UNITED STATES DEPARTMENT OF COMMERCE
Office of the Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

NOV - 3 1997

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action.

TITLE: Amendment 49 to the Fishery Management Plan for Groundfish of the Gulf of Alaska

LOCATION: Federal Waters of the Gulf of Alaska

SUMMARY: Amendment 49 will establish a regulatory program to require all vessels fishing for groundfish in the Gulf of Alaska to retain all pollock and Pacific cod beginning January 1, 1998, and all shallow water flatfish beginning January 1, 2003. It also will establish a 15-percent minimum utilization standard for all at-sea processors; for pollock and Pacific cod beginning January 1, 1998, and for shallow water rockfish beginning January 1, 2003.

RESPONSIBLE OFFICIAL: Steven Pennoyer
Administrator
Alaska Region
National Marine Fisheries Service
P.O. Box 21668
Juneau, AK 99802
Phone: 907-586-7221

The environmental review process led us to conclude that this action will not have a significant impact on the environment. Therefore, an environmental impact statement was not prepared. A copy of the finding of no significant impact, including the environmental assessment, is enclosed for your information. Also, please send one copy of your comment to me in Room 5805, PSP, U.S. Department of Commerce, Washington, D.C. 20230.

Sincerely,

Susan Fruchter

Acting NEPA Coordinator

Enclosure

ENVIRONMENTAL ASSESSMENT / REGULATORY IMPACT REVIEW/ FINAL REGULATORY FLEXIBILITY ANALYSIS FOR AMENDMENT 49 TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE GULF OF ALASKA TO IMPLEMENT AN IMPROVED RETENTION / IMPROVED UTILIZATION GROUNDFISH MANAGEMENT PROGRAM

Prepared by

National Marine Fisheries Service
Alaska Fisheries Science Center
Alaska Region

October 1997

Table of Contents

1.0 Introduction

The groundfish fisheries in the Exclusive Economic Zone (EEZ) [3 to 200 miles offshore] off Alaska are managed under the Fishery Management Plan for the Groundfish Fisheries of the Gulf of Alaska and the Fishery Management Plan for the Groundfish Fisheries of the Bering Sea and Aleutian Islands Area. Both fishery management plans (FMP) were developed by the North Pacific Fishery Management Council (Council) under the Magnuson Fishery Conservation and Management Act (Magnuson Act). The Gulf of Alaska (GOA) FMP was approved by the Secretary of Commerce and become effective in 1978 and the Bering Sea and Aleutian Islands Area (BSAI) FMP become effective in 1982.

Actions taken to amend FMPs or implement other regulations governing the groundfish fisheries must meet the requirements of Federal laws and regulations. In addition to the Magnuson Act, the most important of these are the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), Executive Order (E.O.) 12866, and the Regulatory Flexibility Act (RFA).

NEPA, E.O.12866 and the RFA require a description of the purpose and need for the proposed action as well as a description of alternative actions which may address the problem. This information is included in this document. The document also contains information on the biological and environmental impacts of the alternatives as required by NEPA, as well as a Regulatory Impact Review (RIR) which addresses the requirements of both E.O. 12866 and the RFA that economic impacts of the alternatives be considered. It also contains the Final Regulatory Flexibility Analysis (FRFA) required by the RFA which specifically addresses the impacts of the proposed action on small entities.

This Environmental Assessment/Regulatory Impact Review/Final Regulatory Flexibility Analysis (EA/RIR/FRFA) examines a series of alternatives for an Improved Retention/Improved Utilization management regime for all GOA groundfish fisheries, managed under that region's FMP.

1.1 Purpose of and Need for the Action

On September 20, 1996, the Council unanimously approved an amendment to the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan implementing an Improved Retention/Improved Utilization (IR/IU) program for the groundfish fisheries of those management areas. The Council further moved to develop a "...substantially equivalent" program for the groundfish fisheries of the Gulf of Alaska management area. Specifically, the Council proposed that commercial groundfish fisheries operating in the GOA be required to reduce discards by retaining (some) groundfish species which have historically been discarded bycatch.

When the Council subsequently met in December 1996, it formally adopted the following Problem Statement for the GOA IR/IU amendment proposal:

> *The objective of the Council in undertaking 'improved retention and improved utilization' regulations for Gulf of Alaska groundfish fisheries centers on the same basic concern that motivated an IR/IU program in the BSAI groundfish fisheries: that is, economic discards of groundfish catch are at unacceptably high levels. An IR/IU program for the GOA would be expected to provide incentives for fishermen to avoid unwanted catch, increase utilization of fish that are taken, and reduce overall discards of whole fish, consistent with current Magnuson-Stevens Act provisions.*

In addition, the Council recognizes the potential risk of preemption of certain existing GOA groundfish fisheries which could occur in response to economic incentives displacing capacity and effort from BSAI IR/IU fisheries. This risk can be minimized if substantially equivalent IR/IU regulations are simultaneously implemented for the GOA.

To this end, as part of the BSAI IR/IU management action, the Council proposed an implementation date of January 1, 1998, with the explicit expectation that the GOA IR/IU program could be developed, evaluated, and (if warranted) adopted by the Council and submitted for Secretarial approval, for implementation on the same, January 1, 1998, date.

1.2 The GOA IR/IU Amendment Proposal

In connection with development of the BSAI IR/IU amendment, the Council appointed an industry working group to examine some of the key implementation issues associated with mandated changes in groundfish catch retention and utilization. Following its final action on the BSAI program in September 1996, the Council reconfigured this IR/IU industry working group to better reflect GOA interests and concerns. The Council asked that the group meet and report back to it with specific recommendations for the GOA-version of IR/IU. On the basis of those recommendations, and following AP and public testimony at its December 1996 meeting, the Council adopted a preliminary Gulf of Alaska IR/IU program for analysis.

The specific details of the GOA IR/IU proposal are substantially equivalent to (i.e., an extension of) the program adopted for the BSAI. This EA/RIR/FRFA builds upon the technical analysis; AP, SSC, and public testimony; and Council debate which produced the BSAI IR/IU amendment. As a result, the GOA proposal, and supporting analysis, focuses on two retention alternatives and two utilization alternative.

The proposed IR/IU action would pertain only to Gulf of Alaska groundfish fisheries. It would, however, extend to all gear-types and require 100% retention of pollock, Pacific cod and the 'shallow water' flatfish complex.

The GOA 'shallow water' flatfish complex is composed of rock sole, yellowfin sole, butter sole, English sole, starry flounder, Petrale sole, sand sole, Alaska plaice, and other flounders. When fully implemented, IR/IU would mandate 100% retention of each of these species, whenever present in any groundfish fishery in the Gulf. Some of these species are currently marketable, while others are not. If bycatch composition is predominantly marketable flatfish species, the impact of 100% retention will be substantially smaller than if it is composed predominantly of unmarketable species.

The 100% retention requirement for pollock and P.cod would be mandated for all operations beginning immediately upon implementation of this FMP amendment (presumably, January 1, 1998). In the case of the 'shallow water' flatfish complex, the proposed GOA IR/IU action would delay implementation of the 100% retention requirement for a period of five years following initial implementation. The specific elements of the Council's GOA IR/IU proposal are described below.

For purposes of the analysis which follows, the improved retention and improved utilization alternatives proposed by the Council will be contrasted with the requisite status quo, or no-action, alternative.[1]

---

[1] A much more extensive suite of IR/IU alternatives and sub-options were examined, in-depth, within the context of the BSAI IR/IU EA/RIR/FRFA. Indeed, over the more than two years during which IR/IU was developed, debated, and ultimately adopted for the BSAI, numerous regulatory and structural alternatives were

1.2.1 Improved Retention Alternative [Preferred Alternative]

The Improved Retention Alternative is an inclusive regulatory approach employing a 'species-based' compliance criterion for GOA groundfish fisheries, and extending IR regulations to all gear-types.[2] GOA IR mandates the retention of 100% of the Alaska pollock, Pacific cod, and 'shallow-water' flatfish complex, whenever present in the catch of any GOA groundfish fishery. For example, if bycatches of pollock, Pacific cod, or shallow water flatfish, were present in the catch of an Atka mackerel target operation, or a sablefish target operation, or an arrowtooth flounder operation (or any other GOA groundfish target fishery), then that operator would be required to retain 100% of that pollock, Pacific cod, and/or 'shallow water' flatfish, once IR/IU was fully implemented.[3]

The Council did, however, explicitly acknowledged the possible differential implications of IR for the specific species of concern. That is, the Council surmised, based upon the BSAI analysis, that requiring immediate 100% retention of pollock and Pacific cod (species which are 'fully subscribed') could potentially have substantially different economic and operational implications for existing GOA groundfish fisheries than would an equivalent requirement to immediately retain 100% of the shallow water flatfish present in the catch. The Council, therefore, proposed a five-year delay (from the time of implementation of the GOA IR/IU program) in implementing the 100% retention requirement for 'shallow water' flatfish. This provision is *substantially equivalent* to the five-year delay in implementation of the 100% retention requirement in the BSAI program for yellowfin and rock sole.

Under the GOA IR Alternative, 100% retention of pollock and Pacific cod would be required of all GOA groundfish fishery participants, beginning in the first year of the IR/IU program. Retention requirements for bycatch of shallow water flatfish would, however, be postponed for five-years, at which time the 100% retention requirement would extend to this species complex, as well.

That is, if the IR/IU program is adopted and implemented in 1998 (as anticipated by the Council), 100% of the pollock and Pacific cod catch, in any and all groundfish fisheries in the GOA will be mandatory. No specific retention requirement would be applied to shallow water flatfish at that time. However, under the five-year delay (assuming 1998 as the starting date), beginning in 2003 and every year thereafter, retention of 100% of the catch of 'shallow water' flatfish in any GOA groundfish fishery would also be required.

---

proposed, examined, and rejected, in favor of the set of alternatives summarized within the current document. For a complete treatment, refer to the BSAI Amendment 49 EA/RIR/FRFA and the supporting administrative record.

[2] An alternative "target-based" retention option was examined in detail within the series of BSAI IR/IU implementation analyses prepared by NMFS and debated by the AP, SSC, and Council. The "target-based" option was ultimately rejected, in favor of the broader "species-based" approach. The interested reader may consult, 1) the analysis prepared by NMFS Alaska Fisheries Science Center and presented to the Council September 11, 1995, entitled: *Increased Retention/Increased Utilization Implementation Issues Associated with the BSAI Mid-water Pollock and BSAI Rock Sole Fisheries*, and/or 2) the transcripts of the September 1995 Advisory Panel and Council debates of IR/IU, for an in-depth discussion of the pros and cons of the "target-based" IR option.

[3] Subject to being in compliance with other applicable regulations, e.g., DFS. See Section 5.0.

1.2.2 Improved Utilization Alternative [Preferred Alternative]

The utilization alternative is intended to define the uses which may be made of retained catches of Alaska pollock, Pacific cod, and (eventually) 'shallow water' flatfish, under IR/IU. As such, it pertains only to the use of these specific groundfish species, allowing all other groundfish species to be used (or discarded) at the discretion of the operator.[4] Under the Council's BSAI IR/IU proposal, a total of three Utilization Options, plus the 'status quo' alternative, were carefully and extensively evaluated. On the basis of that analysis[5], the Council determined that, for the GOA amendment, the utilization option would parallel the preferred option under the IR/IU program approved for the BSAI. That alternative is described below and analyzed in Section 6.0 of this EA/RIR/FRFA.

Under current provisions of the MFCMA, the Secretary does not have the authority to regulate on-shore processing of fish.[6] The Council has, nonetheless, assumed for purposes of this analysis, that GOA IR/IU regulations will extend to the on-shore sector. This assumption has particularly significant implications within the GOA management context for two reasons. First, unlike the BSAI, the groundfish fisheries of the Gulf are dominated by the *on-shore* sector. In the two base years, the split was approximately 75% on-shore, 25% at-sea. The proposed IR/IU program could not achieve its objectives if it was applicable only to roughly one-quarter of the groundfish fishing/processing activity in the region.

Second, the expectation that IR/IU will extend to on-shore processing is important as it pertains to the relationship between the processing plant and the delivering vessel. Specifically, it is necessary that an IR/IU program *require* a processor to accept all pollock, Pacific cod, and 'shallow water' flatfish offered for delivery by vessels operating in IR/IU regulated GOA fisheries. If such a requirement did not exist, rejection of deliveries would effectively place the catcher-boat operator in an untenable position (i.e., unable to deliver and unable to discard catch of IR regulated species). Thus, for any IR/IU management regime to be functionally viable, a *primary* point of delivery must be available to participating catcher vessels.

In all other key respects, the Council's proposed Utilization Alternative for the GOA program exactly parallels that of the BSAI amendment, providing that:

The retained catch of the IR/IU groundfish species of concern may be processed into any product form, regardless of whether or not the resulting product is suitable for direct human consumption. The resulting product form could, therefore, be meal, bait, or any other processed product.

The GOA IU Alternative establishes a minimum 15 percent utilization standard for each species of concern (i.e., pollock and Pacific cod immediately upon implementation; 'shallow water' flatfish beginning five years after implementation) for all groundfish processors.

---

[4] Subject, of course, to compliance with all other legal and regulatory requirements governing retention, discards, and discharges at-sea.

[5] See the Final EA/RIR/FRFA for Amendment 49 to the Bering Sea and Aleutian Island Groundfish Management Plan.

[6] See discussion in section 8.0 Legal Authority

1.3 Defining Groundfish Discards

The discarding of unprocessed groundfish from catcher vessels, processor vessels, or shoreside processing plants occur for principally two reasons. In the first instance, a processor or vessel operator is *permitted* to retain the fish, but voluntarily *chooses* not to, for various reasons. For example, owing to the race-for-fish, the operator may opt to retain only the highest valued fish within his or her catch. Alternatively, physical limitations on the capacity and/or capability of holding and/or processing equipment available at the time of harvest may induce discarding of otherwise wholesome groundfish, in the round. And, on occasion, the demands of the marketplace may result in unprocessed groundfish being discarded. These discards may appropriately be regarded as **economic discards**.

The second general reason for discarding unprocessed groundfish is attributable to regulatory prohibitions on retention. In these circumstances, the processor or vessel operator is not permitted to retain a particular species of fish and, thus, must return it, dead or alive, to the sea. This may occur when, for example, the directed fishery for a groundfish species has closed. If the species is placed on "bycatch-only" status, amounts in excess of a specified ceiling must be discarded. When the TAC for a groundfish species has been reached, all additional catch of that species must be discarded, i.e., the species assumes "prohibited" status. These discards are appropriately termed **regulatory discards**. Most discards of unprocessed groundfish in the GOA groundfish fisheries are likely **economic**, rather than **regulatory**.[7]

1.4 Estimating Catch and Discards

The source of discard estimates employed in this analysis depends on how total catch is estimated for a particular vessel or processor. For catcher/processors and mothership vessels with NMFS-certified observers onboard, the NMFS "blend" database is used to estimate total catch by species.

In the case of at-sea processing operations without a NMFS-certified observer onboard, the agency uses the estimates of discards provided by the processor on the WPR. For unobserved catcher vessels delivering to shoreside processing plants, NMFS applies information about the weight and species composition of discards from observed catcher vessels operating in the same area, using the same gear-type, and participating in the same directed fishery.

For fish landed and then discarded from shoreside processing plants, NMFS uses information supplied by processors on WPRs about the weight and species composition of plant discards, regardless of whether the plant is observed or unobserved.

It is difficult to assess the accuracy of either industry or observer estimates. In the case of at-sea operators, neither source provides direct measurement of discards, and once the discards are made, estimates cannot be verified. On-shore estimates, drawn from WPRs, are no better documented, since they depend solely on the data supplied by the operation, itself, and are filed with NMFS well after the discards have been sorted and disposed of, making physical verification impossible.

---

[7] Another source of discards of whole fish in the GOA groundfish fisheries is associated with "prohibited species catch" (PSC). Composed of salmon, halibut, herring, and crabs, these discards are a special case of the "regulatory discard" category. PSC discards are not treated in the present analysis because the IR/IU proposal does not directly alter the regulatory status of this group of bycatch species. Indirect effects will be cited and referenced, where appropriate.

2.0 NEPA Requirements: Environmental Impacts of IR/IU

An environmental assessment (EA) is required by the National Environmental Policy Act of 1969 (NEPA) to determine whether the action considered will result in significant impact on the human environment. If the action is determined not to be significant based on an analysis of relevant considerations, the EA and resulting *finding of no significant impact* (FONSI) would be the final environmental documents required by NEPA. An *environmental impact statement* (EIS) must be prepared for major Federal actions significantly affecting the human environment.

An EA must include a brief discussion of the need for the proposal, the alternatives considered, the environmental impacts of the proposed action and the alternatives, and a list of document preparers. The purpose and alternatives were discussed in Chapter 1.0, and the list of preparers is in Chapter 11.0. This section contains the discussion of the environmental impacts of the alternatives including impacts on threatened and endangered species and marine mammals.

The environmental impacts generally associated with fishery management actions are effects resulting from, (1) harvest of fish stocks which may result in changes in food availability to predators and scavengers; (2) changes in the population structure of target fish stocks; (3) changes in the marine ecosystem community structure; (4) changes in the physical and biological structure of the marine environment as a result of fishing practices, e.g., effects of gear use and fish processing discards; and, (5) entanglement/entrapment of non-target organisms in active or inactive fishing gear. It might be expected that any of the alternatives could have effects related to (1), (3), and (4) above.

A summary of the effects of the annual groundfish total allowable catch amounts on the biological environment and associated impacts on marine mammals, seabirds, and other threatened or endangered species are discussed in the final environmental assessment for the annual groundfish total allowable catch specifications (NMFS 1997). None of the GOA IR/IU alternatives would affect how annual groundfish total allowable catch amounts are determined.

Possible ecological impacts of GOA IR/IU relative to the status quo would primarily occur through the decrease in the amounts of walleye pollock, Pacific cod, and 'shallow water' flatfish that are returned to the sea. Stock assessments of pollock, Pacific cod, and 'shallow water' flatfish already assume 100% mortality of the discards of these species, so no change in the population status of these species is anticipated due to any of the proposed options. However, the decrease in discards returned to the sea could result in a decrease in the amount of food available to scavengers and produce a decline in growth or reproductive output of species that rely on discards for a major portion of their food intake. Also, changes in energy flow to the detritus and local enrichment through an increase in processing waste (offal) could occur.

2.1 Consumers of Discards and Fish Processing Offal

Several years of groundfish food habits data collected by the Trophic Interactions Program at the Alaska Fisheries Science Center confirm the consumption of fish processing offal by fish in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. Estimates of the average percent by weight of offal in the diet of groundfish species in the Gulf of Alaska in 1990 and 1993 (Table 2.1), indicate a decline in the amount of offal in the diet between those years for Pacific cod, arrowtooth flounder, and Pacific halibut. This may be a reflection of the decrease in the amount of offal production from at-sea processors due to the 1993 requirement for 100% onshore processing of pollock and 90% onshore processing of Pacific cod. However, the contribution of offal to the diet of sablefish was the highest of the groundfish sampled and remained relatively constant between the two years. Large percentages of offal in the diet of sablefish off the

Washington-Oregon-California coasts have also been observed, ranging from 13-37% of the diet (Buckley and Livingston, unpubl. manuscr.). Perhaps sablefish, which live in deeper offshore waters that may have lower food abundances, have enhanced sensory capabilities that enable them to more easily detect and find fish processing offal.

An estimate of the amount of offal returned to the sea by at-sea and on-shore processors can be obtained from subtracting the total round weight of the groundfish catch retained and processed from the product weight. These estimates of offal would include all fish substance (solid, liquid, and perhaps even gas) that is not part of the final product. Estimated at-sea offal production for 1995, for example, in the GOA was 13,303 mt [= round wt of the catch (32,260) - product wt (18,957)] and shoreside offal production was 95,820 mt. A large proportion (40%) of the at-sea offal produced consisted of cod parts, while 61% of the shoreside offal was from pollock processing. Using the 1993 diet data on offal percentages in groundfish diets in Table 2.1 and estimates of daily ration and biomass for these groundfish populations, it appears that groundfish in the Gulf of Alaska have the potential to consume about 30% of the at-sea offal produced. This compares to an estimate of about 11% of total discards consumed by fish and crab in a study area off Australia (Wassenburg and Hill, 1990).

Other upper-trophic level scavenger species likely to benefit from offal production include sculpins, crabs, other predatory invertebrates, marine mammals (particularly pinnipeds), and marine birds such as gulls, kittiwakes, and fulmars. Studies performed in the North Sea and Australia indicate that birds are a likely recipient of discards and offal thrown overboard during daytime and which do not immediately sink (Anon., 1994; Evans et al., 1994; Wassenburg and Hill, 1990), while crabs may be the first to arrive in areas when discards reach the bottom (Wassenburg and Hill, 1987). Offal not consumed by these predators would presumably be decomposed by bacteria and also become available as detritus for benthic filter-feeding invertebrates.

Estimates are not available for consumption of whole animal discards by groundfish, marine mammals, or birds in the BSAI and GOA areas. When analyzing stomach contents of groundfish and birds, and scats of marine mammals, it is impossible to discern whether a whole animal in the stomach contents was consumed when alive or dead. Presumably, whole discards are consumed by the same scavengers that consume unground offal.

Table 2.1 Estimates of average percentages by weight of offal (fish processing waste in the diets of groundfish from the Gulf of Alaska during the summers of 1990 and 1993

	Year	
Groundfish predator	*'90*	*'93*
Pacific cod	6.3	1.7
Walleye pollock	0	0
Arrowtooth flounder	1.6	0.5
Sablefish	13.8	16.9
Pacific halibut	3.9	0.2

2.2 Offal and Discard Amounts

Table 2.2 provides a summary of the magnitude of offal and discard amounts relative to catch in the GOA groundfish fisheries for 1995, under the status quo, and the bounds of possible changes in those amounts under improved retention and the ranges of possible product recovery rates that might occur under the utilization option (15% to 100%). Under the status quo option the weight of offal returned to the sea is almost three times as large as the weight of discards. About 60% of the retained catch is converted into offal. About 50% of the total catch becomes offal, while only 18% of the total catch is discarded whole. Obviously, when considering energy transfer in the ecosystem, offal production overshadows discard amounts. The large proportion of the total catch returned to the sea as offal and discards could reduce any potential impacts of fishing to energy loss in these areas. However, availability of the returned energy (as offal and discards) to various ecosystem components may differ from that of the undisturbed energy form (live fish).

Ecosystem level concerns about discards and offal production primarily center on the possibility that these practices might alter the regular paths of energy flow and balance and enhance the growth of scavenger populations. In the Gulf of Alaska, 40% of the discards are of arrowtooth flounder and 33% are of the improved retention species of pollock, cod, and shallow-water flatfish. Although over half of the offal produced is from pollock, most of the pollock offal is produced shoreside, while the major portion (40%) of the at-sea offal is from cod processing. All of the groundfish species found to be consumers of offal (Table 2.1) are also predators of pollock, but not of cod (Yang, 1993). Pacific cod and halibut are also documented consumers of arrowtooth flounder (Yang, 1993). The scavenging birds (gulls, fulmars, kittiwakes), do not normally rely heavily on pollock or cod as their main prey in the Gulf of Alaska (DeGange and Sanger, 1987). The annual consumptive capacity of the scavenging groundfish (cod, halibut, sablefish, and arrowtooth flounder) in the Gulf of Alaska is estimated at 254,000 mt, twice as large as the total amount of offal and discards in 1993 (Livingston, unpublished data). Since the species consuming the at-sea produced offal (mostly cod-derived) and discards (primarily arrowtooth flounder) do not normally rely on

these species for their main prey, it appears that the practice of returning them to the ocean under the status quo option may be disrupting regular paths of energy flow. However, the magnitude of the offal and discards are relatively small if the total consumptive capacity of all the scavenger populations, including birds, crabs, sculpins, and other predatory invertebrates, were to be taken into account.

If all the newly retained fish under improved retention is converted to product with the minimum 15% product recovery rate (Table 2.2), then there is a decrease in discards as a fraction of total catch from 0.18 to 0.12. However, 85% of this newly retained fish would become offal, with the corresponding increase in the amount of offal relative to total catch. There is about a 2% decline in the total amount of dead organic material (offal + discard) returned to the ocean from the at-sea processing operations, or a decline of 543 mt, in absolute terms.

If all the newly retained fish under improved retention is converted to product with the maximum possible product recover rate of 100% (Table 2.2) then there is again a decrease in discards as a fraction of total catch from 0.18 to 0.02. However, there is no increase in offal production relative to total catch. There is an 11% decline in the total amount of dead organic material (offal + discard) returned to the ocean from at-sea processing operations, or a decline of 3,623 mt, in absolute terms.

2.3 Changes in Detrital Flow

Even if offal and discards are not used by the upper trophic level scavengers, the total amount of dead organic material (detritus) that would reach the bottom is probably small relative to other natural sources of detritus. Walsh and McRoy (1986) estimate detrital flow to the middle and outer shelf of the eastern Bering Sea to be 188 $gCm^{-2}\ yr^{-1}$ and 119 $gCm^{-2}\ yr^{-1}$, respectively. When converted to biomass over the whole area[8], an estimated 506.9 million mt of naturally-occurring detritus goes to the bottom each year. Approximately 28% (142.9 million mt), is unused (Walsh and McRoy, op. cit.). The total offal and discard production in the BSAI, as estimated for 1994, was only 1% of the estimate of unused detritus already going to the bottom and only 0.3% of the total detritus. It is unknown what the total detrital flow is to the shelf areas of the Gulf of Alaska, but Feder and Jewett (1987) found the presence of benthically enriched areas in the GOA near to the Alaska Coastal Current with its entrained particulate organic carbon. This suggests a high natural detrital flow to at least some bottom regions of the GOA.

Simulation model results of discard effects on energy cycling in the Gulf of Mexico (Browder, 1983) confirmed that discards, even in that region of relatively high discard rates, tended to be a small portion of the dead organic material on the bottom. However, depending on model assumptions, changing the amount of discards through full utilization or through selective fishing methods had the potential to change populations of shrimp and its fish competitors. Uncertainty about the predation rates and assumptions about alternate prey utilization indicated a need for further research to fully understand and predict responses of populations to changes in food availability. Similar uncertainty about scavenger responses to changes in food availability and alternate prey exist for the Gulf of Alaska. However, the small changes in total offal and discard production in the Gulf of Alaska under the proposed IR/IU options are an indication of no significant impact on flows to the detritus.

---

[8] Assuming 0.4 gC/1g dry weight and 0.5 g dry weight/1g wet weight, and total middle shelf area = 4×10^5 km^2 and outer shelf area = 2.2×10^5 km^2.

Table 2.2 **Summary of offal and discard amounts in the GOA groundfish fisheries for 1995 compared to total and retained catch and hypothetical amounts under Improved Retention (100% retention of pollock, Pacific cod, and shallow-water flatfish)**

Category	*Amount (metric tons) or fraction*	*Hypothetical amount (metric tons) or fraction with 15% PRR for newly retained catch*	*Hypothetical amount (metric tons) or fraction with 100% PRR for newly retained catch*
Retained catch (round weight)	180,119	193,018	193,018
Discarded catch	39,272	26,373	26,373
Total catch (retained + discards)	219,391	219,391	219,391
Offal (retained rnd. wt - product wt)	109,123	120,087	109,123
Offal + discards	148,395	146,460	135,496
Discard/Retained catch	0.22	0.14	0.14
Discard/Total catch	0.18	0.12	0.12
Offal/Total catch	0.50	0.55	0.50
(Offal + discard)/Total catch	0.68	0.67	0.62
Offal/discards	2.8	4.5	4.1

2.4 Scavenger Population Response

Under the status quo rates of offal and discard production, most of the scavenger populations are not showing obvious signs of increase related to offal production. Sablefish, the main groundfish consumer of offal, are exhibiting relatively stable population number and weight as evidenced from longline surveys in the GOA (Fujioka et al., 1996). Kittiwake population increases have been noted in Chiniak Bay, the site of offal disposal at Kodiak Island. However, the increases there occurred between the late 1970s and mid-1980s (Hatch et al., 1993), apparently before offal disposal at that site began. The small changes in total offal and discard production relative to total catch and the evidence suggesting no linkage between offal and discards with any scavenger population trends under the existing system are an indication of **no significant impact** on scavenger populations.

2.5 Changes in Local Enrichment

Local enrichment and change in species composition in some areas might occur if discards or offal returns are concentrated there. There is evidence under the *Status Quo* alternative that such effects have previously been seen in Orca Inlet in Prince William Sound and in Dutch Harbor, Alaska. Poor water quality and undesirable species composition have been cited (Thomas, 1994) as the result of the current policy for grinding fish offal released in inshore areas and the inadequate tidal flushing in that region. However, deep water waste disposal of offal in Chiniak Bay of Kodiak Island has not shown such problems (Stevens and Haaga, 1994). No apparent species composition changes, anaerobic conditions, or large accumulations of offal occurred in Chiniak Bay where such wastes have been dumped for over a decade. Local ocean properties (water depth and flow) and amount of waste discharged per year could be important factors determining the effect of near-shore disposal on local marine habitat and communities. Recent changes to the processing plant at Dutch Harbor have dramatically reduced the amount of offal and ground discards discharged in the last two years under the status quo. The adoption of improved retention could cause some increase in the amount of local enrichment due to disposal of the increased offal from shoreside processing of newly retained fish with product recovery rates less than 100%. In 1995, the estimated amount of offal from GOA shoreside processing was 95,820 mt (147,858 mt retained catch - 52,038 mt product). Increased retention of pollock, Pacific cod, and 'shallow water' flatfish in the shoreside processing sector would be 9,225 mt, using 1995 data. If all of this newly retained fish was converted to fish meal, with a minimum product recovery rate of 15%, then the increase in offal production relative to the status quo would be approximately 8%. The small estimated change in total offal production relative to current shoreside offal production in the GOA, under the proposed IR/IU alternative, is an indication of **no significant impact** due to a change in local enrichment.

2.6 Impacts on Endangered, Threatened or Candidate Species

Endangered and threatened species under the ESA that may be present in the GOA and BSAI include:

Endangered

Northern right whale	*Balaena glacialis*
Sei whale	*Balaenoptera borealis*
Blue whale	*Balaenoptera musculus*
Fin whale	*Baleanoptera physalus*
Humpback whale	*Megaptera novaeangliae*
Sperm whale	*Physeter macrocephalus*
Snake River sockeye salmon	*Oncorhynchus nerka*
Short-tailed albatross	*Diomedea albatrus*
Steller sea lion (Western stock)	*Eumetopias jubatus*

Threatened

Steller sea lion (Eastern stock)	*Eumetopias jubatus*
Snake R. spring and summer chinook salmon	*Oncorhynchus tshawytscha*
Snake R. fall chinook salmon	*Oncorhynchus tshawytscha*
Spectacled eider	*Somateria fischeri*
Steller's eider	*Polysticta stelleri*

The status of the ESA Section 7 consultations, required to assess the impact of the groundfish fisheries on endangered, threatened, or candidate species, is updated annually as part of the annual groundfish specifications process.

Endangered, threatened, and candidate species of seabirds that may be found within the regions of the GOA where the groundfish fisheries operate, and potential impacts of the groundfish fisheries on these species are discussed in the EA prepared for the TAC specifications (NMFS 1997). The U.S. Fish and Wildlife Service (USFWS), in consultation on the 1997 specifications, concluded that groundfish operations will not jeopardize the continued existence of the short-tailed albatross (letter, Rappoport to Pennoyer, February 19, 1997). None of the alternatives considered would be expected to affect threatened or endangered seabird species in any manner or extent not already addressed under previous consultations.

None of the alternatives considered would be expected to have a significant impact on endangered, threatened, or candidate species. None of the alternatives would modify the groundfish harvest thresholds that have been established for reinitiating Section 7 consultation (NMFS 1997).

2.7 Impacts on Marine Mammals

Marine mammals not listed under the Endangered Species Act that may be present in the GOA and BSAI include cetaceans, [minke whale (*Balaenoptera acutorostrata*), killer whale (*Orcinus orca*), Dall's porpoise (*Phocoenoides dalli*), harbor porpoise (*Phocoena phocoena*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), and the beaked whales (e.g., *Berardius bairdii* and *Mesoplodon spp.*)] as well as pinnipeds

obliquidens), and the beaked whales (e.g., *Berardius bairdii* and *Mesoplodon spp.*)] as well as pinnipeds [northern fur seals (*Callorhinus ursinus*), and Pacific harbor seals (*Phoca vitulina*)] and the sea otter (*Enhydra lutris*).

A list of marine mammal species and detailed discussion regarding life history and potential impacts of groundfish fisheries of the BSAI and GOA on these species can be found in the EA prepared for the 1997 Total Allowable Catch Specifications for Groundfish (NMFS 1997). None of the alternatives would be expected to adversely affect marine mammals any manner or extent not already addressed under previous consultations.

2.8 Coastal Zone Management Act

Implementation of each of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

2.9 Conclusions or Finding of No Significant Impact

None of the alternatives is likely to significantly affect the quality of the human environment, and the preparation of an environmental impact statement for the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

Assistant Administrator for Fisheries, NOAA

OCT 30 1997
Date

3.0 Economic and Socioeconomic Impacts of Improved Retention

This section provides information about the economic and socioeconomic impacts of the *retention* alternatives, including identification of the individuals or groups that may be affected by the action, the nature of these impacts, quantification of the economic impacts (if possible), and discussion of the trade-offs between qualitative and quantitative benefits and costs.

The requirements for all regulatory actions, specified in E.O.12866, are summarized in the following statement from the Executive Order:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environment, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

This section of the analysis also addresses the requirements of both E.O.12866 and the Regulatory Flexibility Act (RFA) to provide adequate information to determine whether an action is significant under E.O.12866, or will result in significant impacts to a substantial number of small entities, as defined under the RFA. E.O.12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be *significant*. A *significant regulatory action* is one that is likely to:

1. Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

3. Materially alter the budgetary impact of entitlement, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

A regulatory program is economically significant if it is likely to result in the effects described above. The RIR is designed to provide information to determine whether the proposed regulation is likely to be economically significant.

3.1 Catch, Bycatch, and Discards in GOA Groundfish Fisheries: the Status Quo Alternative

Catch and discard data from NMFS Alaska Region Blend Estimates, and NMFS Weekly Production Reports, have been employed in describing the requisite No-Action or Status Quo alternative. The fishing years of 1995 and 1996 have been utilized as the base period for this analysis. The series of tables which appear in Appendix A summarize the catch, retention, and discard performance of all groundfish target fisheries

operating in the GOA management area, during these years. By utilizing the standard NMFS Alaska Region definition of "target" and focusing on the catch and discard of the groundfish species of concern, i.e., pollock, Pacific cod, and 'shallow water' flatfish, one may assess, in general terms, the likely implications of retaining the status quo alternative, with respect to bycatch discard and retention, in the absence of other changes.

Continued management of the GOA groundfish fisheries under the status quo alternative would, presumably, result in groundfish bycatch discards on the order of those observed in recent years in these fisheries (see Table 3.1).[9] While efforts have been made in some fisheries, by some participants, to adopt bycatch avoidance technologies or techniques, their relative contribution to bycatch reduction is likely to be limited by the continued open access "race-for-fish" in these fisheries. If bycatch discards do continue at approximately the levels observed over the period of analysis, this suggests that retention of the status quo alternative would see total *Alaska pollock* discards in the range of approximately 5,000 mt to 8,000 mt per year (1996 and 1995 estimated aggregate discards, respectively); *Pacific cod* discards ranging from 3,500 mt to 7,600 mt per year (1995 and 1996 estimated aggregate discards, respectively); and *shallow water flatfish* discards continuing to be between 1,300 mt and 1,400 mt per year (1996 and 1995 estimated aggregate discards, respectively).[10]

Because very little empirical data exist pertaining to the size frequency composition or condition of these discarded fish (except in observed components of the target fishery for each individual species) it is impossible to quantitatively estimate, with any precision, the economic impact these discards may have on the various IR-target fisheries.[11] It is reasonable to assume, however, that many of these discarded fish are of a size, condition, and quality that would permit production of marketable products, if retained and processed. Whether the cost of retaining, processing, storing, shipping, and marketing these resulting products can be recovered through their sale, by the operations which intercept them as bycatch, is in part the subject of this analysis.

---

[9] For a detailed break down of catch and bycatch, by target fishery, refer to Appendix A.

[10] For each of these species, the presence of unusually large (or small) year classes in the harvestable biomass can result in significant variability in catch/bycatch rates over time. Historically, annual catch data clearly reveal the effects on total catch, average size in the catch, etc., of atypical year classes as they recruit into, pass through, and exit the harvestable biomass. One would expect this pattern to continue under any IR/IU program, thus making accurate predictions of numerical "improvements" in bycatch, from year-to-year, problematic.

[11] An analysis of the economic opportunity cost of groundfish bycatch has been published by the Alaska Region/Alaska Fisheries Science Center. Interested readers are referred to, L.E. Queirolo, et al., *Bycatch, Utilization, and Discards in the Commercial Groundfish Fisheries of the Gulf of Alaska, Eastern Bering Sea, and Aleutian Islands*. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-58, 148p. November 1995.

Table 3.1 Total Catch and Discards of Groundfish in the Gulf of Alaska, 1995-96

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	73,194	33.4%	7,927	20.2%	10.8%
Pacific cod	68,984	31.5%	3,539	9.0%	5.1%
Shallow	5,116	2.3%	1,433	3.6%	28.0%
Sablefish	20,569	9.4%	1,072	2.7%	5.2%
Arrowtooth	18,003	8.2%	15,884	40.4%	88.2%
Deep flat	1,994	.9%	440	1.1%	22.1%
Flathd sole	2,078	.9%	575	1.5%	27.7%
Rex sole	3,941	1.8%	388	1.0%	9.8%
Rockfish	18,915	8.6%	3,624	9.2%	19.2%
Atka mack.	425	.2%	198	.5%	46.6%
Oth/unk	5,603	2.6%	4,192	10.7%	74.8%
Groundfish total	218,823	100.0%	39,272	100.0%	17.9%
1996					
Pollock	51,123	24.9%	5,139	12.5%	10.1%
Pacific cod	68,293	33.3%	7,581	18.4%	11.1%
Shallow	9,340	4.6%	1,299	3.2%	13.9%
Sable fish	18,149	8.8%	862	2.1%	4.7%
Arrow tooth	22,449	10.9%	17,152	41.7%	76.4%
Deep flat	2,151	1.0%	607	1.5%	28.2%
Flathd sole	3,048	1.5%	668	1.6%	21.9%
Rex sole	5,834	2.8%	299	.7%	5.1%
Rockfish	18,172	8.9%	3,605	8.8%	19.8%
Atka mack.	1,321	.6%	120	.3%	9.1%
Oth/unk	5,333	2.6%	3,305	9.2%	71.3%
Groundfish total	205,213	100.0%	41,137	100.0%	20.0%

Source: NMFS Alaska Region blend estimates.

3.2 GOA Improved Retention

Catch and discard data from NMFS Alaska Region Blend Estimates, and NMFS Weekly Production Reports, have been employed in evaluating the IR alternative[12] and contrasting it with the Status Quo alternative. As previously noted, the fishing years 1995 and 1996 were selected with the expectation that they most nearly reflect the current pattern of catch, utilization, and discards in the GOA fisheries under consideration.

The provisions of the IR alternative are species-based. As such, retention requirements would be applied equally to all groundfish target fisheries (i.e., all fisheries taking any amount of the IR/IU species of concern). The following analysis utilizes the standard Alaska Region target definitions.

Adoption of the species-based retention option would have a broad potential impact on the groundfish fisheries of the GOA. This is so because, the IR alternative requires that, for any groundfish fishery operating in the GOA management area, 100% of the pollock, Pacific cod, and ultimately, 'shallow water' flatfish complex[13] contained in the catch, be retained. In other words, for any GOA groundfish fishery (and any gear-type), e.g., Atka mackerel trawl, sablefish longline, or rockfish jig, this IR option would require retention of all Pacific cod, all pollock (and, when fully implemented, all shallow water flatfish) present in the catch. Any other groundfish species present in the catch could be retained or discarded at the discretion of the operator.[14]

By examining the catch and discard estimates for all groundfish fisheries for the analytical base years, and assuming the IR alternative had been in place, beginning in 1995, the following impacts can be projected (see Appendix A).[15] The potentially affected fisheries are defined and examined below.

Alaska Pollock[16]

---

[12] An extensive analysis of a broad range of retention alternatives and sub-options was prepared, reviewed by the SSC, AP, and Council, and narrowed to the 'species-based' alternative, adopted by the Council for the BSAI IR/IU Amendment, and selected by the Council for analysis in the proposed GOA IR/IU program. The interested reader may consult the Final EA/RIR/RFA for Amendment 49 to the Bering Sea/Aleutian Island Groundfish Management Plan, September 25, 1996.

[13] For a complete treatment of the proposed 'delay' in implementation for shallow water flatfish, see Section 3.3.

[14] Subject, of course, to compliance with any other prevailing regulation or statute, e.g, EPA discharge requirements, NMFS Directed Fishing Standards.

[15] To the extent that harvesters are able to avoid bycatches of unwanted fish, these discard estimates may be further reduced by imposition of a retention requirement. At present, no empirical data are available with which to assess this potentiality. Presumably, adjustments to a retention requirement would occur over time as fishermen learn new techniques, or adjust fishing practices, patterns, and areas. It may require the observation of these operations over several seasons under a retention requirement before such information could be obtained, however.

[16] The GOA Inshore/Offshore Amendment allocated 100% of directed Gulf pollock to the inshore sector. That not withstanding, catch records indicate that, in 1995 and 1996, at-sea directed pollock target fisheries took place in GOA. For purposes of the IR/IU analysis, a distinction is made between inshore and offshore; on-shore and at-sea. The former shall refer only to the TAC apportionment, the latter (as used here) only to the reported location of processing.

Bottom Trawl

For the GOA bottom pollock trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 7 processors participated in the 1995 fishery (all shoreside processing plants). Ten processors participated in the 1996 pollock bottom trawl fishery; all shoreside processors.

There were 32 catcher vessels participating in this fishery in 1995. Fifteen were in the 60' to 124' size range (implying 30% observer coverage). Fourteen were less than 60'. The data suggest that three other vessels participated in this fishery, however, the vessel length is reported as unknown.

Twenty catcher vessels reported landings in this fishery in 1996, all to on-shore plants. Eight were of the 60' to 124' class (30% coverage), while eleven were less than 60' in length, and one was of unknown vessel length.

The NMFS Blend catch and discard data indicate that the GOA bottom pollock target fishery is only relatively species selective (see Appendix A: Table 1.1.1). In 1995, pollock accounted for just under 78% of total reported groundfish catch in this fishery. In 1996, pollock comprised just over 74% of its total groundfish catch. The rate of discards of pollock in this fishery has also been relatively low. In 1995, approximately 1.3% of a total pollock catch of 2,800 mt was discarded (i.e., 35 mt). In 1996, the total reported catch of pollock in this fishery was 4,121 mt (up more than 1,300 mt or >46%). The rate of pollock discard was also up sharply, to 3.7% of pollock catch (or 153 mt).

While rates of bycatch of shallow water flatfish were very low in this fishery (e.g., 0.8% and 2.8% of total groundfish catch, respectively) in 1995 and 1996, the associated rate of discard was relatively high, i.e., between 20% and 30% for these two years. In comparison, bycatches of Pacific cod were somewhat higher, as a percent of total groundfish catch, i.e., 12.1% and 9.7%, respectively. In 1995, just 5% of this bycatch was discarded. In 1996, however, the Pacific cod discard rate rose to 20.5%. The total quantities involved were relatively small, with an estimated 403 mt of Pacific cod bycatch taken in 1995, in this fishery, and approximately 538 mt bycaught in 1996. Therefore, Pacific cod discards totaled 22 mt, in 1995; 110 mt in 1996.

The proposed IR Alternative would have required immediate retention of all of the discards of pollock and Pacific cod, but would have delayed retention requirements for the shallow water flatfish complex for five years following implementation. Had the proposed GOA retention regime been in place in these two years, an additional retained groundfish catch (in the bottom pollock fishery) of 57 mt in 1995, and 263 mt in 1996, would have been required. These additional tons of retained catch represent approximately 0.03% of the reported total GOA groundfish catch in 1995; 0.01% in 1996.[17]

The impact on any individual pollock bottom trawl operation could vary with the size and configuration of the vessel, hold capacity, processing capability, markets and market access, as well as the specific composition and share of the total catch of these IR species. Vessels with the least capacity to hold catch[18],

---

[17] They accounted for approximately 1.6% and 4.7%, respectively, of the GOA 'bottom pollock' trawl total groundfish catch in 1995 and 1996.

[18] The ability to hold roundfish, e.g., pollock and cod, separately from flatfish, e.g., shallow water flatfish, was reported by industry sources to be critical to an operation's ability to comply with retention requirements and simultaneously deliver a "useable" fish to a buyer. Holding round fish and flatfish together causes substantial

and/or which are relatively less physically mobile and independent, i.e., those with the shortest operating ranges and duration, will be most severely impacted by adoption of the IR alternative. In discussions with informed industry sources, these impacts were deemed not to represent a serious impediment to continued operation of the current fleet participating in this fishery, i.e., **no significant impact**. This is so, principally because of the relatively small quantity of additional retained catch these operators will be required to handle under the proposed GOA IR/IU action (as compared to historic catch levels) and the composition of the current fleet.

At-sea versus On-shore

The distinction between at-sea and on-shore operations may be characterized as follows. No pollock bottom trawl landings were reported for the at-sea sector of this GOA-target fishery in 1996, and only a very small quantity of groundfish catch was reported for this sector in 1995 (specifically, 291 mt total or about 9%). Therefore, sectoral comparisons are not particularly useful, in understanding this fishery, in these years. For practical purposes, the on-shore sector profile coincides with the description presented above.

Pelagic Trawl

For the GOA pelagic pollock trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 15 processors participated in the 1995 fishery (all shoreside processing plants). According to these data, eleven on-shore processors participated in the 1996 GOA pelagic pollock trawl fishery.

A total of 122 catcher boats participated in this fishery in 1995. Fifteen were over 124' (i.e., 100% observed), 85 were in the 60' to 124' range (i.e., 30% observed), 17 were less than 60' in length, and 5 were reportedly of unknown length. It is estimated that 121 of the 122 catcher boat fleet delivered to on-shore processors.

Fifty-seven catcher vessels reportedly participated in this fishery in 1996. Thirty-four were in the 30% coverage category (i.e., 60' to 124'), 16 were less than 60' in length (i.e., no observer coverage), and 3 were of unknown length. Again, virtually all delivered their catch on-shore.

The GOA pelagic pollock trawl fishery has historically been very species selective, with 1995 and 1996 total catches consistently composed of approximately 99% pollock (see Appendix A: Table 1.2.1). The rate of discards of pollock in this fishery was moderately low. In 1995, reportedly 7.4% of a total pollock catch of 66,968 mt was discarded (i.e., 4,980 mt). In 1996, while the total catch of pollock was down by just over 24,000 mt (to 42,956 mt), the rate of pollock discards was down sharply, to 3.4% of the pollock catch (i.e., 1,440 mt).

While rates of bycatch of the other species of concern, i.e., Pacific cod, and shallow water flatfish, were extremely low in this fishery (e.g., 0.4% and <0.1% of total groundfish catch, respectively, in 1995), the associated rates of discard were relatively high: An estimated 292 mt of Pacific cod bycatch was taken in 1995, in this fishery. Approximately 33%, or 96 mt, were discarded in-the-round. In 1996, Pacific cod bycatch was estimated at 291 mt, with 109 mt (37.5%) reportedly discarded whole. Shallow water flatfish bycatch amounts were very much smaller, estimated at only 10 mt and 19 mt in 1995 and 1996, respectively. The rate of discard was, however, relatively high at 58.6% in 1995, and 97.7% in 1996.

---

physical damage and deterioration of quality to the softer-fleshed species, e.g., Pacific cod, pollock. Many smaller operations would not have the capability to separate catch in their holds and, as a result, could be significantly disadvantaged operationally by this requirement.

The proposed IR alternative would have required immediate retention of all of the pollock and Pacific cod discards, but a five-year delay in implementation for shallow water flatfish. These retention increases would have represented an addition to reported retained groundfish catch of 5,076 mt in 1995, and an additional 1,549 mt in 1996. This quantity of additional retained catch represents 7.5% of total reported groundfish catch in this fishery in 1995; just over 3.5%, in 1996.

Adoption of the proposed IR alternative could be expected to increase the handling (e.g, sorting, holding/processing, transporting, and transferring) of fish which heretofore have been discarded. While the impact on any individual operation would vary with, for example, size and configuration of the vessel, hold capacity, processing capability, markets and market access, and share of the total catch and bycatch of the species of concern, it would appear that the impact (i.e., operational burden) attributable to adoption of this retention option would likely **not be significant** for the pelagic pollock trawl fishery.

While the additional quantities of *pollock* which would be required to be retained are not trivial, as a percent of total pollock catch they should not pose an operational burden. Note that at present, these operators retain 92% to 97% of the total pollock catch, even without a retention requirement. Furthermore, the quantities of Pacific cod (as well as, 'shallow water' flatfish) present in the catch of this fishery are so small (absolutely and as a percent of total catch) that accommodating 100% retention of these bycatches (immediately, for Pacific cod and pollock; after five-years for shallow water flatfish) should require nothing more than a relatively minor operational adjustment for most participants. That is, any economic burden to this fishery, attributable to compliance with the proposed GOA IR alternative, should be inconsequential.

Pacific Cod[19]

Analysis of the potential impacts of adoption of the proposed IR alternative in the several Pacific cod fisheries of the GOA management area parallels that described above for the pollock directed fisheries, although because of the variety of gear-types employed in the directed fishing for cod, e.g., longline, pot, and trawl, interpretation is a bit more complex. (See Appendix A: Tables 1.3.1 through 1.5.3).[20]

It has been reported that, in general, Pacific cod in the Gulf of Alaska tend to have a greater problem with serious parasite infestation and lesions, than is the case in the BSAI Pacific cod fisheries. If this is so, this could have several potential implications for IR/IU. First, the inclination to discard poor quality fish would be expected to be higher the more heavily parasitized they are. Second, the presence of parasites will reduce the range of product forms which can be produced from these catches. Third, markets into which this fish can be sold will be fewer, and thus product value will be lower, reducing further the options available to operators *required* under IR/IU to retain 100% of their Pacific cod catch. The implications may vary from area to area in the GOA, and perhaps from gear-type to gear-type, or across vessel size categories, but this appears to be a problem which was not faced by operators in the BSAI when IR/IU was evaluated.

---

[19] Information provided by industry sources, and verified by AFSC scientists, suggests that GOA Pacific cod have a much greater frequency of serious parasite infestations and lesions, than is the case in the BSAI. Reportedly, in some areas, the problem is so severe that some fish have virtually no potential value.

[20] Pacific cod is apportioned in the GOA on the basis of the Council's Inshore/Offshore FMP Amendment, with 90% allocated to inshore and 10% allocated to offshore sectors. These apportionments are not gear-type specific. References made in the IR/IU analysis to at-sea and on-shore components of the several Pacific cod target fisheries should not be mis-interpreted as reflecting Inshore/Offshore definitions or management criteria, but rather reflect only reported location of processing.

Cod Longline

For the GOA Pacific cod longline fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 55 processors participated in the 1995 fishery (34 on-shore, 1 mothership, and 20 catcher/processors). The one mothership and seven of the catcher/processors were greater than 124 feet in length, thus indicating 100% observer coverage. Twelve were 60' to 124' in length (30% observed), and 1 was less than 60' (unobserved).

Four-hundred and nine catcher vessels participated in the GOA Pacific cod longline fishery in 1995. Thirty-six were in the 60' to 124' class (30% observed), 359 were less than 60' (no observer coverage), and 14 were reported as of unknown length.

In 1996, these data indicate that 37 on-shore plants, 1 mothership and 16 catcher/processors participated in the GOA Pacific cod longline fishery. The mothership and four of the catcher/processors were greater than 124', while 12 were categorized as between 60' and 124. Two-hundred and seventy catcher boats participated in the GOA Pacific cod longline fishery in this year. Twelve were in the 30% coverage size class (60' to 124'), 250 were under 60' (unobserved), and 8 were of unknown length, according to the data.

The Pacific cod longline fishery has tended to be relatively species selective, in terms of catch composition. For example, in 1995 and 1996, cod reportedly made up between 88% and 94.6% of the total groundfish catch, in this fishery (see Appendix A: Table 1.3.1). Of the remaining catch, pollock accounted for about 0.5%, while shallow water flatfish were considerably less than one-tenth of one-percent (i.e., essentially not present).

Pacific cod discards accounted for about 22.7% of all groundfish discards in this fishery in 1995, and 31.2% of the total in 1996. Pollock accounted for between 1.4% and 3.4% of the total groundfish discards, while shallow water flatfish were, again, fractions of one-percent. The discard rate of Pacific cod was estimated to be 3.3% in 1995, and 2.0% in 1996. Reported rates for the other species of concern are high, but essentially meaningless because the quantities are so small.

Had the proposed GOA IR alternative been in place in the base years, an additional 383 mt of catch would have been required to be retained by these operations, out of an estimated total groundfish catch of 12,225 mt in 1995. An additional 219 mt would have been required to be retained, out of a total catch of 10,477 mt in 1996. This additional groundfish catch would have represented an increase in total landings in the GOA Pacific cod longline fishery of 3.1% and 2.1%, respectively, for 1995 and 1996.[21]

At-sea versus On-shore

The respective performance of the at-sea and on-shore components of the Pacific cod longline fishery, as reported in the NMFS Blend data, suggest that this target fishery is very nearly equally divided between the two sectors. In 1995, the at-sea sector accounted for 51.4% of the total landings of the GOA Pacific cod longline fishery (on-shore accounted for 48.6%). In 1996, the split was reported to be 50.4% at-sea, 49.6% on-shore. There was less species-diversity in the catch of the at-sea sector, wherein approximately 98% of the total catch was Pacific cod. On-shore catch composition was somewhat more variable. For example, Pacific cod made up just 77.4% of total groundfish catch in 1995, but increased to 91.4% in 1996 (see Appendix A: Tables 1.3.2 and 1.3.3). Almost no 'shallow water' flatfish are present in either sector's catch.

[21] Assuming increases in retention of Pacific cod and pollock (required by IR/IU) were not offset by discards of other groundfish species, the retention of which is not regulated by the proposed action.

in the two years under examination. While, over this period, pollock represented 0.2% of the at-sea catch composition, it ranged from 0.6% to 1.0% of the total in the on-shore catch. At-sea operators discarded all of their pollock bycatch, whereas on-shore operators retained relatively significant amounts; 81% in 1995, 62% in 1996.

Indeed, the at-sea component of this fishery effectively retain only Pacific cod, discarding nearly 100% of everything else. The on-shore sector caught more non-cod species than did the at-sea sector, and exhibited high discard rates for most. It did retain a relatively high percentage for some of these, however, e.g., rockfish, sablefish, and as noted, pollock.

The GOA IR alternative requirement that all Pacific cod, pollock (and eventually, 'shallow water' flatfish) present in the catch be retained could be expected to increase the handling (e.g, sorting, processing/storing, transporting, and transferring) of fish which heretofore had been discarded. While the impact on any individual operation would be expected to vary with the size and configuration of the vessel, and share of the total catch of the species of concern, it would appear that the impact (i.e., operational burden) attributable to adoption of proposed IR action would **not be significant** for the GOA Pacific cod longline target fishery, taken as a whole.

Cod Pot

According to NMFS Blend, ADF&G fish ticket, and NORPAC data, the GOA Pacific cod pot fishery included 36 processors in the 1995 fishery. Of these, reportedly, 3 were motherships, 4 were catcher/processors, and the remainder were on-shore plants. All three motherships and two of the C/Ps were over 124' (100% observed), while 1 C/P was 60' to 124' in length (30% coverage) and 1 was less than 60' in length. One-hundred and eighty-six catcher vessels participated in the 1995 Pacific cod pot fishery, 70 in the 60' to 124' category, 102 less than 60', and 6 of unknown length.

In 1996, 18 on-shore and 3 at-sea processors are reported to have participated in this fishery; two motherships greater than 124' in length and 1 catcher/processors in the 60' to 124' class. One-hundred and forty-eight catcher vessels participated in the GOA Pacific cod pot fishery during the 1996 season. Four were over 124', 52 were in the 60' to 124' length range, 84 were under 60', and 8 were reported as unknown vessel length.

The GOA Pacific cod pot fishery has historically discarded relatively little cod, either in total or as a percent of catch (see Appendix A: Table 1.4.1). For example, in 1995, Pacific cod discards accounted for 0.6%, or 99 mt, of the 16,051 mt cod catch in this fishery. In 1996, the cod discard rate dropped to 0.4%, or 45 mt, of the 12,061 mt cod catch. Based upon NMFS Blend Estimates, this fishery is very *species selective* with Pacific cod consistently accounting for over 98% of total catch in 1995 and 1996.

Bycatches of the other species of concern are extremely small, both as a percentage of total catch and in absolute terms, in this fishery.

The potential reduction in discards, had the GOA IR alternative been in place in 1995 and 1996, would have represented only about 0.67% of the *total* groundfish catch in this fishery in 1995; and about 0.37% in 1996. As either an absolute quantity or as a percent of the total catch of all groundfish species in this region, the pot cod discards are, at present, minuscule.

At-sea versus On-shore

The on-shore component of this fishery accounts for the vast majority of activity (see Appendix A: Tables 1.4.2 and 1.4.3). In 1995, vessels delivering on-shore accounted for 99.2% of total catch in the GOA Pacific cod pot fishery. In 1996, catches delivered on-shore represented approximately 99.5% of the total. Because neither segment discards more than a trivial amount of cod, and the quantities of bycatch of pollock and 'shallow water' flatfish in this fishery have been so small, very little additional comparison of the two sectors is meaningful.

Adoption of the GOA IR alternative could potentially require increases in the handling (e.g, sorting, holding/processing, transporting, and transferring) of fish which heretofore would have been discarded. While the burden on any individual operation could vary, attributable impacts of the IR alternative would **not be significant** for the Pacific cod pot fishery in the Gulf, when taken as a whole. That is, with only very minor bycatches of pollock and shallow water flatfish, over the period of analysis, a mandatory 100% retention requirement, immediately for pollock and Pacific cod and after five-years for 'shallow water' flatfish, represents no potential economic burden to this fishery.

Cod Trawl

For the Gulf Pacific cod trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 37 processors, 18 on-shore and 19 at-sea (5 motherships, 14 catcher/processors), participated in the 1995 fishery. All 5 motherships and 9 of the catcher/processors were greater than 124 feet in length, thus indicating 100%observer coverage. Five catcher/processors were classified as being between 60' and 124' in length (30% observed).

One-hundred and forty-two catcher vessel participated in this fishery in 1995. Three of these vessels were over 124' in length. Seventy-eight were between 60' and 124'; fifty-three were less than 60', while records of 8 vessels show unknown vessel length. Ninety-eight percent delivered on-shore.

Nineteen at-sea (3 motherships, 16 catcher/processors) and 12 on-shore processors participated in the 1996 Pacific cod trawl fishery. Of these, all the motherships and 13 catcher/processors were greater than 124' in length, requiring 100% observer coverage. Three catcher/processors were in the 60' to 124' class (thus, with 30% coverage).

One-hundred and eight catcher vessels were identified as participants in this fishery in 1996. Five were over 124' (100% coverage), 47 were in the 60' to 124' class (30% coverage), with 54 less than 60', and 2 catcher boats identified as being of unknown length in the 1996 data. Nearly all delivered to on-shore plants.

The Gulf Pacific cod trawl fishery is, in general, relatively species selective, with between approximately 84% and 89% of its total groundfish catch composed of the target species (see Appendix A: Table 1.5.1). In 1995 and 1996, pollock comprised just 3.6% and 2.8%, respectively, of the total catch in this fishery. The 'shallow water' flatfish complex accounted for between 3% and 4% of the total reported groundfish catch in the base years.

Pacific cod discards accounted for 23.2% of all groundfish discards in this fishery in 1995, and 20.6% of the total in 1996. Pollock was 21.9% of total discards in 1995, 25.7% in 1996. Discards of 'shallow water' flatfish were on the order of 12% and 8%, respectively, in 1995 and 1996. The discard rate of Pacific cod was estimated to be 3.8% in 1995, and just 2.0% in 1996. Discard rates for pollock were very high, consistently above 80%, over this period. Shallow water flatfish discard rates were 42.1% in 1995, 21.0% in 1996.

Had the proposed GOA IR alternative been in place in those years, these data suggests that an addi. 2,834 mt of Pacific cod and pollock would have been required to be retained by these operations, out total catch of 45,971 mt in 1995. (Had these catches occurred after full implemented, including 1(retention of shallow water flatfish, this total would have increased by an additional 749 mt.) An additio. 1,750 mt would have been required to be retained, out of a total catch of 43,029 mt in 1996. (In the sar. year, discards of 'shallow water' flatfish represented 294 mt of potential additional savings, once fu. implementation of IR is achieved.) These additions to total catch represent a potential increase o: approximately 4.0% to 6.0% of the total groundfish catch in the GOA Pacific cod trawl fishery.

At-sea versus On-shore

NMFS Blend catch and discard data for all GOA groundfish fisheries, utilizing the standard Alaska Region target, reveal that the on-shore component accounts for the majority of activity in this fishery (see Appendix A: Tables 1.5.2 and 1.5.3). In 1995, vessels delivering on-shore accounted for over 81% of total catch in the GOA Pacific cod trawl fishery. In 1996, catches delivered on-shore represented approximately 85% of total groundfish in the Pacific cod trawl catch.

The on-shore sector recorded groundfish catches composed of 85.7% Pacific cod in 1995, and 90.2% Pacific cod in 1996. Pollock made up just 3.4% and 2.3% of the reported catch in those years, respectively. Shallow water flatfish represented on the order of 4.0% to 5.0% of the total reported catch. On-shore operators reportedly discarded 78.3% of their pollock bycatch, in 1995; 85.4% in 1996. The discard rate of shallow water flatfish was just over 40% in 1995, but declined to 19.9%, in 1996.

The at-sea sector reported Pacific cod as comprising 73.9% of the aggregate groundfish catch in 1995, 79.6% in 1996. Pollock comprised approximately 4.3% to 5.3% of the total; shallow water flatfish, from 1.4% to a fraction of one-percent of total groundfish landings. In 1995, the at-sea sector discarded 100% of the pollock bycatch and approximately 60% of the 'shallow water' flatfish in its catch. In 1996, this sector reduced its discards of pollock to 74% of bycatch of this species, but increased discards of 'shallow water' flatfish bycatches to 95.3%.

Under provisions of the GOA IR alternative, retention of all Pacific cod and pollock present in the catch would be immediately required (with 100% retention of 'shallow water' flatfish mandated after five-years). Adoption of this proposed action could be expected to increase the handling (e.g, sorting, holding/processing, transporting, and transferring) of fish which heretofore had been discarded. While the impact on any individual operation would vary, impacts attributable to adoption of the proposed IR action would **not be significant** for the Pacific cod trawl target fishery.

This conclusion is based, principally, on the quantity of additional retained catch these operators will be required to handle, as compared to historic catch levels. Specifically, in 1995, vessels in this fishery retained a total of 33,372 mt of groundfish, out of a total estimated catch of 37,408 mt. The GOA IR alternative would have required that an additional 1,892 mt have been retained (an increase of slightly over 5.0%). Even when 'shallow water' flatfish are required to be retained, after five-years, only an additional 677 mt, or less than 2.0% of the catch reported in 1995 for this sector, would be mandated. For catch totals, species composition, and discard patterns like those observed in 1996, the potential effect is even smaller (e.g., approximately a 3.8% increase in retained catch immediately; less than an additional one-percent after 100% retention of shallow water flatfish is required).

For species for which markets are limited or undeveloped, e.g., small Pacific cod, 100% retention requirements under this option will impose direct operational burdens (costs) which probably cannot be

offset (in whole or in part) by expected revenues generated by the sale of the additional catch. No quantitative estimate can be made, at present, of these costs. Industry sources confirm the potential differential impact adoption of the IR alternative may have on various sub-sets of the fishery, however. For example, while this action is expected to have no significant effect (in general and when the fleet is taken as a whole) it nonetheless follows the pattern described earlier, that the smaller the vessel, the larger the probable impact.

For catcher/processors operating in this fishery, the impact may be determined by processing mode. That is, a vessel with the capability to fillet product will face **no significant** burden in complying with the IR provisions. However, a vessel limited to H&G operation could be relatively disadvantaged, since the market for H&G pollock is problematic (per. comm., NPFMC IR/IU Industry Working Group, March 27, 1996). While these impacts are not amenable to measurement at the present time, the Council should be cognizant of their potential existence, and disproportionate distributional effects, in weighing the merits of the proposed alternative.

Sablefish

Sablefish Longline

The GOA sablefish longline fishery is an ITQ fishery. Under provisions of that management program, sablefish longliners are already required to retain all of their Pacific cod bycatch.[22] The GOA IR alternative would extend the prohibition on discarding of pollock (and eventually, 'shallow water' flatfish) to the Gulf sablefish longline fishery.

For the GOA sablefish longline fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 54 on-shore and 16 at-sea catcher/processors participated in the 1995 sablefish longline fishery. Nine of the vessels were classified as greater than 124' in length (100% observed), while 7 were in the 60' to 124' category (30% observed). Three-hundred and seven catcher boats participated in this fishery in 1995. Fifty-seven were in the 60' to 124' class, 239 were under 60', and 11 were listed as unknown length.

The data for 1996 suggest that 47 on-shore and 12 catcher/processors (5 over 124' in length, 6 in the 60' to 124' class, and 1 under 60') participated in this fishery in that year. One-hundred and sixty-three catcher vessels logged deliveries of sablefish in the GOA longline target fishery in 1996, according to these data. Twenty-seven boats were in the 60' to 124' class, 130 were under 60', and 6 were of unknown length.

The NMFS Blend catch and discard data for 1995 and 1996 suggest that this fishery is *not a significant source of bycatch* of the IR species of concern (see Appendix A: Table 1.6.1). In 1995 and 1996, this fishery reported no bycatch whatsoever of 'shallow water' flatfish; and only 2 mt of pollock, in 1995, and 19 mt in 1996.

While already *required* to retain all Pacific cod, catch and discard data suggest discarding of Pacific cod continued in 1995 and 1996. In 1995, just 259 mt of cod bycatch was recorded, of which 144 mt (or 55.8%) was discarded. This, out of a total groundfish catch of 21,507 mt. A similar quantity of cod was reported as bycatch in 1996, i.e., 256 mt, of which 202 mt were discarded (a *rate* of 78.8%). Pacific cod thus

---

[22] Unless under DFS the operator is required to discard, e.g., when Pacific cod is on "bycatch-only" or "prohibited" status.

represented just over 1.4% of total catch and roughly 10.7% of total discards in this fishery, in that year (up from 6.0% in 1995).

At-sea versus On-shore

While potentially a small part of the IR problem, the sablefish longline fishery does reveal a clear contrast between its two sectors (see Appendix A: Tables 1.6.2 and 1.6.3). At-sea operators represented approximately 13% of total groundfish catch in this fishery, in both years, with the balance going to the on-shore sector. They reportedly bycaught just 2 mt of pollock, in 1995, discarding it all. Of the 259 mt bycatch of Pacific cod, reported in 1995, at-sea took 66 mt, discarding 88% (or, 58 mt); on-shore reported 193 mt of Pacific cod, with 106 mt retained (a discard rate of 44.9%).

In 1996, the at-sea sector recorded a 19 mt bycatch of pollock (discarding 100%); the sector caught 100 mt of Pacific cod (discarding 96 mt, or 95.6%). On-shore operators reported almost no pollock bycatch in either year; with Pacific cod bycatch, in 1996, of 156 mt, 50 mt of which was retained, 106 mt discarded (or, a 68.1% discard rate).

While the relative performance of the at-sea and on-shore sectors present some interesting operational indicators, it is clear from these data that, had the GOA IR alternative been in place in these two years, the impact on this fishery would have been very small. As noted, of the species of concern, only Pacific cod is present in meaningful numbers (and it must already be fully retained under provisions of the ITQ program; with the DFS exceptions cited earlier). Had these operators been required to retain the additional pollock, the effect may have been to slow the fishery slightly. But because the sablefish longline fishery is now managed under an ITQ system, the "race-for-fish" is, presumably, no longer the significant issue it was under "open-access". Thus, the marginally slower pace should not adversely impact the individual operators, i.e., **no significant** attributable impact. This conclusion was supported by informed industry sources, who indicate that the burden to this fleet should be negligible, when taken as a whole.

Sablefish Trawl

For the GOA sablefish trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 3 at-sea processors participated in the 1995 sablefish trawl fishery. All the at-sea vessels were catcher/processors and all were greater than 124' in length. No catcher boats were listed as participating in this fishery in 1995.

Only 1 vessels is reported to have participated in this fishery in 1996. Confidentiality requirements prohibit reporting catch and bycatch performance for this operator. The vessel was in the over 124' category, suggesting that its fishing activity was subject to 100% observer coverage.

The GOA sablefish trawl fishery recorded very little bycatch of IR/IU species of concern during the 1995-1996 baseline period (see Appendix A: Table 1.7.1). Indeed, for the one year which can be reported, only pollock, among IR-regulated species, was present in the catch, and then just 10 mt, all of which was discarded in-the-round.

Sablefish trawling was a very small fishery in the Gulf management area, with total groundfish catches of just 408 mt, in 1995 (as noted, no landings can be reported in 1996). Based upon the available historic data, one would conclude with some justification that adoption of the GOA IR alternative should **not significantly** impact operators in this fishery.

Flatfish Fisheries

Arrowtooth Flounder Trawl

The GOA trawl fishery for arrowtooth flounder is another target fishery which would be regulated by the proposed Gulf IR alternative, based upon NMFS Blend data for 1995 and 1996 (see Appendix A: Table 1.8.1, 1.8.2, and 1.8.3).

For the GOA Arrowtooth flounder trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that in 1995, 4 on-shore plants and 3 catcher/processors participated in this target fishery. All three C/Ps were in the over 124' categories. The data report 15 catcher boats recorded arrowtooth landings in that year. Twelve were in the 60' to 124' class, the other 3 were listed as unknown length. All delivered only on-shore.

In 1996, 4 on-shore and 13 at-sea processors participated in the fishery. All the at-sea vessels were catcher/processors. Of these, 6 were classified as greater than 124' in length (100% observed), and 7 were in the 60' to 124' category (30% observed). Records indicate that just 8 catcher vessels participated in this fishery, in this year. Six were classified as being 60' to 124' in length, 1 as under 60', and 1 of unknown length. Again, all delivered on-shore.

The GOA arrowtooth flounder target fishery has been characterized as an emerging fishery. Over the 1995 and 1996 fishing years, the total catch in this fishery has grown nearly three-fold. Based upon these Blend catch and discard data, it appears that the GOA arrowtooth flounder fishery is not species selective. For the two years examined here, roughly 50% of the total groundfish catch in this target-fishery was composed of arrowtooth. The remaining (roughly) 50% is pretty evenly distributed across numerous groundfish species. In 1995, this target fishery had an aggregate groundfish discard *rate* of a fraction under 50%. It discarded 56.8% of the arrowtooth it caught, which constituted virtually the same percentage of its total discards (56.9%). Indeed, the arrowtooth target fishery actually retained a greater percentage of its Pacific cod, 'deep water flats', shallow water flatfish, rex sole, flathead sole, and rockfish bycatch than it did its target species.

In 1996, the proportion of total groundfish catch composed of arrowtooth increased by about 6.0%, and the discard rate for this species dropped to 32.5%. At the same time, the bycatch rate of pollock and Pacific cod also increased significantly, while 'shallow water' flatfish catches declined. The discard rate for all three of these bycatch species increased sharply in this year, with virtually all of the pollock and Pacific cod, and about one-third of the shallow water flatfish bycatch being discarded in-the-round.

At-sea versus On-shore

The arrowtooth flounder target fishery in the Gulf appears to be in an early and evolving phase (see Appendix A: Tables 1.8.2 and 1.8.3). In 1995, the at-sea sector accounted for just 19% of total groundfish catch in this fishery (reportedly 862 mt). It had an aggregate discard rate of 61.5%. The on-shore sector accounted for the balance of the landings (reportedly 3,751 mt). On-shore, the aggregate discard rate was 46.9%. In 1996, the at-sea sector accounted for a fraction under 80% of the total landings in this fishery (9,756 mt), with an aggregate discard rate of 47.8%. On-shore operators' share of landings dropped to approximately 20% of the total (2,562 mt), with an aggregate discard rate of 48.9%.

In both sectors, the discard rate for Pacific cod was 100% in 1996, up sharply from 1995 when the at-sea sector retained approximately 55% of its Pacific cod bycatch (34 mt of 62 mt), and on-shore operators retained nearly two-thirds of their Pacific cod catch (145 mt of 221 mt). The at-sea sector discarded 100%

of its pollock bycatch in each year, while on-shore, pollock bycatch was reportedly discarded at a rate of 53.6% in 1995; increasing to 84.3% in 1996. No 'shallow water' flatfish bycatch was reported by the at-sea sector in 1995, and virtually none (0.8% of total groundfish catch) in 1996. For the on-shore sector, shallow water flatfish accounted for between 7.0% and 8.0% of total groundfish catch in these two years.

While the respective performance of the at-sea and on-shore sectors presents some interesting indications of a developing fishery, it may be too early to accurately predict how the GOA IR alternative will affect this fishery. On the basis of these limited data, one may assert that the impacts may be manageably small. As noted, of the species of concern, only pollock and Pacific cod are present is meaningful numbers. Had these operators been required to retain these additional fish, the increase would have been just over 2,600 mt, or about 21% of the total groundfish catch in this fishery, in 1996.

Since the majority of the total catch was represented in the at-sea sector in 1996, and this component of the fishery voluntarily chose to discard 100% of its pollock and cod bycatch in that year, this may suggest that the current at-sea fleet does not have the ability to readily retain and utilize bycatches of these species. In such a case, the 100% retention requirement mandated by the proposed GOA IR alternative could impose **significant costs** on this segment of the fishery. Because the at-sea sector appears to be increasing relative to the on-shore sector, adoption of the IR alternative could constrain further growth and redistribute shares of the total catch in this target fishery from at-sea to on-shore operators.

Deep Water Flatfish Trawl

The GOA trawl fishery for 'deep water' flatfish would be governed by the proposed Gulf IR alternative, based upon NMFS Blend data for 1995 and 1996 (see Appendix A: Table 1.9.1).

For the GOA 'deep water flats' trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that in 1995, 3 on-shore plants and 7 at-sea operators participated. One mothership and 6 catcher/processors are reported in this fishery. The mothership and 2 of the C/Ps were in the over 124' class, and 4 C/Ps were listed in the 60' to 124' category. The data report twenty catcher boats recorded 'deep water flats' trawl landings in that year. One was in the 124' and over class, 15 were 60' to 124', three were under 60', and the other was listed as unknown. Three catcher boats supplied catch at-sea, the remaining 17 on-shore.

In 1996, 5 on-shore and 3 at-sea processors participated in the fishery. All the at-sea vessels were catcher/processors. Of these, 1 was classified as greater than 124' in length (100% observed), and 2 were in the 60' to 124' category (30% observed). Sixteen catcher boats reported deep water flatfish trawl landings in 1996, of which 13 were between 60' and 124', 1 was less and 60', and 2 were of unknown length.

The NMFS Blend catch and discard data indicate that the 'deep water' flatfish fishery is relatively non-species selective. The Gulf 'deep water' flatfish trawl fishery has been responsible for only relatively small amounts of bycatch of any of the IR species of concern. Pacific cod bycatch totaled 171 mt (of which 60% were retained), out of a total groundfish catch of 3,228 mt, in 1995. In 1996, Pacific cod bycatch was 96 mt (approximately 45% was retained), out of total landings of 2,783 mt. Pollock bycatch totaled 118 mt, in 1995, all of which was discarded. In 1996, pollock bycatch dropped dramatically, both as a percent of total catch (just 0.6%) and in weight (16 mt out of 2,783 mt total catch). Bycatches of shallow water flatfish went from 138 mt (4.3% of catch) to 227 mt (8.2%). Discard *rates* for this species were very low in both years.

At-sea versus On-shore

Total reported catch in this fishery in 1995 and 1996 was relatively evenly distributed between the at-sea and on-shore sectors (see Appendix A: Table 1.9.2 and 1.9.3). The on-shore sector appears to utilize significantly more of its Pacific cod bycatch, and somewhat more of its pollock bycatch, as compared to the at-sea sector, although in neither case are the amounts very great. Shallow water flatfish bycatch is essentially not present in the at-sea sector, while it made up between 7.0% and 14% of total groundfish catch for the on-shore component, in the two years examined here.

Because bycatch quantities of IR regulated species are small, both relatively and absolutely, **no significant** adverse impacts would be expected in this fishery, should the GOA IR alternative be adopted, assuming the catch and bycatch patterns remain approximately as recorded in the base years. For example, had this fleet been required to retain 100% of the pollock and cod bycatch reported in 1996, this increase would have represented slightly over 4.0% of reported retained catch, in that year. Individual operations may experience differential impacts, based upon the size, capacity, configuration, etc., of their operation, as well as their relative share of total catch and bycatch. However, in no case would the impacts of complying with the IR alternative be expected to represent a significant burden.

Shallow Water Flatfish Trawl

The GOA trawl fishery for 'shallow water' flatfish would be impacted by the proposed Gulf IR alternative, based upon NMFS Blend data for 1995 and 1996, even during the first five years of the proposed IR action when retention of shallow water flatfish is not required (see Appendix A: Table 1.10.1).

For the GOA shallow water flatfish trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that in 1995, 7 on-shore plants and 9 at-sea catcher/processors are reported to have participated in this fishery. Four C/Ps were in the over 124', and 5 in 60' to 124' categories. The data report 38 catcher boats recorded 'shallow water' flatfish target landings in that year. Twenty-nine were in the 60' to 124' class, 7 less than 60', and 2 were listed as unknown.

In 1996, 8 on-shore and 8 at-sea processors participated in the fishery. All the at-sea vessels were catcher/processors. Of these, 2 were classified as greater than 124' in length (100% observed), and 6 were in the 60' to 124' category (30% observed). Records indicate that 27 catcher vessels participated in this fishery, in this year. Eighteen were classified as being 60' to 124' in length, 6 as under 60', and 3 of unknown length.

The NMFS Blend catch and discard data indicate that the 'shallow water' flatfish fishery is *not very species selective*. The Gulf 'shallow water' flatfish trawl fishery has been responsible for modest amounts of bycatch of pollock and Pacific cod, while in pursuit of its target. Pacific cod bycatch totaled 872 mt (of which 63.5% was retained), out of a total groundfish catch of 6,197 mt, in 1995. In 1996, Pacific cod bycatch was 3,368 mt (only about 11% was retained), out of a reported total catch of 14,799 mt. In 1995, reported pollock bycatch totaled 352 mt, 81.5% of which was discarded. In 1996, pollock bycatch was reportedly 613 mt, with 72.7% discarded in-the-round. Catches of the target shallow water flatfish went from 2,709 mt to 6,671 mt (43.7% to 45.1% of catch, respectively). Discard *rates* for the 'shallow water' species complex were, respectively, 20.6% and 10.8%, in 1995 and 1996.

At-sea versus On-shore

The on-shore sector accounted for the vast majority of total groundfish catch in this fishery in both 1995 and 1996, i.e., 81.9% and 84.6%, respectively (see Appendix A: Table 1.10.2 and 1.10.3). Likewise, on-shore operators reported catches of the target species complex nearly ten-times that of the at-sea sector in 1995; more than seven-times in 1996. The on-shore component retained a larger percentage of the shallow water flatfish taken, in both years, that did the at-sea sector.

The on-shore sector also utilized a higher percentage of its bycatch of pollock in both years, when compared to those operating at-sea. For Pacific cod bycatch, discard rates were approximately twice as high for at-sea operators as compared to on-shore, in 1995, while both sectors discarded at an equivalent rate (89%) in 1996.

Because (except in the case of at-sea operators in 1995) bycatch quantities of pollock were small, both relatively and absolutely, **no significant** adverse impacts would be expected in this fishery, should the GOA IR requirement to immediately retain 100% of pollock bycatches be adopted (assuming the catch and bycatch patterns remain approximately as recorded in the base years). If there were adverse impacts they would surely accrue most heavily to the at-sea sector of this fishery, and among this group, to the smallest and least operationally diversified vessels.

At present, the at-sea sector reportedly discards 100% of its pollock bycatch. In the case of Pacific cod bycatch, the quantities are somewhat greater, particularly in 1996 in the on-shore sector. In that year, on-shore cod bycatches were reportedly 2,782 mt, of which 2,467 mt were discarded in-the-round (an 88.7% discard rate). Representing more than 22% of the total groundfish catch for that sector, in that year, requiring 100% of this additional quantity of cod would be expected to induce operational changes. The precise nature and form of these adjustments cannot be predicted on the basis of available information. Individual operations may experience differential impacts, based upon the size, capacity, configuration, etc., of their operation, as well as their relative share of total catch and bycatch. The Council explicitly acknowledged this possibility as it debated the IR/IU management process. However, when the GOA 'shallow water' flatfish fishery is taken as a whole, the impact of complying with the GOA IR alternative, as proposed, would **not be expected to represent a significant burden.**

Flathead Sole Trawl

NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 4 on-shore processors and 9 catcher/processors participated in the 1995 flathead sole trawl fishery. Four of the catcher/processors were over 124' in length, the remaining five were in the 60' to 124' class. Just five catcher vessels are reported to have participated in this fishery in this year. Of these, 4 were between 60' and 124', 1 was less than 60'.

These data suggest that in 1996, 16 processors operated in the GOA flathead sole fishery (10 catcher/processors and 6 on-shore plants). Of the catcher/processors, 4 were greater than 124' in length (100% observer coverage), while 6 were reportedly in the 60' to 124' class. Six catcher boats were listed as participants in 1996. Five were categorized as 60' to 124' vessels, 1 was under 60'.

The NMFS Blend catch and discard data indicate that the flathead sole fishery is relatively small and among the least species selective of the GOA groundfish fisheries. Because this target fishery is so small, the reliability of especially the discard data may be in question. That is, with so few participants and such small volumes, the effect on the aggregate target-wide performance estimates of one exceptional or extreme observation can be disproportionately large. With that caveat clearly stated, the following interpretation of the Blend catch and discard data is presented for the GOA flathead sole target fishery.

In 1995, the target species (i.e., flathead sole) accounted for just under 21% of the 1,962 mt total groundfish catch reported by this fishery (see Appendix A: Table 1.11.1). In 1996, flathead sole comprised just 20.5% of the 3,452 mt a total groundfish catch in this fishery. While bycatches of pollock and shallow water flatfish comprise a small percentage of the total reported catch in this fishery (e.g., 5.5% and 2.5%, respectively, in 1995; 5.0% and 4.2% in 1996), bycatches of Pacific cod were more significant. In 1995, 15.9% of reported total groundfish catch in this fishery was made up of cod (313 mt), while nearly 70% (214 mt) was discarded in-the-round. Pacific cod bycatch was 26.9% of the reported total in 1996 (928 mt), with a discard *rate* of 93.2%, or 865 mt.

At-sea versus On-shore

Approximately 80% of the reported catch in the flathead sole fishery was attributed to the at-sea sector in 1995. That share declined to just over 62% in 1996 (see Appendix A: Table 1.11.2 and 1.11.3). Interestingly, in both years, the on-shore sector reportedly bycaught substantially more Pacific cod (in 1995, as a percentage of total catch, and in 1996 both as a percentage and in total catch weight) than did the at-sea sector. In 1996, pollock bycatch was also very much higher for the on-shore sector, both in absolute terms and as a rate. Comparison of the discard performance of the two sectors for pollock and cod was mixed. Both, however, discarded these species at high rates during the two base years under review. The 'shallow water' flatfish complex did not represent a significant component of the total reported groundfish catch of either sector.

Had the proposed GOA IR alternative been in place during these two years, the flathead sole target fishery would have been required to retain 100% of the pollock and Pacific cod bycatch it reported. It is probable that this requirement would have had a dramatic impact on this fishery. By retaining 100% of reported Pacific cod bycatch, the in-shore sector would actually have been "re-targeted" as a Pacific cod-target fishery, in both years. That is, Pacific cod bycatch exceeded the quantity of any other groundfish species or complex in the reported catch in 1996, and all but 'arrowtooth flounder' in 1995. Had all the cod bycatch been retained, as required by IR, the blend-target would have read "Pacific cod" for these operations.

The outcome for the at-sea sector may be less certain. Based on 1995 reported species composition in the retained catch, it would have been impossible for the at-sea sector to have retained 100% of its pollock and Pacific cod and still have retained a sufficient quantity of flathead sole to be categorized as a "flathead" target, unless there existed significant excess hold-capacity within this sector's fleet. In 1996, it would have been technically possible to have retained 100% of the reported pollock and Pacific cod bycatch and still have retained a sufficient quantity of flathead sole to have qualified for that target. Whether that degree of operational flexibility actually existed in this sector is beyond the scope of information available for this analysis. It does suggest, however, that the Council may wish to consider the potential implications for small-volume target fisheries of adopting GOA IR/IU, as proposed.

The aggregate impact of mandatory retention of these two species is difficult to predict. As previously stated, while the impact on any individual operation would be expected to vary, it would appear that the impact (i.e., operational burden) attributable to adoption of the proposed IR alternative could be **significant** for this fishery, as compared to others examined thus far, when this fishery is taken as a whole.

Rex Sole Trawl

The GOA trawl fishery for rex sole would be regulated by the proposed Gulf IR alternative, based upon NMFS Blend data for 1995 and 1996 (see Appendix A: Table 1.12.1).

For the GOA rex sole trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that in 1995, 4 on-shore plants and 13 catcher/processors reportedly participated in this fishery. Six of the C/Ps were over 124', and 7 were 60' to 124'. The data report 11 catcher boats recorded rex sole trawl landings in that year. One was in the over 124' class, 10 were 60' to 124' in length.

In 1996, 1 on-shore and 16 at-sea processors participated in the fishery. All the at-sea vessels were catcher/processors. Of these, 9 were classified as greater than 124' in length (100% observed), and 7 were in the 60' to 124' category (30% observed). Records indicate that just three catcher vessels participated in this fishery, in this year; all 3 classified as being 60' to 124' in length.

The NMFS Blend catch and discard data indicate that the rex sole fishery is non- species selective. According to these data, the Gulf rex sole trawl fishery has been responsible for only modest amounts of bycatch of pollock and Pacific cod. Pacific cod bycatch totaled 671 mt (of which 68.3% was discarded), out of a total groundfish catch of 13,495 mt, in 1995. In 1996, Pacific cod bycatch was 825 mt (only about 54.4% was discarded), out of a reported total catch of 15,656 mt. In 1995, reported pollock bycatch totaled 547 mt, 100% of which was discarded. In 1996, pollock bycatch was reportedly 348 mt, with 100% discarded in-the-round. Bycatches of shallow water flatfish were small in both years (46 mt in 1995, 42 mt in 1996). Discard *rates* for the 'shallow water' species complex were, respectively, 90.3% and 43.2%, in 1995 and 1996.[23]

In 1995, the GOA rex sole target fishery retained a total of 3,708 mt, out of an aggregate groundfish catch of 13,429 mt. Discards of pollock and Pacific cod, in 1995, totaled 543 mt and 457 mt, respectively. Discards of shallow water flatfish were 42 mt. In 1996, this fishery retained 5,471 mt of groundfish from a reported catch of 15,656 mt. Pollock bycatch totaled 348 mt, Pacific cod 449 mt, and 'shallow water' flatfish 18 mt, in that year.

Had the proposed IR alternative been in place in the base years, retention of 100% of the pollock and cod bycatch would have been required. The 'shallow water' flatfish could have continued to be discarded for the first five-years following implementation. This implies that, in 1995, rex sole trawlers would have been required to retain at least an additional 1,000 mt of catch. That would have represented an increase in retained catch of 27%. A majority of this would have been pollock (543 mt).

These operators have voluntarily discarded 100% of this species bycatch, which suggests that, these operations may, at present, not be configured to retain and produce a marketable product from pollock, may not have ready access to markets for pollock, or both. The proposed IR action will require that they overcome these deficiencies, avoid pollock bycatch, or exit this fishery.

Between approximately one-third and one-half of the Pacific cod bycatch in the GOA rex sole fishery was reportedly retained during the two base years. This implies that, at least some of the operations have the capability to retain and deliver a viable product from these cod bycatches. However, because a significant quantity of cod was reportedly discarded in-the-round, a 100% retention requirement would certainly result in some operational impacts. Assuming there does not exist substantial excess capacity in this fishery, operators would, 1) have to slow the prosecution of the target fishery to accommodate retention of the additional cod [and pollock], 2) avoid bycatches of IR regulated species, or 3) increase discards of one or more other species, which are currently retained, to make room for the retention of Pacific cod (and pollock). Any of these actions will impose costs on the individual operators. Some of these could be significant for

[23] Based upon NMFS catch data, at-sea operators recorded 99.5% of the total groundfish catch in the GOA rex sole fishery in 1995; 100% in 1996 (see Appendix A: Tables 1.12.2 and 1.12.3).

some operations, assuming the catch and bycatch patterns remain approximately as recorded in the base years. If there were adverse impacts, they would accrue most heavily to the smallest and least operationally diversified. The Council explicitly recognized this possibility, however, as it debated the IR/IU management process, accepting the inevitable implication.

Rockfish

Rockfish Jig

A small GOA rockfish jig fishery exists (see Appendix A: Table 1.13.1), but recorded no bycatches of pollock or shallow water flatfish, and only very small amounts of Pacific cod (i.e., 6 mt in 1995, 1 mt in 1996) all of which was apparently retained. While, on the basis of this reported Pacific cod bycatch, this fishery would be regulated by the adoption of the proposed GOA IR management program, any expected impacts would be **insignificant**.

Rockfish Longline

The GOA rockfish longline fishery is another fishery which could be marginally affected by adoption of the proposed IR alternative, although it does not target any of the species of concern.

For the GOA rockfish longline fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that were 21 on-shore and no at-sea processors participating in the 1995 fishery. A total of 109 catcher boats recorded landings of rockfish in the target longline fishery in that year. Three were between 60' and 124' (30% observer coverage), 101 were less than 60' (unobserved), and 5 were of unknown length.

In 1996, 23 processors participated in the rockfish longline fishery (1 being a catcher/processors of less than 60'). Ninety-four catcher boats are identified, 3 of which are 60' to 124' boats, 5 are of unknown length, and 86 are less than 60'.

This fishery has been very species selective, based upon NMFS Blend catch and discard data (see Appendix A: Table 1.14.1). Rockfish constituted more than 80% of the groundfish catch in this fishery in each of the base years. Of the IR species of concern, only Pacific cod was reportedly present in the catch, i.e., 29 mt in 1995; 53 mt in 1996. While all of the Pacific cod bycatch was retained in 1995, the discard rate for cod was reportedly 58.8% in 1996.

Had the IR mandate been in place during these two years, there would likely have been **no significant impact** on this fishery. This is so because no IR regulated bycatch was discarded in 1995, and in 1996 the incremental addition to total catch mandated by IR would have represented an increase of approximately 6.0% over that observed. All of the addition would have been Pacific cod, a bycatch species which these operators voluntarily retained at more than a 40% rate in 1996.

Rockfish Trawl

On the basis of its catch composition, the Gulf rockfish trawl fishery would be regulated by the adoption of the proposed GOA IR alternative.

For the GOA rockfish trawl fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that 20 at-sea and 2 on-shore processors participated in the 1995 fishery (all the at-sea operators were catcher/processors). Seventeen of these catcher/processors were greater than 124' in length, thus indicating

100%observer coverage. The remaining 3 were between 60' and 124'. Eleven catcher boats are identified, in 1995, 1 of over 124' (100% observer coverage), 10 in the 60' to 124' range.

In 1996, 7 on-shore and 16 at-sea processors participated in the GOA rockfish trawl fishery (again all at-sea operators were catcher/processors). Twelve of these vessels were greater than 124' in length, requiring 100% observer coverage, the remaining 4 were between 60' and 124' (30% observed). Six catcher boats, all of which were between 60' and 124' in length, reported landings in this fishery, in 1996.

The GOA rockfish fishery has tended to be relatively species selective, based upon NMFS Blend catch and discard data (see Appendix A: Table 1.15.1). Of the IR species of concern, only Pacific cod, in 1995, and Pacific cod and 'shallow water' flatfish, in 1996, were reported in significant numbers in the bycatch of this fishery. The relatively small amounts of pollock which do appear (141 mt, in 1995; 142 mt, in 1996) were largely discarded. Pacific cod bycatches were discarded at a rate of 62.1%, in 1995, and 92.2% in 1996. Rates of discard of the 'shallow water' flatfish complex were, respectively 12.6% and 19.7%.

If 100% retention of the pollock and Pacific cod bycatches had been required of this fishery, as proposed under the IR alternative, the increase in retained catch for this fishery would have been just a fraction over 2.0%, in 1995; approximately 3.6% in 1996.[24] On this basis, one concludes that adoption of the GOA IR alternative would have **no significant** impact on this fishery.

Atka Mackerel

Atka Mackerel Trawl

NMFS Blend catch and discard data record catches and discards for the Gulf Atka mackerel trawl fishery (see Appendix A: Table 1.16.1). Based upon those data, it is apparent that this fishery would be potentially impacted by adoption of GOA IR alternative, as proposed.

For the GOA Atka mackerel fishery, NMFS Blend, ADF&G fish ticket, and NORPAC data indicate that just 2 processors participated in the 1995 fishery, both catcher/processors of more than 124' in length. These two C/Ps account for the entire recorded catch in this year. As a result, catch and discard statistics cannot be reported for this fishery, for 1995.

In 1996, 9 catcher/processors participated in the Atka mackerel trawl harvest. All but one was greater than 124' in length (100% observer category). That one was categorized as between 60' and 124'. These were the only participants listed in this fishery, in this year.

With only a single year of data to present, it is perhaps not surprising that projecting trends or patterns in the catch and bycatch composition in this fishery is difficult. In 1996, pollock, Pacific cod, and shallow water flatfish were all present in the total catch of this fishery. Quantities of each were relatively small (i.e., pollock bycatch was estimated at 47 mt, Pacific cod at 80 mt, and 'shallow water' flatfish at 26 mt, out of a total groundfish catch of 1,530 mt). Operators discarded 100% of the pollock and Pacific cod, but retained 84% of the shallow water flatfish.

---

[24] Catches in this fishery were 92% by the at-sea sector in 1995. In 1996, their share dropped to 62% (see Appendix A: Table 1.15.2 and 1.15.3). IR regulated species are not present in significant or differential amounts between the two sectors.

Had this fishery been required to retain 100% of the cod and pollock bycatch reported in that year, the total groundfish discards for Atka mackerel trawl would have declined by more that 40% (assuming no displacement of other species in the retained catch). Based on the actual reported retained catch of 1,222 mt, the mandated retention would have represented an increase of just over 10% in total retained tonnage, for this fishery.

None of the catch or bycatch data available on the GOA Atka mackerel trawl fishery, nor any other information developed in the course of the assessment, would lead to a conclusion other than there is likely to be **no significant** impact on this fishery from adoption of the IR alternative, *ceteris paribus*.

3.2.1 Potential Aggregate Effect on Discards

Taken as a whole, the several GOA groundfish target fisheries identified above, which would be directly impacted by the proposed IR alternative, accounted for an estimated total groundfish catch in 1995 of approximately 219,000 mt. In 1996, that total was estimated to be 205,000 mt. These fisheries collectively discarded an estimated 39,272 mt of groundfish (or approximately 18% of total catch) in 1995, and 41,137 mt (or about 20% of total catch) in 1996.[25] Had the initial retention provisions of the IR alternative been in effect in these fisheries in these years, aggregate discards could have potentially been reduced by approximately 29% in 1995; approximately 31% in 1996 (assuming increased retention of IR regulated species, i.e., pollock and Pacific cod, was not substantially offset by increased discards of unregulated species). This upper-bound estimate of bycatch *savings* would have represented about 4.0% of the total GOA groundfish TAC in 1995. The impact would have been approximately 5.0% of TAC in 1996. Assuming, for sake of argument, 100% retention of 'shallow water' flatfish had been required in these two seasons, total retained catch would have increased by less than 0.7% in 1995, and just over 0.6% in 1996, all else equal.

As suggested by the data on size composition for each target fishery (see Appendix B), much of the discards of target species is composed of fish which are, by current standards, "unmarketable" (except perhaps as meal). A share of the remaining discards are presumed to be damaged, or otherwise unsuitable for retention and processing. As a result, it seems likely that the amount of additional product deriving from the proposed IR induced reductions in discards will be substantially smaller than the additional retained catch tonnage might suggest. That is, if one were to estimate the potential additional product output deriving from bycatch retention, under the GOA IR alternative, by extrapolating average product mix and recovery rates for *target species* catch in the unregulated fisheries, the estimate would likely be overstated.

While, under the proposed IR action, the mandated retained bycatch may not produce commensurately large increases in product (and may actually reduce operating revenues) it may, nonetheless, have other effects consistent with the Council's stated objectives for this action. First, by creating in the GOA a substantially equivalent regulatory environment to that which was adopted in the BSAI, with respect to retention of pollock and Pacific cod, (and eventually also designated flatfish species), the Council will have eliminated any potential economic incentive for effort and capacity to move from BSAI to GOA to avoid retention requirements, in response to implementation of IR/IU in the former management area. Second, by increasing operating costs, associated with meeting the retention requirements, the GOA IR proposal may induce operators to adopt fishing techniques to avoid, to the maximum extent practicable, catching unwanted and/or undersized fish. While the magnitude of the economic inducement to avoid bycatch will vary from operation to operation and fishery to fishery (and therefore cannot be empirically estimated), it may represent an important potential benefit attributable to adoption of the Council's GOA IR action.

---

[25] More than 40% of the total groundfish discards in these GOA fisheries is comprised of arrowtooth flounder.

3.2.2 Potentially Impacted Vessels

The potentially affected vessels, by size, operating mode, and fishery are identified in the following tables (Tables 3.2.1 and 3.2.2). The indicated "Significant Impact" of the IR proposal reflects the fleet-wide response (i.e., assumes all vessels operate at the mean). There will be individual differences in the relative compliance-burden among vessels within any given target fishery. For example, in a fishery in which the fleet-as-a-whole (likely) will experience significant (Y), compliance impacts attributable to IR/IU, one or more individual vessels may not. Alternatively, in a fishery that, on-average, is expected not to incur significant impacts (N), there may be individual vessels which will find compliance difficult. These preliminary findings do not reflect these potential differences within a fleet.

It should be noted that, while the aforementioned "significance" assessments are, by assumption, reported Gulf-wide, there is expected to be some variation in impact intensity from area to area, as noted in the following tables' footnotes. For example, in the Pacific cod trawl target fishery, the general conclusion is that IR compliance will present no significant burden for this fishery. This conclusion was verified by the IR/IU Industry Working Group at its April 1, 1997, meeting. However, while the conclusion holds for Eastern and Central Gulf operators, some Western Gulf small-boats trawling for Pacific cod in the target fishery may face substantial difficulties in fully complying with the IR mandate. Information and data are insufficient to support a detailed individual analysis of each management area within the GOA. Therefore, when specific instances of variable-impacts can be identified, they are so noted in the text and on the summary tables.

Likewise, conclusions concerning the probable impacts of 100% retention of 'shallow water' flatfish may be over-simplified, according to the IR/IU Working Group. As noted, the GOA 'shallow water' flatfish complex is composed of rock sole, yellowfin sole, butter sole, English sole, starry flounder, Petrale sole, sand sole, Alaska plaice, and other flounders. Some of these species are currently marketable, while others are not. If the shallow water flatfish bycatch composition is predominantly "marketable" flatfish species, the impact of 100% retention will be substantially less burdensome than if composed predominantly of "unmarketable" species.

Because the IR/IU proposal would delay the 100% mandate for 'shallow water' flatfish for five years following initial implementation, the likely species composition of bycatch, as well as the list of marketable/non-marketable species cannot be accurately predicted. Indeed, it is the expectation of the Council that, over the five year interval, the industry would strive to alter these two aspects of 'shallow water' flatfish bycatch, i.e., increase selectivity (avoid unmarketable fish), develop and expand markets.

Table 3.2.1 Trawl Vessel Count by Target, Length, and Processor Class [1] (Target is based on retained catch by processor, week, area, gear.)

	Mother ships	Catcher/ processors		Catchers boats			Significant Impact of Compliance (Y/N)
	Greater than 124'	Greater than 124'	60' to 124'	Greater than 124'	60' to 124'	Less than 60'	Unknown length	
1995							
Pollock bottom	-	-	-	-	15	14	3	N
Pollock pelagic	-	-	-	15	85	17	5	N
Sablefish	-	3	-	-	-	-	-	N
Pacific cod	5	9	5	3	78	53	8	N[2]
Arrowtooth	-	3	-	-	12	-	3	N[3]
Rex sole	-	6	7	1	10	-	-	N
Flathead	-	4	5	-	4	1	-	Y[4]
Flat deep	1	2	4	1	15	3	1	N
Flat shallow	-	4	5	-	29	7	2	N
Rockfish	-	17	3	1	10	-	-	N
Atka mack	-	2	-	-	-	-	-	N
1996*								
Pollock bottom	-	-	-	4	16	12	1	N
Pollock pelagic	-	-	-	12	50	21	4	N
Sablefish	-	1	-	-	-	-	-	N
Pacific cod	3	13	3	6	47	54	2	N[2]
Arrowtooth	-	6	7	-	10	2	1	N[3]
Rex sole	-	9	7	-	5	-	1	N
Flathead	-	4	6	-	6	2	2	Y[4]
Flat deep	-	1	2	-	14	3	2	N
Flat shallow	-	2	6	-	31	10	3	N
Rockfish	-	12	4	-	25	2	1	N
Atka mack	-	8	1	-	-	-	-	N

1/ Catcher/processor vessels in these fisheries with the capability to fillet product will face **no significant burden** in complying with the IR provisions (according to the Council's IR/IU Industry Working Group). Vessels limited to head and gut operation may be **significantly disadvantaged** by the retention requirement.

2/ There may be **significant impacts** on trawl catcher boats less than 60', in the Western Gulf directed fishery for Pacific cod. Because these vessels have limited room onboard, and cannot sort, inadvertent bycatches of pollock, while seeking cod, could end their trip, if all pollock must be retained. If required to land the pollock bycatch, queuing time to off-load an unsalable (or relatively less valuable) catch than the Pacific cod deliveries of competing boats could force a vessel to forego most of the short Pacific cod opening, with devastating consequences, according to industry sources (per. comm., Denby Lloyd, Aleutian East Borough, Feb. 1997).

3/ Pollock and Pacific cod discards in the arrowtooth target fishery are, reportedly, virtually entirely attributable to Regulatory requirements, and would, therefore, be unaffected by the proposed IR/IU action.

4/ For the on-shore only in this fishery reportedly, virtually all pollock and Pacific cod discards are attributable to Regulatory requirements, and would, therefore, be unaffected by the proposed IR/IU action.

Table 3.2.2 Non-trawl Vessel Count by Target, Length, and Processor Class (Target is based on retained catch by processor, week, area, gear.)[26]

	Motherships		Catcher-processors			Catchers boats			Significant Impact	
	More than 124	Less than 60	More than 124	60 to 124 feet	Less than 60	More than 124	60 to 124 feet	Less than 60	Unk.	of compliance (Y/N)
1995										
Sablefish										
Longline	-	-	9	7	-	-	57	239	11	N
Pacific cod										
Longline	1	-	7	12	1	-	36	359	14	N
Pot	3	-	2	1	1	8	70	102	6	N
Rockfish										
Jig	-	-	-	-	-	-	-	10	-	N
Longline	-	-	-	-	-	-	3	101	5	N
1996*										
Sablefish										
Longline	1	-	4	6	1	-	28	136	7	N
Pacific cod										
Jig	-	1	-	-	-	-	-	16	-	N
Longline	1	-	4	12	-	-	12	261	10	N
Pot	2	-	-	1	-	4	52	84	7	N
Rockfish										
Jig	-	1	-	-	-	-	-	12	-	N
Longline	-	-	-	-	1	-	4	88	5	N

Notes: Targets were calculated by AFSC staff. A mothership is defined as a vessel which solely operated as a mothership during a year. Likewise a catcher vessel solely operated as a catcher vessel. However a catcher-processor may have also operated as a mothership or catcher vessel in addition to catcher-processing.

* Fish Ticket data for 1996 are incomplete at this time. These data are employed to derive unique vessel counts, by fishery, by vessel category, by size class. Therefore, the totals for 1996 are subject to change as up-dated Fish Ticket data become available.

Source: NMFS Alaska Region Blend Estimate, ADFG fish tickets, and NORPAC.

[26] As proposed, it is anticipated that five-years following implementation of the GOA IR/IU alternative 100% retention of the bycatch of shallow water flatfish in all groundfish fisheries will be required. However, after examining the vessel counts with and without this additional requirement, one concludes that there are almost no additional vessels that caught some 'shallow water' flatfish, but no pollock or Pacific cod, during the base years. Therefore, the vessel counts cited above are a reasonable approximation of the number of operations which will potentially be impacted when 'shallow water' flatfish retention is added to the 100% pollock and Pacific cod retention requirement.

3.3 Delayed Implementation for Shallow Water Flatfish

From very early in the IR/IU development process, including some provision to ameliorate the most undesirable impacts of implementation of the 100% retention requirement has been a priority of the Council. Within the context of the BSAI discussion, the Council examined both a phase-in proposal and a date-certain delay for IR/IU implementation for the flatfish species of concern. Elements of the phase-in proved to be unmanageable, prompting the Council to adopt a straight-forward delay for yellowfin and rock sole.

By proposing a substantially equivalent IR/IU program for GOA, the Council explicitly incorporated the implementation delay provision for the 'shallow water' flatfish complex bycatch, as an element of the GOA analytical package. It is expected that such a provision would; 1) grant interim relief from the economic and operational burden of IR, in the case of bycatches of species for which adequate markets do not currently exist, [e.g., shallow water flatfish complex]; 2) place the industry on notice that, at a 'date-certain' in the future, 100% retention of this species complex would be required; 3) provide an opportunity and incentive for the industry to develop markets and/or improve gear selectivity; while, 4) proceeding immediately to 100% retention of pollock and Pacific cod bycatches in all GOA groundfish fisheries.

On the basis of the findings of the Implementation Issues Assessment, prepared for the Council in March 1995, and the BSAI IR/IU EA/RIR, the expectation is that by delaying implementation for the 'shallow water' species-complex only, the potentially impacted sectors will have the opportunity to make the necessary adjustments to accommodate the 100% retention requirement at the end of the fifth year of the IR/IU program. Note that the proposed delay in retention of shallow water flatfish in GOA does not affect the mandatory retention of 100% of pollock and Pacific cod, by all groundfish operations, effective immediately upon implementation of the IR/IU amendment.

A quantitative analysis of the impacts of delaying IR/IU implementation for the shallow water flatfish complex is necessarily limited by the data and probable-response information available. Nonetheless, one may project the potential discard savings that might, in theory, accrue from such a proposal. In this case, if the IR/IU requirement was delayed for five years, 'shallow water' flatfish discards could potentially continue at *"status quo" levels for five successive seasons after implementation of the 100% retention requirement* was adopted for pollock and Pacific cod. If all else is assumed constant, this means that approximately 6,800 mt of 'shallow water' flatfish (approximately 1,360 mt each year)[27] could be legally discarded during the delay. The ABC for 'shallow water' flatfish was 492,780 mt in 1995; 447,120 mt in 1996.

Clearly, the estimates of continued 'shallow water' flatfish discards, which might accrue during the five-year delay, are very crude estimates which do not account for possible adjustments by the industry to the eventual 100% retention requirement. Indeed, one would expect that the industry would take affirmative action to reduce these discards during the period of delay, since to do otherwise would almost certainly result in the kind of economic disruption and dislocation the delay was intended to ameliorate when, at the end of the five-year period, 100% retention is extended to shallow water flatfish.

[27] Approximately the average total discard of shallow water flatfish in the GOA groundfish fishery, in 1995 and 1996.

Another significant consideration associated with such a delay in implementation for this species complex would be the resulting accommodation of monitoring and enforcement concerns expressed by the agency and the Coast Guard.[28]

It was the Council's expressed desire to provide time, through provision of a delay in 100% retention for shallow water flatfish, for the GOA fishing sectors to establish and expand markets, develop new product forms, and adopt new techniques and technologies to avoid unwanted bycatches of this species complex. While a five year delay would not assure adequate time for the industry to prepare for 100% retention compliance, it would certainly increase the opportunity substantially. Secondarily, having adopted a five year delay in 100% retention of yellowfin and rock sole in the BSAI IR/IU program, the Council sought to design a "...substantially equivalent" program structure in the GOA, thus minimizing the possibility of confusion, management complexity, and monitoring/reporting/enforcement burdens on all affected parties. Adoption of this element of the proposed action achieves this objective.

3.4 Potential for Capacity and Effort Transfer

Another of the principal concerns of the Council with respect to the GOA IR/IU program, as reflected in the specific language of its problem statement, was "... the potential risk that significant capacity and effort would migrate, from the Bering Sea, to the Gulf of Alaska...", should IR/IU be adopted in the former management areas and not simultaneously in the latter. Because of the current vessel moratorium, and the expectation of a permanent license limitation program (LLP), some constraint on such movement already exists. Nonetheless, an assessment of the remaining opportunity for migration of effort and capacity has been undertaken.

Recall that LLP-qualification for harvesting vessels is not target or gear-specific (although vessels designated "catcher-only" cannot currently upgrade to "catcher/processor"). Therefore, if vessel "A" meets the qualification criteria for LLP-certification in an area as, say, a bottom pollock trawler, vessel "A" is in no way constrained by regulation to limit future fishing activity in that area to the harvest of "bottom pollock" nor, for that matter, to trawling.

Likewise, if vessel "A" qualified under LLP in multiple areas, say the Bering Sea, Eastern and Central Gulf, the vessel operator would have virtually complete latitude to move between groundfish fisheries and gear-types, within any of the areas for which it has qualified.[29]

Within this regulatory framework, then, and based upon the analysis performed by the Council staff in connection with the LLP proposal, there are (at least) 365 groundfish vessels which would have the legal ability to move between groundfish fisheries in the BSAI and one or more of the GOA management areas.

---

[28] NMFS Enforcement and Coast Guard Officers advised the Council that requiring any level of retention compliance below 100%, for a given species, would be effectively unmonitorable and unenforceable, within the context of an IR/IU program. However, a delay in implementation, as distinct from a phase-in, for one or more of the species of concern, could be accommodated, given existing monitoring and enforcement resources and practices.

[29] There are a few exceptions. The first is in the case of a vessel which fished with trawl-gear in the Eastern Gulf during the LLP qualification period. Because groundfish trawling is no longer permitted east of 140° latitude in the Eastern Gulf, this vessel would be required to switch to a legal gear-type to participate in the fisheries in this area. The second would be if a fishery was managed under ITQs, e.g., sablefish fixed-gear. Finally, access to GOA pollock and Pacific cod target fisheries is constrained by apportionments made in connection with the Council's Inshore/Offshore Amendment.

Of these, 285 are LLP-designated "catcher-only" vessels. This group is comprised of 19 boats greater than 124' in length; 154 boats in the 60' to 124' class; and 112 boats under 60' in length.

Of the 365 multi-area qualifying operations, 80 vessels are LLP-designated "catcher/processor". Forty-seven are reportedly greater than 124' in length; 31 are between 60' and 124' in length; and 2 are listed in these data as being less than 60'.

Would the implementation of IR/IU regulations in one area, but not the other, actually create a sufficient economic incentive to induce area switching? And if so, how many operations would actually shift substantial amounts of fishing effort from the Bering Sea/Aleutian Islands fisheries, into Gulf groundfish fisheries, to avoid IR/IU?

At present, these questions cannot be answered in a quantitative way. It may be sufficient to address the Council's concern, however, to note that apparently significant numbers of vessels, representing a substantial amount of fishing (and processing) capacity, will (under LLP) have the potential to move between the BSAI and GOA management areas.

The nature (if not the size) of the implications for GOA fisheries, should such an effort and capacity shift occur, are well known. They include: 1) preemption or partial displacement of current fishery participants; 2) accelerated rates of harvest of target species, leading to shortened fishing seasons; 3) accelerated rates of harvest of bycatch species [including PSC], leading to directed fishing restrictions or closures; and 4) the redistribution of fishing, processing, and support-service revenues among a broader range of participants. Some of these impacts may adversely affect "net National benefits", as a measure of retention of the Status Quo alternative, while others may have *primarily* distributional implications.

In either case, the undesirable (or unanticipated) economic and socioeconomic impacts can be largely avoided, and one of the Council's primary objectives for GOA IR/IU attained, by assuring that a "... substantially equivalent" IR/IU management program is implemented in the Gulf of Alaska, simultaneously with the IR/IU program in the Bering Sea/Aleutian Islands area.

4.0 Monitoring Compliance with Increased Retention Standards

4.1 Observer Coverage - The Role of NMFS-Certified Observers

NMFS observers have a primary responsibility to estimate the weight and species composition of the total catch to provide scientifically reliable information about fishing mortality. The disposition of catch between processed product or discards is, at present, regarded as secondary information, and is provided by the observer on the basis of the best available information. Generally, observers estimate discards by making an approximation of the percentage of fish in their samples which would have been discarded.[30] That is,

---

[30] Estimation procedures and directions to observers are prescribed in the NMFS-Observer Program training manual as follows. "Percent Retained Estimation" - The percent retained by species group represents the round weight of fish that is retained by the vessel from any given tow or set that the observer samples. Observers are to make their best estimate of the weight of whole fish of each report group category that is retained (whether retained in whole or in part) on each sampled tow or set. This figure needs to be estimated and reported on the CMA form.

There is no clear scientific way for observers to arrive at the percent retained by species group figure because of the variability in discarding that occurs on vessels, and the many different places discard takes place. Recognizing these limitations, we want observers to make an approximation based on what they see happening on their particular vessel. Because this is an approximation, corresponding time and effort given to obtaining it should be minimized and complex mathematical approaches to this task avoided.

Because the focus is the entire tow or set, observers need to take all discard into consideration. If a trawler dumps a significant portion of any sampled haul back into the sea before sorting, then none of the species groups of that haul were 100 percent retained. For example, if 30 tons of an 80 ton net were dumped, then no more than 5/8ths or 63 percent of each species group should be reported as retained. Further, if fish are falling off the belts in the factory beyond the observer sampling station and are later washed out of the vessel, these too should be considered as discard. To provide guidance, the following are acceptable methods to determine percent retained by species group for the major gear types:

Catcher/Processor Trawlers: In most instances, this estimate will only be a visual approximation based on the observer's best judgement and observations of what is going on in the factory. For this figure, it is acceptable to make your best guess. In some cases, however, the vessel may have a rigid method for selecting a certain size or sex of fish which is applied consistently to the catch. If that is true, it is acceptable to use the composition sample to determine the weight of fish that would be sorted out by size, sex, or species in the factory. It is also acceptable to just make your best estimate. In making your approximation on a catcher/processor, if any part of a fish is retained then the entire fish is counted as retained. A cursory look at factory production figures, followed up by further investigation, might make you aware that a particular species group is sometimes utilized when you thought it was always discarded.

When making an estimate of the percentage of fish being retained, avoid basing your estimate on relative *numbers* of fish. Remember that this figure is a percentage of *weight*. If small fish are being discarded and the larger ones retained, the weight percentage of retained fish is greater than their percentage by number.

If a C/P vessel puts up product but days later discards it overboard in favor of a more valuable product (high grading), it is not necessary to try to revise earlier figures for percent retained of the discarded product. Just make a note of it in your daily log.

Catcher-only Trawlers: Observers on catcher-only vessels must consider everything that is delivered to the processor as retained, regardless of whether the processor later discards it, or gives it back to the catcher to take back out to sea for discard. With that distinction, the methods are the same as a catcher-processor trawler.

observers only visually approximate the proportion of each species discarded from sampled hauls. NMFS later extrapolate this approximation to unobserved hauls.

4.2 Alternative Means of IR Compliance Monitoring

Accumulating empirical evidence from the NMFS observer program suggests that the level of compliance with any retention regulation may be expected to vary directly with the level of observer coverage. Significant portions of the GOA industry are, at present, either unobserved or have an observer onboard only 30% of the time. Even operations classified as having 100% observer coverage do not, in fact, have all hauls (lifts) or deliveries monitored. Typically an observer samples the catch of only a portion of the hauls (lifts) that the vessel makes. Further, because discards can take place at various sites on a vessel and at various times, it is not reasonable to expect an observer to monitor all discards.

In the face of reduced staff and increasing workloads, the NMFS observer program is having difficulty carrying out current scientific and monitoring responsibilities. However, no additional resources are expected in the near future. Most observers onboard vessels are fully subscribed with current duties and are unable to take on any additional tasks without changing priorities, which means eliminating other duties and responsibilities. Therefore, active NMFS-observer monitoring of the Council's retention alternative **cannot** be accomplished without additional observers and support personnel, or a significant reallocation of existing resources and priorities (although re-prioritization could undermine the observer program's ability to provide primary information for science and management).

As reported in the BSAI IR/IU EA/RIR, without adequate observer monitoring of discards, NMFS expects to be unable to assure strict "real-time" (field-based) compliance with the increased retention regulations. The Council considered several alternative monitoring options within the BSAI IR/IU context, which balance the level of compliance monitoring with the cost of achieving the desired discard savings.[31] On the basis of this analysis, the Council selected an IR monitoring approach which relies primarily on secondary data to confirm compliance. Having adopted this program in the BSAI, the Council voted, at its December 1996 meeting, to proceed with a "... substantially equivalent" program for GOA IR/IU. Because the facts and findings concerning the range of monitoring options are identical for both areas (i.e., BSAI and GOA) the extensive discussion is not repeated here. Instead, the Council's Preferred Alternative is presented as an alternative to retention of the Status Quo.

4.2.1 Monitoring Increased Retention [PREFERRED ALTERNATIVE]

The proposed IR management action would confirm retention compliance principally in two ways. The first involves the procedures for verifying IR compliance during random at-sea boardings by the Coast Guard and NMFS Enforcement Officers. In the case of an enforcement boarding, catch round weights reported in the

---

Longline Vessels: Observers on longliners normally count fish that drop off or are intentionally knocked off the line, as part of their normal sampling procedure. Count these fish as discards, apply an appropriate average weight, and calculate *by weight* what percent of each species was retained in your sample. Should drop-offs of discarded fish be so frequent that they cannot be counted separately from the sample fish, a visual approximation, as with trawlers, is acceptable. Take note also of landed target fish which are later rejected by the processing crew. If sand fleas are present, it is likely that not all the landed fish will be retained.

[31] See the extensive discussion of 'Monitoring Increased Retention Options' in the Bering Sea/Aleutian Island Groundfish Fishery Management Plan Amendment 49 EA/RIR/RFA, September 25, 1996, pages 52 -58.

vessel's fishing log would be compared to the round weight equivalent catch estimates obtained by "back-casting" from primary product weights, using standard product recovery rates (PRRs), published by NMFS. That is, boarding officers would physically inspect the product in the vessel's hold, identifying species/product form and product weight. From this information, a round weight equivalent estimate of the catch would be derived using, as an enforcement tool, standard NMFS' PRRs. This estimate would be compared to the logged catch weight. If the two sources of catch estimates, for each species of concern, are within acceptable limits, compliance with the *retention* requirement would be confirmed.[32]

One of the most serious potential shortcomings of this approach is the reliance upon fixed PRRs. Empirical evidence suggests that PRRs can vary, not only between operations, but within any single operation, over the course of the season. Such factors as the size and condition of the fish, seasonality, efficiency/performance of processing equipment, and market demands (affecting product form/quality/mix), may all influence the actual realized recovery rates for any given operation. It is possible that, for example, an operator might obtain an actual PRR which is significantly higher than the published standard, for a given period of time. In this case, if boarded, use of the standard PRR to derive an estimated round weight equivalent catch from product onboard could lead the enforcement agent to conclude that total catch was being under-logged by the operator. This could result in issuance of a citation-of-violation and (potentially) an unjustified economic and/or legal penalty.

Alternatively, if the actual realized PRR was substantially lower than the published standard, the enforcement agent might conclude, on the basis of the "back-casting" procedure, that discarding of fish in-the-round had occurred, in violation of the retention requirement, even though it had not.

It should be noted that NMFS developed standardized PRRs for use in tracking aggregate fleet performance. NMFS later required the use of PRRs when performing calculations for directed fishing and other formulas. The standard NMFS PRRs are approximations of the average product recovery rate performance observable in the fleet over a given interval of time, e.g., a fishing year, or season opening. There was never an expectation of their use in monitoring the production performance of individual operators. These fundamental difficulties with the use of a standardized PRR may require that NMFS adopt a reasonably large degree of latitude when specifying IR compliance standards.

The second means of monitoring retention compliance under this alternative would rely upon the review of catch and production reports, submitted by industry to the agency, along with the associated observer catch records. Each operation participating in any GOA groundfish fishery is required to maintain and submit regular reports to NMFS (or to the State of Alaska), on catch and/or production, e.g., Weekly Production Reports, ADF&G Fish tickets, Daily Fishing Logs, etc. On the basis of these reports, NMFS could derive estimates of total catch, by species of concern, both from catch records and by use of standard PRRs applied to reported product. These estimates could then be compared to observer catch estimates, for the same operation and period. If the two estimates agree, within some reasonable limit (to be specified in the enabling regulations), retention compliance would be assumed.

---

[32] There may be some practical difficulties with relying on hold-counts at sea. In some cases, it may not be possible to compare catch round weights with the primary product weights without escorting the vessel to port to perform a case-by-case hold count. Although a volumetric hold count may be sufficient for giving a general idea of the amount of product onboard a vessel, it is not exact. Bulkheads, conveyor belts, and other obstructions can undermine accuracy. If the logbook and volumetric hold count do not match, then a case-by-case count must be conducted in order to substantiate a violation. For a variety of reasons, including safety considerations, a case-by-case count will likely not be conducted at sea.

Reliance upon this monitoring system has several potential difficulties. First, it necessitates combining catch estimate information from different sources (observer and processor), which will lead to conflicting conclusions in some cases. For example, an observer's estimate of the total catch of a particular species could be less than the estimate of retained catch, based on applying standard PRRs to product weight. This result could occur due to; 1) expected sampling error in procedures used by the observer [density sampling, species composition sampling, etc.]; 2) incorrect measurement of the volume of fish in a bin or the weight of fish in samples; or 3) the expected difference between individual vessel PRRs and the NMFS Standard (as discussed above).

Another difficulty in this method is that observer estimates of total catch and species composition are made on a haul-by-haul basis. Production data is recorded daily and is not required to be tied to a specific haul, although record keeping and reporting requirements could be changed.

Finally, with existing observer coverage levels, it will be possible to apply this compliance verification method ***only*** to the observed hauls, and not to all catch of the vessel (or delivered to a plant).[33]

There are clearly other shortcomings with this aspect of the proposed monitoring procedure, in addition to those cited above. The most obvious may be that not all participants in the GOA IR regulated fisheries will be observed.[34] Therefore, the independent observer estimate of catch, against which the operator's own estimate would be compared, will not be available for a significant portion of the operations participating in these GOA fisheries.

This leads to the next potential limitation, which is the substantial reliance upon industry supplied catch and production reports. Indeed, unless an operator essentially "self-reports" a violation, by submitting catch logs which are in significant disagreement with its own production reports, it is highly unlikely that failure to comply with the 100% retention requirement will be detected.

In practice, the risk of detection of even relatively significant violations of the retention requirement will depend, in large part, upon random boardings and audits of the data and, thus, will vary directly with the level of resources dedicated to these enforcement functions. If, however, the objectives of the IR/IU proposal can be substantially achieved by, (1) providing an incentive for honest operators (which one assumes most are) to reduce bycatch discards, and (2) increasing the risk of detection of violations of the retention requirement, then this monitoring alternative can likely achieve this.

As proposed, this alternative would rely primarily upon existing observer, enforcement, and management staff and resources.[35] Therefore, if adopted as proposed, there would be ***no significant additional cost*** attributable to IR Compliance Monitoring in the GOA management area.

---

[33] For reference, observers sample about 60 percent of hauls on 100% observed trawl vessels, somewhat more while actually on-board 30% vessels, but obviously much less of total catch for such operations, and nothing of the catch of vessels under 60'

[34] In the GOA groundfish fisheries, the vast majority of vessels are unobserved, while many of the remainder are, at most, 30% observed.

[35] If, however, no additional resources, e.g., FTE, are forthcoming in connection with adoption of GOA IR/IU, diversion of staff from other functions to monitor, investigate, and prosecute IR/IU cases will mean reduced efforts being applied to other programs.

5.0 Other Federal Regulatory Requirements and the GOA IR/IU Program

5.1 Directed Fishing Standards (Maximum Retainable Bycatch Amounts)

NMFS annually assesses each groundfish TAC to determine how much of a species' TAC is needed as bycatch in other groundfish fisheries. The remainder is made available as a directed fishing allowance. Directed fishing is defined in regulations as, "...any fishing activity that results in the retention of an amount of a species or species group onboard a vessel that is greater than the maximum retainable bycatch (MRB) amount for that species or species group.

The MRB amount is calculated as a percentage of the species closed to directed fishing relative to the amount of other species retained onboard the vessels that are open for directed fishing. The MRB percentage of a bycatch species that may be retained is established in regulations governing the groundfish fisheries. Current regulations prohibit the retention of a species closed to directed fishing in amounts that exceed the MRB percentage, and excess catch must be discarded.

The MRB percentages established in regulations serve as a management tool to slow down the rate of harvest of a species placed on "bycatch-only" status, and to reduce the incentive to fishing vessels to target that species. Nonetheless, vessels may "top off" their retained catch of species open to directed fishing with a species on "bycatch-only" status, up to the MRB amount. For some species such as GOA rockfish and sablefish, MRB percentages are set at reduced levels to limit the amount of these species that may be harvested in topping-off activity. In most cases, however, a general default of 20 percent is established to serve as a general management tool to slow the harvest rate of species closed to directed fishing, yet avoid significant discard amounts of these species to the extent they are taken as bycatch in other open groundfish fisheries.

During the course of a fishing year, NMFS routinely closes directed fishing for specified GOA groundfish species. Directed fishing closures occur because, 1) the directed fishing allowance for a target groundfish species has been attained, 2) a fishery has reached a halibut bycatch allowance, or 3) overfishing concerns for another groundfish species taken as bycatch.

When directed fishing for a species is closed for any of these reasons, bycatch amounts of the species still *may* be retained onboard a vessel, up to the specified MRB percentage of other species open to directed fishing that are retained onboard the vessel. NMFS attempts to manage groundfish TACs so that directed fishing closures are implemented in a timely enough manner, so as to leave sufficient portions of the TAC to provide for bycatch in other fisheries. If TAC is reached, however, the species becomes "prohibited", and all catch of that species must be discarded.

5.1.1 Interactions of MRB Percentages and IR/IU

The complexity associated with monitoring and enforcing compliance with the Council's IR/IU proposal is increased if mandatory retention of pollock, Pacific cod, or 'shallow water' flatfish is secondary to NMFS regulations that require discard of the portion of the catch of these species that exceed MRB amounts (or prohibit their retention when on "prohibited" status). For example, directed fishing for GOA Pacific cod typically is closed by mid-March in the Western and Central GOA, due to the attainment of directed fishing allowances for the inshore and offshore components. The MRB percentage for Pacific cod, relative to retained groundfish, is 20 percent (except that the percentage relative to arrowtooth flounder is 5 percent). Pacific cod is a bycatch species in the flatfish and other GOA fisheries and could, if permitted, comprise more than 20 percent of the retained catch of species for which directed fishing is open.

Under the GOA IR/IU program as proposed, when Pacific cod is on DFS "bycatch-only" status, Pacific cod must be retained during a fishing trip, up to an amount that equals 20 percent of other retained groundfish species open for directed fishing.[36] However, Pacific cod bycatch amounts in excess of the 20 percent ceiling must be discarded, by regulation.

Table 5.1.1 illustrates this situation with an example of catch during a hypothetical 'shallow water' flatfish target fishery, assuming GOA IR/IU is fully implemented. Under the heading "without increased retention," is the hypothetical catch, retention, and discard of 100 metric tons of groundfish. Fishery status for all species in the catch is indicated as either "open" or "bycatch-only." Under the heading "with increased retention," the theoretical retained and discarded catch is redistributed to show that:

1. all catch of 'shallow water' flatfish must be retained because the directed fisheries for these species are open;

2. catch of groundfish open to directed fishing, other than 'shallow water' flatfish may be retained or discarded, at the discretion of the operator, subject to other regulations;

3. with the exception of Pacific cod and pollock, catch of groundfish closed to directed fishing may, at the discretion of the operator, be retained up to the MRB amount;

4. catch of Pacific cod and pollock, for which the directed fishery is closed (i.e., on "bycatch-only" status) must be retained, until the MRB amount is reached. At that point, all additional bycatch of Pacific cod or pollock must be discarded.[37]

In Table 5.1.1, groundfish species on "bycatch-only" status are shown in the bottom-half of the table. Catch of rockfish and sablefish do not exceed MRB thresholds, so all of this catch may be retained or discarded at the discretion of the operator. Under the proposed GOA IR/IU program, all of the pollock catch must be retained, because the catch of this species does not exceed the allowable MRB amount. However, if all of the Pacific cod catch of 14 mt were to be retained, the MRB threshold for this species would be exceeded. The vessel must retain Pacific cod up to 20% of the retained catch of other groundfish species for which the directed fishery is open, except that only 5 percent of the retained catch of arrowtooth flounder may be used as a basis for retaining Pacific cod bycatch. That is, in this example, [(.2 x 52 mt) + (.05 x 2 mt) = 10.5 mt retainable P. cod]. If we assume that the vessel must retain 10.5 mt of Pacific cod under IR requirements, then it must discard the remainder to comply with MRB requirements (i.e., 3.5 mt).

The example in Table 5.1.1 illustrates a simple case of one species for which the vessel operator must retain a portion of the bycatch to meet increased retention standards, while he or she simultaneously must discard the remainder to stay within MRB threshold levels, under the Pacific cod fishery closure. While the vessel operator's accounting in this example is exactly the same calculation that is currently required to maximize retention of species closed to directed fishing, the IR/IU proposal would make this process mandatory for all groundfish fishing vessels with respect to pollock, Pacific cod, and 'shallow water' flatfish.

As more fisheries are put on "bycatch-only" or "prohibited" status, it becomes more complicated for the industry, observers, and NMFS to monitor the exact quantity of bycatch species that must be retained, and

---

[36] Except, as noted, with respect to retained arrowtooth flounder.

[37] In fact, to prevent retained catch from exceeding MRB, a vessel might tend to discard too much to prevent the next haul from pulling it into a violation status.

that which must be discarded. Continuous accounting must be made of, (1) the status of all groundfish fisheries [open, bycatch-only, or prohibited status], (2) the vessel's retained catch composition, (3) how much bycatch of each species on "bycatch-only" status must be retained to comply with IR thresholds, and (4) at what point further bycatch of that species must be discarded to comply with MRB thresholds.

Options to reduce the potential amount of regulatory discards under directed fishing closures and associated MRB amounts were discussed in Section 5.1.2 of the EA/RIR/FRFA prepared for Amendment 49 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area (BSAI IR/IU program). Interested readers are referred to that discussion. No alternative to retention of the 'status quo' on this issue was deemed feasible, by the Council, at this time. Therefore, if GOA IR/IU is adopted and implemented, Directed Fishing Standards requirements will supersede IR/IU requirements whenever the two come into conflict in Gulf groundfish fisheries.

5.2 Potential Impact of IR/IU on Other Fishery Management Programs

Increased retention of Pacific cod, pollock, and 'shallow water' flatfish, under GOA IR/IU, could affect the assignment of vessels to fisheries, based on the species composition of retained catch. Vessels are assigned to fisheries for purposes of the NMFS groundfish observer program (50 CFR part 677.50), the Vessel Incentive Program (50 CFR part 679.21(f)), and fishery-specific accountability for GOA halibut bycatch (50 CFR parts 679.21(d)). An in-depth discussion of this potential impact of IR/IU is presented in Sections 5.2 and 5.3 of the EA/RIR/FRFA prepared for the BSAI IR/IU program. Those findings extend directly to the GOA proposed action, and are not repeated here.

A discussion about using scale weights of catch to monitor retention and/or utilization standards is presented in Section 5.4 of the EA/RIR/FRFA prepared for the BSAI IR/IU program. Sections 5.5 and 5.6 of the BSAI analysis also present a discussion of the potential interaction of the IR/IU program with the temporary moratorium on entry of new vessels into the groundfish fisheries, as well as, the proposed license limitation program. The results of that analysis are identical in the GOA and BSAI programs, and thus, those discussions are adopted, by reference, here.

Other Federal regulations are discussed in Section 5.7 of the BSAI IR/IU analysis that may impose costs on some segments of the industry as a direct consequence of retention and utilization requirements. These regulations include the requirement for some vessels to obtain a Certificate of Compliance, Loadline Certification, and/or Survey and Class certification. As was the finding within the context of the BSAI IR/IU program, these requirements could impose effectively insurmountable barriers for some current operators in the groundfish fisheries of the GOA.

One result could be the displacement of some vessels from the fleet and/or loss of some directed fisheries. The complete rational for these conclusions can be found in the referenced section of the BSAI Amendment 49 EA/RIR/FRFA. In summary, however, the Council concluded that removal of excess capacity, slowing of harvest rates in some fisheries, and reducing the total fishing effort were consistent with the stated objectives of the IR/IU management program.

Table 5.1.1 Hypothetical distribution of 100 metric tons of groundfish catch in the GOA 'Shallow water' flatfish fishery, without and with an increased retention requirement

Species	Status of Fishery	Without Increased Retention[a]			With Increased Retention		
		Retained	Discarded	Total	Retained[b]	Discarded	Total
Shallow water flatfish	open	36	9	45	45	0	45
Deepwater flatfish	open	2	0	2	2	0	2
Flathead sole	open	3	1	4	3	1	4
Rex sole	open	1	0	1	1	0	1
Arrowtooth flounder	open	2	14	16	2	14	16
Other groundfish	open	1	9	10	1	9	10
Subtotal		45	33	78	54[b]	24	78
Pacific cod	bye[d]	8.7	5.3	14	10.5	3.5[c]	14
Pollock	bye	1	5	6	6	0	6
Rockfish	bye	0.5	1	1.5	0.5	1	1.5
Sablefish	bye	0.5	0	0.5	0.5	0	0.5
Subtotal		10.7	11.3	22	17.5	4.5	22
Total		55.7	44.3	100	71.5	28.5	100

[a] Only catch exceeding MRB amounts must be discarded.

[b] All catch of pollock, Pacific cod and 'shallow water' flatfish must be retained, except that amounts of Pacific cod, which is closed to directed fishing, that exceed MRB amounts must be discarded.

[c] Amount of retained groundfish used to calculate retainable bycatch amounts for species on bycatch-only status.

[d] Bycatch-only status

[e] Amount of Pacific cod that must be discarded because retention would violate MRB threshold.

5.3 Economic Versus Regulatory Discards

Two general categories of discards in the groundfish fisheries, economic and regulatory, have received a great deal of attention. Section 3 of the Magnuson-Stevens Act defines the term "economic discards" to mean fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, or quality, or for other economic reasons. The term "regulatory discards" is defined to mean fish harvested in a fishery which fishermen are required by regulations to discard whenever caught, or are required by regulations to retain, but not sell.

In actuality, the distinction between these two types of discards in the Alaska groundfish fisheries often is ambiguous. Individual fishermen make bycatch and discard decisions in response to a variety of incentives and constraints that reflect the economic, social, regulatory, biological, and physical environments in which they operate, and linking a decision to a single incentive or constraint often is not possible. For example, a fisherman may be required to discard a groundfish species that is on "prohibited" status, because TAC has been reached (i.e., regulatory discard), but the fishermen would have discarded that species anyway.

NMFS has been requested to estimate the amount of regulatory and economic discards in the groundfish fisheries so that the impact of IR/IU on these types of discards may be assessed. Notwithstanding the difficulties in arriving at quantitative estimates, NMFS suggested that no more than 30 percent of the total discard amounts in the BSAI groundfish fisheries could be categorized as regulatory discards, and the remainder as economic or discretionary discards.[38]

For purposes of the GOA IR/IU analysis, the same assumption is made. The empirical data which are available clearly suggest that regulatory discards in the GOA are no less than this. If, in reality, they are greater, then discard savings estimates attributed to GOA IR/IU would be proportionately smaller. In any case, one could expect that the amount of discretionary discards under IR/IU would be reduced in Gulf groundfish fisheries from the current level (i.e., Pacific cod, pollock, or 'shallow water' flatfish will be retained that otherwise would have been discarded for purely economic reasons).

---

[38] Galen Tromble, Inseason Management Branch, Fisheries Management Division, Alaska Region, NMFS. P.O. Box 21668, Juneau, Alaska 99802.

6.0 Economic and Socioeconomic Impacts of Improved Utilization

The Council examined three different utilization alternatives within the BSAI IR/IU context. Several confounding problems were identified with specific aspects of two of the three IU proposals.[39] The Council adopted the remaining utilization alternative in connection with its BSAI amendment. As noted, at its December 1996 meeting, the Council voted to proceed with analysis of a"... substantially equivalent" GOA IR/IU program to that which was adopted in the BSAI. Relying on the extensive analysis of the range of IU options from the BSAI debate, a preferred alternative for GOA IU was identified. That alternative is treated below.

6.1 Data Sources and Analytical Assumptions

In estimating the additional output values produced from retention discard-savings, four different data sources were used, 1995 ADF&G Processor Price survey, the 1995-96 Finished Product data, the 1995-96 NMFS-observer length frequency data, and the Blend data files. The following explanation provides an overview of the methodology used, as well as its shortcomings.

For purposes of the utilization portion of this analysis, it is assumed that the 100% retention requirement is met by all operations. This is a necessary simplifying assumption, but one which may not actually be achievable under the proposed IR/IU action (see Section 3.0). Some operations may not be able to comply with this absolute retention requirement and may be forced to leave the fishery. Others may continue to discard amounts of the IR species of concern, despite the prohibition. And some "leakage"[40] is to be expected in any case. Therefore, the estimated discard-savings, cited below, must be regarded as upper-bound estimates of the potential reduction in discards and resulting product output.

6.1.1 Price Data

The price data used to calculate value for both 1995 and 1996 were a subset of the 1995 ADF&G Processor Price survey. No 1996 processor price data are currently available.

6.1.2 Observer Length Frequency Data

These data contain observer length frequency estimates for a given species in a given target fishery by year, month, day, species, gear, and three digit statistical area. For instance, the pollock length data in this file are generally from the pollock target fishery only. These length frequencies were assumed to be constant, for each IR species of concern, across all target fisheries (see Appendix B). Using this information, as well as weight:length ratios from the 1995 and 1996 GOA SAFE document and discussions with industry members as to the marketable size thresholds for each species, a marketable/non-marketable weight ratio was

---

[39] See the extensive analysis of utilization alternatives summarized in "Economic and Socioeconomic Impacts of Improved Utilization", in the Final Bering Sea/Aleutian Island Groundfish Fishery Management Plan Amendment 49 EA/RIR/RFA, September 25, 1996, pages 74-111.

[40] Leakage, in this context, is defined as whole fish which are not processed, as required under IU.

calculated for the IR species of concern. The marketable length thresholds used in this analysis are as follows: Pacific cod> 46 cm; pollock >32 cm, and 'shallow-water' flatfish>28 cm (see Appendix B).[41]

6.1.3 Finished Product Data

These data provide finished product weights by processor type (i.e. shoreside, mothership or catcher/processor), gear, and species. The price data were matched to this file for GOA processors.

6.1.4 Methodology

The marketable/non-marketable weight ratios, as well as product values and product ratios from the finished product data files, were matched to the Blend data. With the combination of these data, it is possible to crudely apportion currently discarded catch between "marketable" and "non-marketable" categories, as well as provide estimates of currently discarded tons going to meal and to "all other products". Using the price data discussed above, it is possible to provide rough estimates of the corresponding gross values of these product categories.[42]

For the GOA IU alternative, this product value was obtained by summing the value of marketable and non-marketable catch. The incremental value of the marketable catch was found by multiplying the estimate of marketable catch, less the actual retained catch, times a weighted average price for all products. The non-marketable catch estimate was assumed to be used for meal and was multiplied by the price for meal.

There are several shortcomings with the data utilized throughout this IU modeling exercise that should be noted. One complication with these data is the reporting of gear and area across various input files. For shoreside processors, no gear-type is reported in the finished product file, while the normal range of gear designations is present in the Blend data. Similarly, shoreside processors report only large areas (i.e., GOA) in the finished product file, while 3 digit statistical areas are used in the Blend data. It should also be noted that this model looks annually at an entire sector of the industry (e.g., processor mode and gear-type) and not at individual processors on a weekly basis.

Finally, the effect of Directed Fishing Standards on retention and utilization have not been factored into these estimates (see Section 5.3). The impact of DFS-discards may be considerable. Therefore, the following estimated "discard-savings" and gross product values must be regarded as upper-bound estimates. In fact, the actual savings may be **substantially lower** if regulatory discards account for a significant portion of total discarded bycatch. It has not been possible with the resources available to conduct a detailed analysis of the proportion of total discards attributable to regulatory requirements prior to release of this analysis.

Within these analytical limitations, and under the assumptions cited above, the following gross impacts can be projected for the GOA IU alternative under consideration.

---

[41] Industry sources suggested that, while using 'length' as a marketable/non-marketable indicator may be an acceptable analytical simplification, it does not reflect the complex mechanisms at work in the actual marketplace.

[42] Production costs should be deducted from these gross value estimates to obtain the appropriate net measure of product value deriving from these retained catches. These cost data are, unfortunately, not available.

6.2 GOA Improved Utilization [PREFERRED ALTERNATIVE]

The Council's GOA Utilization Alternative provides that the retained catch of the IR/IU groundfish species of concern may be processed into any form, regardless of whether or not the resulting product is suitable for "... direct human consumption." The resulting output could, therefore, be meal, bait, or any other processed product. Compliance with the IU requirement under this alternative would require only that "... no whole fish of an IR/IU species of concern (initially, pollock and Pacific cod; subsequently, 'shallow water' flatfish) be discarded in-the-round..." That is, it must either, 1) be delivered in-the-round for processing to an operation capable and authorized to process the fish, or 2) be processed onboard the catching vessel itself.[43] Specifically, some form of processing must be applied to each pollock, Pacific cod, and (after five-years) 'shallow water' flatfish taken in a GOA groundfish fishery, under this proposed action.

6.2.1 Monitoring IU Compliance

As adopted for BSAI, and proposed for GOA, monitoring utilization compliance under the IU alternative would require that the sum of the product weights of all primary and ancillary product forms, prepared from the retained catch, by species, be at least 15% of the logged catch weight of that species. In other words, if an operation recorded catches of, say, Pacific cod in a given reporting week of 100 mt, the GOA IU alternative would require that the aggregate product weight for all primary and ancillary products made from that 100 mt of cod equal at least 15 mt, to confirm compliance with the utilization standard.[44] [45]

6.2.2 An Estimate of IU Impacts on Production and Gross Value

On the basis of this IU compliance criterion, and employing the estimated increase in retained catch, by species of concern, the following conclusions can be drawn with respect to the potential impacts of adopting the GOA IU alternative.

Assuming 100% retention of each of the IR/IU species of concern, and assuming the proposed IU alternative had been in place in the 1995 fishing season, the aggregate incremental increase in product value, deriving from IR/IU discard savings from all GOA groundfish fisheries, would have totaled approximately $11 million. Add to this the retained product value (approximately $114 million, in 1995) from the species/quantities historically retained and the total output value under the proposed IU alternative would have been approximately $125 million in 1995. In 1996, the same estimates are roughly $12 million in gross product value deriving from discard- savings, $106 million in retained product value, for a total of $118 million, all else equal (see Table 6.0).

---

[43] Under the LLP, as proposed, a vessel with a "catcher-only" designation will not be permitted to process its catch. This IU alternative would, therefore, require that it deliver (or otherwise convey) IR-species to an operator with the capability and authority to process groundfish, to be in compliance. A vessel with an LLP "catcher/processor" designation could either deliver (or otherwise convey) raw fish to an authorized processor, or process IR/IU regulated catch itself, to be in compliance with this IU alternative.

[44] The 15% PRR was identified as an "acceptable" minimum utilization standard by the IR/IU Industry Working Group and adopted as part of that group's report, for purposes of this analysis, by the Council at its April 1996 meeting.

[45] Note that an operator must *simultaneously* meet the retention standard, discussed above under GOA IR, and the utilization standard to be judged in compliance with the requirements of IR/IU, i.e., compliance with either standard, in the absence of the other, is not sufficient.

As noted, these figures must be regarded as a rough upper-bound estimate, since the impact of regulatory discards on the actual IR/IU discard savings suggests totals may be significantly smaller than predicted by the raw data. Furthermore, these figures reflect gross product value estimates which do not account for the cost of production. As a result, they almost certainly overstate the potential value which may accrue from discard savings to an unknown, but perhaps significant, extent.[46]

[46] It is implicit in these estimates that no operational adjustments are made in response to the IU requirements. That is, we have not attempted to predict the response of the industry, at the advice of the IR/IU industry working group.

Table 6.0 IU AlternativeGross Values (by year, processing mode, gear, fishery, species)

	Retained Product Value ($)	Discard Savings Value ($)
1995		
MS & C/P		
Longline		
Pacific cod		
Pacific cod	4,121,648	207,110
Sablefish		
Pacific cod	5,572	40,503
Discard		
Pacific cod	0	1,586
Other		
Pacific cod		
Shallow flats	62	2,465
Pollock	0	7,047
Sablefish		
Shallow flats	0	7,815
Pollock	0	974
Pot		
Pacific cod		
Pacific cod	107,337	3,120
Trawl		
Atka Mackerel		
Pacific cod	49,387	58
Pollock	0	1,175
Pacific cod		
Pacific cod	4,924,759	473,141
Shallow flats	57,394	78,192
Pollock	1,150	230,389
Deep flats		
Pacific cod	15,962	41,212
Shallow flats	389	2,321
Pollock	0	38,214
Shallow flats		
Pacific cod	41,673	82,312
Shallow flats	233,800	45,570
Pollock	348	70,856

Table 6.0 - (cont.)

Rockfish		
Pacific cod	99,631	173,131
Shallow flats	81,645	1,171
Pollock	658	88,045
Flathead		
Pacific cod	75,052	141,265
Shallow flats	38,611	11,145
Pollock	100	56,506
Sablefish		
Pacific cod	4,876	3,698
Shallow flats	0	25
Pollock	0	6,020
Arrowtooth		
Pacific cod	29,434	25,179
Shallow flats	785	5
Pollock	0	92,580
Rex sole		
Pacific cod	179,101	415,018
Shallow flats	5,567	45,119
Pollock	1,127	338,110
Discard		
Pacific cod	0	2,238
Shallow flats	0	4,242
Pollock	0	4,327
Shoreside		
All gears		
Bot. pollock		
Pacific cod	466,303	7,911
Shallow flats	34,707	24,579
Pollock	1,424,866	22,740
Pacific cod		
Pacific cod	58,918,327	1,127,089
Shallow flats	1,432,540	953,446
Pollock	136,389	650,182
Deep flats		
Pacific cod	95,732	29,627
Shallow flats	205,207	22,894
Pollock	2,805	35,676
Shallow flats		
Pacific cod	580,154	289,111
Shallow flats	4,004,690	703,051
Pollock	36,680	109,367

Table 6.0 - (cont.)

Rockfish		
Pacific cod	110,349	4,113
Shallow flats	175,989	181,624
Pollock	0	16,570
Flathead		
Pacific cod	12,620	74,211
Shallow flats	3,339	5,743
Pollock	141	10,704
Other gf		
Pacific cod	2,396	251
Pollock	299	0
Pel. pollock		
Pacific cod	222,979	111,205
Shallow flats	5,314	98,223
Pollock	34,203,320	3,118,399
Sablefish		
Pacific cod	121,325	110,345
Shallow flats	708	646
Pollock	0	467
Arrowtooth		
Pacific cod	165,939	96,816
Shallow flats	1,359,621	284,655
Pollock	65,051	84,087
Rex sole		
Pacific cod	3,822	788
Shallow flats	677	186
Pollock	1,800	2,257
Discard		
Pacific cod	0	2,303
1995 total	$113,971,256	$10,922,142

Table 6.0 - (cont.)

1996

MS & C/P		
Longline		
Pacific cod		
Pacific cod	3,772,438	30,793
Rockfish		
Pacific cod	148	0
Sablefish		
Pacific cod	3,247	71,042
Other		
Pacific cod		
Shallow flats	0	1,790
Pollock	1	4,113
Sablefish		
Shallow flats	39	41
Pollock	0	8,170
Pot		
Pacific cod		
Pacific cod	69,869	0
Trawl		
Atka Mackerel		
Pacific cod	2,466	74,706
Shallow flats	26,140	812
Pollock	0	20,124
Pacific cod		
Pacific cod	4,713,721	198,731
Shallow flats	978	19,001
Pollock	36,609	111,519
Deep flats		
Pacific cod	5,275	33,805
Shallow flats	0	58
Pollock	0	2,615
Shallow flats		
Pacific cod	60,991	488,843
Shallow flats	810,343	61,754
Pollock	0	34,907
Rockfish		
Pacific cod	29,626	135,953
Shallow flats	3,906	16,661
Pollock	2	44,496

Table 6.0 - (cont.)

Flathead		
Pacific cod	39,866	255,174
Shallow flats	97,085	5,155
Pollock	117	20,980
Sablefish		
Pacific cod	1,735	0
Shallow flats	1,091	0
Arrowtooth		
Pacific cod	11,582	759,238
Shallow flats	34,692	40,937
Pollock	9,247	415,448
Rex sole		
Pacific cod	352,663	421,463
Shallow flats	27,660	15,364
Pollock	4,031	150,188
Discard		
Pacific cod	0	938
Shoreside		
All gears		
Bot. pollock		
Pacific cod	499,844	138,434
Shallow flats	142,739	51,503
Pollock	2,436,634	80,612
Pacific cod		
Pacific cod	57,150,287	689,478
Shallow flats	1,531,720	301,036
Pollock	86,800	493,355
Deep flats		
Pacific cod	50,043	21,606
Shallow flats	237,812	13,620
Pollock	1,743	4,804
Shallow flats		
Pacific cod	363,074	3,138,524
Shallow flats	7,366,687	490,756
Pollock	102,682	244,854
Rockfish		
Pacific cod	26,674	328,126
Shallow flats	394,006	50,946
Pollock	6,360	26,189

Table 6.0 - (cont.)

Flathead		
Pacific cod	24,548	754,646
Shallow flats	61,541	1,847
Pollock	9,810	72,380
Other gf		
Pacific cod	1,436	15,839
Shallow flats	373	174
Pollock	92	15,295
Pel. pollock		
Pacific cod	212,188	138,104
Shallow flats	577	19,272
Pollock	25,156,269	731,838
Sablefish		
Pacific cod	60,694	143,432
Shallow flats	8,871	3,465
Pollock	866	935
Arrowtooth		
Pacific cod	78,071	584,913
Shallow flats	221,635	39,244
Pollock	44,478	261,425
Rex sole		
Pacific cod	4,660	11
Shallow flats	1,143	93
Pollock	2,904	2
Discard		
Pacific cod	0	3,170
1996 total	$106,461,084	$12,306,790

NOTE: The foregoing are gross value estimates, i.e., they do not account for associated production costs, nor do they reflect the influence of regulatory discards on attainable improvements in retention. They must, therefore, be regarded as "upper-bound" estimates which likely overstate (perhaps significantly) the net value attributable to products deriving from "discard savings" under this IU option.

6.3 Contrasting the IU Alternative with the Status Quo

Based upon the forgoing analysis of the expected *gross* value deriving from discard-savings under the proposed GOA IU alternative, and within the limits of the simplifying assumptions cited above, the following general conclusions may be made.[47]

Because the proposed IU alternative does not specify, or otherwise constrain, the product forms which an operator may produce to comply with the utilization requirement, it provides the maximum flexibility and latitude to the operation to optimize production, within the constraints of its own physical plant, while achieving the primary IR/IU objectives of the Council to, 1) eliminate [to the fullest extent practicable] discards of whole pollock and Pacific cod [and eventually shallow water flatfish], and 2) utilize all retained catch. Retention of the 'Status Quo' alternative would fail to achieve these management objectives.

The GOA IU alternative, as proposed, also has the potential to produce increases in aggregate gross revenues from the additional retained and processed product (e.g, $ 11 million based on 1995 catch estimates; just over $12 million for 1996). As was the case in the BSAI analysis, net revenue estimates, attributable to IU, are not readily attainable. They would, however, be expected to be much smaller that the gross revenue projections cited above (and may, in fact, be negative).

Clearly, the foregoing represents a crude, highly simplified estimation of the potential impacts that adoption of the GOA IU alternative could impose on the target groundfish fisheries that will be regulated under this amendment. For example, it is assumed that, 1) no adjustments in product mix will be made, 2) no other sector increases catch to absorb the foregone catch of the potentially non-compliant sectors, and 3) product and hold capacity are not constraining. The first two assumptions may overstate impacts, the third may overstate the total product yield.

One could expect that, in the face of constraints on utilization of retained catch, some adjustments would be made to lessen these projected impacts. But it is unlikely, given the capacity and nature of the existing industry, that all of these adverse impacts can be ameliorated, at least in the short run.

On the basis of the foregoing analysis (and within the limitations of the simplifying assumptions made), it appears that, when compared to the Status Quo Alternative, the Council's proposed GOA IU Alternative, 1) imposes relatively insignificant economic and operational burdens on the industry, when viewed as a whole; 2) may be expected to produce discard-savings value [although the net impact may be small]; and 3) retains the maximum possible flexibility for the industry to respond to changing markets, while simultaneously achieving the Council's basic objectives of reducing discards and more fully utilizing retained catch.

The IU alternative also provides each operation the opportunity to optimally utilize its existing physical plant to comply with the IR/IU requirements, thus reducing potential short term adjustment costs. These adjustment cost could, nonetheless, be expected to be relatively most burdensome for the smallest, least mobile, and least operationally diversified participants in the fishery.

---

[47] Note that it is implicit in these estimates that no operational adjustments are made in response to the IU requirements. That is, we have not attempted to predict the response of the industry, at the advice of the IR/IU industry working group.

6.4 Fish Meal Reduction Capability

At present, meal capacity does not exist, to any significant extent, in many sectors of the GOA groundfish industry. Available data do not permit a detailed examination of the probable response of individual operations (or even individual target fisheries) to limitations on meal production. However, if one makes several simplifying assumptions, a general assessment may be possible.

It is assumed, for purposes of the following discussion, that, if an operator had fish meal production capacity, the operator would have produced some quantity of meal at some time during the fishing year. It need not have been pollock meal in the pollock fishery, or Pacific cod meal in the Pacific cod fishery, etc., but if an operator produced any meal, from any source, it is assumed the operation has meal capability; otherwise not.

Unfortunately, no information on fish meal capacity (as distinct from capability) is available for the existing plants, which would clearly bear on the ability of an operation (or sector) to convert retained bycatch into meal. Instead, only the "absence" or "presence" of meal production can be ascertained, at this time. This limits the conclusions one may draw about probable sectoral response to IR/IU requirements, or the cost of additional capacity. These data are, nonetheless, presented as a crude proxy for existing capacity. Based upon NMFS Weekly Production Reports, for both on-shore and at-sea processors, and the GOA target fisheries of concern, the following results emerge.

For the base year 1995, just one operation in the GOA groundfish at-sea sector was identified as "... having fish meal production capability". In 1996, catch and production data identify two. When GOA on-shore catch records were examined, a total of 5 processors were identified as having meal capacity. Interestingly, however, of these five facilities, three were identified as being in Dutch Harbor, one in Akutan, and one in Sandpoint. Obviously, a portion of the GOA groundfish catch is being landed and processed outside of the GOA.

The Kodiak community facility did not show up in these counts, because it is not a primary processing facility. It, nonetheless, represents a significant capital asset within the context of the proposed GOA IR/IU program, as noted below.

When these preliminary results were informally reviewed by members of the IR/IU Industry Working Group, they suggested that, with respect to the on-shore fish meal component, the Gulf should be regarded as comprised of a number of different and relatively distinct areas.[43] They report the following:

> *"Most of the pollock and Pacific cod shorebased tonnage caught in the Gulf of Alaska is delivered to Kodiak where adequate meal facilities exist."... "The Kodiak plant is perfectly capable of handling all whole fish sent for meal production."*
>
> *"There is one meal plant in the Western Gulf. The smaller Western Gulf processors may have to incur costs under IR/IU -- either for meal facility or for shipping unused fish to a meal facility."*
>
> *"The Cook Inlet/Prince William Sound area does not have meal plants, but processes only a small amount of tonnage* (of the species of concern). *Owners of several of the plants in this area say they may incur some costs, but feel IR/IU is worth the cost."*

---

[43] Chris Blackburn, Alaska Groundfish Data Bank, Re: GOA IR/IU. February 25, 1996.

"Southeast groundfish deliveries are mostly from pot and longline gear. Much of the longline deliveries are IFQ species where IR/IU is already mandated for Pacific cod. Pollock is rare in a longline or pot operation."

The major source of fish meal reduction capacity in the GOA is located in Kodiak, where Kodiak Reduction, Inc., processes discards and waste from several facilities in the community. One should not underestimate the importance to the IR/IU proposal of this operation as a source of fish reduction capacity in the GOA. Indeed, because the collective fleet of GOA groundfish fishing and processing vessels is composed of so many relatively small vessels, it is almost literally impossible for the existing fleet to acquire additional meal capacity, at-sea. It must, therefore, rely largely upon on-shore capacity (at least in the short run) to comply with the IR/IU mandate, for that portion of the bycatch which is "unmarketable" in a form other than meal.

Recently, plans to build a fish meal reduction facility at King Cove have been made public. The facility is expected to come on-line in January; 1998, coinciding with the proposed implementation date of IR/IU. The facility is designed to process 400 tons of fish and processing waste per day. Reportedly, the cost of the plant will exceed $5 million. The facility will produce both white fish meal and brown fish meal, depending upon the source of raw material.[49] This could represent an important additional capital asset available to GOA groundfish operations, as they seek to comply with IR/IU requirements.

6.4.1 Interpreting the Effects of Limited Fish Meal Capacity

The foregoing discussion indicates that fish meal reduction capability is limited and concentrated largely on-shore within the potentially impacted GOA groundfish fisheries. While "through-put" (i.e., raw material input/meal output) information for the existing reduction capacity is not currently available, it would appear that reliance on meal production as a primary means to absorb the increases in retained bycatch is, in general, not feasible for most fisheries which would come under IR/IU regulation. This may be so, not only because of the limited number of meal plants in a sector, but also due to physical and logistical considerations of operators without plants.

Precisely how prices, product supply and mix and, ultimately, consumers will be affected cannot be anticipated, although generally one would anticipate that as operating costs rise, GOA operations, which are largely "price-takers" in the groundfish marketplace, would be at an economic disadvantage vis-à-vis their larger competitors in the Bering Sea.

Certainly, fisheries with the least access to meal capacity could rely least on meal as a production response to IR/IU.[50] Some suggestion has been made that existing on-shore fish meal reduction capacity is sufficient to accommodate the demands from GOA operations without meal plants, although no empirical evidence has been offered to verify this assertion. This is certainly the case if one includes the Bering Sea meal plants in this calculation.

---

[49] Per. comm., Mr. Clyde Sterling, Peter Pan Seafoods, February 26, 1997.

[50] This result may be regarded as entirely consistent with Council expectations for IR/IU. One purpose of the proposal is to provide economic disincentives to catch unwanted fish, which this may be interpreted to provide. Another aspect of IR/IU focuses on the desire to see "meals" not "meal" produced from retained catch. This result may support that objective. Finally, some have accepted the possibility that one indirect outcome of IR/IU will be displacement of some current capacity, perhaps even loss of some target fisheries. This too may be consistent with the outcome cited here.

Even if this were assumed to be so, there are several concerns which emerge in assessing such a plan. The simple physical and logistical limits of such a scheme have already been mentioned. In addition, it is likely that deliveries of whole fish, expressly for reduction, would not produce positive revenues for the delivering vessel. Indeed, some propose that on-shore plants would charge vessels for such a service. The fee would, presumably, be whatever the market would bear (depending upon such factors as area, season, available reduction capacity, storage and holding costs, meal prices, etc.).

In some GOA fisheries, these additional operating costs for IR/IU compliance could force marginally profitable operations into unprofitability, resulting in removal of capacity from the industry. The most potentially vulnerable would be expected to include those operations with the smallest capacity to hold and transport bycatch, those most constrained in mobility, and least operationally diverse. Thus, as with other aspects of the proposed GOA IR/IU action, the potential operational and economic burden attributable to adoption of an improved retention and utilization requirement may be expected to fall disproportionately on this latter segment of the industry, while the larger, more mobile, most operationally diversified will assume a greater share of the catch and production.[51]

Alternatively, however, in the GOA a substantial majority of the fleet in question is too small to carry observer coverage. As previously noted, the level of IR/IU compliance may be directly correlated with the level of observer coverage onboard. In this case, the burden may fall most heavily upon observed vessels, since their performance may be directly scrutinized. The extent to which these outcomes will emerge following adoption and implementation of a GOA IR/IU management regime remain an empirical question. It is, however, useful to acknowledge these potentialities in weighing the alternatives.

6.4.2 Cost of Adding Fish Meal Capacity

Reliance upon meal production capacity to achieve compliance with improved utilization, under the GOA IU alternative, may be problematic for nearly all of the operations which do not already have this capability. This is so for several reasons. First, as noted, the vast majority of the vessels which currently participate in GOA groundfish fisheries are less than 124' in length, and most of these are under 60' in length. Adding *any* form of processing equipment, let alone meal reduction capacity, is literally impossible.

Second, for most vessels currently operating in the GOA groundfish fisheries, the cost (including design, installation, and operation of a meal plant) may be prohibitive. Estimates for installing a fish meal plant on an existing *vessel* are hard to acquire, since the cost would vary literally from operation to operation, depending upon the existing physical plant. However, sources familiar with such installations suggested, within the BSAI IR/IU context, that the cost of adding a fish meal plant to an existing vessel would vary with the size of the vessel and expected output of the plant. Assuming the plant was suited for production of a high quality fish meal, i.e., the product was derived from whole fish and fresh offal, the cost of even a small plant (approximate capacity 50 tons of raw material per 24 hours) would be between $1 million and $1.3 million, assuming that the existing vessel is an adequate platform (and as just noted, most in GOA are not).

Even for the very few operations which have the physical size to consider adding or supplementing processing capacity there are several other limiting factors they must confront. Among the most confounding could be the regulatory limitations imposed on retro-fitting a commercial fishing vessel with processing capacity. U.S. Coast Guard regulations pertaining to load line and vessel stability requirements present one

---

[51] Assuming any operation remains profitable in a given fishery. An alternative outcome could be that a target fishery simply ceases to exist following adoption of GOA IR/IU regulations.

such set, while the Council's own Moratorium and License Limitation Program represent others (see Section 5.0, Other Federal Regulatory Requirements and the GOA IR/IU Program).

Another consideration is that, even if a meal plant could be installed, most existing vessels without such capacity at present would not have the hold or storage capacity to retain the meal once it was produced. Without such holding capabilities, the ability to make meal would not provide a viable means of remaining operationally competitive in the fishery.

Alternative means of responding to the mandatory retention requirement, for operations currently without access to meal reduction capacity, were treated at length in the BSAI IR/IU analysis. However, because the vast majority of the groundfish fishing activity in the GOA is, 1) associated with on-shore processors, 2) conducted by small boats without the capability [or legal authority, as under LLP] to process at-sea, and, thus, 3) largely unobserved and therefore unmonitorable, 4) governed by In-shore/Off-shore apportionments of Pacific cod and pollock, or 5) regulated under ITQ provisions [including retention requirements for Pacific cod], an extensive discussion of this topic is largely unnecessary in the present context. Interested readers may consult the discussion in Section 6.6, page 118-120, of the Final EA/RIR/RFA for Amendment 49 to the Bering Sea/Aleutian Islands Groundfish Management Plan, September 25, 1996.

6.5 GOA IU Compliance

The ability of NMFS to monitor **any** utilization requirement associated with the GOA IR/IU alternative will be limited, and some leakage will be unavoidable. This is so for several reasons. First, some fish are inevitably damaged beyond use in both the fishing and processing activities of any operation and, therefore, will not be utilized, despite the IU requirement. The quantities involved would be expected to be relatively small, however.

Second, reliance upon PRRs as a tool to monitor compliance on an individual operation basis is expected to present serious difficulties (see the discussion of PRRs, above). Their applicability and precision at the individual operator level is in doubt.

Third, unlike the Bering Sea/Aleutian Islands fisheries, GOA groundfish fisheries are dominated by small vessels (see, Section 3.2.2). As a result, observer coverage of the various target fleets will be significantly thinner[52] than is the case under the BSAI IR/IU management program. Because compliance monitoring of the proposed GOA IR/IU action relies heavily upon secondary catch and production information, a significant portion of which is to be drawn from observer data-sources, the lower level of observer coverage will likely reduce the agency's ability to monitor and enforce IR/IU provision in the Gulf of Alaska.

Fourth, NOAA General Counsel has issued an opinion that the Magnuson Act does not authorize the agency to regulate utilization of catch by on-shore processors (see, Section 8.0). GOA groundfish production is dominated by the on-shore sector. In 1995, for example, 74% of the aggregate reported total catch of groundfish in the Gulf was attributed to the on-shore sector; in 1996, the figure was 71%, placing the majority of groundfish production activity in GOA beyond the regulatory authority of the agency, for IU monitoring and enforcement purposes.

In the BSAI IR/IU amendment, the Council attempted to address this potential problem by requesting that the State of Alaska adopt and implement equivalent retention and utilization requirements for the BSAI on-

[52] Thinner in the sense of the proportion of total catch in a given target fishery observed versus unobserved.

shore sector. The State expressed its willingness to do so. An equivalent action by the State of Alaska is even more crucial to program viability in the GOA IR/IU context. Failure to adopt simultaneous parallel regulations could render the Council's GOA IR/IU program functionally ineffectual. This is so because, should these parallel IR/IU regulations not be forthcoming for the on-shore sector, adoption of the GOA IR/IU alternative by the Council could not produce significant improvements in retention or utilization of bycatch. Furthermore, under these conditions, this action would likely impose a significant, disproportionate, and unjustifiable economic burden on the at-sea segment of the industry.

As a result, the expected benefits from adopting IR/IU for GOA would most probably **not** exceed the attributable costs (i.e., there would be no "net benefit" to the Nation). This argues for close coordination with the State of Alaska, if the Council decides to proceed with development of the GOA IR/IU alternative.

Fifth, no monitoring is possible beyond the primary processing level in any case. This constrains, even further, the agency's ability to assure complete IU compliance. NMFS-certified observers are not generally able to provide a level of coverage of the processing operation that could be said to represent a systematic monitoring program, given the resources available and their other duties and priorities. Establishing a corps of "utilization monitors" was contemplated by the Council's IR/IU Industry Working Group, but rejected as too costly and burdensome for the improvement in compliance that might reasonably be expected.

6.5.1 Monitoring Procedures

The method of assessing IU compliance, endorsed by the Council's IR/IU Working Group, would (as in the case of the GOA IR monitoring approach) rely primarily upon random boardings of processing vessels (and presumably "spot-checks" of plants[53]) by U.S. Coast Guard and/or NMFS Enforcement agents as an inducement to IU compliance. In addition, it could employ audits of catch and production records periodically submitted to NMFS.

An example may help to clarify this latter proposed monitoring procedure. NMFS Alaska Region would, as it currently does, monitor the catch and production records submitted to it by participating groundfish processing operations. These records could be scrutinized on the basis of the required minimum performance criteria specified in the Council's IU alternative (i.e., minimum aggregate 15% PRR) and compared to NMFS' published Standard PRRs, by product form and species. If substantial inconsistencies appear to exist between reported catch and product output, on the basis of the adopted IU performance criteria, NMFS Enforcement would be notified and (if warranted) an enforcement investigation initiated.

In the case of random boardings (or spot-checks), the logged catch of the species of concern would be compared to the product weights, by statistical reporting area, of all products onboard (or appearing in production logs). A judgment as to utilization compliance could then be made by the boarding officer, on the basis of criteria specified in the IR/IU enabling regulations, and (if necessary) an enforcement action initiated.

Leakages will occur, and should be anticipated, under this IU compliance monitoring system. However, the risk of detection of violations of the utilization requirement is expected to provide a sufficient "incentive-for-compliance" to achieve an acceptable level of adherence to the IU mandate, while recognizing the limitations of a program based on secondary-data and existing monitoring and enforcement capabilities.

---

[53] As noted, the conduct of IU compliance "spot-checks" of on-shore plants by Federal enforcement personnel would require the State of Alaska to adopt regulations extending such authority.

No provision for increased observer or enforcement resources is contained in the Council's proposed GOA IU action. Therefore, adoption would impose no significant additional administrative, monitoring, or enforcement costs, as compared to retention of the "status quo" alternative.

It is important to point out that policing of retention and utilization standards will not be strictly confined to the staff and resources expressly dedicated to IR/IU monitoring and enforcement. As noted during the BSAI IR/IU debate by Captain William Anderson, U.S. Coast Guard, at the April 1996 Council meeting:

> *"If you have an observer onboard a vessels (or at a plant), while perhaps not officially tied to this (IR/IU) program, he or she is present and walking around. If that person sees a large amount of pollock, rock sole, yellowfin, and/or Pacific cod continuously going over the side, when those fisheries are in open status, you don't need to have a specific number tied to a specific standard to say that that operation is in violation, because it can't be discarding those species; it's 100% retention. So, you have observers, you have all the crew members, you have other boats in the area, a lot of opportunities to have enough of a framework there that brings that 750 million pound (ADF&G projected discard) figure down. So I don't want to get too hung up on how well we can back calculate (round weight from product weight using PRRs) and get into arguments over the numbers, because there are other methods out there that are going to help achieve the Council's goal of dramatically reducing discards."*

The same conclusion can reasonably be extended to the administration of the proposed GOA IR/IU program.

6.6 Technical and Market Limits on Production

Provisions of the Council's IR/IU proposal will necessarily require the retention and utilization of a substantial range of sizes of fish for each of the species of concern, many of which have, heretofore, been primarily treated as discards. While some of these discards have been forced by regulations, and others have clearly been due to economic considerations, e.g., lack of markets or lower values than the primary target species, etc., still others may have occurred for technical reasons. That is, existing mechanical processing technology imposes both effective and absolute limits on the size (and to perhaps a lesser extent, species) of fish which can be efficiently converted into a product form (excluding, of course, meal reduction and freezing in-the-round).

From the standpoint of economic effects on the industry, attributable to adoption of IR/IU, existing production capacity and technology are fixed in the short run, and only marginally malleable in the intermediate-run. It will, undoubtedly, take time and perhaps significant capital investment, before the majority of prevailing production capacities can be optimally adjusted, within the current fish processing sectors, to meet IR/IU mandates. It may be useful, therefore, to consider existing technical limits which will confront the industry as it attempts to adjust to the proposed IR/IU provisions.

While each operation in these fisheries is, to a greater or lesser extent, unique in terms of configuration, capacity, and technology, all are confronted by similar limitations on what can be produced from the raw catch. These limitations may be useful indicators of the probable impact on, and response of, the industry to changes in retention and utilization requirements.

Information on size frequencies and species composition appear in Appendix B. These data suggest that size composition for each of the IR/IU species of concern present in the catch can vary significantly.

6.6.1 Size Composition

Species size composition data are drawn from NMFS observer samples of catch in the GOA groundfish fisheries for 1995 and 1996. Because of the way in which catch composition sampling is conducted, in general, size frequency data are limited to the species which is of "primary abundance" in the catch, while no size data are compiled for the other groundfish species present. That is, the pollock size frequency data reported in Appendix B are associated with samples taken during pollock fisheries, the Pacific cod size frequency are taken from sample data obtained during cod fisheries, etc. Because no equivalent data on size composition are available for the other species of concern in a given fishery's catch, it has been assumed that, for example, the size of pollock in a Pacific cod fishery is distributed as in a pollock fishery; and the size frequency of shallow water flatfish in a flathead sole fishery is distributed as in a shallow water flatfish fishery; and so forth for all possible combinations of the species of concern under IR/IU.

6.6.2 Technological Limits

Technical information (provided by Baader Fish Processing Machinery, Inc.), suggests that prevailing fish processing machinery, in general use in the industry, has absolute limits on the size of fish which can be processed. For filleting round fish, e.g., pollock and Pacific cod, these limits are highly variable, depending upon the specific machine model at hand. For the most commonly deployed machines, the range is generally from 27 cm to 66 cm. For the Baader 212, which also allows the extraction of roe, the bounds are 35 cm to 55 cm. These mechanical limits define the boundaries of possible production.

Utilizing these technical limits, in combination with the size composition data for the GOA fisheries, it appears that the proportion of catch of pollock and Pacific cod in IR/IU regulated fisheries which is too small to be processed by the available filleting technology is highly variable by fishery. This suggests that, at the lower end of the size range, technology, currently available to the industry, does not provide a means to utilize a relatively small (but not trivial), portion of the pollock and Pacific cod bycatch for anything but reduction purposes (or perhaps freezing in-the-round).

Very large fish, which cannot be mechanically processed, could perhaps be processed by hand. The issue becomes whether physical limitations, e.g., adequate space for labor intensive processing, and the economics of the fishery will accommodate such practices. Some operators will clearly have an advantage over others in this respect. That is, physical space is not typically a limiting factor for on-shore operations. It may not be for some of the largest C/P. Space will be a limiting constraint for smaller operations, however.

Similar characterizations can be made for the mandatorily retained 'shallow flats' bycatch, as well. The interested reader should refer to the frequency data presented in Appendix B. There, by target fishery and species of concern, the percentages of catch in each size frequency category are listed.

Technical information (also provided by Baader Fish Processing Machinery), suggest that each of the V-cut heading machines available on the market have absolute limits on the size of fish which can be processed. The limits range from 30 cm to 100 cm. These mechanical limits define the boundaries of possible production without substantial modification to the machines. In the case of operations which hand-process catch, these limits clearly do not apply. However, the issues of scale and cost per unit output are of concern in such cases.

The interested reader should refer to the detailed statistical data presented, by target, by species of concern, in Appendix B, to examine the implications of technical limits on flatfish catches and H&G roundfish operations, as well.

At the lower end of the size range then, *technology* currently available to the industry does not provide a means to utilize a relatively small, but non-trivial, portion of the catch in GOA groundfish fishery for anything but reduction purposes (or freezing in-the-round).

Very large fish, which cannot be mechanically processed, could be processed by hand. The issue, as before, is whether physical limitations, e.g., adequate space for labor intensive processing, and the economics of the fishery will accommodate such practices.

While the foregoing discussion identifies the limits *technology* currently imposes on groundfish processors in the GOA groundfish fisheries, the actual binding constraint on these operations is imposed by the marketplace.

6.6.3 Market Limitations[54]

In a sense, the technological limits describe what can be processed, while markets define what should be processed, at least in the short run, in a straight-forward economic sense.

Despite the industry's best efforts, it is probable that unwanted bycatches of pollock, Pacific cod, and 'shallow water' flatfishes will continue to occur in the GOA groundfish fisheries, even with the incentives provided by an IR/IU program, given the nature of the fishing technology employed. And, while industry may be expected to investigate opportunities to develop new products or markets to utilize previously discarded fish, these opportunities will take time and resources. Some may eventually yield results for the industry and benefits to the Nation, but, in the short run at least, the industry will have to deal with existing markets and product demand.

Clearly, if a profit maximizing firm expends scarce productive resources, e.g., labor, capital, etc., to produce a product for which there is no market, that firm will not remain in business for long. Similarly, if it costs $1.00 to produce $0.10 worth of output, society has "wasted" $0.90. Therefore, in order to assess the likely impact on, and response of, the industry to the proposed GOA IR/IU requirements, it is important to consider what market limitations, in addition to the technological limitation, may confront the industry as it responds to IR/IU requirements.

At present, markets dictate the following limits on groundfish products deriving from the GOA IR/IU species of concern. For pollock, the assumed minimum size fish that can currently be used to produce a marketable product is approximately 33 cm, although some minor variability exists among product forms.[55] For example, fillets generally require at least a 36 cm fish. For surimi production, the lower limit is about 300 grams (approximately 33 cm). Reportedly, pollock H&G requires a fish of no less than 350 grams, although some sources indicated that they would not buy pollock of less than 450 grams (approximately 40 cm) for H&G. Fish of as little as 400 grams (or about 38 cm) would be the lower limit for that operator's surimi production. Deep-skin blocks and IQF fillets required fish of at least 600 grams (or roughly 44 cm). Small fish, i.e., under the identified minimums, could not be utilized to produce a saleable product (other than meal) given existing markets.

---

[54] The Council should be aware of a potentially significant impact associated with requiring 100% retention of GOA Pacific cod, which does not appear to be extend to Gulf pollock or shallow water flatfish. Information provided by industry sources, and verified by AFSC scientists, suggests that, in general, GOA Pacific cod have a much greater frequency of serious parasite infestations and lesions, than is the case in the BSAI. In some areas, the problem is so severe that the fish have virtually no potential market value (except perhaps as meal). Given the limited distribution of meal reduction capacity in GOA, requiring 100% retention of Pacific cod may impose significant operational burdens on some sectors, and could have several other implications. The inclination (need?) to 'discard' Pacific cod would be greater, the more heavily parasitized the bycatch. The presence of parasites and lesions will significantly reduce the range of product-forms which can be produced from retained catch. That is, markets into which these GOA cod can be sold will be fewer and, thus, product value will be lower, reducing further the options available to operators required, under IR/IU, to retain. The problem is reportedly worst inshore and near marine mammal concentrations. This suggests that the greatest burden may fall upon smaller, less mobile operations. While perhaps most serious for Pacific cod target fisheries, under IR/IU, these impacts will extend to all GOA groundfish operations taking any amount of Pacific cod. To the extent that these fish ultimately enter the processing and distribution stream, they could, according to industry sources, adversely effect the marketing and reputation of all Pacific cod products coming out of the Gulf.

[55] The "marketable" determination implies that a final primary product, other than industrial forms (e.g., meal, bait), can be made and sold from the raw material.

The market imposed limits on Pacific cod were reportedly somewhat higher. For purposes of assessing the implications of the retention requirement, a 47 cm minimum length has been employed. Smaller fish than this minimum would generally be assumed to be reduced to meal (or perhaps frozen in-the-round for export), under the proposed GOA IR/IU action. Depending, again, on product form and market, some variation is present for this species. For example, minimum round weight for Pacific cod destined for the domestic H&G market was estimated to be approximately 900 g (about 2 pounds), while for the Japanese H&G market a minimum round weight of 1,360 g (about 3 pounds) was required.

The GOA 'shallow water' complex includes a wide variety of flatfish species (see, Footnote 1). The two species specifically referenced here are rock sole and yellowfin sole, although the conclusions are believed to be generalizable to the remaining members of this complex. Rock sole which are smaller than 29 cm in length have been assumed to be below "marketable" size, for purposes of this analysis and, as in the case of the other species of concern under IR/IU, fish smaller than this threshold have been assumed to be destined for fish meal reduction (or perhaps freezing in-the-round for export). Industry sources suggest that some size variability is associated with differences in product form. For example, current markets dictate the following limits. For rock sole H&G with roe, the minimum size fish that can be used to produce a marketable product is about 280-300 grams. For H&G without roe, the lower limit is about 250 grams. Rock sole in-the-round requires a fish of no less than 300 grams.

While these are "minimums", industry sources report that the optimum size is somewhat larger for each product form. A fish of 385 grams would be optimum for H&G with roe; for H&G without roe, 330 grams; and for rock sole in-the-round 400 grams is ideal.

The "marketable" limit defined for yellowfin sole is currently assumed to be 28 cm. That is, any yellowfin present in the catch of IR/IU regulated fisheries would be assumed to be usable only for meal production (or perhaps freezing in-the-round for export), under prevailing market conditions. One source reported that yellowfin sole weighing no less than 260 g (round weight) were marketable domestically for re-processing, while fish as small as 150 g (round) had historically been sold into the Japanese market, although nothing smaller. For the H&G market the minimum marketable size was slightly larger, 300 g round, yielding a product weight of about 180 g.

Another source reported that, when 'shallow water' flatfish complex is taken as a whole, fish in the range of 400 g round-weight, are regarded as the "lower-limit" for producing a marketable final product.

The variability of the proportion of discards composed of "marketable-size" fish between target fisheries is considerable. (For a comprehensive listing, by target/gear-type, see Appendix B).

The NMFS observer size frequency data suggest the following about *discarded* catch in GOA:

Pollock Bycatch in Pollock Target Fisheries

For the at-sea segment, in 1995, the quantity of pollock discarded in the bottom pollock fishery was very small, totaling just 9 mt, but was composed of 99.4% "marketable" sized fish. Just 0.6% were below the minimum size threshold. In 1996 in this fishery, pollock discards were virtually non-existent at just 0.6 mt.

In the at-sea pelagic pollock fishery, for 1995, pollock discards were composed of 99.5% "marketable" sized fish, 0.5% undersized. In 1996, these figures were 95.9% "marketable", 4.1% "unmarketable".

On-shore, "bottom pollock" discards of pollock were made up of 73% "marketable" sized fish 27% under market size, although total discards represented only 7.3 mt. The numbers changed dramatically in 1996, with discards rising to 110 mt, 96.3% "marketable" size, 3.7% unmarketable.

On-shore "pelagic pollock" discards were composed of 98.5% "marketable" sized fish, the remaining 1.5% being below the minimum size limit, in 1995. The following year, 98% and 2% of the discarded pollock were "marketable" and "unmarketable"size, respectively, in the on-shore pelagic sector.

Pacific cod Bycatch in Pacific cod Target Fisheries

The at-sea cod longline discards of Pacific cod, in 1995, were comprised of 88.6% "marketable" sized fish, with 11.4% being too small to sell. The same comparison in 1996 indicate that 44.7% of the cod discards were "marketable" size, with 55.3% below the limit.

For the on-shore sector, cod longliners' discards were 82.4% of "marketable" size, while 17.6% were too small, in 1995. The pattern did change somewhat in 1996, when 90% of their discards were "marketable' size fish, with the remaining 10% below market limits.

For pot caught cod, the 1995 at-sea discards were composed of 99% "marketable", 1% small sized fish. In 1996, there was no "reportable" catch or discards.

Shoreside cod pot data reveal that 85.6% of the cod discarded in 1995 were of "marketable" size, while 14.4% were not. The 1996 figures were, 86% and 14%, respectively.

Trawl Pacific cod fisheries at-sea had cod discards composed of 88.5% "marketable" sized fish, while 11.5% were not, in 1995. Discards in 1996 in this fishery were 99.3% marketable size, with the remaining 0.7% being too small.

On-shore Pacific cod trawlers' discards of cod were 82.9% "marketable" size, 17.1% below the minimum, in 1995. The pattern in 1996 was, 55.6% being large enough to sell, 44.4% being too small.

Shallow Water Flatfish Bycatch in Shallow Water Target Fisheries

The 1995 at-sea shallow water flatfish trawl fishery discards of 'shallow water' flatfish were made up of 48.1% "marketable" size fish, with the balance (51.9%) not of salable size. In 1996, just 4.2% of the discarded 'shallow water' flatfish met the market size standard, while 95.8% did not.

The on-shore fishery for this species reported bycatches composed of 80.3% marketable size shallow water flatfish, the remaining 19.7% being too small, in 1995; 56.4% marketable, 43.6% below minimum size limits, in 1996.

As noted above, the preceding summarizes only the direct relationships between "marketable" size, discards, and "target fishery", for each IR/IU species of concern. Many additional interactions between bycatch and market constraints are associated with adoption of an IR/IU requirement, since in every GOA groundfish target there is the potential for mandatory retention of all these species of concern (e.g., pollock, Pacific cod, and shallow water flatfish in the Atka trawl fishery, and the rockfish longline fishery, etc.). Those interactions are listed in Appendix B.

While some of the discards of the IR/IU species of concern can be seen to be composed of "marketable" sized fish, varying from fishery to fishery, very significant portions are too small to market (at present). To the extent that the industry is unable, 1) to substantially reduce the bycatch of, in this case, under-sized fish, and/or 2) to develop new product forms and markets through which to utilize under-sized fish, relatively substantial quantities of small pollock, Pacific cod, and 'shallow water' flatfish may be diverted into ancillary byproducts, exported in-the-round, or reduced to meal, at least in the short run, in response to the proposed GOA IR/IU regulatory action. Furthermore, the potential costs of IR/IU compliance can be expected to be distributed unevenly across the several fisheries which will be required to meet the retention standards. That is, some fisheries will be significantly burdened by 100% retention requirements, while others face a much less difficult challenge in complying. Likely, this differential impact will extend to segments within many of the potentially affected fisheries, once again with the greatest potential impacts accruing to the smallest, least mobile, and least operationally diversified participants.

Clearly, compliance will impose costs on the industry, in the form of refitting of physical plant, re-capitalization of some operations, the displacement of some capacity, and potentially slowing of the fishery, with accompanying reductions in revenues and increases in operating costs. Quantitative estimates of these impacts cannot be made, given available information. They nonetheless should be recognized as likely outcomes of adoption of the proposed GOA IR/IU action and weighed in the decision.

7.0 Improved Utilization and the Marketplace

Markets are dynamic and respond to numerous and varied forces. Unfortunately, very little analysis is presently available regarding market characteristics for most of the principal products derived from the GOA groundfish fisheries. These analytical limitations cannot be quickly or easily overcome. Therefore, such key economic aspects as price elasticities, inventory holdings, substitutional relationships, and market trends cannot be quantitatively treated in the present EA/RIR.

Notwithstanding these limitations, several qualitative observations concerning the probable response of the market to GOA IR/IU can be made. In the first five years following implementation of the GOA action, only bycatches of pollock and Pacific cod would be required to be fully retained. If catch composition is assumed essentially constant at the base-year levels, then the total quantity of additional landings, from GOA IR/IU regulated groundfish fisheries, of pollock would be expected to represent between 10% and 11% of pre-IR/IU landings, while increases in Pacific cod landings would be between 5% and 11%. If the industry, as hoped, reduced bycatches of unwanted pollock and Pacific cod by adopting alternative fishing techniques or technologies, these increases could be somewhat smaller.

7.1 Price/Market Response

While regulations can require that product be produced, they cannot guarantee how the marketplace will respond to the resulting production. For example, by requiring the individual operators to retain and utilize species for which they are ill-equipped, or with which they are unfamiliar, a further complication, in the form of a price/demand response to quality variation, may arise (at least in the short run). Because the GOA fisheries account for only a small fraction of the total domestic production of pollock and Pacific cod, these effects should have minimal impact on the aggregate market for U.S.-produced cod and pollock.[56]

Even if we assume that the high-end of the range of retained bycatch of pollock and Pacific cod in the GOA fisheries is realized, the quantities involved would be on the order of 8,000 mt round weight for each species, per year. It is apparent that an increase of this size in a U.S. domestic fishery that produces annual pollock catches in the range of 1.3 million mt to 1.4 million mt, and Pacific cod catches of more than 310,000 mt, per year, would be expected to have '**no discernable impact**' on either market supply or price.[57] Localized effects could accrue if small and/or isolated operators were required to absorb a disproportionate share of these IU induced increases, but there is no indication that such a result would occur. Because of the sheer size of the pollock and Pacific cod fisheries in the BSAI, GOA operators have very little market leverage and can be expected to be "price-takers" in this market.

When 100% retention of 'shallow water' flatfish becomes mandatory in the Gulf groundfish fisheries, the same conclusions concerning price and market response seem probable. That is, the change in catch volume and product supply attributable to the incremental increase in retained catch of 'shallow water' flatfish in Gulf groundfish fisheries, will be imperceptible in the market for flatfish into which these products flow.

---

[56] In 1995 and 1996, reported BSAI pollock catch accounted for over 95%, GOA just under 5.0%, of the aggregate catch of this species. For Pacific cod, BSAI accounted for 78%, GOA 22%, of aggregate catch in each year.

[57] Eight-thousand tons of pollock would represent an increase in total U.S. landings of this species of just over 0.5%. An equivalent quantity of Pacific cod would increase total landings of this species by 2.6%, over average 1995-96 reported levels. These percentages would be smaller yet, once BSAI IR/IU retention of 100% of that region's pollock and Pacific cod bycatch is added to total production.

This is likely so, because at the time shallow water flatfish come under the proposed IR mandate, BSAI rock sole and yellowfin sole bycatches are scheduled to be fully-retained.

8.0 Legal Authority

A December 1, 1989, memorandum from the NOAA Office of General Counsel to the North Pacific Fishery Management Council summarized the Council's authority to prohibit roe-stripping and increase retention and utilization of pollock:

4. There is authority under the Magnuson Fishery Conservation and Management Act to limit wasteful practices. Controlling wasteful practices is as legitimate a purpose as conserving a stock of fish or allocating fishing privileges. Requiring fuller utilization of a fishery resource should be justified as a means of achieving optimum yield.

2. There are a multitude of conservation and management measures, directed at harvesting activities, available to eliminate or restrict practices such as roe-stripping. These include seasons, quotas, gear requirements, discard restrictions, and catch limits.

3. There is also authority under the Act to limit wasteful practices requiring at-sea processors to retain harvested fish rather than discarding them. At-sea processing is "fishing" subject to regulation under the Act.

4. There is authority -- though not as clear-cut -- to limit wasteful practices by requiring at-sea processors to utilize fish flesh for food products and fish meal. There have been no instances thus far of directly mandating what a processor does with legally possessed fish for purposes of full utilization.

5. There is no authority to limit wasteful practices by regulating onshore processors, because onshore processors can be regulated only indirectly as an incidence of managing "fishing."

As a result of this legal opinion, the need for the Council to affirm that the State of Alaska will adopt "... substantially equivalent" regulations governing the utilization of IR/IU species by onshore processors is fundamental to the viability of the proposed GOA IR/IU amendment.

In the absence of parallel regulations, roughly 75% of total GOA groundfish production would be beyond IR/IU management authority. Under such a circumstance, it is likely that the primary objectives, identified by the Council for GOA IR/IU in its problem statement, **could not be achieved**. (i.e., the GOA IR/IU alternative would not produce significant improvements in retention or utilization of bycatch). Furthermore, under these conditions, the proposed action would likely impose a significant, disproportionate, and unjustifiable economic burden on one segment of the industry. As a result, the expected benefits from adopting IR/IU for GOA would most probably **not** exceed the attributable costs (i.e., there would likely be **no "net benefit to the Nation"**). [58]

---

[58] In addition, this becomes particularly significant from a management perspective, for the viability of the IR/IU program as it pertains to the relationship between the processing plant and the delivering vessel. It is necessary that an IR/IU program *require* a processor to accept all pollock, Pacific cod, and (eventually) 'shallow water' flatfish offered for delivery, by vessels operating in GOA IR/IU regulated fisheries. If such a requirement does not exist, rejection of deliveries would constitute effective discarding of IR/IU regulated species by the processor, and place the catcher-boat operator in an untenable position, i.e., no means of delivering the IR/IU-regulated catch, and a strict prohibition against discarding it.

9.0 Final Regulatory Flexibility Analysis

The objective of the Regulatory Flexibility Act is to require consideration of the capacity of those affected by regulations to bear the direct and indirect costs of regulation. If an action will have a significant impact on a substantial number of small entities an Initial Regulatory Flexibility Analysis (IRFA) must be prepared to identify the need for the action, alternatives, potential costs and benefits of the action, the distribution of these impacts, and a determination of net benefits.

NMFS has defined all fish-harvesting or hatchery businesses that are independently owned and operated, not dominant in their field of operation, with annual receipts not in excess of $3,000,000 as small businesses. In addition, seafood processors with 500 employees or fewer, wholesale industry members with 100 employees or fewer, not-for-profit enterprises, and government jurisdictions with a population of 50,000 or less are considered small entities. A "substantial number" of small entities would generally be 20% of the total universe of small entities affected by the regulation. A regulation would have a "significant impact" on these small entities if it reduced annual gross revenues by more than 5 percent, increased total costs of production by more than 5 percent, or resulted in compliance costs for small entities that are at least 10 percent higher than compliance costs as a percent of sales for large entities.

If an action is determined to affect a substantial number of small entities, the analysis must include:

1. a description and estimate of the number of small entities and total number of entities in a particular affected sector, and total number of small entities affected; and

2. analysis of economic impact on small entities, including direct and indirect compliance costs, burden of completing paperwork or record keeping requirements, effect on the competitive position of small entities, effect on the small entity's cash flow and liquidity, and ability of small entities to remain in the market.

9.1 Alternatives Considered for the Purpose of the RFA

9.1.1 Improved Retention Alternatives

The Council's IR proposal contains two retention options in addition to the requisite status quo option. IR Option 1 is an inclusive alternative employing a "species-based" compliance criterion for GOA groundfish fisheries, and extending IR regulations to all gear-types. Under this proposed management regime, IR/IU would mandate the retention of 100% of all four groundfish species of concern, whenever present in the catch of any BSAI groundfish fishery. For example, if pollock, Pacific cod, or shallow water flatfish, is present in the catch of an Atka mackerel target operation, or a sablefish target operation, or a Greenland turbot operation (or any other GOA groundfish fishery), then that operator would be required to retain 100% of that pollock, Pacific cod, or shallow water flatfish.

The Council explicitly acknowledged the differential implications of IR for pollock and Pacific cod, and requiring 100% retention of shallow water flatfish. The Council, therefore, requested that the analysis examine two retention suboptions. In both cases, 100% retention of pollock and Pacific cod would be required of all groundfish targets (all gear-types) beginning in the first year of the IR/IU program.

IR Suboption A. This retention suboption was analyzed extensively in the EA/RIR/FRFA for the IR/IU program in the BSAI. Under suboption A, retention of shallow water flatfish would be "phased-in," beginning in the first year of an IR/IU program (assumed to be 1998). The "phase-in" schedule would be

over either two-years or five-years, and would begin at 60% retention for flatfish. That is, in the case of a two-year phase-in (and assuming the IR/IU program starts in 1998) all GOA groundfish fisheries would be required to retain at least 60% of their shallow water flatfish in 1998; 80% in 1999; and 100% in 2000. Under a five-year phase-in, the increments would be 60% in 1998; 70% in 1999; 80% in 2000; 90% in 2001; and 100% in 2002.

IR Suboption B - [PREFERRED ALTERNATIVE]. Suboption B is a variation on a theme, taking into account the inherent difficulty of monitoring differential rates of discard below 100% as discussed in section 4.0. Under this suboption, 100% retention of pollock and Pacific cod would be required of all BSAI groundfish fishery participants, beginning in the first year of the IR/IU program. Retention requirements for shallow water flatfish would, however, be postponed for five-years, at which time the 100% retention requirement would extend to these two species, as well. That is, if the IR/IU program is adopted and implemented in 1998 (as anticipated) 100% retention of the pollock and Pacific cod catch, in all groundfish fisheries in the GOA will be mandatory. No specific retention requirement would be applied to shallow water flatfish at that time. However, under the five-year delay (assuming 1998 as the starting date), beginning in 2002 and every year thereafter, 100% of the catch of shallow water flatfish in any GOA groundfish fishery would be required to be retained.

9.1.2 Improved Utilization Alternatives

The Council's IR/IU proposal for the BSAI contained three Utilization Options, plus the status quo alternative, which are repeated here. Options 2 and 3 each contain three suboptions. The family of options and suboptions is intended to define the uses which may be made of retained catches of Alaska pollock, Pacific cod, and shallow water flatfish under IR/IU. As such, they pertain only to the use of these three groundfish species, allowing all other groundfish species to be used (or discarded) at the discretion of the operator.

Utilization Option 1 - [PREFERRED ALTERNATIVE]. Utilization Option 1 can be characterized as potentially the least restrictive of the three options under consideration, in as much as it provides that the retained catch of the four groundfish species of concern may be processed into any form, regardless of whether or not the resulting product is suitable for direct human consumption. The resulting product form could, therefore, be meal, bait, or any other processed product.

Utilization Option 2. Containing specific provisions governing the form of the products which may be produced from retained catches of the four species of concern, Utilization Option two is potentially the *most restrictive* of three options. It requires that all retained pollock, Pacific cod, and shallow water flatfish be processed into a product form for direct human consumption, based upon a percentage of total round weight of harvest of each respective species of concern. The three suboptions under Option 2 specify the minimum percentage of the retained catch of the species of concern which must be processed for direct human consumption," i.e., the percentage which may not be processed into either meal or bait. The respective suboption thresholds are: Suboption A - 50%; Suboption B- 70%; and Suboption C - 90%.

Utilization Option 3. The final utilization option under consideration speaks directly to limits on the production of fish meal from the retained catch of the four species of concern, without direct reference to the issue of direct human consumption. Specifically, Utilization Option 3 provides that reduction of pollock, Pacific cod, and shallow water flatfish to meal be limited to a maximum percentage of the retained catch of the species of concern. The three suboptions establish these maximum meal rates as follows: Suboption A - 50%; Suboption B - 30%; Suboption C - 10%. Thus, under the respective suboptions A through C, 30%,

70%, and 90% of the retained catch of the four species of concern could be processed into any product form, except meal.

9.1.3 Other Alternatives Considered and Rejected by the Council

During the development of the IR/IU program, the Council considered a number of other alternatives to address the problem of discards in the groundfish fisheries off Alaska. In addition to the IR/IU program alternative programs under analysis included individual fishing quotas for groundfish species and a "Harvest Priority" program, which would provide for quota set-asides for vessels exhibiting low bycatch rates of non-target species. These alternative programs were rejected in favor of retention and utilization requirements because the IR/IU program was seen as the most expeditious way of reducing groundfish discards. The Council also considered exemptions and phase-in periods based on vessel size. However, these proposals were rejected because they would have diluted the expected reductions in bycatch and discards and were thought to provide an unfair competitive advantage to a certain sector of the industry.

In addition, the Council considered and rejected various voluntary programs to reduce bycatch and discards because it was believed that voluntary efforts would not meet the statutory requirements of the Magnuson-Stevens Act. Section 303(a)(11) of the Magnuson-Stevens Act requires the Council to "establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority--(A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided." In implementing this provision of the Act, the Council is further required under section 313(f) to "submit conservation and management measures to lower, on an annual basis for a period of not less than 4 years, the total amount of economic discards occurring in the fisheries under its jurisdiction." The proposed IR/IU program, submitted by the Council, is intended to meet these statutory requirements.

9.2 Economic Impact on Small Entities

Most of the vessels participating in the groundfish fisheries off Alaska which will be regulated under the proposed IR/IU action meet the definition of a small entity under the RFA. IR Option 1, in combination with any of the three IU Options under consideration, could result in a significant economic impact on a substantial number of small entities, as that concept is defined for purposes of the RFA.

The specific economic impacts of the proposed action on small entities in each sector of the groundfish industry are addressed in detail in sections 3.0 and 6.0 of this document and are summarized below. Sections 3.0 and 6.0 of the analysis examined the economic effects of this proposed rule by fishery and gear type and made the following conclusions: (1) The economic effects on longline, pot and jig gear vessels would not be significant.; (2) the economic effects on trawl vessels participating in the pollock, sablefish, deep water flatfish, shallow water flatfish, rockfish, and Atka mackerel fisheries also would not be significant; (3) the economic effects on trawl vessels participating in the Pacific cod, arrowtooth flounder, rex sole, and, flathead sole fisheries would be significant. Compliance with the proposed rule could impose significant operational costs on these fisheries, taken as a whole. Furthermore, for fish for which markets are limited or undeveloped, e.g., small Pacific cod, and some flatfish species, 100 percent retention requirements would impose direct operational costs which probably cannot be offset (in whole or in part) by expected revenues generated by the sale of the additional catch. No quantitative estimate can be made of these costs at present.

In general, the impacts on any operation would vary inversely with, for example, size and configuration of the vessel, hold capacity, processing capability, markets and market access, as well as the specific composition and share of the total catch of the three IR/IU species. The burden will tend to fall most heavily

upon the smallest, least diversified catcher/processor in the current fleet. The vessel moratorium and license limitation programs, as well as Coast Guard load-line requirements, place severe limits on reconstruction to increase vessel size and/or processing capacity, which will further limit the ability of smaller catcher/processors to adapt to the proposed IR/IU program.

NMFS is currently undertaking a number of efforts to reduce the impact of the proposed IR/IU program on small entities, including ongoing research on fishing gear and fishing techniques. NMFS is supporting and providing technical assistance to industry-based gear research efforts, and has authorized a large-scale experimental fishing permit proposal to systematically test the effects of a open-top intermediate trawl configuration on bycatch of pollock and Pacific cod in the flatfish fisheries. NMFS is also funding university-based gear research through the Saltonstall-Kennedy Grant Program including a study to examine the effects of various mesh size configurations on bycatch of undersize pollock in pelagic trawl fisheries. The objective of these efforts is to provide industry with information that will assist in the development of more selective fishing gear and fishing techniques in the groundfish fisheries off Alaska.

9.3 Response to Comments on the IRFA

No comments were received on the IRFA, FMP amendment or proposed rule.

10.0 NEPA and E.O. 12866 Conclusions

The GOA IR/IU alternative would not result in a "Significant Regulatory Action", as defined in E.O. 12866.

Neither is the GOA IR/IU alternative likely to significantly affect the quality of the human environment. Therefore, the preparation of an environmental impact statement for the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

11.0 Document Prepared by

Lewis E. Queirolo	AFSC - National Marine Fisheries Service
David A. Colpo	AFSC - National Marine Fisheries Service
Angie Greig	AFSC - National Marine Fisheries Service
Patricia Livingston	AFSC - National Marine Fisheries Service
Susan J. Salveson	AKR - National Marine Fisheries Service
Kent A. Lind	AKR - National Marine Fisheries Service

12.0 References

Anon. 1994. Report of the working group on ecosystem effects of fishing activities. International Council for the Exploration of the Sea, ICES CM 1994/Assess/Env:1, 109 p.

Browder, J.A. 1983. A simulation model of a near-shore marine ecosystem of the north- central Gulf of Mexico. In: K.W. Turgeon (ed.), Marine ecosystem modeling: proceedings from a workshop held April 6-8, 1982 in Frederick, MD, by the U.S., p.179-222.

DeGange, A.R. and G.A. Sanger. 1987. Marine birds. p 479-524. In: D.W. Hood and S.T. Zimmerman (eds) The Gulf of Alaska. NOAA/MMS, Anchorage, AK.

Evans, S.M., J.E. Hunter, Elizal, and R.I. Wahju. 1994. Composition and fate of the catch and bycatch in the Farne Deep (North Sea) *Nephrops* fishery. ICES J. Mar. Sci. 51:155-168.

Feder, H.M. and S.C. Jewett. 1987. The subtidal benthos. p. 347-396. In: D.W. Hood and S.T. Zimmerman (eds) The Gulf of Alaska. NOAA/MMS, Anchorage, AK.

Fujioka, J.T., M.F. Sigler and S.A. Lowe. 1996. Sablefish. In: Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council, 605 W. 4th Ave, Suite 306, Anchorage, AK 99501.

Hatch, S.A., G.V. Byrd, D.B. Irons, and G.L. Hunt, Jr. 1993. Status and ecology of kittiwakes (*Rissa tridactyla and R. brevirostris*) in the North Pacific. *In*: K.Vermeer, K.T. Briggs, K.H. Morgan, and D. Siegel-Causey (eds). The status, ecology, and conservation of marine birds of the North Pacific. Can. Wildl. Serv. Spec. Publ., Ottawa.

National Marine Fisheries Service (NMFS). 1995. Increased Retention/Increased Utilization Implementation Issues Associated with the BSAI Mid-water Pollock and BSAI Rock Sole Fisheries. NMFS-Alaska Fisheries Science Center, 7600 Sand Point Way N.E., Seattle, Washington 98115. (Revised, September 1995).

National Marine Fisheries Service (NMFS). 1995. An Improved Retention Program for the BSAI Groundfish Fisheries. Alaska Region-Alaska Fisheries Science Center. National Marine Fisheries Service. NMFS-Alaska Fisheries Science Center, 7600 Sand Point Way N.E., Seattle, Washington 98115.

National Marine Fisheries Service (NMFS). 1996. Final Environmental Assessment/Regulatory Impact Review/Regulatory Flexibility Analysis for Amendment 49 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area to Implement an Improved Retention - Improved Utilization Groundfish Management Program. Alaska Region-Alaska Fisheries Science Center. National Marine Fisheries Service. NMFS-Alaska Fisheries Science Center, 7600 Sand Point Way N.E., Seattle, Washington 98115.

National Marine Fisheries Service (NMFS). 1997. Environmental Assessment for 1997 Groundfish Total Allowable Catch Specifications. NMFS-Alaska Region, P.O. Box 21668, Juneau, Alaska 99802-1668.

North Pacific Fishery Management Council. 1996. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. NPFMC, 605 W. 4th Avenue, Suite 306, Anchorage, Alaska 99501.

Queirolo, L.E. 1988. Measuring the Economic Implications of Prohibited Species By-Catch Mortality, Including Loss of Reproductive Potential, in Nonselective Multispecies Commercial Fisheries. U.S. Dep.Commer., NOAA Tech. Memo. NMFS F/NWC-131, 97 p.

Queirolo, L.E., L.W. Fritz, P.A. Livingston, M.R. Loefflad, D.A. Colpo, and Y.L. deReynier. 1995. Bycatch, Utilization, and Discards in the Commercial Groundfish Fisheries of the Gulf of Alaska, Eastern Bering Sea, and Aleutian Islands. NOAA Tech. Memo. NMFS-AFSC-58, 148 p.

Sproul, J.T. and L.E. Queirolo. 1994. Trade and Management: Exclusive Economic Zones and the Changing Japanese Surimi Market. Marine Fisheries Review. Vol.56 No.1 pp.31-39.

Stevens, B.G., and J.A. Haaga. 1994. Ocean dumping of seafood processing wastes: Comparisons of epibenthic megafauna sampled by submersible in impacted and non-impacted Alaskan bays and estimation of waste decomposition rate. Unpublished manuscript, National Marine Fisheries Service, Kodiak Laboratory, P.O. Box 1638, Kodiak, AK 99615.

Thomas, G.L. 1994. Economically and ecologically responsible fish waste recycling in Orca Inlet, Prince William Sound, Alaska. Research proposal by Prince William Sound Science Center, P.O. Box 705, Cordova, AK 99574.

Walsh, J.J., and C.P. McRoy. 1986. Ecosystem analysis in the southeastern Bering Sea. Cont. Shelf Res. 5:259-288.

Wassenburg, T.J., and B.J. Hill. 1987. Feeding by the sand crab, *Portunus pelagicus*, on material discarded from prawn trawlers in Moreton Bay, Australia. Mar. Biol. 95:387-393.

Wassenburg, T.J., and B.J. Hill. 1990. Partitioning of material discarded from prawn trawlers in Moreton Bay. Aust. J. Mar. Freshwat. Res. 41:27-36.

Yang, M-S. 1993. Food habits of the commercially important groundfishes in the Gulf of Alaska in 1990. NOAA Tech. Memo. NMFS-AFSC-22. 150p.

Table 1.1.1 Catch and discards of groundfish in the Bottom Pollock trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	2,806	78.7%	35	15.1%	1.3%
Pacific cod	430	12.1%	22	9.3%	5.0%
Shallow	30	.8%	6	2.7%	21.5%
Arrowtooth	82	2.3%	82	35.0%	100.0%
Deep flat	1	.0%	1	.5%	100.0%
Flathd sole	51	1.4%	10	4.1%	18.7%
Rex sole	10	.3%	4	1.7%	38.2%
Rockfish	17	.5%	0	.2%	2.2%
Oth/unk	138	3.9%	74	31.5%	53.2%
Groundfish total	3,565	100.0%	234	100.0%	6.6%
1996					
Pollock	4,121	74.1%	153	15.4%	3.7%
Pacific cod	538	9.7%	110	11.1%	20.5%
Shallow	155	2.8%	45	4.5%	29.0%
Arrowtooth	498	8.9%	474	47.6%	95.2%
Deep flat	2	.0%	.	.	.
Flathd sole	14	.3%	6	.6%	39.7%
Rex sole	7	.1%	1	.1%	16.6%
Rockfish	1	.0%	1	.1%	100.0%
Oth/unk	225	4.1%	205	20.6%	90.9%
Groundfish total	5,562	100.0%	995	100.0%	17.9%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.2.1 Catch and discards of groundfish in the Pelagic Pollock trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	66,968	98.9%	4,980	92.0%	7.4%
Pacific cod	292	.4%	96	1.8%	33.0%
Shallow	10	.0%	6	.1%	58.6%
Sablefish	<1	.0%	<1	.0%	100.0%
Arrowtooth	205	.3%	199	3.7%	97.1%
Flathd sole	18	.0%	17	.3%	95.9%
Rex sole	10	.0%	10	.2%	100.0%
Rockfish	7	.0%	4	.1%	59.1%
Atka mack.	8	.0%	8	.1%	100.0%
Oth/unk	208	.3%	95	1.8%	45.6%
Groundfish total	67,724	100.0%	5,414	100.0%	8.0%
1996					
Pollock	42,956	98.9%	1,440	84.6%	3.4%
Pacific cod	291	.7%	109	6.4%	37.5%
Shallow	19	.0%	19	1.1%	97.7%
Arrowtooth	86	.2%	74	4.4%	86.5%
Flathd sole	22	.0%	17	1.0%	76.5%
Rex sole	1	.0%	1	.1%	70.4%
Rockfish	2	.0%	2	.1%	100.0%
Oth/unk	55	.1%	41	2.4%	74.5%
Groundfish total	43,432	100.0%	1,703	100.0%	3.9%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.3.1 Catch and discards of groundfish in the Pacific cod longline fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	73	.6%	23	1.4%	31.4%
Pacific cod	10,758	88.0%	360	22.7%	3.3%
Shallow	5	.0%	5	.3%	98.0%
Sablefish	40	.3%	8	.5%	21.0%
Arrowtooth	575	4.7%	575	36.3%	100.0%
Deep flat	<1	.0%	<1	.0%	100.0%
Flathd sole	5	.0%	5	.3%	100.0%
Rockfish	69	.6%	4	.2%	5.2%
Atka mack.	1	.0%	1	.1%	100.0%
Oth/unk	699	5.7%	601	38.0%	86.0%
Groundfish total	12,225	100.0%	1,583	100.0%	12.9%
1996					
Pollock	41	.4%	22	3.4%	52.5%
Pacific cod	9,907	94.6%	197	31.2%	2.0%
Shallow	4	.0%	3	.5%	87.8%
Sablefish	13	.1%	.	.	.
Arrowtooth	54	.5%	54	8.6%	100.0%
Deep flat	<1	.0%	<1	.1%	100.0%
Flathd sole	2	.0%	1	.1%	38.8%
Rockfish	57	.5%	2	.3%	3.4%
Oth/unk	399	3.8%	352	55.8%	88.1%
Groundfish total	10,477	100.0%	630	100.0%	6.0%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.3.2 Catch and discards of groundfish in the Pacific cod at-sea processing longline fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	11	.2%	11	2.5%	100.0%
Pacific cod	6,162	98.0%	324	72.5%	5.3%
Shallow	3	.1%	3	.7%	100.0%
Sablefish	2	.0%	2	.5%	100.0%
Arrowtooth	6	.1%	6	1.4%	100.0%
Flathd sole	4	.1%	4	.9%	100.0%
Rockfish	3	.0%	3	.6%	98.0%
Atka mack.	1	.0%	1	.2%	100.0%
Oth/unk	95	1.5%	92	20.5%	97.0%
Groundfish total	6,288	100.0%	447	100.0%	7.1%
1996					
Pollock	10	.2%	10	4.7%	100.0%
Pacific cod	5,159	97.6%	77	38.1%	1.5%
Shallow	2	.0%	2	1.2%	100.0%
Arrowtooth	12	.2%	12	6.0%	100.0%
Flathd sole	<1	.0%	<1	.2%	100.0%
Rockfish	2	.0%	2	.9%	100.0%
Oth/unk	99	1.9%	99	48.8%	99.4%
Groundfish total	5,284	100.0%	203	100.0%	3.8%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.3.3 Catch and discards of groundfish in the Pacific cod on-shore processing longline fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	61	1.0%	12	1.0%	18.7%
Pacific cod	4,596	77.4%	36	3.1%	.8%
Shallow	2	.0%	2	.1%	93.8%
Sablefish	37	.6%	6	.5%	16.0%
Arrowtooth	569	9.6%	569	50.1%	100.0%
Deep flat	<1	.0%	<1	.0%	100.0%
Flathd sole	1	.0%	1	.1%	100.0%
Rockfish	66	1.1%	1	.1%	1.2%
Oth/unk	605	10.2%	510	44.9%	84.3%
Groundfish total	5,937	100.0%	1,135	100.0%	19.1%
1996					
Pollock	32	.6%	12	2.8%	38.1%
Pacific cod	4,749	91.4%	119	27.9%	2.5%
Shallow	1	.0%	1	.2%	64.6%
Sablefish	13	.3%	.	.	.
Arrowtooth	42	.8%	42	9.8%	100.0%
Deep flat	<1	.0%	<1	.1%	100.0%
Flathd sole	1	.0%	0	.1%	19.6%
Rockfish	55	1.1%	.	.	.
Oth/unk	299	5.8%	253	59.1%	84.4%
Groundfish total	5,193	100.0%	428	100.0%	8.2%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.4.1 Catch and discards of groundfish in the Pacific cod pot fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	8	.1%	8	3.4%	100.0%
Pacific cod	16,051	98.8%	99	40.3%	.6%
Shallow	2	.0%	2	.9%	100.0%
Sablefish	<1	.0%	<1	.1%	100.0%
Arrowtooth	10	.1%	10	4.0%	100.0%
Rockfish	3	.0%	2	.8%	79.2%
Atka mack.	1	.0%	1	.4%	100.0%
Oth/unk	163	1.0%	123	50.1%	75.3%
Groundfish total	16,238	100.0%	246	100.0%	1.5%
1996					
Pollock	8	.1%	8	4.7%	100.0%
Pacific cod	12,061	98.4%	45	25.7%	.4%
Shallow	<1	.0%	<1	.3%	100.0%
Sablefish	<1	.0%	<1	.3%	100.0%
Arrowtooth	6	.0%	6	3.1%	100.0%
Rockfish	1	.0%	1	.6%	100.0%
Oth/unk	176	1.4%	115	65.3%	65.6%
Groundfish total	12,253	100.0%	177	100.0%	1.4%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.4.2 Catch and discards of groundfish in the Pacific cod at-sea processing pot fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pacific cod	132	98.4%	4	63.5%	2.8%
Oth/unk	2	1.6%	2	36.5%	100.0%
Groundfish total	134	100.0%	6	100.0%	4.3%
1996					
Pacific cod	60	99.4%	.	.	.
Oth/unk	<1	.6%	<1	100.0%	88.9%
Groundfish total	60	100.0%	0	100.0%	.6%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.4.3 Catch and discards of groundfish in the Pacific cod on-shore processing pot fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	8	.1%	8	3.5%	100.0%
Pacific cod	15,919	98.8%	95	39.8%	.6%
Shallow	2	.0%	2	.9%	100.0%
Sablefish	<1	.0%	<1	.1%	100.0%
Arrowtooth	10	.1%	10	4.1%	100.0%
Rockfish	3	.0%	2	.8%	79.2%
Atka mack.	1	.0%	1	.4%	100.0%
Oth/unk	161	1.0%	121	50.4%	75.0%
Groundfish total	16,104	100.0%	240	100.0%	1.5%
1996					
Pollock	8	.1%	8	4.7%	100.0%
Pacific cod	12,002	98.4%	45	25.7%	.4%
Shallow	<1	.0%	<1	.3%	100.0%
Sablefish	<1	.0%	<1	.3%	100.0%
Arrowtooth	6	.0%	6	3.2%	100.0%
Rockfish	1	.0%	1	.6%	100.0%
Oth/unk	176	1.4%	115	65.3%	65.5%
Groundfish total	12,193	100.0%	175	100.0%	1.4%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.5.1 Catch and discards of groundfish in the Pacific cod trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	1,657	3.6%	1,378	21.9%	83.2%
Pacific cod	38,401	83.5%	1,456	23.2%	3.8%
Shallow	1,778	3.9%	749	11.9%	42.1%
Sablefish	55	.1%	23	.4%	41.0%
Arrowtooth	2,229	4.8%	1,773	28.2%	79.6%
Deep flat	127	.3%	15	.2%	11.5%
Flathd sole	539	1.2%	186	3.0%	34.4%
Rex sole	340	.7%	55	.9%	16.2%
Rockfish	302	.7%	147	2.3%	48.7%
Atka mack.	167	.4%	167	2.7%	100.0%
Oth/unk	375	.8%	330	5.3%	88.0%
Groundfish total	45,971	100.0%	6,280	100.0%	13.7%
1996					
Pollock	1,183	2.8%	971	25.7%	82.1%
Pacific cod	38,122	88.6%	779	20.6%	2.0%
Shallow	1,402	3.3%	294	7.8%	21.0%
Sablefish	3	.0%	0	.0%	8.6%
Arrowtooth	1,191	2.8%	1,191	31.5%	100.0%
Deep flat	16	.0%	1	.0%	7.4%
Flathd sole	361	.8%	159	4.2%	44.1%
Rex sole	228	.5%	17	.5%	7.5%
Rockfish	161	.4%	119	3.2%	73.9%
Atka mack.	4	.0%	4	.1%	100.0%
Oth/unk	367	.8%	247	6.5%	69.1%
Groundfish total	43,029	100.0%	3,783	100.0%	8.8%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.5.2 Catch and discards of groundfish in the Pacific cod at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	370	4.3%	370	16.5%	100.0%
Pacific cod	6,332	73.9%	572	25.5%	9.0%
Shallow	119	1.4%	72	3.2%	60.3%
Sablefish	40	.5%	7	.3%	17.4%
Arrowtooth	983	11.5%	983	43.8%	100.0%
Deep flat	25	.3%	7	.3%	29.3%
Flathd sole	220	2.6%	32	1.4%	14.7%
Rex sole	218	2.5%	17	.8%	7.9%
Rockfish	112	1.3%	49	2.2%	43.5%
Atka mack.	49	.6%	49	2.2%	100.0%
Oth/unk	95	1.1%	85	3.8%	90.1%
Groundfish total	8,564	100.0%	2,244	100.0%	26.2%
1996					
Pollock	349	5.3%	258	22.3%	74.0%
Pacific cod	5,241	79.6%	213	18.4%	4.1%
Shallow	19	.3%	18	1.6%	95.3%
Sablefish	2	.0%	0	.0%	12.3%
Arrowtooth	513	7.8%	513	44.4%	100.0%
Deep flat	<1	.0%	<1	.0%	100.0%
Flathd sole	199	3.0%	88	7.6%	44.1%
Rex sole	178	2.7%	8	.7%	4.6%
Rockfish	43	.7%	25	2.1%	57.3%
Atka mack.	1	.0%	1	.1%	100.0%
Oth/unk	35	.5%	31	2.7%	87.4%
Groundfish total	6,582	100.0%	1,156	100.0%	17.6%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.5.3 Catch and discards of groundfish in the Pacific cod on-shore processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	1,287	3.4%	1,008	25.0%	78.3%
Pacific cod	32,069	85.7%	884	21.9%	2.8%
Shallow	1,659	4.4%	677	16.8%	40.8%
Sablefish	16	.0%	16	.4%	100.0%
Arrowtooth	1,246	3.3%	790	19.6%	63.5%
Deep flat	102	.3%	7	.2%	7.2%
Flathd sole	319	.9%	153	3.8%	48.0%
Rex sole	122	.3%	38	.9%	30.9%
Rockfish	190	.5%	98	2.4%	51.8%
Atka mack.	118	.3%	118	2.9%	100.0%
Oth/unk	280	.7%	245	6.1%	87.2%
Groundfish total	37,408	100.0%	4,036	100.0%	10.8%
1996					
Pollock	835	2.3%	713	27.1%	85.4%
Pacific cod	32,881	90.2%	565	21.5%	1.7%
Shallow	1,383	3.8%	276	10.5%	19.9%
Sablefish	1	.0%	.	.	.
Arrowtooth	678	1.9%	678	25.8%	100.0%
Deep flat	15	.0%	1	.0%	4.7%
Flathd sole	162	.4%	72	2.7%	44.1%
Rex sole	49	.1%	9	.3%	18.0%
Rockfish	118	.3%	94	3.6%	80.0%
Atka mack.	3	.0%	3	.1%	100.0%
Oth/unk	322	.9%	216	8.2%	67.1%
Groundfish total	36,447	100.0%	2,626	100.0%	7.2%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.6.1 Catch and discards of groundfish in the Sablefish longline fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	3	.0%	2	.1%	100.0%
Pacific cod	259	1.2%	144	6.0%	55.8%
Shallow	<1	.0%	<1	.9%	100.0%
Sablefish	18,537	86.2%	424	17.8%	2.3%
Arrowtooth	961	4.5%	961	40.2%	99.9%
Deep flat	79	.4%	75	3.1%	95.6%
Flathd sole	2	.0%	2	.1%	100.0%
Rockfish	1,291	6.0%	418	17.5%	32.4%
Oth/unk	375	1.7%	362	15.1%	96.4%
Groundfish total	21,507	100.0%	2,389	100.0%	11.1%
1996					
Pollock	19	.1%	19	1.0%	99.2%
Pacific cod	256	1.4%	202	10.7%	78.8%
Shallow	<1	.0%	<1	.9%	100.0%
Sablefish	15,955	86.6%	335	17.7%	2.1%
Arrowtooth	543	3.0%	543	29.9%	100.0%
Deep flat	40	.2%	34	1.8%	84.1%
Flathd sole	<1	.0%	<1	.0%	100.0%
Rockfish	1,162	6.3%	335	17.7%	28.9%
Oth/unk	446	2.4%	421	22.2%	94.4%
Groundfish total	18,427	100.0%	1,895	100.0%	10.3%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.6.2 Catch and discards of groundfish in the Sablefish

at-sea processing longline fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	2	.1%	2	.4%	100.0%
Pacific cod	66	2.4%	58	15.2%	88.0%
Sablefish	2,133	78.9%	34	8.8%	1.5%
Arrowtooth	151	5.5%	151	39.8%	100.0%
Deep flat	9	.3%	7	1.8%	76.6%
Rockfish	289	10.4%	62	16.4%	21.6%
Oth/unk	69	2.5%	67	17.6%	96.6%
Groundfish total	2,769	100.0%	381	100.0%	13.7%
1996					
Pollock	19	.8%	19	4.2%	100.0%
Pacific cod	100	4.2%	96	21.2%	95.6%
Shallow	<1	.0%	<1	.0%	100.0%
Sablefish	1,771	73.7%	47	10.5%	2.7%
Arrowtooth	142	5.9%	142	31.4%	100.0%
Deep flat	9	.4%	6	1.4%	67.3%
Rockfish	276	11.5%	56	12.5%	20.4%
Oth/unk	87	3.6%	85	18.8%	97.7%
Groundfish total	2,404	100.0%	451	100.0%	18.8%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.6.3 Catch and discards of groundfish in the Sablefish

on-shore processing longline fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	1	.0%	1	.0%	100.0%
Pacific cod	193	1.0%	87	4.3%	44.9%
Shallow	<1	.0%	<1	.0%	100.0%
Sablefish	16,354	87.3%	391	19.5%	2.4%
Arrowtooth	810	4.3%	810	40.3%	99.9%
Deep flat	70	.4%	68	3.4%	98.1%
Flathd sole	2	.0%	2	.1%	100.0%
Rockfish	1,002	5.3%	355	17.7%	35.4%
Oth/unk	306	1.6%	295	14.7%	96.3%
Groundfish total	18,738	100.0%	2,008	100.0%	10.7%
1996					
Pollock	<1	.0%	<1	.0%	61.4%
Pacific cod	156	1.0%	106	7.4%	68.1%
Sablefish	14,134	88.5%	283	19.9%	2.0%
Arrowtooth	406	2.5%	406	28.1%	100.0%
Deep flat	31	.2%	27	1.9%	99.2%
Flathd sole	0	.0%	0	.0%	100.0%
Rockfish	886	5.5%	279	19.3%	31.5%
Oth/unk	359	2.2%	336	23.3%	93.6%
Groundfish total	16,023	100.0%	1,444	100.0%	9.0%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.7.1 Catch and discards of groundfish in the Sablefish at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	10	2.4%	10	3.1%	100.0%
Sablefish	40	9.7%	.	.	.
Arrowtooth	218	53.4%	218	70.7%	100.0%
Deep flat	1	.3%	1	.4%	100.0%
Rex sole	24	5.8%	.	.	.
Rockfish	13	3.3%	.	.	.
Oth/unk	103	25.2%	80	25.8%	77.4%
Groundfish total	408	100.0%	309	100.0%	75.6%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.8.1 Catch and discards of groundfish in the Arrowtooth flounder trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	397	8.6%	282	12.3%	71.0%
Pacific cod	284	6.2%	104	4.5%	36.6%
Shallow	273	5.9%	33	1.5%	12.2%
Sablefish	380	8.2%	286	12.5%	75.3%
Arrowtooth	2,295	49.8%	1,303	56.9%	56.8%
Deep flat	228	5.0%	33	1.4%	14.3%
Flathd sole	262	5.7%	17	.7%	6.3%
Rex sole	211	4.6%	54	2.3%	25.4%
Rockfish	125	2.7%	43	2.1%	33.1%
Oth/unk	157	3.4%	130	5.7%	82.5%
Groundfish total	4,612	100.0%	2,288	100.0%	49.6%
1996					
Pollock	1,423	11.5%	1,350	22.8%	94.9%
Pacific cod	1,269	10.3%	1,269	21.5%	100.0%
Shallow	276	2.2%	87	1.5%	31.6%
Sablefish	134	1.1%	134	2.3%	100.0%
Arrowtooth	6,767	54.9%	2,201	37.2%	32.5%
Deep flat	365	3.0%	187	3.2%	51.3%
Flathd sole	535	4.3%	84	1.4%	15.7%
Rex sole	709	5.8%	32	.5%	4.6%
Rockfish	227	1.8%	181	3.1%	79.6%
Oth/unk	615	5.0%	389	6.6%	63.2%
Groundfish total	12,318	100.0%	5,914	100.0%	48.0%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.8.2 Catch and discards of groundfish in the Arrowtooth flounder at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	149	17.3%	149	28.1%	100.0%
Pacific cod	62	7.2%	28	5.3%	44.8%
Sablefish	117	13.5%	91	17.1%	77.8%
Arrowtooth	408	47.3%	237	44.7%	58.0%
Deep flat	29	3.4%	.	.	.
Flathd sole	16	1.9%	.	.	.
Rex sole	42	4.9%	.	.	.
Rockfish	22	2.6%	10	2.0%	46.7%
Oth/unk	16	1.9%	15	2.9%	95.3%
Groundfish total	862	100.0%	530	100.0%	61.5%
1996					
Pollock	962	9.9%	962	20.6%	100.0%
Pacific cod	809	8.3%	809	17.4%	100.0%
Shallow	74	.8%	45	1.0%	60.6%
Sablefish	133	1.4%	133	2.9%	100.0%
Arrowtooth	5,908	60.6%	1,985	42.6%	33.6%
Deep flat	330	3.4%	184	3.9%	55.8%
Flathd sole	380	3.9%	84	1.8%	22.1%
Rex sole	612	6.3%	32	.7%	5.3%
Rockfish	225	2.3%	178	3.8%	79.3%
Oth/unk	323	3.3%	249	5.4%	77.4%
Groundfish total	9,756	100.0%	4,662	100.0%	47.8%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.8.3 Catch and discards of groundfish in the Arrowtooth flounder on-shore processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	248	6.6%	133	7.6%	53.6%
Pacific cod	221	5.9%	76	4.3%	34.3%
Shallow	273	7.3%	33	1.9%	12.2%
Sablefish	264	7.0%	196	11.1%	74.2%
Arrowtooth	1,887	50.3%	1,066	60.6%	56.5%
Deep flat	199	5.3%	33	1.9%	16.5%
Flathd sole	246	6.6%	17	.9%	6.7%
Rex sole	169	4.5%	54	3.0%	31.7%
Rockfish	103	2.7%	37	2.1%	36.3%
Oth/unk	141	3.8%	114	6.5%	81.1%
Groundfish total	3,751	100.0%	1,758	100.0%	46.9%
1996					
Pollock	461	18.0%	389	31.0%	84.3%
Pacific cod	460	17.9%	460	36.7%	100.0%
Shallow	201	7.9%	42	3.4%	20.9%
Sablefish	1	.0%	1	.0%	100.0%
Arrowtooth	858	33.5%	216	17.2%	25.1%
Deep flat	35	1.4%	3	.2%	8.9%
Flathd sole	155	6.1%	.	.	.
Rex sole	96	3.8%	.	.	.
Rockfish	2	.1%	2	.2%	100.0%
Oth/unk	293	11.4%	139	11.1%	47.7%
Groundfish total	2,562	100.0%	1,252	100.0%	48.9%

Source: NMFS Alaska Region Blend Estimates(target calculated by AFSC staff).

Table 1.9.1 Catch and discards of groundfish in the Deep-water flat trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	118	3.6%	118	7.1%	100.0%
Pacific cod	171	5.3%	69	4.1%	40.1%
Shallow	138	4.3%	2	.1%	1.5%
Sablefish	218	6.7%	83	5.0%	38.3%
Arrowtooth	1,089	33.7%	1,089	65.4%	100.0%
Deep flat	774	24.0%	69	4.1%	8.9%
Flathd sole	89	2.8%	40	2.4%	45.4%
Rex sole	275	8.5%	14	.9%	5.2%
Rockfish	214	6.6%	86	5.2%	40.4%
Oth/unk	142	4.4%	94	5.6%	66.0%
Groundfish total	3,228	100.0%	1,664	100.0%	51.6%
1996					
Pollock	16	.6%	13	1.1%	82.3%
Pacific cod	96	3.4%	53	4.6%	55.3%
Shallow	227	8.2%	18	1.6%	8.1%
Sablefish	199	7.1%	72	6.2%	36.2%
Arrowtooth	854	30.7%	793	68.4%	92.8%
Deep flat	902	32.4%	58	5.0%	6.5%
Flathd sole	58	2.1%	14	1.2%	24.3%
Rex sole	142	5.1%	6	.5%	4.3%
Rockfish	181	6.5%	69	5.9%	37.9%
Oth/unk	108	3.9%	62	5.4%	57.7%
Groundfish total	2,783	100.0%	1,159	100.0%	41.6%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.9.2 Catch and discards of groundfish in the Deep-water flat

at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	61	4.4%	61	7.4%	100.0%
Pacific cod	64	4.6%	45	5.5%	70.9%
Shallow	2	.2%	2	.3%	100.0%
Sablefish	109	7.9%	51	6.1%	46.4%
Arrowtooth	539	39.0%	539	64.7%	100.0%
Deep flat	254	18.4%	18	2.2%	7.2%
Flathd sole	29	2.1%	20	2.4%	68.9%
Rex sole	161	11.6%	7	.8%	4.3%
Rockfish	125	9.0%	52	6.3%	42.1%
Oth/unk	36	2.6%	36	4.3%	99.2%
Groundfish total	1,381	100.0%	832	100.0%	60.3%
1996					
Pollock	6	.5%	6	.8%	100.0%
Pacific cod	36	3.2%	36	4.8%	100.0%
Sablefish	109	9.6%	60	8.1%	55.1%
Arrowtooth	577	50.5%	577	77.4%	100.0%
Deep flat	151	13.2%	3	.4%	1.7%
Flathd sole	25	2.2%	7	.9%	26.7%
Rex sole	88	7.7%	3	.3%	2.9%
Rockfish	72	6.3%	14	1.9%	19.3%
Oth/unk	77	6.8%	40	5.3%	51.5%
Groundfish total	1,141	100.0%	744	100.0%	65.2%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.9.3 Catch and discards of groundfish in the Deep-water flat on-shore processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	56	3.1%	56	6.8%	100.0%
Pacific cod	107	5.8%	23	2.8%	21.8%
Shallow	136	7.4%	.	.	.
Sablefish	109	5.9%	33	3.9%	30.1%
Arrowtooth	550	29.8%	550	66.1%	100.0%
Deep flat	519	28.1%	51	6.1%	9.7%
Flathd sole	60	3.2%	20	2.4%	33.9%
Rex sole	115	6.2%	7	.9%	6.4%
Rockfish	89	4.8%	34	4.1%	37.9%
Oth/unk	106	5.7%	58	6.9%	54.5%
Groundfish total	1,847	100.0%	833	100.0%	45.1%
1996					
Pollock	10	.6%	7	1.7%	71.6%
Pacific cod	60	3.6%	17	4.1%	28.5%
Shallow	227	13.8%	18	4.4%	8.1%
Sablefish	89	5.4%	12	2.8%	13.1%
Arrowtooth	277	16.9%	216	52.1%	77.9%
Deep flat	751	45.8%	56	13.5%	7.4%
Flathd sole	32	2.0%	7	1.6%	22.4%
Rex sole	55	3.3%	4	.9%	6.7%
Rockfish	109	6.6%	55	13.2%	50.3%
Oth/unk	31	1.9%	23	5.5%	73.1%
Groundfish total	1,642	100.0%	415	100.0%	25.2%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.10.1 Catch and discards of groundfish in the Shallow flat trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	352	5.7%	287	10.5%	81.5%
Pacific cod	872	14.1%	318	11.7%	36.5%
Shallow	2,709	43.7%	557	20.4%	20.6%
Sablefish	27	.4%	1	.0%	2.4%
Arrowtooth	1,033	16.7%	861	31.6%	83.3%
Deep flat	103	1.7%	5	.2%	4.5%
Flathd sole	251	4.0%	35	1.3%	14.1%
Rex sole	80	1.3%	14	.5%	17.1%
Rockfish	91	1.5%	69	2.5%	76.0%
Atka mack.	1	.0%	1	.0%	100.0%
Oth/unk	679	11.0%	577	21.2%	85.1%
Groundfish total	6,197	100.0%	2,724	100.0%	44.0%
1996					
Pollock	613	4.1%	446	6.7%	72.7%
Pacific cod	3,368	22.8%	2,988	44.7%	88.7%
Shallow	6,671	45.1%	718	10.7%	10.8%
Sablefish	19	.1%	6	.1%	29.4%
Arrowtooth	1,836	12.4%	1,495	22.4%	81.4%
Deep flat	53	.4%	7	.1%	12.7%
Flathd sole	676	4.6%	86	1.3%	12.7%
Rex sole	137	.9%	19	.3%	14.1%
Rockfish	105	.7%	69	1.0%	65.6%
Atka mack.	5	.0%	5	.1%	100.0%
Oth/unk	1,316	8.9%	843	12.6%	64.1%
Groundfish total	14,799	100.0%	6,681	100.0%	45.1%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.10.2 Catch and discards of groundfish in the Shallow flat at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	114	10.2%	114	14.9%	100.0%
Pacific cod	139	12.4%	91	11.9%	65.1%
Shallow	254	22.7%	64	8.3%	25.0%
Arrowtooth	313	27.9%	313	40.9%	100.0%
Deep flat	18	1.6%	2	.3%	12.4%
Flathd sole	71	6.3%	18	2.3%	25.2%
Rex sole	13	1.1%	1	.1%	5.7%
Rockfish	40	3.6%	34	4.5%	85.1%
Oth/unk	158	14.1%	127	16.7%	80.6%
Groundfish total	1,121	100.0%	764	100.0%	68.1%
1996					
Pollock	81	3.5%	81	6.4%	100.0%
Pacific cod	586	25.6%	521	41.5%	88.9%
Shallow	810	35.4%	123	9.8%	15.2%
Arrowtooth	349	15.3%	330	26.3%	94.6%
Deep flat	1	.1%	1	.1%	100.0%
Flathd sole	160	7.0%	20	1.6%	12.2%
Rex sole	64	2.8%	10	.8%	16.1%
Rockfish	30	1.3%	30	2.4%	100.0%
Atka mack.	5	.2%	5	.4%	100.0%
Oth/unk	199	8.7%	133	10.6%	66.7%
Groundfish total	2,286	100.0%	1,254	100.0%	54.9%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.10.3 Catch and discards of groundfish in the Shallow flat on-shore processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	238	4.7%	173	8.8%	72.7%
Pacific cod	733	14.4%	227	11.6%	31.0%
Shallow	2,455	48.4%	493	25.2%	20.1%
Sablefish	27	.5%	1	.0%	2.4%
Arrowtooth	720	14.2%	548	27.9%	76.1%
Deep flat	85	1.7%	2	.1%	2.7%
Flathd sole	179	3.5%	17	.9%	9.7%
Rex sole	68	1.3%	13	.7%	19.3%
Rockfish	50	1.0%	34	1.8%	68.6%
Atka mack.	1	.0%	1	.1%	100.0%
Oth/unk	521	10.3%	450	22.9%	86.4%
Groundfish total	5,077	100.0%	1,961	100.0%	38.6%
1996					
Pollock	532	4.3%	365	6.7%	68.6%
Pacific cod	2,782	22.2%	2,467	45.5%	88.7%
Shallow	5,861	46.8%	595	11.0%	10.2%
Sablefish	19	.2%	6	.1%	29.4%
Arrowtooth	1,487	11.9%	1,165	21.5%	78.3%
Deep flat	52	.4%	5	.1%	10.5%
Flathd sole	516	4.1%	67	1.2%	12.9%
Rex sole	73	.6%	9	.2%	12.4%
Rockfish	75	.6%	39	.7%	51.3%
Oth/unk	1,116	8.9%	710	13.1%	63.6%
Groundfish total	12,512	100.0%	5,427	100.0%	43.4%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.11.1 Catch and discards of groundfish in the Flathead sole trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	108	5.5%	108	8.2%	100.0%
Pacific cod	313	15.9%	214	16.3%	68.4%
Shallow	48	2.5%	17	1.3%	35.6%
Sablefish	17	.9%	.	.	.
Arrowtooth	747	38.1%	747	56.8%	100.0%
Deep flat	23	1.2%	5	.4%	22.7%
Flathd sole	408	20.8%	64	4.9%	15.6%
Rex sole	117	6.0%	21	1.6%	17.9%
Rockfish	36	1.8%	23	1.7%	62.7%
Oth/unk	145	7.4%	117	8.9%	81.0%
Groundfish total	1,962	100.0%	1,316	100.0%	67.1%
1996					
Pollock	172	5.0%	156	6.8%	90.7%
Pacific cod	928	26.9%	865	37.9%	93.2%
Shallow	146	4.2%	16	.7%	10.7%
Sablefish	16	.5%	2	.1%	12.5%
Arrowtooth	958	27.7%	946	41.4%	98.8%
Deep flat	46	1.3%	15	.7%	32.7%
Flathd sole	706	20.5%	61	2.7%	8.7%
Rex sole	175	5.1%	34	1.5%	19.4%
Rockfish	74	2.2%	30	1.3%	40.5%
Oth/unk	232	6.7%	158	6.9%	68.2%
Groundfish total	3,452	100.0%	2,283	100.0%	66.1%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.11.2 Catch and discards of groundfish in the Flathead sole at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	91	5.7%	91	8.8%	100.0%
Pacific cod	244	15.2%	156	15.1%	64.0%
Shallow	42	2.6%	13	1.3%	31.5%
Sablefish	17	1.1%	.	.	.
Arrowtooth	566	35.3%	566	54.8%	100.0%
Deep flat	23	1.4%	5	.5%	22.7%
Flathd sole	383	23.9%	64	6.2%	16.7%
Rex sole	107	6.7%	21	2.0%	19.4%
Rockfish	33	2.0%	19	1.9%	58.7%
Oth/unk	99	6.2%	99	9.6%	99.4%
Groundfish total	1,604	100.0%	1,033	100.0%	64.4%
1996					
Pollock	49	2.3%	49	3.8%	100.0%
Pacific cod	314	14.6%	272	21.4%	86.5%
Shallow	94	4.4%	12	1.0%	13.0%
Sablefish	16	.8%	2	.2%	12.2%
Arrowtooth	698	32.4%	686	54.0%	98.3%
Deep flat	37	1.7%	15	1.2%	40.1%
Flathd sole	592	27.4%	52	4.1%	8.8%
Rex sole	155	7.2%	33	2.6%	21.0%
Rockfish	65	3.0%	29	2.3%	44.5%
Oth/unk	136	6.3%	121	9.5%	88.8%
Groundfish total	2,156	100.0%	1,270	100.0%	58.9%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.11.3 Catch and discards of groundfish in the Flathead sole on-shore processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	17	4.7%	17	6.0%	100.0%
Pacific cod	69	19.3%	58	20.6%	84.0%
Shallow	6	1.7%	4	1.4%	63.2%
Arrowtooth	181	50.6%	131	64.2%	100.0%
Flathd sole	26	7.1%	.	.	.
Rex sole	11	3.0%	0	.1%	2.8%
Rockfish	4	1.0%	4	1.2%	100.0%
Oth/unk	45	12.6%	18	6.5%	40.5%
Groundfish total	358	100.0%	282	100.0%	78.8%
1996					
Pollock	124	9.5%	108	10.6%	87.1%
Pacific cod	613	47.3%	593	58.5%	96.7%
Shallow	51	3.9%	3	.3%	6.6%
Sablefish	<1	.0%	<1	.0%	100.0%
Arrowtooth	260	20.1%	260	25.7%	100.0%
Deep flat	10	.7%	0	.0%	4.3%
Flathd sole	114	8.8%	9	.9%	7.8%
Rex sole	19	1.5%	1	.1%	6.2%
Rockfish	9	.7%	1	.1%	13.1%
Oth/unk	96	7.4%	37	3.7%	38.9%
Groundfish total	1,296	100.0%	1,013	100.0%	78.1%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.12.1 Catch and discards of groundfish in the Rex sole trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	547	4.1%	547	5.6%	100.0%
Pacific cod	671	5.0%	458	4.7%	68.3%
Shallow	46	.3%	42	.4%	90.3%
Sablefish	223	1.7%	41	.4%	18.6%
Arrowtooth	7,093	52.6%	7,073	72.5%	99.7%
Deep flat	463	3.4%	173	1.8%	37.3%
Flathd sole	437	3.2%	191	2.0%	43.7%
Rex sole	2,769	20.5%	187	1.9%	6.8%
Rockfish	675	5.0%	482	4.9%	71.4%
Oth/unk	572	4.2%	558	5.7%	97.5%
Groundfish total	13,495	100.0%	9,751	100.0%	72.3%
1996					
Pollock	348	2.2%	348	3.4%	100.0%
Pacific cod	825	5.3%	449	4.4%	54.4%
Shallow	42	.3%	18	.2%	43.2%
Sablefish	169	1.1%	66	.6%	38.9%
Arrowtooth	7,421	47.4%	7,335	72.0%	98.8%
Deep flat	395	2.5%	180	1.8%	45.5%
Flathd sole	553	3.5%	214	2.1%	38.6%
Rex sole	4,175	26.7%	128	1.3%	3.1%
Rockfish	972	6.2%	702	6.9%	72.2%
Oth/unk	757	4.8%	746	7.3%	98.6%
Groundfish total	15,656	100.0%	10,185	100.0%	65.1%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.12.2 Catch and discards of groundfish in the Rex sole at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	543	4.0%	543	5.6%	100.0%
Pacific cod	667	5.0%	457	4.7%	68.6%
Shallow	46	.3%	42	.4%	90.3%
Sablefish	221	1.6%	41	.4%	18.3%
Arrowtooth	7,078	52.7%	7,058	72.6%	99.7%
Deep flat	461	3.4%	173	1.8%	37.4%
Flathd sole	436	3.2%	191	2.0%	43.9%
Rex sole	2,751	20.5%	185	1.9%	6.7%
Rockfish	668	5.0%	477	4.9%	71.4%
Oth/unk	558	4.2%	556	5.7%	99.6%
Groundfish total	13,429	100.0%	9,721	100.0%	72.4%
1996					
Pollock	348	2.2%	348	3.4%	100.0%
Pacific cod	825	5.3%	449	4.4%	54.4%
Shallow	42	.3%	18	.2%	43.2%
Sablefish	169	1.1%	66	.6%	38.9%
Arrowtooth	7,421	47.4%	7,335	72.0%	98.8%
Deep flat	395	2.5%	180	1.8%	45.5%
Flathd sole	553	3.5%	214	2.1%	38.6%
Rex sole	4,175	26.7%	128	1.3%	3.1%
Rockfish	972	6.2%	702	6.9%	72.2%
Oth/unk	757	4.8%	746	7.3%	98.6%
Groundfish total	15,656	100.0%	10,185	100.0%	65.1%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.12.3 Catch and discards of groundfish in the Rex sole on-shore processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	4	5.4%	4	12.0%	100.0%
Pacific cod	4	6.0%	1	2.1%	15.7%
Sablefish	2	3.2%	1	3.0%	42.9%
Arrowtooth	15	23.0%	15	51.3%	100.0%
Deep flat	2	2.4%	.	.	.
Flathd sole	2	2.3%	.	.	.
Rex sole	18	26.9%	2	7.3%	12.2%
Rockfish	7	9.8%	5	17.3%	78.9%
Oth/unk	14	20.9%	2	6.9%	14.8%
Groundfish total	66	100.0%	30	100.0%	44.9%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.13.1 Catch and discards of groundfish in the Rockfish on-shore processing jig fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pacific cod	6	1.2%	.	.	.
Rockfish	494	98.8%	.	.	.
Oth/unk	<1	.0%	<1	100.0%	30.3%
Groundfish total	500	100.0%	<1	100.0%	.0%
1996					
Pacific cod	1	.3%	.	.	.
Rockfish	390	99.6%	.	.	.
Oth/unk	<1	.1%	<1	100.0%	97.0%
Groundfish total	391	100.0%	<1	100.0%	.1%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.14.1 Catch and discards of groundfish in the Rockfish on-shore processing longline fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pacific cod	29	10.5%	.	.	.
Sablefish	2	.7%	0	1.5%	20.3%
Rockfish	234	84.5%	14	52.3%	5.8%
Oth/unk	12	4.3%	12	45.3%	98.8%
Groundfish total	277	100.0%	26	100.0%	9.3%
1996					
Pollock	<1	.0%	<1	.4%	100.0%
Pacific cod	53	8.7%	31	60.5%	58.8%
Sablefish	33	5.5%	.	.	.
Arrowtooth	15	2.6%	15	30.1%	100.0%
Rockfish	497	82.2%	0	.5%	.1%
Oth/unk	6	1.0%	4	8.4%	68.0%
Groundfish total	605	100.0%	51	100.0%	8.5%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.15.1 Catch and discards of groundfish in the Rockfish trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	141	.7%	141	3.0%	100.0%
Pacific cod	308	1.5%	191	4.1%	62.1%
Shallow	74	.4%	9	.2%	12.6%
Sablefish	1,015	5.1%	204	4.3%	20.1%
Arrowtooth	1,406	7.0%	934	19.8%	66.4%
Deep flat	195	1.0%	64	1.4%	33.0%
Flathd sole	15	.1%	8	.2%	53.3%
Rex sole	104	.5%	29	.6%	28.0%
Rockfish	15,246	76.2%	2,323	49.4%	15.3%
Atka mack.	247	1.2%	19	.4%	7.9%
Oth/unk	1,256	6.3%	783	16.7%	62.5%
Groundfish total	20,007	100.0%	4,714	100.0%	23.6%
1996					
Pollock	152	.8%	142	2.8%	93.2%
Pacific cod	403	2.1%	372	7.2%	92.2%
Shallow	368	1.9%	72	1.4%	19.7%
Sablefish	1,378	7.1%	238	4.6%	17.3%
Arrowtooth	2,075	10.6%	1,878	36.6%	90.5%
Deep flat	329	1.7%	123	2.4%	37.3%
Flathd sole	115	.6%	27	.5%	23.4%
Rex sole	259	1.3%	58	1.1%	22.5%
Rockfish	14,154	72.5%	2,006	39.1%	14.2%
Atka mack.	126	.6%	49	1.0%	38.7%
Oth/unk	174	.9%	166	3.2%	95.5%
Groundfish total	19,533	100.0%	5,131	100.0%	26.3%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.15.2 Catch and discards of groundfish in the Rockfish at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1995					
Pollock	141	.8%	141	3.5%	100.0%
Pacific cod	308	1.7%	191	4.7%	62.1%
Shallow	74	.4%	9	.2%	12.6%
Sablefish	1,015	5.5%	204	5.0%	20.1%
Arrowtooth	1,406	7.6%	934	23.0%	66.4%
Deep flat	195	1.1%	64	1.6%	33.0%
Flathd sole	15	.1%	8	.2%	53.3%
Rex sole	104	.6%	29	.7%	28.0%
Rockfish	14,745	80.2%	2,328	57.4%	15.8%
Atka mack.	247	1.3%	19	.5%	7.9%
Oth/unk	139	.8%	130	3.2%	93.7%
Groundfish total	18,388	100.0%	4,058	100.0%	22.1%
1996					
Pollock	103	.8%	103	4.0%	100.0%
Pacific cod	176	1.5%	145	5.6%	82.1%
Shallow	20	.2%	17	.7%	84.8%
Sablefish	768	6.3%	126	4.8%	16.4%
Arrowtooth	560	4.6%	420	16.1%	74.9%
Deep flat	84	.7%	63	2.4%	74.8%
Flathd sole	14	.1%	9	.3%	60.3%
Rex sole	48	.4%	25	1.0%	52.8%
Rockfish	10,140	83.5%	1,547	59.4%	15.3%
Atka mack.	124	1.0%	47	1.8%	37.8%
Oth/unk	107	.9%	103	4.0%	95.9%
Groundfish total	12,145	100.0%	2,605	100.0%	21.4%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.15.3 Catch and discards of groundfish in the Rockfish on-shore processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1996					
Pollock	49	.7%	39	1.5%	78.9%
Pacific cod	227	3.1%	227	9.0%	100.0%
Shallow	348	4.7%	55	2.2%	15.9%
Sablefish	610	8.3%	112	4.4%	18.3%
Arrowtooth	1,515	20.5%	1,459	57.8%	96.3%
Deep flat	245	3.3%	60	2.4%	24.4%
Flathd sole	100	1.4%	18	.7%	13.2%
Rex sole	211	2.9%	33	1.3%	15.6%
Rockfish	4,014	54.3%	459	18.2%	11.4%
Atka mack.	2	.0%	2	.1%	100.0%
Oth/unk	66	.9%	63	2.5%	94.9%
Groundfish total	7,387	100.0%	2,526	100.0%	34.2%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Table 1.16.1 Catch and discards of groundfish in the Atka mackerel at-sea processing trawl fishery

	Catch metric tons	Species percent of catch	Discards metric tons	Species percent of discards	Discard rate
1996					
Pollock	47	3.0%	47	15.1%	100.0%
Pacific cod	80	5.2%	80	25.8%	100.0%
Shallow	26	1.7%	4	1.4%	15.9%
Arrowtooth	27	1.8%	27	8.7%	100.0%
Rockfish	115	7.5%	74	24.0%	64.2%
Atka mack.	1,186	77.5%	62	20.1%	5.2%
Oth/unk	50	3.3%	15	4.9%	30.0%
Groundfish total	1,530	100.0%	308	100.0%	20.1%

Source: NMFS Alaska Region Blend Estimates (target calculated by AFSC staff).

Appendix B: Size Composition of Bycatch in IR/IU Fisheries

The following tables identify the "size composition" of discarded Alaska pollock, Pacific cod, and 'shallow water' flatfish whenever present in GOA groundfish fisheries. Using a binary qualifying criterion based upon prevailing "minimum" marketable size (as expressed in round-weight-equivalent terms and reported by industry sources), the percentage of bycatch discards of each species of concern, composed of fish above and below the market threshold, was calculated.

NMFS Observer "length frequency" data, for 1995 and 1996, were employed in this calculation. Only GOA groundfish target fisheries potentially impacted by the proposed IR/IU action were included. Length frequency data are generally collected only for the "predominant" groundfish species in the catch, e.g., Pacific cod in a cod target, pollock in a pollock target. Thus, for purposes of the analysis, it was assumed that the frequency distribution of any given species of concern was approximately constant across all targets.

Percent of "marketable" and "non-marketable" discards, by species, were computed on the basis of the following "minimum" length thresholds: Pacific cod - 47 cm; Pollock - 33; Shallow-water flatfish 28 cm. Length/weight ratios were based upon GOA Alaska Fisheries Science Center's Stock Assessment and Fishery Evaluation (SAFE) documents, by species.

The Catch Size Frequency table employs the following definitions: *Below technical* - implies fish is smaller than current minimum technical length limits for mechanical processing. *Below market* - implies fish is above technical length limits, but below minimum "marketable" length limits (except for meal). *Marketable* - implies fish is above minimum market length limits and below upper technical length limits. *Above technical* - implies fish is above current maximum technical length limits for mechanical processing.

Table of Sampled Catch Size Frequencies:
(length and kg.)

	Number of Fish Sampled	Percent by Length	Total Weight of Sampled Fish	Percent by Weight
Jig				
Pacific cod				
Marketable	151	100.0	463	100.0
Pollock				
Below market	4	1.9	1	.7
Marketable	206	98.1	178	99.3
Longline				
Pacific cod				
Below market	284	1.9	238	.4
Marketable	14,748	98.1	61,459	99.6
Pollock				
Marketable	88	100.0	126	100.0
Pot				
Pacific cod				
Below market	85	.2	80	.1
Marketable	36,906	99.8	152,462	99.9
Pollock				
Marketable	133	100.0	384	100.0
Trawl				
Pacific cod				
Below market	1,941	4.4	1,390	.7
Marketable	42,501	95.6	189,437	99.3
Shallow flats				
Below market	16,584	20.8	2,984	6.1
Marketable	63,162	79.2	46,193	93.9
Pollock				
Below market	4,531	6.3	972	1.0
Marketable	66,813	93.7	98,393	99.0

Estimated Pacific cod, pollock and shallow water flatfish discards (mt), percentage of marketable size and smaller than marketable size fish in the GOA, by processor type, IR/IU species and target fishery, 1995-95.

	1995			1996		
	Discard	marketable	non-marketable	Discard	marketable	non-marketable
Mothership & C/P						
Jig						
(Pacific cod bycatch)						
Pacific cod	.1	100.0	.0	.0	.0	.0
Longline						
(Pacific cod bycatch)						
Pacific cod	324.4	88.6	11.4	77.3	44.7	55.3
Other gf	2.3	99.4	.6	.0	.0	.0
Sablefish	57.7	99.3	.7	95.6	99.1	.9
(Shallow flats bycatch)						
Pacific cod	3.3	95.6	4.4	2.4	95.0	5.0
Sablefish	10.5	95.7	4.3	.1	90.6	9.4
(Pollock bycatch)						
Pacific cod	11.3	100.0	.0	9.6	100.0	.0
Sablefish	1.6	100.0	.0	19.0	100.0	.0
Pot						
(Pacific cod bycatch)						
Pacific cod	3.6	99.0	1.0	.0	.0	.0

	1995			1996		
	Discard	marketable	non-marketable	Discard	marketable	non-marketable
Mothership & C/P						
Trawl						
(Pacific cod bycatch)						
Atka mackerel	.5	.0	100.0	79.6	100.0	.0
Pacific cod	571.9	88.5	11.5	213.1	99.3	.7
Deep water flats	45.4	98.5	1.5	36.0	100.0	.0
Shallow flats	90.8	98.4	1.6	520.9	100.0	.0
Rockfish	191.0	98.3	1.7	144.9	100.0	.0
Flathead sole	155.8	98.4	1.6	271.9	100.0	.0
Other gf	2.5	99.0	1.0	1.0	100.0	.0
Sablefish	4.1	97.5	2.5	.0	.0	.0
Arrowtooth	27.9	97.7	2.3	809.0	100.0	.0
Rex sole	457.3	98.5	1.5	449.2	99.9	.1
(Shallow flats bycatch)						
Atka mackerel	.0	.0	.0	4.2	8.7	91.3
Pacific cod	72.0	78.5	21.5	18.5	84.7	15.3
Deep water flats	2.1	85.1	14.9	.1	85.4	14.6
Shallow flats	63.6	48.1	51.9	123.1	4.2	95.8
Rockfish	9.4	.0	100.0	17.0	82.9	17.1
Flathead sole	13.2	58.9	41.1	12.2	.0	100.0
Other gf	3.2	87.0	13.0	.0	.0	.0
Arrowtooth	.1	.0	100.0	45.0	76.0	24.0
Rex sole	41.8	85.6	14.4	18.0	66.3	33.7

	1995			1996		
	Discard	marketable	non-marketable	Discard	marketable	non-marketable
Mothership & C/P						
Trawl						
(Pollock bycatch)						
Atka mackerel	1.9	100.0	.0	46.6	99.9	.1
Pacific cod	370.1	100.0	.0	258.2	99.9	.1
Deep water flats	61.4	100.0	.0	6.1	99.9	.1
Shallow flats	113.8	100.0	.0	80.8	99.9	.1
Rockfish	141.4	100.0	.0	103.0	99.9	.1
Flathead sole	90.8	100.0	.0	48.6	99.9	.1
Other gf	7.0	100.0	.0	.0	.0	.0
Sablefish	9.7	100.0	.0	.0	.0	.0
Arrowtooth	148.7	100.0	.0	961.6	99.9	.1
Rex sole	543.1	100.0	.0	347.6	99.9	.1
Shoreside processor						
Jig						
(Pacific cod bycatch)						
Pacific cod	.8	100.0	.0	.0	.0	.0
Longline						
(Pacific cod bycatch)						
Pacific cod	35.6	82.4	17.6	119.4	90.0	10.0
Rockfish	.2	83.3	16.7	30.9	99.6	.4
Other gf	2.0	99.5	.5	7.8	99.7	.3
Sablefish	86.5	99.7	.3	106.4	99.6	.4
(Shallow flats bycatch)						
Pacific cod	1.5	95.4	4.6	.8	92.3	7.7
Other gf	1.5	5.7	94.3	.0	.0	.0
Sablefish	.4	91.0	9.0	.0	.0	.0

Shoreside processor	1995 Discard	1995 marketable	1995 non-marketable	1996 Discard	1996 marketable	1996 non-marketable
Longline						
(Pollock bycatch)						
Pacific cod	11.5	100.0	.0	12.1	100.0	.0
Rockfish	.0	.0	.0	.2	100.0	.0
Sablefish	.7	100.0	.0	.2	100.0	.0
Pot						
(Pacific cod bycatch)						
Pacific cod	95.5	85.6	14.4	45.3	86.0	14.0
(Shallow flats bycatch)						
Pacific cod	2.1	95.7	4.3	.5	95.0	5.0
(Pollock bycatch)						
Pacific cod	8.5	100.0	.0	8.4	100.0	.0
Trawl						
(Pacific cod bycatch)						
Bottom pollock	7.3	73.0	27.0	110.4	96.3	3.7
Pacific cod	884.4	82.9	17.1	565.5	55.6	44.4
Deep water flats	23.4	97.8	2.2	17.1	97.3	2.7
Shallow flats	227.3	98.5	1.5	2,466.8	99.1	.9
Rockfish	3.2	90.5	9.5	226.9	99.2	.8
Flathead sole	58.0	99.4	.6	592.9	99.2	.8
Other gf	.0	.0	.0	7.1	99.2	.8
Pelagic pollock	87.4	98.5	1.5	109.2	98.0	2.0
Sablefish	.0	.0	.0	6.5	99.0	1.0
Arrowtooth	76.0	98.6	1.4	459.8	99.1	.9
Rex sole	.6	97.0	3.0	.0	.0	.0

	1995			1996		
	Discard	marketable	non-marketable	Discard	marketable	non-marketable
Shoreside processor						
Trawl						
(Shallow flats bycatch)						
Bottom pollock	6.4	81.5	18.5	45.0	84.7	15.3
Pacific cod	677.4	90.3	9.7	275.7	77.8	22.2
Deep water flats	21.0	70.3	29.7	18.4	45.3	54.7
Shallow flats	493.5	80.3	19.7	595.1	56.4	43.6
Rockfish	129.8	92.5	7.5	55.5	72.2	27.8
Flathead sole	3.9	93.7	6.3	3.3	32.5	67.5
Other gf	.0	.0	.0	.1	95.6	4.4
Pelagic pollock	5.6	93.2	6.8	18.8	95.5	4.5
Sablefish	.0	.0	.0	3.4	87.8	12.2
Arrowtooth	33.3	67.5	32.5	42.2	78.9	21.1
Rex sole	.1	83.7	16.3	.1	40.0	60.0
(Pollock bycatch)						
Bottom pollock	35.2	88.5	11.5	153.0	73.5	26.5
Pacific cod	1,008.1	99.8	.2	712.9	98.8	1.2
Deep water flats	56.4	99.8	.2	7.2	98.6	1.4
Shallow flats	172.9	99.8	.2	364.8	98.6	1.4
Rockfish	26.2	99.8	.2	38.7	98.8	1.2
Flathead sole	16.9	99.8	.2	107.5	98.9	1.1
Other gf	.0	.0	.0	22.7	99.0	1.0
Pelagic pollock	4,915.0	97.9	2.1	1,432.3	70.9	29.1
Sablefish	.0	.0	.0	1.2	97.9	2.1
Arrowtooth	132.9	99.7	.3	388.6	98.8	1.2
Rex sole	3.6	99.7	.3	.0	.0	.0

Appendix C: Product Recovery Rates in GOA IR/IU Fisheries

Empirical evidence suggests that product recovery rates (PRRs) vary from operation to operation, but also within any given operation, over time. These variations are attributable to several factors, including, physical changes in the fish over the course of the fishing season, market requirements, stock dynamics, as well as, technical and mechanical considerations in the plant, among others. Table C-1 presents the "maximum", "minimum", and "mean" PRRs reported by GOA groundfish processors, for pollock, Pacific cod, and 'shallow water' flatfish, in 1995 and 1996 (rounded to the nearest percent). These data reflect the range of reported product forms for these species, for these years, in the GOA.

Table C-2, presents the Alaska Region NMFS-Standard PRRs for the GOA IR/IU species of concern, January 1997. These PRR standards would be used as one of the principal tools, by NMFS Enforcement and U.S. Coast Guard boarding officers, to assess IR/IU compliance, under the Council's proposed GOA IR/IU Program.

Table C-1. Processed Product from Pollock, Pacific cod, and Shallow water Flatfish Retained and Processed

(Derived from all reported GOA production 1995 - 1996)

	PRR		
"Primary" products	Max.	Min.	Mean
Whole fish (food)	1.00	1.00	1.00
Bled only	1.00	0.96	0.98
Gutted only	1.00	0.75	0.86
H&G w/roe	1.00	0.63	0.68
H&G western	1.00	0.50	0.57
H&G eastern	0.67	0.40	0.48
Kirimi	0.50	0.48	0.48
Salted/split	0.46	0.45	0.45
Fillets w/skin, w/ribs	0.50	0.32	0.38
Fillets w/skin, no ribs	0.35	0.25	0.30
Fillets, no skin, no ribs	0.33	0.20	0.23
Fillets w/ribs, no skin	0.30	0.25	0.25
Fillets, deep-skin	0.20	0.13	0.15
Surimi	0.19	0.15	0.19
Minced	0.50	0.22	0.30
"Ancillary" products			
Roe	0.05	0.04	0.05
Belly	0.01	0.01	0.01
"Industrial" products			
Bait (primary)	1.00	1.00	1.00
Fish meal (ancillary)	0.33	0.00	0.17

Table C-2. NMFS-Standard Product Recovery Rates for GOA IR/IU Species

SPECIES		PRODUCT CODE											
	Species Code	1 WHOLE FOOD FISH	2 WHOLE BAIT FISH	3 BLED	4 GUTTED	6 H&G WITH ROE	7 H&G WESTERN CUT	8 H&G EASTERN CUT	10 H&G W/O TAIL	11 KIRIMI	12 SALTED & SPLIT	13 WINGS	14 ROE
PACIFIC COD	110	1.00	1.00	0.98	0.85	0.63	0.57	0.47	0.44	....	0.45	....	0.05
POLLOCK	270	1.00	1.00	0.98	0.80	0.70	0.65	0.56	0.50	....	....	....	0.04
SHALLOW WATER FLATFISH	119	1.00	1.00	0.98	0.90	0.80	0.72	0.65	0.62	0.48	....	....	0.08

SPECIES		PRODUCT CODE												
	Species Code	15 PECTORAL GIRDLE	16 HEADS	17 CHEEKS	18 CHINS	19 BELLY	20 FILLETS W/SKIN & RIBS	21 FILLETS SKIN ON NO RIBS	22 FILLETS W/RIBS NO SKIN	23 FILLETS SKNLESS/ BONELESS	24 FILLETS DEEP SKIN	30 SURIMI	31 MINCE	32 MEAL
PACIFIC COD	110	0.05	....	0.05	....	0.01	0.45	0.35	0.25	0.25	....	0.15	0.5	0.17
POLLOCK	270	....	0.15	....	....	....	0.35	0.30	0.30	0.21	0.16	0.16 2/	0.22	0.17
SHALLOW WATER FLATFISH	119	....	....	....	....	....	0.32	0.27	0.27	0.22	....	....	....	0.17

SPECIES		PRODUCT CODE						
	Species Code	33 OIL	34 MILT	35 STOMACHS	36 MANTLES	37 BUTTERFLY BACKBONE FISH REMOVED	96	92, 94, 98, 99, M99 DECOMPOSED
PACIFIC COD	110	....	....	....	....	0.43	0.00	1.00
POLLOCK	270	....	....	....	....	0.43	0.00	1.00
SHALLOW WATER FLATFISH	119	....	....	....	....	....	0.00	1.00

Appendix D: Percent of Total GOA Groundfish Catch Observed (by gear-type and target, 1995)

Gear type	Target	Unobserved	30% Observed	100% Observed
JIG				
	Pacific cod	99%	0%	1%
	Rockfish	100%	0%	0%
LONGLINE				
	Pacific cod	40%	52%	8%
	Rockfish	99%	1%	0%
	Sablefish	56%	38%	6%
	Other	28%	48%	23%
POT				
	Pacific cod	59%	39%	2%
TRAWL				
	Pollock (bottom)	30%	62%	8%
	Pollock (pelagic)	14%	68%	18%
	Pacific cod	26%	52%	22%
	Shallow Flats	13%	83%	3%
	Sablefish	1%	0%	99%
	Arrowtooth	19%	63%	19%
	Rex sole	0%	55%	45%
	Flathead sole	1%	70%	29%
	Deep Flats	3%	77%	20%
	Rockfish	0%	9%	91%
	Other	2%	6%	93%

Source: NMFS Alaska Region Blend, ADF&G Fishtickets. All targets calculated by AFSC staff.