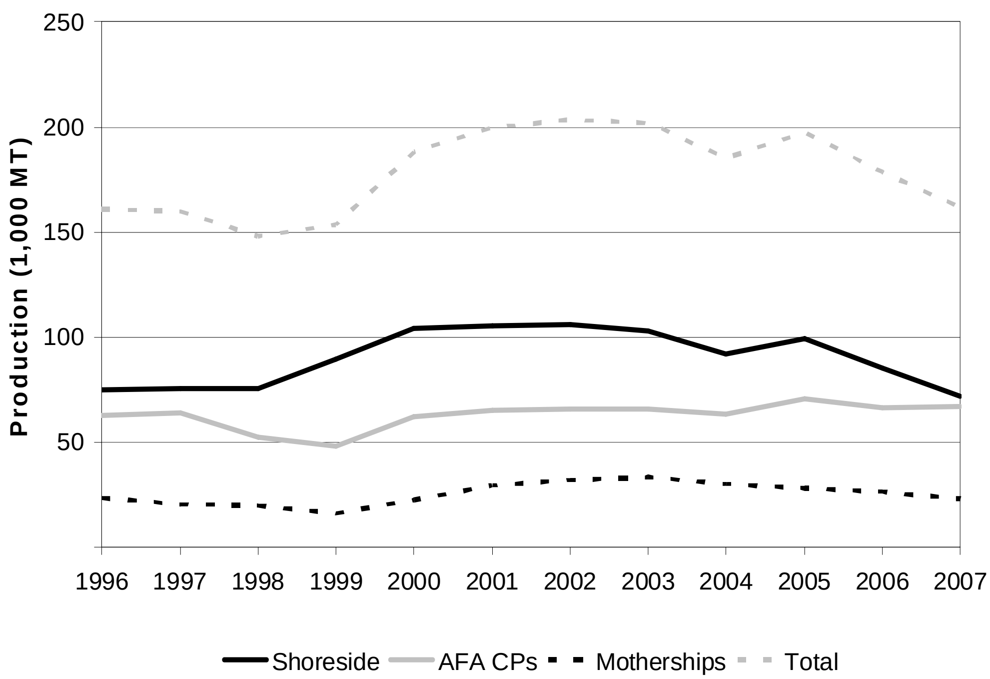
Source: GLOBEFISH (2006)

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 washwater (Guenneugues and Morrissey 2005).

The result of this more efficient processing is that the volume and value of surimi produced from Alaska-harvested pollock has remained fairly stable (Figure 14 and Figure 15) even though fillet production has increased. Alaska pollock surimi wholesale prices spiked in 1999, possibly due to the decrease in the total allowable catch for Alaska pollock in the BSAI. Wholesale prices declined between 1999 and 2001, but have since been relatively stable (Figure 16). Industry representatives note that fluctuations in wholesale prices may be due to 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 – 2007

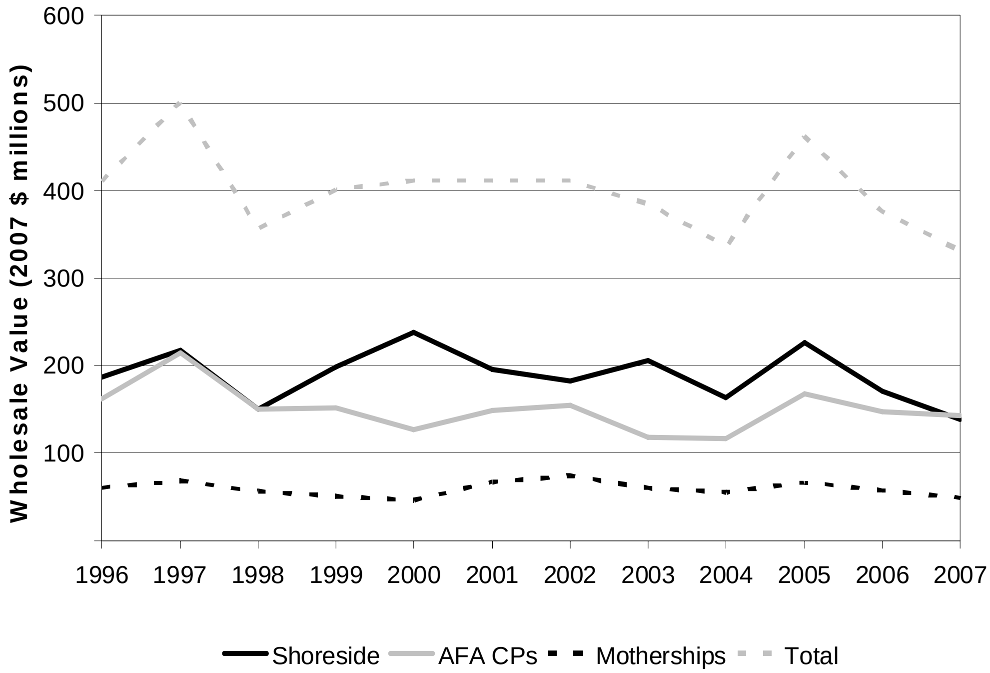


Note: Reported surimi production and value do not specify the grade of products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Alaska Pollock Surimi Market Profile

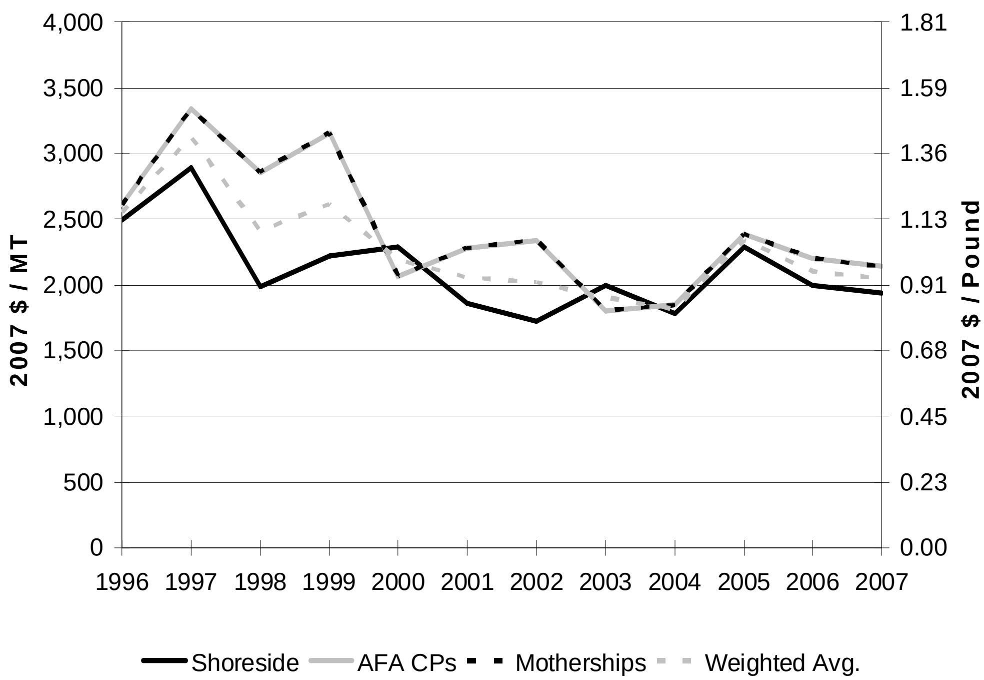
Figure 15. Wholesale Value of Alaska Primary Production of Alaska Pollock Surimi by Sector, 1996 – 2007



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 1996-2007

Figure 16. Average Wholesale Prices for US Primary Production of Pollock Surimi by Sector, 1996 – 2007



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 1996-2007

Product Composition and Flow

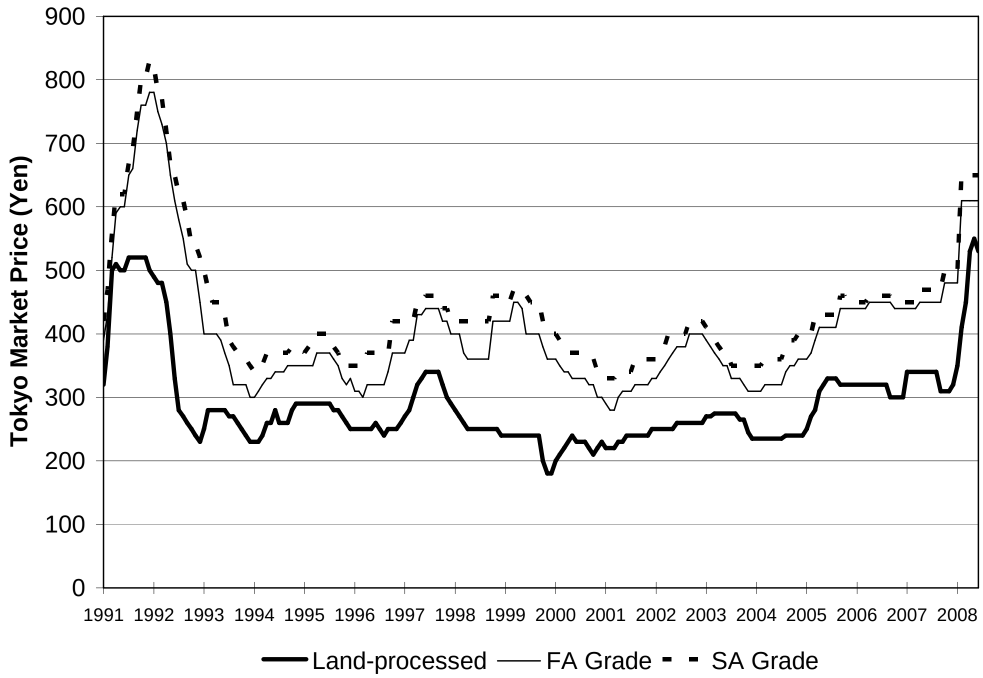
Surimi is the generic name for a processed white paste made from whitefish. In the case of Alaska pollock surimi, the fish are first filleted and then minced. Fat, blood, pigments and odorous substances are removed through repeated washing and dewatering. As washings continue, lower-quality product is 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" that shown Figure 16 are calculated by taking total reported wholesale value from all grades of surimi and dividing that 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 acnilliary product made from the skins, and trimmings that are created with 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.

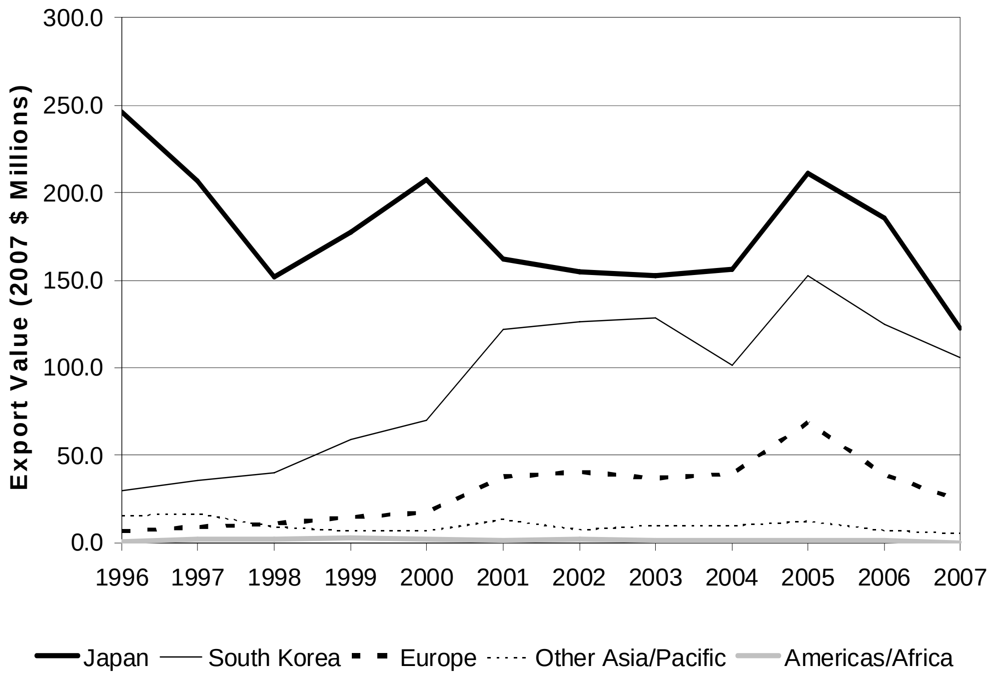
2) The second factor to take into consideration is the yen-dollar exchange rate. From January 2005 through July 2007 the dollar was gaining relative to the yen. On January 1, 2005, one dollar purchased 102.44 yen; On July 14, 2007, one dollar purchased 122.34 yen (Oanda, 2008). Thus, prices for surimi in Japan would have had to have risen by nearly 20 percent in order for the US price to have remained at 2005 levels. More recently, the weakness of the US dollar between July 2007 and August 2008 coupled with production declines resulting from significantly lower pollock TACs in 2008 will likely mean that average prices received for US pollock surimi could actually increase for 2008 as a whole.

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). 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).

Figure 18. U.S. Exports of Alaska Pollock Surimi to Leading Importing Countries, 1996 - 2007



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

Source: NMFS 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). While these higher values are not reflected in the average prices received through 2007 by US producers (as shown in Figure 16), US industry sources indicate receiving higher prices in 2008.

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).

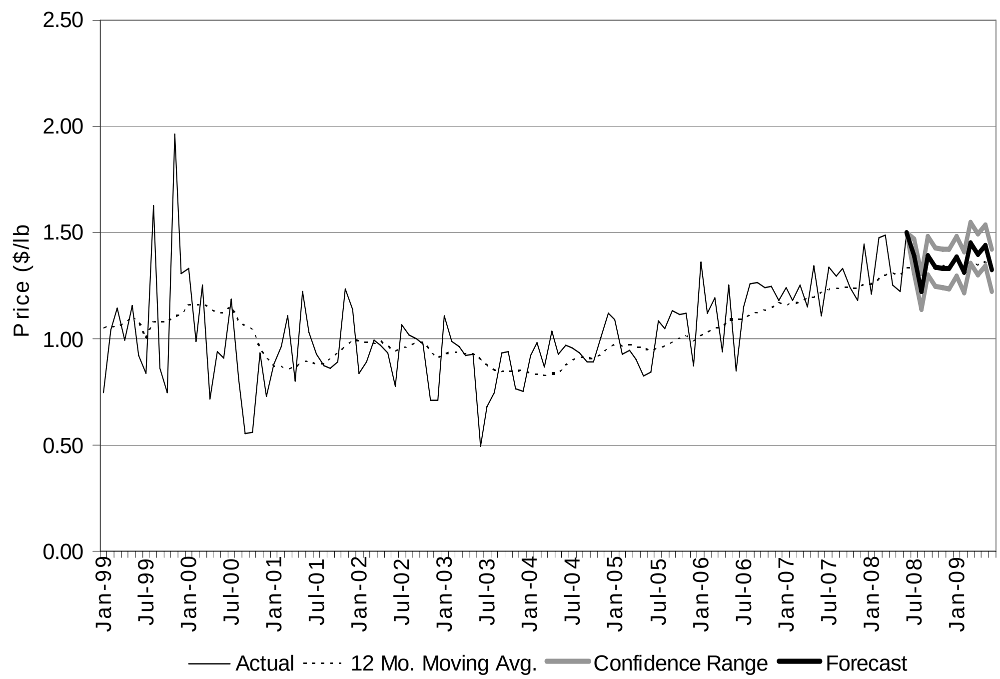
Forecasts of U.S. export prices predict a drop in price (Figure 19); however, the forecast model does not adjust for exogenous factors such as potential further cuts in the U.S. pollock quota.[3]

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%

[3] The methodology used to develop forecasts shown in Figure 19 through Figure 20 is described in Appendix A: Alaska Groundfish Export Market Forecast Methodology and Details.

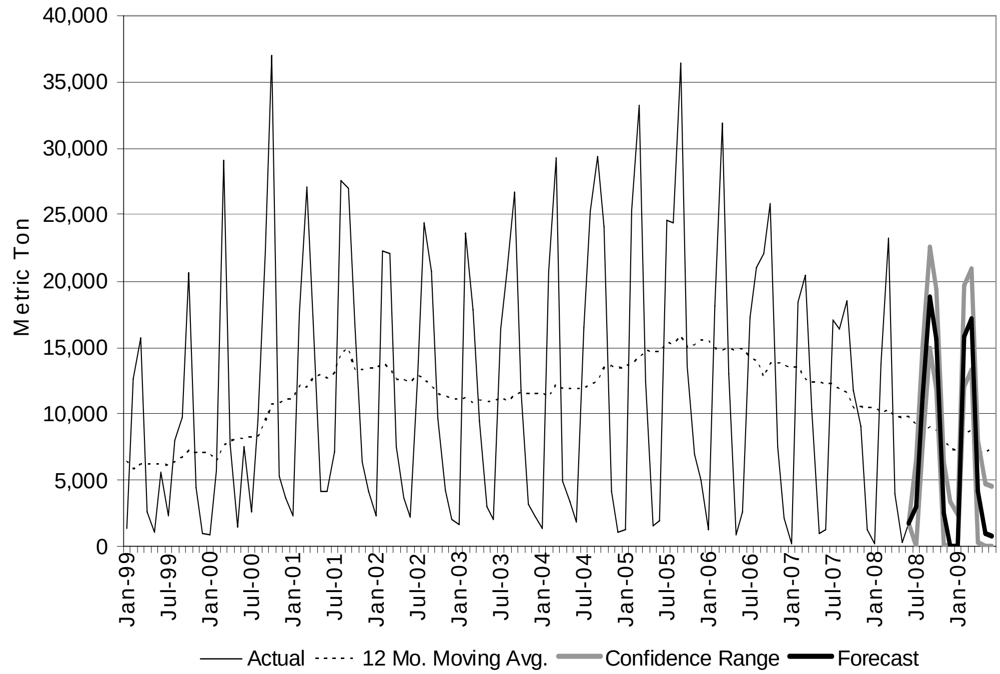
of global production is based on non-Alaska pollock fish species that are caught all over the world. These products can be derived from either coldwater whitefish species (for example, Pacific whiting, hoki (blue grenadier), northern and southern blue whiting), or coldwater pelagic fishes (for example, 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. Actual and Forecast Nominal U.S. Export Prices of Alaska Pollock Surimi to All Countries, 1999 - 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 20. Actual and Forecast U.S. Export Volumes of Alaska Pollock Surimi to All Countries, 1999 - 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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Alaska Pollock Roe Market Profile

Description of the Fishery

See *Alaska Pollock Fillets Market Profile*

Production

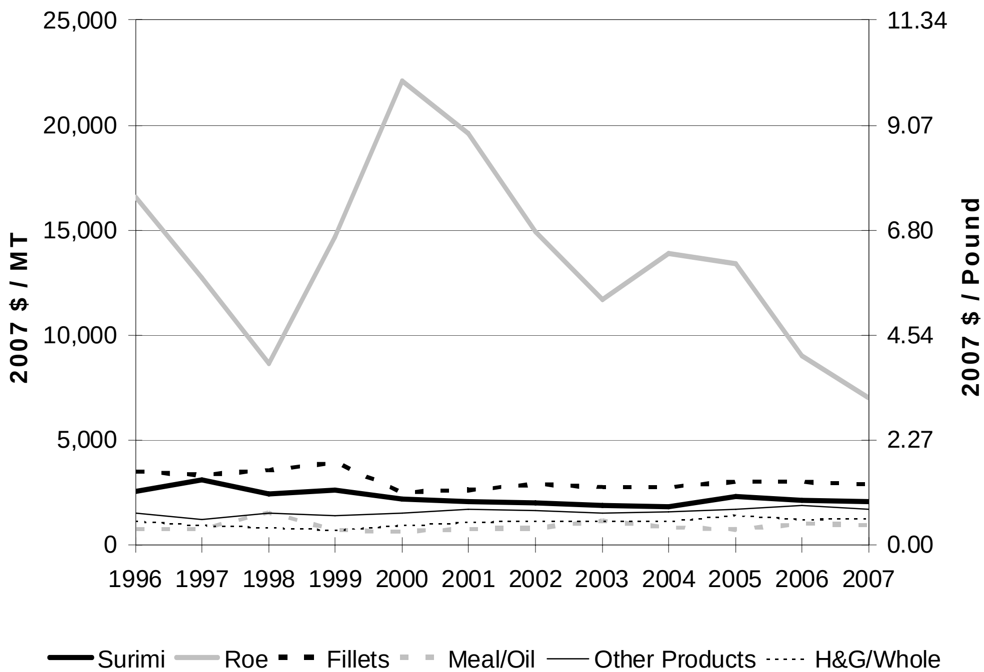
The two major sources of Alaska pollock roe are the United States and Russia. U.S. pollock roe production between 1999 and 2006 has been significantly higher than in prior years, reflecting both an increase in pollock harvests as well as an increase in pollock roe yields—the latter a result of AFA according to industry representatives interviewed for this assessment. However, increasing U.S. production of pollock roe has been 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). Production of roe remained stable in 2007 despite lower overall harvests. (See Figure 21).

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 has increased due to an increase in pollock harvests and 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.

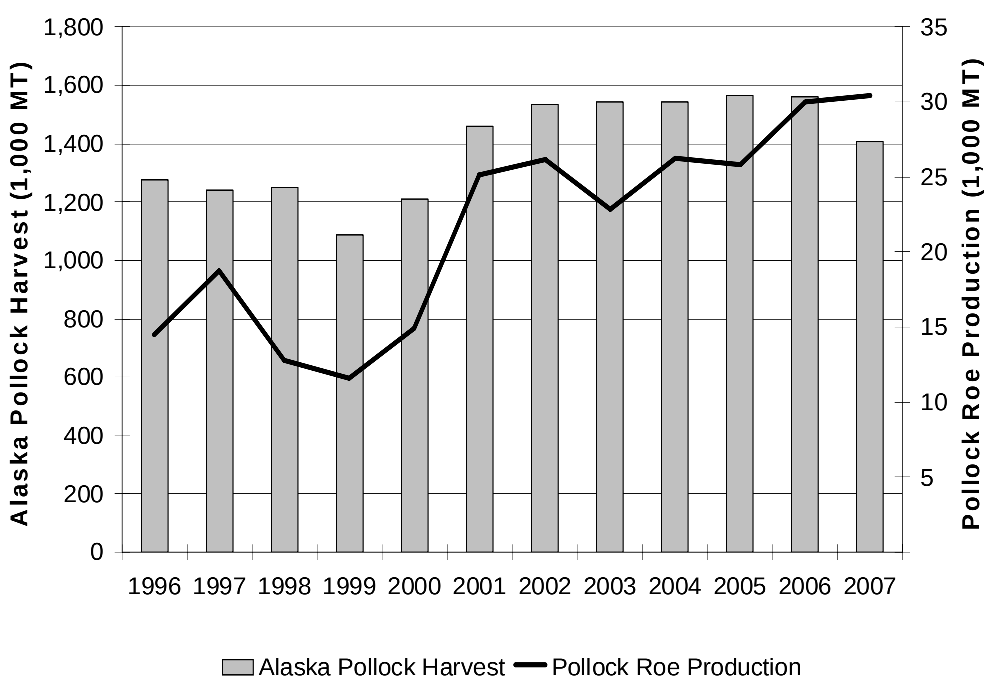
Figure 21. Wholesale Prices for Alaska Primary Production of Pollock by Product Types, 1996 – 2007



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

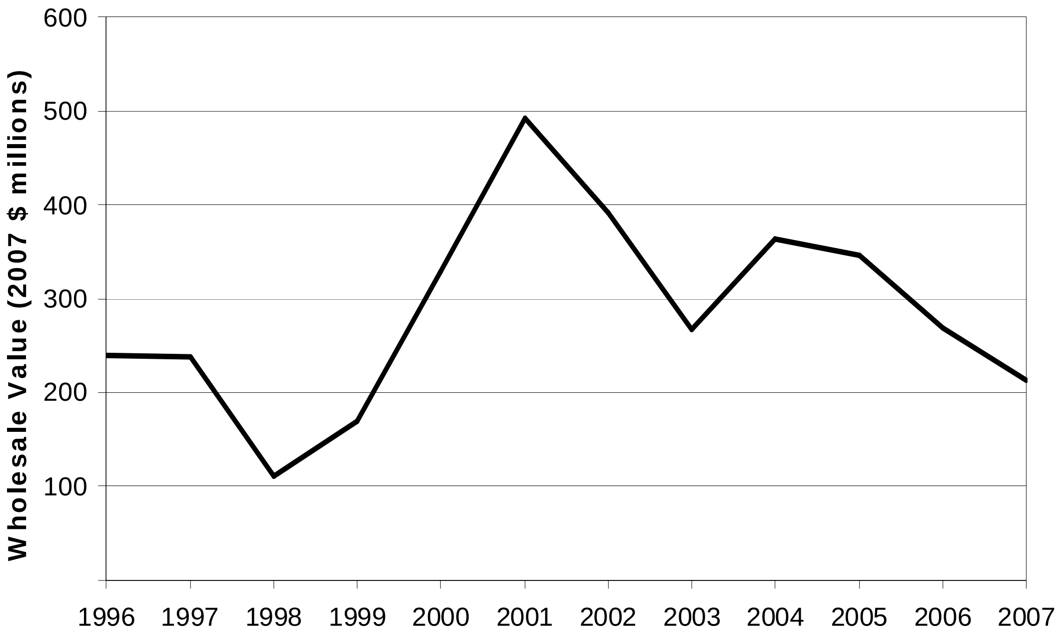
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 22. Alaska Pollock Harvest and Primary Production of Pollock Roe, 1996 – 2007



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 23. Wholesale Value of Alaska Primary Production of Pollock Roe, 1996 – 2007



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 1996-2007

Product Composition and Flow

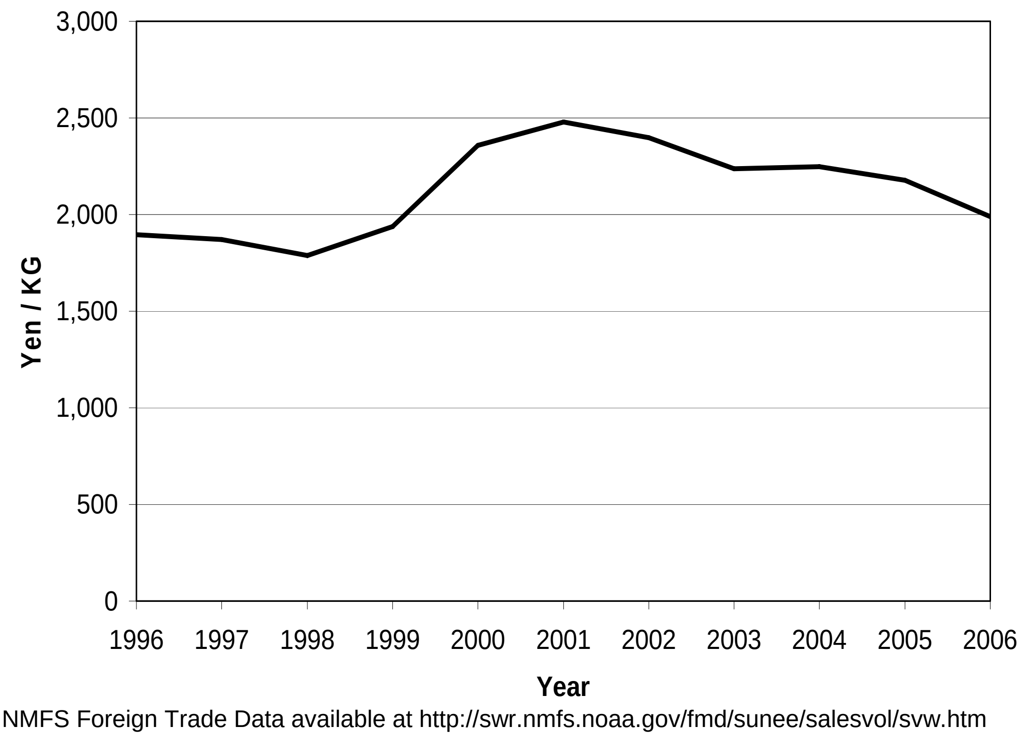
The roe is extracted from the fish after heading, separated from the other viscera, washed, sorted, and frozen. After the roe is stripped from the pollock, the fish can be further processed into surimi or fillets (NMFS 2001). There are dozens of different grades of pollock roe, which command widely varying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

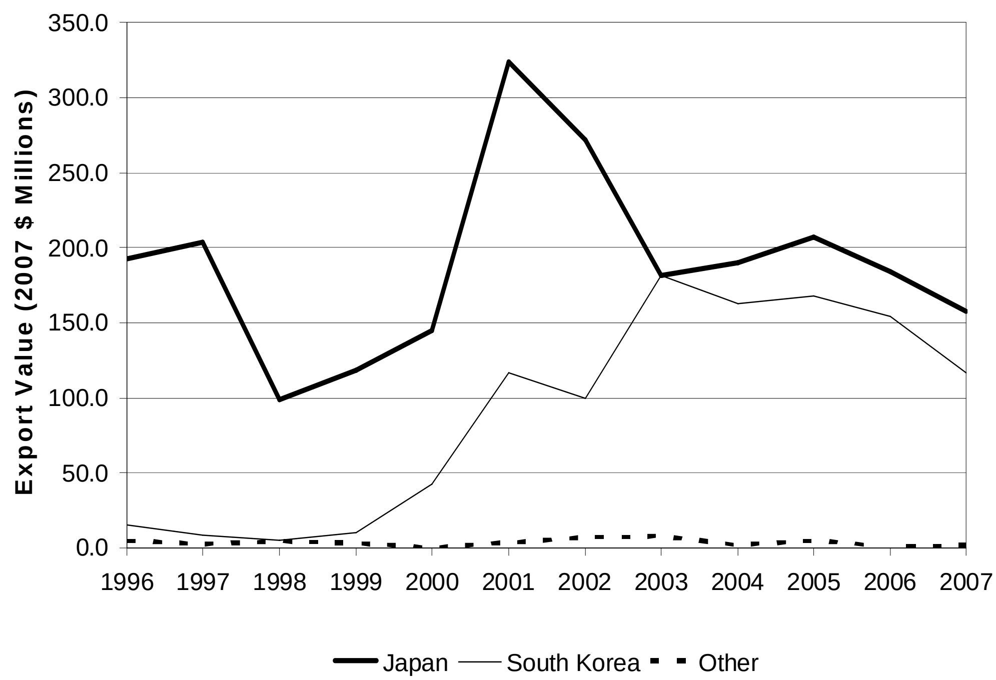


Source: NMFS Foreign Trade Data available at http://swr.nmfs.noaa.gov/fmd/sunee/salesvol/svw.htm

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 - 2007



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

Source: NMFS 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, and the volume of U.S. exports is expected to remain high over the short term (Figure 26 and Figure 28).[4] 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.

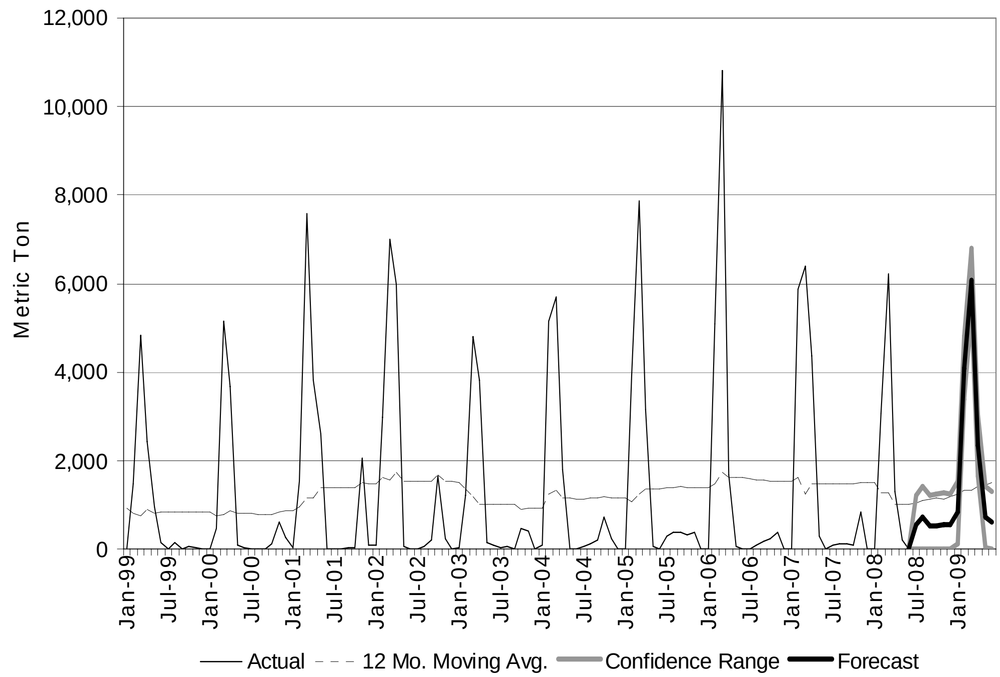
Another factor that will affect future pollock roe markets is even more difficult to predict: Japanese and Korean consumer tastes for traditional and new pollock roe products (Knapp 2006). As roe products in these markets become more mainstream and demand for pollock roe as a gourmet gift product declines consumers may become less discriminating among different types and qualities of

[4] The methodology used to develop forecasts shown in Figure 26 through Figure 29 is described in Appendix A: Alaska Groundfish Export Market Forecast Methodology and Details.

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).

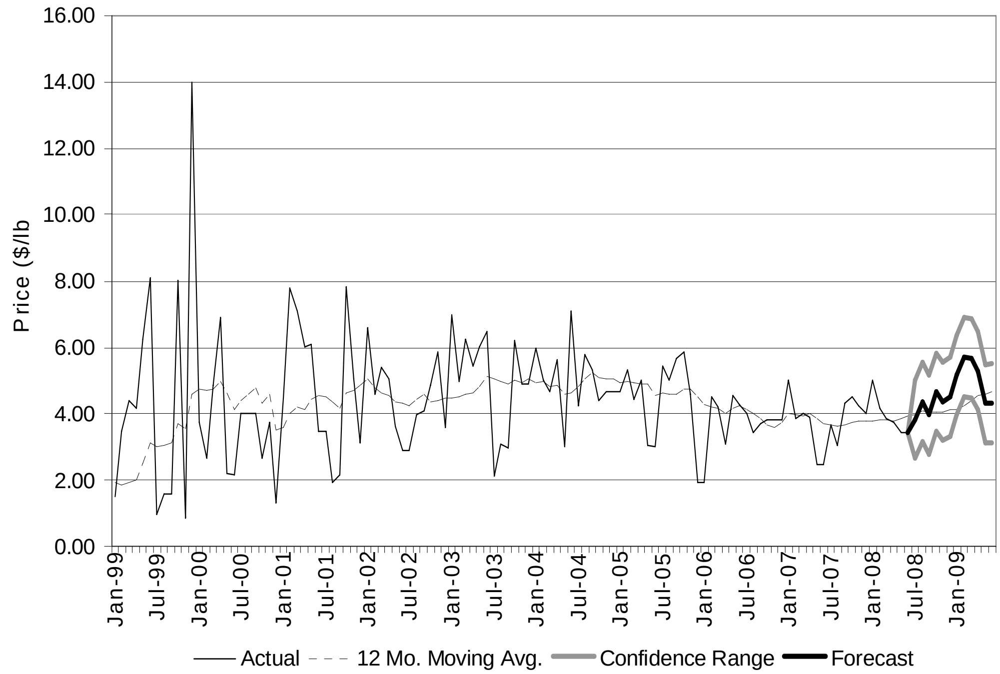
Historically, Japanese wholesale prices for pollock roe have been inversely related to total supply. However, the price of pollock roe is also heavily influenced by the size and condition of roe skeins, color and freshness and the maturity of the fish caught. In addition, prices are influenced by anticipated 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), and price forecasts indicate that they will continue to do so in the future (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. Actual and Forecast U.S. Exports Volumes of Pollock Roe to Japan, 1999-2009



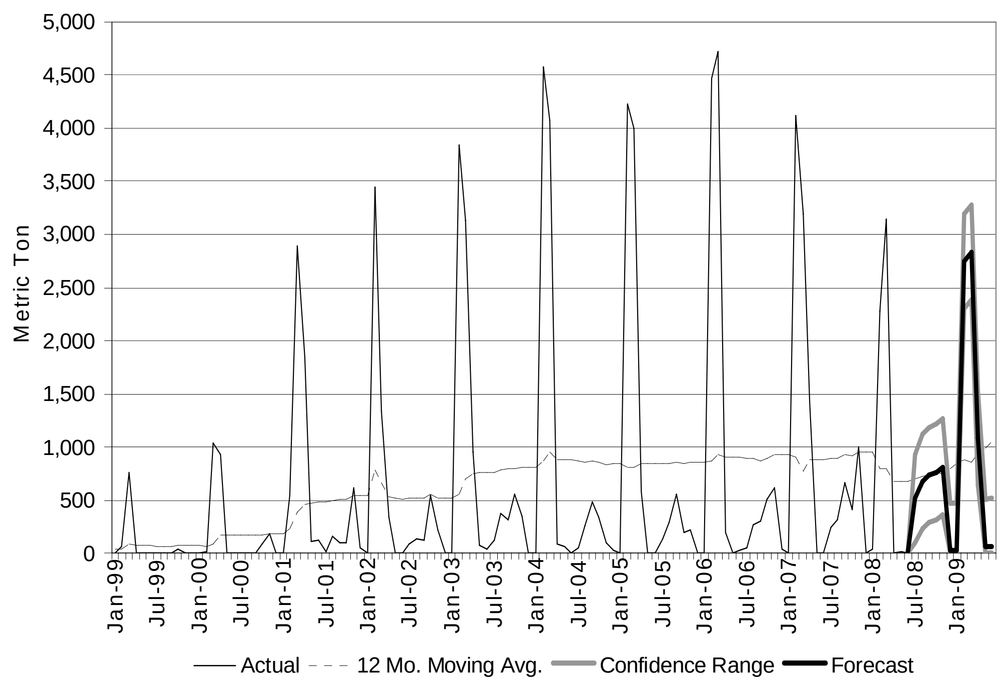
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 27. Actual and Forecast Nominal U.S. Export Prices of Pollock Roe to Japan, 1999-2009



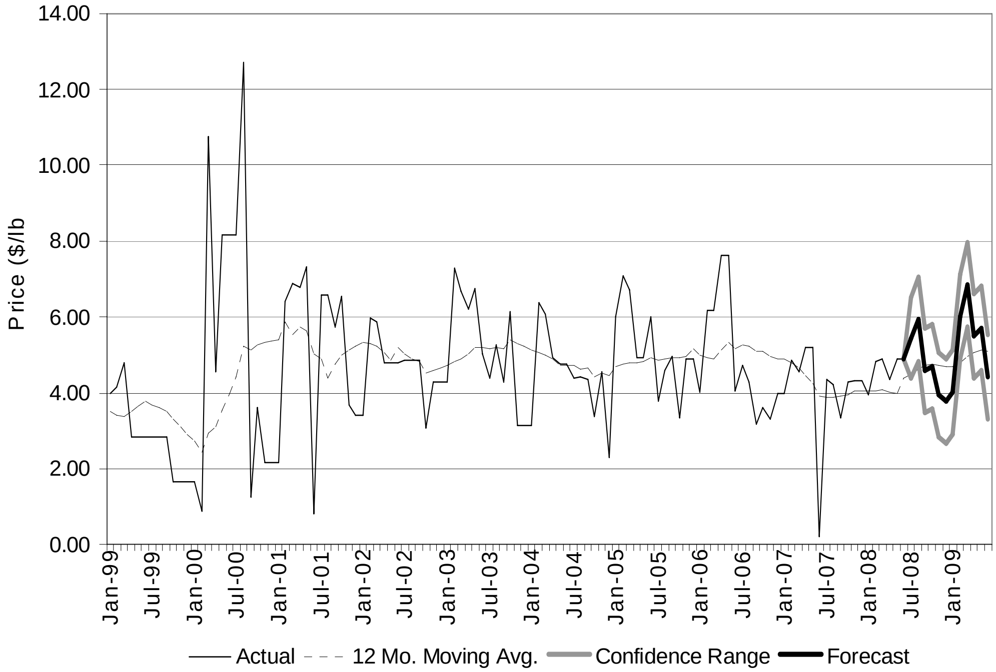
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 28. Actual and Forecast U.S. Exports Volumes of Pollock Roe to Korea, 1999-2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 29. Actual and Forecast Nominal U.S. Export Prices of Pollock Roe to Korea, 1999-2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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Seafood Market Bulletin. April 2008. Whitefish Update. Available at: http://www.alaskaseafood.org/fishingprocessing/seafoodweb_apr08/whitefish.html. Accessed July 14, 2008.

Pacific Cod Market Profile

Description of the Fishery

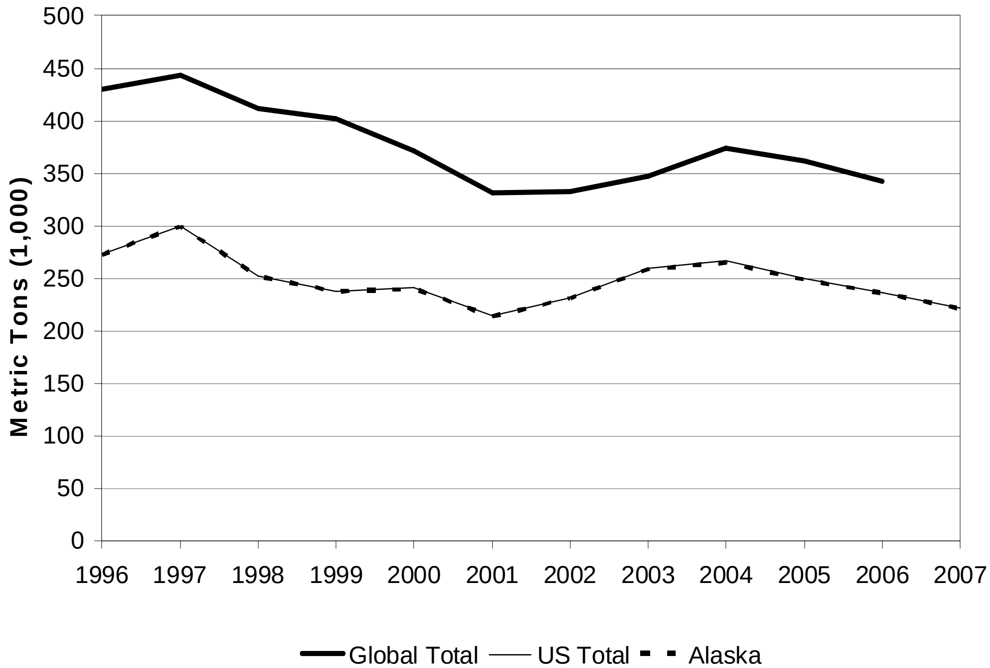
Pacific cod (*Gadus macrocephalus*) is widely distributed over the eastern Bering Sea and Aleutian Islands (BSAI) areas. Behind Alaska pollock, Pacific cod is the second most dominant species in the commercial groundfish catch off Alaska. The BSAI Pacific cod fishery is targeted by multiple gear types, 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 – 2007



Note: Data for 2007 were unavailable for global total. The fish landing statistics of some countries may not distinguish between Pacific cod and other cod species.

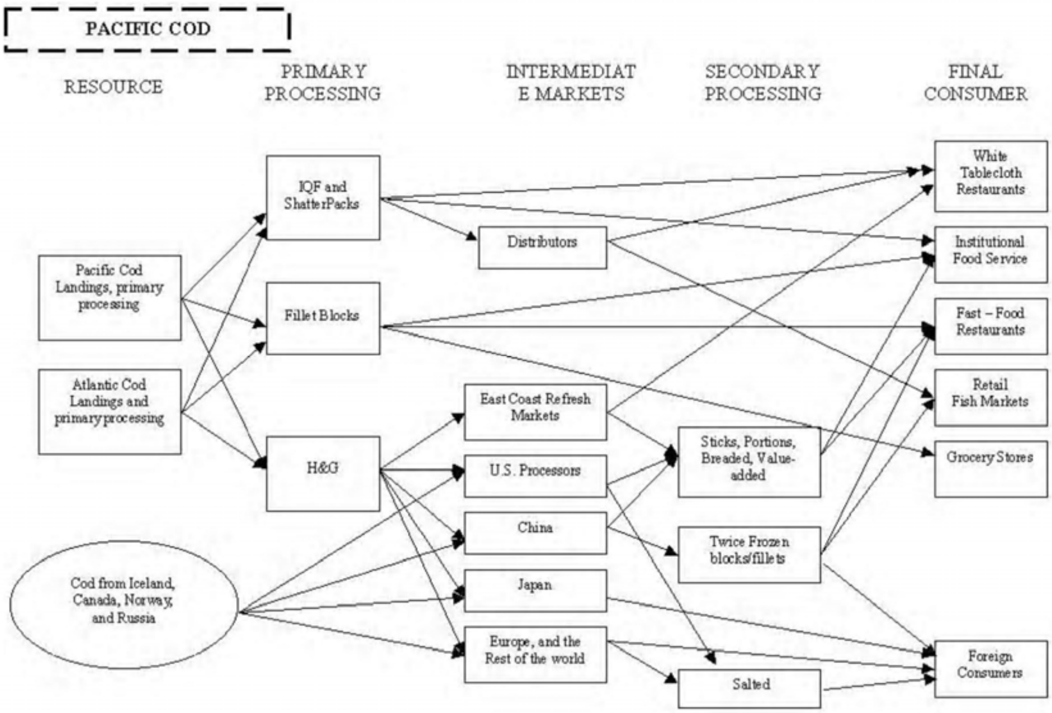
Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html; Global data from FAO, "FishStat" database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

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.

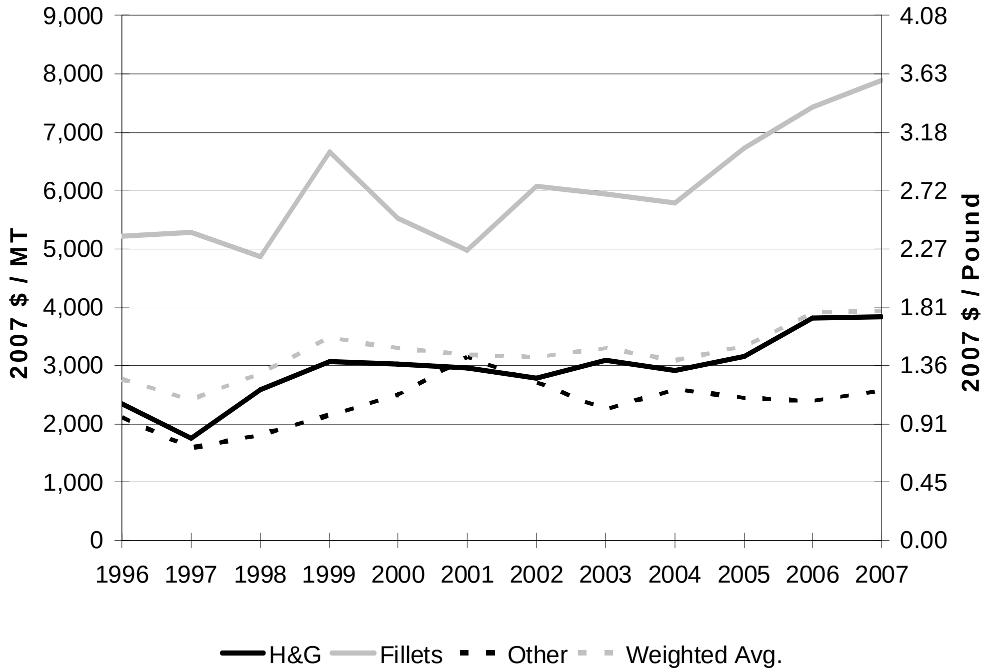
Figure 31. Product Flow and Market Channels for Pacific Cod.



Source: NMFS (2001)

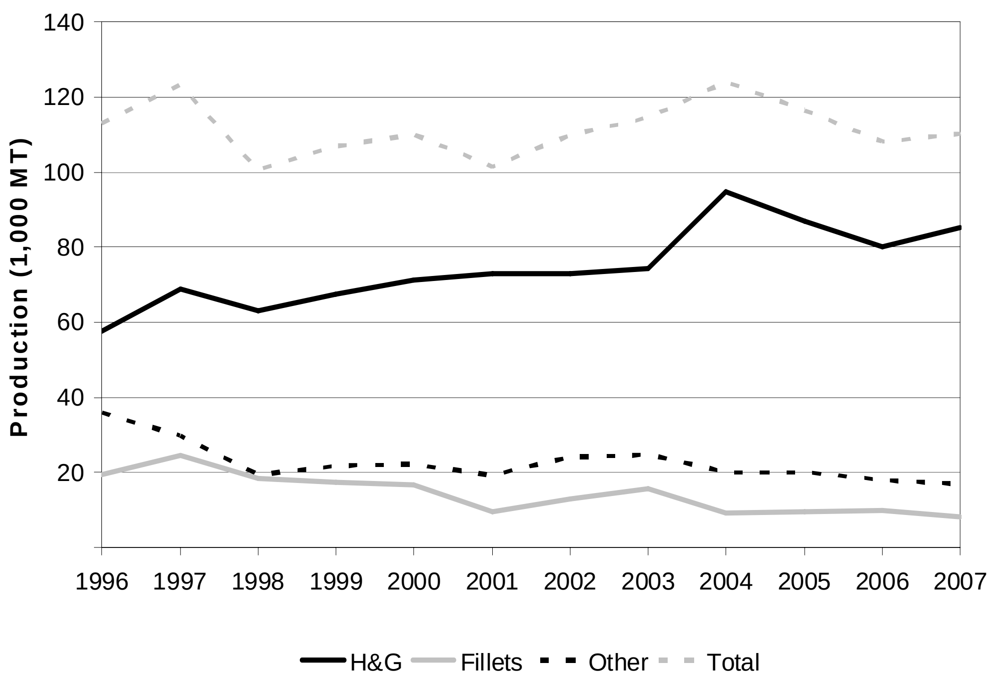
Wholesale prices are highest for fillet products, but H&G fish account for by far the largest share of Alaska Pacific cod production. This share has been increasing over time, from just over 50% in 1996 to around 75% in 2006. Over the same period, the product share of skinless-boneless fillets has declined 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.

Figure 32. Wholesale Prices for Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2007



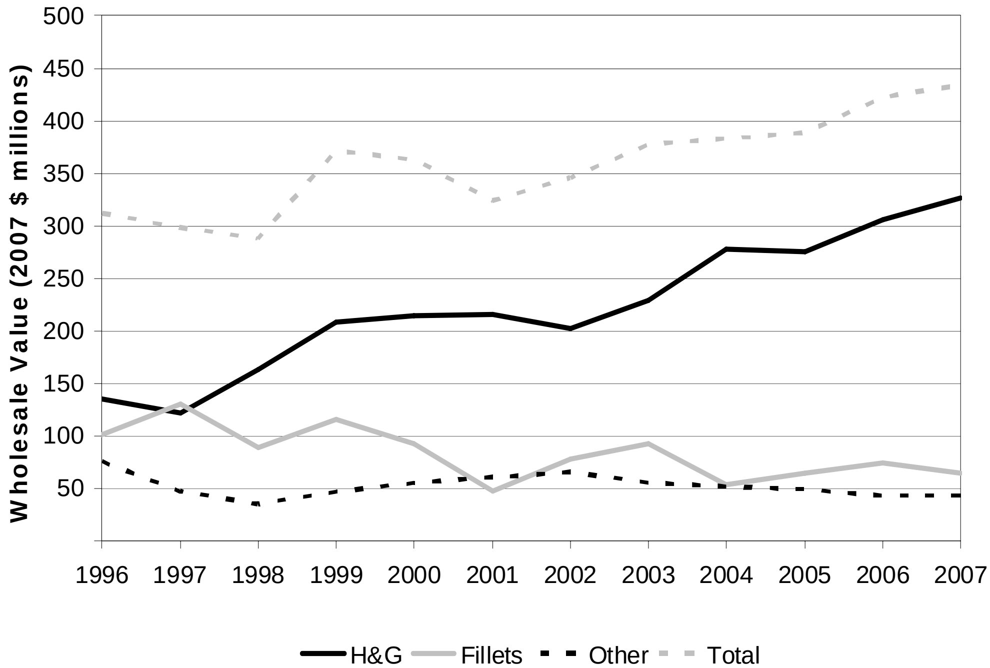
Notes: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 33. Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2007



Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 34. Wholesale Value of Alaska Primary Production of Pacific Cod by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

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.

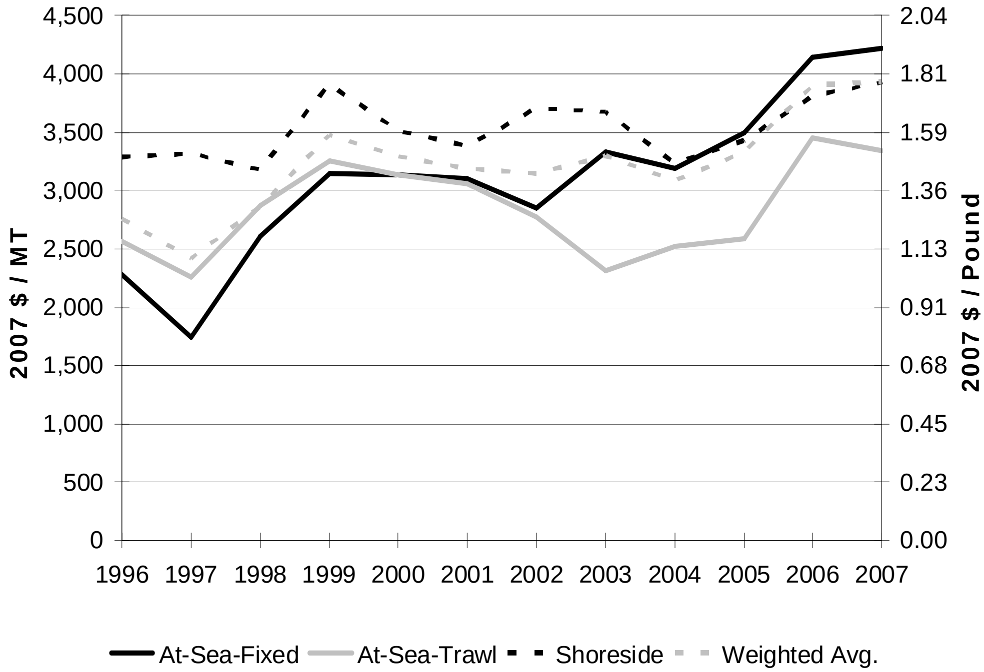
H&G Pacific cod is frozen after the first processing, and then proceeds to another processor within the U.S., or is exported for secondary processing. Some domestic H&G Pacific cod is sent to the East Coast refresh market, where it is thawed and filleted before being processed further, or sold as refreshed. 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).

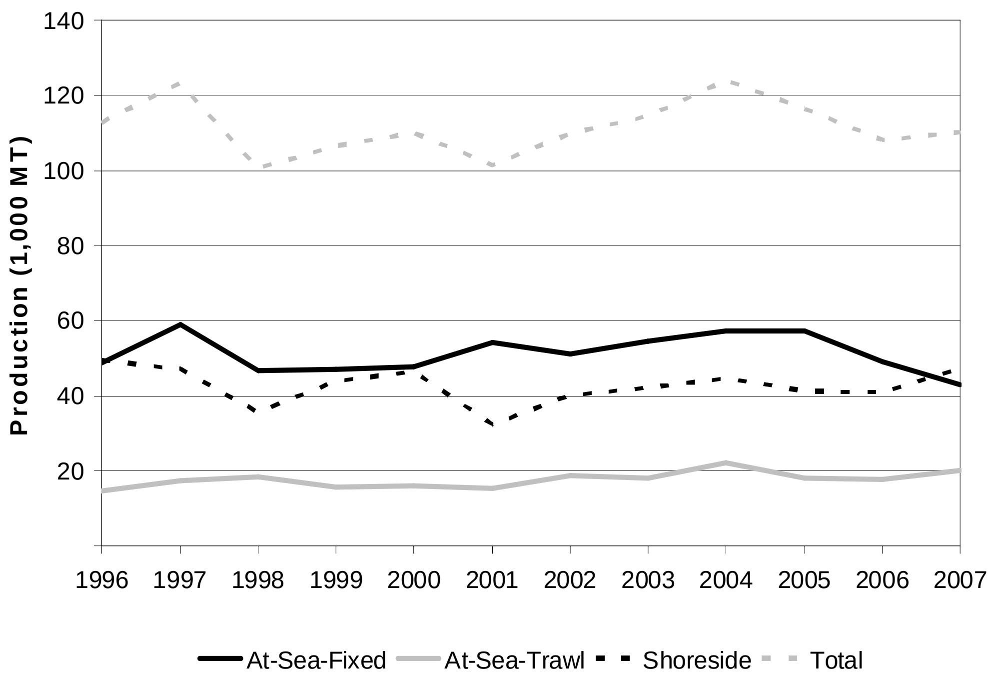
Figure 35. Wholesale Prices for Alaska Primary Production of H&G Cod by Sector Type, 1996 – 2007



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 1996-2007

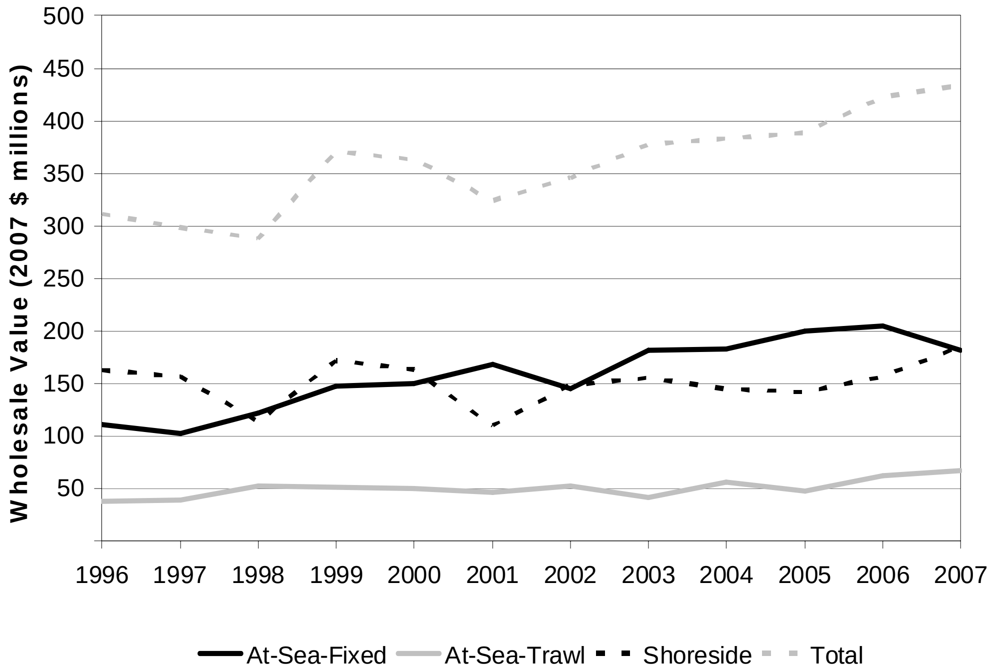
Figure 36. Alaska Primary Production of H&G Pacific Cod by Sector, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 37. Wholesale Value of Alaska Primary Production of H&G Pacific Cod by Sector, 1996 – 2007



Note: Product type may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

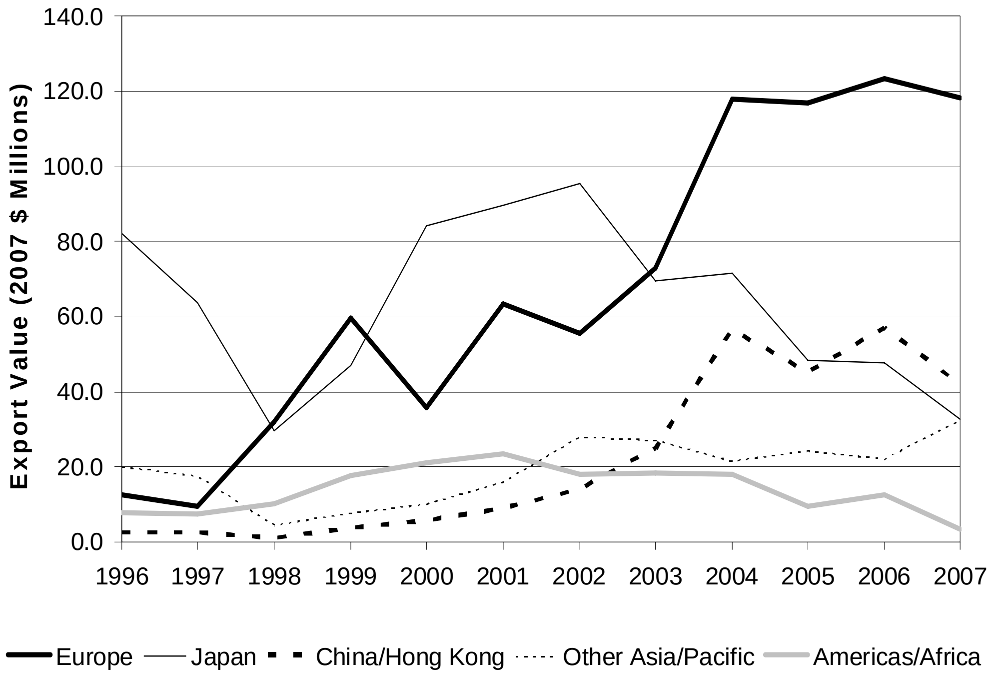
International Trade

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 has increased steadily since 2002 (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 an acceptable 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 are 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.

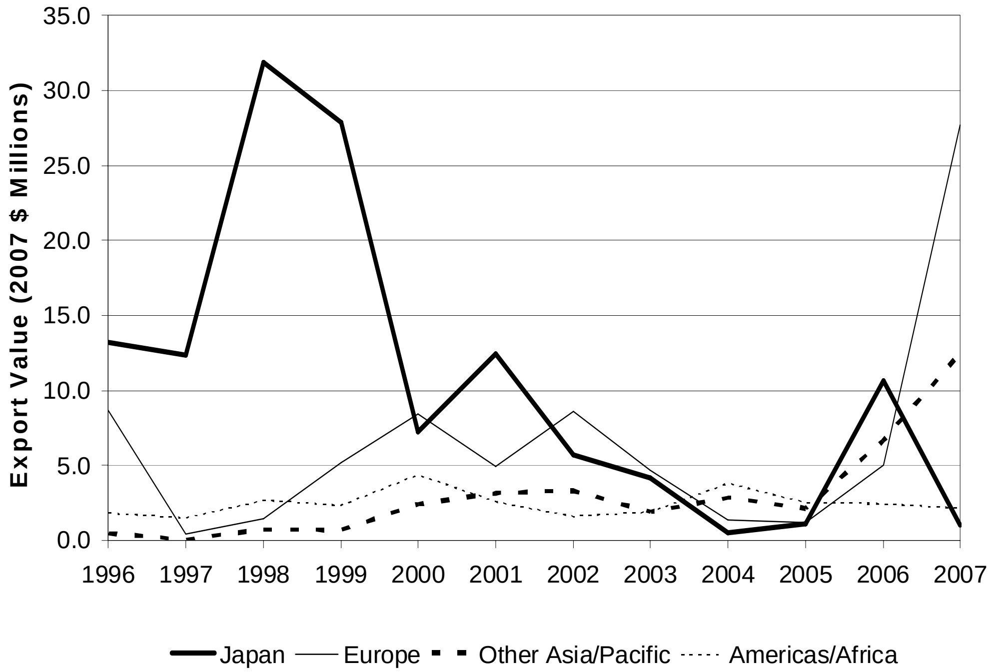
Figure 38. U.S. Exports of Frozen Pacific Cod (excluding Fillets) to Leading Importing Countries, 1996 - 2007



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: NMFS 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 – 2007



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," NMFS 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. The upward trend in U.S. export prices and volumes of Pacific cod fillets is expected to continue over the short term (Figure 40 and Figure 41).[5]

U.S. export prices and volumes of "frozen cod (excluding fillets)" are also expected to continue to climb in the near future (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).

[5] The methodology used to develop forecasts shown in Figure 40 through Figure 47 is described in Appendix A: Alaska Groundfish Export Market Forecast Methodology and Details.

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).

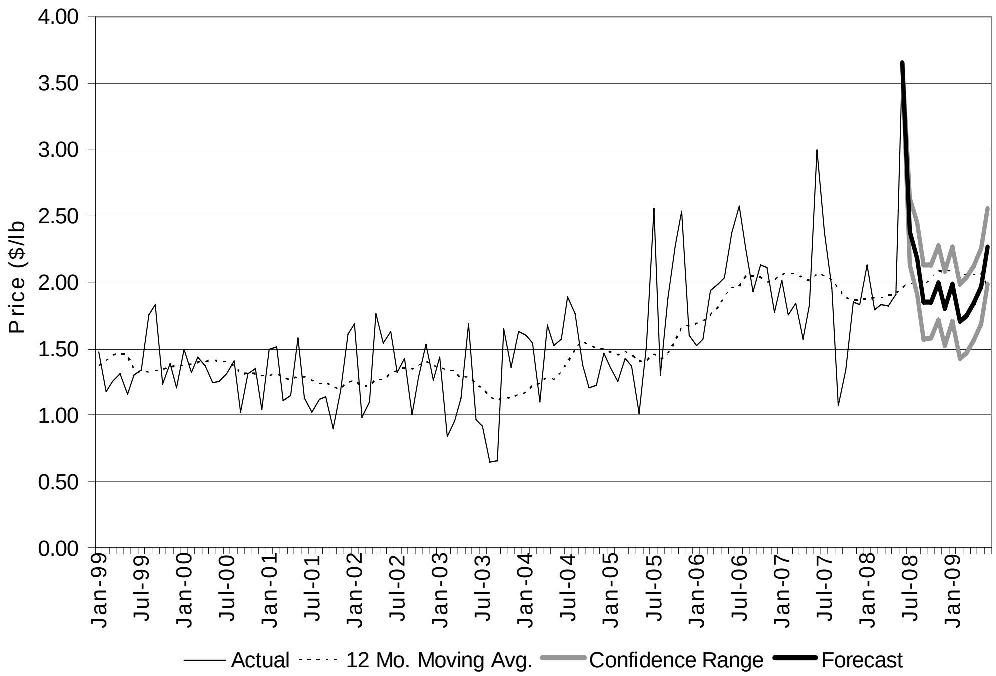
Marketing seafood from well-managed fisheries, such as Pacific cod, is especially important to EU seafood processors (Chetrick 2005). Some U.S. companies have also begun to shift their seafood purchases toward species caught in fisheries considered sustainable. In 2006, for example, Compass Group USA, 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. Actual and Forecast Nominal U.S. Export Prices of Cod Fillets to All Countries, 1999 – 2009

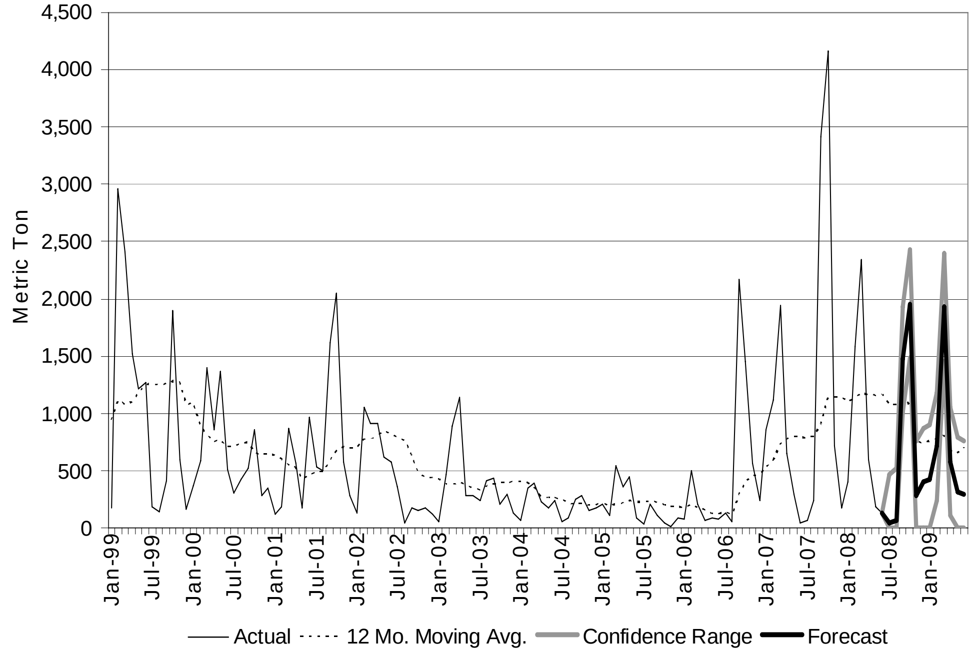


Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Pacific Cod Market Profile

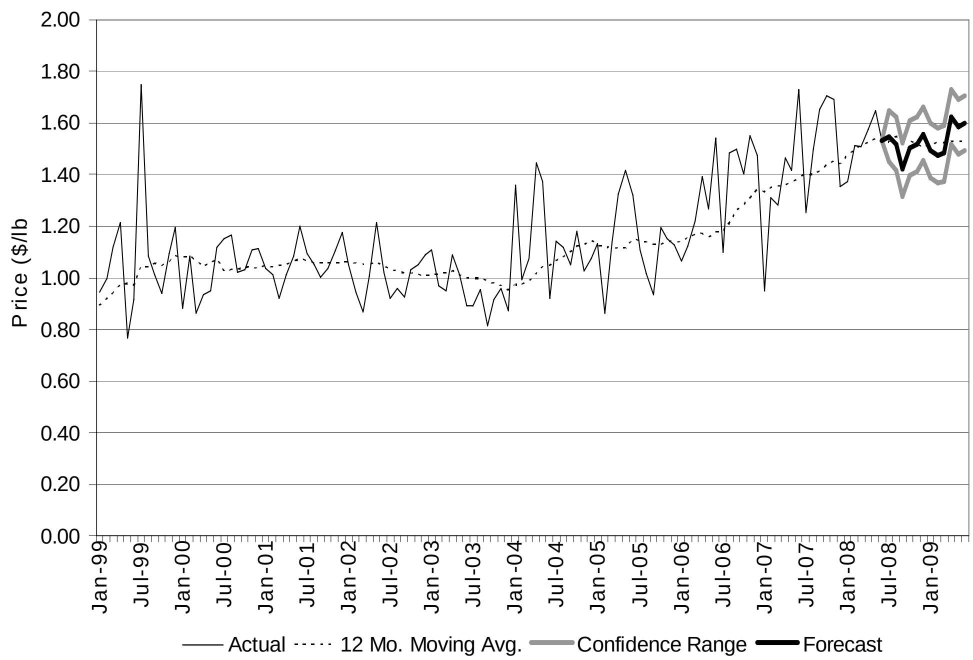
Figure 41. Actual and Forecast U.S. Export Volumes of Cod Fillets to All Countries, 1999 – 2009



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

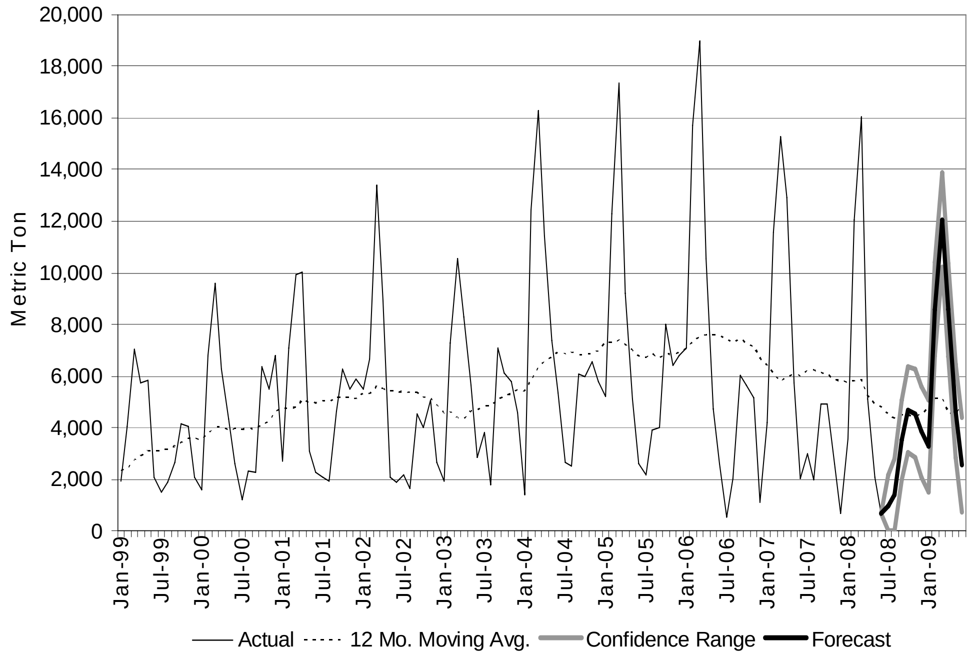
Figure 42. Actual and Forecast U.S. Export Prices of Frozen Cod (Not Fillets) to All Countries, 1999 – 2009



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

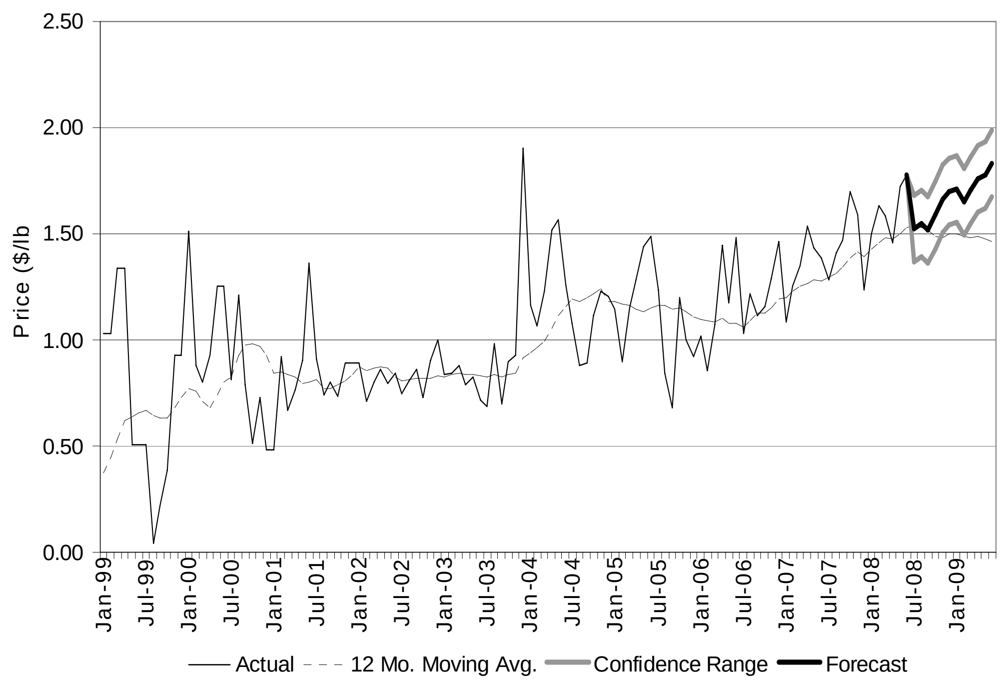
Figure 43. Actual and Forecast U.S. Export Volumes of Frozen Cod (Not Fillets) to All Countries, 1999 – 2009



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

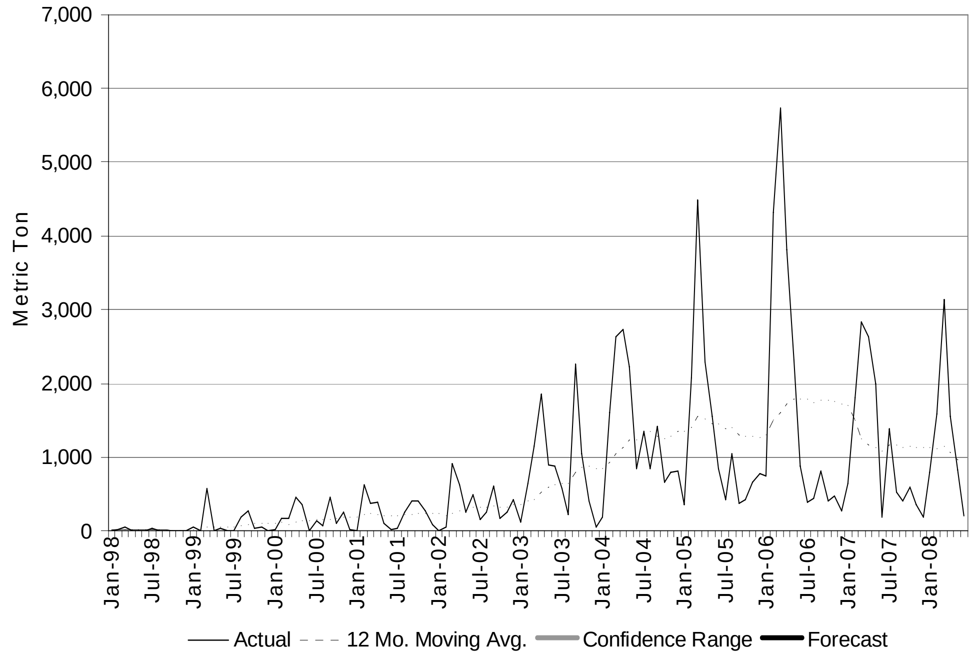
Figure 44. Actual and Forecast Nominal U.S. Export Prices of Frozen Cod (Not Fillets) to China, 1999 – 2009



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

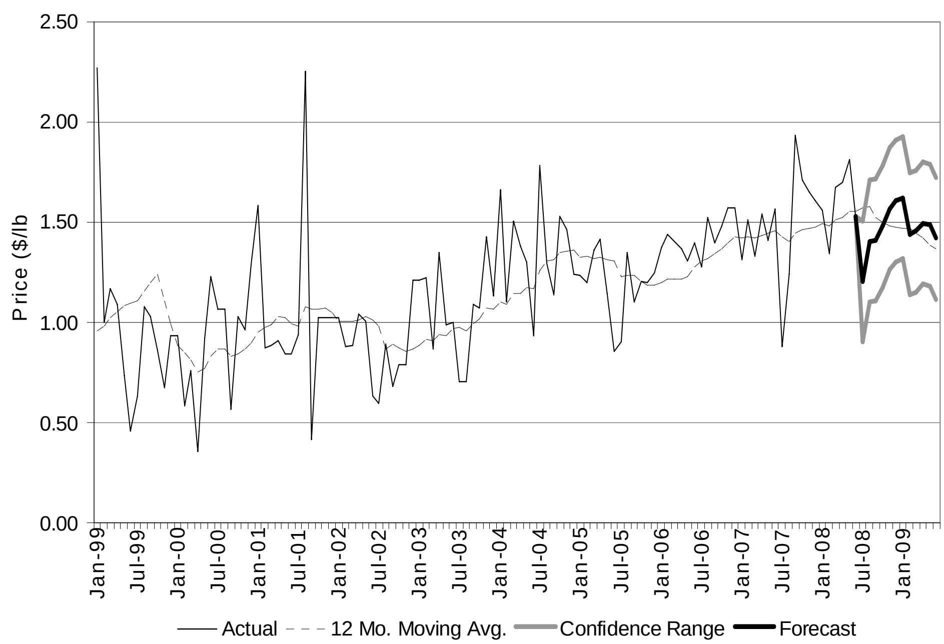
Figure 45. Actual and Forecast U.S. Export Volumes of Frozen Cod (Not Fillets) to China, 1999 – 2009



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

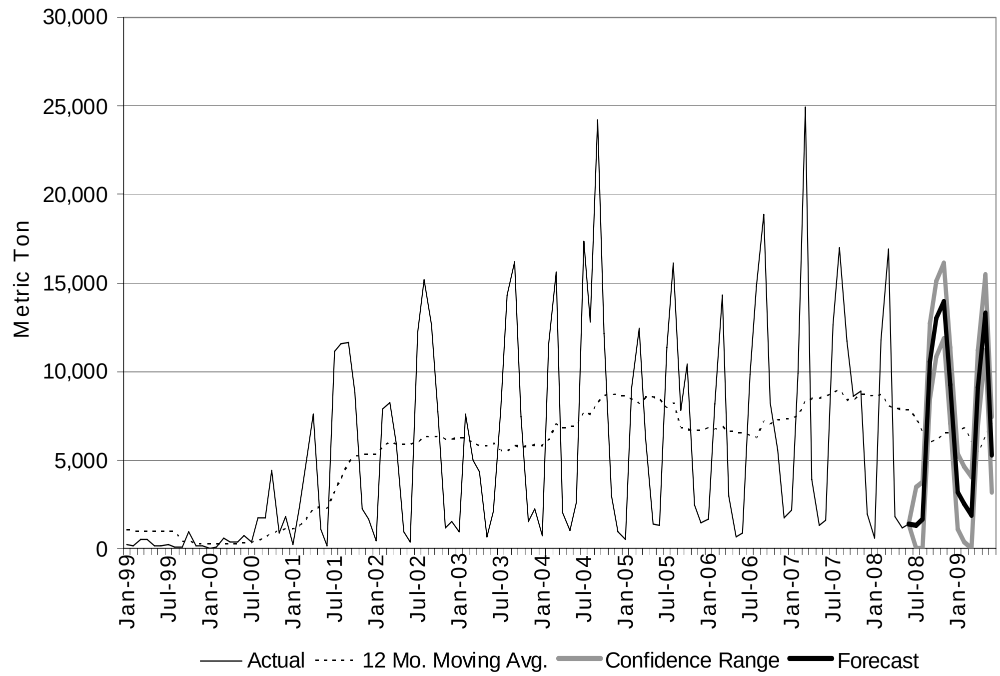
Figure 46. Actual and Forecast Nominal U.S. Export Prices of Frozen Cod (Not Fillets) to Portugal, 1999 – 2009



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 47. Actual and Forecast U.S. Export Volumes of Frozen Cod (Excluding Fillets) to Portugal, 1999 – 2009



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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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.

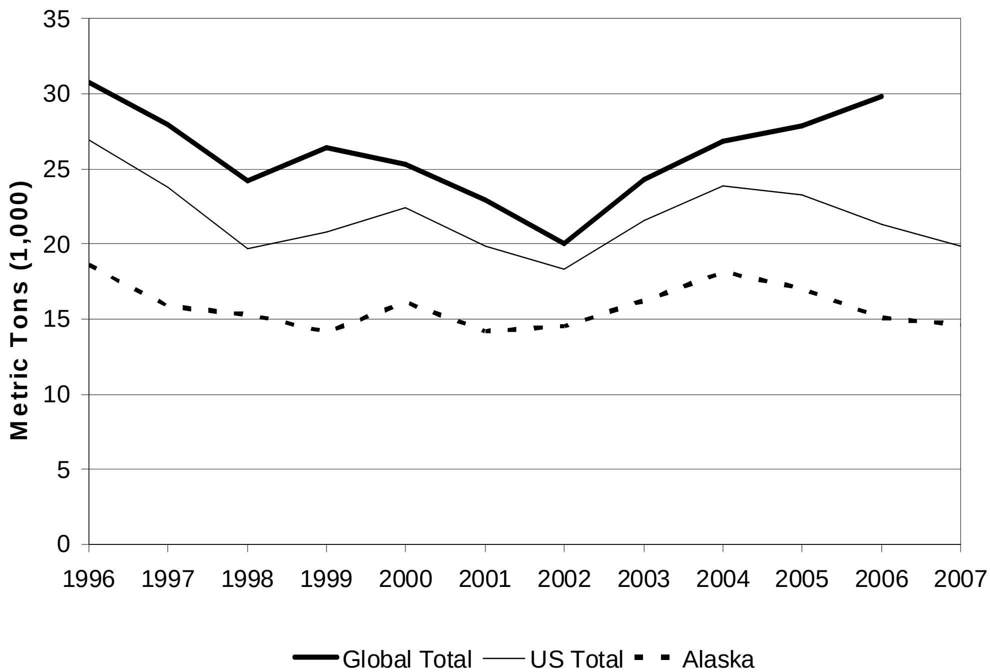
The fishing fleet for sablefish is primarily composed of owner-operated vessels that use hook-and-line or pot (fish trap) gear. An IFQ program for the Alaska sablefish and halibut fisheries was developed by the North Pacific Fishery Management Council and implemented by NMFS in 1995. The program was 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 – 2007



Note: Data for 2007 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

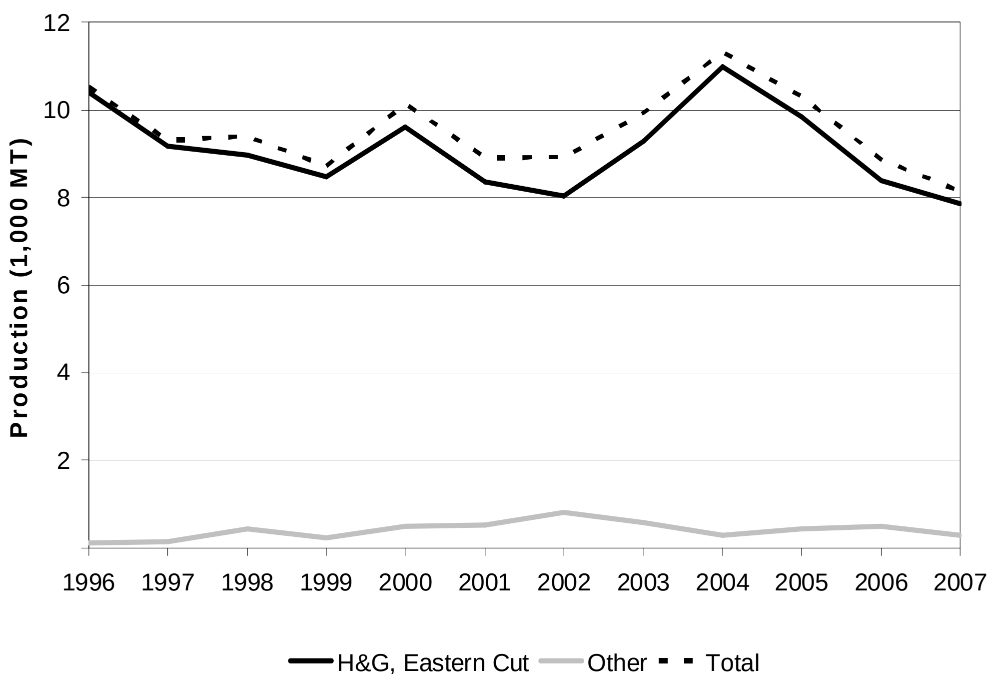
Until recently, about 90 percent of sablefish delivered by catcher vessels to shoreside processors was already headed and gutted (H&G) in an eastern cut—head removed just behind the collar bone (pers. comm., Jeannie Heltzel, Fisheries Analyst, North Pacific Fishery Management Council, September 19, 2007).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

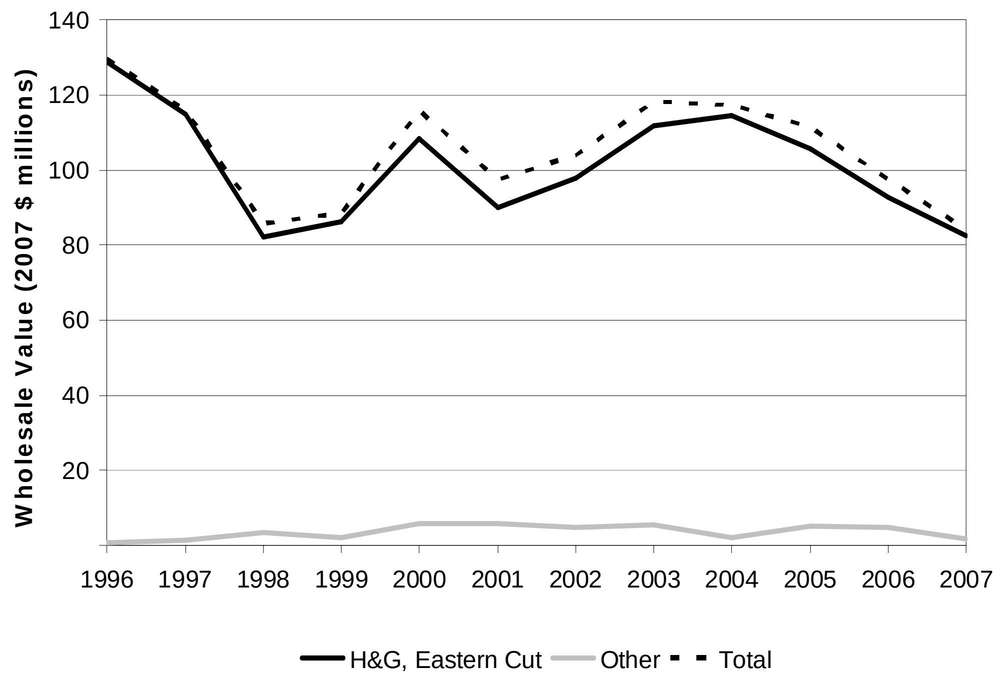
Figure 49. Alaska Primary Production of Sablefish by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

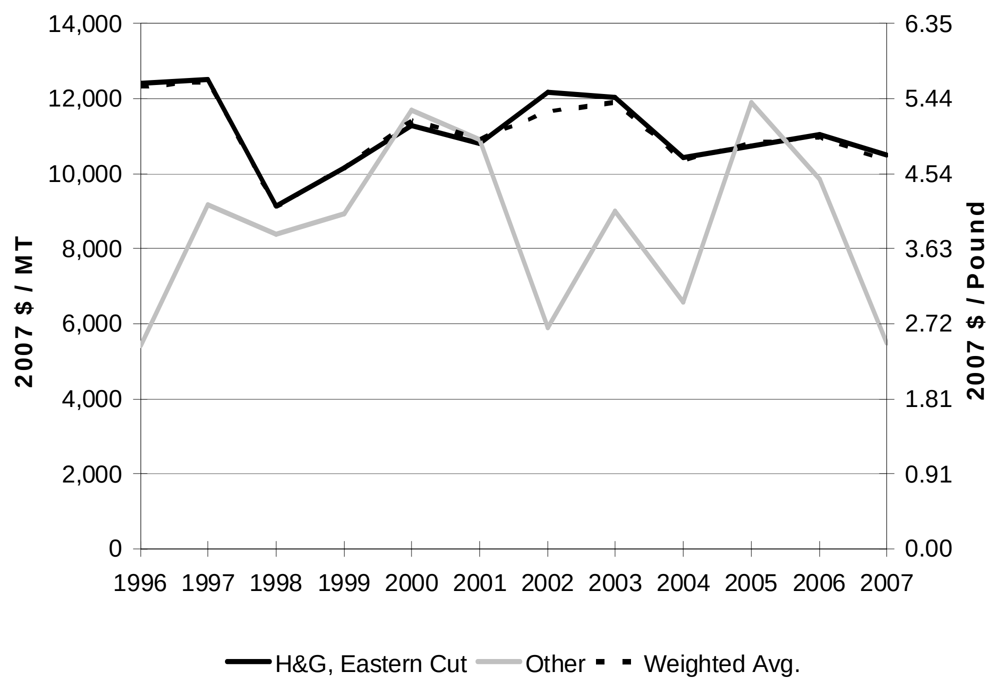
Figure 50. Wholesale Value of Alaska Primary Production of Sablefish by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 51. Wholesale Prices for Alaska Primary Production of Sablefish by Product Type, 1996 – 2007



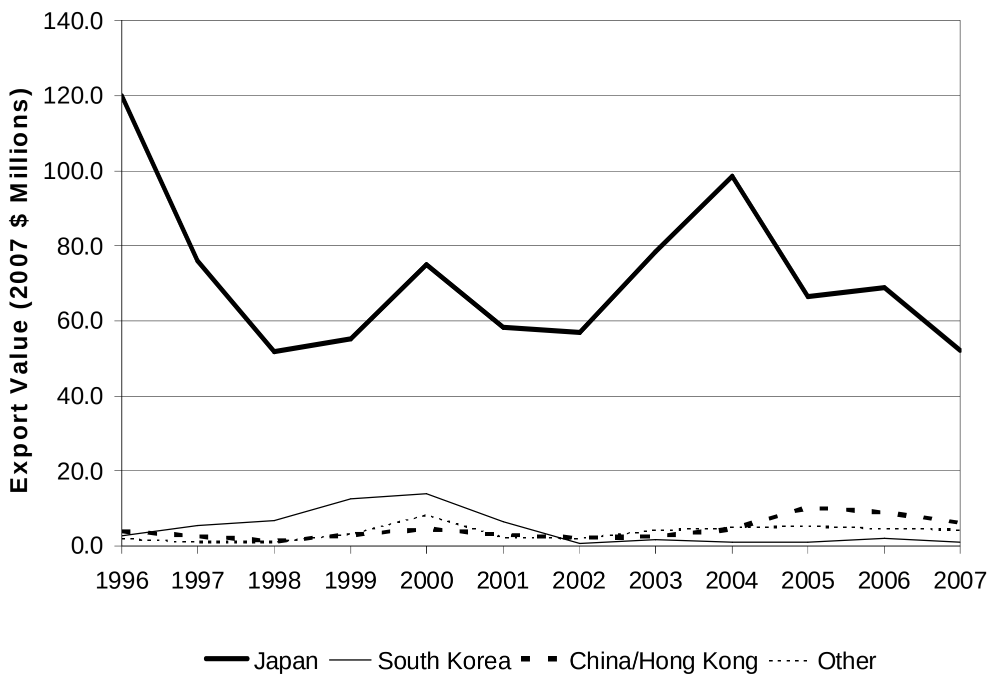
Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

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 – 2007



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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).

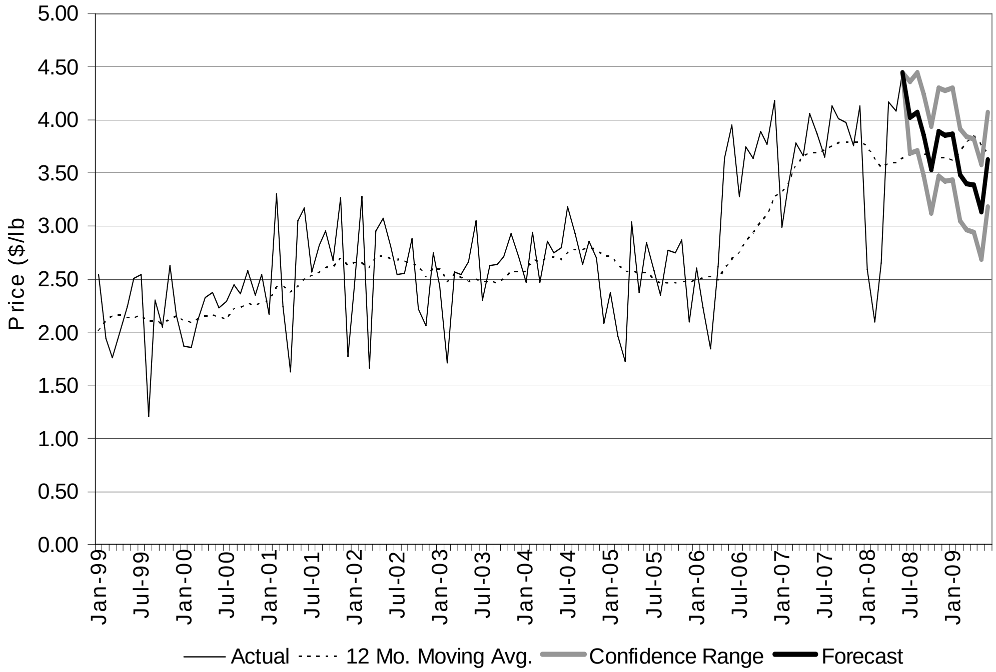
Japan remains the primary market destination for Alaska sablefish. Forecasts of U.S. export prices predict a drop in price over the short term (Figure 53).[6] However, the forecast model does not adjust for exogenous factors such as cuts in the Alaska sablefish quota. As noted above, sablefish market 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).

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).

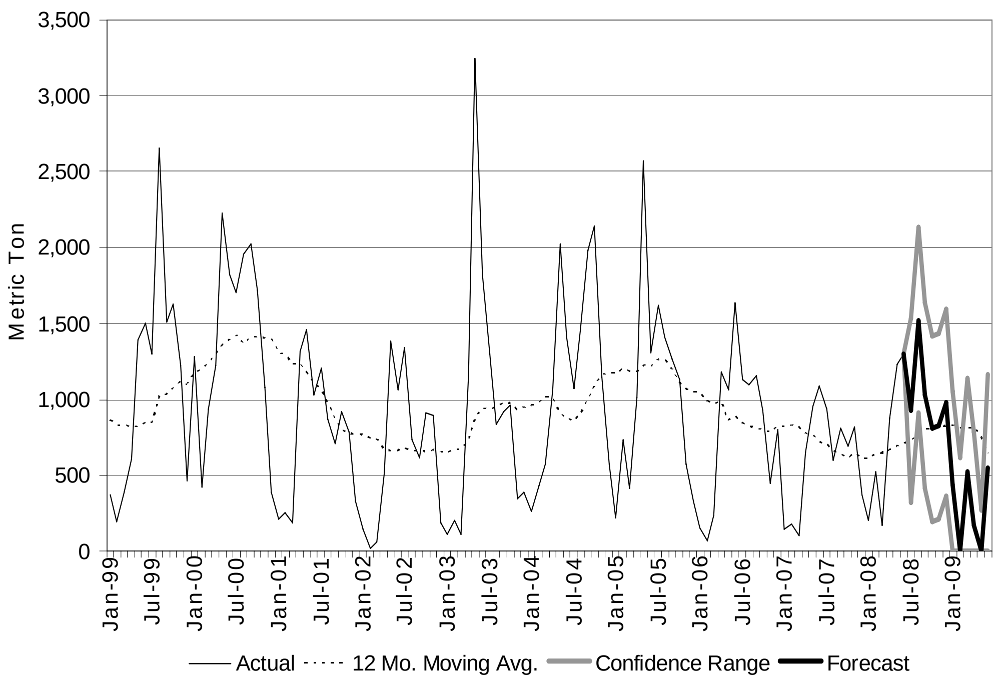
[6] The methodology used to develop forecasts shown in Figure 53 through Figure 54 is described in Appendix A: Alaska Groundfish Export Market Forecast Methodology and Details.

Figure 53. Actual and Forecast Nominal U.S. Export Prices of Sablefish to All Countries, 1999 – 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 54. Actual and Forecast U.S. Export Volumes of Sablefish to All Countries, 1999 – 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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Welch, L. April 24, 2006. Sablefish (Black Cod) Also Will Get MSC Approval Next Month, Says the Fishing Vessel Owners Association. SeafoodNews.com.

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.

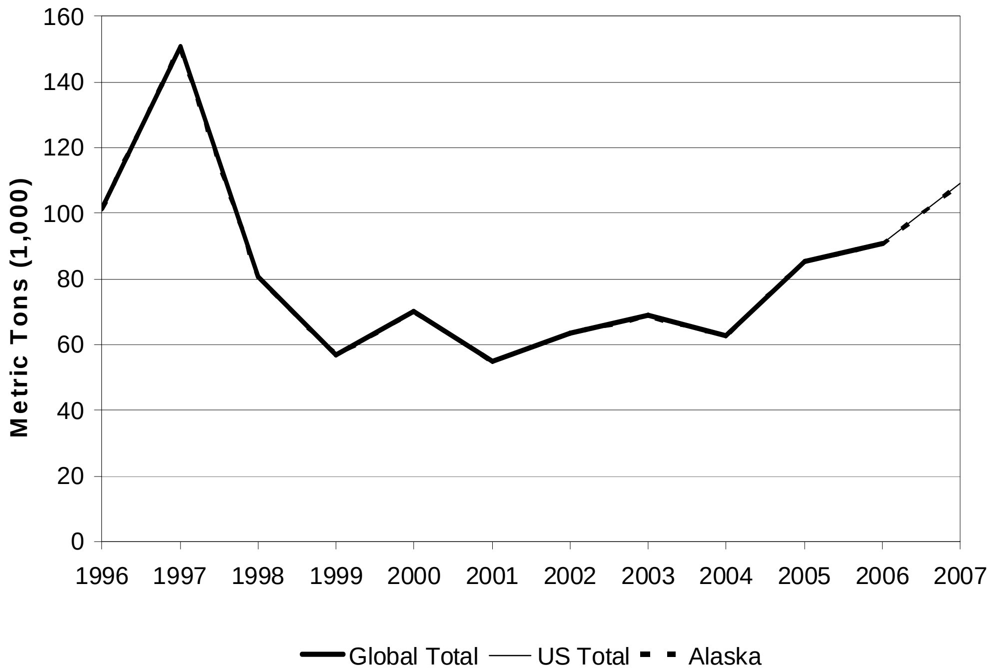
Production

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.

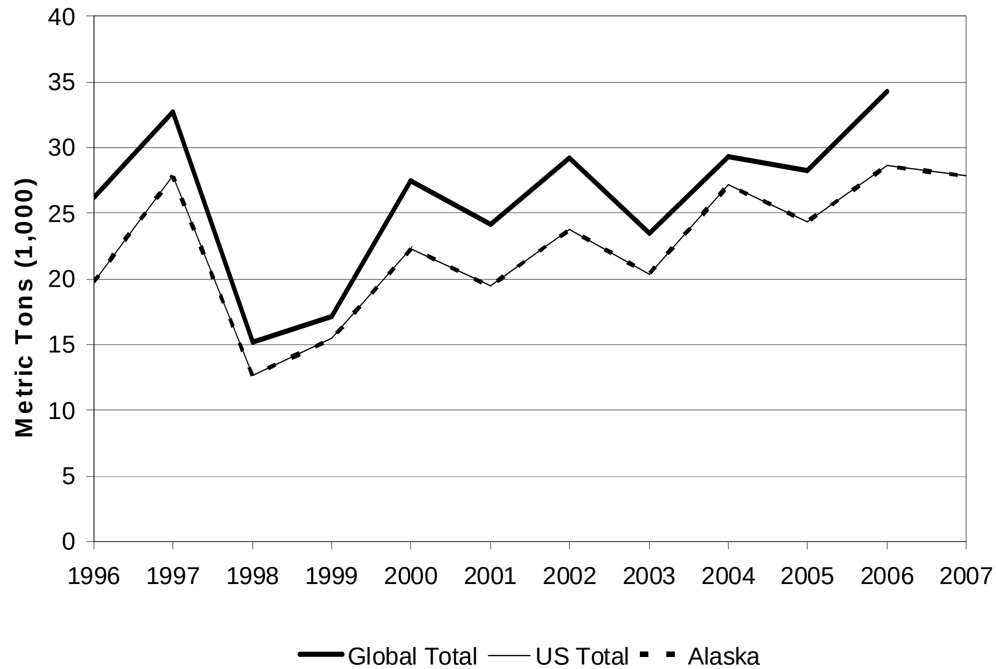
Figure 55. Alaska, Total U.S. and Global Retained Harvest of Yellowfin Sole, 1996 – 2007



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 2007 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 – 2007



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 2007 are unavailable.

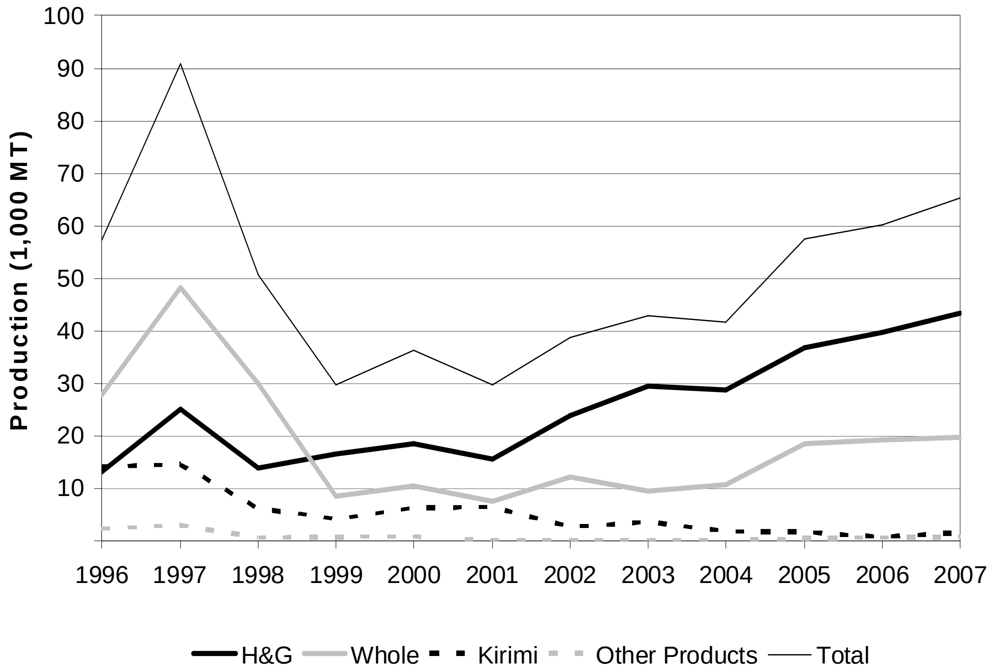
Source: Alaska data from NMFS Blend and Catch Accounting System Data. Other U.S. data from PacFIN, available at http://www.psmfc.org/pacfin/pfmc.html. Global data from FAO, “FishStat” database available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073.

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.

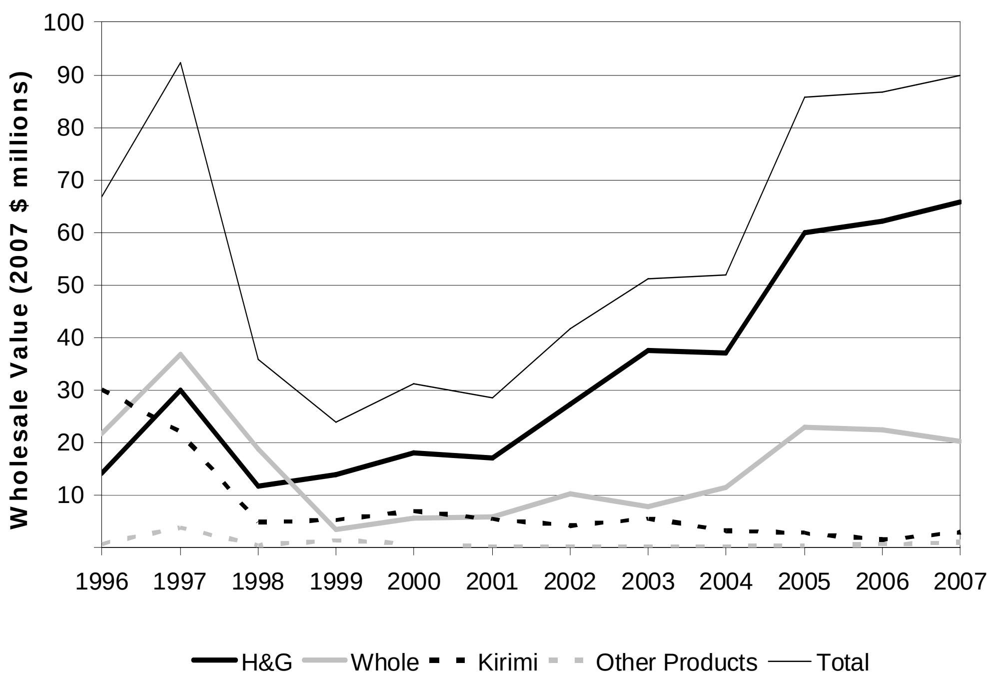
Figure 57. Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 58. Wholesale Value of Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

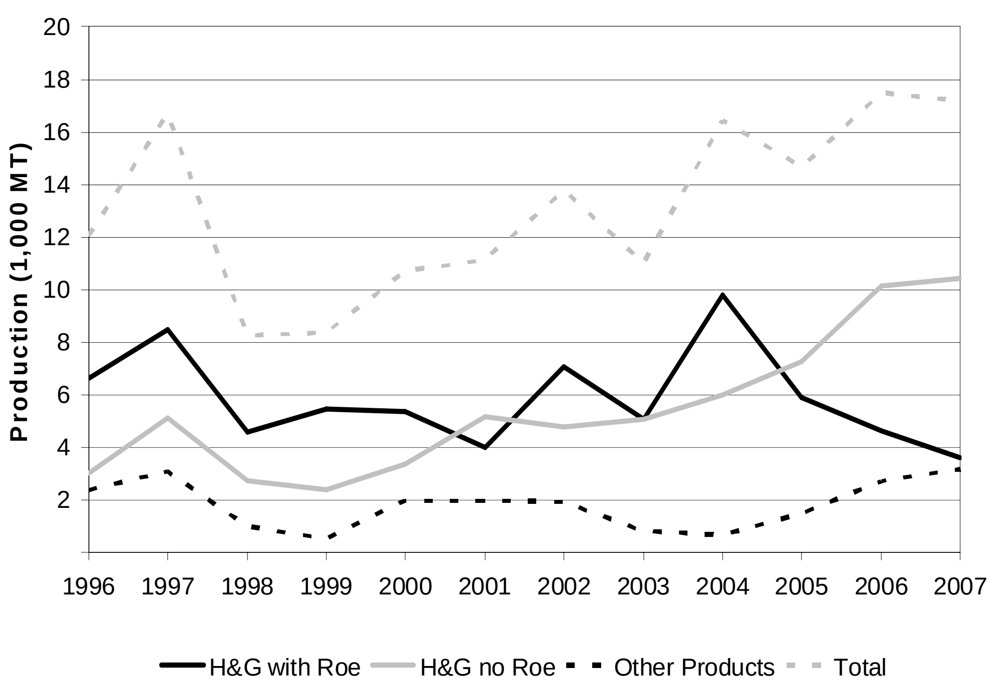
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 59. Wholesale Prices for Alaska Primary Production of Yellowfin Sole by Product Type, 1996 – 2007

Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

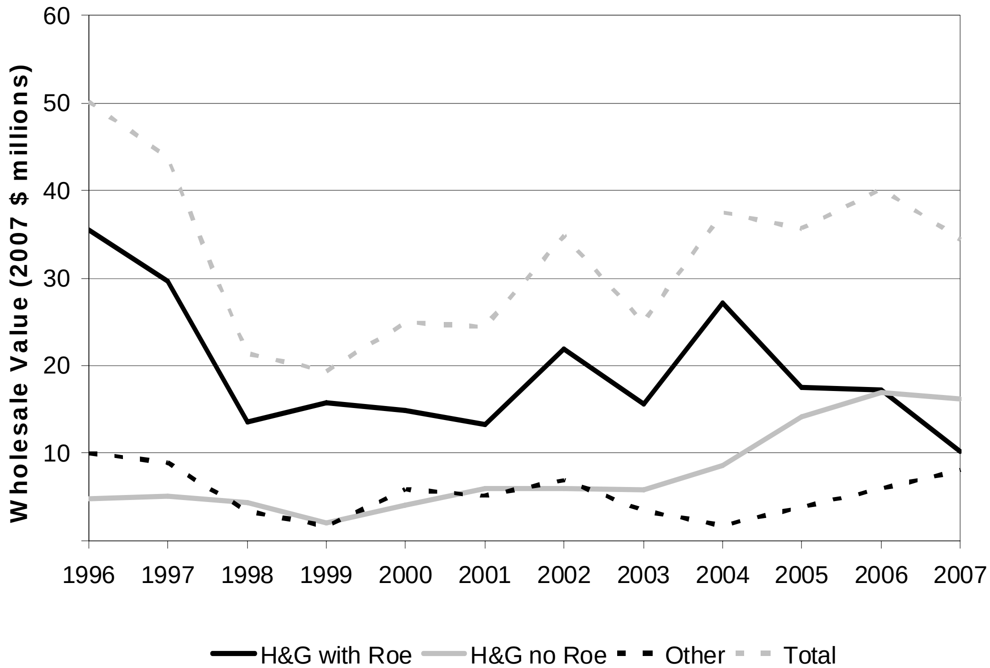
Figure 60. Alaska Primary Production of Rock Sole by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

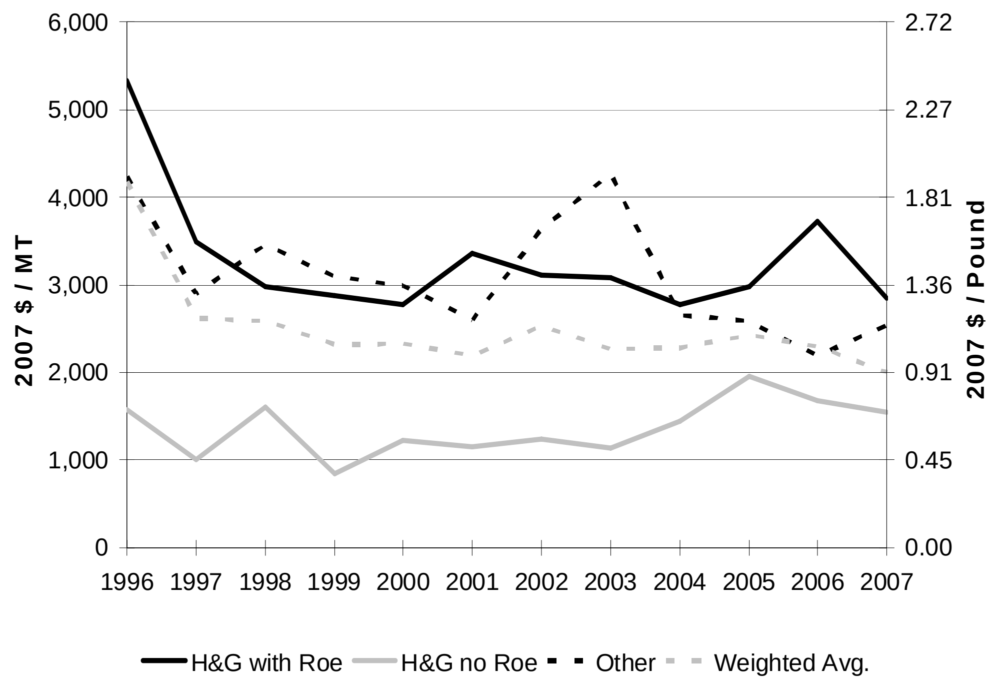
Figure 61. Wholesale Value of Alaska Primary Production of Rock Sole by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 62. Wholesale Prices for Alaska Primary Production of Rock Sole by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

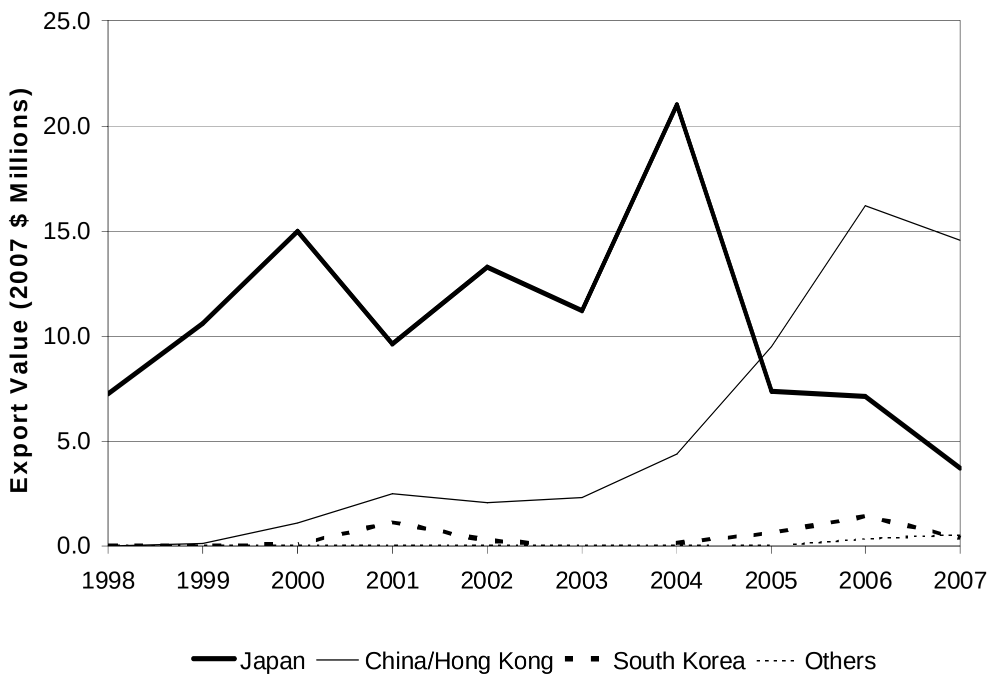
International Trade

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.

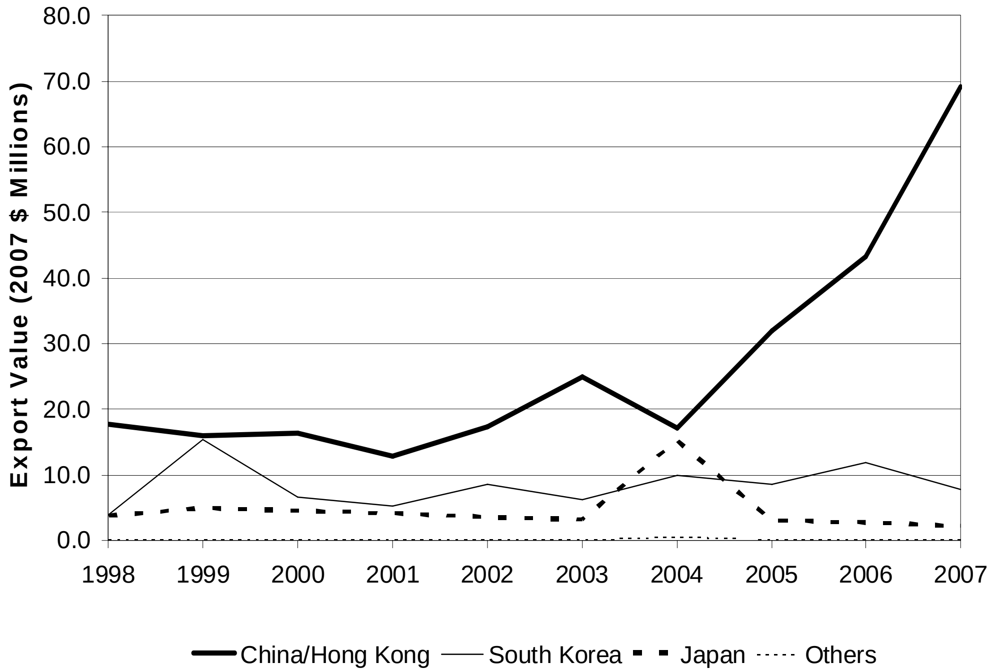
Figure 63. U.S. Exports of Rock Sole to Leading Importing Countries, 1998 – 2007



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

Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/.

Figure 64. U.S. Exports of Yellowfin Sole to Leading Importing Countries, 1998 – 2007



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

Source: NMFS 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 may increase in 2008 due to a TAC increase in the BSAI from 136,000 mt in 2007 to 225,000 mt in 2008 and 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. In general, the export prices and volumes of yellowfin and rock sole are predicted to remain stable over the short term (Figure 65 through Figure 68).[7] However, these forecasts do not account for exogenous factors such as a quota increase. 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).

The TAC for rock sole also increased in 2008 (from 55,000 to 75,000 mt). While the fleet will also have the ability to act collectively and avoid halibut bycatch when fishing for rock sole, it is uncertain whether total landings will increase. According to industry sources, the uncertainty arises because of the relatively low value that is received for rock sole after the roe season. Because of the low value, the fleet may not choose to target rock sole during the fall fishery and concentrate instead on higher value flatfish such as flathead sole.

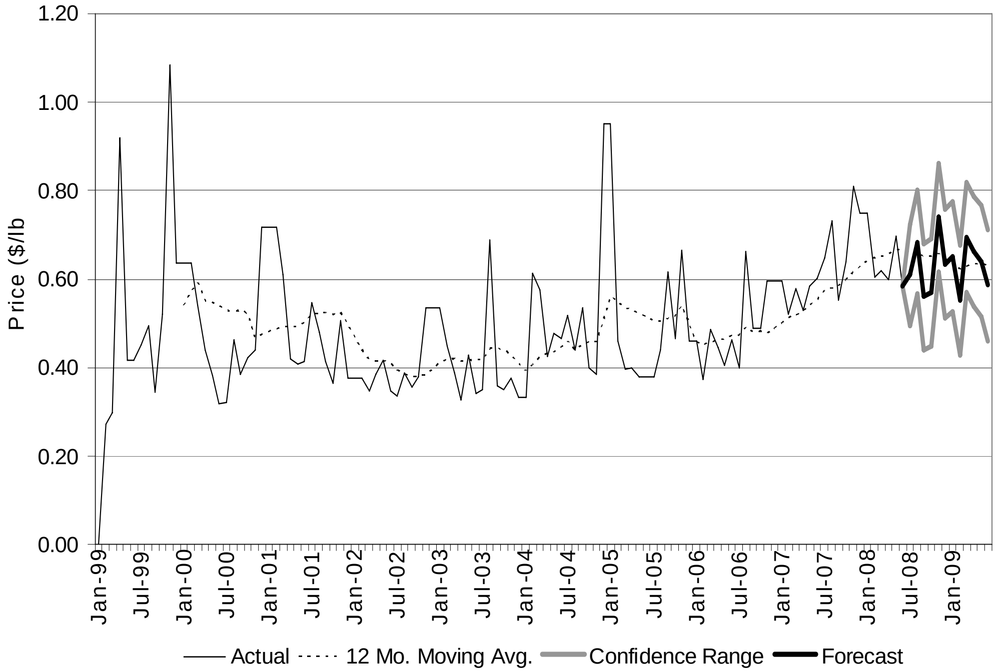
It is likely that Alaska-harvested yellowfin sole competes in international markets with yellowfin sole harvested by Russian trawlers operating in the western Bering Sea. However, as discussed earlier, the harvest levels in the Russian fishery are uncertain. Similar to the Alaska harvest, most of the 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).

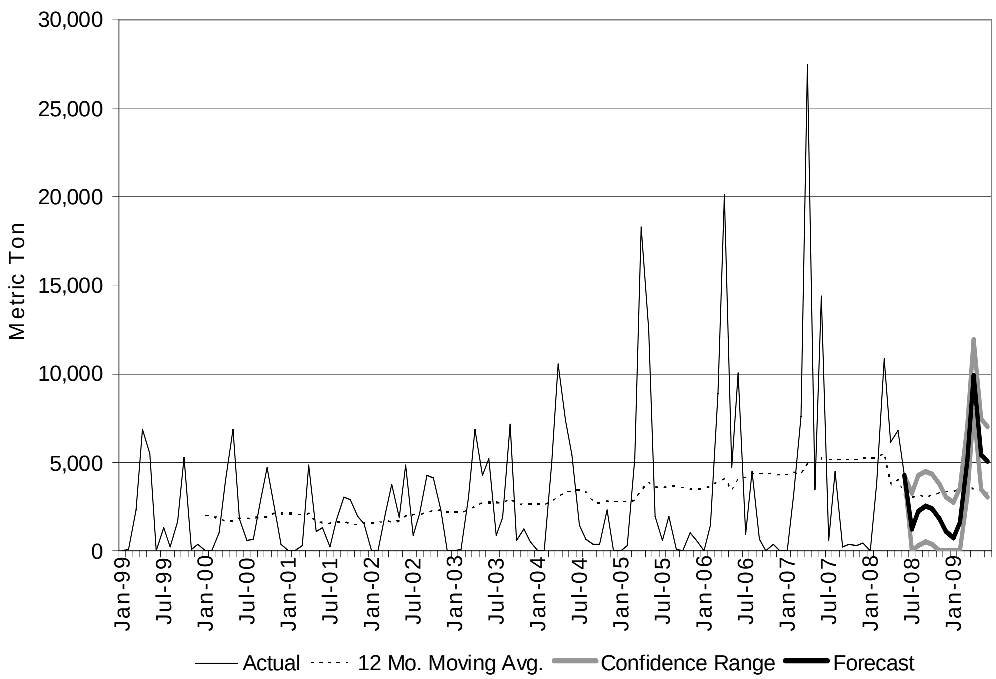
[7] The methodology used to develop forecasts shown in Figure 65 through Figure 70 is described in Appendix A: Alaska Groundfish Export Market Forecast Methodology and Details.

Figure 65. Actual and Forecast Nominal U.S. Export Prices of Yellowfin Sole to All Countries, 1999 – 2009



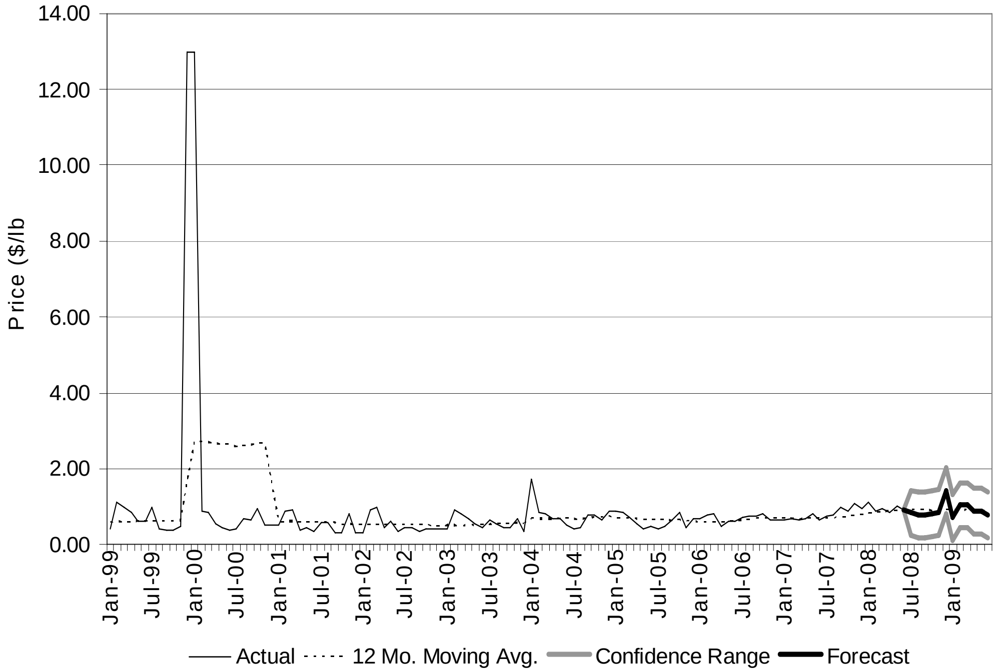
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 66. Actual and Forecast U.S. Export Volumes of Yellowfin Sole to All Countries, 1999 – 2009



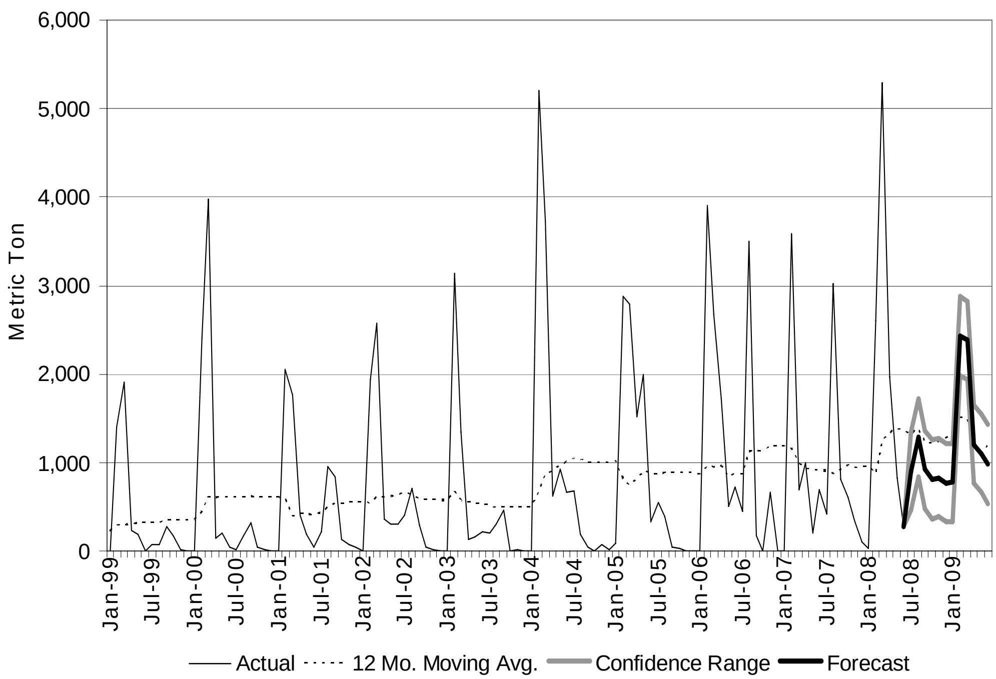
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 67. Actual and Forecast Nominal U.S. Export Prices of Rock Sole to All Countries, 1999 – 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

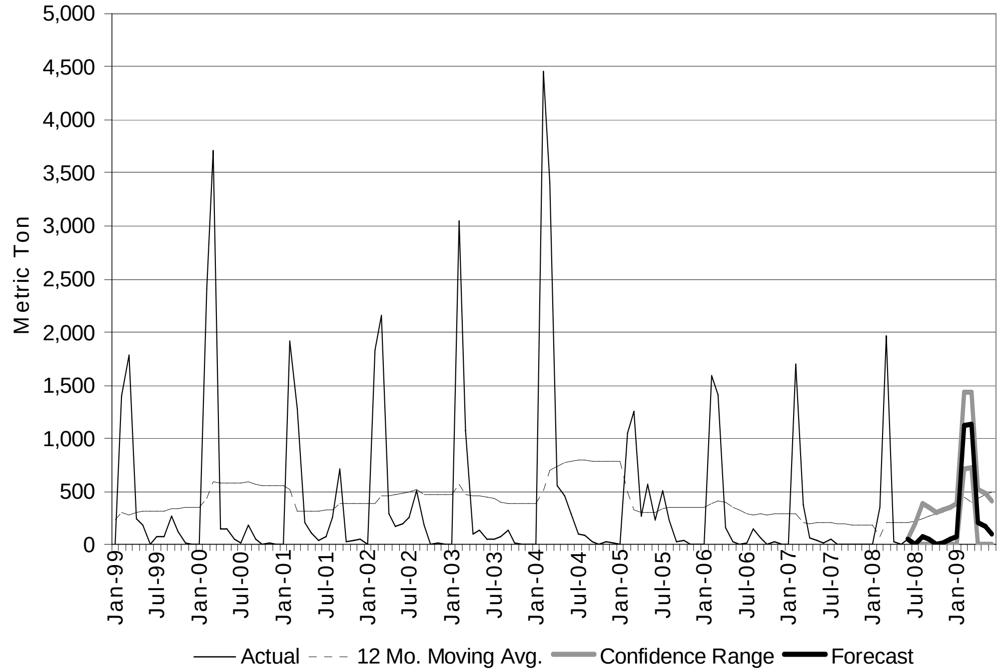
Figure 68. Actual and Forecast U.S. Export Volumes of Rock Sole to All Countries, 1999 – 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

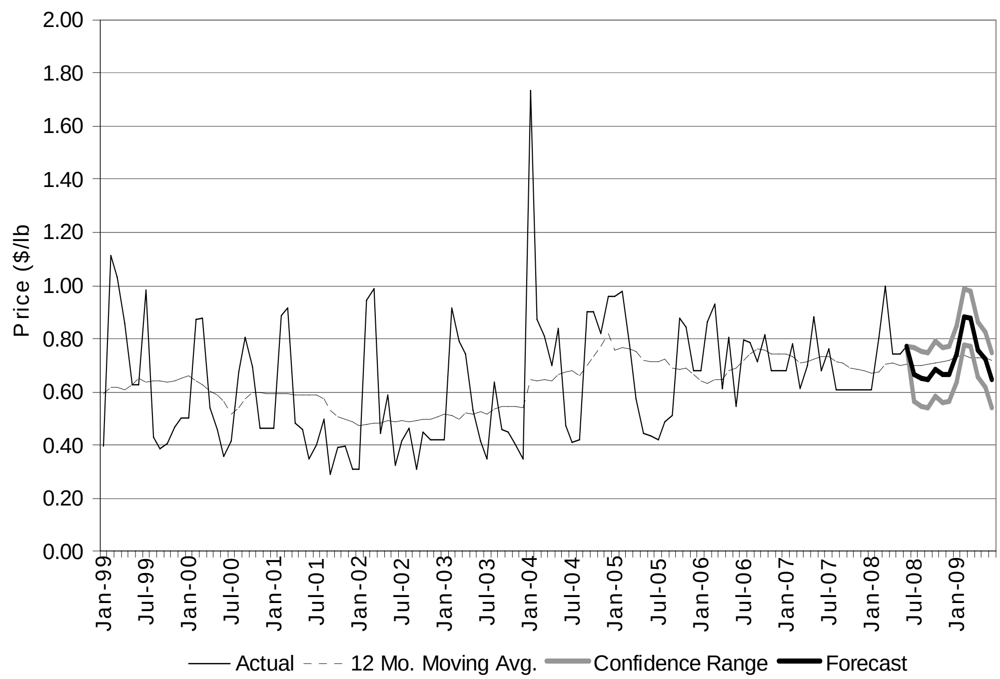
Alaska Groundfish Market Profiles

Figure 69. Actual & Forecast U.S. Exports Volumes of Rock Sole to Japan, 1999 – 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 70. Actual & Forecast Nominal U.S. Export Prices of Rock Sole to Japan, 1999 – 2009



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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

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

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

Vaisman, A. 2001. Trawling in the Mist: Industrial Fisheries in the Russian Part of the Bering Sea. TRAFFIC International, Cambridge, U.K.

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Arrowtooth Flounder Market Profile

Description of the Fishery[8]

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.

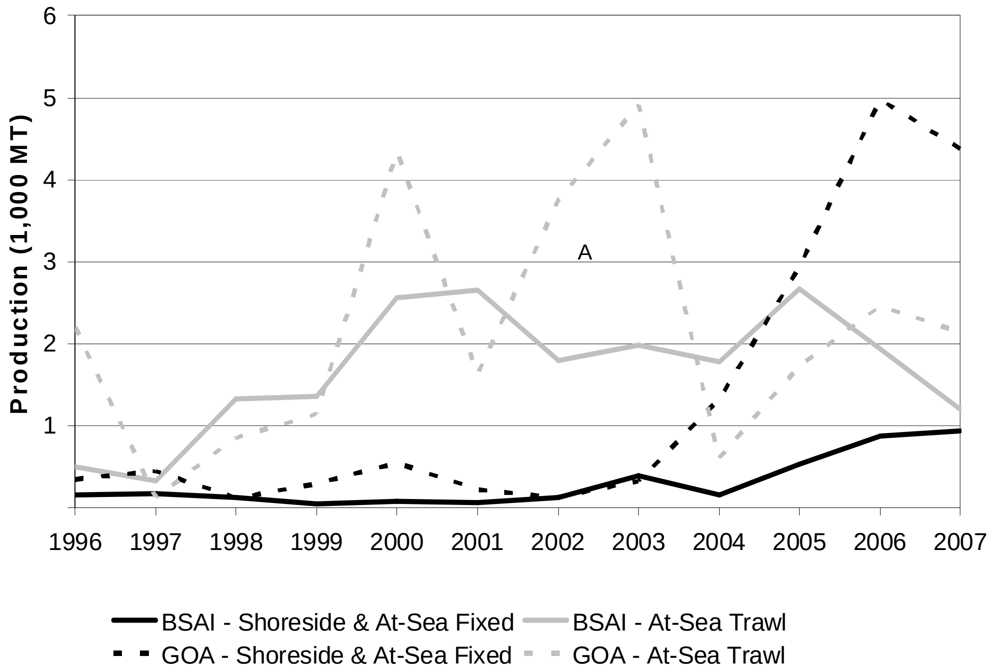
The catcher/processors participating in the GOA arrowtooth flounder fishery enter the fishery following the closure of rock sole and yellowfin sole in the Bering Sea (NMFS 2007). Most of the harvest of arrowtooth flounder occurs from March through May. Depending upon the availability of the halibut prohibited 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. In 2005, about half of the arrowtooth flounder catch in the BSAI region was discarded. Retention is expected to increase in the future 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.

[8] 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 exports nor does it contain forecasts of export volumes and prices.

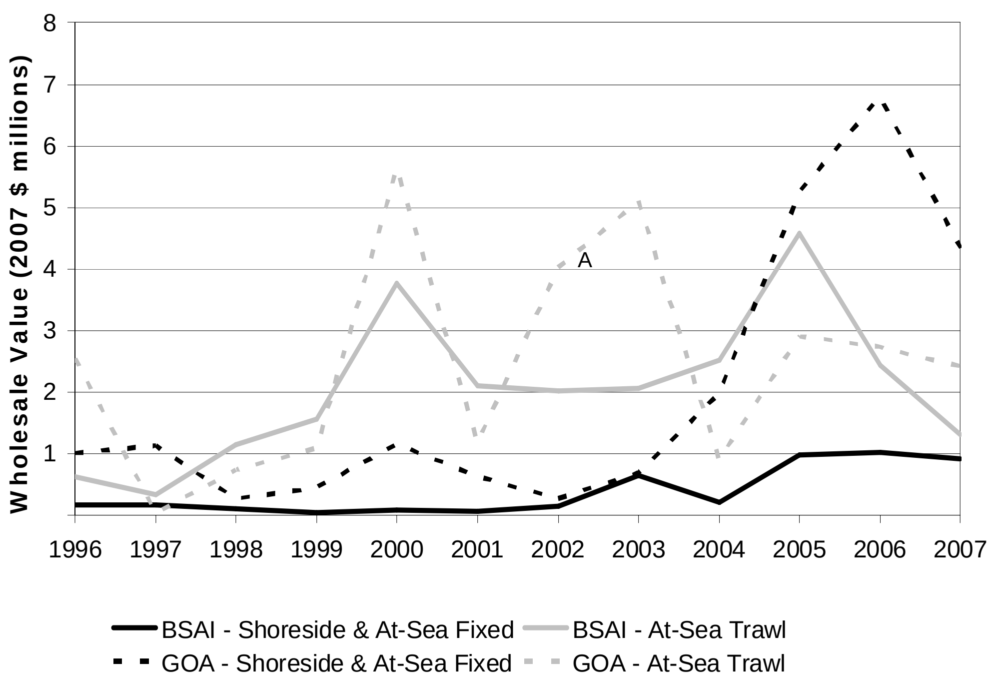
Alaska Groundfish Market Profiles

Figure 71. Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2007



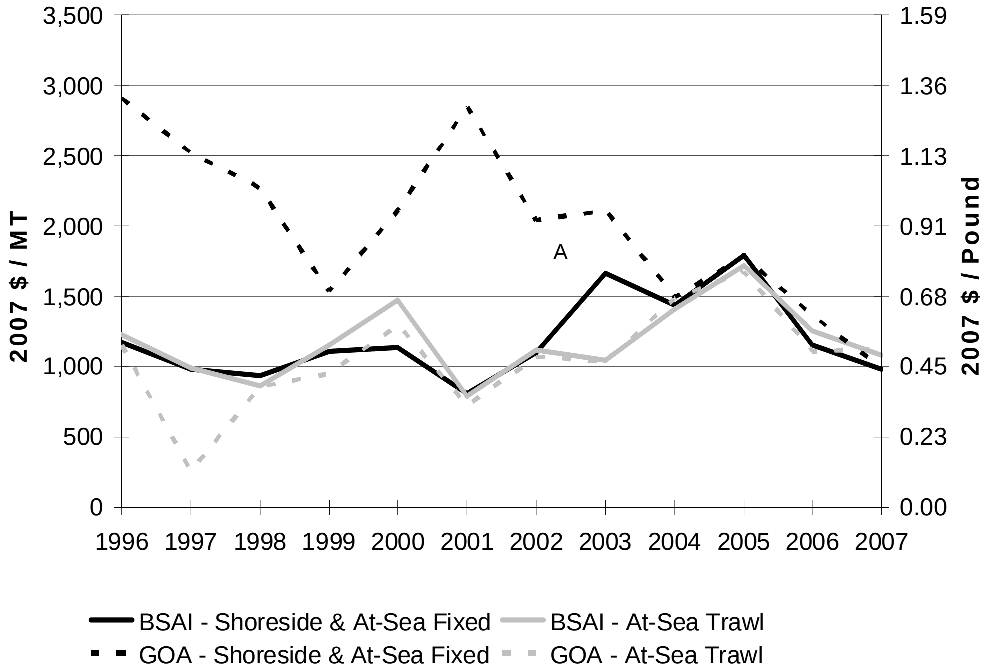
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 72. Wholesale Value of Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2007



Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 73. Wholesale Prices for Alaska Primary Production of Arrowtooth Flounder by Sector, 1996 – 2007

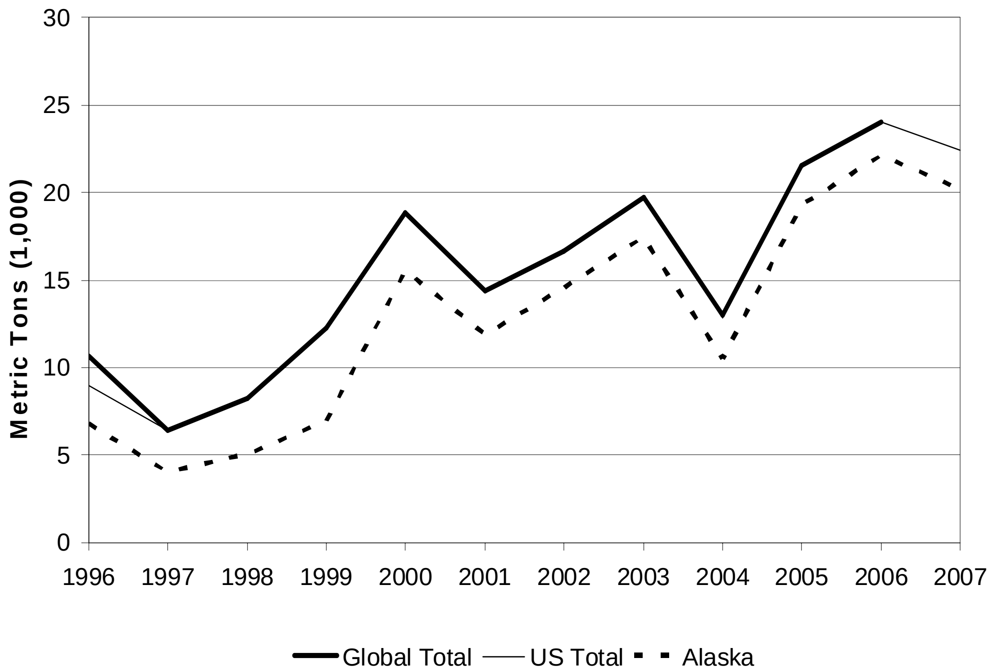


Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

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 – 2007



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.

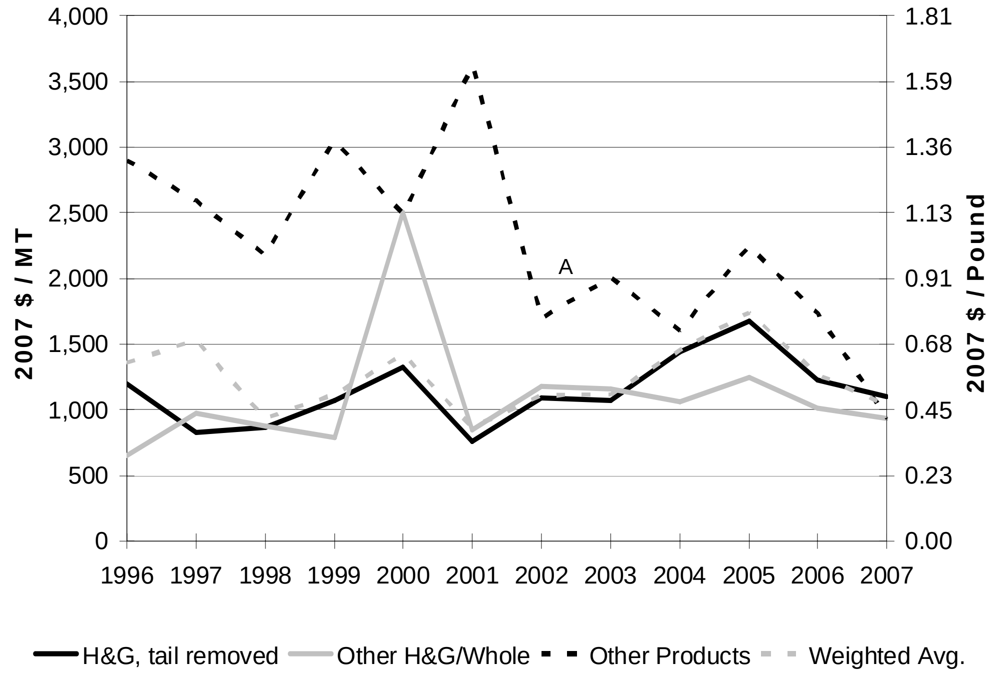
Product Composition and Flow

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.

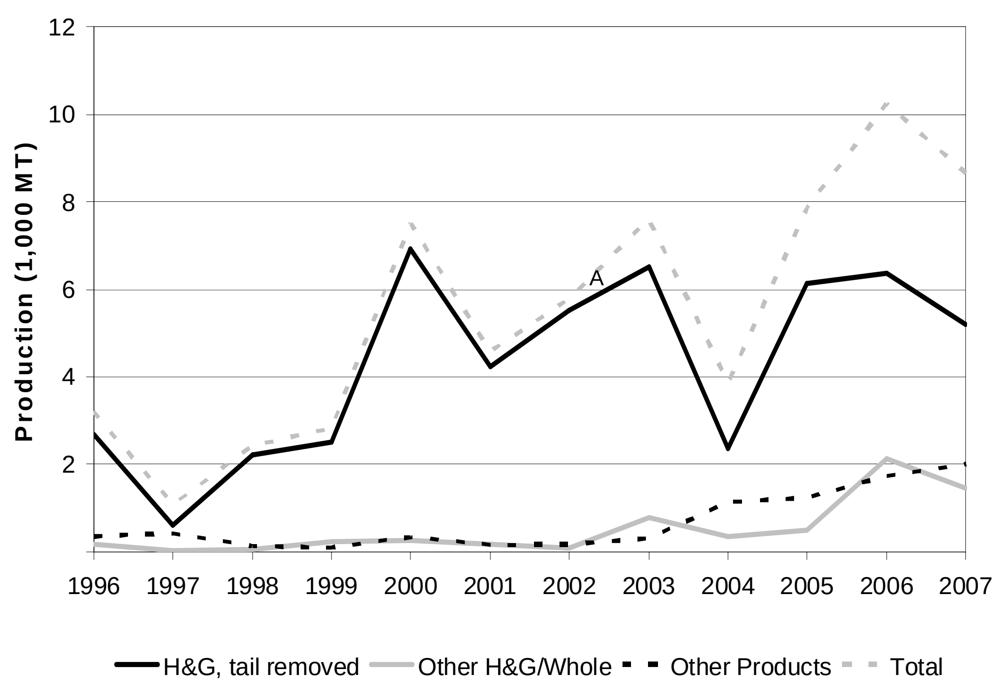
A secondary product for arrowtooth flounder is fillets (NMFS 2007). A large portion of the arrowtooth flounder exported to China are processed into fillets and re-imported to U.S. markets as inexpensive flounder. Some arrowtooth flounder processed in Japan is also sold as fillets in the Japanese market.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

Figure 75. Wholesale Prices for Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2007



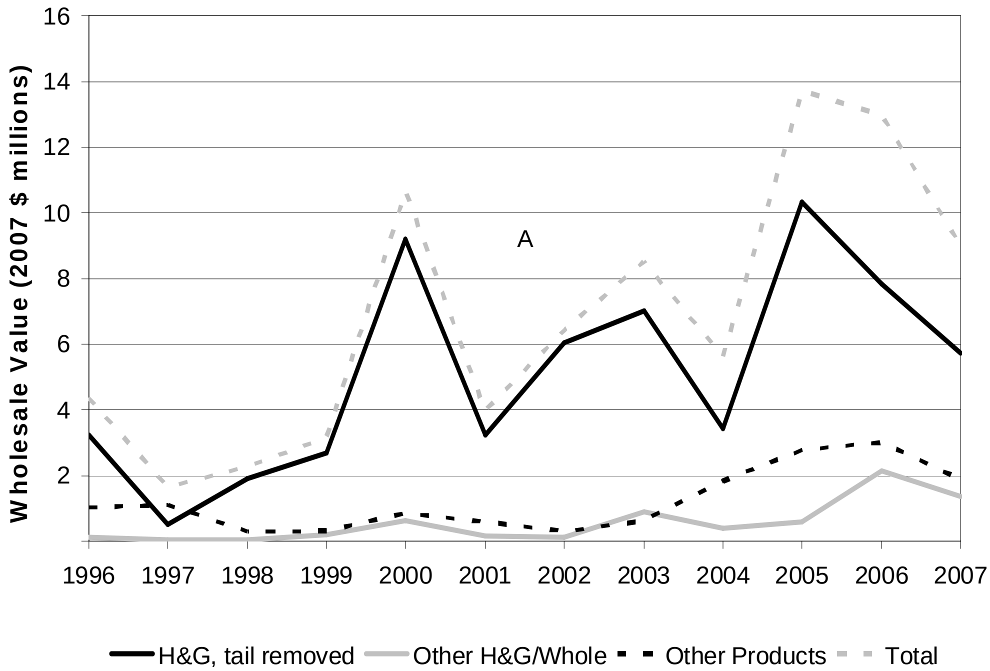
Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 76. Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2007



Note: Product types may include several more specific products.
Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

Figure 77. Wholesale Value of Alaska Primary Production of Arrowtooth Flounder by Product Type, 1996 – 2007



Note: Product types may include several more specific products.

Source: NMFS Weekly Product Reports and ADF&G Commercial Operator Annual Reports 1996-2007

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 forecasting 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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Appendix A: Alaska Groundfish Export Market Forecast Methodology and Details

Introduction

Export market forecasts for selected Alaska groundfish products were developed by Dr. James L. Anderson of J.L. Anderson Associates.[9]

The following is a formal explanation of the underlying features of the technical model used in forecasting groundfish export quantities and prices. The raw data set included monthly groundfish export quantities and prices from January 1990 to May 2007. The approach used is based on Gu and Anderson (1995).

Several of the forecasts are included in the sections above. Additional summaries of the data and forecasts follow the discussion of the methodology.

The Model

The model explanation is largely excerpted from Gu and Anderson (1995). The multivariate, state-space innovations model (Aoki, 1987) used is of the form:

$$x_{t+1} = Ax_t + Be_t$$

$$w_t = Cx_t + e_t, \qquad (1)$$

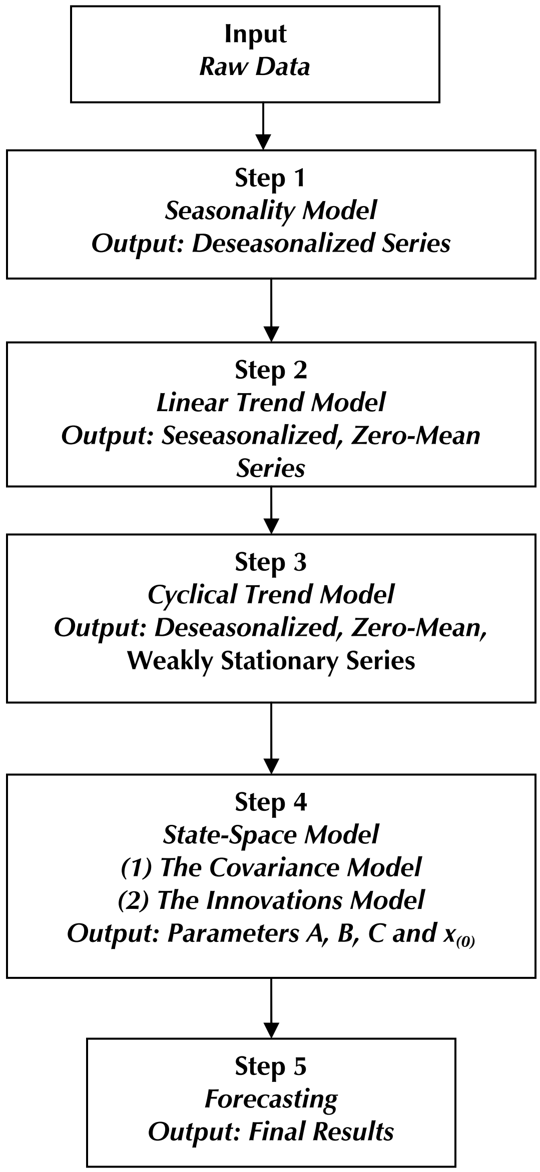
where x_t is the unobservable state vector, input, e_t, is the white noise and w_t is a zero-mean, weakly stationary, stochastic process (a system that generates the observed time series). Matrices A, B, C and the initial state vector, x_0, are parameters of the system which can be estimated directly from the raw data by a two-step procedure. The raw data set included monthly groundfish export quantities and prices from 1990 to May 2007. However, generally only the past 120 months of data were used in estimating the models. The two-step procedure involves: (1) obtaining a model that estimates the covariance sequence of the process (i.e., $E[w_{t+j}\, w_t']$, where t is the time index, j = ± 1,2, …), and (2) deriving the innovations model from the covariance model parameters (for derivations see Vukina, 1991 and Flint, *et al.*, 1994). The covariance model is further specified by two parameters: the number of lags (j) and the number of the states (n). The number of lags provides a "window," outside of which the covariances between the data at time t = k and the data at time t> [k + j] are assumed to be insignificant. The number of lags was set at 25, which should be more than enough under most conditions. The number of states, which is determined by the singular value decomposition (SVD) method (Strang, 1988), indicates the number of linearly independent random variables that generate the process (analogous to bases in a vector space).

The state-space modeling approach assumes that the input to the model is stationary (or time-invariant), since parameters A, B and C are not a function of time. However, this condition can rarely be met in practice. The deterministic component of an economic time series may consist of linear,

[9] Dr. Anderson is also a professor and chair of the Department of Environmental and Natural Resource Economics at the University of Rhode Island, and is the editor of Marine Resource Economics and SeafoodReport.com.

cyclical, seasonal and possibly other exogenous factors. In this example, a linear model is applied to estimate the seasonal effect from the raw data. The deseasonalized time series is further detrended via an approach used by Vukina and Anderson (1994), in which the linear and cyclical components are removed from the time series before state-space modeling. This modeling approach is schematically represented in Figure 78.

Figure 78. Deseasonalized State-Space Forecasting Model Procedures



Appendix A: Alaska Groundfish Export Market Forecast Methodology and Details

The procedure is illustrated (in the univariate case for simplicity) by the following steps:

(1) The seasonality is modeled by the ordinary least squared (OLS) regression:

$$yt = \alpha_0 + \sum_{j=1}^{11} \alpha_j D_j + \in_t$$

$$Dj = \{1, \text{ if during month } j, 0, \text{ otherwise}$$
$$\forall t = 1,\ldots,T,\ j = 1,\ldots,11, \tag{2}$$

where y_t is the raw data, α_0 is the intercept and α_j is the coefficient for the monthly dummy variable, D_j. The residual, $\in_t$, is the raw data with seasonality removed, t is the time index, T is the number of observations and j is the index for month (1 for January, 2 for February, etc.).

(2) The output of (2), $\in_t$, is used as input to a linear trend model:

$$\in_t = \beta_0 + \beta_1 t + \gamma_t , \tag{3}$$

where β_0 is the intercept, and β_1 is the coefficient for the time index, t. The output, γ_t, becomes the deseasonalized, zero-mean series.

(3) Using the output from (3) as input, the remaining cyclical component is modeled as:

$$\gamma_t = C^* A^{*t-1} B^* + \eta_t, \qquad t \geq 1, \tag{4}$$

where $C^* A^{*t-1} B^*$ represents the cyclical component of the input, γ_t, which can be estimated from γ_t by a combination of the singular value decomposition (SVD) and least squared methods (similar to the method used to obtain parameters in (1)). For detailed discussion regarding the theoretical basis upon which the cyclical model of time series is constructed, see Vukina and Anderson (1994). By rearranging terms, (4) becomes:

$$\begin{aligned} \eta_t &= \gamma_t - (C^* A^{*t-1} B^*) \\ &= \in_t - (\beta_0 + \beta_1 t) - (C^* A^{*t-1} B^*) \\ &= y_t - (\alpha_0 + \sum_{j=1}^{11} a_j D_j) - (\beta_0 + \beta_1 t) - (C^* A^{*t-1} B^*) , \end{aligned} \tag{5}$$

where output, η_t, becomes deseasonalized, zero-mean and weakly stationary (constant mean and variance), and γ_t is the raw data. All variables and parameters are defined in equations (2) through (4).

(4) using η_t from (5) as input, the state-space innovations model (1) parameters A, B, C and the initial state vector, x_0, can now be estimated.

(5) Out-of-sample forecast can then be generated using the formula:

$$\hat{y}_{T+k+1} = \hat{C}\hat{A}^k \hat{x}_{T+1} + (\hat{\alpha}_0 + \sum_{j=1}^{11} \hat{a}_1 D_j) + (\hat{\beta}_0 + \hat{\beta}_1 (T + k + 1)) + (\hat{C}^* \hat{A}^{*T+k} \hat{B}^*), \tag{6}$$

where $\hat{y}_{T+k+1}$ is the out-of sample prediction, $\hat{x}_{T+1}$ is the last updated state vector calculated in (6), T is the number of observations and k represents the prediction steps (k = 0,1,2 …). The parameters for deterministic components (α's, β's and matrices, C^*, A^*, B^*) are estimated by equations (2) through (4).

As a caveat, it should be noted that these models tends to overestimate export quantities during periods of season closures. Therefore, forecast exports during such closed periods may be subjectively adjusted. For example, with pollock the distinct A and B seasons create periods of virtually zero exports. The model tends to overestimate exports during those closed periods. Therefore the model forecasts of pollock volumes when the forecast should have been close to zero have been adjusted to reflect the closed seasons. Similarly rock sole forecast volumes were adjusted.

References

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Appendix A-1: Comparisons between 2007 Forecasts and Actual Data

This appendix compares forecasts for groundfish export quantities and prices over the period September 2007 through August 2008 with actual data. State-space, time-series models generally perform well if there are no exogenous shocks to the system. Exogenous shocks could include: natural or economic disasters, extreme weather events or sudden changes in regulations or fishery quota or a food scare. These models are useful as reference points for discussion if the market behaves similarly in successive years.

The pollock fillet, pollock roe and surimi models performed well and generally resulted in forecasts that were in the fifty percent confidence interval.

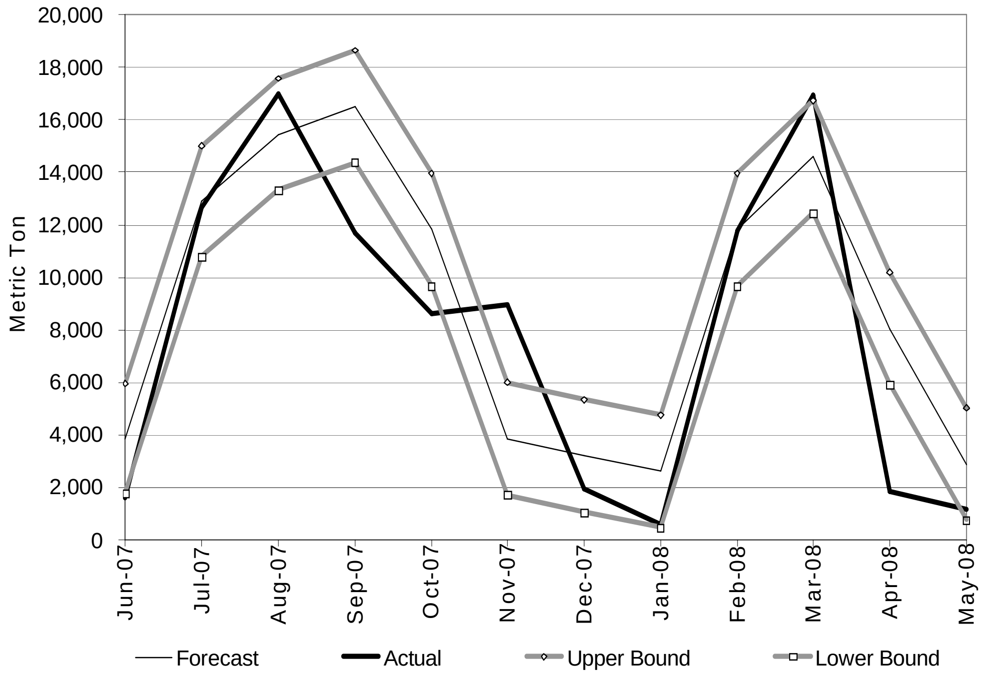
Frozen cod fillet export quantities forecasted reasonably well with the exception of June, September and October 2007. These seasonal peaks were missed primarily because there was a substantial shift in the seasonality of cod fillet shipments in recent years that did not occur in years past. Frozen cod (excluding fillets) was generally under the levels predicted by the model, and prices were typically higher. This may be partly explained by the shift to fillets.

Sablefish quantity and price models performed well. Quantity was forecast to be somewhat higher, but this may be explained by the reduction in quota and possibly by greater US consumption.

The predicted yellowfin sole exports were higher than actual in April and March 2008, and prices were generally higher. The rock sole model under-forecasted the key seasonal peaks in August 2007 and March 2008. This can be partially explained by an increase in the rock sole TAC. In addition, there were considerable changes in the regulatory environment. In 2008, the BSAI flatfish fisheries were, for all intents and purposes, rationalized. NMFS has set up a system that allows the head and gut trawl catcher processors to form cooperatives. The cooperative may be able to reschedule harvests of yellowfin sole and rock sole to optimize returns. One reason to re-schedule harvests may be to reduce halibut bycatch. Another may be to spread harvests throughout the year (perhaps a factor with yellowfin sole). A third reason could be to maximize harvest of rock sole during the roe season (spring) when it is most valuable.

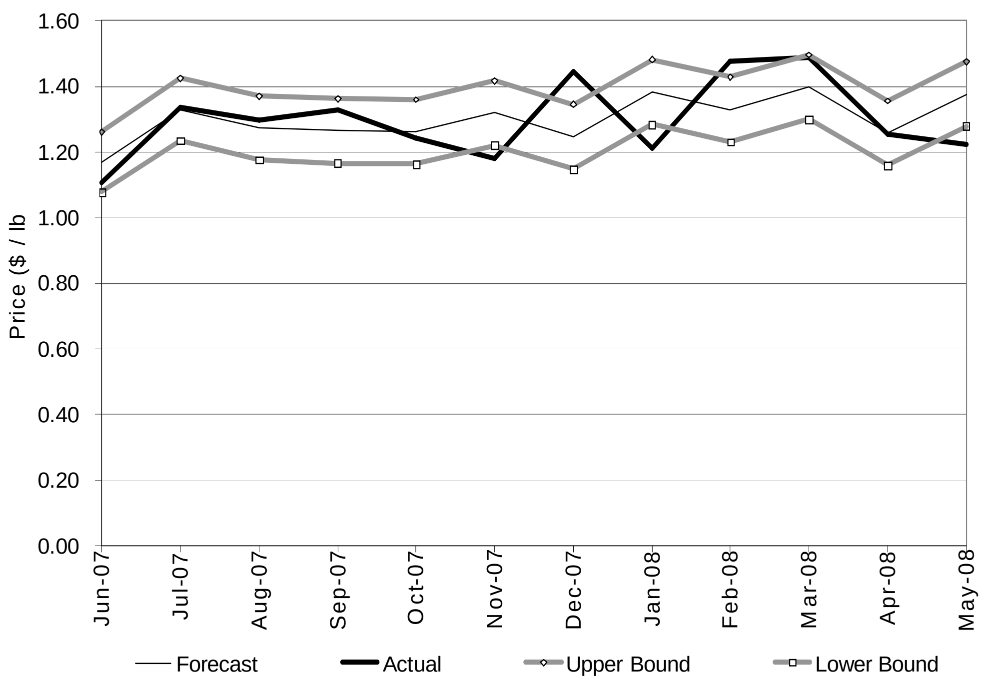
Alaska Groundfish Market Profiles

Figure 79. Comparison of Forecast Volumes to Actual Volumes of Pollock Fillet Exports



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

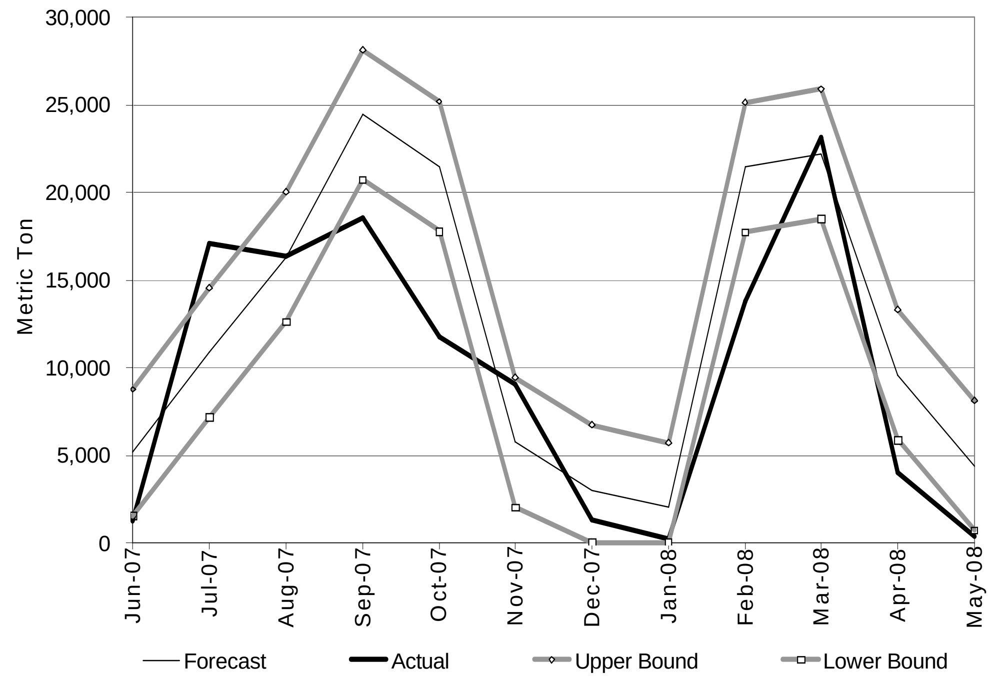
Figure 80. Comparison of Forecast Prices to Actual Prices of Pollock Fillet Exports



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

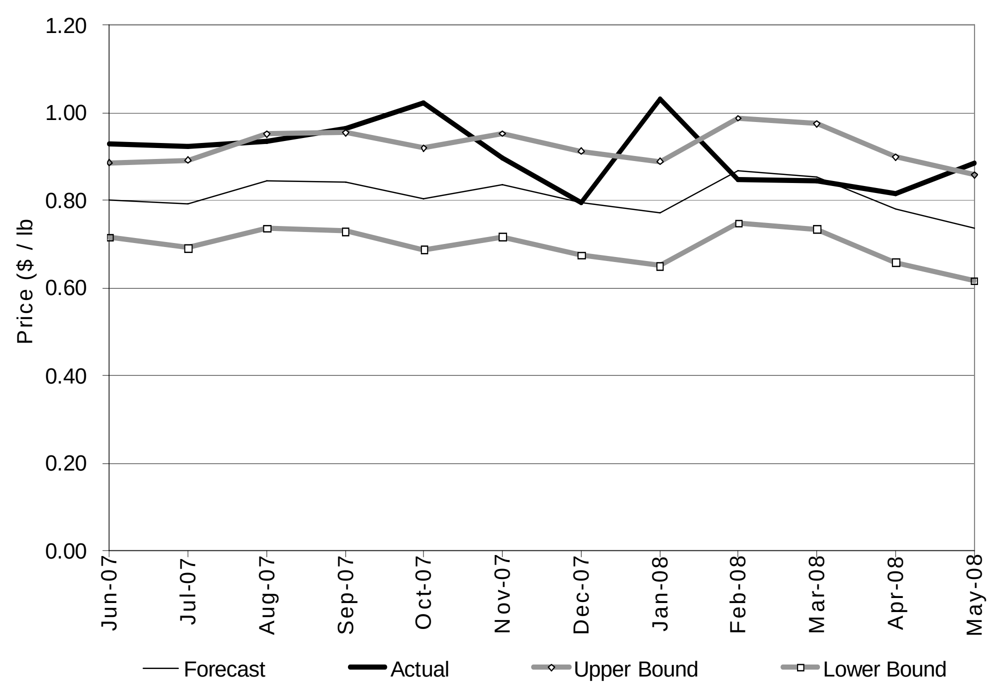
Appendix A-1: Comparisons between 2007 Forecasts and Actual Data

Figure 81. Comparison of Forecast Volume to Actual Volumes of Pollock Surimi Exports



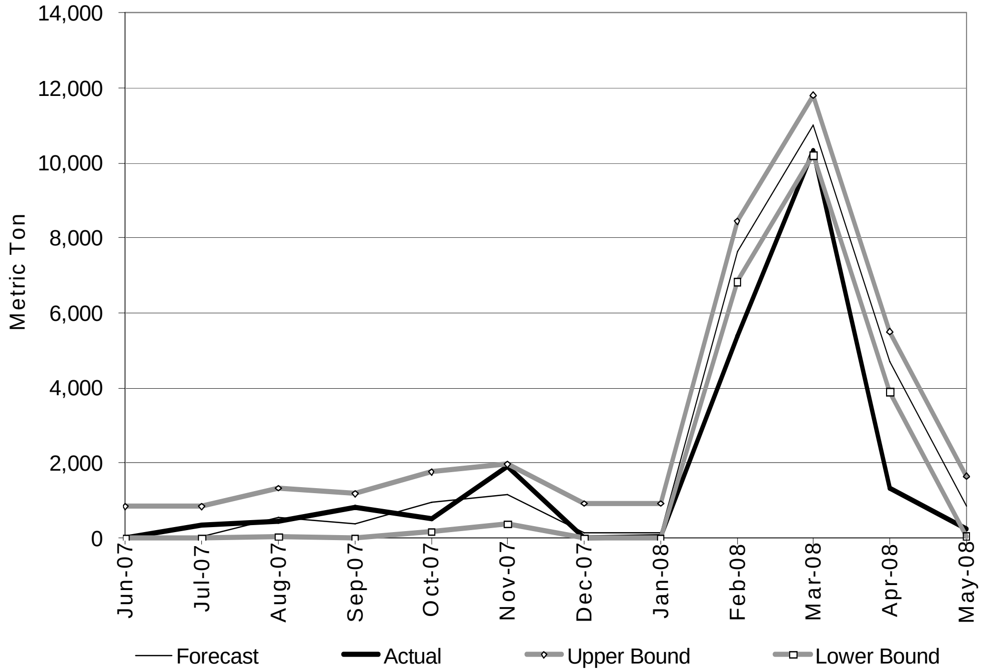
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 82. Comparison of Forecast Prices to Actual Prices of Pollock Surimi Exports



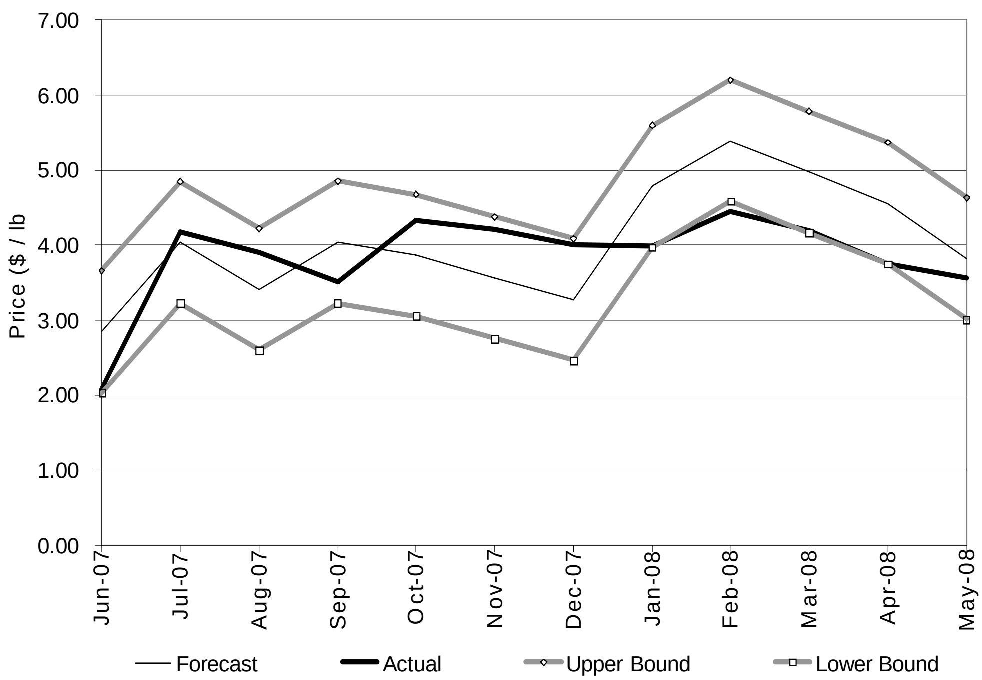
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 83. Comparison of Forecast Volumes to Actual Volumes of Pollock Roe Exports



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

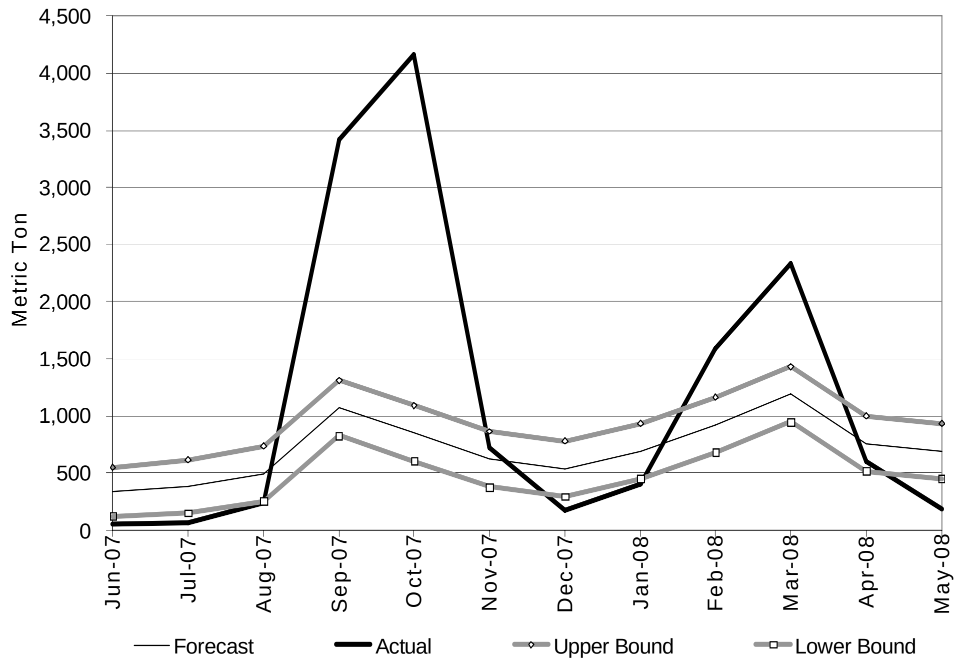
Figure 84. Comparison of Forecast Prices to Actual Prices of Pollock Roe Exports



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Appendix A-1: Comparisons between 2007 Forecasts and Actual Data

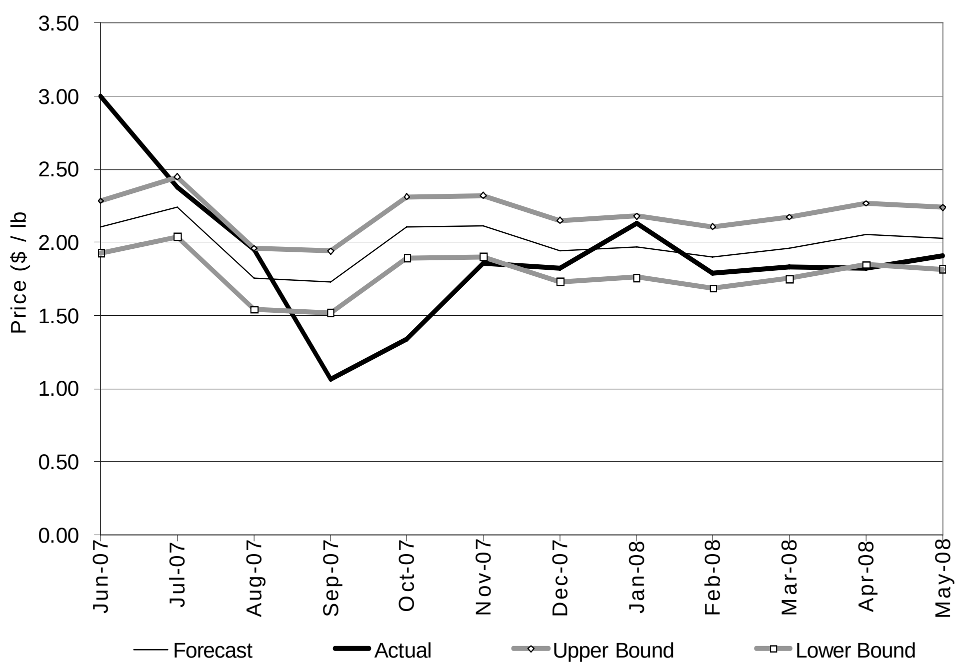
Figure 85. Comparison of Forecast Volumes to Actual Volumes of Cod Fillet Exports



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

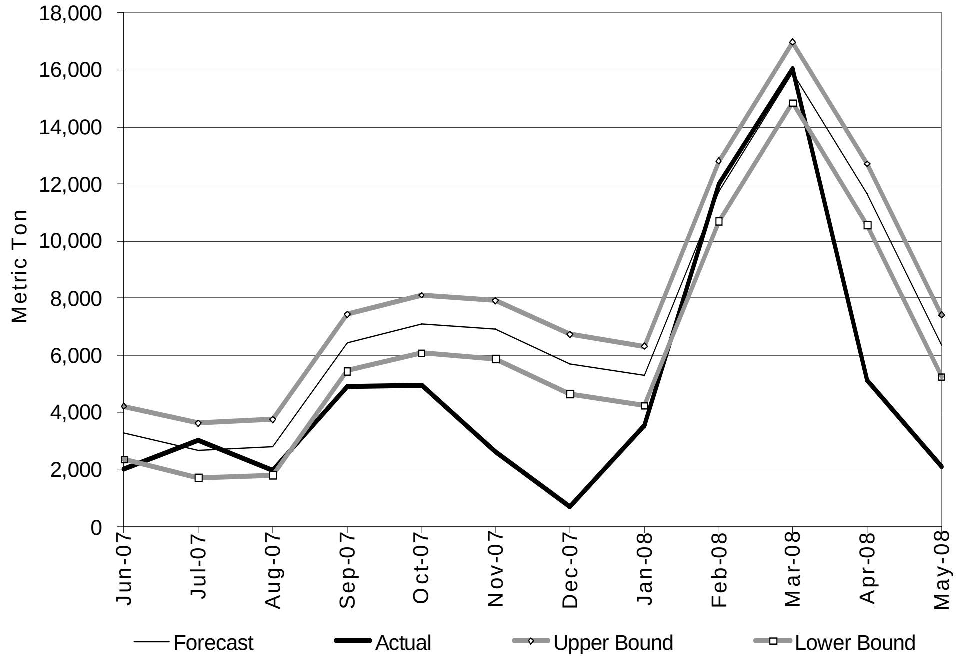
Figure 86. Comparison of Forecast Prices to Actual Prices of Cod Fillet Exports



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

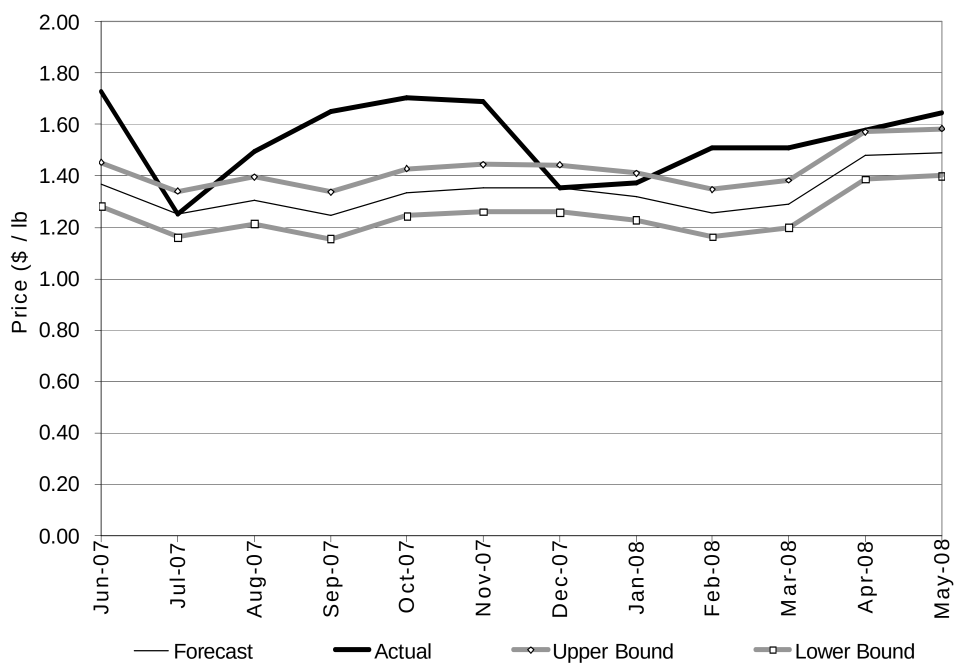
Figure 87. Comparison of Forecast Volume to Actual Volumes of Frozen Cod Exports (Excluding Fillets)



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: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 88. Comparison of Forecast Prices to Actual Prices of Frozen Cod Exports (Excluding Fillets)

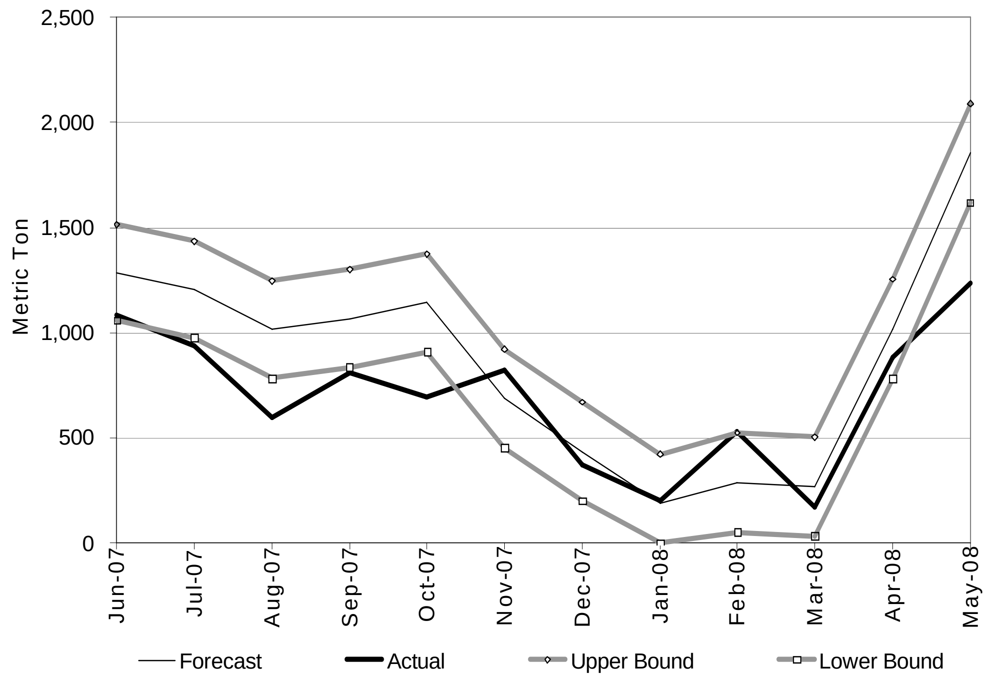


Note: U.S. foreign trade data do not differentiate Pacific and Atlantic cod; however, as discussed in the text, nearly all of this product category is Pacific cod.

Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

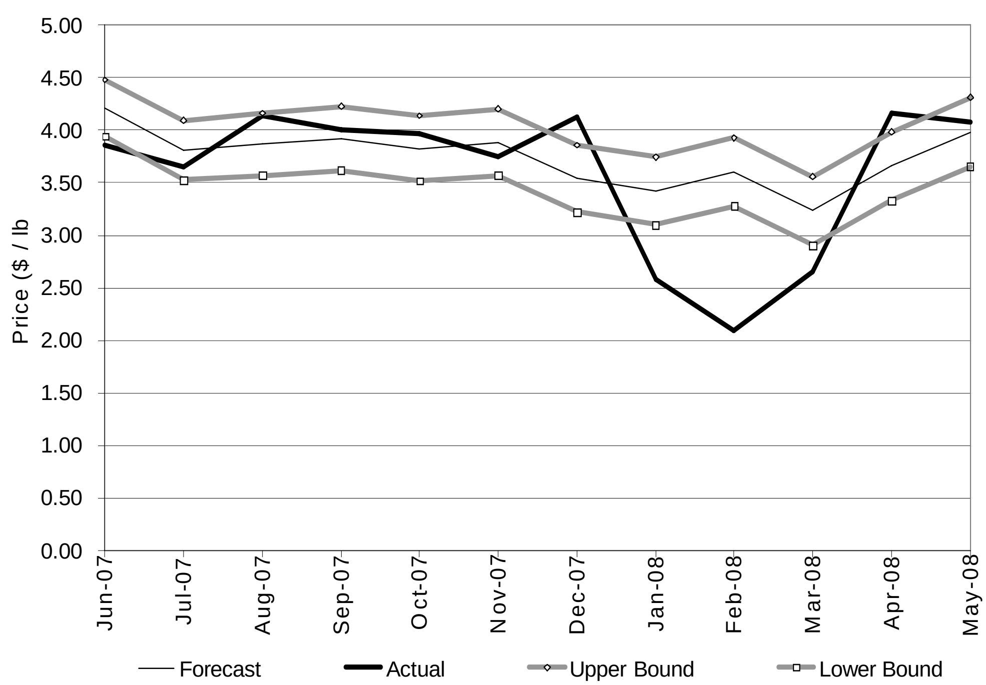
Appendix A-1: Comparisons between 2007 Forecasts and Actual Data

Figure 89. Comparison of Forecast Volumes to Actual Volumes of Sablefish Exports



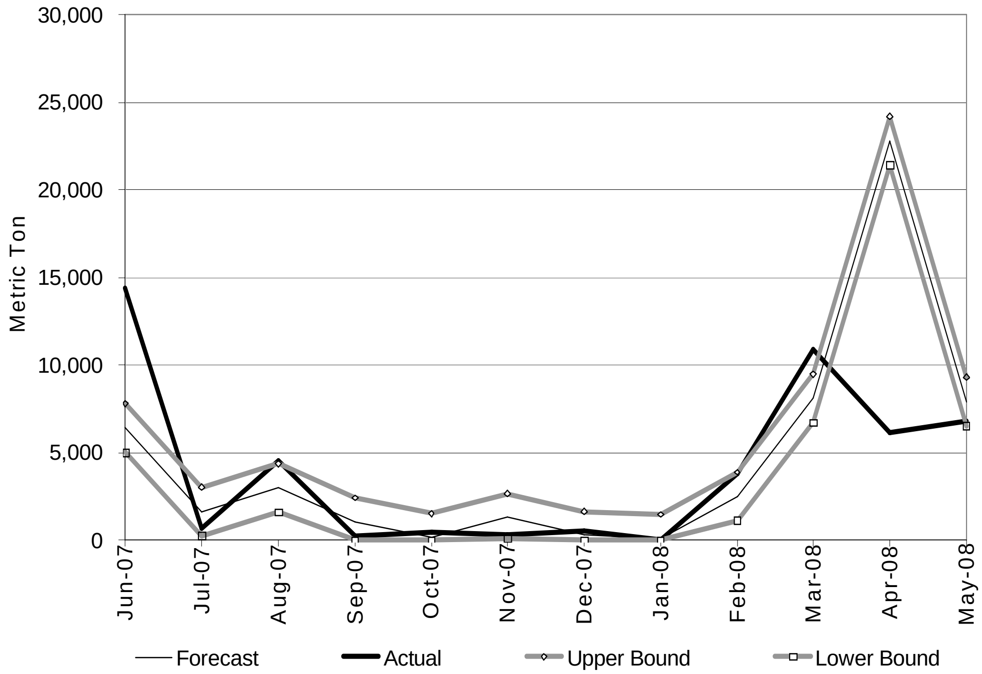
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 90. Comparison of Forecast Prices to Actual Prices of Sablefish Exports



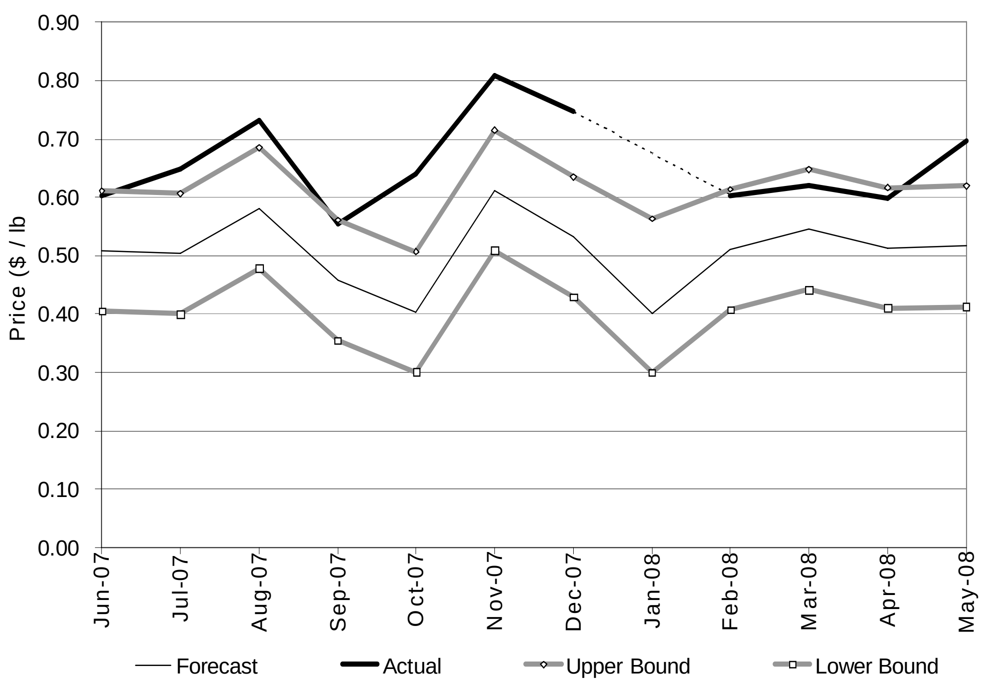
Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 91. Comparison of Forecast Volumes to Actual Volumes of Yellowfin Sole Exports



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 92. Comparison of Forecast Prices to Actual Prices of Yellowfin Sole Exports

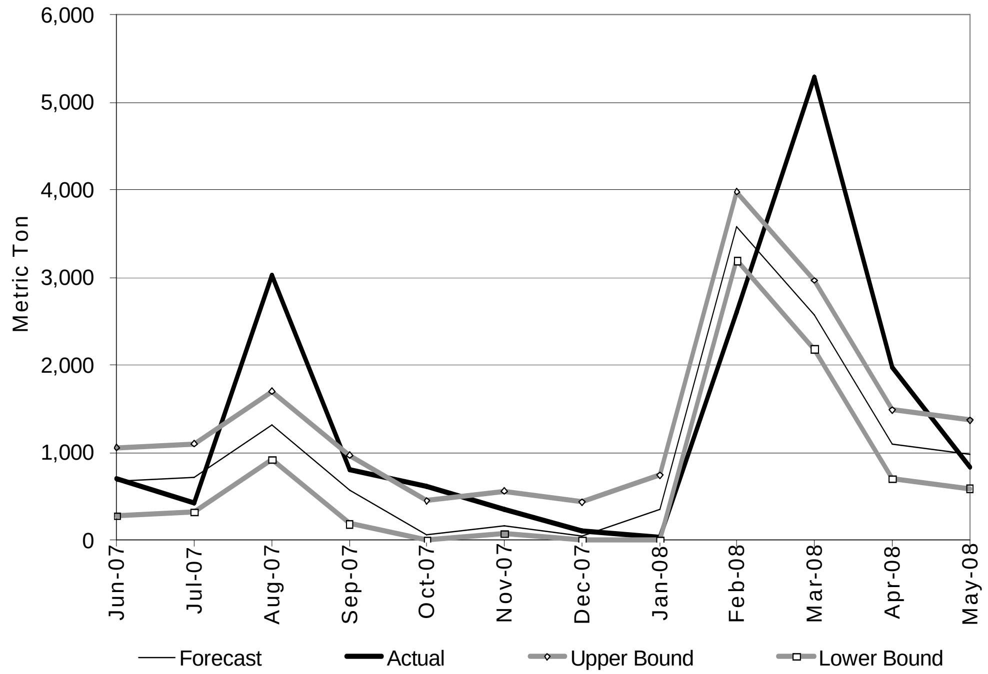


Note: Because there were zero exports in January 2008, there was no price to calculate. The figure shows the average price between December 2007 and February 2008.

Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

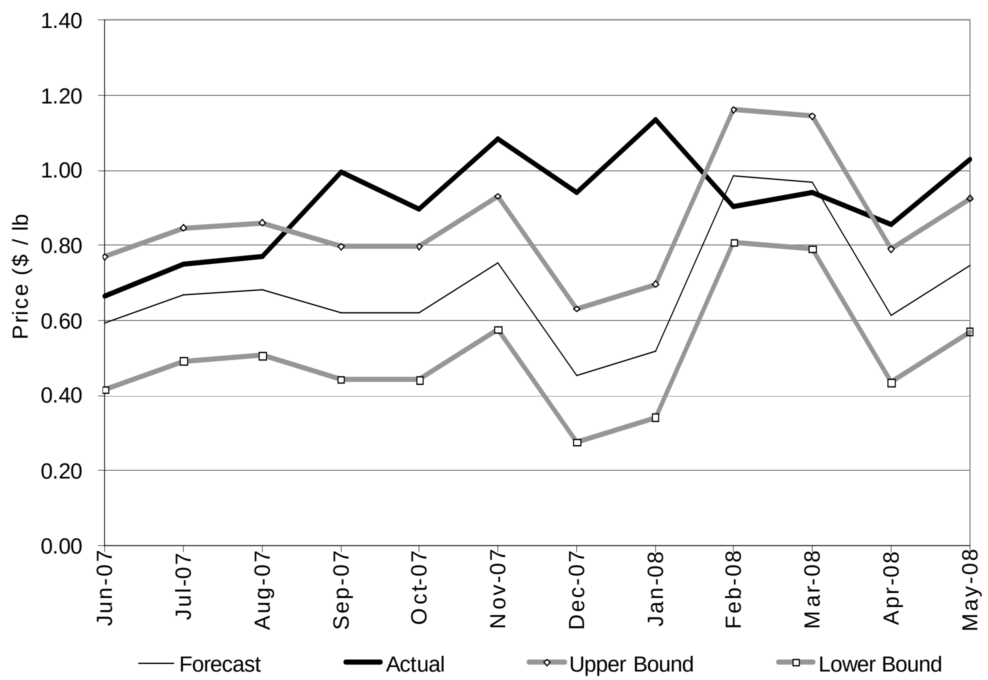
Appendix A-1: Comparisons between 2007 Forecasts and Actual Data

Figure 93. Comparison of Forecast Volumes to Actual Volumes of Rock Sole Exports



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

Figure 94. Comparison of Forecast Prices to Actual Prices of Rock Sole Exports



Source: NMFS Foreign Trade Data available at www.st.nmfs.gov/st1/trade/. Forecasts developed by J.L. Anderson Associates.

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Appendix A-2: Detailed Monthly Export Forecasts for 2008 and 2009

A complete set of detailed monthly export market forecasts for July 2008 – June 2009 is available by contacting terry.hiatt@noaa.gov. We were unable to reproduce the market forecasts here because the margins of the printed forecasts are too small to fit the format of this document.

The first part of each forecast set provides a summary of all exports. Where applicable, these are followed by forecasts for top importing companies. It should be noted that U.S. export data do not specifically identify exports of arrowtooth flounder, and therefore no forecasts of arrowtooth exports are included. In the completed set of forecasts mentioned above, individual forecasts appear in the following order:

1) Alaska Pollock Fillet Export Forecasts
2) Alaska Pollock Surimi Export Forecasts
3) Alaska Pollock Roe Export Forecasts
4) West Coast Cod Frozen (Except Fillets) Export Forecasts
5) West Coast Cod Fillet Export Forecasts
6) Sablefish Frozen Export Forecasts
7) Rock Sole Frozen Export Forecasts
8) Yellowfin Sole Frozen Export Forecasts

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Research and Data Collection Project Summaries and Updates, 2008
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 (Quarterly Report, Oct.-Dec. 2006). 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 Quarterly Report, Jan.-March 2007). In particular, this project involves the continued development of a global Population-Environment-Technology (PET) Model for scenario-based (e.g. IPCC) analyses of trade, ocean acidification, and climate change. An application of these scenarios is described in the AFSC Ocean Acidification Research Plan.

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.

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 is being performed by researchers at NCAR and IIASA. Eventually the PET model will represent 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)

IPCC emissions scenarios provide assumptions about future rates of technical change and other variables. Future work will embed a regional economic model of Alaska, which includes a detailed fisheries sector, in the PET model framework.

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 recently completed. 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).

Work on estimating bilateral trade flows and recent results with the PET model were presented in July 2008 at the International Institute for Fisheries Economics and Trade (IIFET) conference in Nha Trang, Vietnam.

Estimating Time-varying Bargaining Power: A Fishery Application

Harrison Fell and Alan Haynie*
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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.

Data Collection and Synthesis

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

Brian Garber-Yonts and Ron Felthoven*
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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 will be implemented 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 will collect cost, revenue, ownership, and employment data on an annual basis. During 3rd Quarter, 2008, ESSRP economists held focus groups and interviews with the Amendment 80 sector to develop draft survey forms for collection of revenue, cost, employment, and capacity data required under the Amendment 80 regulations. Improved testing and development of data collection forms is anticipated to minimize reporting burden and improve data quality. Data collection for the H&G fleet is expected to begin in 2009.

Collecting Regional Economic Data for Alaska Fisheries

Hans Geier 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. Currently, two data collection projects that will help reduce these deficiencies are nearing completion in the Southwest and Gulf Coast regions of Alaska. As of today the contractor has sent out a total of 1,504 mail surveys, and has 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 are the highest (25% for Southwest and Gulf Coast regions) while the response rates for the large vessel classes are the lowest (18% and 22% for Southwest and Gulf Coast regions, respectively). There is no significance difference in total response rate between the two regions (Southwest region – 23%, Gulf Coast region – 24%).

In the two projects we are collecting 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 costs we are using two different methods. First, for much of the operating and ownership costs for vessels we are using a “cost-engineering” approach in which boat builders and suppliers are being contacted with average vessel specifications, and asked to provide information on the costs associated with operating such vessels. Second, interview and telephone calls are being made to suppliers of inputs to vessels (i.e., local businesses and fish processors).

To date, the following tasks have been 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 mailout surveys were sent out to the vessel owners and the vessel owners’ returns of the surveys have been received and tabulated in spreadsheets ready for analysis. The contractor (Professor Hans Geier at Univ. of Alaska, Fairbanks) has been contacting those vessel owners who did not respond to the mail surveys and trying to conduct phone interviews to supplement the mailout survey response rate. Fourth, 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) have been and are being conducted. Fifth, 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. Sixth, interviews were made with, or telephone calls were made to, boat builders/dealers (for cost engineering). Seventh, visits to processing plants (headquarters) were made to maintain the relationships that are important for data collection. Eighth, community visits were made to groundtruth the IMPLAN information.

The remaining tasks are to: (1) finish interviewing local businesses, (2) conduct cost engineering estimates, (3) prepare a project report, (4) examine the statistical validity of the survey results, (5) revise IMPLAN data with the primary data estimated as above and balance the social accounting matrix (SAM), and (6) develop regional economic models such as input-output (IO) or computable general equilibrium (CGE) models.

It should be emphasized that a good deal of effort has gone into developing an appropriate sampling methodology for the ongoing 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. Since each sector will be used as a separate economic sector in the IMPLAN model, we face three separate problems for three different sectors in sampling (and thus must use a UPS without replacement for each sector). 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 will use 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 has been completed and an Excel program has been developed to show these procedures using actual data (2006 ex-vessel value data for the three boat sectors).

When these two regional data collection projects are completed, another data collection project for the Southeast region will be conducted. The regional economic models developed with the data obtained via these projects as well as other available data are expected to provide policy makers with useful information on the effects of fishery management policies on fishery-dependent communities.

<u>References</u>

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Holland, David W., Hans Geier, and Ervin Schuster. "Using IMPLAN to Identify Rural Development Opportunities." USDA Forest Service Intermountain Research Station, General Technical Report INT-GTR-350, May 1997.

Comprehensive Socioeconomic Data Collection for Alaskan Fisheries

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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 two formal meetings and at present is developing a formal template that defines the elements to be collected within the program and the mechanisms for collecting the data.

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 Fisheries 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 (Department) 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.

The overall goal of this project is to implement a crew participation data collection program. This program will be defined by the Department if they choose to adopt a formal system, or by an independent contractor should the Department conclude in their scoping that an independent survey is likely to be more successful or feasible than a larger program run through the Department. They 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 the Department or independent contractor. Specifically, PSMFC will utilize the results of this scoping process to provide personnel with the proper skills and experience to implement the data collection system that is deemed to be most effective by the Department's scoping study.

Data Management and Reporting Tools

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At present, the analysts working in the socioeconomics unit at the AFSC rely upon a programmer in the ESSRP to generate datasets and reports from state and federal databases in order to conduct applied research. The purpose of this project is to develop a user friendly data management and reporting tool interface for all socioeconomists at the AFSC to facilitate data queries and retrieval and in turn broaden current capabilities. This project will make all staff more independent and productive and free up the programmer's time for other purposes. The specific goals of this project are to 1) expand the availability of a data-access utility (either the Oracle Discoverer Tool or the similar Oracle Answers Tool) held by the Alaska Fisheries Information Network (AKFIN), a subsidiary of PSMFC, for use by the Alaska Fisheries Science Center, Economic and Social Sciences Research Program analysts; and 2) add additional data sources to the Oracle framework so that all datasets currently utilized by AFSC staff will be contained.

Oracle Discoverer is a web-based ad-hoc query, reporting, and data analysis tool that allows users to gain secure access to Oracle databases. It is a component of Oracle Application Server and requires Oracle Internet Developer Suite for administration. Oracle Answers is a similar product, which the NMFS Alaska Region (AKR) and the Alaska Department of Fish and Game (ADFG) are considering for use with data collected by their new Interagency Electronic Reporting System. AKFIN is currently in the process of deciding which of the two products they will use as their data-access utility; if AKR and ADFG decide to use Oracle Answers, AKFIN will likely make the same choice. With either of the two data-access utilities, query results can be viewed or analyzed online or exported to most standard file formats. AKFIN currently has a production instance of Oracle Application Server in place and has developed four standardized reports. This project would extend the availability of the Oracle Discoverer or Oracle Answers component, increase the number of reports and data sources available, and dedicate resources to developing specific datasets and provide support and training for the AFSC.

AKFIN or its contractors will provide basic user training and ongoing technical support for Oracle Discoverer or Oracle Answers to the AFSC. The data sources are the AKR, ADFG, and Commercial Fisheries Entry Commission (CFEC). Analysis of the base data and standardized reports to help users better understand the limits of the data will need to be developed. Best available metadata will be provided. The following datasets will be added to the existing Oracle framework for use by AFSC staff:

- AKR catch accounting catch tables
- AKR catch accounting bycatch tables
- AKR CDQ catch report tables
- AKR weekly production reports
- ADFG COAR buying data
- ADFG COAR production data
- AKFIN comprehensive fish tickets (CFEC fish tickets with FMP variables appended)
- ADFG Intent to Operate listings
- CFEC vessel registration listings
- AKR Federal Fisheries Permit listings (vessels and plants)
- AKR Pre-2003 'blend' tables

Upon completion of the project, AKFIN will have provided a comprehensive, functional data query tool that allows AFSC socioeconomics staff to more easily and quickly retrieve data reports from all of the primary federal and state databases.

Integrating Bering Sea and Gulf of Alaska Climate Data for Socioeconomic Research

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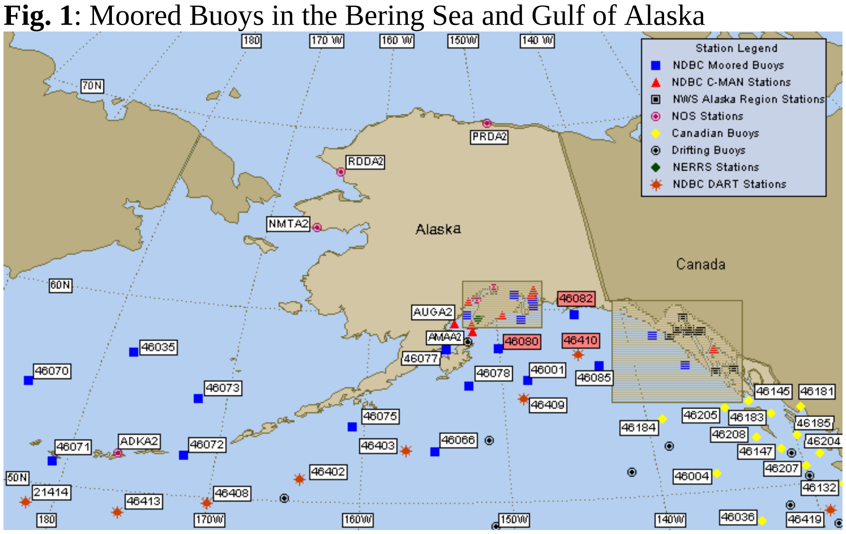
Spatial time series of various climate variables are obviously relevant to any economic model that will be used to analyze the potential effects of a change in climate on a fishery's spatial distribution of effort in the future. This project aims to improve fishery models in economics by augmenting them with area-specific information on ice coverage, winds, sea surface height, and potentially, primary productivity (see Quarterly Report, Jan.-March 2007). One area where climate data can be utilized is in fisher location choice models. These models incorporate observable information on the vessel characteristics, expected returns from choosing an area, and travel distance. A second area of research will examine spatial correlation of fishery economic productivity and climate. A third is to utilize time series of climate data in economic models of fishery dynamics.

Recently two undergraduates from the School of Aquatic and Fishery Sciences at the University of Washington completed research projects that compiled data on daily sea surface temperatures (SST) and other weather variables for use in spatial econometric models. In the first project, the student worked with NOAA's Pacific Marine Environmental Laboratory staff to obtain and process information from moored buoy "M2," and then she processed data from NOAA's National Buoy Data Center for other moored buoys in the Bering Sea and Gulf of Alaska (including data for some Canadian buoys; see Fig. 1 from http://www.ndbc.noaa.gov/maps/Alaska.shtml). The second project involved processing daily weather data (min/max air temperature and precipitation) from a few dozen weather stations located in coastal areas of Alaska near ports and shore-side processing facilities. Work on the first project will continue through at least September 2008. Recent results include an analysis of the spatial and temporal covariance structure of time series associated with the set of moored buoys. Next steps in the project will be to retrieve SST time series from GIS layers of satellite data at the same locations as the moored buoys and make a formal comparison. In addition, GIS layers with wind vectors will also be made available.

Fig. 1: Moored Buoys in the Bering Sea and Gulf of Alaska



Predicting Fishing with Vessel Monitoring System (VMS) 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.

Though the VMS tells NMFS the location of each participating vessel, it does not directly determine whether the vessel is fishing or not. However, when a vessel is fishing, its course and speed are generally different than when the vessel is simply transiting an area. These differences produce a "signature" that indicates fishing is taking place. The nature of a given vessel's signature depends on many factors, including the gear type being used (trawl, hook-and-line, or pot), the type of vessel deploying the gear, and the length of time the vessel spends fishing. In addition to VMS, many vessels carry a NMFS-certified observer during 30-100 percent of their days at sea. Thus, NMFS can determine directly and independently whether or not fishing is taking place and can thus corroborate whether a given signature indeed demonstrates that fishing is taking place.

The primary purpose of this research is to determine the extent to which the signatures can be used to accurately predict whether fishing is occurring or not. In previous work by Pat Sullivan for the NMFS Alaska Region, a number of techniques were explored to predict fishing for a select number of vessels. This current project builds upon that exploratory work and develops an operational algorithm. To the extent that a given signature can accurately predict whether fishing is taking place, NMFS will use the signatures to develop computer algorithms that will automatically predict whether a given vessel is or was engaged in fishing operations. The predictive power of the developed algorithms can be expressed as a percentage of predicted fishing events that correspond to actual fishing events. Functions of lagged speed and bearing have been developed which predict spatial effort with relatively low error. Preliminary results from this work were presented at the Fourth International GIS/ Spatial Analysis Symposium this summer and final results are being prepared for publication.

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 a limit on the amount of halibut that can be harvested by the recreational charter fishery 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. 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 evaluated 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.

The project is in its planning stage, but will involve interacting with representatives from the industry to gain input and cooperation that will help successfully facilitate data collection by means of voluntary surveys. A survey instrument and sampling plan will be developed that provides baseline knowledge about the halibut charter sector that can be used by the Council, NMFS, and the charter industry to begin understanding the potential impacts of management actions on this fishing sector.

Demand for Halibut Sport Fishing Trips in Alaska

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The halibut sport fishery in Alaska is quite large. In 2004, for instance, over 480,000 halibut were harvested by sport anglers in the state (Jennings, et al., 2007). To assess the impacts of pending and potential regulatory changes on sport angler behavior, it is necessary to have estimates of the baseline demand for halibut fishing trips and an understanding of the factors that affect it. To this end, Dan Lew has been working with Doug Larson (University of California, Davis) to develop and implement a survey that collects information about saltwater recreational fishing trips in Alaska, and to analyze the data. Three primary survey instruments were developed, each customized to specific angler populations based on residency: non-Alaska resident anglers (referred to as non-resident anglers), resident anglers of Southeast Alaska (referred to as SE resident anglers), and other Alaska resident anglers (referred to as SC resident anglers).

The project consists of three major phases. The first phase involves developing and pretesting the survey instruments. This phase includes testing the survey instrument using focus groups, cognitive interviews, and a formal pretest survey implementation. These activities were completed in 2006 following OMB approval. During the second phase, final versions of the survey are developed and implemented through a mail survey of Alaska sport anglers. Mail survey implementation followed a modified Dillman Tailored Design Method (Dillman, 2000), and consisted of an advance letter, a survey mailing (survey booklet, cover letter, map, and business reply envelope), a thank you/reminder postcard, and a second survey mailing. A follow-up telephone survey was also used to elicit participation. This phase of the project was completed in August 2007. The survey collected information about anglers' 2006 fishing activities. Response rates (total complete/total delivered) for each stratified sample are in Table 1.

Table 1: Response rates by sample

Sample	Total Mailed	Total Delivered	Total Complete	Response Rate
Non-resident (NR)	1,900	1,801	1,115	61.91%
Non-Southeast Alaska (SC)	1,200	1,071	559	52.19%
Southeast Alaska (SE)	900	808	435	53.84%
Total	**4,000**	**3,680**	**2,109**	**57.31%**

The third and final phase of the project involves the description and analysis of the data. In the following, we briefly summarize some general characteristics of the 1,115 NR, 559 SC, and 435 SE saltwater recreational anglers who completed the survey. Econometric models of recreation demand are currently being developed and estimated to assess the baseline demand for saltwater fishing trips in Alaska.

Non-Resident Anglers

A total of 1,115 non-Alaskan anglers responded to the survey. Since individuals in this sample have to travel to Alaska from the lower 48 or Hawaii to fish in Alaska, the character of the trips they take to fish in Alaska is distinct from the other sample populations. The vast majority of non-residents (NR) who fished in saltwater (817 out of 1,115 total NR respondents) only took 1 trip to Alaska that included fishing (786 out of the 817); the remaining 31 included 25 who took 2 trips, 5 who took 3 trips, and 1 who took 6 trips. Table 2 further breaks down respondents by the number of trips taken to Alaska to primarily saltwater fish. As the table shows, every trip to Alaska was primarily to saltwater fish for 491 of the 817 individuals in the sample (60.1%).

Table 2. Breakdown of saltwater fishing trips to Alaska undertaken primarily to saltwater fish

	Trips during 2006 to primarily saltwater fish				
Number of trips to Alaska during 2006	***0***	***1***	***2***	***3***	***5***
0	298				
1	322	452[a]			
2	3	8	14		
3	1	0	0	4	
6	0	0	0	0	1

[a] There are an additional 12 individuals who reported more Alaska trips that were primarily to saltwater fish than were reportedly taken to Alaska.

Another key feature of the NR data is the different modes and durations of fishing trips taken by non-residents. Information about days fishing by each of three saltwater fishing modes—charter boat fishing, private boat fishing, and shore fishing—was collected in the survey. The distribution of participation in each fishing mode is provided in Table 3. The second column contains the count of all individuals who reported fishing in the sample, while the third column includes only those respondents that reported taking a single trip to Alaska.

Table 3. Distribution of 2006 fishing effort over sample by fishing mode

Fishing mode fished during 2006	All individuals in sample	Only individuals taking one trip to Alaska
Any charter boat	593	572
Any private boat	193	179
Any shore	93	89
Charter boat only	511	496
Private boat only	138	129
Shore only	14	14
Charter boat and private boat only	22	19
Charter boat and shore only	46	44
Private boat and shore only	19	18
All three fishing modes	14	13

As Table 2 shows, over the entire sample of saltwater anglers the majority fished by charter boat only (511 of 817 or 62.5%). In addition, another 82 individuals fished by at least one other fishing mode in addition to by charter boat, including 14 who reportedly fished by all three. Private boat fishing was the next most popular fishing mode with 193 individuals reportedly fishing by this mode, of which 138 fished solely on private boats. Except for a few individuals, shore fishing appears to be largely undertaken in conjunction with one or more boat fishing modes.

In contrast to the number of trips to Alaska to saltwater fish, fishing trip duration, as measured by the number of days fishing (partial days are counted as full days), appears to vary widely over the sample and is dependent upon fishing mode. There are a total of 26 fishing sites included in this study.

1. Glacier Bay
2. Haines – Skagway
3. Juneau
4. Kake
5. Ketchikan
6. Petersburg
7. Prince of Wales Island
8. Sitka
9. Wrangell
10. Yakutat
11. Hoonah
12. Elfin Cove
13. Angoon
14. Anchor Point
15. Bristol Bay – Alaska Peninsula
16. Clam Gulch
17. Cordova
18. Ninilchik – Deep Creek
19. Homer
20. Kenai
21. Kodiak
22. Seldovia
23. Seward
24. Valdez
25. Whittier
26. Unalaska – Dutch Harbor

The survey itself only included 22 named fishing locations, which were laid out in maps defining Southeast Alaska and Southcentral Alaska. All other areas of Alaska were considered “other areas in Alaska”, which were assumed to be Unalaska-Dutch Harbor (unless otherwise specified) given it was the only location in the “other Alaska area” that has significant sport catch and harvest according to the ADF&G statewide harvest survey (Jennings, et al., 2007). However, enough individuals wrote in Hoonah, Elfin Cove, and Angoon in Southeast Alaska that they were added to the above list of fishing locations.

Tables 4, 5, and 6 provide the number of trip durations across individuals who took only *one* trip to Alaska and engaged in charter boat fishing (Table 4), private boat fishing (Table 5), or shore fishing

(Table 6).[1] As a result, the observed fishing days at a site can be interpreted as the fishing trip length (since there is only one trip taken during 2006).

Across sites, there are 394 individuals spending one day charter boat fishing, 82 fishing for two days, 75 fishing for three days by charter boat, 42 fishing four days, 26 fishing five, and 12 fishing six. The observed charter boat fishing trip lengths decrease significantly beyond six days of fishing. Among those taking one trip to Alaska during 2006, the most charter boat fishing trips appear to be taken to Homer (140 individuals) and Seward (76) in Southcentral Alaska, and Sitka (76) and Ketchikan (75) in Southeast Alaska. There were no charter boat fishing trips to Kake, Cordova, or Unalaska-Dutch Harbor.

A similar pattern emerges for the observed private boat fishing trip lengths. The most commonly-observed duration of private boat trips is one-day trips (72 individuals). 35 individuals are observed to take two-day private fishing trips, 27 take three-day trips, 16 each take four-day and five-day trips, and 11 each take six- and seven-day trips. There are a few individuals taking trips between eight and ten fishing days. The remaining private boat fishing trip durations range from fourteen days to 30. Homer and Ketchikan appear to be the most popular sites for private boat fishing (26 and 22 individuals, respectively). Clam Gulch and Kake did not have any private boat fishing trips.

For shore fishing, we again observe a familiar pattern. While there are 49 individuals observed to take one-day shore fishing trips, only 21 take two-day trips, and 15 take three-day trips. For lengthier trips, there are only a few observations, if any, for each duration, with the longest shore fishing trip a twenty-day trip. Homer is again the most popular fishing location for this fishing mode based on the number of individuals who take trips to this site (24). The next most popular site for shore fishing is Kenai (13 individuals). No shore fishing trips were taken to Kake, Wrangell, Hoonah, Angoon, Elfin Cove, or Unalaska-Dutch Harbor.

[1] For individuals taking more than one trip to Alaska, we cannot determine individual fishing trip durations from the data.

Table 4. Duration of Charter Boat Fishing Trip by Site for Individuals Taking One Trip to Alaska During 2006

	Number of Charter Boat Fishing Days at Site in 2006 (One trip to Alaska)										
Fishing Location	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Glacier Bay	3	0	0	1	3	1	0	0	0	0	0
Haines-Skagway	6	0	0	0	0	0	0	0	0	0	0
Juneau	20	1	2	7	2	1	0	0	0	0	0
Kake	0	0	0	0	0	0	0	0	0	0	0
Ketchikan	56	5	4	4	3	3	0	0	0	0	0
Petersburg	2	1	3	1	2	0	0	1	0	0	0
Prince of Wales Island	4	2	14	7	6	3	0	1	0	0	0
Sitka	31	2	28	9	5	1	0	0	0	0	0
Wrangell	2	0	0	0	0	0	0	0	0	0	0
Yakutat	2	3	0	1	0	0	0	0	0	0	0
Anchor Point	20	2	2	0	0	1	0	0	0	0	0
Bristol Bay - Alaska Peninsula	0	0	0	0	1	0	0	0	0	0	0
Clam Gulch	3	0	0	0	0	0	0	0	0	0	0
Cordova	0	0	0	0	0	0	0	0	0	0	0
Ninilchik - Deep Creek	35	11	3	0	0	0	0	0	0	0	1
Homer	102	25	9	3	0	1	0	0	0	0	0
Kenai	12	6	0	1	1	0	0	0	0	0	0
Kodiak	6	7	2	3	0	0	0	0	0	1	0
Seldovia	1	1	1	0	0	0	0	0	0	0	0
Seward	58	10	3	4	1	0	0	0	0	0	0
Valdez	8	2	1	0	0	0	0	0	0	0	0
Whittier	7	1	2	0	0	0	0	0	0	0	0
Hoonah	16	0	1	0	0	0	0	0	0	0	0
Elfin Cove	0	1	0	1	1	1	0	0	0	0	0
Angoon	0	0	0	0	1	0	0	0	0	0	0
Unalaska - Dutch Harbor	0	0	0	0	0	0	0	0	0	0	0
Total trips	**394**	**80**	**75**	**42**	**26**	**12**	**0**	**2**	**0**	**1**	**1**

Table 5. Duration of Private Boat Fishing Trip by Site for Individuals Taking One Trip to Alaska During 2006

	Number of Private Boat Fishing Days at Site in 2006 (One trip to Alaska)														
Fishing Location	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**15**	**20**	**21**	**23**	**30**
Glacier Bay	0	1	1	0	2	0	2	0	0	0	0	0	0	0	0
Haines-Skagway	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Juneau	5	0	2	0	1	0	0	0	0	0	0	0	0	0	0
Kake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ketchikan	6	2	3	3	3	2	1	0	0	1	0	0	0	0	1
Petersburg	1	2	3	0	0	0	2	0	0	0	0	0	0	0	1
Prince of Wales Island	1	5	1	2	1	3	1	0	0	0	0	0	1	0	0
Sitka	3	1	4	2	2	2	1	0	0	1	0	0	0	0	0
Wrangell	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Yakutat	0	0	2	1	1	1	1	0	0	0	0	0	0	0	0
Anchor Point	5	0	0	0	0	0	1	0	1	0	0	0	0	0	0
Bristol Bay - Alaska Peninsula	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0
Clam Gulch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cordova	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0
Ninilchik - Deep Creek	2	6	1	0	0	0	0	0	0	0	0	0	0	0	0
Homer	15	5	3	1	0	0	0	0	0	0	0	1	0	1	0
Kenai	4	4	0	0	1	0	0	1	0	0	0	0	0	0	0
Kodiak	5	1	1	1	0	1	0	0	0	0	0	0	0	0	0
Seldovia	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0
Seward	7	1	1	0	1	0	0	0	0	0	0	0	0	0	0
Valdez	4	1	1	2	1	1	2	0	0	0	0	0	0	0	0
Whittier	4	2	1	1	1	0	0	0	0	0	0	0	0	0	0
Hoonah	2	0	0	0	1	1	0	1	0	1	0	0	0	0	0
Elfin Cove	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Angoon	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Unalaska - Dutch Harbor	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total trips	**72**	**35**	**27**	**16**	**16**	**11**	**11**	**3**	**2**	**4**	**1**	**1**	**1**	**1**	**2**

Note: Durations that were not observed in the data were not included for space concerns.

Table 6. Duration of Shore Fishing Trip by Site for Individuals Taking One Trip to Alaska During 2006

	Number of Shore Fishing Days at Site in 2006 (One trip to Alaska)												
Fishing Location	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**18**	**20**
Glacier Bay	0	0	0	0	0	0	0	0	0	0	0	0	1
Haines-Skagway	1	1	0	0	0	0	0	0	0	0	0	0	0
Juneau	3	2	0	0	0	1	0	0	0	0	0	0	0
Kake	0	0	0	0	0	0	0	0	0	0	0	0	0
Ketchikan	4	0	0	0	0	0	0	0	0	0	0	0	0
Petersburg	1	0	1	0	0	0	1	0	0	0	0	0	0
Prince of Wales Island	1	2	2	0	0	0	0	0	0	0	0	0	0
Sitka	1	0	0	0	0	0	0	0	0	0	0	0	0
Wrangell	0	0	0	0	0	0	0	0	0	0	0	0	0
Yakutat	0	1	1	1	0	0	0	0	0	0	0	0	0
Anchor Point	1	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Bay - Alaska Peninsula	0	0	0	0	1	0	0	0	0	1	0	0	0
Clam Gulch	2	0	0	0	0	0	0	0	0	0	0	0	0
Cordova	1	0	0	0	0	0	0	0	0	0	0	0	0
Ninilchik - Deep Creek	3	0	0	0	0	0	0	0	0	0	0	0	0
Homer	13	4	4	1	1	0	0	0	1	0	0	0	0
Kenai	5	5	1	0	0	0	0	1	0	0	0	1	0
Kodiak	1	2	2	0	1	0	0	0	0	0	0	0	0
Seldovia	2	0	0	0	0	0	0	0	0	0	0	0	0
Seward	5	2	1	0	0	0	0	0	0	0	1	0	0
Valdez	4	2	3	0	1	1	0	0	0	0	0	0	0
Whittier	1	0	0	1	0	0	0	0	0	0	0	0	0
Hoonah	0	0	0	0	0	0	0	0	0	0	0	0	0
Elfin Cove	0	0	0	0	0	0	0	0	0	0	0	0	0
Angoon	0	0	0	0	0	0	0	0	0	0	0	0	0
Unalaska - Dutch Harbor	0	0	0	0	0	0	0	0	0	0	0	0	0
Total trips	**49**	**21**	**15**	**3**	**4**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note: Durations that were not observed in the data were not included for space concerns.

Southcentral Alaska Saltwater Anglers

Of the 559 SC Alaska resident respondents, only 275 took a saltwater fishing trip during 2006. The remaining 284 respondents did not fish in saltwater during 2006. They either fished only in freshwater or did not fish at all during the year. Across sites and fishing modes, the mean number of trips taken by these 275 saltwater anglers was 6.34. Of the 275 saltwater anglers, 93 fished at more than one fishing location. No one fished at more than 7 fishing sites during 2006, while the mean number of fishing sites visited by an individual was 1.5. The largest number of fishing trips reported by any individual was 135. Table 7 provides a closer look at the distribution of trips taken during 2006 to saltwater fish.

Table 7. Breakdown of saltwater fishing trips in Alaska irrespective of site choice

Number of Trips During 2006	***No. Respondents***
0	284
1	93
2	53
3	20
4	19
5	15
6	12
7	4
8	3
9	5
10	18
11	1
12	4
13	1
14	3
15	4
More than 15	20

Another key feature of the SC data is the different modes and durations of fishing trips taken by SC residents. Information about days fishing by each of three saltwater fishing modes—charter boat fishing, private boat fishing, and shore fishing—was collected in the survey. The distribution of participation in each fishing mode is provided in Table 8. As the table shows, most saltwater anglers fished by private boat, with charter boat fishing the next most popular fishing mode.

Strictly in terms of fishing days, a total of 392 charter boat fishing days (19.6%), 1,408 private boat fishing days (70.3%), and 303 shore fishing days (10.1%) were reported.

Table 8: Fishing modes

Fishing Mode(s) During 2006	No. of Individuals
Any charter boat fishing	119
Any private boat fishing	183
Any shore fishing	60
Only charter boat fishing	70
Only private boat fishing	130
Only shore fishing	17
Charter and private boat only	26
Charter and shore only	16
Private and shore only	20
All fishing modes	7

Table 9 shows the total number of trips and fishing days spent at each fishing site during 2006 by the 275 SC saltwater anglers. Note that very few trips were taken to fish outside Southcentral Alaska. Of the 1,611 fishing trips reported, only 15 were taken outside Southcentral Alaska (<1%). The most frequently reported fishing locations were Valdez, Homer, Seward, and Whittier. Across sites and fishing modes, the mean number of days per fishing trip was 1.24. This suggests a good portion of trips were single day fishing trips, but some longer trips were taken.

Table 9. Total Trips and Fishing Days by Fishing Location

Site	Total Trips	Total Days
Glacier Bay	0	0
Haines-Skagway	0	0
Juneau	0	0
Kake	0	0
Ketchikan	2	2
Petersburg	0	0
Prince of Wales Island	0	0
Sitka	5	5
Wrangell	0	0
Yakutat	7	7
Anchor Point	86	98
Bristol Bay - Alaska Peninsula	16	16
Clam Gulch	19	19
Cordova	105	113
Ninilchik - Deep Creek	112	115
Homer	263	306
Kenai	76	84
Kodiak	71	95
Seldovia	6	7
Seward	256	321
Valdez	345	497
Whittier	220	294
Hoonah	0	0
Elfin Cove	1	3
Angoon	0	0
Unalaska - Dutch Harbor	21	21
Total	**1611**	**2003**
Average fishing days per trip		**1.24**

In sum, Southcentral Alaska resident anglers tended to display wide variation in terms of the number of trips taken over the course of the year, plus some variation in the length of each trip. The fishing trips were usually by private boat, but there were substantial numbers of charter boat and shore fishing trips as well. Only a tiny fraction of trips were taken outside of Southcentral Alaska to fish in saltwater. There were four sites that dominated the locations where most of the saltwater fishing occurred.

Southeast Alaska Saltwater Sport Anglers

Of the 435 Southeast Alaska resident respondents, 288 (66.2%) took a saltwater fishing trip during 2006. The remaining 147 respondents did not fish in saltwater during 2006. They either fished only in freshwater or did not fish at all during the year. Across sites and fishing modes, the mean number of trips taken by these 288 saltwater anglers was 13.4. Of the 288 saltwater anglers, almost all fished at a single fishing location (254). No one fished at more than 4 fishing sites during 2006, while the mean number of fishing sites visited by an individual was 1.14. The largest number of fishing trips reported by any individual was 111.

Table 10 provides a closer look at the distribution of trips taken during 2006 to saltwater fish. Clearly, there is a wide range of observed trips taken by respondents.

Table 10. Breakdown of saltwater fishing trips in Alaska irrespective of site choice

Number of Trips During 2006	***No. Respondents***
0	147
1	24
2	25
3	18
4	9
5	19
6	22
7	8
8	9
9	6
10	32
11	2
12	9
13	1
14	5
15	19
16 to 20	26
21 to 25	13
26 to 30	15
More than 30	38

Another key feature of the SE data is the dominance of private boat fishing as the primary fishing mode, compared with the other samples. Information about days fishing by each of three saltwater fishing modes—charter boat fishing, private boat fishing, and shore fishing—was collected in the survey. The distribution of participation in each fishing mode is provided in Table 11. As the table shows, almost all anglers (96%) fished by private boat, with almost three-quarters of all saltwater anglers from SE Alaska fishing exclusively by private boat during 2006. In terms of the distribution of fishing days among modes, there were 119 charter boat fishing days (3.3%), 3,054 private boat fishing days (84.2%), and 452 shore fishing days (12.5%).

Table 11: Fishing Modes

Fishing Mode(s) During 2006	No. of Individuals
Any charter boat fishing	24
Any private boat fishing	277
Any shore fishing	74
Only charter boat fishing	9
Only private boat fishing	214
Only shore fishing	12
Charter and private boat only	4
Charter and shore only	3
Private and shore only	51
All fishing modes	8

Table 12 shows the total number of trips and fishing days spent at each fishing site during 2006 by the 288 saltwater anglers from Southeast Alaska. Note that very few trips were taken to fish outside Southeast Alaska. Of the 3,444 fishing trips reported, only 30 were taken outside Southeast Alaska (<1%). By far, the most trips and fishing days occurred in Juneau, with Ketchikan, Sitka, and Prince of Wales Island representing the remaining top fishing locations. The average number of days spent fishing per trip was 1.05, suggesting virtually all fishing trips were daytrips.

Table 12. Total Trips and Fishing Days by Fishing Location

Site	Total Trips	Total Days
Glacier Bay	46	52
Haines-Skagway	140	168
Juneau	1393	1376
Kake	15	28
Ketchikan	516	533
Petersburg	131	135
Prince of Wales Island	433	515
Sitka	493	504
Wrangell	128	128
Yakutat	63	73
Anchor Point	0	0
Bristol Bay - Alaska Peninsula	0	0
Clam Gulch	0	0
Cordova	0	0
Ninilchik - Deep Creek	6	6
Homer	10	10
Kenai	1	1
Kodiak	0	0
Seldovia	0	0
Seward	3	6
Valdez	8	16
Whittier	2	5
Hoonah	13	19
Elfin Cove	31	40
Angoon	12	10
Unalaska - Dutch Harbor	0	0
Total	**3444**	**3625**
Average fishing days per trip		**1.05**

In sum, Southeast Alaska resident anglers tended to display wide variation in terms of the number of trips taken over the course of the year, but little variation in the length of each trip. The fishing trips were primarily, if not almost exclusively, by private boat and a day in length. Only a tiny fraction of trips were taken outside of Southeast Alaska to fish in saltwater. In addition, there were four Southeast Alaska fishing locations that dominated the places where most of the saltwater fishing occurred.

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Nonconsumptive Value of Steller Sea Lion Protection

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Steller sea lions (*Eumetopias jubatus*) live in the North Pacific Ocean and consist of two distinct populations, the Western stock and the Eastern stock, which are separated at 144° W longitude. As a result of large declines in the populations since at least the early 1970s, in April 1990 the Steller sea lion (SSL) was listed as threatened throughout its range under the Endangered Species Act (ESA) of 1973 (16 U.S.C. 35). The decline continued through 2000 for the Western stock in Alaska, which was declared endangered in 1997, while the Eastern stock remains listed as threatened. Both the Western and Eastern stocks are also listed as depleted under the Marine Mammal Protection Act (MMPA) of 1972 (16 U.S.C. 1362).

NMFS is the primary agency responsible for the protection of marine mammals, including Steller sea lions. Multiple management actions have been taken (e.g., 68 FR 204, 68 FR 24615, 69 FR 75865), and are being contemplated, by NMFS and the North Pacific Fishery Management Council to protect and aid the recovery of the SSL populations. These actions differ in the form they take (e.g., limits on fishing to increase the stock of fish available for Steller sea lions to eat, area restrictions to minimize disturbances), which stock is helped, when and how much is done, and their costs. In deciding between these management actions, policy makers must balance the ESA and MMPA goals of protecting Steller sea lions from further declines with providing for sustainable and economically viable fisheries under the Magnuson-Stevens Fishery Conservation Act (P.L. 94-265). Since Steller sea lion protection is linked to fishery regulations, decision makers must comply with several federal laws and executive orders in addition to the ESA and MMPA, including Executive Order 12866 (58 FR 51735), which requires regulatory agencies to consider costs and benefits in deciding among alternative management actions, including changes to fishery management plans made to protect Steller sea lions.

Public preferences for providing protection to the endangered Western and threatened Eastern stocks of Steller sea lions are primarily the result of the non-consumptive value people attribute to Stellar sea lions. Little is known about these preferences, yet such information is needed for decision makers to more fully understand the trade-offs involved in choosing between management alternatives. The amount the public is willing to pay for increased Steller sea lion stock sizes or changes in listing status is information that can aid decision makers to evaluate protection actions and more efficiently manage and protect these resources, but is not currently known.

NMFS has conducted a study to collect information that can provide insights into public values for protecting Steller sea lions. During 2004 and 2005, a survey instrument was developed with the assistance of experts in non-market valuation, environmental economics, and survey research, as well as fisheries scientists and researchers who study Steller sea lions. It was extensively tested using qualitative focus groups and one-on-one cognitive interviews conducted in Seattle, WA, Denver, CO, Sacramento, CA, Rockville, MD, and Anchorage, AK. Two formal pretests were conducted during Fall 2005 and Spring 2006 to assess the survey protocols. Subsequently, the survey instruments were revised to reflect updated information about Steller sea lions. The final survey implementation followed a modified Dillman Tailored Design Method to maximize response, and consisted of an advance letter, a survey mailing (survey booklet, cover letter, map, and business reply envelope), a thank you/reminder postcard, a telephone reminder (interview) to encourage response, and a second survey mailing. It was completed during 2007 following Office of Management and Budget (OMB) approval and achieved an overall response rate of 62.1%.

Since threatened and endangered (T&E) species, like Steller sea lions, are not traded in observable markets, standard market-based approaches to estimate their economic value cannot be applied. As a result, studies that attempt to estimate these values must rely on survey-based non-market valuation methods, which involve asking individuals to reveal their preferences or values for non-market goods, such as the protection of T&E species, through their responses to questions in hypothetical market situations. One particular stated preference method, the contingent valuation (CV) method, has been the dominant approach for valuing T&E species. Although contingent valuation has been subject to much criticism, the NOAA Panel on Contingent Valuation found that despite its problems, "a well-conducted CV study provides an adequately reliable benchmark" (Arrow *et al.*, 1993) to begin discussions on appropriate values.

This study employs a choice experiment (CE), or stated choice, approach for eliciting economic values for Steller sea lions. CE methods are relatively new to the valuation of environmental goods, despite having a long history in the marketing and transportation fields (e.g., Louviere [1992]).[2] A typical CE involves presenting respondents with two or more choice questions, each having a set of alternatives that differ in attributes. For each question, respondents are asked to select the alternative they like best. The choice responses are used to estimate a preference function that depends upon the levels of the attributes.

In this study, the stated choice questions take the following form: respondents are asked to choose between the status quo level of protection and two alternative protection programs that embody more protection, but at added costs. Each alternative program is described in terms of their results on each stock's population size and ESA status in 60 years. Since population and status projections are uncertain, three survey versions that embody different assumptions about the likely future Western population and ESA status were developed. One version assumes an increasing Western stock population, another assumes a stable one, and the final one assumes a decreasing population. Use of these alternative versions of the survey allows us to account for the uncertainty surrounding future stock sizes within our analytic framework.

Stated choice data collected through the survey have been analyzed using a suite of models and specifications, and although analysis continues, the methodologies used and some results are presently undergoing peer review. The models estimate preference functions for explaining choices between protection programs that differ in the levels of population sizes, ESA listing statuses, and costs. The estimated functions will provide NMFS and the NPFMC with information on public preferences and values for alternative Steller sea lion protection programs, and how several factors affect these values. This information can then be compared with program costs and other impacts when evaluating protection alternatives.

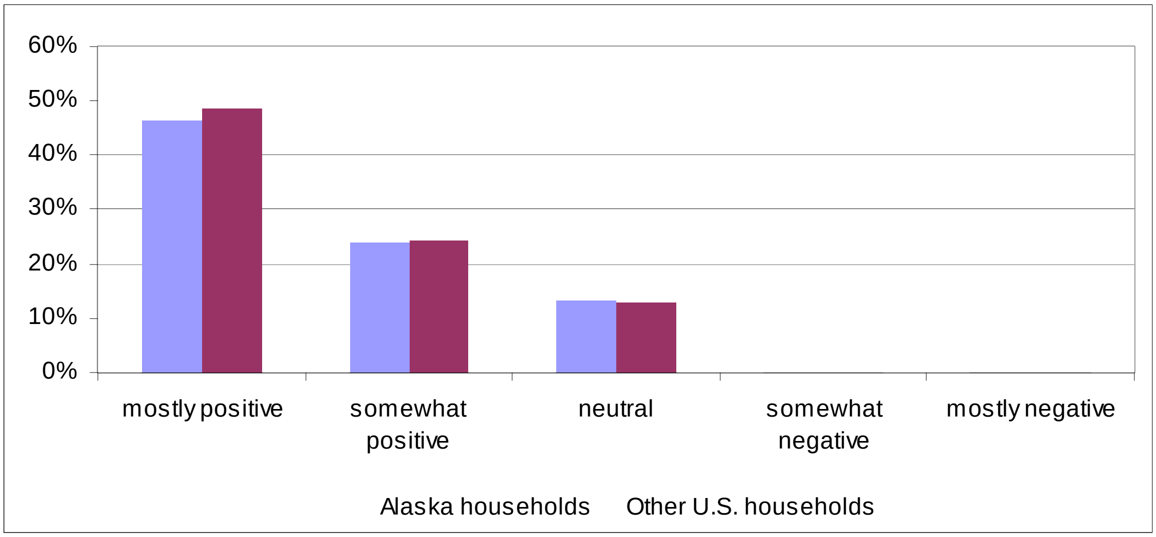
The survey also collected other information from randomly-selected Alaska households and other U.S. households (U.S. households outside Alaska) useful for understanding public preferences for, and

[2] Hanley, Wright, and Adamowicz (1998), Alpizar, Carlsson, and Martinsson (2001), and Hanley, Mourato, and Wright (2001) provide useful overviews of choice experiments in non-market valuation.

attitudes about, threatened and endangered species generally and Steller sea lions particularly. These preferences and attitudes are summarized below,[3] but econometric model results from the analysis of the stated preference choice questions also collected in the survey will not be presented here since this is an area of ongoing work.

In general, Alaskan and other U.S. respondents had very similar views on the Endangered Species Act, with over 70% of respondents in each sample having a positive view of the law (see Figure 1).

Figure 1. When you think of the Endangered Species Act, how positive or negative is your general reaction?



Respondents were asked the extent to which they agreed or disagreed with two statements about threatened and endangered species, “Protecting threatened and endangered species is important to me” (Figure 2) and “Protecting jobs is more important than protecting threatened and endangered species” (Figure 3). In each question, Alaskan and other U.S. respondents had similar distributions of responses.

[3] The following results can be found in the Fall 2007 AFSC Quarterly Report.

Figure 2. How much do you agree or disagree with the statement, "Protecting threatened and endangered species is important to me"?

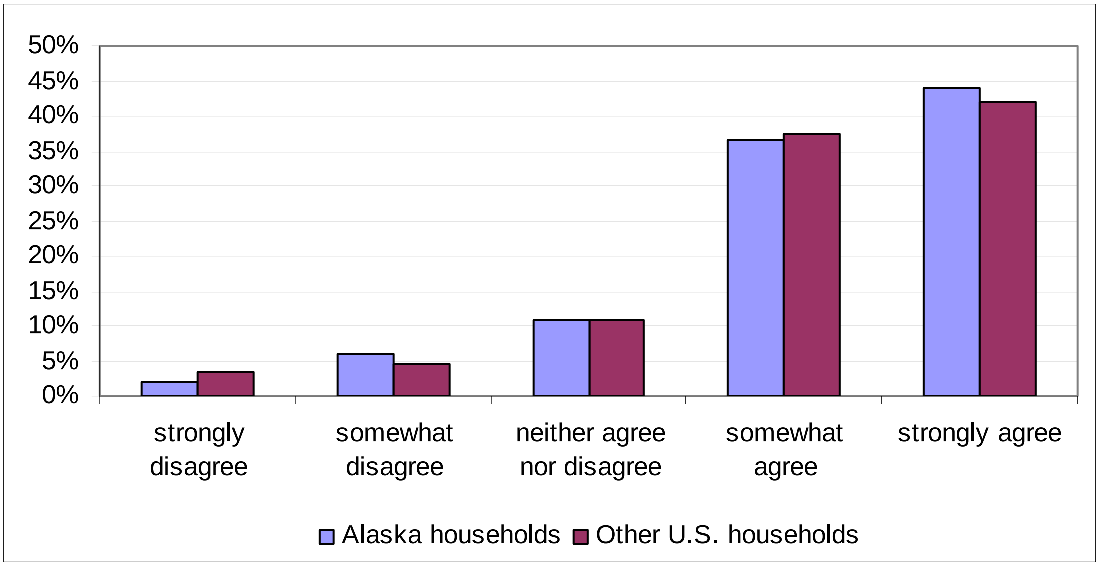
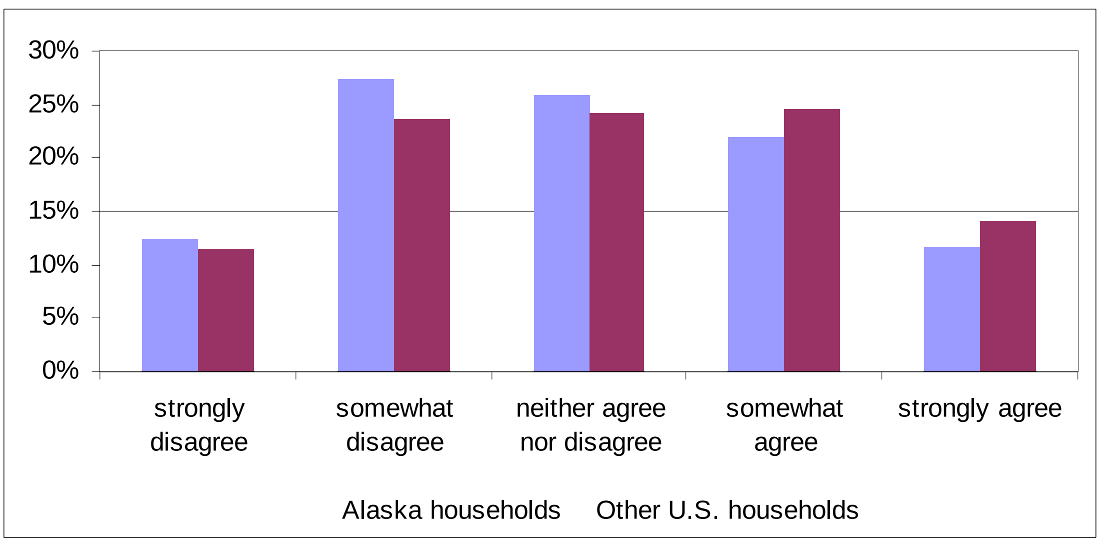


Figure 3. How much do you agree or disagree with the statement, "Protecting jobs is more important than protecting threatened and endangered species"?



The survey provides some basic information about Steller sea lions and describes the two stocks of Steller sea lions in the U.S., the *threatened* Eastern stock and *endangered* Western stock, and the population trends of each. The Eastern stock population has been increasing for a number of years. Until recently, the Western stock population as a whole has been decreasing. Alaskans tended to be more knowledgeable and experienced with Steller sea lions, with about 92% of Alaskan respondents indicating they had seen, heard, or read about them compared with about 40% of other U.S. respondents. Over 40% of respondents in each sample (44% of Alaska respondents and 41% of other U.S. respondents) indicated they are "very concerned" or "extremely concerned" about the Western stock. In contrast, the proportion of respondents in each sample that is "very concerned" or "extremely concerned" about the Eastern stock is lower (23% of Alaska respondents and 25% of other U.S. respondents).

The survey also presents information and asks the respondents how concerned they are about possible costs of additional protection, including the possibility of commercial fishing jobs being lost and higher prices for seafood that may result as the fishing industry adjusts to commercial fishing restrictions that may occur as part of measures to protect Steller sea lions. Most respondents in each sample either indicated they were “a little concerned” or “somewhat concerned” (63% of Alaska respondents and 70% of other U.S. respondents). A higher proportion of Alaskans were “very concerned” or “extremely concerned” (22%) compared to non-Alaskans (16%). With respect to concern about the possibility of higher seafood prices, the most frequently selected response in each sample was “not at all concerned” (36% of Alaskan respondents and 33% of other U.S. respondents). About 17% of Alaskan respondents and 15% of other U.S. respondents were “very concerned” or “extremely concerned” about higher seafood prices that may result from additional Steller sea lion protection.

To qualitatively gauge respondents’ preferences for the need for further protection actions, respondents were asked the extent to which they agreed or disagreed with two statements: “Even if it costs us more money, we should do more so the Western stock is no longer endangered” and “So long as the Eastern stock recovers, it doesn’t matter to me if the Western stock remains endangered.” Over 60% of respondents in each sample indicated they “strongly agree” or “somewhat agree” with the first statement (62% of Alaska respondents and 61% of other U.S. respondents), indicating the majority of each sample believe more should be spent to ensure the Western stock is no longer endangered. A similarly large proportion of respondents in each sample indicated they “strongly disagree” or “somewhat disagree” with the second statement (74% of Alaska respondents and 67% of other U.S. respondents), suggesting the majority of respondents feel protecting the Western stock is independent of how the Eastern stock is doing.

Table 1 presents descriptive statistics for several demographic characteristics for the other U.S. and Alaska samples. Compared to each other, the other U.S. respondents and Alaska respondents were similar in terms of education distribution, median age, and household size. Income distribution was also somewhat similar across the two sample, with the Alaska sample having a larger proportion in the $50,000-$150,000 household income range, but similar proportions in the higher income ranges. The two samples did differ in ethnic composition, with the Alaska sample having higher percentages of American Indian/Alaska Natives and Asians compared with the other U.S. sample.

*Table 1. Demographics of Alaska Sample and Rest of U.S. Sample Respondents**

Characteristic	Other U.S. sample	Alaska sample
Educational attainment		
High school or less	5.70%	3.8%
High school graduate or equivalent	25.4%	24.2%
Some college or Associate's degree	30.1%	34.2%
College degree or higher	38.9%	37.9%
Median age (18 and older)	53	53
Mean household size	1.74	1.72
Percent male (18 and older)	58.4%	69.6%
Percent Hispanic	6.1%	1.9%
Race		
Asian	2.8%	3.5%
American Indian	2.0%	12.9%
Black	6.3%	0.6%
Hawaiian	0.7%	0.6%
White	84.3%	81.5%
Household income		
Less than $10,000	4.6%	3.1%
$10,000 to $49,999	36.0%	26.6%
$50,000 to $99,999	37.8%	42.7%
$100,000 to $149,999	13.5%	19.7%
$150,000 to $199,999	3.9%	3.4%
$200,000 or more	4.2%	4.5%

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Economic Impacts of Alaska Saltwater Sport Fishing

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Saltwater sport fishing is an important economic activity in Alaska, generating jobs and sales of related industries throughout coastal regions and the state generally.[4] 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 resident anglers of Southeast Alaska (SE) and Southcentral Alaska (SC), and non-resident anglers (NR). 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 Halibut Sport Fishing Trips in Alaska"). In this project, Dan Lew and Chang Seung will estimate the regional economic impacts of Alaska saltwater sport fishing and the likely effects of fishing regulation changes on regional economies.

Using data from these surveys, the total expenditure for each expenditure category will be estimated. Non-resident anglers' expenditures for each expenditure category will be split into expenditures made in SE, SC, and rest of Alaska, respectively. Next, each expenditure category will be mapped to IMPLAN sectors. Then, using input-output (IO) or social accounting matrix (SAM) models, the economic impacts from non-resident anglers' expenditures will be estimated for the SE and SC regions for 2006.

[4] A recent American Sportfishing Association publication estimates that saltwater sport fishing accounted for \$164.4 million of retail sales and 2,610 jobs in the state (Southwick Associates, 2007). Southwick Associates is updating these estimates for Alaska using data from a survey they conducted that collects angler expenditure data (www.sf.adfg.state.ak.us/Statewide/economics/2007Study.cfm).

Furthermore, estimates of the recreation demand for Alaska saltwater sportfishing will be calculated and be combined with the IO or SAM model to examine how sensitive the regional economic impacts will be to changes in trip attributes that are caused by changes in fishery management policies, changes in recreation quality, or changes in trip costs. The results of this project will be summarized in a paper which will be submitted to a journal.

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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, and survey materials continue to be developed. 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 have been conducted over the last couple 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. The first phase survey instrument has been programmed into the Internet-based format and is undergoing peer review at present. Following the review, a post-review version will be tested in a small on-line implementation, with full implementation expected to follow in 2009.

Models of Fishermen Behavior, Management and Economic Performance

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

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Salmon bycatch in the United States Bering Sea pollock fishery has reached record levels in recent years and the North Pacific Fisheries Management Council (NPFMC) has recently considered implementing time-area closures that would attempt to reduce salmon bycatch. To assist in this process, Alan Haynie has written 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 this summer and final results are being prepared for publication.

A Tradable Salmon Bycatch Quota System for the Pollock Fishery?

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The Bering Sea pollock fishery has experienced significant benefits from economic rationalization brought about by the 1998 American Fisheries Act. The "race for fish" was ended in the fishery, product recovery rates increased markedly, and inter-cooperative agreements (ICA) allow the participants in the fishery to jointly address problems through civil contracts. These ICA have facilitated, among other things, the development of real-time information sharing on bycatch and voluntary rolling hotspots

(VRHS). These hotspots close areas of the Bering Sea for periods of time after observations of spatially aggregated high-bycatch areas.

Despite aggressive action by industry to close areas in which Chinook and 'other salmon' bycatch was high, the fishery experienced record levels of Chinook bycatch in 2007. In 2008 the North Pacific Fisheries Management Council (NPFMC) evaluated a large suite of potential policies including both new spatial closures and the imposition of a hard-cap on the amount of salmon that can be caught in the pollock fishery before the fishery is closed.

Creating a hard cap would by design limit the total quantity of salmon caught in the pollock fishery, but without allowing for individual or cooperative-level allocations of salmon, a hard cap could restart the race for fish in the pollock fishery. If participants in the pollock fishery expect the fishery to close early due to the fleet reaching the salmon hard-cap, cooperatives will speed up fishing to ensure that their pollock quota can be fished before it is lost to the hard cap.

Fortunately, tradable salmon bycatch quotas or other individual bycatch accountability (IBA) mechanisms can help to efficiently ensure that the benefits of rationalization continue to be experienced by the pollock fishery. A tradable salmon quota requires that vessels hold salmon quota in order to fish for pollock. Tradable quotas do not cause a race for fish because vessels or cooperatives are able to fish their entire pollock quota as long as they possess or can purchase bycatch quota.

Under the current system or under a hard-cap system without tradable bycatch quota, bycatch is a classic environmental externality – the vessel choosing whether or not to fish in a high- or low-bycatch area does not pay the cost of catching salmon bycatch or appropriate the benefits of reducing bycatch. However, the cost of the salmon bycatch affects the fleet as a whole (and other users of salmon). A tradable bycatch quota system makes vessels pay a direct cost for salmon bycatch and would thus provide efficient incentives for vessels to decide whether or not to take action to avoid bycatch – or to instead expend bycatch quota to avoid the costs of traveling to cleaner areas. A quota system is a market-based regulation rather than a "command and control" system. Rather than putting the decision about what area to control in the hands of a regulator, the decision to avoid bycatch is put in the hands of every individual making the tradeoff of fishing benefits and bycatch costs. As a result, vessels can choose whatever means of bycatch reduction that they see fit – be it avoiding hotspots, fishing more intensively in different times of the year, or using salmon excluders or other alternative fishing technologies that might reduce bycatch.

In June 2008, the NPFMC selected a preliminary preferred alternative that would include a tradable bycatch system under a hard cap. Final action is expected in coming meetings but implementation is not expected to occur before 2011. Before implementation, AFSC, NMFS Alaska Region and NPFMC researchers will continue to work to design and evaluate the new salmon bycatch management system.

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.

Evaluating the Cost and Effectiveness of Fixed and Rolling Bycatch Closures in the Bering Sea

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Bycatch is repeatedly noted as a primary problem of 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 have risen substantially since the beginning of the decade and significant areas of the pollock fishery have been closed at some points between 2002 and 2006. These closures have consisted of both large long-term Salmon Savings Area closures and short-term voluntary rolling hotspot (VRHS) closures. In this paper, we consider the costs and benefits of spatial closures designed to reduce salmon bycatch in the Bering Sea pollock fishery. Specifically, we estimate the costs of both fixed and VRHS closures and estimate the change in bycatch that has resulted from VRHS closures from 2002-2006.

Modeling Spatial Location Choice with a Generalized Extreme Value Model

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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 apply the model to fisher location choice in the Alaska Bering Sea pollock fishery.

The Effects of Rationalization on Processor Competition

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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 (e.g. Hotelling (1929), Salop (1979), and Gabszewicz and Thisse (1979)) and empirical (e.g. Davis (1997), Pinske, Slade, and Brett (2002) and McMillen, Singell, and Waddell (2007)) perspectives for a variety of industries, the issue has remained largely untouched with respect to the fish processing industry.

There are two central questions that will be examined with this research. One, we want to determine how spatial competition of processors, in terms of timing and intensity of price responses, has changed as a result of rationalization. Two, we want to determine how distance costs of fishers, and thus spatial effort and port delivery decisions, has changed as a result of rationalization. To achieve these research objectives a three-step approach will be employed. First, we will develop a theoretical model of spatial competition for a fish processing sector and, through the use of simulation analysis, examine how rationalization is expected to impact the competitive behavior of processors under different assumed market and cost structures. Second, using the results of the theoretical model for guidance, we will econometrically examine how rationalization has impacted competition in processing sectors for fisheries that have changed management from regulated open-access to individual fishing quota (IFQ) management. The likely candidates for fisheries to use in this empirical section are the Alaska sablefish fishery and the Alaska halibut fishery, and potentially the Bering Sea and Aleutian Islands crab fisheries. These fisheries seem well suited for this analysis because the fish are caught and processed over a large geographic area and key to this study will be examining the spatial distribution of fishers' effort and the spatial distribution of the processors themselves. Finally, and related to the second step, we will empirically test how rationalization has changed fishers' distance traveled cost. This is important with respect to competition aspects of the processing sector, because if it is found that the distance cost for fishers has decreased in response to rationalization, then presumably processor competition would increase as processors vie for fishers distributed across a larger geographic area.

Monte Carlo simulations will be conducted to identify pricing paths under different model parameter values. In particular the research will focus on different assumptions about the degree of competition in the processing sector, different time costs for fishers, and different information assumptions of both fishers and processors. Using these simulations we hope to be able to assess how model results are affected by assumed spatial abundance of resources, changes in climate, or area closures. Based on these results we should also be able to form some solid comparative static results which can then be used to form an empirical strategy.

In terms of empirically modeling pricing competition among processors in a spatial sense, it is important to remember that ex-vessel pricing introduces interesting market features that are not encountered in more traditional location models. First, location models are often framed as a competitive monopolist situation with no quantity constraints. Ex-vessel markets are often better characterized as monopsonistic markets and the markets are quantity-constrained by total allowable catch measures (TAC). Second, where more traditional location models consider the situation to be one of optimal location choice by competing monopolists, ex-vessel markets present situations where the competing monopsonists (processors) are stationary while the fishers are mobile. Therefore, one key to understanding competition among processors will be to understand fishing site selection and distance cost estimates. The empirical methodology that will be utilized here will most likely need to be a combination of semiparametric approaches such as those described in Pinkse, Slade, and Brett (2002) and more traditional panel methods as used in McMillen, Singell, and Waddell (2007).

To determine how distance costs for fishers have changed as a result of rationalization, we will use the latest in dynamic random utility modeling. An aim of this research will be to extend this literature by including landing ports into the fishers' decision problem to see if fish location is also affected by price differentials across ports.

Regional Economic Modeling

Estimating Economic Impacts of Alaska Fisheries Using a CGE Model

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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 easily 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 productive capacity of resource-based industries.
This project will build a CGE model of the Alaska economy with explicit recognition of the fishery sectors. The investigators will use IMPLAN and other available data. Once developed, the CGE model will be used to estimate the distribution and magnitude of economic impacts associated with harvesting, processing and support activities related to Alaska fisheries. Implementation will include the following steps:

1. Gather recent annual catch for Alaska fisheries from PacFIN, AKFIN, NORPAC and related data systems.
2. Gather summary data on the residence of owners and crews of vessels operating in Alaska fisheries and labor employed by Alaska seafood processors. 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. Gather information on cost structures and the locus of input purchases by vessels and processors involved in Alaska fisheries. Major sources of data will include review of relevant literature, and interviews with researchers and key industry informants.
4. Generate a Social Accounting Matrix (SAM) of the Alaska economy using IMPLAN, REIS data, and the information gathered in steps 1–3. The SAM will incorporate the latest comprehensive economic data available and will update and build on earlier work by Seung and Waters (2006; see below).
5. Obtain estimates of the values of key parameters and elasticities governing economic relationships in the Alaska economy. These include aggregate industry supply functions, aggregate household demand functions, and aggregate commodity import and export propensities. The focus will be 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. Develop a CGE model of the Alaska economy using data assembled in steps 1–5.
7. Use the CGE model to estimate economic impacts of selected, relevant policy issues affecting commercial fishing and related activities in Alaska.
8. Prepare final report and develop drafts for possible publication.

Currently, steps 1-4 above have been completed; the fishery-related data needed to develop the CGE model are ready. The sub-contractors (Shannon Davis and Dr. Hans Radtke) prepared a draft 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). For step 4, Edward Waters developed an "import-purged" SAM. Based on this SAM, the PIs have developed a supply-driven SAM (SDSAM) model to estimate the impacts of a hypothetical, 10% reduction of pollock TAC, and have finished writing a journal paper (Seung and Waters 2008) based on the results from SDSAM. The remaining steps will be implemented beginning with development of an "import-ridden" SAM, which will be used as database for the Alaska CGE model.

<u>References</u>

Seung, C. and E. 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*, 40:2 335-350.

Seung, C. and E. Waters. 2008. Measuring the Economic Linkage for Alaska Fisheries: A Supply-Driven Social Accounting Matrix (SDSAM) Approach. Manuscript completed.

Examining Dynamic Impacts of Alaska Fisheries within a Time Series Modeling Framework

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Virtually all regional economic impact models developed so far for analysis of U.S. fisheries are static models. For example, frequently used input-output (IO) models, which have been implemented with IMPLAN for calculating regional economic impacts of fisheries, are static models. However, when the regional economic impacts of fishery management actions are calculated using single period, static models the results can be misleading since most of fishery management policies have permanent effects over time as the impacts occur over a number of periods. With static models, it is impossible to address *the timing of the impacts*, which needs to be considered in formulating fishery management policies. In addition, IO models predict always positive (negative) impacts with positive (negative) shocks to seafood industries. Fishery managers may be misled by relying on only one type of model (IO) in understating regional economic aspects of fisheries. An alternative approach that avoids these weaknesses of an IO model is to instead choose among time series models such as the vector autoregression (VAR) model, Bayesian VAR (BVAR) model, or cointegration model. Developing a time series model for Alaska fisheries will be an important milestone in research on estimating the regional dynamic impacts of fisheries. It will contribute to fishery managers' understanding of how the impacts of fishery policies may be distributed across time and better satisfy the requirements of National Standard 8.

A previous study at the AFSC did use a similar time series framework for regional economic analysis of Alaska fisheries (Seung 2008). However, the data available for the study covered a shorter time period (1990-2000), did not perform comprehensive out-of-sample forecasts to validate the model, and the results have yet to be compared with those from economic impacts (multipliers) derived from IMPLAN, indicating the differences between the two alternative models (the IO model and the time series model).

This work is ongoing.

Using borough-level historical monthly NAICS employment data (1991-2005) from the Alaska Department of Labor (ADOL), Chang Seung prepared several different datasets for each of eleven fishery-dependent boroughs or census areas and for each of two fishery-dependent regions (Southwest and Gulf Coast regions). In addition, state-level data from Bureau of Labor Statistics (BLS) was added to the datasets. Professor Ahn, a time series modeler at Washington State University, has conducted preliminary analyses of the borough-level, regional level, and state-level data. The preliminary analyses show that there are not many sectors or industries that exhibit unit root behavior. This led the investigators to analyze the state-level data within a VAR or BVAR framework.

Although a significant amount of time was spent on this modeling project, the PIs have yet to derive any meaningful results. Major findings from this project are the following:

1. The borough level data has a lot of noise attributable to human recording errors and to unexplainable outliers, among others. Furthermore, even after the adjustment to these errors (to the best of our ability), almost all the borough level data did not contain unit roots. This made it inappropriate to apply cointegration analysis for the long-run dynamics.
2. With the regional and state level data, the data quality appeared to be much more uniform (as outliers may have “averaged out”), but as in the borough level data, unit roots were rarely found. Furthermore, in the models considered, the exogeneity of the basic sector variables were not supported in general.
3. As the final model, vector autoregressive model with lags at one and twelve was considered for the state level data. The state level data with seventeen variables was considered. But because of large prediction errors in some of the variables for natural resource industries, the variables for the natural resource industries were aggregated into one variable and the resulting fifteen variables were used for model fitting. As the model diagnostics were satisfactory, this model was used for the cross-validation of prediction performances. For the hold-out sample for 2006, the mean absolute percentage error (MAPE) ranged approximately from 0.5% to 7.5%. Using the same model, the impulse responses were calculated. It turned out that the impulse responses to the own shock converged to zero fast, and thus the effect is transitory. However, the impulse responses of some of the variables to other variables do not converge, and even diverge, and thus the effect are permanent. This phenomenon needs further investigation for the economic explanation and for the economic validity of the model. Similar results were obtained with the regional level data. It was concluded that other modeling approach such as a Bayesian Vector Autoregressive (BVAR) model is the only option left, and is worth investigating. Chang Seung has since attempted to develop a BVAR model which incorporates Bayesian information (i.e., relationships between industries obtained from IMPLAN data) in the estimation of the model to see if the forecasting performance improves, and generated some preliminary results. Based on these results, he has been drafting a working paper.

<u>Reference</u>

Seung, Chang. “Estimating Dynamic Impacts of Seafood Industry in Alaska.” *Marine Resource Economics*, Vol. 23, No.1, pp. 87-104, 2008

Socioeconomic, Cultural and Community Analyses

An Analysis of Place, History, and Globalization in Unalaska/Dutch Harbor

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Dr. Jennifer Sepez and her colleagues published an article in the journal *Polar Geography,* entitled "Unalaska, Alaska: Memory and Denial in the Globalization of the Aleutian Landscape." The article explores the history and globalization manifested in the landscape of Unalaska/Dutch Harbor. The article grew from fieldwork conducted in Unalaska in 2002 by Dr. Sepez and a presentation at a session on Reading History in the Landscape at the American Anthropological Association meetings. The article included contributions, also based on fieldwork in the Aleutians, from co-authors Christina Package (Oregon State University – formerly with AFSC), Patrica Malcolm (Western Washington University), and Amanda Poole (University of Washington – formerly AFSC).

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. In the article, the history of the area is characterized by successive waves of occupation and resource extraction by the geopolitical powers of Asia and North America, which began with Russian colonization. Of particular focus is the legacy of World War II, characterized as an array of both presences and absences. Obvious to most all who visit the Aleutians is the presence of World War II debris that still echoes of Japanese attacks in 1942. Less obvious are the absences of Aleut villages and the community social structures that bound them together. The article compiles information on the ten Aleut villages that were forcibly evacuated by the United States, resulting in years of brutal internment of the entire indigenous Aleut population. Only six of these villages (four in the Aleutians and two in the Pribilofs) were permitted resettlement after the war. Since that time, the 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 capital investment by Japanese companies. The article includes a description of the current fishing industry based in Dutch Harbor, including its global markets and labor force. Applying post-colonial theory to Unalaska's history suggests that historical power asserted by conquest and territorial acquisition has been succeeded by the dynamics of economic globalization in this American periphery. Residents draw on the legacy of history and globalization to shape and contest identity and power in the modern landscape.

References

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

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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 two papers 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 (in progress 2008) will compile and analyze population structure information including age, gender, and ethnicity/race, and examine 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). Phase 2 will include a typology of BSAI communities that reflects recent demographic trends, comparative analysis of demographic trends and fisheries trends over the period 1990-2007, and a regression analysis of 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.

Community Profiles Published for Washington, Oregon, and Other U.S. States Showing Involvement in West Coast and North Pacific Fisheries

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A Technical Memorandum profiling communities involved in West Coast and North Pacific Fisheries was published recently by the Northwest Fisheries Science Center (Technical Memorandum NMFS-NWFSC-85). The result of a joint project between NWFSC, AFSC, and SWFSC, the document profiles 125 fishing communities in Washington, Oregon, California, and two other U.S. states with basic social and economic characteristics and a compilation of information regarding participation in fisheries along the West Coast and in the North Pacific. The publication is a companion volume to the Alaska profiles, which used the same basic format to profile communities in Alaska and their participation in North Pacific fisheries.

The profiles are provided in a narrative format with four sections: 1) People and Place, 2) Infrastructure, 3) Involvement in West Coast Fisheries, and 4) 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 and waste water, solid waste, electricity, schools, police, public accommodations, and ports). "Involvement in West Coast Fisheries" and "Involvement in North Pacific Fisheries" detail community activities in commercial (processing, permit holdings, and aid receipts), recreational, and subsistence fishing.

The community selection process assessed involvement in commercial fisheries using quantitative data from the year 2000, in order to coordinate with 2000 U.S. Census data. Census place-level geographies were used where possible to define communities, yielding 125 individual profiles. Quantitative indicators measured fisheries involvement in communities with commercial fisheries landings (weight and value of landings, number of unique vessels delivering fish to a community) and the number of documented participants in the fisheries (state and federal permit holders and vessel owners) residing in a community. These indicators were assessed in two ways, as a ratio to the community's population and as a ratio of involvement within a particular fishery. A data envelopment analysis model enabled a multivariate analysis to rank communities in terms of participation in commercial fisheries. 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 model is described in more detail in the AFSC Quarterly Report for July-August-September 2007 (see url:
http://www.afsc.noaa.gov/Quarterly/jas2007/divrptsREFM5.htm#model)

The communities selected and profiled are as follows:

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 Island, 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.

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.

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.

Other U.S. States
Pleasantville, New Jersey, and Seaford, Virginia (both of which have concentrations of ownership engagement in North Pacific scallop fisheries).

The Community Profiles for West Coast and North Pacific Fisheries, including Washington, Oregon and

Other U.S. States can be downloaded at http://www.nwfsc.noaa.gov/publications/displayinclude.cfm?incfile=technicalmemorandum2007.inc (see NMFS-NWFSC-85). The Community Profiles for North Pacific Fisheries, for Alaska, can be downloaded at http://www.afsc.noaa.gov/Publications/techmemos.htm (see NMFS-AFSC-160).

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 the ecosystem-based management, and have discussed how to implement the 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. (2008), 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 not integrated with non-socioeconomic indicators, and therefore were not as useful as desired. Therefore, in the present project, the socioeconomic indicators will be synthesized with non-socioeconomic indicators in order to facilitate a more holistic assessment of fisheries. Specifically, the principal investigators (PIs) will define and discuss some concepts that are required to measure the socioeconomic status of fisheries, including concepts such as attributes, indicators, reference points, and risk indices. Second, Eastern Bering Sea Bottom Trawl Fishery data will be used as an example to develop the socioeconomic indicators, objective risk index (ORI), species risk index (SRI), and fishery risk index (FRI). Third, the PIs will discuss limitations and future directions for developing and refining the socioeconomic indicators. Fourth, an ecosystem risk index (ERI) will be developed to assess the ecosystem status at the management level. Finally, a management status index (MSI) will be developed to evaluate the level of management improvement in species, fisheries, or ecosystems among different time periods or different areas. 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. Presently, the PIs are drafting a working paper (Seung and Zhang 2008).

Reference

Chang Ik Zhang, Suam Kim, Donald Gunderson, Richard Marasco, Jae Bong Lee, Hee Won Park, and Jong Hee Lee. 2008. "An Ecosystem-based Fisheries Assessment Approach for Korean Fisheries." *Fisheries Research*. In Press.

Seung, Chang and Chang-Ik Zhang. 2008. "Developing Socioeconomic Indicators for the Eastern Bering Sea Bottom Trawl Fishery." Working Paper.

Ramadan, Sticky Rice, and Tortillas in the Sub-Arctic: Culture and the Globalized Labor Force in the Alaska Seafood Processing Industry through the Lens of the Company Cafeteria

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The Alaska seafood processing industry draws a labor force from around the world although there is little documentation of ethnicity of processing crews. The multicultural character of the processing workforce is reflected in the practices of many company cafeterias that provide food for workers onsite. The goal of most companies is to provide foods that address their workers' cultural and identity needs as well as nourish their bodies. Anthropology has shown food and eating practices to be powerfully connected to identity and culture (Mintz and Du Bois 2002, Phillips 2006). The ability of companies in the far north to accommodate the food needs of a multicultural workforce is a point of pride for some places — an aspect of transnational migratory labor that companies seem willing to discuss. From content (e.g., rice and tortillas at every meal) to timing (e.g., special non-daylight meal times during Ramadan), seafood processing companies are finding ways to make their workers feel at home in the sub-Arctic.

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 equal to 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, North America (Mexico and 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. 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 (Levitt and Jaworsky 2007; Sepez et al. 2007:203-4), the internal peripheries of post-industrial nation-states (Vacarro 2006), culture and globalization (Tomlinson 1999; Phillips 2006) and the anthropology of food and identity (Mintz and Du Bois 2002).

This research is set to begin in January 2009. Interviews with processing company management and ethnographic work in communities where seafood processing companies provide food and housing to workers will form the methodological backbone of this project. Emphasis will be on remote communities with shore-based processors where large numbers of processing workers depend entirely or almost entirely on company cafeteria food. To the extent feasible, at-sea processing companies 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.

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

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.

Carothers, C. and **Sepez, J**. “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.

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.

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. 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.

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. 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.

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., 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* 28(1).

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 a 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.

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.

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. 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.

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.

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.

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.

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.

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.

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. "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.

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.

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.

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.

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, Chefornak 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. 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.

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.

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. 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.

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 extirpation. 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.

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. 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.

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., 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.

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, addresses 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.

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.

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 cannot 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.

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.

Vaccaro, I., L. Zanotti, and J. **Sepez**. 2008. Commons and Markets: Opportunities for Development of Local Sustainability. 30pp. In press at *Environmental Politics*.

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.

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: Tucson, 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 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.

<u>Working or Submitted Papers:</u>

Ahn, Sung and **C. Seung**. 2008. "Using Bayesian Vector Autoregression to Identify Inter-industry Relationships for Alaska Fisheries." Working paper.

Virtually all regional economic impact models developed so far for analysis of U.S. fisheries are static models. For example, frequently used input-output (IO) models, which have been implemented with IMPLAN for calculating regional economic impacts of fisheries, are static models. However, when the regional economic impacts of fishery management actions are calculated using single period, static models the results can be misleading since most of fishery management policies have permanent effects over time as the impacts occur over a number of periods. With static models, it is impossible to address *the timing of the impacts*, which needs to be considered in formulating fishery management policies. In addition, IO models predict always positive (negative) impacts with positive (negative) shocks to seafood industries. Fishery managers may be misled by relying on only one type of model (IO) in understating regional economic aspects of fisheries. An alternative approach that avoids these weaknesses of an IO model is to instead choose among time series models such as the vector autoregression (VAR) model, Bayesian VAR (BVAR) model, or cointegration model. Developing a time series model for Alaska fisheries will be an important milestone in research on estimating the regional dynamic impacts of fisheries. It will contribute to fishery managers' understanding of how the impacts of fishery policies may be distributed across time and better satisfy the requirements of National Standard 8.

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." Revised and submitted to *Ocean and Coastal Management*.

Individual fishing quota programs, like other dedicated access privilege programs, are often criticized for their distributional consequences. In the Gulf of Alaska halibut fishery, many regulatory precautions were taken to preserve the character of the fishery. However, there is concern that fishing quota holdings are being reduced in small, remote Alaska fishing communities (SRFCs). Jennifer Sepez and Dan Lew have been working with University of Washington Ph.D. student Courtney Carothers to analyze quota share transactions from 1994 to 1999 to assess whether halibut fishing quota holdings are migrating away from SRFCs.

In this study, a community is a SRFC if it meets criteria based on population size, proximity to the coast, historical participation in Alaska fisheries, and designation as a rural area, which is a proxy for remoteness. Several size-based SRFC definitions are developed to account for sensitivity to population size threshold assumptions. The data show that quota share did leave the smallest SRFC communities over the five-year period, as evidenced by the net quota share change in these communities during that time. In more populated SRFC communities, the trend is generally reversed; that is, more quota share entered these communities than left. These results suggest the size of a SRFC community may influence whether its residents will sell or buy halibut IFQ and hence whether we see quota share leaving or entering the community in aggregate.

To more formally investigate the role of SRFC residency in decisions to buy or sell halibut quota share, the probability that an individual is a buyer or seller is modeled as a function of characteristics of the individual and analyzed using logit techniques. In this way, the influence of individual characteristics, such as age and the community's population, on buying and selling behavior can be separated from effects due to residency specifically in SRFCs. The logit results indicate that the marginal effect due to SRFC residency influences the decision to buy or sell more than one's age (other individual and transaction-specific effects were precluded from the model due to data limitations). The size of SRFC communities matters as well. Additional analysis is planned to explore the extent to which specific characteristics of communities contribute to buying and selling behavior more generally and to investigate the reasons underlying the observed buying and selling trends in SRFCs.

Dalton, M. 2007. "Simulated Maximum Likelihood Estimation and Analysis of Covariance in a Panel Tobit Model of California's Groundfish Trawl Fishery, 1981-2001." Working paper to be submitted to *Journal of Applied Econometrics* or *North American Journal of Fisheries Management*. [Possible revision to include analysis of AK processors].

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. The model includes autocorrelation. A simulated maximum likelihood approach is used to compute parameter estimates and conduct hypothesis tests, including an analysis of covariance to detect sources of individual heterogeneity. The model is used with ten panels of data, representing fleets from ports in California's groundfish trawl fishery. Results show that ex-vessel prices are the most important explanatory variable in the model, and affect the spatial distribution of fishing effort. Regulatory variables, in the form of limits on landings for some species, are also important in most cases, and these reveal both spatial and temporal effects of past regulations. Dynamic factors such as autocorrelation, or effects of past fishing effort in a particular area on current effort, are also significant at several ports, but spatial interactions in effort are important in only two cases. Results from the analysis of covariance show that using pooled time series data to analyze effects of spatial management is acceptable practice in some cases.

Dalton, M. 2007. "Monte Carlo Simulations of Linear Rational Expectations Models with Static and Stock Externalities and Dynamically Interrelated Variables." Working paper to be submitted to *Journal of Economic Dynamics and Control*. [Revision will use new extended version of the model].

Information about future conditions can influence economic behavior. Lucas (1976) showed that a fundamental conflict exists in models used for policy analysis that do not explicitly consider the microeconomic aspects of how decisions are made when information about future conditions is available. He contended that a major revision of prevailing econometric practice was needed to resolve this conflict with microeconomic theory. Lucas' critique gave way to a new class of econometric models, based on a hypothesis of rational expectations. Typically, externalities associated with common property resources justify limited entry or other regulations, and thus, are a fundamental component of resource management, but effects of these externalities with rational expectations are complicated. Therefore, the level of technical sophistication required to estimate and test rational expectations models has probably been an impediment to their use in natural resource management. This paper presents a linear model of resource use, under rational expectations, with multiple dynamic variables, and considers two types of externalities among resource users. Simulated data from the model are used to compute maximum likelihood estimates, and for conducting tests of rational expectations and other hypotheses. The model in this paper is based on solving the dynamic optimization problem of a single firm that operates in an industry with many identical firms, and quadratic adjustment costs. To enhance the interpretation of renewable resources, the model in this paper includes a static congestion externality among labor variables, and a dynamic externality that operates through productivity of the resource stocks. Because of these externalities, symmetric industry equilibrium with optimizing behavior by individual firms is generally not efficient. The first goal of the paper is to evaluate maximum likelihood estimates and Sargent's (1978) test of rational expectations in the model without dynamically interrelated variables. Performance of the maximum likelihood estimates is evaluated by comparing point estimates from the maximum likelihood procedure with successively longer time series in Monte Carlo simulations. Estimation results from the Monte Carlo simulations show the limits appear to be unbiased in most cases. Exceptions are limited to a set of parameters that form a nonlinear relationship across equations, which are identified only if each takes a nonzero value. The relationship among these parameters is the most complex in the model, and involves a three-way interaction among exogenous variables, capital, and labor: i) effects of exogenous variables on capital stocks, ii) effects of labor on capital stocks, and iii) direct and indirect influence of these effects on productivity and labor through stock externalities. These interactions highlight the subtle nature of some relationships implied by rational expectations, and demonstrate why a careful numerical approach is needed. However, the stock and congestion externalities are specialized features of the model in this paper, and point estimates for other parameters typically found in linear rational expectations models are accurate to within 10% after one hundred time periods, and some after twenty. The second goal of the paper is to evaluate maximum likelihood estimates and significance tests for dynamically interrelated variables. These results are based on a restricted version of the model, with only parameters related to dynamic adjustment costs allowed to vary, because severe convergence problems were encountered in less restricted versions of the model with dynamically interrelated variables.

Dalton, M. 2008. “Spatial Rational Expectations and Renewable Resources.” To be submitted to *Econometrica*.

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.

Dalton, M., L. Jiang, S. Pachauri, and B.C. O’Neill. 2007. “Demographic Change and Future Carbon Emissions in China and India.” International Institute for Applied Systems Analysis Interim Report. In revision: formerly listed as completed in 2007 but data problems for India were discovered in fall 2007.

This paper investigates whether projected changes in the demographic characteristics of Chinese and Indian households over the next century could have a substantial influence on consumption, economic growth, energy demand, and carbon dioxide emissions. We use new household projections for China and India that model changes in population size, urbanization, and the size and age structure of households over the next 100 years. The initial economic characteristics of different household types, including demand for consumer goods, supplies of labor, and capital, are estimated from household surveys and production data for each country. A global energy-economic growth model simulates economic growth as well as changes in consumption of various goods, direct and indirect energy demand, and carbon emissions over time. Effects of demographic change are compared under different scenarios that include technical change. Results show that explicit consideration of urbanization leads to a substantial increase in projected emissions, while aging leads to a decrease. The net effect of demographic change is to increase projected emissions from China by 45% by the end of the century, and from India, by 25-55%.

Dalton, M. C. Pomeroy, M. Galligan. 2006. Measuring Impacts on Fishing Communities: A Framework for Integrated Socioeconomic Assessment. NOAA working paper.

An impact assessment with scientific review is typically required before U.S. fishery managers are able to implement new programs or regulations. These assessments may be the primary, or even sole, source of information that managers have about the economic effects of a proposed policy, and thus, are an important part of any policy-making process in which economic tradeoffs are a consideration. Ideally, accurate data and an economic model would be available to analyze tradeoffs among policy alternatives, but in practice, the models usually are not. Instead, fishery analysts often use a simplified approach based on total requirements, or other, multipliers derived from a system of regional economic accounts. Under rigid assumptions, the use of multipliers to analyze economic tradeoffs may be justified, but even so, the multipliers are valid only if the underlying data from the regional accounts are consistent with producers' current expenditures. This paper investigates whether data derived from the regional accounts for a particular county, which has two major ports, diverse fisheries, and a sufficiently large number of fish processors, are realistic, and if not, show how these data can be improved. This paper describes a methodology for two tests that are applicable to commercial fishing industries represented in IMPLAN data for coastal counties with at least one fishing port in Alaska, or along the West Coast of the United States. The first test uses data for ex-vessel revenues and processors' fish purchases that are readily available for each West Coast port from the Pacific Coast Fisheries Information Network (PacFIN) and for each Alaskan port from the AKFIN database. Data for the second test involve expenditure levels on inputs for fishing operations and processors, which are harder to acquire, and must be collected in the field from fishery participants. For the second test, we developed a set of research protocols, and conducted two waves of interviews and surveys in Monterey County, California. Results of both tests imply increases in total requirements multipliers computed from the adjusted SAMs. Total requirements multipliers for raw and processed fish did not change much with the adjustments to ex-vessel revenues and processors' fish purchases, but the cross-multipliers for processed fish in the raw fish industry increase drastically in the 2003 SAM. The reason is that purchases of raw fish at Monterey ports by fish processors located in Monterey County from PacFIN data are about 40 times larger than the corresponding IMPLAN value. Results of the second test include both adjustments to PacFIN, and expenditure shares for raw fish and processed fish that are sample means from the surveys. In this case, the multiplier for raw fish increases modestly, by 10% or 20%, and the multiplier for processed fish decreases, by 100% in 1998, but only 5% in 2003. The cross-multipliers increase dramatically after adjusting to the survey data.

Fell, H. and **A. Haynie**. 2007. "Estimating Time-varying Bargaining Power with Nonlinear Kalman Filters: An Application to the Alaskan Sablefish Fishery." Revising for re-submission to *Economic Inquiry.*

There is a large body of literature outlining the efficiency gains possible by managing common property resources, such as fisheries, under an individual property rights system. Despite these numerous studies, many fisheries in the world do not use rights-based management systems. One of the major obstacles to the further adoption of individual fishing quota (IFQ) management systems is the concern that by giving quota to only fishers there will be a severe rent distribution distortion between relevant processors and fishers. To analyze this rent distribution issue, we propose an unobserved components inspired estimation approach to estimate time-varying bargaining power in a bilateral bargaining framework. We apply the technique to a specific fishery, the Alaska sablefish fishery, which has undergone a change in management from a regulated open-access system to an IFQ management system over the time span analyzed. We find that, after the implementation of IFQ management, fishers do improve their bargaining power and thus accrue more of the rents generated by the fishery. However, unlike previous studies, we find that the fishers do not move to a point of complete rent extraction, but rather the fishers and processors appear to be in a near symmetric bargaining situation after IFQ management is imposed. The method introduced provides an important tool that has the potential to resolve uncertainty about the adoption of rights-based management and also allow empirical estimation of bilateral bargaining power in a variety of market settings.

Felthoven, R., B. Garber-Yonts and J. Sepez. 2008. “Socioeconomic Data Needs for Policy Analysis in Fisheries in and off Alaska.” To be submitted to the *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. In this paper 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.

Felthoven, R., W. Horrace, and K. Schnier. 2008. "Estimating Heterogeneous Capacity and Capacity Utilization in a Multi-Species Fishery." Revised and resubmitted to the *Journal of Productivity Analysis.*

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. Furthermore, we propose a new fleet capacity estimate that incorporates complete information on the stochastic differences between each vessel-specific technical efficiency distribution. Results indicate that ignoring heterogeneity in production technologies within a multi-species fishery, as well as the complete distribution of a vessel's technical efficiency score, may yield erroneous fleet-wide production profiles and estimates of capacity.

Haynie, A. 2008. "Estimating the Value of a Fishing Right: An Analysis of Changing Usage and Value in the Western Alaska Community Development Quota (CDQ) Program." NOAA Working Paper.

An important element of groundfish 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 pollock fishery is the largest of these fisheries, for which the 10 percent of total allowable catch is set aside as CDQs. 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 rationalized the pollock fishery. We also provide a brief overview of the CDQ program and discuss how CDQ royalties have grown 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.

Haynie, A. 2008. "A Method for the Design of Fixed Time-Area Closures to Reduce Salmon Bycatch." NOAA Working Paper.

Salmon bycatch in the United States Bering Sea pollock fishery has reached record levels in recent years and the North Pacific Fisheries Management Council (NPFMC) has recently considered implementing time-area closures that would attempt to reduce salmon bycatch. This paper offers a discussion of important issues for consideration in marine closure design and develops and implements a methodology to identify potential candidate closures. 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. Temporally, we consider closures lasting 2-8 weeks and spatially from 1-10 ADF&G statistical areas. 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.

Haynie, A., R. Hicks, and K. Schnier. 2007. "Bycatch Avoidance via Information Sharing." Submitted to the *Journal of Economic Behavior and Organization*.

A substantial theoretical and experimental literature has focused on the conditions under which cooperative behavior among actors providing public goods or extracting common-property natural resources is likely to occur. The literature identifies the importance of coercion, small groups of actors, or the existence of social norms as being conducive to cooperation. In this paper we investigate a natural experiment in which information on extractive activities with respect to a common property resource is relayed to all players. These players operate under an overall harvest total allowable catch (TAC), and consequently, one player's actions can have a deleterious effect on all players. The case we investigate is incidental catch (termed bycatch) of halibut by the Alaskan flatfish fishery, where participants voluntarily report bycatch information to an agent who then distributes data to the fleet. Consequently, fishermen know the extent to which other fishermen are avoiding bycatch, and are thereby able to observe efforts by other fishermen to avoid bycatch and to extend the fishing season for marketable fish species. Using a mixed logit model of spatial fishing behavior our results show that cooperative behavior is prevalent early in the season, but significant heterogeneity with respect to bycatch avoidance arises as bycatch TACs tighten.

Haynie, A. and D. Layton. 2007. "A Discrete Choice Expected Profit Model for Analyzing Spatial Fishing Behavior." Revising for re-submission to the *Journal of Environmental Economics and Management.*

Marine protected areas have expanded rapidly across the globe over the last decade as a means to preserve marine habitat. In these areas, commercial fishing is banned or heavily restricted which creates costs due to the need to travel to and fish in other less desirable areas. We develop a new discrete/continuous model for analyzing spatial location choice which can be used to monetize location choices and to predict the costs of creating protected areas. Utilizing this model with a frequentist model averaging approach, we estimate costs of the Steller sea lion conservation area in the Bering Sea.

Haynie, A. and P.J. Sullivan. 2008. "Predicting Fishing with Vessel Monitoring System (VMS) Data." Working paper.

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 VMS. The system sends each vessel's location, heading, and speed to NMFS every 20-

30 minutes while the transmitter is operating.

Though the VMS tells NMFS the location of each participating vessel, it does not directly determine whether the vessel is fishing or not. However, when a vessel is fishing, its course and speed are generally different than when the vessel is simply transiting an area. These differences produce a “signature” that indicates fishing is taking place. The nature of a given vessel’s signature depends on many factors, including the gear type being used (trawl, hook-and-line, or pot), the type of vessel deploying the gear, and the length of time the vessel spends fishing.

The primary purpose of this research is to determine the extent to which the signatures can be used to accurately predict whether fishing is occurring or not. In previous work by Pat Sullivan for the NMFS Alaska Region, a number of techniques were explored to predict fishing for a select number of vessels. This current project builds upon that exploratory work and develops an operational algorithm. To the extent that a given signature can accurately predict whether fishing is taking place, NMFS will use the signatures to develop computer algorithms that will automatically predict whether a given vessel is or was engaged in fishing operations. The predictive power of the developed algorithms can be expressed as a percentage of predicted fishing events that correspond to actual fishing events. Functions of lagged speed and bearing have been developed which predict spatial effort with relatively low error.

Lew, D.K. and D.M. Larson. 2007. "Valuing a Beach Day with a Repeated Nested Logit Model of Participation, Site Choice, and Stochastic Time Value." Submitted to *Marine Resource Economics.*

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 $26 per day.

Lew, D.K., D.F. Layton, and R.D. Rowe. 2007. "Efficiency and Robustness of Experimental Designs for Economic Valuation Choice Experiments." Working paper.

Stated preference choice experiments, which involve respondents choosing between alternatives that differ in attributes, increasingly have been used in recent years to gain insights into preferences and values for non-market goods, including recreational fisheries and other recreational resources. In constructing choice experiment questions, researchers must determine the set of attributes and attribute levels that respondents see in each question. These experimental designs are commonly based on efficiency criteria, but assume a specific utility specification. As a result, these designs are not necessarily efficient with respect to the true utility specification, which is never known with certainty. In this paper, we investigate the extent to which various efficiency-based experimental designs perform with respect to estimating several true utility models and associated willingness to pay in two Monte Carlo experiments. The experimental designs differ in the assumed underlying true model values used in their construction, and in whether or not model or parameter uncertainty was explicitly accounted for in design construction. The Monte Carlo results suggest that efficiency-based designs are fairly robust to utility misspecification, suggesting that more complicated designs that incorporate uncertainty may not be needed to estimate models and willingness to pay efficiently.

Morrison Paul, C., Marcelo Torres, and **R. Felthoven**. 2008. "Fishing Revenue, Productivity and Product Choice in the Alaskan Pollock Fishery." Submitted to *Environmental and Resource Economics.*

Performance measurement is important in evaluating the impacts of fishery management, yet little attention has been paid to this area in the fishery economics literature. The few existing studies focus on fish harvesting and technical efficiency, capacity utilization or quotas. Another important aspect of fishery performance, however, pertains to the revenue generated through 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, recognizing potential endogeneity and a variety of fishing inputs and conditions, to evaluate the factors underlying fishing revenues in the Alaskan pollock fishery. We find significant own-price supply responses and product substitutability, and enhanced revenues from the increased days fished and number and duration of tows induced by regulatory change. We also find significant growth in economic productivity – higher revenues over time after controlling for observed productive factors and price changes, which exceeds that attributable to increased harvests.

Morrison Paul, C., **R. Felthoven** and M. Torres. 2008. "Economic Performance in Fisheries: Modeling, Measurement and Management." Working paper.

In this paper we will discuss issues associated with modeling and measuring fisheries' economic performance to provide policy-relevant guidance for fishery managers and analysts. In particular, we discuss the state of the literature on the representation and estimation of production structure models to construct economic performance measures, promising directions for future research in this area, and the management implications of measures reported in the literature for a particular fishery that we have analyzed in some depth (the catcher-processor sector of the Alaska pollock fishery).

Schnier, K., W. Horrace and **R. Felthoven**. 2008. “Occupational Risk and Fisheries Management: Studying Changes in the Deadliest Catch.” Working paper.

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. 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 from data on the Alaskan red king crab fishery.

Sepez, J., H. Lazrus, and **R. Felthoven**. 2008. “Post-Rationalization Restructuring of Commercial Crew Member Opportunities in Bering Sea and Aleutian Island Crab Fisheries.” Working paper.

Rationalization of the Bering Sea crab fishery in 2005 resulted in swift consolidation of the fleet from over 250 vessels to just 89. A large reduction in the ex-vessel prices paid for crab also occurred at this time. Among the most important impacts on communities has been the loss of crew jobs, estimated in a University of Alaska study to be approximately 1350 positions. As the initial effects of the rationalization program begin to stabilize, it is important to understand the actual impacts of this program on crewmembers. Loss of crew jobs was a predicted effect, but the specifics of crew impacts are not understood in great detail. Beginning in the fall of 2007, this project used ethnographic interview techniques to study current and former crewmembers, how they have been affected, and how their jobs have been affected. Field sites have included Akutan, Kodiak, Old Harbor, Seattle, Unalaska/Dutch Harbor, and Astoria, Oregon. Interviews have focused on issues of employment opportunities and job characteristics that may be useful in understanding how crewmembers might be affected in other rationalization initiatives. Decision theory and occupational communities theory provide the preliminary analytical framework for this research.

Sepez, J. and A. Poole. 2007. “Recent and Historic Population Trends in Bering Sea and Aleutian Island Fishing Communities: Hubs and Spokes, Booms and Busts.” Undergoing pre-submission revisions.

This research examines demographic change in Bering Sea and Aleutian Island (BSAI) fishing communities since 1920, in an attempt to begin introducing human population dynamics as an indicator for regional ecosystem analyses. By examining past population trends in relation to fisheries factors, we are laying the groundwork for tying population to ecosystem in a manner that can be used to predict the demographic effects of global climate change in the region. We focus here on human inhabitants of the Bering Sea coast, using total population by community and by Census area as the primary indicator.

The project examined birth rates, migration, indigeneity, boom-bust economic cycles, and seasonality as factors in understanding population trends in the region. Ecosystem factors are a result of changes in fish populations, fisheries management, industry conditions and markets (especially fish prices), and climate characteristics. The methods section gives details on how and why communities were selected for inclusion in the study. The rest of the paper describes and analyzes the causes of demographic trends in BSAI fishing communities since 1920, points to the impacts of recent population decline or growth on local communities, and finally, suggests opportunities for including demographic information in future research.

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