

OTHER SPECIES ANALYSIS 2007

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MARCH 2007

Abstract

The North Pacific Fishery Management Council is considering alternatives for restructuring the management of the "other species" categories in the Bering Sea and Aleutian Islands and Gulf of Alaska management areas because of disproportionate catch of some of the constituent groups. This analysis considers five alternatives ranging from maintaining the status quo to setting individual overfishing levels and acceptable biological catches for each constituent group individually. Considerations include that when species groups are combined, disproportionate catch can still occur. Alternatively, when species are segregated, attainment of overfishing or acceptable biological catch levels may restrict harvest of groundfish. Fishery catch is more likely to attain the acceptable biological catch and the overfishing level for categories assessed within tier 6. Grenadiers are also considered in this analysis as an addition to the Fishery Management Plans of the Gulf of Alaska and the Bering Sea and Aleutian Islands.

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Appendix A: “Other Species” Discussion Paper Presented to Council in October 2005

Appendix B: BSAI Sharks--A Case Study of Overfishing Closures

Appendix C: Technical Notes

Council Action

In April 2005, The North Pacific Fishery Management Council (Council) adopted a problem statement and requested an analysis of a suite of alternatives to modify the “other species” category in the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) management areas. The Council’s Bering Sea Groundfish Plan Team, Scientific and Statistical Committee, Advisory Panel, and Non-Target Species Committee likewise recommended the analysis. The issues are summarized in an October of 2005 discussion paper (Appendix A). The following problem statements and alternatives are excerpted from that document.

Both the BSAI and GOA groundfish fishery management plans (FMPs) require the establishment of a single set of management benchmarks for the “other species” category. These benchmarks are an overfishing level (OFL) and acceptable biological catch (ABC) in the BSAI and a total allowable catch (TAC) in the GOA. The primary concern is that management of the assemblage may not offer sufficient protection from overfishing for all of the component groups. The OFL and ABC for the BSAI “other species” category is set equal to the sum of the estimates for the species groups. The GOA TAC for “other species” is established as a percentage of the combined TACs. Because a constituent species group may be caught in excess of its individual benchmark it is vulnerable to overfishing.

The Council adopted the following general problem statement in April 2005.

The current management regime may not provide appropriate protection for all species in the ecosystem impacted by the groundfish fisheries, including species for which little biological information is available. The current management system also purports to manage species that are not targeted by groundfish fisheries and may be unaffected or minimally affected by groundfish fisheries. These non-target species are often managed as a complex, which carries the risk that individual species within the complex may be overfished while the complex catch as a whole is within allowable catch guidelines.

Conversely, attempts to remove these species from complexes often result in single species quotas that constrain targeted groundfish operations. Since many of these non-target species are either not abundant, not well surveyed, or have life histories that are not well understood, the quotas may not be set appropriately. However, obtaining sufficient data to appropriately manage them under the current quota system may be prohibitively expensive or not possible with current sampling technology. In addition, there is no mandate to manage these species for optimum yield so it may be desirable for both management and conservation to move these species outside of the current quota system.

The problem is then one of deciding how to manage data-poor non-target species outside of the traditional yield-oriented framework used for groundfish species, while still maintaining appropriate protection for those species. If yield-based approaches are not used, then other guidelines for acceptable levels of catch must be determined. Also, if acceptable levels of take cannot be determined and catch is still of concern, protection measures outside of the current quota system may also be considered. Additionally, since markets and circumstances change, a process for transitioning in a timely manner between quota-based target and non-target species management should be established.

Five alternatives and an option of adding grenadier as a TAC category were considered for managing the “other species” complex in the BSAI and GOA groundfish fisheries:

Alternative 1. No action.

Alternative 2. Set aggregate “other species” OFL and ABC for the GOA.

Alternative 3. Remove BSAI skate from the other species category.

Alternative 4. Remove BSAI skate and BSAI and GOA sculpins from the other species category.

Alternative 5. Eliminate the “other species” assemblage and manage squid, skate, sculpins, sharks, and octopuses as separate assemblages under the harvest specification process

Grenadier Management Option: Add grenadiers and other non-specified species that are caught in the fishery.

The “other species” categories in the BSAI and GOA aggregate very different taxa into a common TAC category. Catch of multiple species groups with distinct life histories is regulated under a single set of management benchmarks (OFL and ABC) in the BSAI and under a single TAC in the GOA. In the BSAI each OFL and ABC for skate, sharks, sculpins, and octopuses are combined to a single OFL and ABC. In the GOA a single TAC is calculated and specified for sharks, sculpins, octopuses and squid based on the combined TACs of all species not in the “other species” complex. Because the species have been caught incidentally, and have not been considered targets of high value, the species groups are combined to simplify management.

The practice of combining species groups under umbrella catch limits risks catch in excess of maximum fishing mortality thresholds (also called the overfishing level or OFL) for some of the constituents. This analysis describes recent catch trends of the aggregated categories and their constituents relative to their management benchmarks. The analysis identifies the gear and target fisheries that catch different species groups and identifies management actions that could be invoked to restrict fisheries to prevent overfishing. This review considers the alternatives within the context of approaching the management benchmarks of OFL and ABC for the alternatives. Figures are provided to illustrate the distribution of catch of the species groups among gear and targets and relative to management benchmarks. The method used to develop the figures is described in Appendix C.

The OFLs and ABCs of the Gulf of Alaska species groups used in this analysis were reviewed and developed by the GOA Plan Team only for the purpose of this analysis. The OFLs and ABCs of the constituent species groups for the BSAI “other species” group are developed as part of the specification process that result in a single OFL and ABC. Any exceptions or modifications are noted in the analysis.

The Tier System and Inseason Management

To a large extent, the tier system drives the relative size of allowable catch for a specified TAC category. In general the Inseason Management Branch’s tasks become easier as the total allowable catch increases.

The tier system uses six tiers to proscribe the maximum fishing mortality threshold. The tiers are established in a descending order of preference corresponding to descending order of information availability.¹ Tier 1 is the highest level of information tier 6 is the lowest. Catch in excess of the maximum fishing mortality threshold is considered overfishing. All of the species groups addressed in the proposal are calculated at the tier 5 or 6 level.²

Both the Plan Teams and the Scientific and Statistical Committee (SSC) have noted the difficulty of developing an OFL and ABC for tier 6 species. The SSC has charged the Plan Teams with developing alternative methods to establish OFLs within tier 6. The SSC recognized, among several issues, that the incidental catch of species like octopuses and sharks may be so low that average catch is not a meaningful measure of an overfishing limit (February 2006 SSC minutes).

¹ From Bering Sea and Aleutian Islands Stock Assessment and Fishery Evaluation Report, December 2006.

² Tier 5 requires reliable point estimates of biomass and natural mortality rate. The OFL is calculated as the fishing mortality (equal to the natural mortality rate) times the biomass. The ABC is calculated as three quarters of the OFL. In Tier 6, the average catch history from 1978 through 1995 is assigned the value of the overfishing level and the ABC is three quarters of the OFL. The tier process allows the SSC to establish an alternate value in tier 6.

The tier assigned to a species or species group has an effect on the size of the OFL and ABC. A tier 5 assessment is likely to result in a higher OFL/ABC than a tier 6 assessment. The magnitude of the OFL/ABC affects management of that TAC category. As the OFL/ABC increases more management options are available. If the TAC is large enough relative to incidental catch needs, a directed fishery is allowed. Otherwise retention is restricted to limit catch to the TAC (which often is equal to the ABC).

The Inseason Management Branch of the Alaska Region National Marine Fisheries Service (NMFS) is charged with managing the complex of TAC categories annually specified by the NMFS after recommendations by the Council. An important objective of management is to limit catch of a TAC category to its specified amount at the end of a fishing year. The Inseason Management Branch determines how much of an individual TAC is necessary as the incidental catch allowance (ICA) in other directed fisheries. For example, Pacific cod taken incidentally in a pollock fishery contributes to the Pacific cod ICA. After deducting the ICA, the remaining TAC is the directed fishing allowance (DFA) which grants vessels full retention of the species. Once the DFA is caught the fishery closes to directed fishing. Closure of a TAC category limits a vessel's retention to a portion of other TACs open to directed fishing. If the ABC is taken and the trajectory of catch indicates that the OFL may be approached, additional fishery closures are imposed. To prevent overfishing, specific fisheries identified by gear and area that incur the greatest incidental catch are closed. Areas may be subsets of regulatory or reporting areas. Catch data provided by observers and vessel locations provided by vessel monitoring systems help the Inseason Management Branch determine potential discrete areas for closure to prevent overfishing while allowing groundfish fisheries to occur in other areas. Closures can expand to other fisheries and larger areas if the rate of catch is not sufficiently slowed. Overfishing closures are rare. A case study of an overfishing closure is provided in Appendix B.

The "other species" categories under consideration in these alternatives have been closed to directed fishing during recent years. The proposed alternatives to the status quo envision managing one or more of the constituent species on an individual basis. Species groups assessed at the tier 5 level are generally assigned an OFL/ABC that allows for sufficient incidental catch and may allow enough for a directed fishery. Species assessed at the tier 6 level are not likely to be allowed a directed fishery, are more likely limited to incidental catch status. Catch of tier 6 species is more likely to attain an OFL and ABC because those management benchmarks are based on historic average catch.

Alternative 1: Status Quo

The current process of managing the "other species" categories in the GOA and BSAI is described below.

Bering Sea Aleutian Islands "Other Species"

The status quo combines four species into a single category. Skates and sculpins are assessed within tier 5, sharks and octopuses are assessed within tier 6 (Table 11). Skates and sculpins provide a high portion (99%) of the combined OFL/ABC assigned to 'other species' (Table 12). Within the last several years the TAC has been established to account for incidental catch and has been closed to directed fishing since 2003. The BSAI "other species" combined OFL and ABC are well above recent catch levels (Figure 1).

Overview of BSAI Status quo

Management actions associated with the "other species" category have been limited. In 2004 the "other species" category was prohibited to retention in October. The prohibition was primarily out of concern over total groundfish catch approaching the BSAI optimum yield, not out of concern over the OFL or ABC. In 2005 and 2006 the TAC was increased to address incidental catch needs. Otherwise the category has not incurred recent management actions and none to prevent overfishing.

Discussion of BSAI Status quo

The OFL/ABC for the BSAI “other species” category is recommended by the SSC each year as a combination of the four constituent species groups’ estimated OFL/ABCs and a proportional step procedure initiated nine years ago. The SSC’s recommendation for 2007 is an OFL of 91,000 mt and an ABC of 68,600 mt. The Council recommended a 2007 TAC of 37,355 mt.

Figure 2 shows average catch of the status quo TAC category of “other species.” A wide variety of gear and target combinations catch one or more of the constituent species groups. The hook-and-line Pacific cod fishery takes more than half of the catch with the remainder scattered across a variety of trawl and hook-and-line fisheries. The catch rate (in kilograms per metric ton) show the rate is high in hook-and-line sablefish and Greenland turbot even though the absolute amount caught is very low.

The contribution of each species group to aggregate catch is shown in Table 1. Skate comprise the majority of “other species” category catch, accounting for 76 percent of the 2003-2006 average catch of 27,798 mt. The hook-and-line Pacific cod fishery catches the most skates (Figure 3). In general the hook-and-line Pacific cod fishery is not only the most dominate of the “other species” fisheries in terms of total volume of incidental catch of skate, it also catches a relatively high proportion of the sculpins, sharks, and octopuses (Figures 4 through 6).

Sculpins are the second most dominate catch accounting for 21 percent of the aggregate catch (Table 1). Sculpins are caught in greater abundance across a variety of gear and target combinations dominated by non-pelagic trawls and a large portion by hook-and-line gear in the Pacific cod target (Figure 4).

Octopuses and sharks are caught in the least number and by fewer fisheries. Octopuses comprise 1 percent and sharks comprise 2 percent of the 2003-2006 average catch. Octopuses are primarily taken in the pot gear Pacific cod fishery (Figure 5). Because of the way targets are calculated, a pot octopus target fishery is identified though the directed fishery has not been open. Sharks are taken primarily in the pollock fisheries and the hook-and-line Pacific cod fishery and in small amounts throughout non-pelagic trawl fisheries and hook-and-line fisheries for Greenland turbot and sablefish.

Gulf of Alaska “Other Species”

The GOA “other species” category consists of sharks, sculpins, octopuses, and squid. The category is assigned a TAC. The TAC is not determined by the tier system but is established as a proportion of all remaining TAC categories. The TAC can be equal to or less than 5 percent of the sum of other TAC categories. Prior to 2006, regulations required that the TAC for “other species” equal 5 percent of the other TAC categories.

Overview of GOA Status quo

The “other species” category’s TAC, established to account for incidental catch in other groundfish targets, is 4,500 mt for 2007. The maximum TAC that could have been calculated for 2007 is 5 percent of 292,412 mt, or 14,621 mt. The process that calculates the TAC is not within the tier system and does not allow for a calculation of an OFL or ABC. The “other species” category is closed to directed fishing.

Discussion of GOA Status quo

Figure 7 shows recent cumulative catch of “other species” relative to the status quo TAC. Increases in catch from 2004 through 2006 are driven by catch of sharks and squid and are discussed in greater detail under Alternative 2. Because the “other species” TAC is established to accommodate incidental catch based on past performance of the fishery, the TAC for the category generally isn’t exceeded unless unanticipated catch occurs.

Figure 8 shows a variety of gear and target combinations that account for incidental catch in the “other species” category. Skate were part of the “other species” category until 2004, but they are not included in catch amounts displayed in Figure 8 so that catch composition is consistent with the current definition.

The contribution of each species group to average 2003 through 2006 GOA “other species” catch is given in Table 2. Sharks, at 38 percent of the catch, are taken in a variety of fisheries ranging from the greatest amount in the hook-and-line fisheries for sablefish and Pacific cod to trawl fisheries for pollock, Pacific cod, rockfish, and flatfish fisheries (Figure 9). The two highest incidental catch rates are associated with the “other species” target. The “other species” fishery is not opened to directed fishing. That a target is assigned is an artifact of the catch accounting system’s calculation of a target rather than the fishery status of being open or closed.

Sculpins comprised 27 percent of the average “other species” catch and are not as widely dispersed as sharks across gear and target combinations. Sculpins are caught primarily in non-pelagic trawls (Figure 10). Sculpin catch is highest in the multiple non-pelagic trawl flatfish targets followed by pot and hook-and-line Pacific cod fisheries.

Octopuses, 10 percent of average catch, are almost entirely caught within the pot gear Pacific cod fishery. Since octopus are not open to directed fishing, the pot gear octopus target in Figure 11 is an artifact of the calculation of the target rather than the fishery status. Relatively small amounts are taken in the non-pelagic trawl arrowtooth flounder and hook-and-line Pacific cod fisheries.

Squid, 26 percent of average catch, are incidentally caught in the pelagic trawl pollock fisheries (Figure 12) with minor amounts caught in the non-pelagic trawl rockfish and pollock targets.

Alternative 2

Alternative 2 proposes to stop calculating the GOA TAC for “other species” as a proportion (less than or equal to 5 percent) of the TACs of species assessed under the tier system in the GOA. Alternative 2 would instead establish the “other species” group OFL and ABC as a combination of the constituents’ individual OFLs and ABCs. Sharks, sculpins, octopuses, and squid comprise the GOA “other species” category (Table 3). Table 11 identifies the species groups and their stock assessment tier assignment. sculpins are assessed within tier 5, sharks, octopuses and squid are assessed within tier 6. Sculpins provide more than half (54%) of the combined OFL/ABC assigned to ‘other species’ (Table 3).

Overview of Alternative 2 Effects

Alternative 2 would establish the TAC category through a stock assessment process rather than the status quo that uses a somewhat arbitrary percentage to determine the allowable catch. Consequently alternative 2 would allow the use of management measures associated with the OFL/ABC levels that are currently not explicitly available under the status quo. However, Alternative 2 would not address the potential issue of disproportionate catch of one constituent species group relative to its contribution to the combined “other species” management benchmarks.

Discussion of Alternative 2

The “other species” category’s TAC, currently established to account for incidental catch in other groundfish targets, is 4,500 mt for 2007. The algorithm that calculates the TAC is not within the tier system and does not allow for a calculation of an OFL/ABC. The amount available is intended by managers to meet incidental catch needs of the fishery based on historic activity.

The combined OFL and ABC proposed under Alternative 2, 10,588 mt and 7,943 mt respectively are larger than the status quo specification of 4,500 mt (Table 3). Both the current specification and the OFL/ABC proposed under Alternative 2 are less than the maximum amount possible in the status quo.

The status quo process could specify a TAC that greatly exceeds the OFL/ABC under Alternative 2. The maximum amount under status quo is 14,621 mt (Table 4). Table 4 shows the process that calculates the maximum “other species” TAC as 5% of the combined TACs in the GOA and compares that value to the OFL and ABC proposed under Alternative 2. The maximum ABC for “other species” under status quo is 184 percent of the Alternative 2 ABC and 138 percent of the Alternative 2 OFL. Under status quo managers would likely consider the individual species groups’ management benchmarks available in Alternative 2 in establishing a TAC. However status quo does provide the opportunity to specify a TAC and therefore allow catch in excess of the Alternative 2 combined ABC and OFL based on the tier system.

Figures 13 and 14 characterize recent catch in the GOA “other species” complex. Figure 13 compares catch of the “other species” category compiled by month for 2004-2006 to status quo TAC and the combined Alternative 2 OFL/ABC. Figure 14 shows the predominate gear and target fisheries that catch “other species.”

Clearly total catch each year has not attained or closely approached status quo specified TAC or the Alternative 2 management benchmarks (Figure 13). Catch by gear and target for the status quo “other species” complex in the GOA from 2003-2006 are shown in Figure 14. This figure reveals that the highest catch rates were in the pot Pacific cod and trawl pollock fisheries, followed by lesser amounts in several targets in non-pelagic trawl fisheries.

Catch of the “other species” category has increased each of the last three years (Figure 13). Table 5 shows which species group has driven the category’s increased catch by year. Catch of sculpins, octopuses, and squid are tracked at the aggregate levels. More resolution is available in the case of sharks. Catch of shark and squid have steadily increased each year from 2004 through 2006.

The shark group (comprised of dogfish, sleeper, salmon, and other sharks) catch has increased from 468 mt in 2004, to 983 mt in 2005, to 1,177 mt in 2006. Dogfish and sleeper sharks drive the increase in 2004 accounting for about 90 percent of the catch. In 2006 the amount of dogfish caught doubled. Dogfish catch has occurred primarily in the hook-and-line sablefish, halibut, and Pacific cod fisheries (Figure 15). Shark catch in the GOA has remained below the tier 6 ABC but has increased in the recent years (Figure 18).

Squid catch has increased in recent years as well. Incidental squid catch increased from 157 mt in 2004, to 626 in 2005, to 1,527 mt in 2006, an essentially 10 fold increase in three years. Virtually all the catch occurs in the bottom and mid-water pollock targets (Figure 16). If these increases represent a trend in incidental catch, a higher ABC under the status quo (up to 5 percent of combined GOA assessed TACs) may be required in the future. Squid catch reached the squid tier 6 ABC in 2006 and the trend in catch indicates annual catch may be increasing (Figure 17). The distribution of squid catch is identified in Figure 43.

Catch of the aggregated species whether calculated by the status quo algorithm or under Alternative 2 is below the management benchmarks (Figure 13). However neither management approach provides direct management of catch under benchmarks for component species. Figure 17 shows squid catch at the squid ABC in 2006 in what may be an increasing trend. Octopus catch hasn’t shown the same increasing trend but did reach the 2007 ABC in 2004 (Figure 28). Catch of sharks has increased somewhat. Catch for these species tends to be variable because they are incidentally caught, not targeted, but also not necessarily avoided.

The status quo TAC can be adjusted upward to 5 percent of cumulative TAC which under the 2007 TACs is much higher than the combined ABC and OFL proposed under Alternative 2. In that sense managing the species groups under a combined ABCs and OFLs is a more conservative management. The option exists to set the TAC

less than the ABC to provide for incidental catch or perhaps a limited directed fishery on one of the constituent species.

The ability of NMFS to respond to overfishing concerns regarding a subset of a species group that is not established in the specification process is not explicitly identified in regulation. An overfishing closure may be generated for an individual species or stocks for which an ABC and OFL is identified (50 CFR 679.25). That ABC and OFL may not be one documented in the specification process. The regulations are much more explicit regarding specified OFLs and ABCs. Alternative 2 establishes a specified OFL for the “other species” group, not the individual constituents.

Alternative 3

Alternative 3 proposes to remove skate from the BSAI “other species” category leaving sharks, sculpins, and octopuses combined. The ABC for the current BSAI “other species” category, including skate, has been established by recommendation of the SSC as 64,235 mt, using a stair step procedure to scale the recommended ABC from the maximum ABC (Table 6). Skates and sculpins are assessed within tier 5, sharks and octopuses are assessed within tier 6 (Table 11). Skates and sculpins provide a high portion (99%) of the combined OFL/ABC assigned to ‘other species’ (Table 6).

Overview of Alternative 3 Effects

Alternative 3 would establish the skate TAC category which based on its 2007 OFL and ABC can sustain the current incidental catch and possibly a directed fishery. The Alternative 3 “other species” category of sculpins, sharks, and octopuses could sustain the expected incidental catch within the combined management benchmarks. However, Alternative 3 would not address the potential issue of disproportionate catch of one constituent species group relative to its contribution to the combined Alternative 3 “other species” management benchmarks.

Discussion of Alternative 3

Catch for the species in the status quo “other species” category relative to their management benchmarks are shown in Figure 19. Under the status quo, catch of “other species” is well within OFL and ABC. Figure 20 characterizes the status quo “other species” catch by gear and target. The hook-and-line fishery for Pacific cod dominates catch.

This analysis uses the same constituent OFLs and ABCs as recommended by the SSC with the exception of octopuses. The Plan Team recommended an OFL of 688 mt and ABC of 516 mt based on an alternate tier 6 strategy. The SSC recognized the approach as novel, did not recommend it as part of the combined “other species” ABC for 2007, but noted the alternative was viable if “other species” were to be separated.

The ABC and OFL for skate as a separate TAC category, and the remaining OFL and ABC for sharks, sculpins, and octopuses in the “other species” categories are compared in Table 7. The OFL and ABC for the Alternative 3 “other species” category are about half the status quo amounts.

Skate comprise the majority of the “other species” catch in the BSAI. Table 8 shows catch and percent of total status quo “other species” catch by species group by year for 2003 through 2006. Figure 21 shows that catch of BSAI skate over the last three years is consistent and has been about 10,000 mt less than the 2007 skate ABC. Catch is driven by the hook-and-line Pacific cod fishery (Figure 3). If the ABC and directed fishery for Pacific cod with hook-and-line gear increases, the incidental catch needs for skate would likely increase as well. Given that incidental catch is substantially less than the ABC, a directed fishery for skate could be considered. Figure 36 shows the distribution of skate catch is very widespread. A broad distribution indicates that in the event of an

overfishing concern a discreet area for closure may not be able to be identified and a broad area could be at risk of closure.

The catch of Alternative 3 BSAI “other species” category consisting of sharks, sculpins, and octopuses is within the level established by the OFLs and ABCs aggregated for those three species (Figure 22). Annual catch is consistent at about 6,700 mt over the last three years. Table 7 shows the contributions of the Alternative 3 “other species” category constituent assessments to the combined management benchmarks. Clearly the tier 5 assessment of sculpins provides the greatest contribution to the combined OFL and ABC. Focusing on the OFLs for comparison, the sculpin OFL is 41,200 mt compared to the shark OFL at 617 mt and octopuses at 688 mt. Sculpin catch dominates the reconfigured “other species” category as shown in Table 9. Catch of sculpin at about 5,800 mt per year are well within the sculpin OFL and ABC (30,900 mt in Table 7) as show by Figure 23. Assuming the Alternative 3 OFL/ABC amounts remain larger than the catch of the proposed TAC category, management actions to require discards of “other species” or restrict the groundfish fishery will not be required.

Current catch and OFL/ABC levels indicate the establishment of skates and the Alternative 3 “other species” TAC categories are not likely to create management concerns. However the concern expressed in the problem statement regarding catch exceeding the management benchmarks of the still combined Alternative 3 “other species” group is not entirely address by this alternative.

Table 9 shows shark and octopus catch are similar in relative volume and much lower than sculpins. Catch of shark and octopus within the Alternative 3 “other species” category relative to their individual management benchmarks (Figures 24 and 25) would be masked by the dominance of the sculpin contribution (Table 7). Figure 25 shows shark catch approached the shark tier 6 ABC in 2005, exceeded the ABC in 2004 and exceeded the shark tier 6 OFL in 2007. The catch of octopuses slightly exceeded its ABC in 2004 (Figure 24).

The approach of the sharks and octopuses catch to an individual benchmark occurs whether the species is part of the aggregation in the status quo “other species” category or under the Alternative 3 “other species” definition. The Alternative 3 “other species” category ABC is dominated by the sculpin ABC (Table 7). As long as the sculpin ABC remains relatively high and catch remains constant it will continue to contribute a disproportionate share of ABC (relative to its catch) to the combined Alternative 3 “other species” category. The sculpin ABC in excess of catch compensates for catch of the two tier 6 species groups within the complex. If the three species groups are combined under the Alternative 3 “other species” category catch in excess of the management benchmarks for one or both of the species groups assessed within tier 6 has and can continue to occur.

Alternative 4

Alternative 4 would remove sculpins from the “other species” category in the GOA. The TAC for Alternative 4 “other species” would continue to be established with the same algorithm as used under the status quo but without sculpins. Sculpins are assessed within tier 5, sharks, octopuses, and squid are assessed within tier 6 (Table 11). Sculpins provide a high portion (54%) of the combined OFL/ABC assigned to the status quo ‘other species’ (Table 6).

The flexibility of the status quo algorithm for determining the “other species” TAC was discussed in Alternative 2. The maximum ABC could be established at 14,621 mt (Table 4), although that would be unlikely given the combined OFL and ABC for the constituents of the Alternative 4 “other species” group is much lower (Table 10). The status quo calculation of the Alternative 4 “other species” TAC could by convention be limited to the combined tier 6 assessments for sharks, squid, and octopus. The ABC for the combined limits is 3,616 mt (Table 10).

Overview of Alternative 4 Effects

Alternative 4 would establish the skate TAC category which based on its 2007 OFL and ABC can sustain the current incidental catch and possibly a directed fishery. Based on recent catch trends the Alternative 4 “other species” category of sharks, octopuses and squid could sustain the expected incidental catch within the combined management benchmarks. However, the Alternative 4 “other species” category would not address the potential issue of disproportionate catch of one constituent species groups relative to its contribution to the combined Alternative 4 “other species” management benchmarks. If a convention is adopted to limit the status quo TAC to the combined assessment ABC, the potential for the entire category to reach the combined management benchmark is higher because the constituents are all assessed at the tier 6 level.

Discussion of Alternative 4

Catch trends relative to the 2007 TAC are shown for the Alternative 4 “other species” category in Figure 26. Table 10 provides the management benchmarks for GOA sculpins versus the constituents of Alternative 4 “other species” category. Recent catch of the Alternative 4 “other species” category is compared to the combined management benchmarks as calculated in Table 10 in Figure 27 rather than the status quo TAC algorithm. The ABC is lower and the increasing catch trend as discussed in Alternative 2 is driven by shark and squid incidental catch. Squid catch over the last three years has reached the GOA squid ABC (Figure 17) while sharks (Figure 18) and octopuses (Figure 28), are below the ABC although displaying an increasing trend. Peak catch by year can be sporadic because these are incidentally caught species. All three species in the Alternative 4 “other species” category are assessed in tier 6. The potential exists for one or all three species groups assessed in tier 6 in any given year to reach the individual or combined management benchmarks based on the expectation that average catch will occur.

The GOA sculpin OFL and ABC are 5,770 mt and 4,327 mt, respectively (Table 10). Average catch has been consistent between 500-700 mt and is much less than the ABC (Figure 29). The gear and target combinations that take sculpins are displayed in Figure 30. Sculpins are caught in a variety of fisheries dominated by non-pelagic trawl fisheries, pot Pacific cod fisheries, and the non-pelagic trawl shallow-water flatfish fishery. The primary target in the shallow-water flatfish fishery is rock sole. If for some reason catch in the sculpins species group were to attain the ABC and approach the OFL, the shallow-water flatfish fishery and pot Pacific cod fisheries would be likely candidates for restrictions to slow or eliminate the incidental catch of sculpins. Figure 41 shows that the distribution of sculpin catch tends to concentrate in a few areas. The somewhat localized concentration of catch could allow an overfishing closure to be restricted to a proscribed area rather than affect an entire FMP area or subarea.

Alternative 5

This alternative would eliminate both BSAI and GOA “other species” groups and manage each constituent species group by its OFL and ABC.

In the BSAI skate, sharks, sculpins, and octopuses each would be managed as a single species group. In the GOA sharks, sculpins, octopuses, and squid each would be managed as a single TAC category. Tier assignment recent catch trends and the current estimate of OFL and ABC are identified with each species group.

Overview of Alternative 5 Effects

As described in the introduction, management options are limited by the size of an OFL and ABC. Skate in the BSAI and sculpins in the BSAI and GOA are managed under tier 5. Sharks and octopuses in the GOA and BSAI and squid in the GOA are managed in tier 6 (Table 11). Consequently the species groups that could be managed with the least likelihood of incurring closures to prevent overfishing are BSAI skate and sculpins in both areas. Species groups in tier 6 are more likely to incur closures to prevent overfishing. OFLs for species groups managed under tier six are calculated based on average catch. ABCs are calculated as a fraction of the OFL. Depending on catch rates during the years averaged to determine the benchmarks applied under tier 6 relative to the current trend in annual catch, catch may or may not approach the ABC or OFL. If an overfishing level is approached groundfish fishery implications can be wide spread. A case study is provided in Appendix B.

Discussion of Alternative 5

Examples of how species groups would be managed in the BSAI and GOA under Alternative 5 are given below. Table 12 is a compilation of the management benchmarks for the components of the “other species” TAC categories in the BSAI and GOA. The implication of catch management for each constituent species group relative to their management benchmarks are provided below.

Bering Sea and Aleutian Islands

Skate

The tier 5 OFL and ABC for skate are 42,900 mt and 36,000 mt, respectively. The implications of managing BSAI skate as a separate TAC category are described in Alternative 3. Skate are caught at a moderate rate relative to individual species group benchmarks (Figure 21). Under the current relationship between incidental catch and the size of the management benchmarks, a directed fishery for skate could be considered. Catch is dominated by the hook-and-line Pacific cod fishery (Figure 3). If the directed fishery for Pacific cod increases the incidental catch for skate would likely increase as well. Figure 36 shows the broad distribution of skate catch across the BSAI.

Sharks

The BSAI shark tier 6 OFL and ABC are 617 mt and 463 mt, respectively. The cumulative average catch of sharks approached the ABC in 2005, exceeded the ABC in 2004, and exceeded the OFL in 2006 (Figure 25). The bulk of the shark incidental catch is caught in the mid-water pelagic trawl pollock and hook-and-line Pacific cod target fisheries (Figure 6). The hook-and-line Greenland turbot and sablefish fisheries catch sharks at high rates, but the tonnage of sharks caught in these fisheries is low (Figure 6).

Given that the cumulative catch of sharks regularly approaches one or both of the management benchmarks, actions in the future to prevent overfishing and reduce the incidental catch of sharks would be likely if this species were managed on an individual basis. The general distribution of shark catch is provided in Figure 40 and shows shark catch is broadly distributed across the broad expanse of the pollock and Pacific cod fishery.

Shark management in the BSAI are identified a case study in Appendix B to illustrate the process and potential impacts of an overfishing closure.

Sculpins

The BSAI sculpins tier 5 OFL and ABC are 41,200 mt and 30,900 mt, respectively. The 2003-2006 catches of BSAI sculpins of around 5,000 mt are well below the OFL and ABC (Figure 23). Incidental catch would have to increase significantly for management concerns to develop that would impact the groundfish fishery. Based

solely on this analysis, a difference of nearly 25,000 mt between incidental catch and the ABC, this species group could be considered for a directed fishery. Management decisions would have to focus on the species of sculpin that would be targeted perhaps developing a stock assessment for that particular species; incidental catch of other groundfish in a sculpin target; and implications of prohibited species bycatch, among other considerations.

This species group is taken in multiple gear and target combinations including non-pelagic trawl flatfish fisheries, non-pelagic trawl Pacific cod, and hook-and-line Pacific cod (Figure 4). Sculpins are caught across a broad geographic distribution in the BSAI (Figure 35).

Octopuses

The BSAI octopus tier 6 OFL and ABC are 688 mt and 516 mt, respectively. Catch of octopuses approached the ABC in 2004 and came in at about 300 mt per year in 2005 and 2006 (Figure 24). Given that this species group is assessed in tier 6, catch is expected to approach either benchmark as long as octopuses are caught consistent with the catch rates that produced the tier 6 assessment. Octopuses are predominately caught in pot gear Pacific cod fisheries (Figure 5). Occasionally enough octopuses are caught and delivered with pot gear that it is identified as a target. Its target status is an artifact of the catch accounting system even though the directed fishery remains closed.

If incidental catch rates relative to Pacific cod tend to be consistent over years, octopus catch should fluctuate with the ABC for Pacific cod. If octopus biomass experiences rapid growth and expansion they can become more abundant relative to Pacific cod. Their catch rates are expected to increase as well.

A market exists for octopus which promotes its retention. If a separate TAC is established, if the species group could be assessed at tier 5 or higher, a larger ABC could sustain a directed fishery. The lack of appropriate information, including a lack of accurate biomass estimates, means that octopuses will likely remain in tier 6 and closed to directed fishing. Over time catch is expected to meet the ABC and approach the OFL. If the OFL is approached fisheries shown in Figure 5 (Pacific cod fisheries with pot gear followed by hook-and-line and non-pelagic trawl gear) would be candidates for closure to prevent overfishing. The patchy distribution of octopus catch (Figure 37) may lead to discrete area closures if an overfishing closure were required.

Gulf of Alaska

Sharks

The GOA shark tier 6 OFL and ABC are 2,390 mt and 1,792 mt, respectively. Shark catch has increased over the last three years in the GOA (Figure 18). More details of the increase are discussed under Alternative 2. Catch is currently below the ABC, but if the increasing trend continues, the ABC will be reached and the OFL may be approached. Multiple gear and target combinations take sharks in the GOA (Figure 9). The single largest catch of sharks occurs in the hook-and-line sablefish fishery, followed by pollock (both the mid-water and 'bottom' targets), and followed by hook-and-line Pacific cod and multiple non-pelagic trawl flatfish targets. Figure 9 implies that if a closure to prevent overfishing were warranted, the hook-and-line sablefish, trawl pollock, and multiple flatfish fisheries would be vulnerable to restrictions ranging from area closures to complete closures of the fisheries. Shark catch in the GOA is distributed broadly enough that distinct "hot spot" closures in the event of overfishing are unlikely (Figure 45).

Sculpins

The GOA sculpin tier 5 OFL and ABC are 5,770 mt and 4,327 mt, respectively. Managing sculpins as a separate species in the GOA was discussed under Alternative 4. Sculpins catch in the GOA was consistent between 2004 through 2006 and averaged about 15 percent of the ABC (Figure 29). The variety of fisheries that

share in the incidental catch of sculpins reflect the distribution of the species group. Pot gear, non-pelagic trawl gear, and hook-and-line gear take sculpins in the GOA (Figure 10). Because of the high scuplin management benchmarks relative to catch, restrictions on fishing are not a current concern. Sculpin have an irregular distribution in the GOA compared to other species (Figure 41) and generally reflect the preferred areas for many of the gear and target combinations identified in Figure 10.

Octopuses

The GOA octopuses tier 6 OFL and ABC are 398 mt and 298 mt, respectively. In 2004 catch approached the ABC, but was well below the ABC in 2005 and 2006 (Figure 28). The proximity of the 2004 catch to the ABC shows that catch can approach the ABC, and given the nature of tier 6 stock assessments, can occasionally be expected to attain the ABC or OFL. The fisheries that take skate are primarily Pacific cod taken by pot gear and a moderate amount assigned to an octopus target (Figure 11). When this species group approaches the OFL, the pot gear fishery for Pacific cod will be closed. The area closed could be limited to particular 'hot spots' if localized incidental catch were detected through the use of vessel monitoring and observer data (Figure 42).

Squid

The GOA squid tier 6 OFL and ABC are 2,030 mt and 1,526 mt, respectively. Squid catch attained the ABC in 2006. In 2004 and 2005, catch was well below the ABC but has increased each year. Squid catch accelerates during the pollock A season and remains flat for the remainder of the year (Figure 17). Squid catch is nearly entirely in the pollock fishery (Figure 16). Nearly the entire catch of squid occurs in Area 620 during February and March (Table 14). If the squid OFL and ABC are managed separately and catch exceeds the ABC, Inseason Management would focus on the pollock fishery in Area 620 to identify an area for potential closure. The plot of squid density in kg/mt of groundfish (Figure 43) shows the highly localized nature of squid incidental catch. With the use of information from vessel operators, reported catch, VMS, and observer data, the high squid catch area can be identified. The area can either be closed by NMFS or closure can be avoided through cooperation from vessel operators. If vessel operators can cooperatively reduce incidental catch they can preserve more flexibility to their fishing operations than if NMFS closes the pollock fishery. Current catch trends indicate that squid incidental catch is highly localized in Area 620 in Shelikof Strait (Figure 43). If an overfishing closure is warranted, that area would clearly be a candidate for closure while allowing pollock fishing to continue in other areas. However, the area described is very popular for high-value roe-bearing pollock and would impact the value of the A season pollock fishery.

Conclusions

By the nature of the tier 6 assessment, individual ABC and OFLs will be approached or caught unless for some reason the historic average catch that the assessment is based on is significantly higher than current annual catch. The figures showing average catch by gear and target highlight fisheries that are likely candidates for closures to prevent overfishing. For example, in both the BSAI and GOA sharks are caught in greatest abundance in the trawl pollock and hook-and-line Pacific cod fisheries; and in the GOA hook-and-line sablefish fishery (Figures 6 and 9). Octopuses are caught at the highest rate in the pot Pacific cod fishery in both areas (Figures 5 and 11).

Actions short of a complete closure of the fisheries to prevent overfishing can be constructed. Closures can be limited to hot spot areas and fleets can change their fishing behavior to lower catch and avoid overfishing (Figures 35 through 45). However, those efforts may fail as described in the case study of overfishing in Appendix B.

Skate in the BSAI and sculpins in both areas are assessed at tier 5. Directed fisheries for these species groups currently don't have momentum; the OFL and ABC are well above catch. The threat of reaching those levels is much less than the potential associated with the tier 6 species.

Whether a species is targeted either in a directed fishery or as a “top off” fishery, when the directed fishery is closed, can affect how much is taken either as a single TAC category or as a constituent of a larger species complex. If a species is valuable, effort is made to maximize its incidental catch relative to the open fishery.

To some extent the desirability of these species can be assessed by the retention rates. Table 15 shows the 2006 aggregate retention rates for the individual species groups identified in this alternative. Sharks are retained at a minimal rate and are assessed within the tier 6 process. Octopuses and squid are assessed at tier 6, are retained at reasonably high rates, and are potential targets. While overall BSAI skate retention is 31 percent, within that category longnose skate are retained at 76 percent, big skate at 20 percent, and “other skate” at 31 percent. Species that are highly desirable are likely to be retained at higher rates while the directed fishery is closed, increasing the potential for indirect targeting and increased fishing pressure on those species.

One option is to separate economically desirable tier 5 species while leaving less economically attractive tier 5 species in a group with tier 6 species. Sculpins are not highly desirable and are assessed at tier 5. If they are managed as part of a species complex, especially with species groups assessed at a tier 6 level, they contribute significant amount of ABC to a complex. Managing tier 6 species within a complex with a species that is assessed at the tier 5 level such as sculpins, and keeping that complex closed to directed fishing, allows catch of those species without triggering management actions. However exceeding the tier 6 species OFL/ABC as the species group is managed within the complex is a likely event.

An OFL and ABC generated from a tier 6 assessment is given the same regulatory weight as management benchmarks developed in tiers 1-5. In the December 2006 SSC minutes a concise description is provided of the concerns regarding managing species under tier 6.

”...a common feature of these assessments is that a choice must be made between managing under Tier 5 (based on a biomass estimate) and Tier 6 (usually based on average catch). Determination of a Tier 5 OFL is problematic due to survey limitations or lack of a robust estimate of natural mortality. Use of average catch in Tier 6 could be problematic for several reasons: (1) the time series of catches may be of indeterminate accuracy due to difficulties in species identification, (2) the time series may be short because catch monitoring did not separately identify the species in the past, or (3) the bycatch of the species may be very low in relation to its population size, so that average catch is not a meaningful measure of an overfishing limit. The application of Tier 6 calculations could unreasonably constrain any directed fishery that might develop, and overly restrictive OFLs could unreasonably constrain other fisheries, such as the cod pot fishery that takes octopus as bycatch.”

The struggle to develop a tier 6 analysis so that average catch is a meaningful overfishing limit is ongoing. The SSC has reviewed efforts by the Plan Teams and assessment authors to develop new approaches and encourages continued effort to develop new approaches.

Managing individual species groups at a tier 6 level risks attaining the management benchmarks and incurring restrictions on groundfish fisheries based on stock assessments that are the least desirable.

Grenadier Management Option

This option would develop a management system for grenadiers. This analysis identifies the gear and target combinations that currently take grenadier and considers the possible structure of a grenadier fishery. It does not extensively consider the addition of grenadier to the “other species” complex. Grenadiers are assessed in tier 5. If grenadiers were combined with species groups within the ‘other species’ complex it would fulfill a role similar to “other species” constituent species groups assessed within tier 5 (BSAI skates and sculpins in the BSAI and GOA). That is it would tend to mask catch of tier 6 species in excess of their individual ABCs and OFLs.

Data from the 2006 groundfish fishery on grenadier hauls in the BSAI and GOA are provided in Tables 17 and 18. The amounts shown in the tables are from those grenadier hauls alone and do not represent the total grenadier sample for 2006. A haul was considered a “grenadier haul” if grenadier were the most prevalent species. These data can provide some insight into what a grenadier directed fishery might look like, but they may not be entirely representative because these hauls were not targeting grenadier. For this discussion, grenadier are considered groundfish.

In the BSAI hook-and-line fisheries (Table 17), grenadier comprised 68 percent of the total groundfish catch followed by relatively small amounts of Greenland turbot (11 percent) and sablefish (6 percent). A grenadier fishery could be expected to take some catch of both these species. Because sablefish is controlled under the IFQ Program, a hook-and-line vessel catching that species would have to have IFQ to retain it. Additional amounts of rockfish and Pacific cod would also be caught in a grenadier directed fishery. Both rockfish and Pacific cod are highly utilized. An expanded grenadier fishery would increase incidental catch of these species as well. Of the grenadier hauls in the non-pelagic trawl fishery, grenadier comprised 32 percent of the catch, followed by Greenland turbot at 31 percent, and arrowtooth flounder at 29 percent (Figure 17). Given that these hauls were derived from fishing that is targeting other species, it is likely Greenland turbot was the species of intent.

In the GOA hook-and-line fishery, grenadiers accounted for 73 percent of the catch in what was likely a sablefish target fishery. If these catch data indicate the character of a grenadier target fishery, sablefish are the second most prevalent catch (22 percent) followed by thornyhead rockfish (2 percent), and small amounts arrowtooth flounder, skate, shorttraker rockfish, and roughey rockfish (Table 18).

Bering Sea Aleutian Islands

The BSAI grenadier tier 5 OFL and ABC are 108,888 mt and 81,666 mt, respectively. Catch of grenadier is well below the ABC (Figure 31). Incidental catch of grenadier is taken predominately in hook-and-line fisheries for Greenland turbot and sablefish (Figure 32). The incidental catch rates of over 800 kg/mt in the Greenland turbot target and over 1,000 kg/mt in the sablefish target indicate that grenadier average about half the catch in those fisheries. Figure 38 shows the broad distribution of grenadier catch.

Gulf of Alaska

The GOA grenadier tier 5 OFL and ABC are 27,852 mt and 20,889 mt, respectively. The increase starting in March clearly matches the beginning of the IFQ fisheries for halibut and sablefish in the GOA (Figure 33). Grenadier are most often caught in the GOA hook-and-line sablefish target fisheries, followed distantly by non-pelagic trawl gear in the rockfish, deep-water flatfish, and flathead sole targets (Figure 34). The rate of more than 500 kg/mt groundfish in the hook-and-line sablefish target indicates that, on average, about a quarter of the catch in that fishery is grenadier. Figure 44 shows grenadier catch tracking the distribution of most of the sablefish fishery.

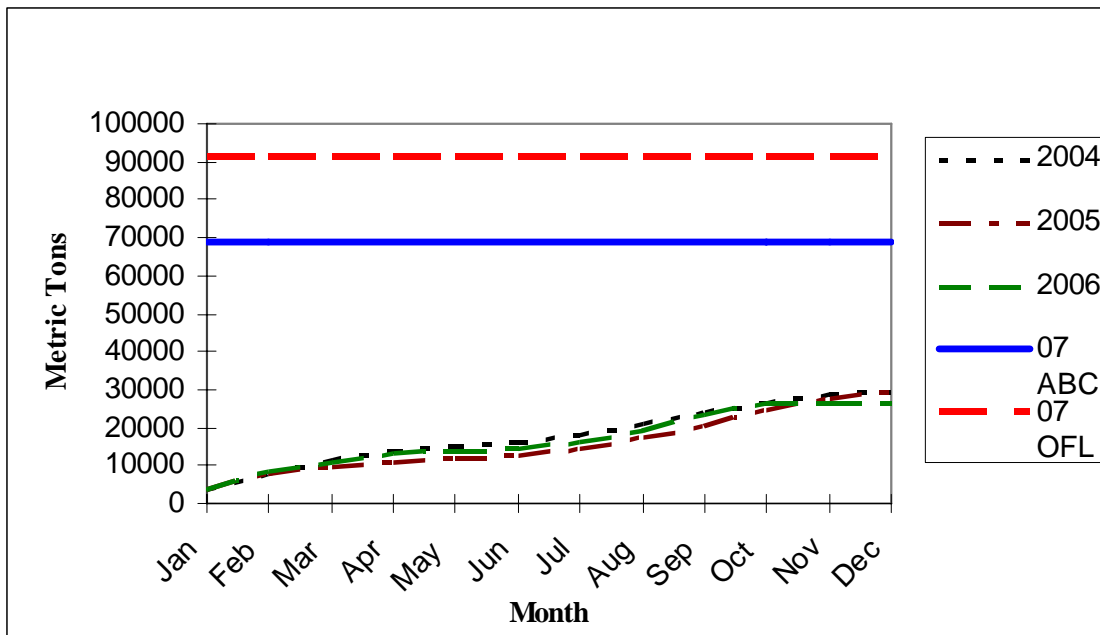


Figure 1. Cumulative BSAI “Other Species” Catch by Year (2004-6)

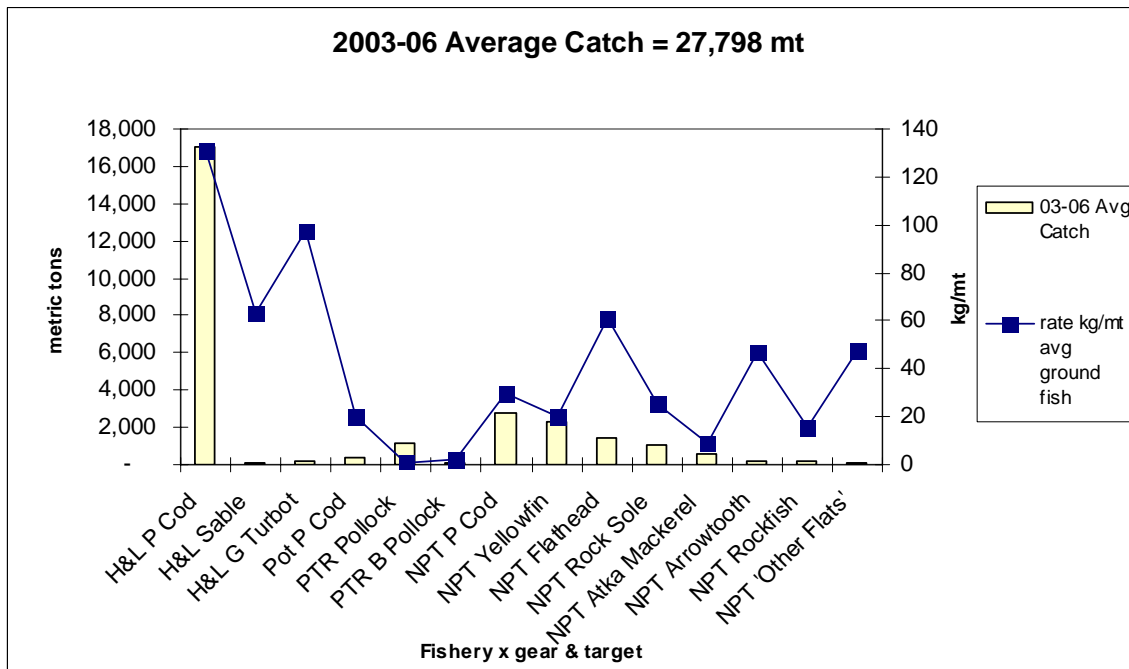


Figure 2. BSAI “Other Species” Average Catch by Gear and Target

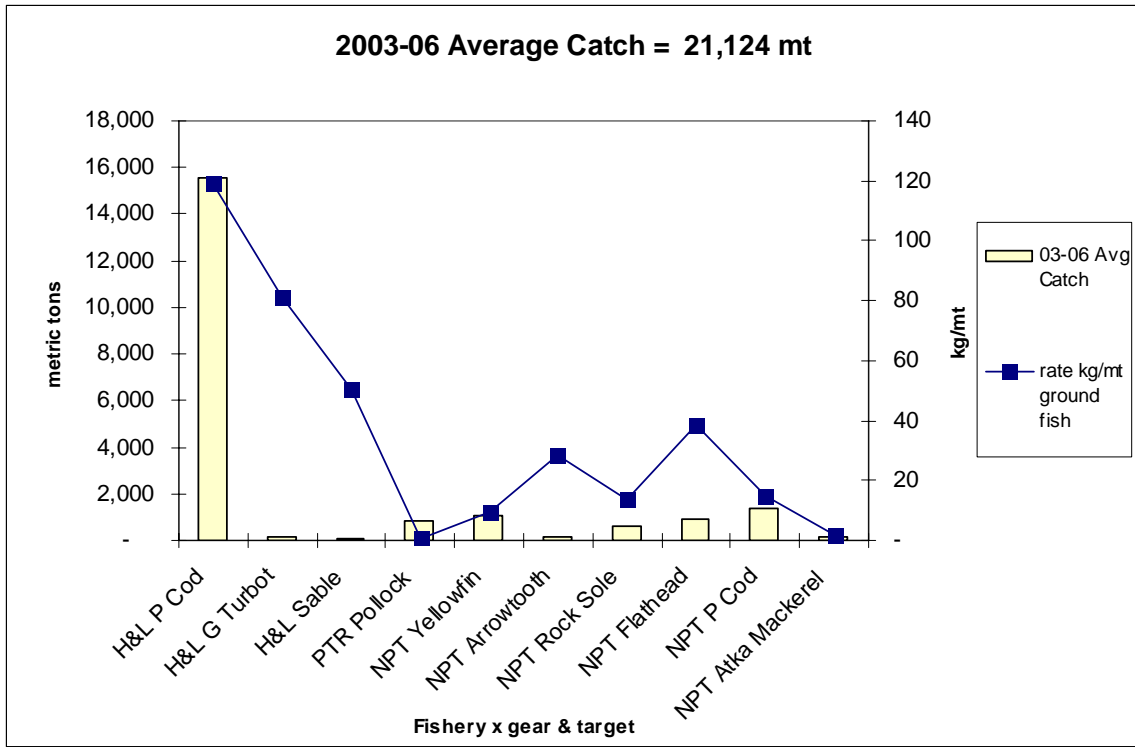


Figure 3. BSAI Skate Average Catch by Gear and Target

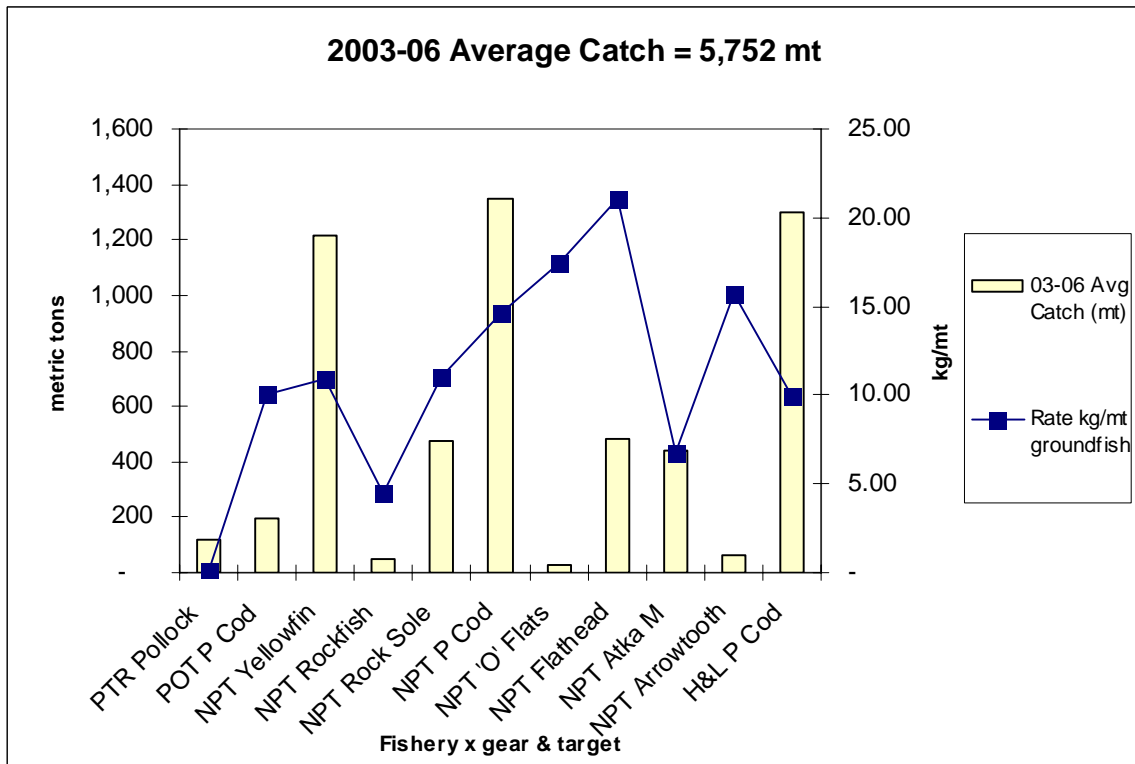


Figure 4. BSAI Sculpins Average Catch by Gear and Target

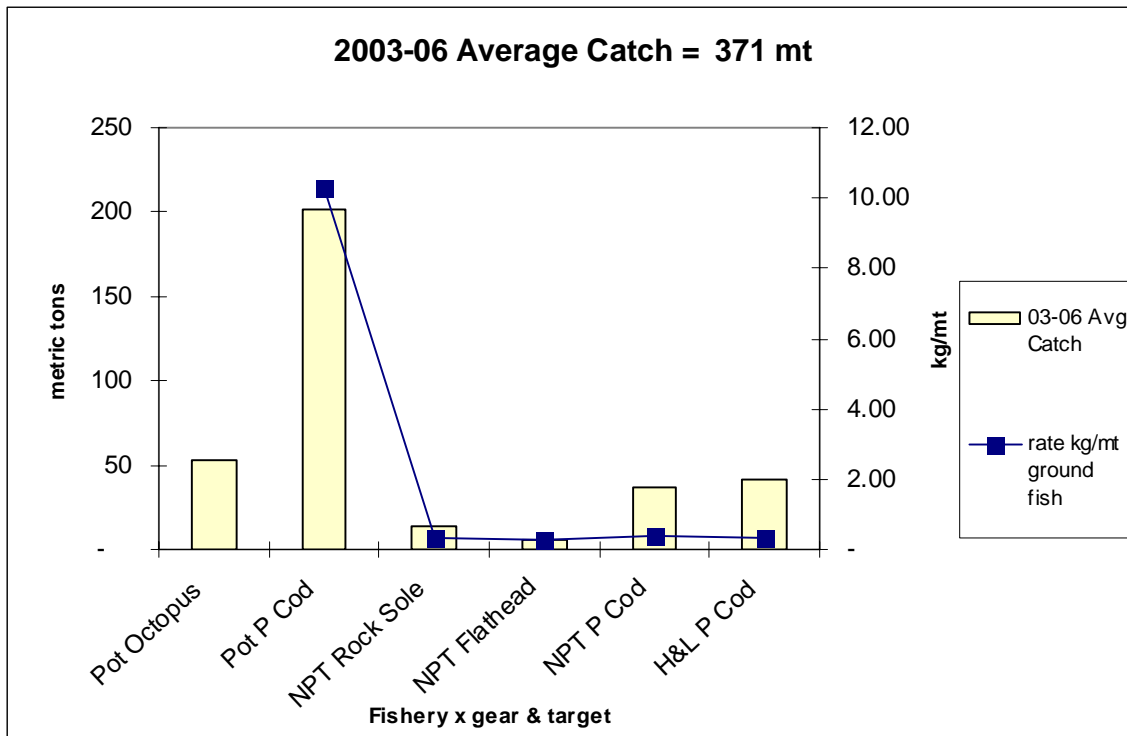


Figure 5. BSAI Octopuses Average Catch by Gear and Target

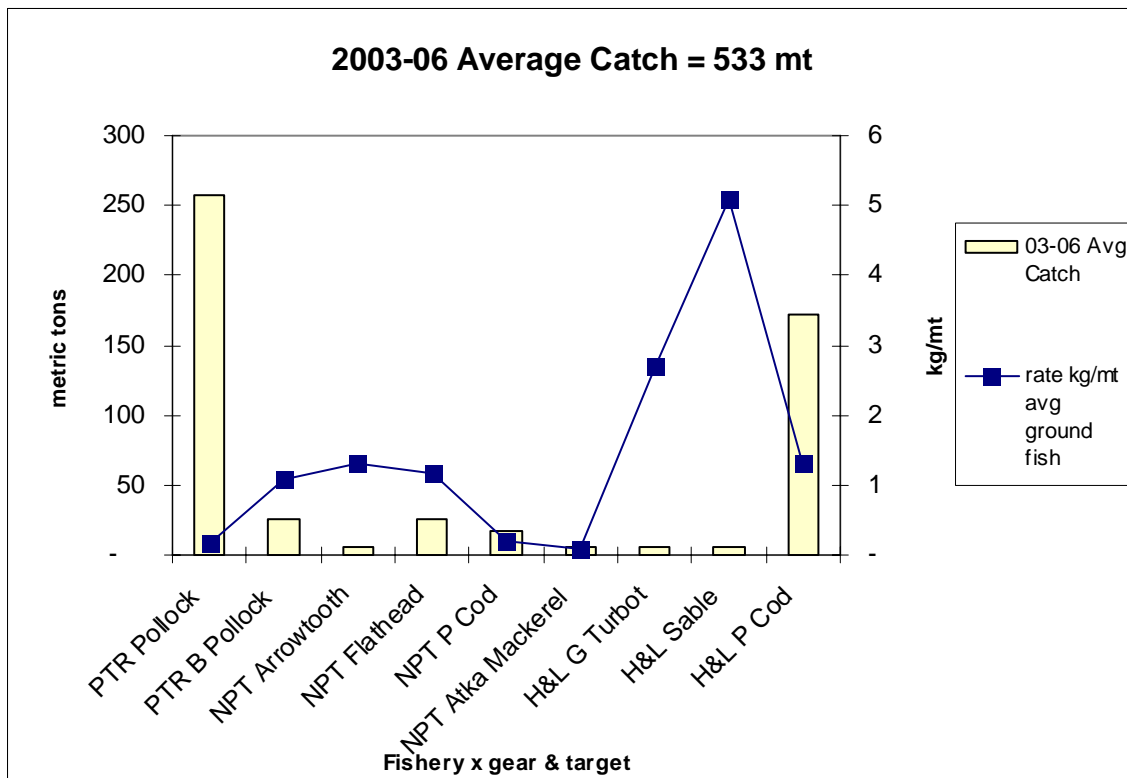


Figure 6. BSAI Sharks Average Catch by Gear and Target

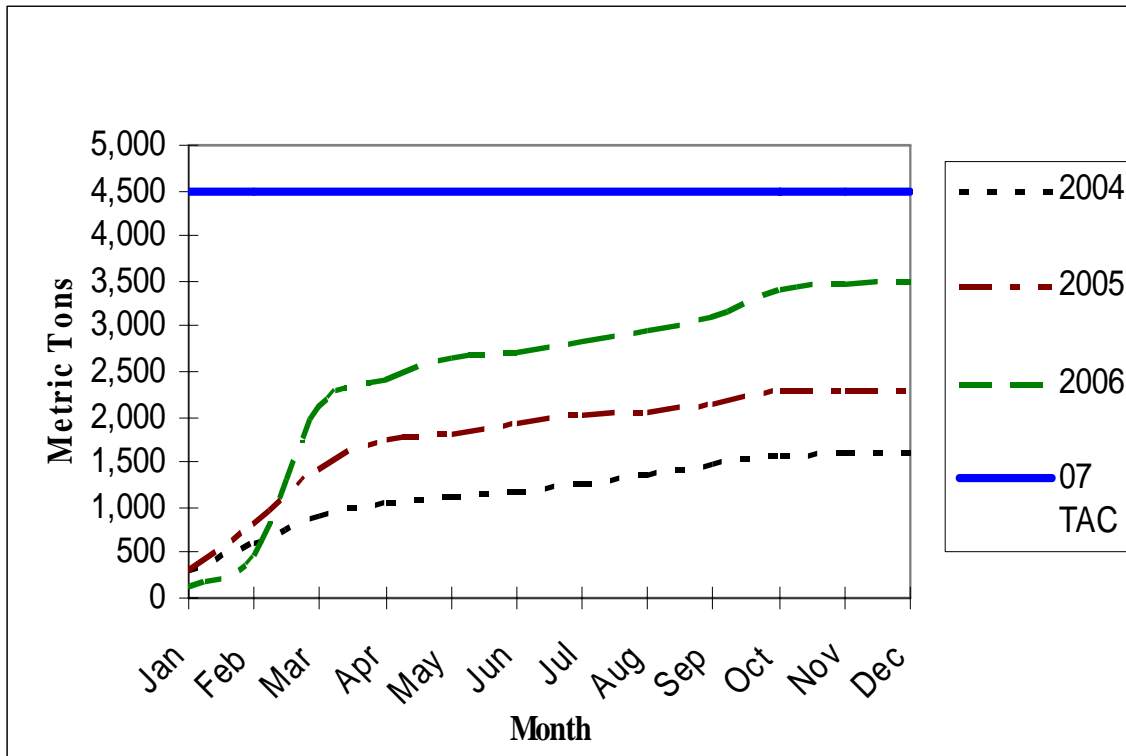


Figure 7. Cumulative GOA “Other Species” Catch by Year (2004-6)

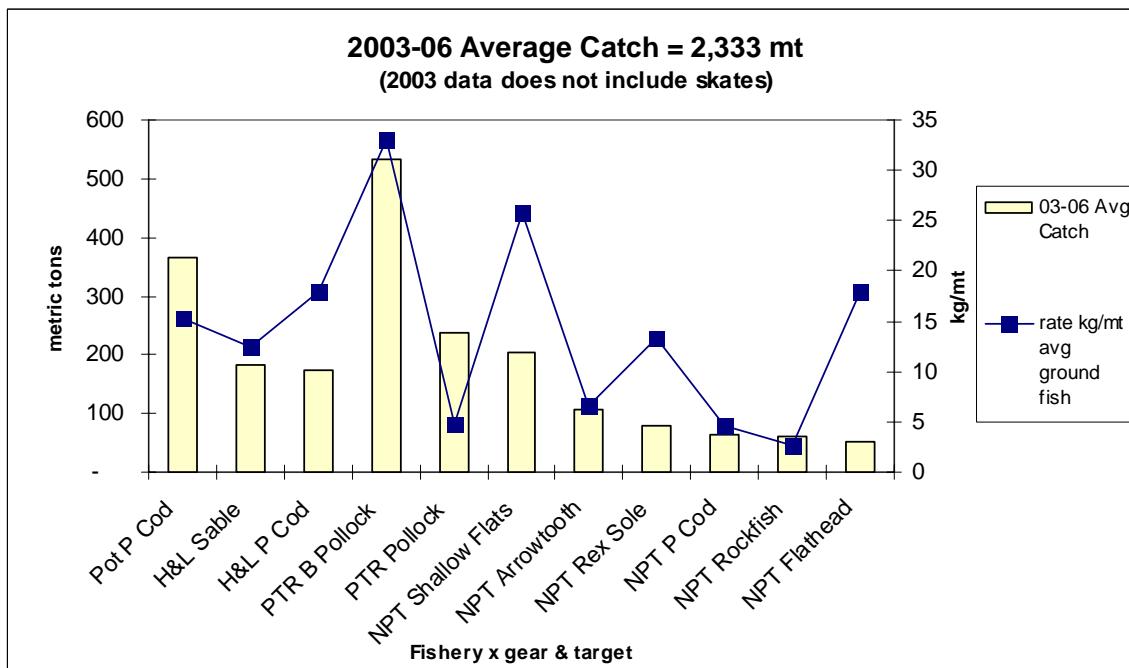


Figure 8. GOA “other species” Average Catch by Gear and Target

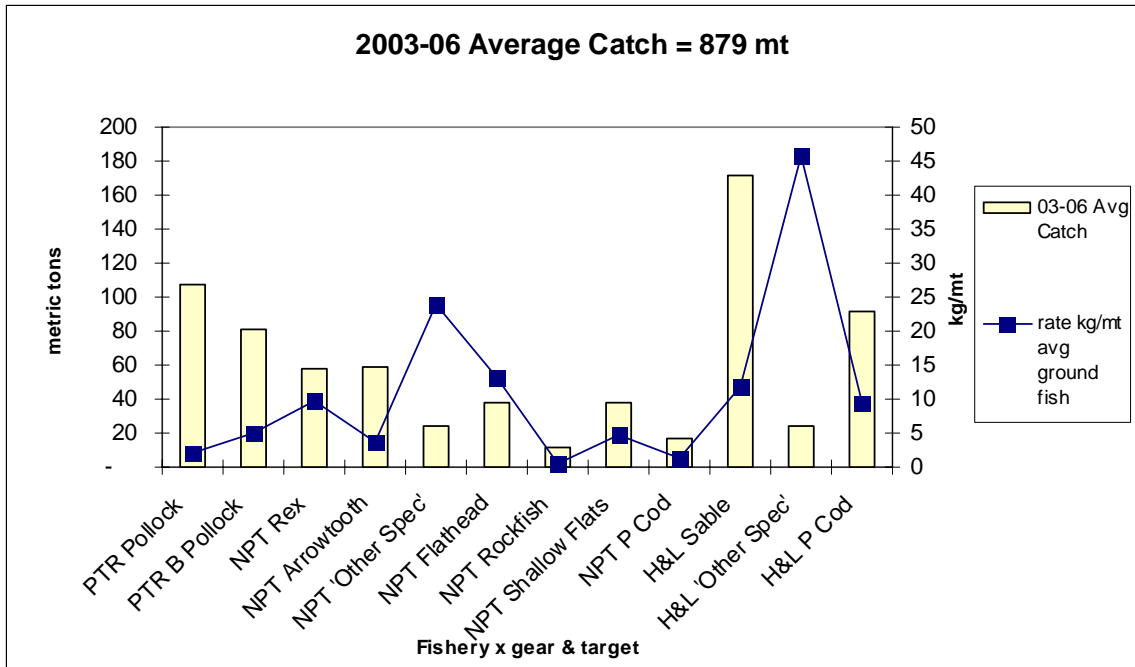


Figure 9. GOA Sharks Average Catch by Gear and Target

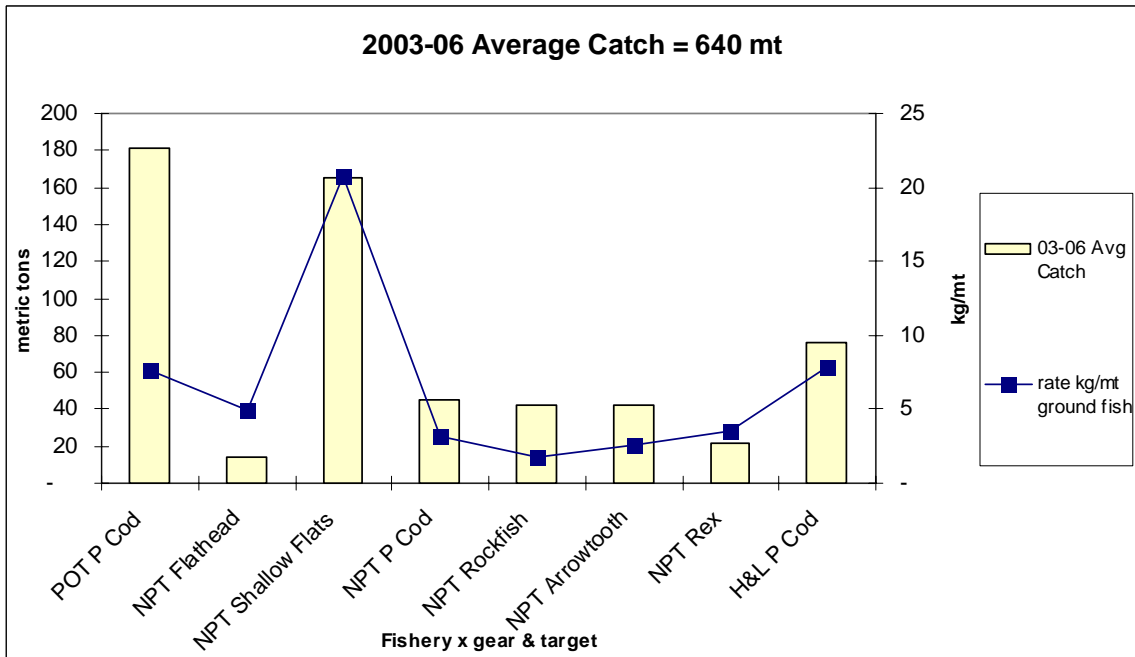


Figure 10. GOA Sculpins Average Catch by Gear and Target

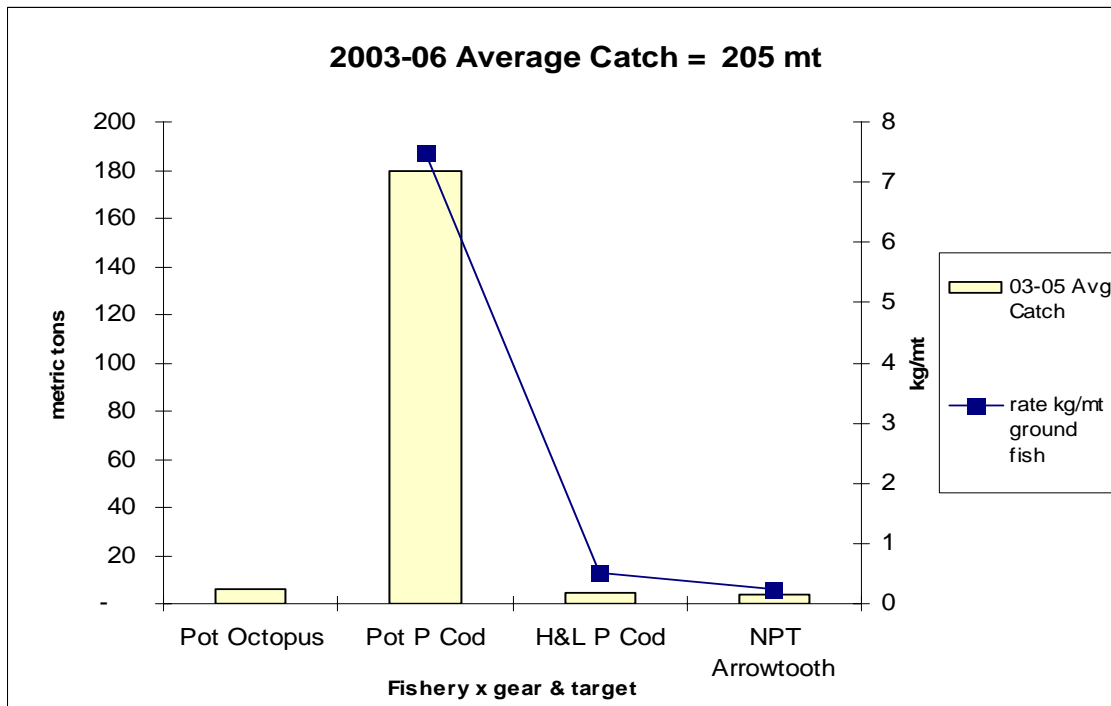


Figure 11. GOA Octopuses Average Catch by Gear and Target

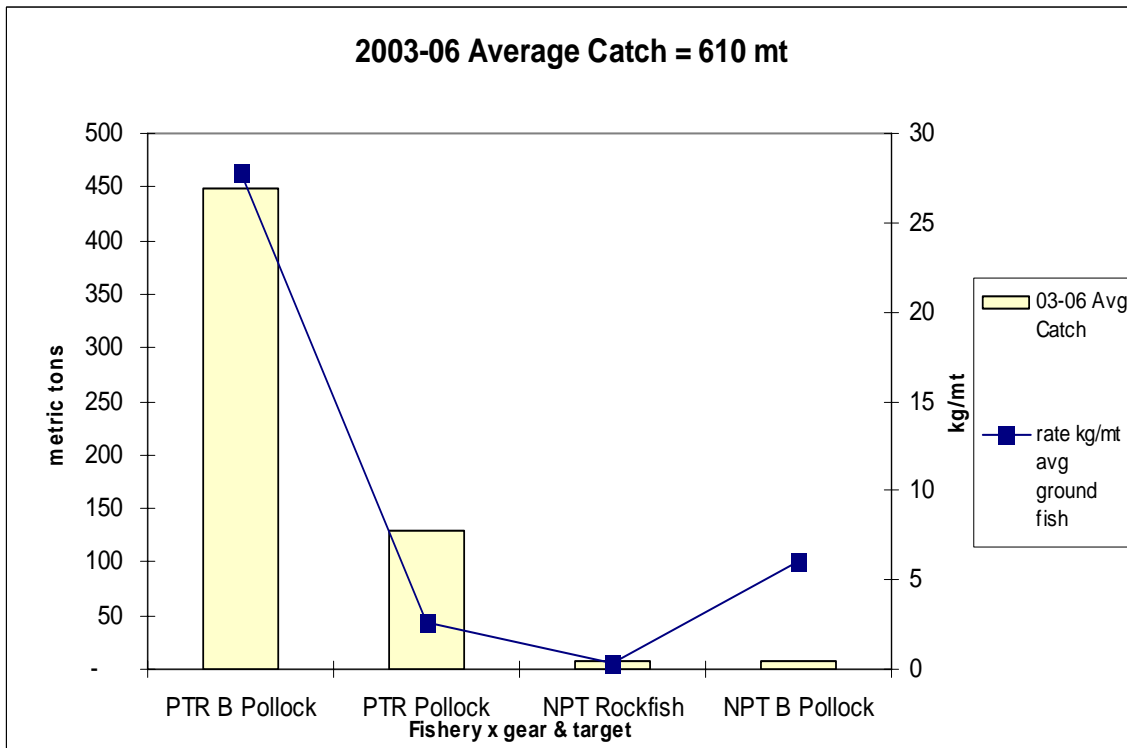


Figure 12. GOA Squid Average Catch by Gear and Target

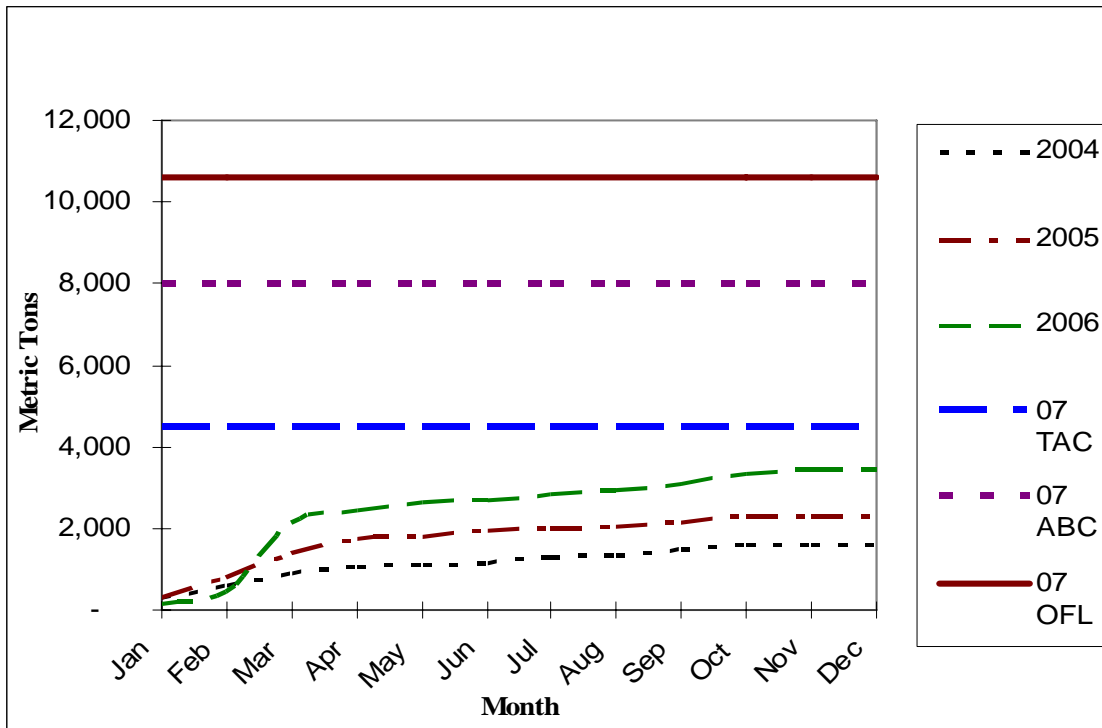


Figure 13. Cumulative GOA “Other Species” Catch by Year (2004-6) Relative to Status Quo TAC and Alternative 2 ABC, and OFL

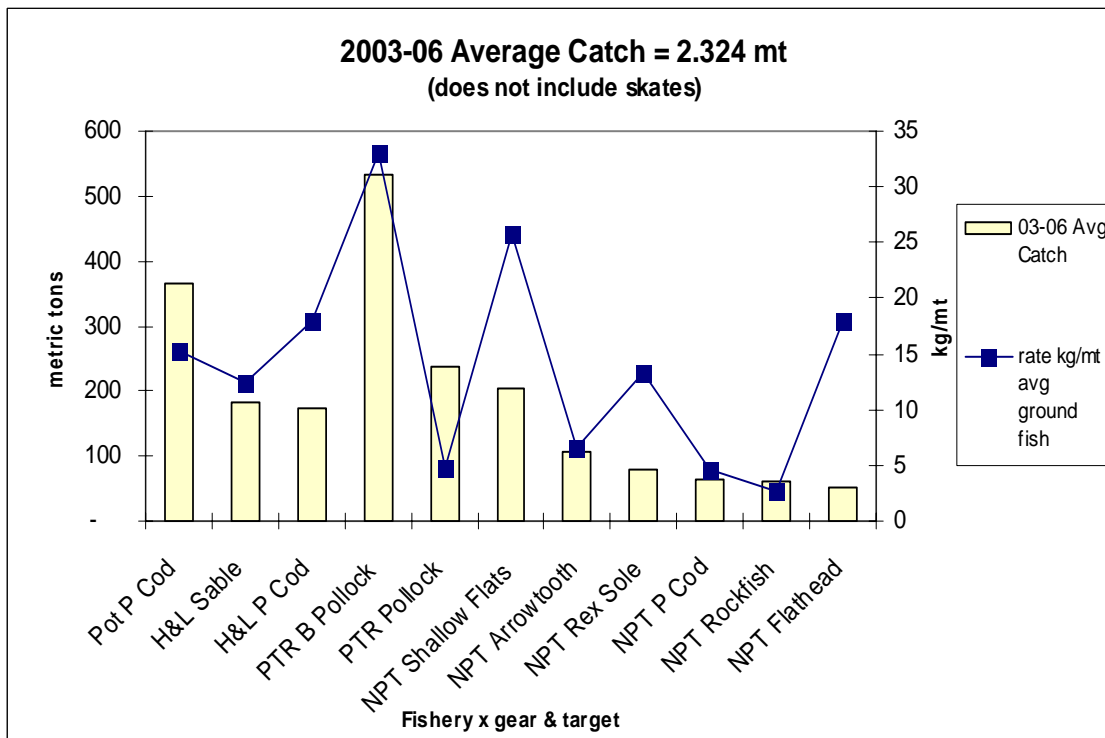


Figure 14. GOA “Other Species” Average Catch by Gear and Target (excluding skate in 2003)

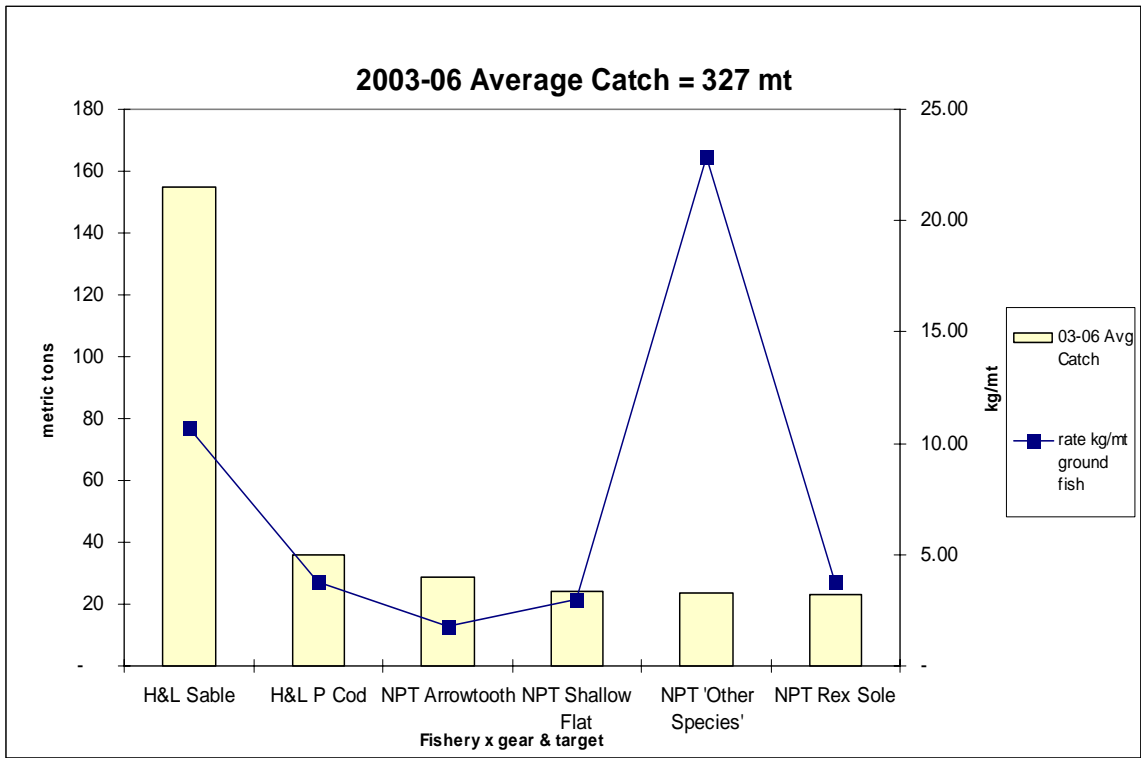


Figure 15. GOA Dogfish Shark Average Catch by Gear and Target

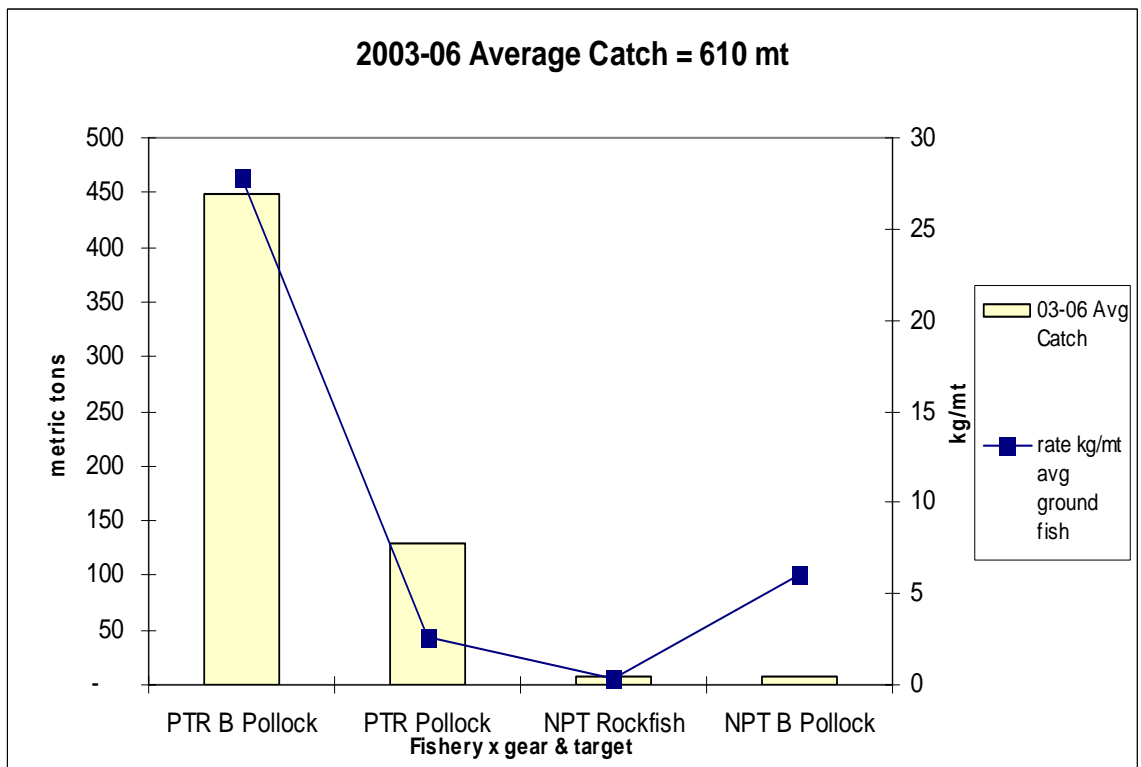


Figure 16. GOA Squid Average Catch by Gear and Target

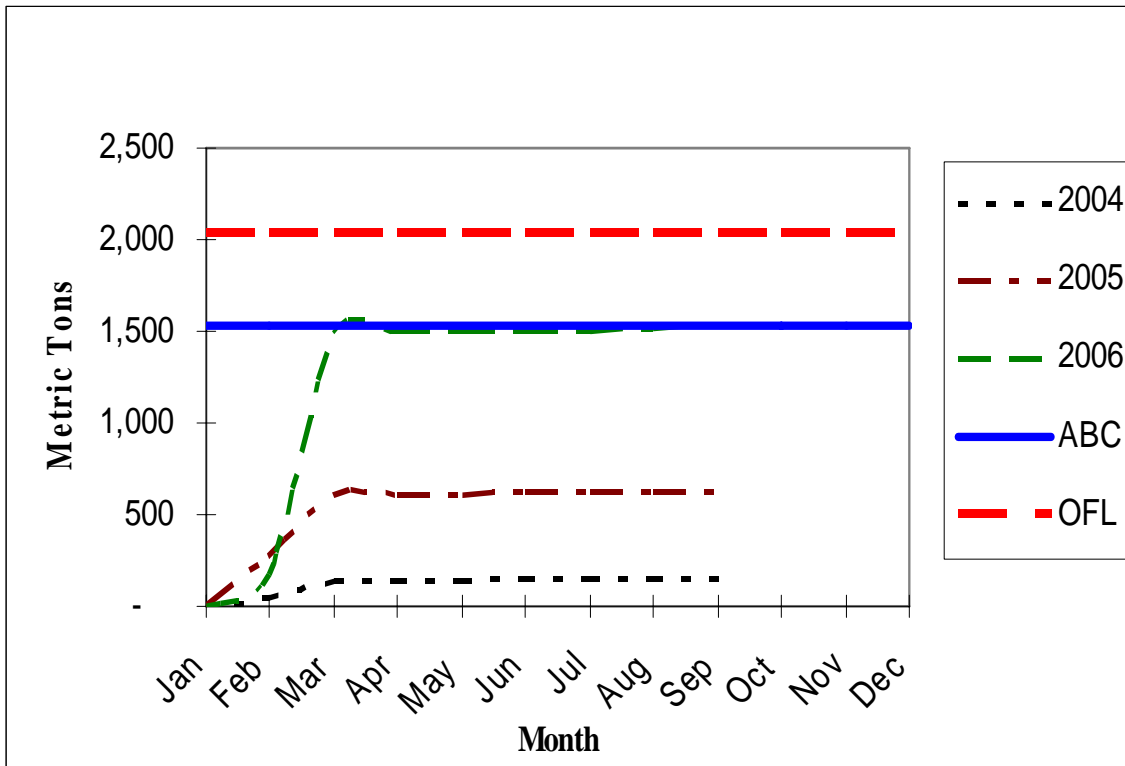


Figure 17. Cumulative GOA Squid Catch by Year (2004-6) Relative to ABC and OFL

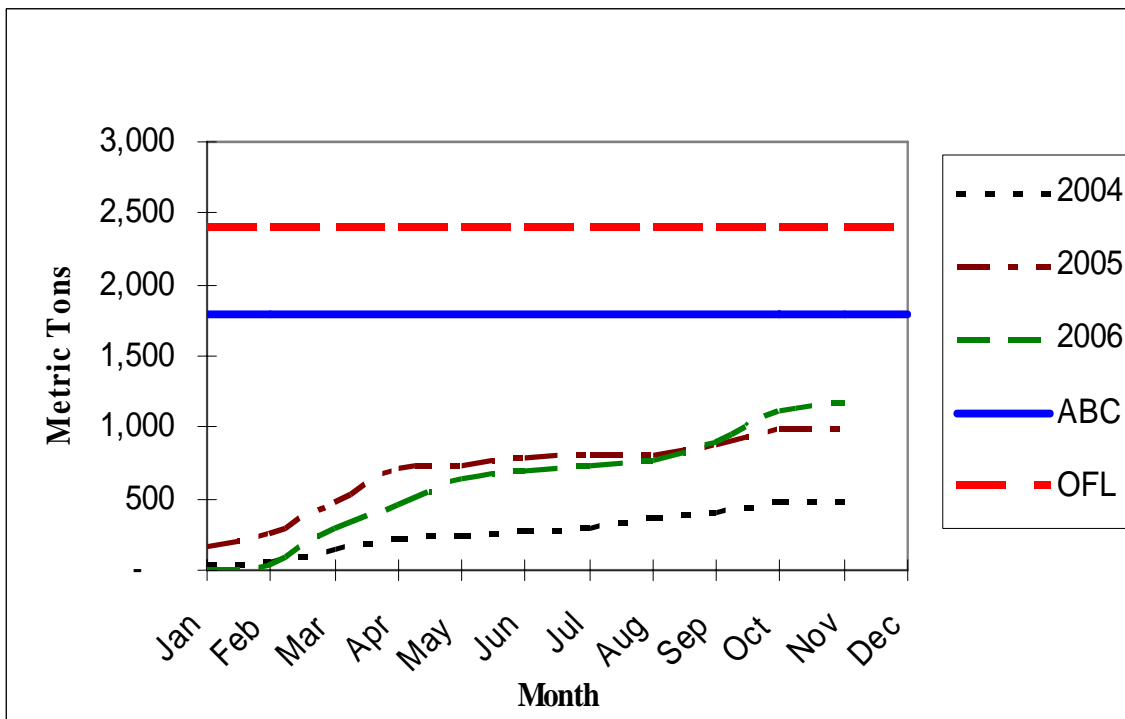


Figure 18. Cumulative GOA Sharks Catch by Year (2004-6) Relative to ABC and OFL

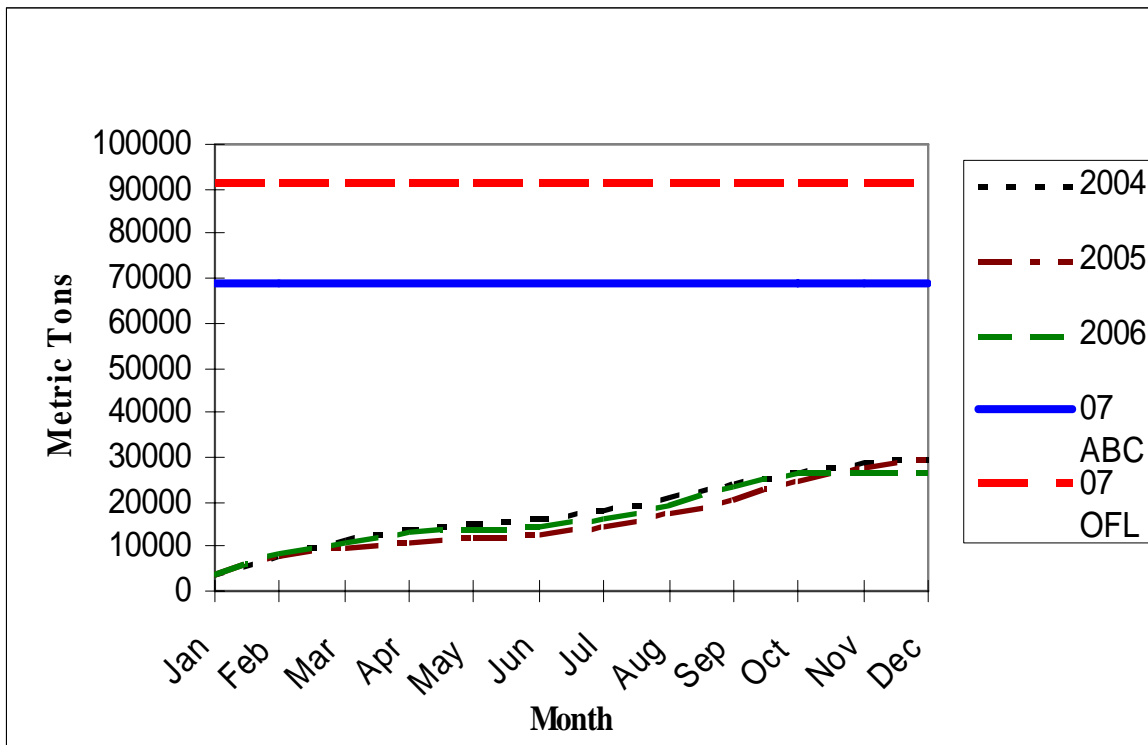


Figure 19. Cumulative BSAI “Other Species” Catch by Year (2004-6) Relative to Status Quo ABC and OFL

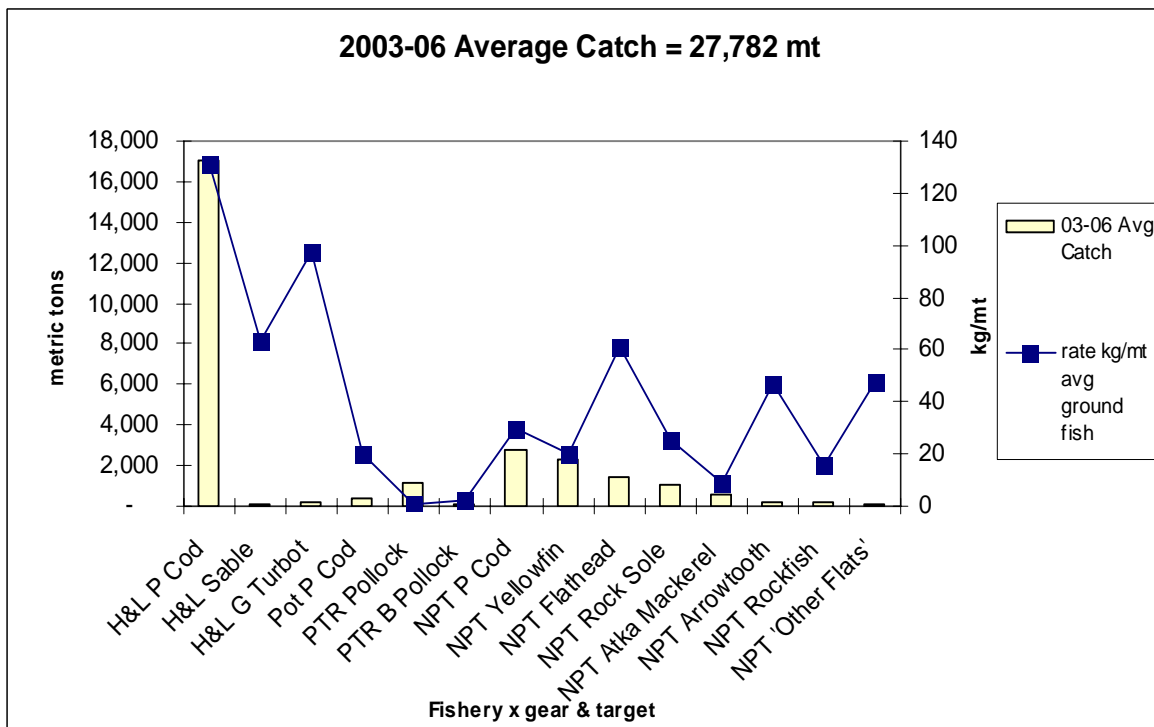


Figure 20. BSAI “Other Species” Average Catch by Gear and Target

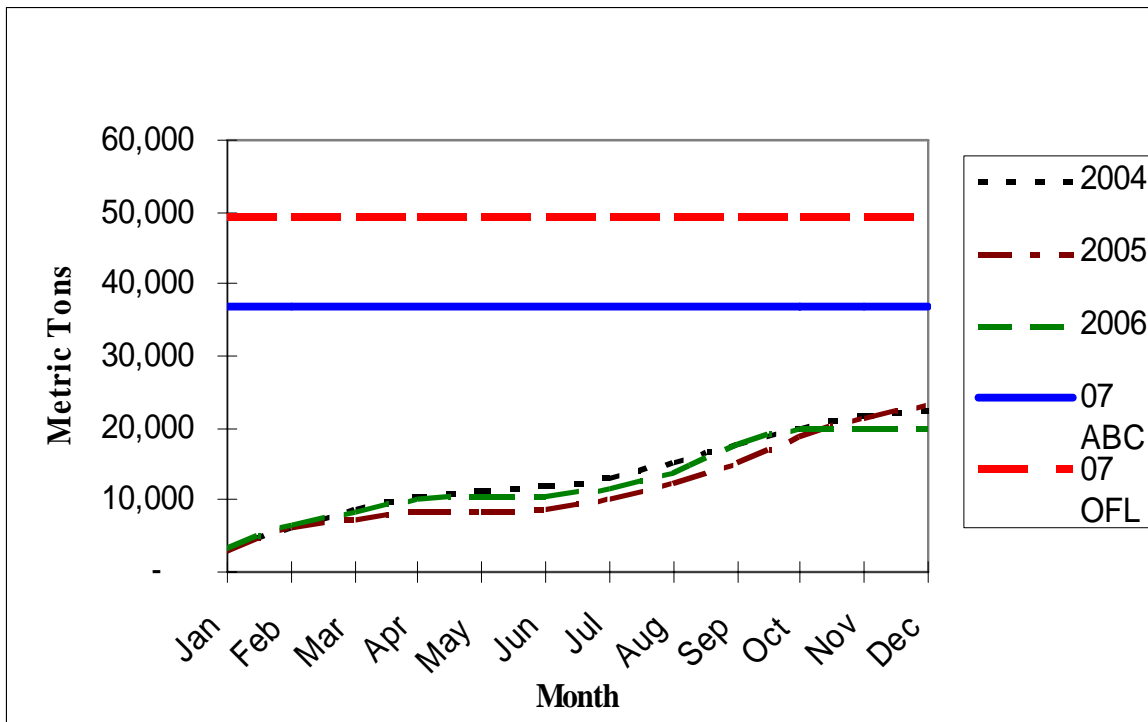


Figure 21. Cumulative BSAI Skate Catch by Year (2004-6) Relative to Skate ABC and OFL

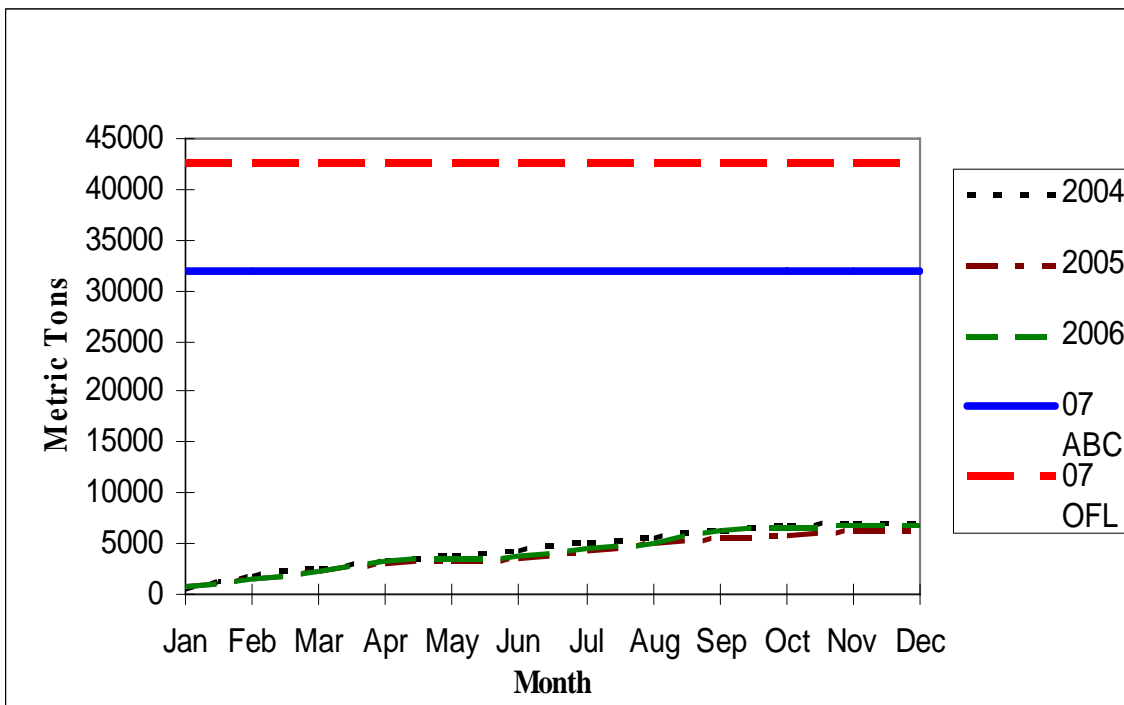


Figure 22. Cumulative BSAI Sharks, Sculpins, and Octopuses Catch by Year (2004-2006) Relative to Alternative 3 "Other Species" ABC and OFL

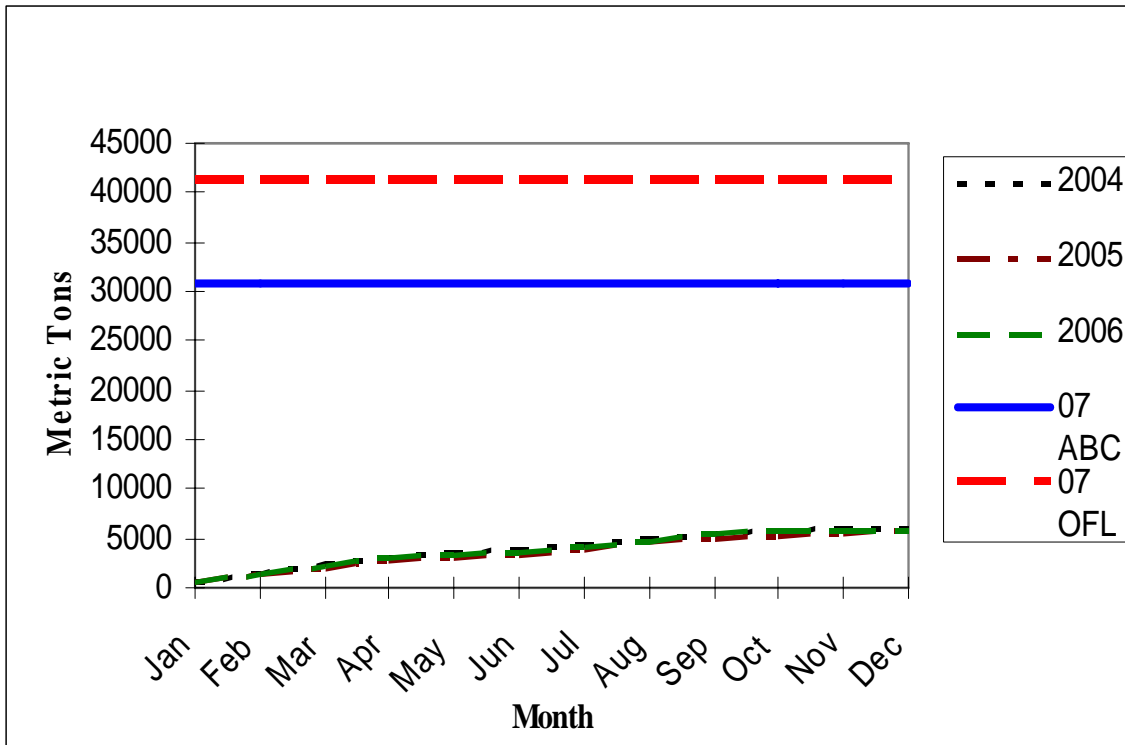


Figure 23. Cumulative BSAI Sculpins Catch by Year (2004-6) Relative to ABC and OFL

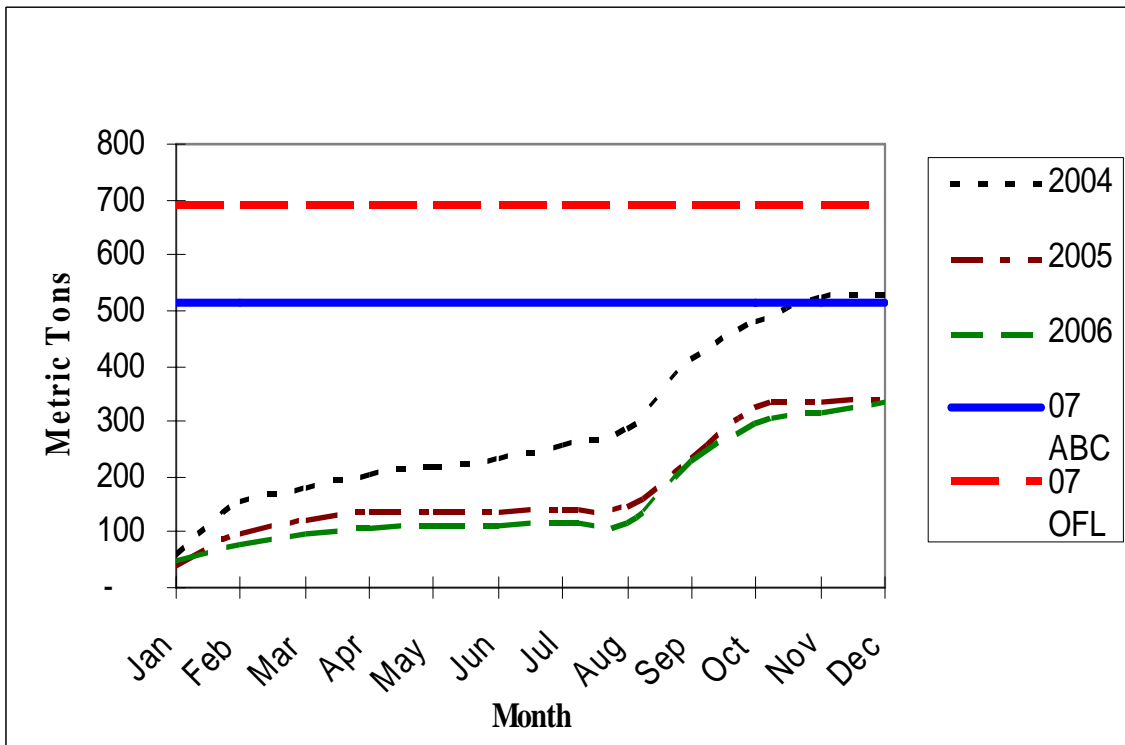


Figure 24. Cumulative BSAI Octopuses Catch by Year (2004-6) Relative to ABC and OFL

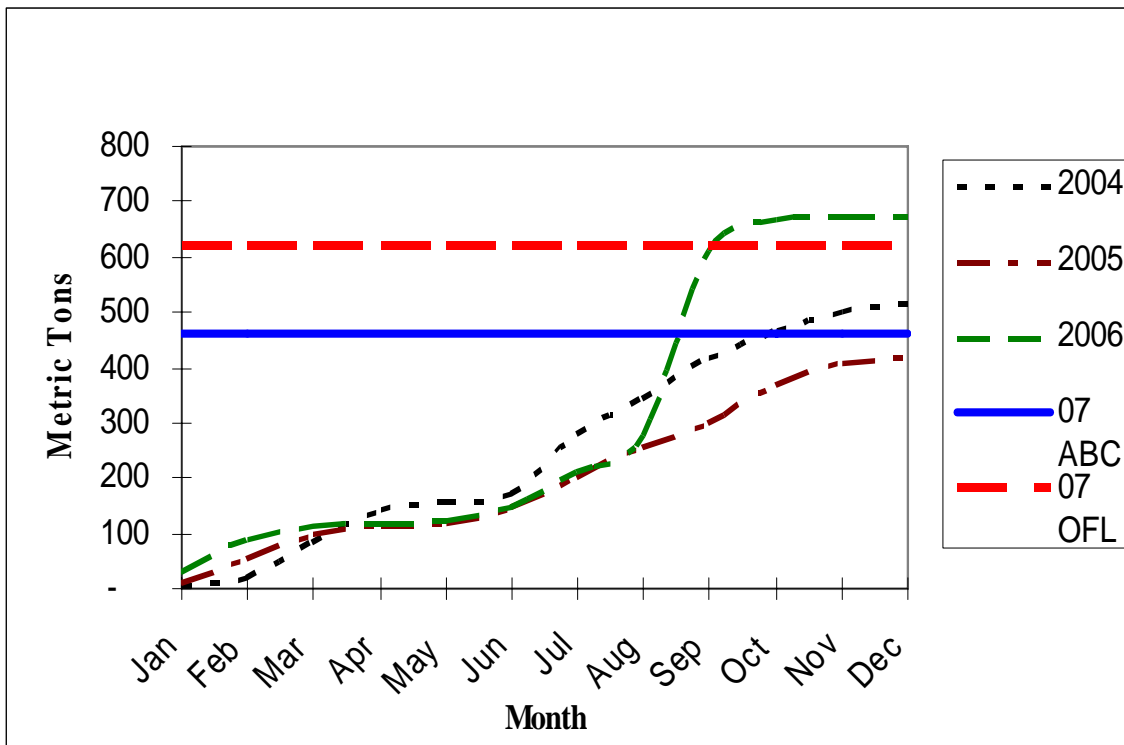


Figure 25. Cumulative BSAI Sharks Catch by Year (2004-6) Relative to ABC and OFL

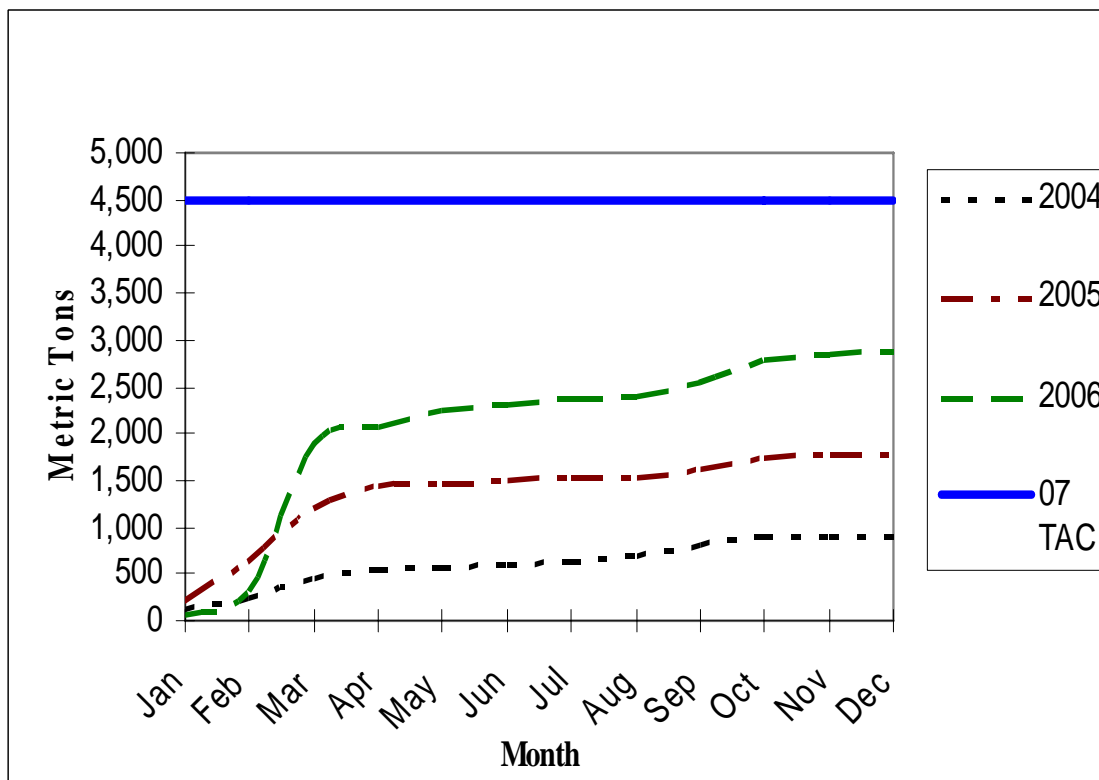


Figure 26. Cumulative GOA Sharks, Sculpins, Octopuses Catch by Year (2004-2006) Relative to Status Quo "other species" ABC

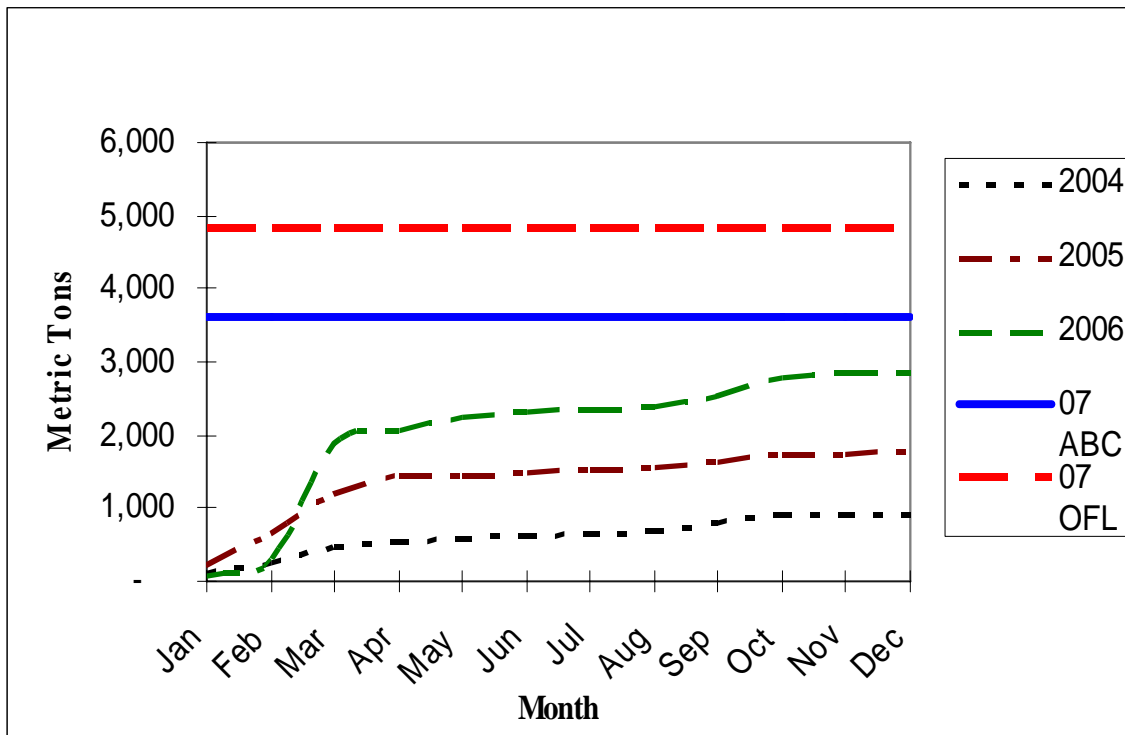


Figure 27. Cumulative GOA Sharks, Sculpins, Octopuses Catch by Year (2004-2006) Relative to Combined Constituent OFLs and ABCs

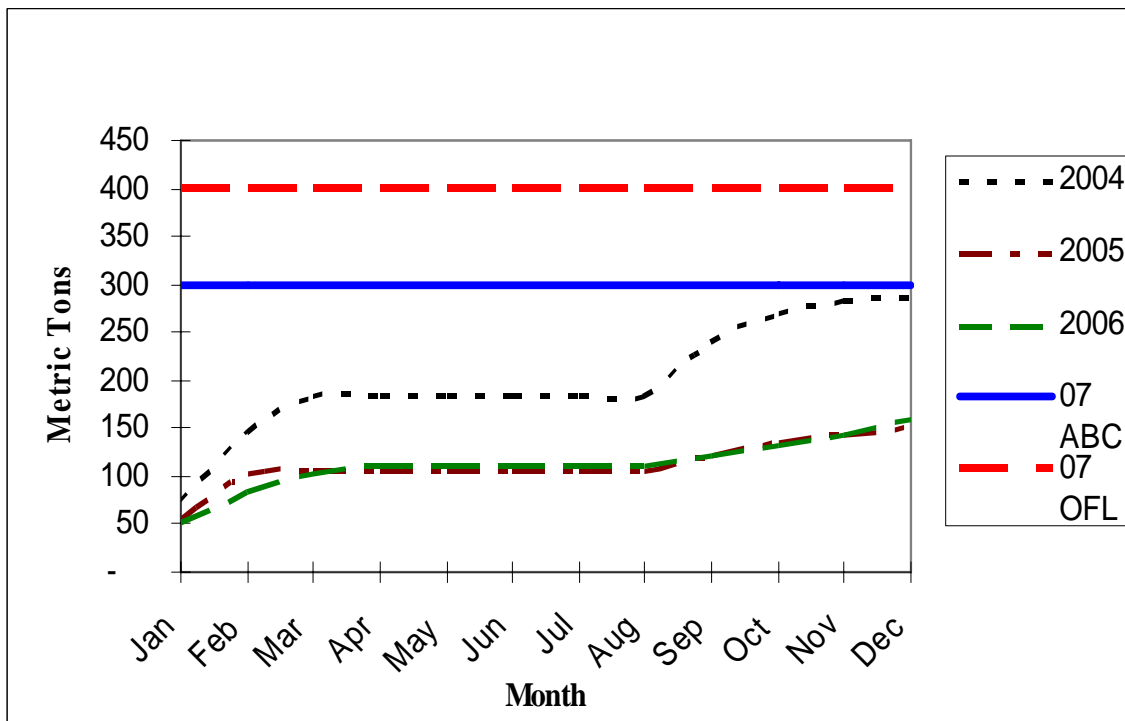


Figure 28. Cumulative GOA Octopuses Catch by Year (2004-2006) Relative to OFL and ABC

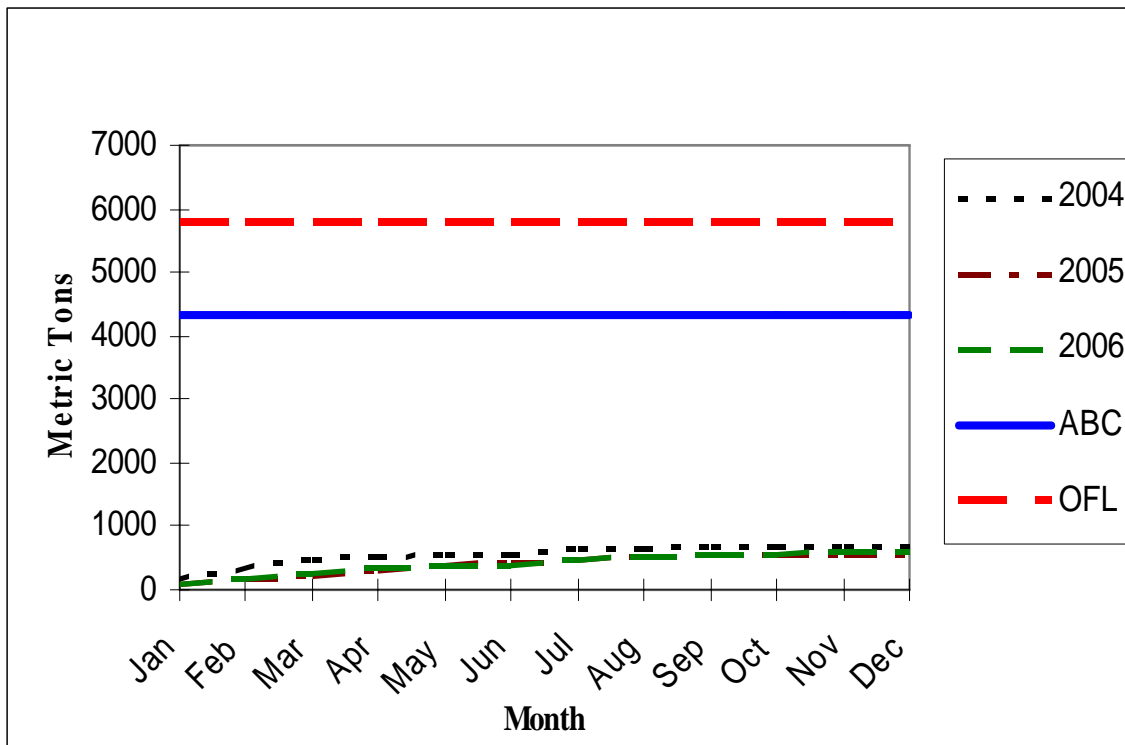


Figure 29. Cumulative GOA Sclupins Catch by Year (2004-6) Relative to ABC and OFL

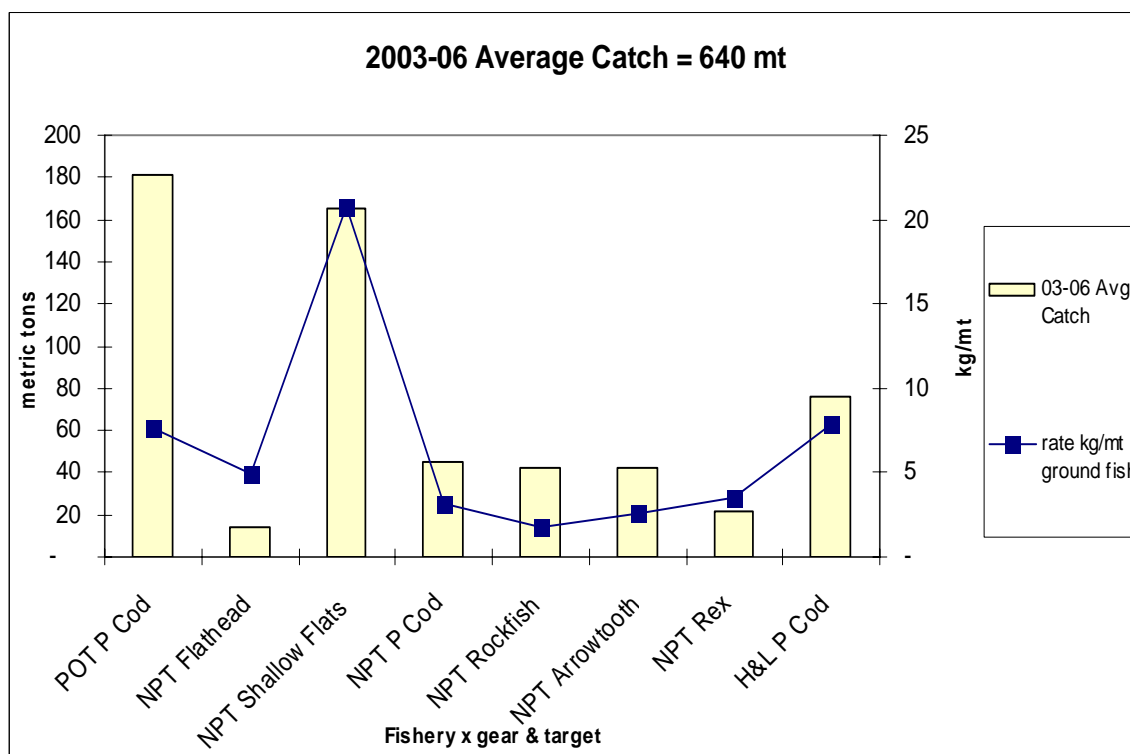


Figure 30. GOA Sclupins Average Catch by Gear and Target

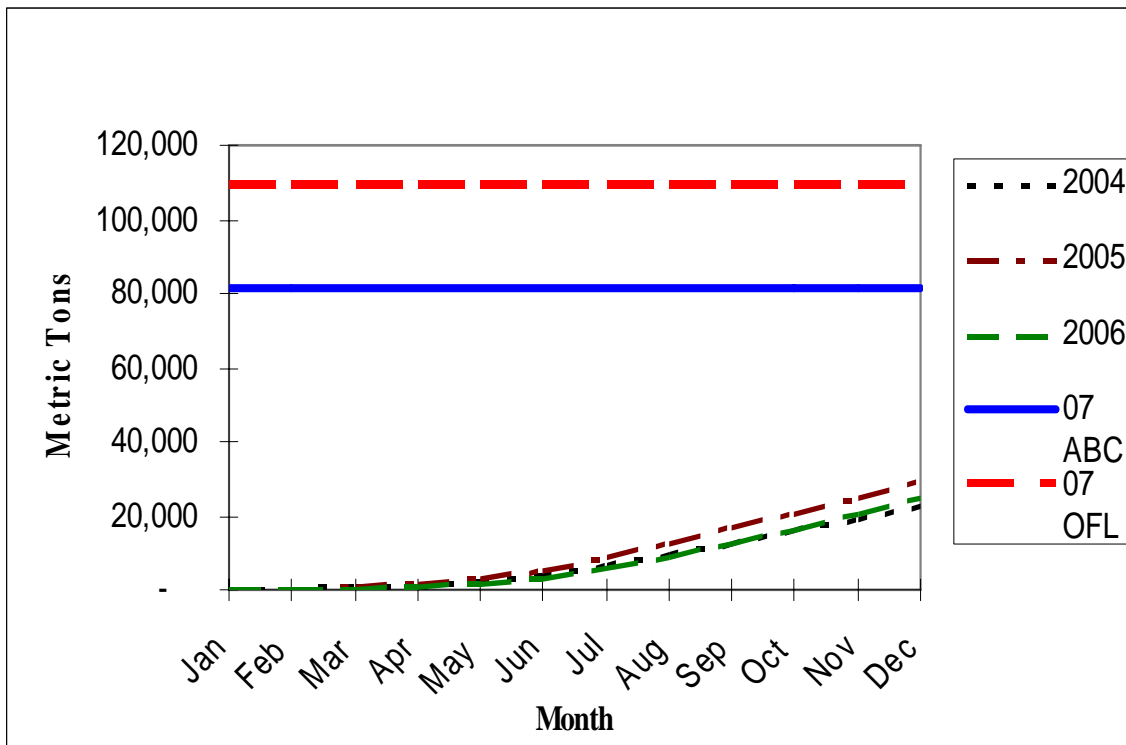


Figure 31. Cumulative BSAI Grenadier Catch by Year (2004-06) Relative to ABC and OFL

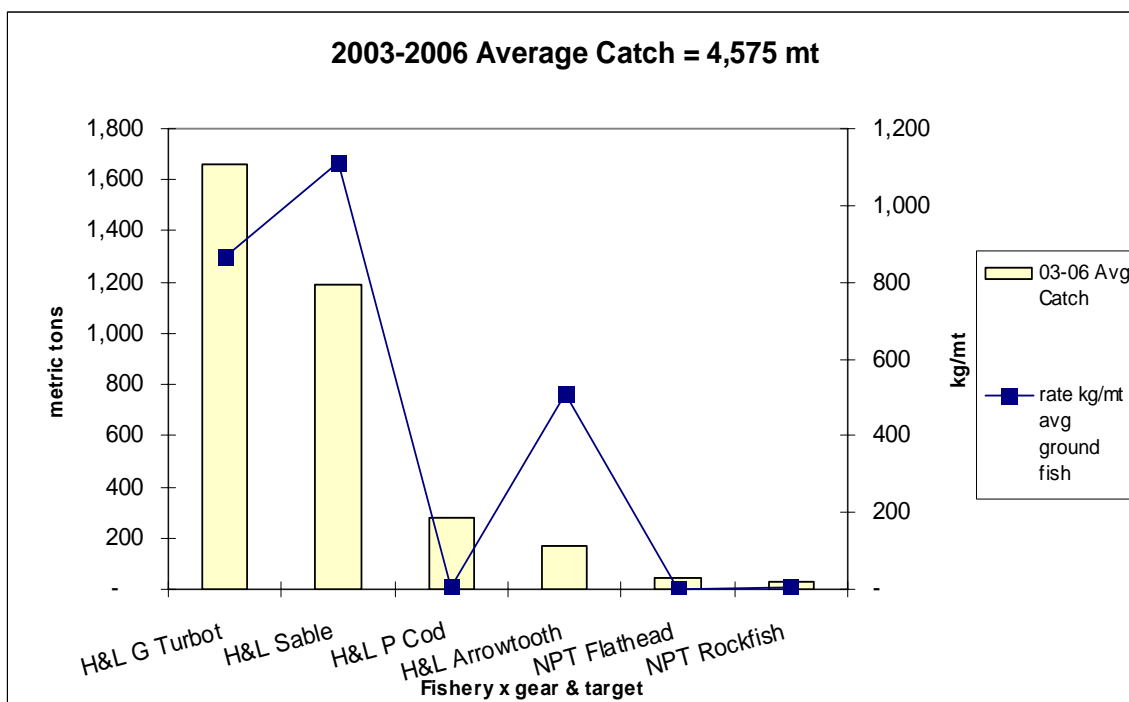


Figure 32. BSAI Grenadier Average Catch by Gear and Target

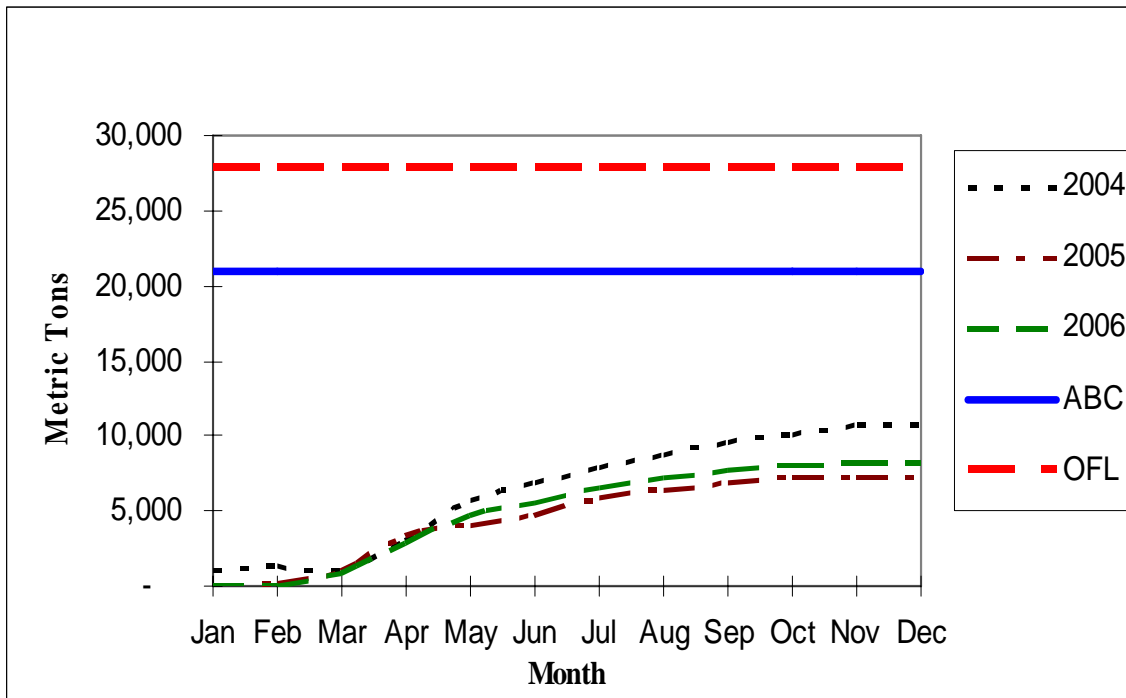


Figure 33. Cumulative GOA Grenadier Catch by Year (2004-06) Relative to ABC and OFL

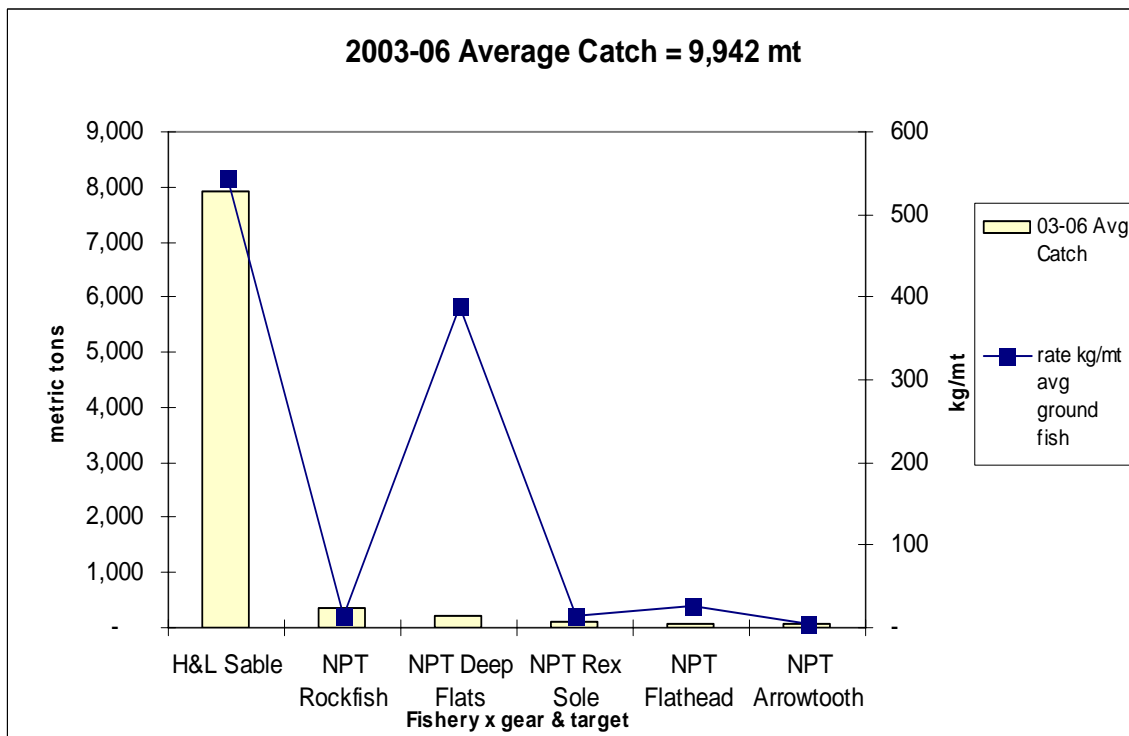


Figure 34. GOA Grenadier Average Catch by Gear and Target

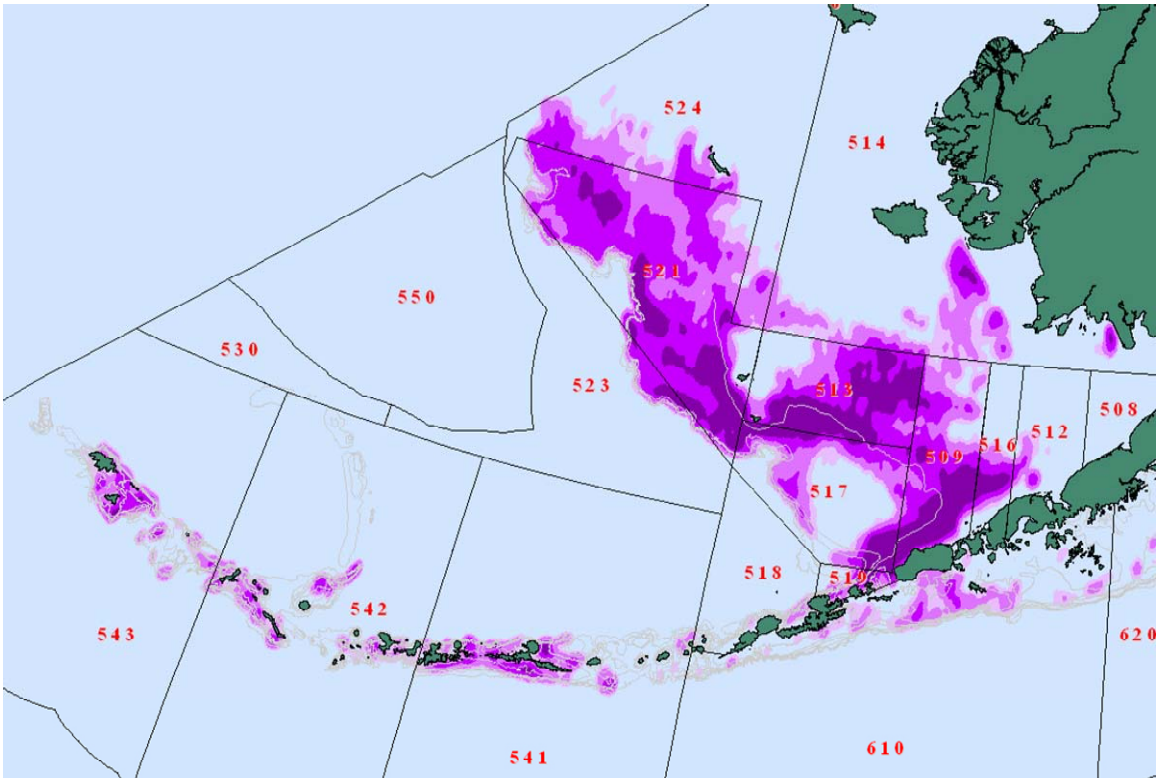


Figure 35. BSAI Sculpin Catch Density (kg/mt groundfish) 2003-2005

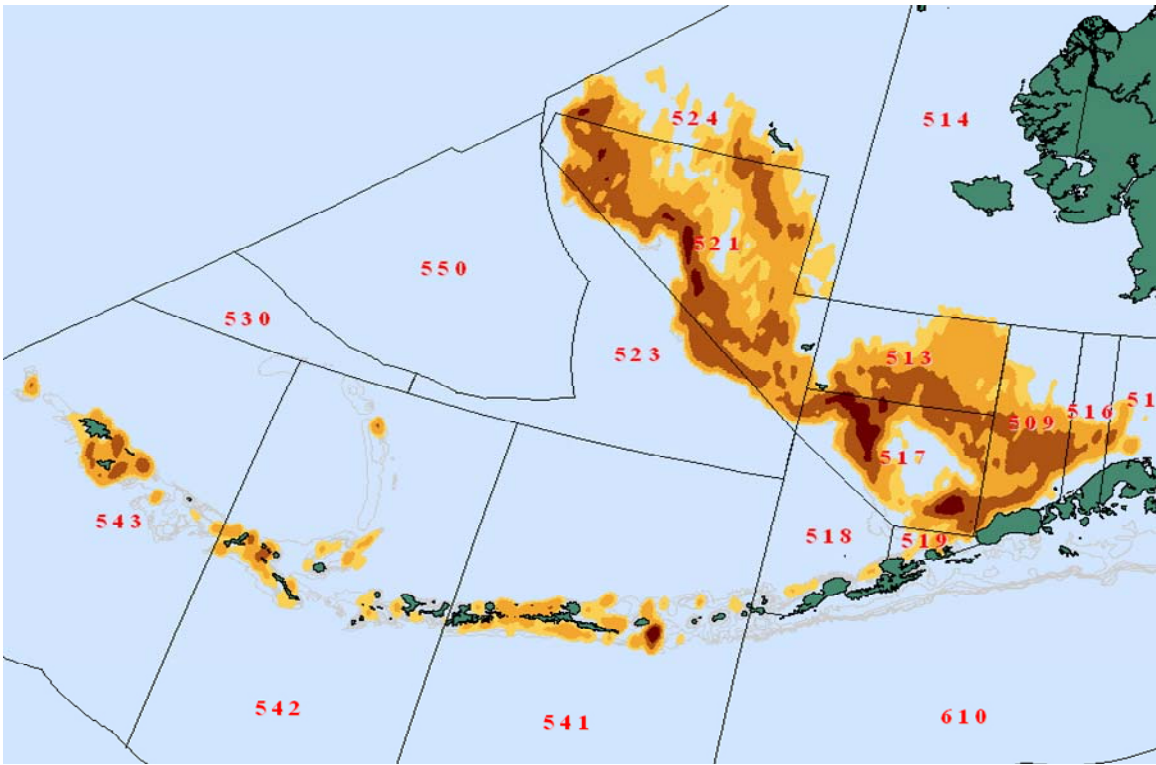


Figure 36. BSAI Skate Catch Density (kg/mt groundfish) 2003-2005

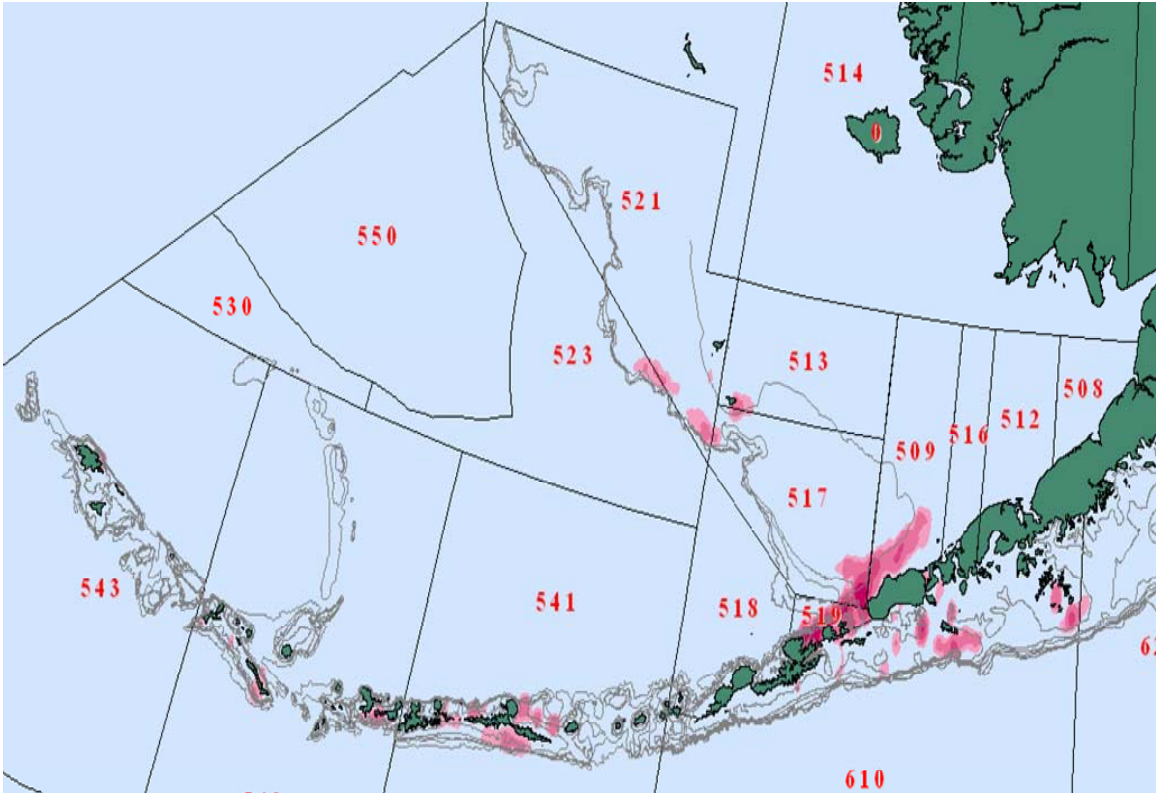


Figure 37. BSAI Octopuses Catch Density (kg/mt groundfish) 2003-2005

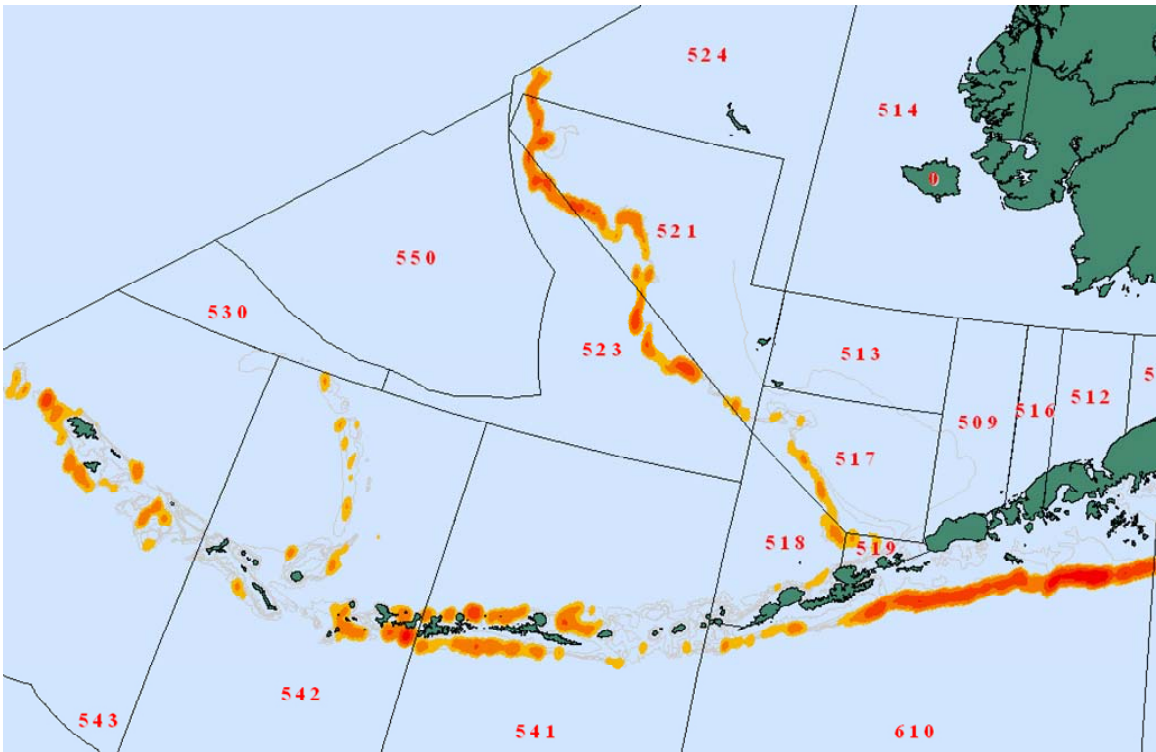


Figure 38. BSAI Grenadiers Catch Density (kg/mt groundfish) 2003-2005

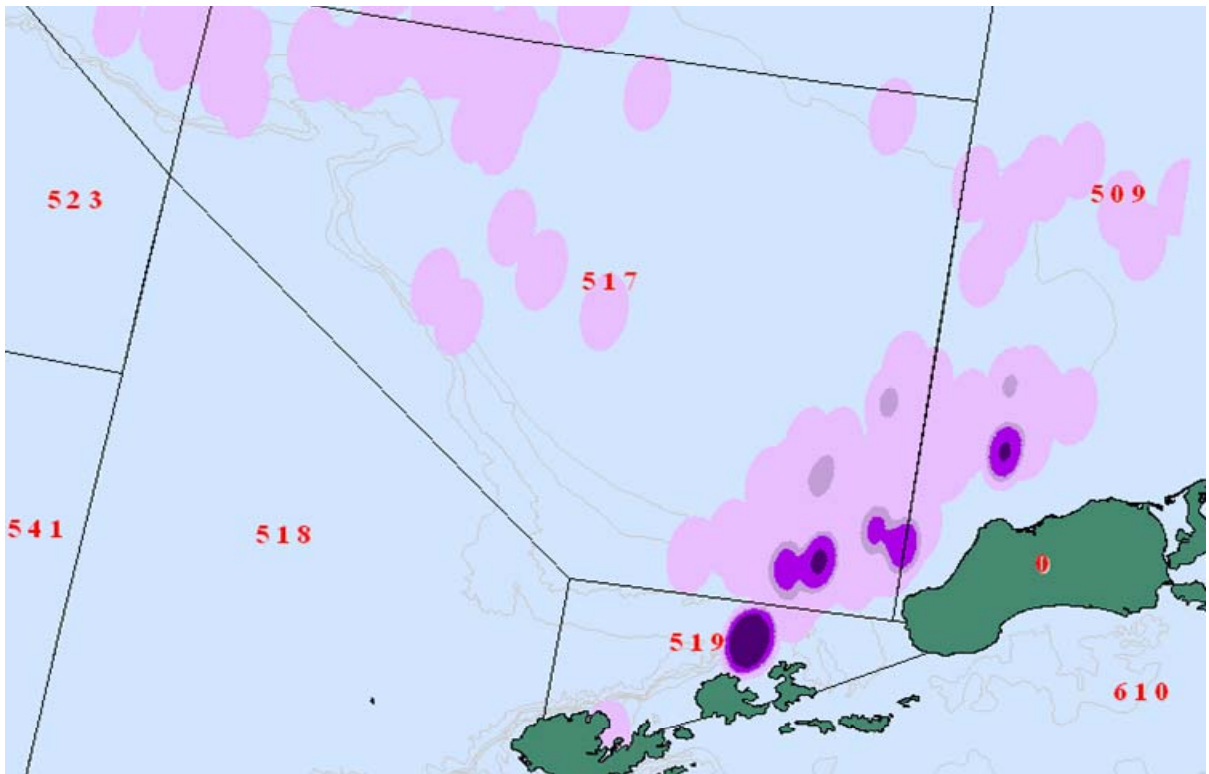


Figure 39. BSAI Pollock B Season Shark Density (kg/mt groundfish) 2006

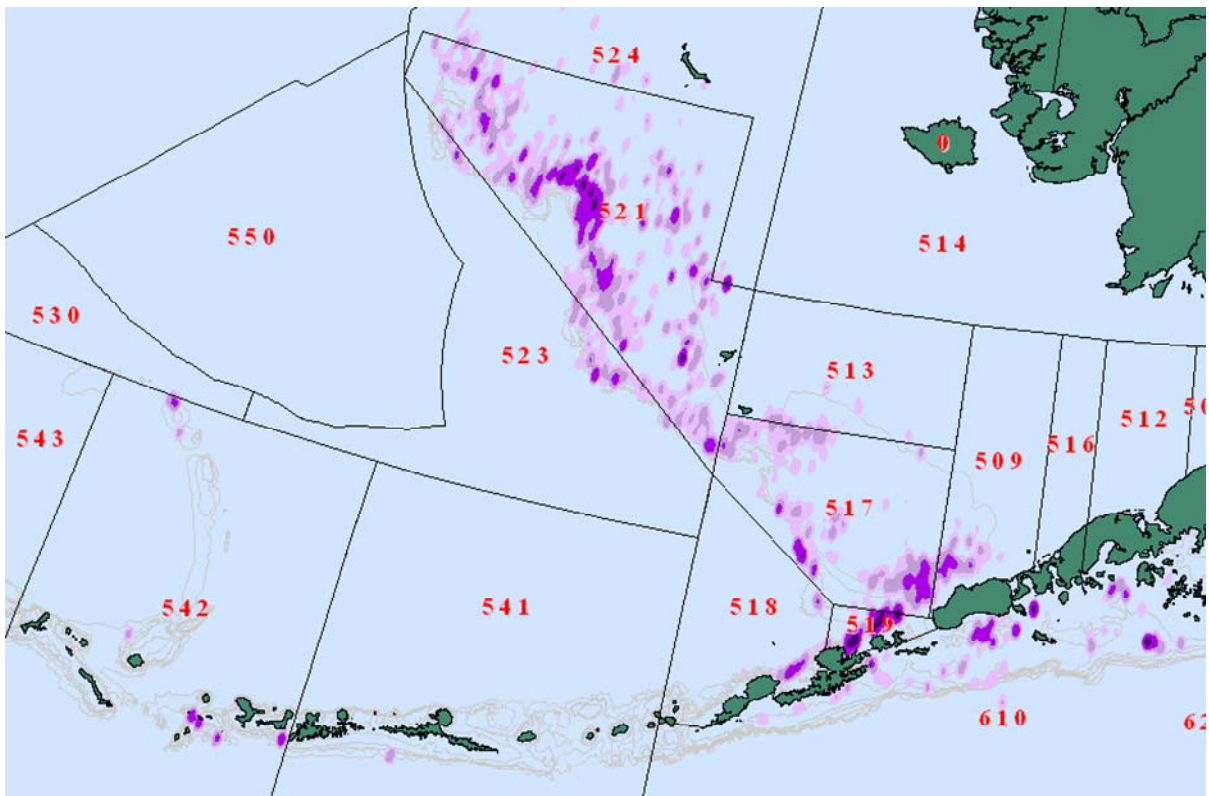


Figure 40. BSAI Shark Catch Density (kg/mt groundfish) 2003-2005

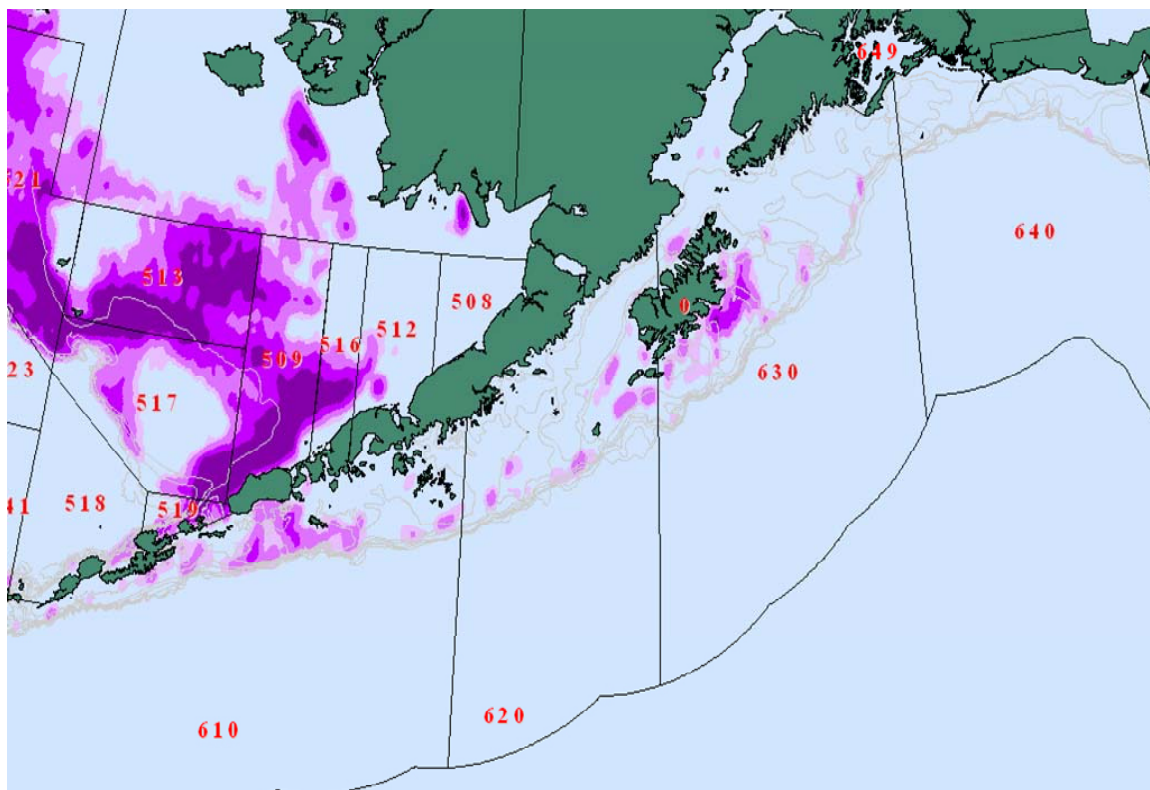


Figure 41. GOA Sculpin Catch Density (kg/mt groundfish) 2003-2005

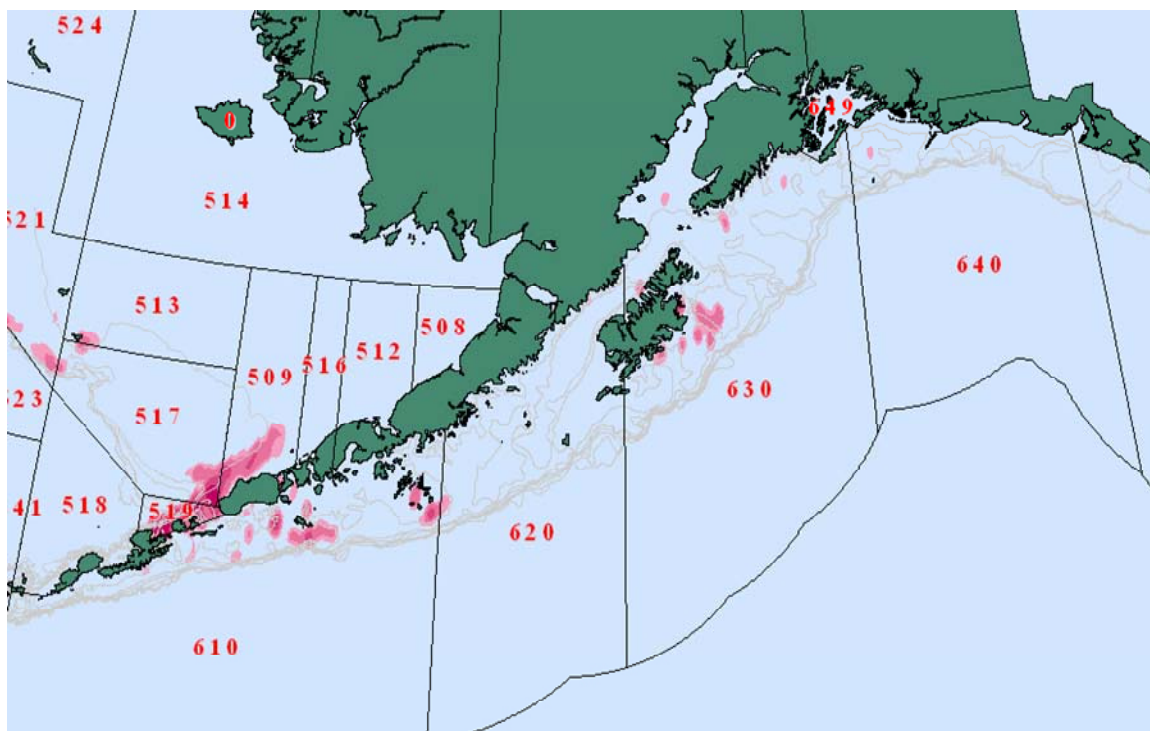


Figure 42. GOA Octopuses Catch Density (kg/mt groundfish) 2003-2005

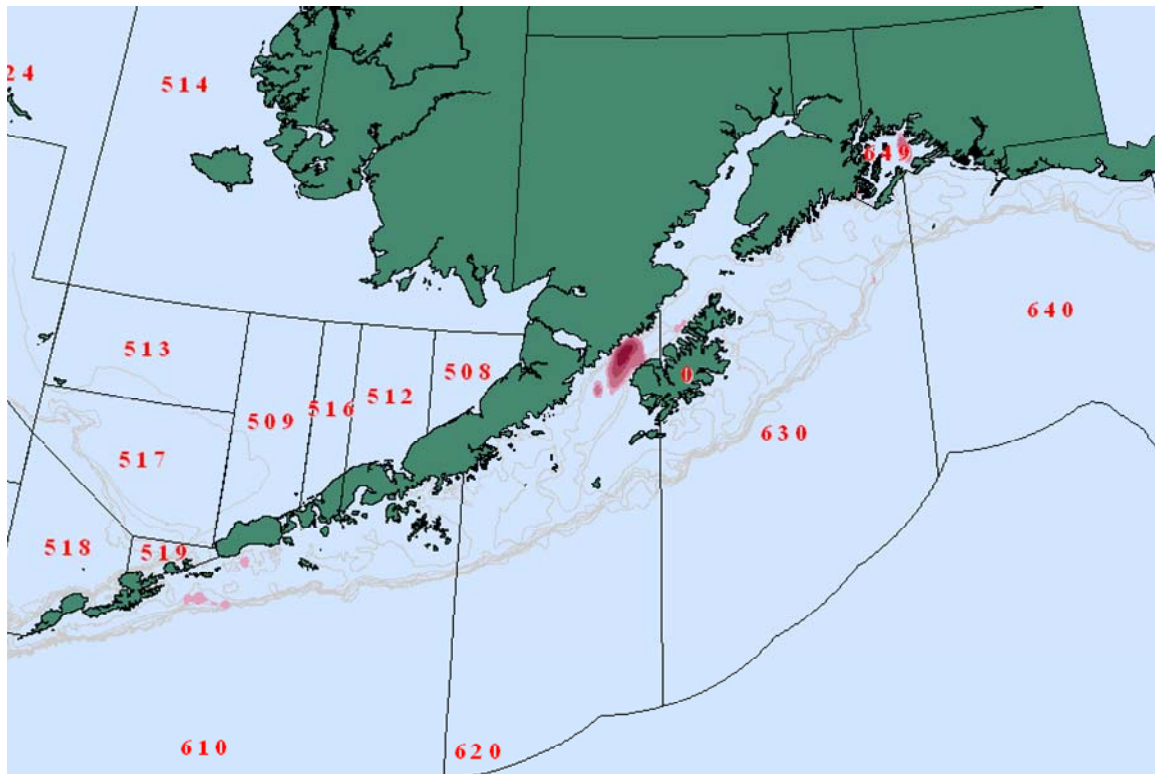


Figure 43. GOA Squid Catch Density (kg/mt groundfish) 2003-2005

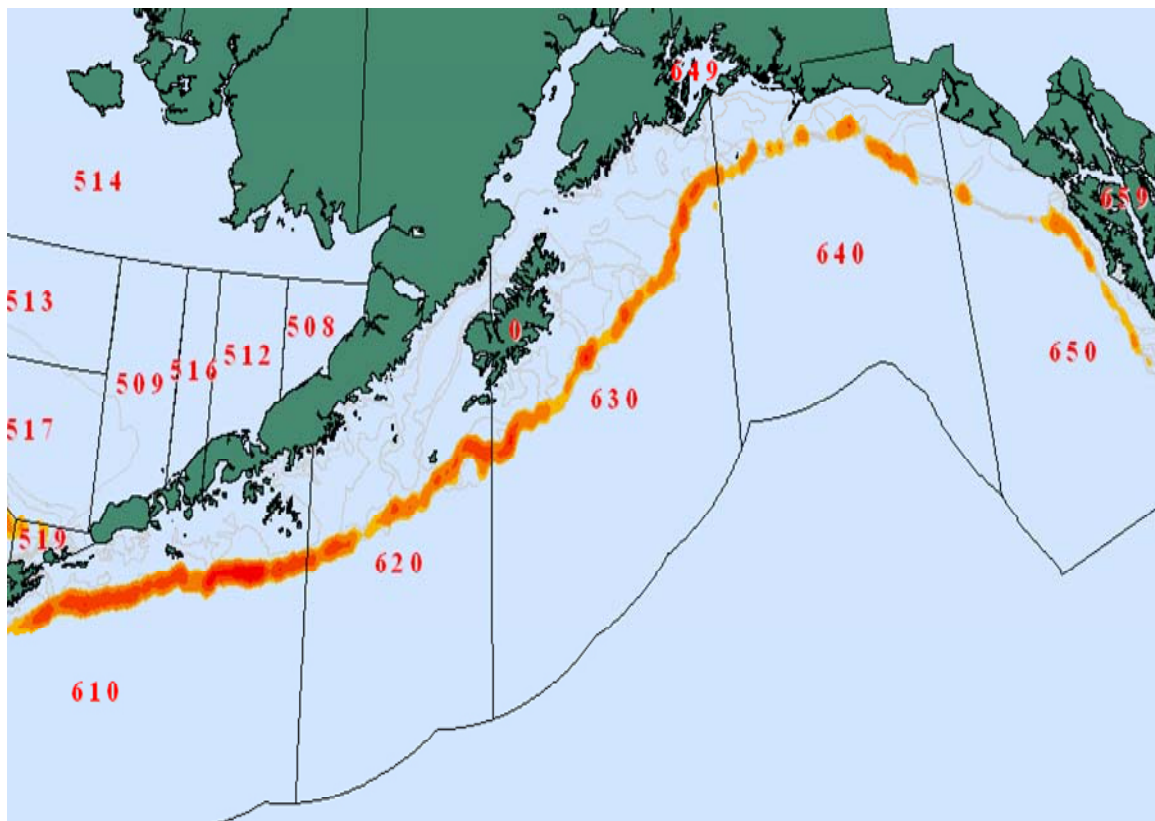


Figure 44. GOA Grenadier Catch Density (kg/mt groundfish) 2003-2005

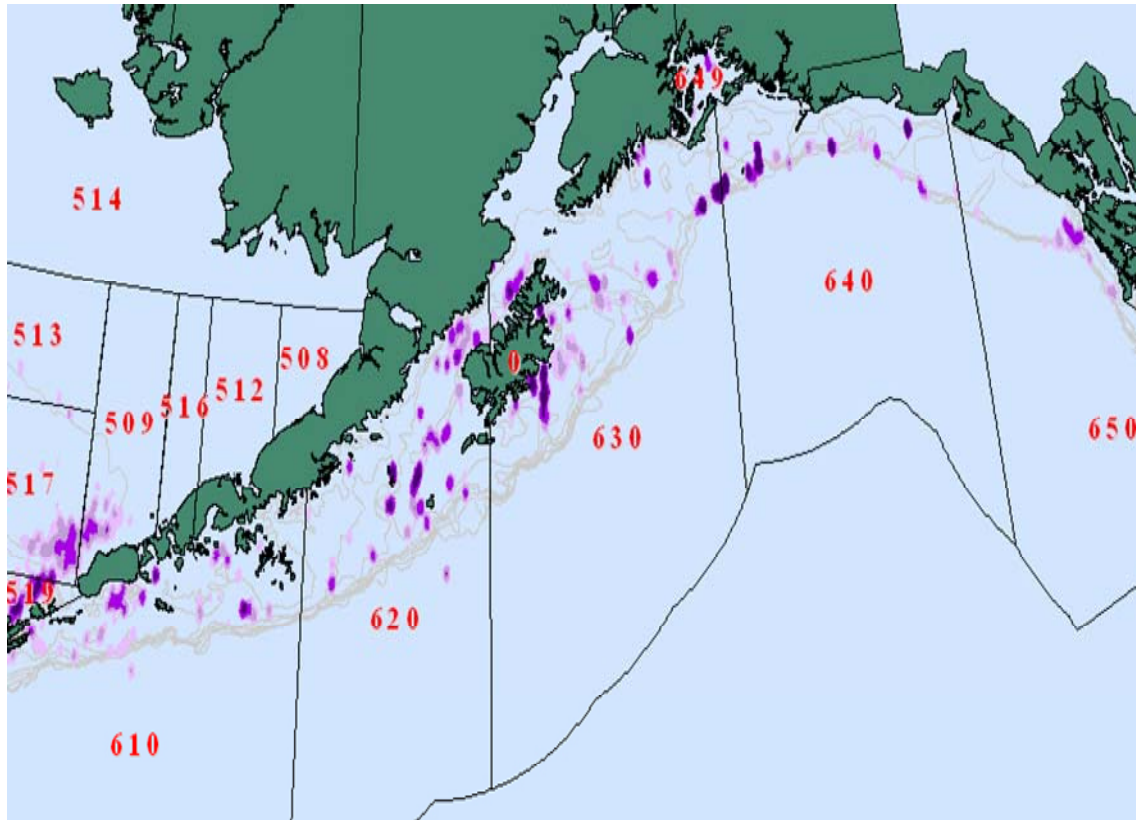


Figure 45. GOA Shark Catch Density (kg/mt groundfish) 2003-2005

Table 1. 2003-2006 Average BSAI “Other Species” Catch by Species Group

Species Group	metric tons	percentage
Sharks	533	2
Sculpins	5,752	21
Octopuses	371	1
Skate	21,142	76
Total Catch	27,798	100

Table 2. 2003-2006 Average GOA “Other Species” Catch by Species Group

Species Group	metric tons	percentage
Sharks	879	38
Sculpins	640	27
Octopuses	205	9
Squid	610	26
Total Catch	2,333	100

Table 3. 2007 Combined ABC and OFL for GOA Species Comprising the “Other Species” Category (in mt)

Species Group	OFL	ABC
Sharks	2,390	1,792
Sculpins	5,770	4,327
Octopuses	398	298
Squid	2,030 *	1,526
Total	10,588	7,943
Specified 2007 ABC		4,500

*A squid OFL was not recommended by the Plan Team. This amount is 1.33 times the ABC. The OFL is calculated in order to have a value for analytical purposes.

Table 4. Calculation of Maximum Status Quo ABC Relative to Alternative 2 ABC and OFL (amounts in mt)

292,412	2007 GOA combined TACs without “other species”
5%	Maximum % for “other species” under current regulation
14,621	Maximum status quo GOA “other species” ABC (5% of 292,412)
7,943	Alternative 2 GOA “other species” ABC
184%	Percentage of Maximum status quo ABC relative to Alternative 2 ABC (100*(14,621/7,943))
10,588	Alternative 2 GOA “other species” OFL
138%	Percentage of Maximum status quo ABC relative to Alternative 2 OFL (100*(14,621/10,588))

Table 5. Gulf of Alaska “Other Species” Catch 2004-2006

Species Group	2004	2005	2006
Sculpins	678	544	575
‘other’ sharks	39	60	83
salmon shark	22	53	29
dogfish shark	176	416	828
sleeper shark	232	454	238
Total Shark	468	983	1,177
Octopuses	286	152	159
Squid	157	626	1,527
Total catch	1,589	2,304	3,438

Table 6. SSC Recommended ABCs and OFLs for “Other Species” in the BSAI (in mt)

Species	OFL	ABC
Skate	49,200	36,900
Sharks	617	463
Sculpins	41,200	30,900
Octopuses	323	242
Total	91,340	68,505
SSC recommended 2007 ABC		64,235

Table 7. ABCs and OFLs Resulting from Alternative 3 Removal of Skate from the “Other Species” Complex

TAC category	OFL	ABC
Skate	49,200	36,900
Alternative 3 “other species”		
Sharks	617	463
Sculpins	41,200	30,900
Octopuses	688	516
Total Alternative 3 “other species”	42,505	31,879

Table 8. Catch and Percentage Catch by Species by Year of Status Quo BSAI “Other Species” Category

Species Group	Catch by Year (metric tons)			Percent Catch by Year		
	2004	2005	2006	2004	2005	2006
Skate	22,285	23,048	20,008	76	78	75
Sharks	514	417	672	2	2	3
Sculpins	6,022	5,643	5,696	20	19	21
Octopuses	528	339	334	2	1	1
Total	29,349	29,447	26,711	100	100	100

Table 9. Relative Catch of BSAI Sharks, Sculpins and Octopuses 2004-2006.

Species Group	Catch by Year (mt)			Percent Catch by Year		
	2004	2005	2006	2004	2005	2006
Sharks	514	417	672	7	7	10
Sculpins	6,022	5,643	5,696	85	88	85
Octopuses	528	339	334	8	5	5
Totals	7,064	6,399	6,703	100	100	100

Table 10. GOA ABCs and OFLs: Sculpins vs Sharks, Octopuses, Squid, and Combined

TAC category	OFL	ABC
Skate	5,770	4,327
Combined	4,818	3,616
Sharks	2,390	1,792
Octopuses	398	298
Squid	2,030	1,526

Table 11. Species Group by Tier for “Other Species” Category in the GOA and BSAI

BSAI		GOA	
Species group	Tier	Species group	Tier
skate	5	squid	6
sharks	6	sharks	6
sculpins	5	sculpins	5
octopuses	6	octopuses	6

Table 12. OFL and ABC for Components of the BSAI and GOA “Other Species” TAC Category (in metric tons)

	BSAI		GOA	
	OFL	ABC	OFL	ABC
Sharks	617	463	2,390	1,792
Skate	49,200	36,900	na	na
Sculpins	41,200	30,900	5,770	4,327
Octopuses	688	516	398	298
Squid	na	na	2,030	1,526

Table 13. BSAI Sharks Catch September-October 2006

	Weekly Catch	Total catch
Catch prior to 16-Sep-06		291
16-Sep-06	259	550
23-Sep-06	36	586
30-Sep-06	21	607
07-Oct-06	11	618

Table 14. Proportion of GOA Squid Catch from Area 620 in February and March

Year	2004	2005	2006
Annual Catch	138	612	1,496
Area 620 Feb & Mar Catch	122	591	1,457
Percentage From 620 Feb & Mar	89	97	97

Table 15. 2006 Retention Rates of Species in the “Other Species” Complex

Species Group	Retention Rate (%)	
	GOA	BSAI
Sculpins	16	3
Sharks	5	4
Octopuses	88	57
Squid	85	na
Skate	na	31

Table 16. Groundfish Targets and FMP Area Association

Groundfish Target Category	BSAI	GOA
Atka mackerel	X	X
Pollock -- bottom -B	X	X
Pacific cod	X	X
Deep-water flatfish		X
Alaska plaice	X	
Other flatfish	X	
Shallow-water flatfish		X
Rockfish	X	X
Flathead sole	X	X
'Other'	X	X
Pollock - mid-water P	X	X
Rock sole	X	
Sablefish	X	X
Greenland turbot	X	
Arrowtooth flounder	X	X
Rex sole		X
Yellowfin sole	X	

Table 17. Compilation of BSAI Observed Grenadier Hauls* Based on 2006 Data

Species TAC Category	Hook-and-line		Non-pelagic trawl	
	Metric tons	Percent	Metric tons	Percent
Grenadiers	1,739	68	19	32
Greenland turbot	290	11	18	31
Sablefish (blackcod)	151	6	3	5
Arrowtooth/Kamchatka flounder	136	5	17	29
Skate	126	5	1	2
Thornyhead rockfish (Idiots)	47	2		
Shortraker rockfish	21	1		
Shortraker/roughey rockfish	15	1		
Unidentified rockfish	12	0.5		
Roughey rockfish	1	0.1		
Pacific cod	14	1		
Pollock	2	0		
Total groundfish including grenadier	2,556	100	59	100
Pacific halibut	55	2		

Note: Only catch greater than 1mt is reported.*

A grenadier haul is a haul that is predominately grenadier

Table 18. Compilation of GOA Observed Grenadier Hauls* Based on 2006 Data

Species TAC Category	Hook-and-line		Non-pelagic trawl	
	Metric tons	Percent	Metric tons	Percent
Grenadiers	1,194	73	727	87
Sablefish (blackcod)	360	22	36	4
Thornyhead rockfish (Idiots)	38	2	13	2
Arrowtooth/Kamchatka flounder	25	2	18	2
Skate	9	1	7	1
Shortraker/rougheye rockfish	6	0.4	-	-
Shortraker rockfish	6	0.3	7	1
Rougheye rockfish	1	0.1	5	1
Dover sole	-	-	5	1
Rex sole	-	-	6	1
Pacific ocean perch	-	-	16	2
Total groundfish including grenadier	1,638	100	841	100
Pacific halibut	36	2	1	0.1

Note: Only catch greater than 1mt is reported *A grenadier haul is a haul that is predominately grenadier

BREAK OTHER SPECIES CATEGORY INTO SQUID, SHARKS, SKATES, SCULPINS, AND OCTOPI
Discussion Paper
Revised October 14, 2005

In December 2004, the Council requested that staff develop a discussion paper of a proposal from the Groundfish Plan Teams and Science and Statistical Committee to amend the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fishery Management Plans. The amendments would provide additional precautionary management of five groups of non-target species that are managed in the “other species” category. The Plan Teams, SSC, ad hoc committee, and Non-Target Species Committee have been continuing development of recommendations for improving management of all non-target species, which began with a proposal by the State of Alaska in 1998. These plan amendments combine two steps that were first discussed in a previous draft of this discussion paper, which were recommended by the teams, SSC, and two committees for improving management of non-target species. Step 1 revised the GOA Groundfish FMP to set the GOA “other species” TAC ≤ 5 percent of the sum of all Groundfish TACs in time for the 2006 specification cycle; this would allow for setting the category on bycatch status at the beginning of the year (Council action occurred in 2005). Step 2 (now Alternative 2 below) would set an overfishing level and allowable biological catch for the GOA “other species” category to match the BSAI Groundfish FMP. Step 3 would eliminate the “other species” assemblage by setting specifications for the component groups contained in the assemblage.

PROPOSED ACTION: In April 2005, the Council reviewed a previous draft of this paper (dated February 1, 2005), initiated the plan amendments, and set a timeline for action. The Council adopted a problem statement and requested an analysis of a suite of alternatives to modify the “other species” category in the BSAI and GOA, based on recommendations by the SSC, Bering Sea Groundfish Plan Team, Advisory Panel, and Non-Target Species Committee. These amendments include both Steps 2 and 3.

PROBLEM STATEMENT/OBJECTIVE: The two groundfish FMPs require that specifications be set for the “other species” assemblage category; however, management of the assemblage does not offer sufficient protection from overfishing of the component groups because the overfishing level, allowable biological catch, and total allowable catch for the category is set equal to the sum of the estimates for the individual groups. Therefore, any one (or more) groups are vulnerable to overfishing because they are managed under specifications that are set for the category, which is set equal to the sum of five (in the GOA) or four (in the BSAI) groups.

The Council adopted the following general problem statement in April 2005.

The current management regime may not provide appropriate protection for all species in the ecosystem impacted by the groundfish fisheries, including species for which little biological information is available. The current management system also purports to manage species that are not targeted by groundfish fisheries and may be unaffected or minimally affected by groundfish fisheries. These non-target species are often managed as a complex, which carries the risk that individual species within the complex may be overfished while the complex catch as a whole is within allowable catch guidelines. Conversely, attempts to remove these species from complexes often result in single species quotas that constrain targeted groundfish operations. Since many of these non-target species are either not abundant, not well surveyed, or have life histories that are not well understood, the quotas may not be set appropriately. However, obtaining sufficient data to appropriately manage them under the current quota system may be prohibitively expensive or not possible with current sampling technology. In addition, there is no mandate to manage these species for optimum yield so it may be desirable for both management and conservation to move these species outside of the current quota system.

The problem is then one of deciding how to manage data-poor non-target species outside of the

traditional yield-oriented framework used for groundfish species, while still maintaining appropriate protection for those species. If yield-based approaches are not used, then other guidelines for acceptable levels of catch must be determined. Also, if acceptable levels of take cannot be determined and catch is still of concern, protection measures outside of the current quota system may also be considered. Additionally, since markets and circumstances change, a process for transitioning in a timely manner between quota-based target and non-target species management should be established.

BACKGROUND: For several years, the BSAI Groundfish Plan Team and SSC have recommended that the Council initiate a FMP amendment to set group-specific (squid, sharks, skates, sculpins, and octopi) OFLs and ABCs rather than complex-wide (“other species”) specifications. The SSC and Plan Team recommended that the “other species” category be placed on bycatch-only status until implementation of an industry proposed and Council-approved data collection program that minimally provides accurate data on location of catch, total fishery removals by species, and opportunities for biological sampling of the catch for age, length, weight, and sex. Bycatch-only status (meaning retention of other species is only allowed as a percentage of target species on board) is recommended to prevent directed fishing on all species groups in this category until stock assessment information improves. The assessment authors wholeheartedly concur with SSC recommendations for data collection programs and setting of group-specific ABCs and OFLs. The entire assessment was reformatted in 2004 to better accommodate group-specific management. The section for each group recommended potential data collection programs, including increased retention for the purpose of collecting biological data at delivery points without additional burdens to at-sea observers.

Catches of “other species” have been very small compared to those of target species, but they appear to be increasing. There are data limitations in terms of life history for all creatures in the other species complex; we lack information on age and growth, reproductive biology, habitat requirements, and in some cases, species descriptions. Considerable further investigation is necessary to be sure that all components of “other species” are not adversely affected by groundfish fisheries. Furthermore, if target fisheries develop for any component of the other species group (as they have for skates in the Gulf of Alaska in 2003), effective management will be extremely difficult with the current limited information. The development of a skate fishery in 2003 in the central GOA and concerns about potential overfishing of several skate species prompted the Council to initiate a GOA plan amendment to separate GOA skates from the category in 2004. Similar concerns regarding a developing spiny dogfish (shark) fishery in the GOA are occurring in 2005. Interest has been reported for developing a target fishery for octopus species in the BSAI, and also for sculpin species in the GOA.

Until 2004, the BSAI “other species” TAC has never been exceeded in the BSAI or the GOA with the current composition of the category. As of October 23, 2004, the BSAI non-CDQ TAC of 23,124 mt was exceeded, so the category was put on prohibited status (meaning no further retention is allowed, but catch and discard can continue up to the OFL of 81,150 mt). In addition, the CDQ reserve of 2,040 mt was also exceeded as of November 4. While it was exceeded, the TAC was reduced from the amount of harvest allowed under the ABC to keep the total catch of groundfish in compliance with the BSAI OY cap, so it is likely there were no biological threats to the groups. However, if interest continues in developing fisheries within this category, the lower aggregate TAC may restrict retention and utilization of the more valuable components of the “other species” category (i.e., skates and octopus).

The 2004 BSAI “other species” assessment and 1998 draft assessment for GOA “other species” identified the fisheries and gear types that catches each species in each area and possible group level specifications (Attachment). Current data suggests that the only catches that approached group level specifications was GOA octopus in 1999; it should be noted that octopus are poorly covered by the biennial GOA trawl survey.

ANALYSIS: An EA/RIR/IRFA for a joint BSAI/GOA plan amendment is required.

RANGE OF ALTERNATIVES:

- Alternative 1. No action.
 - Alternative 2. Set aggregate “other species” OFL and ABC for the GOA.
 - Alternative 3. Break out BSAI skates from the other species category
 - Alternative 4. Break out BSAI skates and BSAI and GOA sculpins from the other species category
 - Alternative 5. Eliminate “other species” assemblage and manage squids, skates, sculpins, sharks, and octopi as separate assemblages under specification process
- Option: Add grenadiers and other non-specified species that are caught in the fishery.

ESTIMATE OF STAFF RESOURCES: Approximately 30 person weeks of total interagency staff time for analytical and regulatory writing and review. Anticipated staff includes project leader/analyst (Jane DiCosimo), Melanie Brown (regional coordinator), In-Season management staff, CDQ staff, Analytical Team.

TIMELINE TO IMPLEMENTATION: Initial Review/Final Action is tentatively identified as June 2006/October 2006. Implementation would occur no earlier than the 2008 fishing year.

Attachment to Other Species Discussion Paper

Table 16- 2. Estimated total (retained and discarded) catches of other species (mt) in the eastern Bering Sea and Aleutian Islands by groundfish fisheries, 1977-2002. JV=Joint ventures between domestic catcher boats and foreign processors. Estimated catches of other species from 1977-98 include smelts.

Year	Eastern Bering Sea				Aleutian Islands				Grand Total
	Foreign	JV	Domestic	Total	Foreign	JV	Domestic	Total	
1977	35,902			35,902	16,170			16,170	52,072
1978	61,537			61,537	12,436			12,436	73,973
1979	38,767			38,767	12,934			12,934	51,701
1980	33,955	678		34,633	13,028			13,028	47,661
1981	32,363	3,138	100	35,651	7,028	246		7,274	42,925
1982	17,480	720		18,200	4,781	386		5,167	23,367
1983	11,062	1,139	3,264	15,465	3,193	439	43	3,675	19,140
1984	7,349	1,159		8,508	184	1,486		1,670	10,178
1985	6,243	4,365	895	11,503	40	1,978	32	2,050	13,553
1986	4,043	6,115	313	10,471	1	1,442	66	1,509	11,980
1987	2,673	4,977	919	8,569		1,144	11	1,155	9,724
1988		11,559	647	12,206		281	156	437	12,643
1989		4,695	298	4,993		1	107	108	5,101
1990			16,115	16,115			4,693	4,693	20,808
1991			16,261	16,261			938	938	17,199
1992			29,994	29,994			3,081	3,081	33,075
1993			20,574	20,574			3,277	3,277	23,851
1994			23,456	23,456			1,099	1,099	24,555
1995			20,923	20,923			1,290	1,290	22,213
1996			19,733	19,733			1,706	1,706	21,440
1997			23,656	23,656			1,520	1,520	25,176
1998			23,077	23,077			2,455	2,455	25,531
1999			18,884	18,884			1,678	1,678	20,562
2000			23,098	23,098			3,010	3,010	26,108
2001			23,148	23,148			4,029	4,029	27,178
2002			26,639	26,639			1,980	1,980	28,619
2003									28,703
2004*									26,298

*2004 open access catch reported through October 23, 2004 plus CDQ catch reported through November 4, 2004.

Data Sources: Foreign and JV catches-U.S. Foreign Fisheries Observer Program, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, BIN C15700, Bld.4, 7600 Sand Point Way NE, Seattle, WA 98115. Domestic catches before 1989 (retained only; do not include discards): Pacific Fishery Information Network (PacFIN), Pacific Marine Fisheries Commission, Portland, OR 97201. Domestic catches since 1989: NMFS Regional Office BLEND and CAS databases, Juneau, AK 99801.

Table 16- 3. Estimated total catch (t) of BSAI non-target species groups by FMP category, 1997-2002. Source: NORPAC observer database and year-end estimates of target species catch from the NMFS Regional Office BLEND database (see text for estimation methods). ***Note that this estimation method is different from the one used in Table 16-2, so Other species totals reported here do not match Table 16-2 totals for 1997-2002 exactly.

Group	1997	1998	1999	2000	2001	2002	6 year avg	avg % of cv category	
squid	1,573.40	1,255.80	501.76	412.93	1,810.37	1,742.13	1,216.07	0.51	
skates	17,747.37	19,317.86	14,079.84	18,876.53	20,570.46	21,278.69	18,645.12	0.14	70.76%
sculpin	7,477.84	6,285.46	5,470.00	7,086.45	7,669.76	7,176.18	6,860.95	0.12	26.04%
dogfish	4.09	6.38	4.95	8.88	17.33	7.27	8.15	0.59	0.03%
salmonshk	6.82	18.04	29.96	23.30	24.45	33.90	22.75	0.42	0.09%
sleepershk	304.07	336.00	318.68	490.43	687.27	433.17	428.27	0.34	1.63%
shark	52.77	136.08	176.40	67.61	34.97	44.40	85.37	0.67	0.32%
octopus	248.37	189.68	326.08	418.15	227.28	374.45	297.33	0.30	1.13%
Total Other Species	25,841.33	26,289.50	20,405.92	26,971.35	29,231.51	29,348.07	26,347.95	0.12	
smelts	29.76	36.57	45.30	51.68	80.12	18.64	43.68	0.49	88.32%
gunnel		0.02	0.04	0.00	0.01	0.02	0.02	0.68	0.04%
sticheidae	0.40	0.24	0.03	0.11	0.41	0.09	0.21	0.77	0.43%
sandfish	1.11	0.40	3.29	20.29	1.85	1.68	4.77	1.61	9.64%
lanternfish	0.42	0.40	0.02	0.11	0.29	2.75	0.67	1.55	1.35%
sandlance	0.10		0.02	0.00	0.14	0.28	0.11	1.03	0.22%
Total Forage Species	31.79	37.64	48.70	72.19	82.81	23.46	49.45	0.47	
grenadier	5,851.55	6,589.04	7,388.23	7,320.94	3,753.93	4,698.09	5,933.63	0.25	28.05%
otherfish	1,569.15	1,362.69	1,327.28	1,458.20	1,459.89	1,189.60	1,394.47	0.09	6.59%
crabs	303.78	185.92	108.86	142.69	144.18	134.15	169.93	0.41	0.80%
starfish	6,191.00	3,287.17	3,051.47	3,174.02	4,221.00	3,742.66	3,944.55	0.30	18.64%
jellyfish	8,849.21	7,147.51	7,153.25	10,491.25	3,861.50	1,897.49	6,566.70	0.48	31.04%
invertunid	1,608.58	638.35	140.08	1,121.43	923.35	784.41	869.37	0.56	4.11%
seapen/whip	2.61	2.40	4.96	4.96	8.16	13.60	6.12	0.69	0.03%
sponge	530.12	500.83	321.84	164.91	245.36	330.26	348.89	0.41	1.65%
anemone	182.96	113.73	171.52	347.24	209.24	229.16	208.97	0.37	0.99%
tunicate	1,793.67	728.06	372.01	1,055.72	1,525.29	1,273.77	1,124.75	0.46	5.32%
benthinv	672.70	531.37	226.43	365.96	556.36	371.70	454.09	0.36	2.15%
snails					0.00	0.60	0.30	1.41	0.00%
echinoderm	44.88	24.27	30.32	42.37	43.42	32.76	36.34	0.23	0.17%
coral	38.89	27.67	52.49	43.12	183.29	79.23	70.78	0.82	0.33%
shrimp	2.73	1.71	1.23	3.70	2.41	3.03	2.47	0.36	0.01%
birds	28.69	43.49	24.39	27.04	17.44	8.19	24.87	0.48	0.12%
Total Non-Specified	27,670.52	21,184.21	20,374.36	25,763.55	17,154.83	14,788.70	21,156.23	0.23	
Total Non-Targets	55,117.04	48,767.14	41,330.75	53,220.02	48,279.51	45,902.36	48,769.69	0.10	

We recommended group specific ABCs and OFLs (based on the 10 year average EBS shelf survey biomass by group plus the 10 year average EBS slope survey biomass by group plus the 10 year average AI survey by group, all times the natural mortality rates listed below times 0.75 for ABC and 1 for OFL), and **placing all groups on "bycatch-only" status until information improves:**

	Sharks	Skates	Sculpins	Octopi
Avg Biomass	17,711	477,993	206,148	6,321
M (see text)	0.09	0.10	0.19	0.50
BSAI ABC	1,195	35,849	29,376	2,371
BSAI OFL	1,594	47,799	39,168	3,161
recent avg catch	545	18,645	6,861	297

These ABCs and OFLs would permit the levels of bycatch historically observed (1997-2002 average) while increasing protection for the species groups.

Most recent ABC and OFL estimates from the GOA were done for the 1999 SAFE appendix, would obviously have to be redone for assessment in 2006, but can serve as a baseline, note that octopus and sculpin Ms = Fofls would change based on analysis presented in 2004 BSAI assessment:

This is the first assessment of Gulf of Alaska Other species. The purpose of this chapter is to highlight some of the available data for these species and develop some approaches toward evaluating the harvest levels and resource abundances. Input data included catch estimates by species groups from 1990-98, and GOA triennial trawl survey biomass estimates for each species group. The proposed assessment model is a simple state-space model described in Appendix E. Although changing the procedure for establishing TAC of other species requires a amendment to the GOA FMP, we proposed separate ABC and OFL levels for each species groups within other species to ensure that less productive groups are not overharvested. These individual ABCs sum to slightly less than the recent aggregate TACs in the range of 14,000 t, but observed catches in each of the categories have never exceeded these proposed ABCs in the domestic fishery, with the eception of octopus catches in 1992 and 1997. We believe that cephalopod biomass is substantially underestimated by the bottom trawl survey, resulting in overly conservative estimates of ABC and OFL for these species groups, but we have no other data on which to base recommendations.

		Sharks	Skates	Sculpins	Octopi	Squid	Total
Tier 5	M	0.09	0.10	0.15	0.30	0.40	
Model estimated 1999 biomass		34,214	72,164	30,259	550	2,134	
F=0.75M ABC		2,309	5,412	3,404	124	640	11,890
F=M OFL		3,079	7,216	4,539	165	854	15,853

Estimated total catch (t) of GOA non-target species groups by FMP category, 1997-2002. Source: NORPAC observer database and year-end estimates of target species catch from the NMFS Regional Office BLEND database (see BSAI other species SAFE for estimation methods).

Group	1997	1998	1999	2000	2001	2002	6 year avg	cv	avg % of category
sculpin	906.58	540.83	544.39	943.01	601.28	925.65	743.62	0.27	15.16%
skates	3,119.83	4,476.19	2,000.41	3,238.44	1,828.40	6,483.86	3,524.52	0.49	71.85%
shark	123.48	1,379.86	33.00	73.64	76.98	25.91	285.48	1.88	5.82%
salmonshk	123.77	70.96	131.58	37.82	32.78	58.17	75.85	0.56	1.55%
dogfish	657.47	864.85	313.57	397.60	493.97	117.04	474.08	0.55	9.66%
sleepershk	135.87	74.02	557.66	608.19	249.00	225.56	308.38	0.72	6.29%
octopus	232.19	112.00	166.34	175.95	88.17	298.27	178.82	0.43	3.65%
squid	97.49	59.22	40.69	18.62	90.78	42.72	58.25	0.53	1.19%
Total Other Species	4,490.10	7,037.10	3,243.23	4,550.26	2,860.08	7,251.53	4,905.38	0.38	
smelts	23.06	122.74	26.09	123.78	534.85	156.41	164.49	1.15	98.06%
gunnel	0.11	0.03	0.03		0.00		0.04	1.08	0.03%
sandfish	3.68	2.16	0.53	0.32	1.24	1.70	1.60	0.77	0.96%
sticheidae	0.29	0.03	3.53	0.49	4.66	0.13	1.52	1.33	0.91%
lanternfish	0.00	0.00	0.00		0.03	0.00	0.01	2.04	0.00%
sandlance	0.02	0.01	0.06	0.35	0.04	0.04	0.09	1.50	0.05%
Total Forage Species	27.15	124.97	30.24	124.94	540.82	158.28	167.75	1.14	
grenadier	12,029.38	14,683.06	11,387.68	11,610.01	9,684.62	10,479.16	11,645.65	0.15	76.38%
otherfish	575.92	8,400.26	819.00	979.34	696.56	2,173.02	2,274.02	1.34	14.91%
crabs	15.42	25.13	10.85	12.43	4.24	4.30	12.06	0.65	0.08%
starfish	987.15	1,244.53	1,510.44	894.20	469.22	518.51	937.34	0.43	6.15%
jellyfish	36.05	166.60	107.16	37.87	235.16	159.72	123.76	0.64	0.81%
invertunid	8.15	42.86	1.33	15.18	6.42	12.83	14.46	1.02	0.09%
seapen/whip	0.62	2.92	2.69	0.90	0.30	0.35	1.30	0.92	0.01%
sponge	3.61	3.65	12.90	4.30	3.97	5.07	5.58	0.65	0.04%
anemone	17.57	15.68	17.41	16.17	15.86	20.51	17.20	0.10	0.11%
tunicate	1.57	1.16	0.03	3.55	2.62	3.88	2.14	0.69	0.01%
benthinv	24.56	31.25	25.24	10.35	12.53	5.59	18.25	0.55	0.12%
echinoderm	22.55	32.39	8.45	7.02	8.12	8.60	14.52	0.72	0.10%
coral	4.06	7.92	1.16	10.24	5.20	16.32	7.48	0.71	0.05%
shrimp	3.74	2.33	0.62	1.39	3.04	6.01	2.85	0.67	0.02%
birds	2.00	5.64	6.40	3.27	2.99	0.94	3.54	0.59	0.02%
Total Non-Specified	13,759.50	24,790.36	13,941.60	13,731.14	11,691.68	13,573.09	15,247.91	0.31	
Total Non-Targets	15,854.01	26,847.60	15,981.35	15,750.12	13,783.50	15,617.85	15,306.25	0.31	

Appendix B: BSAI Sharks--A Case Study of Overfishing Closures

If sharks are managed as an individually specified TAC category and approach an overfishing level, the 2006 data can be used as an example of how inseason management measures might be developed and employed.

Catch of sharks in 2006 was fairly consistent with prior years until September (Figure 25). Table 13 tabulates the total catch for the week prior to September 19 and weeks following. The week ending September 19 was very high relative to other weeks. Average weekly catch of all other weeks during June through November was about 70 mt. Total annual catch up to that point was essentially doubled during that one week in September. The total catch as of September 19 was 550 mt, 87 mt greater than the ABC and 67 mt less than the OFL.

The sudden increase in catch would have triggered several actions if NMFS were managing on the shark specific OFL and ABC. The inseason manager would review industry reported catch, observer catch reports, and vessel monitoring data to determine which fleet, gear, and target were involved and where catch occurred. The fleet would be notified to alert them to the problem.

A review of the catch data shows that 95 percent of the 259 mt reported for the week ending September 19 came from the catcher vessel fleet targeting pollock operating in Area 519. Observer and vessel monitoring system (VMS) data can be used to generate a plot of the density of catch in the area (Figure 39). From that plot, Inseason Management could recommend closures of the directed fishery for pollock within the restricted area on the plot. The purpose of the closure would be to prevent overfishing of sharks. In an accompanying action, shark retention would be prohibited because the ABC was taken. The closed area would be monitored using the VMS for compliance. If shark incidental catch stopped, no further restrictions on the fishery would be required.

However, if continued incidental catch occurred that approached the OFL, NMFS would expand the closures to prevent overfishing. Examining catch data after the week ending September 19 shows an additional 90 mt of shark catch occurred in all groundfish fisheries in the BSAI outside Reporting Area 519. In retrospect the cumulative shark catch would exceed the OFL by 24 mt assuming the first closure within Area 519 was effective. The hook-and-line fishery for Pacific cod in Areas 509, 513, 517, and 521 took an additional 54 mt or 60 percent in Area 521. The trawl pollock (both catcher/processors and catcher vessels) fishery took an additional 36 mt in Areas 517 and 521. With the continued catch of shark in broad areas outside the initial closure areas, Inseason Management would be hard-pressed to continue to identify specific small areas to close to prevent overfishing of sharks. A general closure of broader areas would have to be contemplated, perhaps including entire reporting areas that consist of most of the productive directed fishing areas.

The scenario outlined assumes clear effective reporting of catch information and nearly immediate action on the part of NMFS Inseason Management. Normally the process can respond quickly, but communications systems break down due to both human and equipment problems. The scenario assumes the initial high catch of sharks that exceeded the ABC would be detected immediately and inseason actions to prevent overfishing were implemented quickly. If the problem described above were not detected immediately and the OFL taken, regulations require broad actions to be taken to prevent overfishing. The intermediate steps of detection, proscribing a relatively small closed area, and continued monitoring of the groundfish fishery for additional incidental catch of sharks wouldn't be an option.

The fishing industry can play a critical role in avoiding incidental catch of species if they are alerted to the problem. The Bering Sea pollock catcher vessel cooperatives quickly responded to high incidental catch of squid during the 2006 B season pollock fishery. In that case NMFS identified the area of concern and the fleet stopped fishing through an intra-cooperative agreement. Incidental catch was essentially stopped before the BSAI squid ABC was exceeded. In the shark scenario incidental catch continued after the invented initial closure in response to the spike in shark catch. The incidental catch occurred over a broad area and across several components of the groundfish fishery. The broad distribution of shark incidental catch after September 19 suggests catch of sharks may be much more difficult for the fleet to avoid and would require broader closures to prevent overfishing.

Appendix C: Technical Notes

Figure Compilation

Along with the tables two general figures are used to characterize the current status of catch of current and proposed TAC categories in this analysis. First, cumulative catch of the current or proposed TAC category is compared to the management benchmarks, OFL, ABC or TAC in the case of the GOA “other species” category. Three years (2004 through 2006) are displayed relative to the relevant benchmarks. Three years is an arbitrary choice and is provided to represent recent trends of catch and provide readable figures. Prior to 2003 catch of species within the “other species” category were aggregated in the Alaska Region database. The species groups identified for analyses were not individually identified in the “blend” system used from the early 1990s through 2002.

Second, average catch of a species group by gear and target is calculated. In addition, the incidental catch rate of the TAC category relative to the average annual groundfish caught in the gear and target combination is calculated. Catch by year for 2003 through 2006 are compiled and an average catch across year, gear, and target category is calculated. The average catch across years is the sum of the average gear and target catch. The categories accounting for the greatest amount of catch of a TAC category are displayed. Other gear and target combinations with minor amounts of catch are not. The incidental catch rate is the average catch by gear and target in kilograms relative to the total average groundfish catch in metric tons by gear and target for 2003 through 2006.

Although skate were part of the GOA “other species” category in 2003, they are excluded from the calculations for the displays of the “other species” category in the ‘gear and target’ figures so that estimates of average catch are consistent with the 2004-2006 definition of GOA “other species.”

Catch of the groundfish species categories in the IFQ halibut fishery is not calculated. Halibut catch was not reported consistently relative to groundfish landings prior to 2007.

Gear and Target Calculation

Targets are calculated based on fishing gear, reporting area, and a specified time frame. For catcher vessels, targets are calculated based on a fishing trip defined by a delivery to a processing plant. For catcher/processors and most motherships, targets are calculated on the basis of a weekly reporting period, using weekly production reports or observer data. With the exception of pollock, targets are calculated relative to prevalence of retained species. Pollock targets are based on catch composition. Catch assigned to the P or ‘mid-water’ pollock fishery must be 95 percent or more pollock. The B (bottom) target consists of catch that is predominately pollock but less than 95 percent. The B target does not imply the catch was necessarily taken in a non-pelagic or ‘bottom’ trawl.

Particular in the BSAI, the flatfish species targeting algorithm first identifies whether it is a flatfish target by prevalence of flatfish. If it is a flatfish target, more than 70 percent of the flatfish must be yellowfin sole to be identified as a yellowfin sole target. Otherwise it is a mixed flatfish target consisting of rock sole, flathead sole, other flatfish, etc.

In the GOA, deep-water flatfish includes Dover sole and Greenland turbot; shallow-water flatfish includes non-deep-water flatfish, flathead sole, rex sole, and arrowtooth flounder. In the BSAI “other flatfish” includes all flatfish species except Pacific halibut and those flatfish species that have a separate specified TAC amount.

Table 16 shows the targets and the fishery management plan areas they apply to. Target fishery calculations have a limited relationship to whether a particular species or species group is open to directed fishing. In this analysis, species closed to directed fishing are calculated as a target on the basis of retention in a particular

reporting area. A vessel can easily be in compliance with directed fishing closures, fish in two or more reporting areas, and on the basis of retention within a reporting area, be assigned the specified TAC category closed to directed fishing as a target.

Species Density Plots

The plots of density of catch are kilograms of the species sampled relative to the total groundfish sampled. Both sampled and extrapolated hauls were used. Data for 2003, 2004, and 2005 were pooled.