FINAL

ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW

FOR THE

PROPOSAL TO CREATE DISTRICTS
WITHIN THE ALEUTIAN ISLANDS MANAGEMENT SUBAREA

AMENDMENT 28

TO THE FISHERY MANAGEMENT PLAN FOR
GROUNDFISH OF THE BERING SEA AND ALEUTIAN ISLANDS

Prepared for the
North Pacific Fishery Management Council

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1.0 INTRODUCTION

1.1 Management Background

The eastern Bering Sea (BS) groundfish fisheries in the U.S. exclusive economic zone (EEZ) are managed under the Fishery Management Plan for the Groundfish Fishery in the Bering Sea and Aleutian Islands Area (BSAI). The Fishery Management Plan (FMP) was prepared by the North Pacific Fishery Management Council (NPFMC, Council) under the Magnuson Fishery Conservation and Management Act (Magnuson Act). The FMP was approved by the Secretary of Commerce (Secretary) and became effective in 1982.

Most Bering Sea groundfish total allowable catches (TAC) are set for the BSAI. The exceptions are pollock, sablefish, and rockfish, for which separate TACs are set for the eastern BS and Aleutian Islands (AI) subareas. Presently, the FMP does not provide for apportioning AI TACs in any geographical units smaller than the entire subarea. At its September meeting, the Council recommended the initiation of a plan amendment to split the AI. This request stemmed from Scientific and Statistical Committee (SSC) discussions that in recent years the commercial catches of groundfish in the AI had become spatially concentrated in a relatively small portion of the subarea. At its September meeting, the SSC recommended an overall preliminary ABC of 117,100 metric tons (mt) for Atka mackerel if the TAC could be apportioned among districts within the AI, noting the need to distribute this increased harvest level in proportion to the distribution of biomass. Due to the lack of the current legal regulatory ability to permit the apportionment of TACs within the AI, the SSC set the Atka mackerel preliminary ABC at 32,100 mt, the amount it felt could be safely taken in the portion of the AI normally fished. These ABCs were adopted as final ABCs at the December SSC meeting. In response, the Council, at its December meeting set ABC for Atka mackerel at 117,100 mt and the TAC at 32,000 mt. Additional quota of Atka mackerel could become available from the reserves, to be fished in the western portion of the AI, if the subarea is subdivided in 1993. Thus, the need for a plan amendment to split the AI, thereby providing a mechanism to apportion AI TACs, became particularly critical for the Atka mackerel fishery.

This environmental assessment/regulatory impact review (EA/RIR) is an analysis of the efficacy and the potential biological and socioeconomic impacts of establishing districts within the AI. The creation of districts within the subarea could potentially provide for the apportionment of TACs for any groundfish species. However, only Atka mackerel was included in the analysis because (1) Atka mackerel is the only species for which sufficient biological information currently exits on which to establish separate ABCs within the AI, and (2) industry demand for an increase in availability of Atka mackerel in 1993 is high.

The Council reviewed this EA/RIR and recommended a preferred alternative at its January meeting. The Council recommended a plan amendment that will subdivide the AI into three smaller management areas. If this action is approved by the Secretary, the implementing regulations could be in place by August 1993. Under this amendment, the Council will have the opportunity, during its specification process at the September and December meetings, to assign TACs to more finite areas within the AI portion of the BSAI. For 1993, the Council is expected to consider an increase in the TAC of Atka mackerel at its June 1993 meeting.

1.2 Purpose of the Document

This document provides background information and assessments necessary for the Secretary to determine if the alternatives being considered by the Council are consistent with the Magnuson Act and other applicable law. It also provides the public with information to assess the alternatives that the Council is considering and to comment on the alternatives. These comments will enable the Council and Secretary to make a more informed decision concerning the resolution of the management problems being addressed.

1.2.1Environmental Assessment

One part of the package is the EA that is required in compliance with the National Environmental Policy Act of 1969 (NEPA). The purpose of an EA is to determine whether significant impacts on the quality of the human environment could result from a proposed action. The environmental analysis in the EA provides the basis for this determination and must analyze the intensity or severity of the impact of an action and the significance of an action with respect to society as a whole, the affected region and interests, and the locality. If the action is determined not to be significant based on an analysis of relevant considerations, the EA and resulting finding of no significant impact (FONSI) would be the final environmental documents required by NEPA. An environmental impact study (EIS) must be prepared if the proposed action may cause a significant impact on the quality of the human environment.

1.2.2Regulatory Impact Review

The RIR is required for all regulatory actions undertaken by the National Marine Fisheries Service (NMFS) for significant Department of Commerce or NOAA policy changes that are of public interest. The RIR: (1) provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems; and (3) ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are "major" under criteria provided in Executive Order 12291 and whether or not proposed regulations will have a "significant impact" on a substantial number of small entities in compliance with the Regulatory Flexibility Act (P.L. 96-354, RFA). The primary purpose of the RFA is to relieve small businesses, small organizations, and small governmental jurisdictions (collectively, "small entities") of burdensome regulatory and record-keeping requirements. This RFA requires that the head of an agency must certify that the regulatory and record-keeping requirements, if promulgated, will not have a significant effect on a substantial number of small entities or provide sufficient justification to receive a waiver.

1.3 Purpose and Need for the Proposed Action

The domestic and foreign groundfish fisheries in the EEZ of the BSAI are managed by the Secretary according to the BSAI FMP, which was prepared by the Council under the authority of the Magnuson Act. The FMP is implemented by regulations for the foreign fishery at 50 CFR part 611 and for the U.S. fishery at 50 CFR part 675. General regulations that also pertain to the U.S. fishery are implemented at 50 CFR part 620. At times, amendments to the FMP and/or its implementing regulations are necessary to respond to fishery conservation and management issues.

The purpose of the proposed amendment is to provide a mechanism for the Council to spatially allocate the harvest of fish species, in the AI of the BSAI, and to facilitate a potential TAC increase for Atka mackerel during 1993. Yearly catch allocations for the AI are based on estimates of the available exploitable biomass of each species or complex within the entire subarea. In recent years, commercial fishery catches in the AI, particularly of Atka mackerel, have become concentrated in a relatively small portion of the subarea. Spatially concentrated harvests in the AI could lead to localized depletions of fish species that exhibit only limited movements, such as Atka mackerel and Pacific ocean perch. In turn, localized depletions of these fish stocks could have adverse biological consequences for these species, and for marine mammals that prey upon them. Presently, the FMP does not provide for apportioning AI TACs in any geographical units smaller than the entire subarea.

1.4 Alternatives

Alternative 1 - Status quo, no action: Under this alternative, the AI would remain one single undivided subarea. Within the AI, groundfish species would continue to be managed as AI or BSAI TACs with no further spatial allocation. For 1993, the BSAI TAC for Atka mackerel would remain at 32,000 mt.

Alternative 2: Under this alternative, the AI would be separated into two districts by dividing the region at 177ø E longitude for the purpose of spatially allocating TACs. Groundfish TACs could be apportioned between the two districts within the AI in future years. For 1993, the TAC for Atka mackerel could be increased, through allocation of non-specific operational reserves, up to 117,100 mt. As recommended by the SSC, any such increase would be proportional to the distribution of biomass of Atka mackerel.

Alternative 3 - (Councilþs preferred alternative): Under this alternative, the AI would be separated into three districts by dividing the region at 177ø E and 177ø W longitude for the purpose of spatially allocating TACs. As with Alternative 2, groundfish TACs could be apportioned among the three districts within the AI in future years. For 1993, the TAC for Atka mackerel could be increased, through allocation of non-specific operational reserves, up to 117,100 mt. As recommended by the SSC, any such increase would be proportional to the distribution of biomass of Atka mackerel; since the current TAC of 32,000 mt has already been harvested, primarily from the eastern AI district, any increase during 1993 would be apportioned to the central and western districts, in approximately equal amounts.

Alternatives Dropped from Further Consideration

Dividing the AI into four management districts (north and south of the island chain as well as an east/west subdivision) was rejected from further consideration. Four to six subareas would likely result in unmanageably small TACs in some locations, would greatly complicate the NMFS's work load and could cause increased scheduling costs for the fishery. The fishery for Atka mackerel has been concentrated in certain passes in the Aleutian chain. A north-south division would split some fishing grounds. For these reasons, this alternative is currently considered impracticable.

Dividing the AI into two districts at 180ø W longitude was also considered and rejected. It was determined that the impacts of a division at 180ø W longitude are similar to those resulting from a division at 178ø W longitude, which was specifically requested as an alternative by the Council. Furthermore, a division at 180øW divides Petrel Bank, an important fishing area for Atka mackerel. This would unnecessarily complicate the reporting requirements for the fishery and would separate what is most likely a single fish stock into two management districts.

Although a split at 178ø West longitude was specifically requested by the Council, Alternative 2 analyzes a split at 177ø East. A split at 178ø W would create a large district (west of 178ø W) encompassing several major Atka mackerel fishing grounds. According to the most recent AI resource survey, 90% of the Atka mackerel biomass was detected west of 178ø W. Thus it was postulated that if the Atka mackerel TACs increase in the future and 90% is apportioned to the typical fishing grounds west of 178ø W, effort would increase but would unlikely be re-distributed within this district, making a split at 178ø W unacceptable. A split at 177ø E creates two districts, each with approximately 50% of the Atka mackerel biomass according to the 1991 NMFS survey data.

2.0 ENVIRONMENTAL AND BIOLOGICAL IMPACTS

2.1 Atka Mackerel Biology and Life History

Atka mackerel (Pleurogrammus monopterygius) are distributed from the east coast of the Kamchatka peninsula, throughout the Komandorskiye and AI, north to the Pribilof Islands in the eastern BS, and eastward through the Gulf of Alaska (GOA) to southeast Alaska. Their center of abundance according to past surveys has been in the AI, particularly from Buldir Island to Seguam Pass (Figure 2.1). Atka mackerel populations appear to be quite localized once they assume the demersal phase of their life history, and occur in large localized concentrations. They live in shallow water habitat with extremely hard, rough, and rocky bottom.

Atka mackerel eggs are demersal and sessile. Following hatching, Atka mackerel larvae migrate out to the open ocean as indicated by the frequent presence of larvae in stomachs of salmon caught in the open sea 150-500 miles from the coast (Gorbunova 1962). Young juveniles are pelagic and occur from nearshore to depths of 200 meters (m), and are also found in the upper 200 m as far as 800 kilometers (km) offshore. Older juveniles are found nearshore to 200 m, and adults are found nearshore to depths of 575 m but are mostly distributed less than 300 m.

Adult Atka mackerel have been characterized as semi-demersal and epipelagic. They are not bottom dwellers, but are apparently found in the water column near the bottom.

Atka mackerel reach sexual maturity in the third or fourth year at lengths of approximately 33-35 cm (Gorbunova 1962). They form large spawning schools and move inshore to shallow spawning grounds. Spawning takes place on the inner shelf at depths of 5-30 m. The timing is generally June-September in the Northeast Pacific. Spawning areas are located in the straits between islands, as in the passes of the Aleutian, Shumagin, and Commander Islands. Spawning schools are composed of fish 3 to 11 years of age with ages 5+ and 6+ predominating.

Atka mackerel begin recruiting to the commercial fishery around age 2 and appear to be fully recruited at age 4 (Lowe 1992). The oldest Atka mackerel aged at the Alaska Fisheries Science Center was 14 years old. Atka mackerel reach maximum lengths of approximately 50 centimeters (cm) and maximum weights of about 1.4 kilograms (kg).

Atka mackerel are primarily pelagic feeders but occasionally seek benthic prey. Adults feed primarily on euphausiids, and pelagic fish, although amphipods, copepods, shrimp, and molluscs are also important. They feed most actively at night in midwater or near the surface and return to the near-bottom during the day. Inshore foraging has been noted to occur May-October.

Atka mackerel are fairly important in the diet of a number of fish, birds, and mammals at various stages in their life cycle. The eggs are eaten by crustaceans, echinoderms, rock greenlings (Hexagrammos lagocephalus), and yellow Irish lords (Hemilepidotus jordani). Pelagic larvae and juveniles are frequently found in the stomach contents of salmon caught in the open ocean. Adults are eaten by Pacific cod (Gadus macrocephalus), Pacific halibut (Hippoglossus stenoplepis), northern fur seals (Callorhinus usinus), and Steller sea lions (Eumetopias jubatus) (Gorbunova 1962). The importance of Atka mackerel in the diets of marine mammals is further discussed in Section 2.4.

2.1.1Movement and Migration

Atka mackerel do not perform extensive migrations but move inshore-offshore and vertically in the water column. Their spawning migrations are a fairly prominent feature of the AI at certain times of the year. During May and June they move inshore from pelagic waters for feeding and spawning. They have been observed to initially move to shallow waters of 70-150 m during the prespawning period (May-June), and then from June on to move close to shore (0-30 m) to spawn. Juveniles and adults have been noted to perform diel vertical migrations, occurring near the surface at night and at greater depths during the day (Gorbunova 1962).

2.1.2Stock Structure Information

A morphological and meristic study suggested that there may be separate populations in the GOA and the AI (Levada 1979). This study was based on a comparison of samples collected off Kodiak Island in the central GOA, and the Rat Islands in the AI. There have not been any other studies to explore the possibility of sub-populations existing within the AI.

There are indications that Atka mackerel are very localized, and fish from various areas in the AI have shown significant differences in weight and length at age. Kimura and Ronholt (1988) estimated parameters of the von Bertalanffy length-age equation and a weight-length relationship using data collected in all areas during the 1980, 1983, and 1986 NMFS surveys. Sexes were combined in the analysis as sex was not determined to be an important differentiating variable for Atka mackerel growth. The observed mean length- and weight-at-age data for six areas in the AI are given in Table 2.1.

Atka mackerel exhibit large annual and geographic variability in length at age. Because survey data provided the most uniform sampling of the AI, data from these surveys were further analyzed to evaluate variability in growth (Kimura and Ronholt 1988). Length-at-age data from the 1980, 1983, and 1986 U.S.-Japan surveys, and the U.S.-U.S.S.R. surveys in 1982 and 1985 were analyzed by six areas. It appeared that length at age was smallest in the west and largest in the east. Analysis of variance was used to evaluate these differences statistically, and results showed that the differences among areas were statistically significant.

These spatial differences in length at age cannot be considered conclusive indications of separate populations within the AI, but rather are indications of this possibility, and at the very least show that Atka mackerel are very localized.

2.2 Atka Mackerel Survey Biomass Distribution

Atka mackerel is a difficult species to survey because: (1) they do not have a swim bladder, making them poor targets for hydroacoustic surveys; (2) they live in shallow water on hard, rough and rocky bottom which makes sampling with bottom trawls difficult; and (3) their schooling behavior makes the species susceptible to large variances in catches which would greatly affect area-swept estimates of biomass. Despite these shortcomings of trawl surveys, the U.S.-Japan cooperative surveys conducted in 1980, 1983 and 1986 and the domestic survey of 1991 provide the only direct estimates of Atka mackerel population biomass from the entire AI region (see Kimura and Ronholt (1988) for a complete description of the surveys).

Figures 2.2 and 2.3 show the distribution and relative abundance of Atka mackerel based on each successful haul of the four surveys in the AI. Localized concentrations of Atka mackerel were found in Seguam Pass, Tanaga Pass, on Petrel Bank, south of Amchitka Island, west of Kiska Island, on Buldir and Tahoma Reefs, and on Stalemate Bank.

Biomass estimates of Atka mackerel were calculated for each survey area and subarea shown in Figure 2.4 and for each of the following depth strata within each subarea: 1-100 m, 101-

200 m, 201-300 m, 301-500 m, and 501-900 m (Table 2.2). In the 1980 survey, no successful sampling occurred in shallow waters around Kiska and Amchitka Islands, and seven depth/subarea strata in waters less than 200 m depth (where Atka mackerel are likely to be found). In the 1983 survey, four 1-100 m strata in different subareas were not sampled, and this survey had the fewest successful stations of all four surveys. In the 1986 survey, only three 1-100 m subarea strata were not sampled but the survey vessels were excluded from waters surrounding Adak Island by the US Navy. In 1991, no depth/subarea strata in waters less than 500 m depth were missed and the area around Adak Island was sampled.

Trawl survey biomass estimates of Atka mackerel in the AI (170øW-170øE) increased from 130,500 mt in 1980, 343,300 mt in 1983, 634,000 mt in 1986 to 688,200 mt in 1991. These values may differ from other values reported (in Lowe 1992) due to differences in fishing power corrections between vessels. The respective variance estimates for these mean values are high, and are: 1980: 4.36 x 1011; 1983: 6.82 x 1011; 1986: 1.65 x 1013; and 1991: 1.24 x 1012.

Distribution of the survey Atka mackerel biomass in the districts proposed in Alternatives 2 and 3 are shown in Table 2.3 and Figure 2.5. Based on these surveys, the distribution of biomass has changed, with less concentrated in the eastern (170ø-177øW) district, and more to the west, particularly the central (177øW-177øE) district. In the 1980 and 1983 surveys, approximately 40% of the Atka mackerel biomass was located in the eastern district, but this percentage declined to between 6-11% in 1986 and 1991. The biomass estimate for the eastern district varied between 40,000 and 140,000 mt in these four surveys, and was approximately 74,000 mt in 1991. The largest differences in district biomass between surveys were noted in the central (177øW-177øE) and western (177ø-170øE) districts. Between 1983 and 1986, the estimated biomass and percentage of total increased from 50,000 mt to 545,000 mt, and 15% to 86%, respectively, in the central district, but declined to 307,000 mt and 45% in 1991. In the western district, the biomass varied between 33,000 mt and 152,000 mt (and the percentage between 8% and 44% of the total) between 1980-1986, and then increased to 306,000 mt and 44% of the total in 1991.

While these surveys provide the best absolute estimates of the size and distribution of the Atka mackerel population available, caution in using and interpreting them is necessary due to variations in sampling intensity and the highly aggregated nature of the Atka mackerel population. The difficulties associated with making precise area-swept estimates of schooling fish are evident in the variance estimates for each survey biomass as well as the details of the 1983, 1986, and 1991 survey results. In 1983, 17 successful hauls (of 213 in the survey area) accounted for over 70% of the survey's Atka mackerel biomass, while in 1986, 13 of 319 successful hauls accounted for over 80% of the survey biomass. Furthermore, in the 1986 survey, the Atka mackerel biomass estimate for a single subarea/depth stratum that was sampled with three hauls (the 1-100 m depth strata in the eastern subarea of the southwest area) accounted for 76%, or 481,000 mt, of the entire Aleutian area biomass of Atka mackerel. It is this single strata (sampled by three hauls) that accounts for the large difference in district biomass distribution between 1983 and 1986 in Figure 2.5. In the 1991 survey, biomass appeared to be less unevenly distributed, with 11 of 279 hauls accounting for over 50% of the survey biomass. However, the two largest single strata biomass estimates in the 1991 survey were each based on only one successful haul in each strata, and accounted for 205,681 mt, or 30% of the total AI Atka mackerel biomass.

Length-frequencies of Atka mackerel sampled in each area, subarea and depth strata during the 1991 survey are shown in Figure 2.6. Size generally increases with depth (with some exceptions), and most Atka mackerel were between 25-45 cm in length. Some older fish > 50 cm were found between 100-200 m, between 170ø-174øW south of the island chain (survey area 2, district 3), which is the Seguam Island and Pass area. Small fish < 25 cm were found in the far western AI (survey area 1, district 1), near Amchitka Island and on Petrel Bank (survey area 3, district 2), and in the Delarof Islands and on Petrel Spur (survey area 4, district 1). Very few fish smaller than 20 cm were collected in any of the four surveys.

2.3 Atka Mackerel Fishery

2.3.1 Catch and Quota History

Catches from 1978-1992 are shown below; "JVP" is joint venture processing in which U.S. catcher vessels deliver to foreign processors, and "DAP" is domestic annual processing in which U.S. catch vessels deliver to U.S. processors:

	Eastern Bering Sea				Aleutians Islands			
Year	Foreign	Domestic		Total	Foreign	Domestic		Total
		JVP	DAP			JVP	DAP	
1978	831	0	0	831	23,418	0	0	23,418
1979	1,985	0	0	1,985	21,279	0	0	21,279
1980	4,690	265	0	4,955	15,533	0	0	15,533
1981	3,027	0	0	3,027	15,028	1,633	0	16,661
1982	282	46	0	328	7,117	12,429	0	19,546
1983	140	1	0	141	1,074	10,511	0	11,585
1984	41	16	0	57	71	35,927	0	35,998
1985	1	3	0	4	0	37,856	0	37,856
1986	6	6	0	12	0	31,978	0	31,978
1987	tr	12	0	12	0	30,049	0	30,049
1988	0	43	385	428	0	19,577	2,080	21,656
1989	0	56	3,070	3,126	0	0	14,868	14,868
1990	0	0	480	480	0	0	21,725	21,725
1991	0	0	1,836	1,836	0	0	21,004	21,004
1992*	0	0	2,369	2,369	0	0	43,857	43,857

* Source: Pacific Fisheries Information Network (PacFIN), 1992 catch is current as of 10/13/92.

A history of the total BSAI catch and the corresponding TAC for 1978-1992 are given below:

	Bering Sea/Aleutian Islands Catch (mt)	Total Allowable Catch (mt)
1978	24,249	24,800
1979	23,264	24,800
1980	20,488	24,800
1981	19,688	24,800
1982	19,874	24,800
1983	11,726	24,800
1984	36,055	23,130
1985	37,860	37,700
1986	31,990	30,800
1987	30,061	30,800
1988	22,084	21,000
1989	17,994	20,285
1990	22,205	23,500
1991	22,840	24,000
1992	46,226*	43,000
1993	**	32,000

* Source: PacFIN, 1992 catch is current as of 10/13/92.
** 1993 catch data not available.

Annual catches of Atka mackerel in the BSAI increased during the 1970s reaching an initial peak of 24,250 mt in 1978. From 1979 to 1982 catches gradually declined, then dropped sharply to 11,726 mt in 1983. The decline from 1980 to 1983 was due to changes in the target species and allocations to the nations fishing rather than changes in stock abundance. From 1984 to 1987 catches were at record high levels, averaging 34,000 mt annually. The 1992 Atka mackerel quota (43,000 mt) was reached early in the year, and the directed fishery was shut down on April 16. The 1992 catch of 43,875 mt is the largest reported Atka mackerel catch taken in the history of the fishery.

The TAC values for 1978-1983 were set at 24,800 mt, which was 75% of an unverified Soviet estimate of maximum sustainable yield (MSY) of 33,000 mt (NPFMC 1979). The 1984 TAC of 23,130 mt was determined by adjusting the equilibrium yield (EY) estimate of 25,000 mt downward, so that the aggregate sum of TACs totalled 2 million mt (the OY cap). In 1985, the TAC was raised to 37,700 mt, which was based on an updated MSY estimate of 38,700 mt determined from Stock Reduction Analysis. The 1986-87 TACs (30,800 mt) are equal to the estimated EY. The 1988 TAC of 21,000 mt is equal to the acceptable biological catch (ABC) which was based on a yield per recruit analysis and the F0.1 fishing mortality rate (NPFMC 1987). The 1989 TAC was based on the ABC determined from catch-at-age analysis which also equaled 21,000 mt, adjusted downward so that the sum of the groundfish TACs totalled 2 million mt. The 1990 TAC of 23,500 mt was based on an updated ABC estimate of 24,000 mt determined from catch-at-age analysis, and adjusted so that the sum of the TACs totalled 2 million mt. The 1991 TAC of 24,000 mt equalled the average catches from 1978-1990.

The 1992-1993 TACs are based on results from stock synthesis analysis, which incorporated the latest survey biomass (1991 AI). A new estimate of biomass in excess of 0.5 million mt coupled with a fishing mortality rate equal to the natural mortality rate (M) of 0.30, suggested that acceptable harvest levels could be much larger that those recommended in the 1980s. Concern for the resource and the uncertainty involved led to a reluctance to implement radically higher catch levels immediately. An additional problem was that the majority of the biomass (73%) was found west of 180þW, while the fishery for the most part was prosecuted east of 180þW. The SSC recommended phasing in the new ABC estimates over a 6-year period, adopting the current exploitable biomass estimate and raising the exploitation rate in steps from M/6 in 1992 to M/3 in 1993, and M in 1997. Thus in 1992, the Council set ABC and TAC equal to M/6 multiplied by the exploitable biomass estimate which provided a value of 43,000 mt. In the 1993 assessment, M/3 multiplied by an updated assessment of current biomass provided an ABC of 117,100 mt (Lowe 1992). Continued concern for the resource due to the disproportionate distribution of the catch relative to NMFS survey biomass distribution, led the SSC to recommend an ABC of 32,100 mt (the portion of the harvest that could be taken east of 180þW based on the survey). The SSC stated that if a plan amendment were in place to subdivide the Aleutian district, the ABC would be the full 117,100 mt (SSC minutes, Dec. 1992). The Council set ABC equal to 117,100 mt and the TAC at 32,000 mt for the 1993 fishery.

2.3.2Number and Types of Vessels

Prior to 1989-90, the Atka mackerel fishery in the AI was conducted by foreign motherships and domestic catcher vessels (the joint-venture fisheries of 1981-1988) and foreign catcher-processors (the foreign fisheries of the 1970s through 1984). In the last 3 years (1990-92), the Atka mackerel fishery has been almost exclusively conducted by domestic catcher-processing vessels (offshore sector). In 1991 and 1992, there were 29 and 25 catcher-processors, respectively, targeting on Atka mackerel in the AI subarea based on weekly processing records. In 1991, only one mothership (with two catcher vessels supplying it) was involved in the Aleutian Atka mackerel fishery, while in 1992, there were two motherships (J. Gharrett, NMFS Regional Office, Juneau, AK). Using target fishery definitions based on the species composition of individual hauls (Table 2.4), the NORPAC observer database yielded 18, 24, and 24 vessels in 1990, 1991, and 1992, respectively, that targeted on and caught at least 100 mt of Atka mackerel in the AI.

Atka mackerel is caught almost exclusively with trawls fished on the bottom. During the last 3 years, more than 99.2% of the Atka mackerel landed were caught with bottom trawls, 0.3-0.7% caught by pelagic trawls, and small amounts using pots and longlines (NORPAC observer data base).

2.3.3Fishing Patterns

The patterns of the Atka mackerel fishery generally reflect the behavior of the species: (1) the fishery is highly localized and occurs in the same few locations each year; (2) the schooling semi-pelagic nature of the species makes it particularly susceptible to trawl gear fished on the bottom where the larger, older fish are located; and (3) trawling occurs almost exclusively at depths less than 200 m, where bottom trawl surveys have found over 97% of the Atka mackerel biomass in the AI since 1980. The following briefly outlines the recent temporal and spatial distribution of the Atka mackerel fishery in the AI, and relates this to what is known about the distribution of the Atka mackerel stock(s) in the management subarea. Observer data for 1989 is particularly sparse because the foreign and JVP fisheries had largely been replaced by domestic fisheries by this time, but the domestic observer program had not yet been fully implemented. In the AI, Atka mackerel have been fished primarily in only four locations over the last 10 years (1982-92; see Figures 2.7-22):

(1)in Seguam Pass and approximately 30m SSE of Seguam Island (171-172øW approximate longitude);
(2)in Tanaga Pass and within the Delarof Islands (178øW approximate longitude);
(3)on Petrel Bank and Spur (179øW approximate longitude); and
(4)in two locations south of Amchitka Island (178ø-179øE approximate longitude).

Three of the locations listed above are in the central AI (177øW-177øE), while Seguam is the only one in the eastern AI (170ø-177øW) and is the most important in terms of percentage of landed catch each year (Table 2.5). None of the important Aleutian Atka mackerel fishing locations of the last 10 years are in the western AI (177ø-170øE).

In the early 1970s, most Atka mackerel catches occurred in the western AI (west of 180øW) on Tahoma and Buldir Reefs and on Stalemate Bank in the 177ø-170øE district. Fishing effort moved progressively eastward in the late 1970s with significant landings coming from the central and eastern AI. From 1982-84, more than 80% of the Atka mackerel landed came from the Seguam location, while the three locations in the 177øW-177øE district yielded between 33-73% of the catch between 1985-87 with Seguam yielding the remainder. Since 1990, between 56-68% of the Atka mackerel landed in the AI have come from Seguam. In 1982, 1984, 1990 and 1992, there was some effort for Atka mackerel in the 177ø-170øE district on Buldir and Tahoma reefs, but this yielded only 1% of the catch or less.

The Atka mackerel catch distribution has differed greatly from the biomass distribution as revealed by bottom trawl surveys. Since 1980, the percentage harvested from the eastern AI (170ø-177øW) has far exceeded the proportion of biomass found there, while the percentage harvested from the western AI (177ø-170øE) has been far less than the proportion of biomass in that area (Tables 2.2 and 2.5). In recent years (1990-92), the percentage of Atka mackerel landed from the eastern AI (170ø-177øW) has ranged between 56-68%, while the district's percentage of the 1991 survey biomass was only 11%. In the western AI (177ø-

170øE), the 1991 survey found over 44% of the Atka mackerel biomass but less than 1% of the catch has been harvested there. The percentages of Atka mackerel caught and biomass found in the central AI (177øW-177øE) have been similar since 1990, with catch percentages ranging between 32-44% and a 1991 survey biomass percentage of 45%.

Because of the shallow habitats favored by Atka mackerel and the localized nature of the fishery, a large percentage of the harvest between 1980-91 was caught near Steller sea lion rookeries in the BSAI (Table 2.6). The Steller sea lion was listed as threatened under the Endangered Species Act (ESA) in April 1990. From 1982-1986, between 70-80% of all BSAI landings of Atka mackerel were caught within 10 nautical miles (nm) and between 83-98% within 20 nm of Steller sea lion rookeries. The principal rookeries near where this fishing effort occurred are: (1) on Seguam and Agligadak Islands in the 170ø-177øW district; (2) in the Delarofs Islands (on Tag and Ulak Islands and Gramp Rock) in the 177øW-177øE district; and (3) on Amchitka and Rat Island (East Cape and Column Rocks near Amchitka Island, and Ayugadak Point on Rat Island) also in the 177øW-177øE district. In 1987-88, less than 50% of the Atka mackerel landings were harvested within 20 nm of sea lion rookeries as more effort was shifted to Petrel Bank and Spur. In 1990-91, however, there was a return to the pattern observed between 1982-86, with 70-80% caught within 10 nm and 90% within 20 nm of sea lion rookeries. Beginning in 1992, trawling was prohibited within 20 nm of Seguam and Agligadak island rookeries during the BSAI pollock "A" season (January through April 15 or until the TAC is reached) and within 10 nm of all rookeries year-round. The intent of these actions was to exclude trawl fishing activity from areas known to be important for sea lion foraging and reproduction. As a result, the percentages of Atka mackerel harvested within 10 and 20 nautical miles (nm) of rookeries declined to 0 and 17% in 1992 (Table 2.6).

From 1982-88, the Atka mackerel fishery was conducted in the second and third quarters of the year, with most of the harvest usually landed in the second quarter (Table 2.7). The fishery generally lasted for several months during the late spring and summer each year. Beginning in 1990, the fishery has occurred earlier in the year and lasted for a shorter period of time. In 1990, almost 94% of the catch was harvested in the second quarter, with over half landed in June. In 1991, 97% of the catch was harvested in the first quarter with over half landed in late March. In 1992, significant harvests occurred in both the first and second quarters, but over half the landings occurred between mid-March and mid-April.

2.3.4Sizes of Atka Mackerel Caught

Length distributions from the domestic fishery in 1989, 1990, and 1991 are shown in Figure 2.23. Mean length was 36.6 cm in 1989, 38.8 cm in 1990, and 38.2 cm in 1991. Since very few Atka mackerel were sampled for length data in 1989, the data are probably not a good representation of the length distribution of Atka mackerel in the 1989 commercial fishery. The 1990 and 1991 data show few fish less than 35 cm, and that for the most part, the fishery harvested fish 35 to 45 cm in size.

Fishery selectivity patterns were estimated by the stock synthesis model for the time periods of 1972-1983 and 1984-1991 (Lowe 1992). Prior to 1984 the fishery basically consisted of fish 2-7 years old. The oldest fish during this time period was 9 years old. After 1983, fish greater than 7 years old appeared in the fishery, with the oldest fish aged at 14 years in the

1990 fishery. The estimated selectivity-at-age for the fishery is dome-shaped (Figure 2.24). The age composition of the recent fishery consists mostly of fish 3-9 years old.

2.3.5 Bycatch of Prohibited Species, Other Allocated Groundfish, and Forage Species by the Atka Mackerel Fishery

Since the domestic Atka mackerel fishery has been concentrated east of 180øW, the small amount of data available that can address regional differences in bycatch rates of prohibited, other allocated groundfish and important forage species within the AI was collected by foreign and joint-venture fishery observers from 1977-88. These are summarized below and in Table 2.8, along with data collected from 1990-92 from the domestic fishery.

Prohibited Species: Compared to other bottom trawl fisheries (e.g., BS pollock, cod, and rockfish), the Atka mackerel fishery has relatively low bycatch rates of prohibited species (Pacific halibut, king and Tanner crabs, herring, and salmon), primarily because it is conducted in the AI away from centers of abundance of these species on the eastern BS shelf (data for halibut in Tables 2.9). The Atka mackerel fishery is currently (1993) included within the BSAI Other Trawl Fisheries category for the Vessel Incentive Program, but has bycatch rates of halibut and king crab considerably lower than the category's incentive program rate standards for 1993 (Table 2.10).

Halibut - Mean 1977-88 bycatch rates of halibut decreased from 2.8 kg/mt Atka mackerel in the 170ø-177øW district to less than 0.1 kg/mt Atka mackerel in the 177ø-170øE district, with corresponding decreases in the maximum rates observed. The recent domestic fishery has had rates between 0.5-3.3 kg/mt Atka mackerel in the eastern and central districts, considerably below the vessel incentive program rates for BSAI other trawl fisheries (Table 2.10).

King Crab - Mean and maximum bycatch rates of king crabs were at least three times higher in the eastern (0.043 crabs/mt Atka mackerel) than in the central and western districts from 1977-88. Rates during the domestic 1990-92 fisheries have also been generally low, except for 0.472 crab/mt rate observed in 1992 in the eastern district. Even this rate is considerably below the vessel incentive program rate for BSAI other trawl fisheries (Table 2.10).

Tanner Crab and Herring - Bycatch rates of Tanner crab and herring by Atka mackerel fisheries from 1977-92 were extremely low and should not be affected under any of the proposed alternatives.

Salmon - Salmon bycatch rates have generally been higher in the eastern district than in the central and western districts, and may have been higher in the late 1980s and 1990 than from 1984-86. Salmon bycatch rates of the recent domestic Atka mackerel fishery have been very low.

Other Allocated Groundfish: Other allocated groundfish species caught by Atka mackerel fisheries include Pacific cod, walleye pollock, Pacific ocean perch (POP), and other rockfish. Flatfish and sablefish are not caught by the Atka mackerel fishery to any great extent.

Pacific cod - Annual Pacific cod bycatch in a district has been as high as 22% by weight of the Atka mackerel caught (1984 JVP fishery in the eastern district), but has usually been in the 1-15% range. Cod bycatch rates have been higher in the eastern district than in districts to the west. Mean district bycatch rates by the foreign and JVP fisheries of 1977-88 decreased from east to west, from 14% in the eastern district (maximum annual rate of 44%) to 11% in the central district (maximum of 34%) to less than 1% in the western district (maximum of 6%).

Data collected onboard domestic vessels in 1990-92 suggest that cod bycatch rates were similar to the mean 1977-88 rates in 1990 and decreased from this level in 1991-92. In 1990 and 1991, cod bycatch was higher in the central district (14% and 8%, respectively) than to the east (11% and 6%, respectively), but this pattern was reversed in 1992 (8% in the eastern and 5% in the central district).

Walleye pollock - Pollock bycatch rates by the Atka mackerel fishery have declined to low levels in recent years and have generally been higher in the eastern district than further west. Pollock bycatch rates by the foreign and JVP fisheries were higher in the eastern district (mean rate of 8%) than in the central and western districts (1% and 0.5%, respectively). The domestic fishery of 1990-92 had lower pollock bycatch rates than the foreign and JVP fisheries that preceded it, reflecting the declining abundance and aging of the pollock population in the AI especially in shallow areas inhabited by Atka mackerel (Wespestad and Dawson 1992). Pollock bycatch rates in 1990 were approximately 3% (in both the eastern and central districts), while in 1991, rates remained the same in the central district but declined to under 1% in the eastern district. Rates in all areas in 1992 were below 1%.

Pacific ocean perch (POP) and Other Rockfish - Bycatch of POP and other rockfish by the Atka mackerel fishery has generally been higher in the western district than in the central and eastern districts, and may be increasing. From 1977-88, foreign and JVP fisheries averaged 2% and 4% bycatch rates of POP and all rockfish, respectively, in the eastern district, compared with mean rates below 1% and 2%, respectively, in the eastern and central districts. Bycatch rates of POP by the domestic 1990-92 Atka mackerel fishery have increased from less than 1% in the eastern and central districts in 1990 to between 2-3% in 1991-92. Similarly, bycatch rates of all rockfish increased from 2-4% in 1990 to between 4-8% in 1992, with higher rates observed in the central than in the eastern district. Shifting effort for Atka mackerel to the western district could increase the bycatch of POP and other rockfish by this fishery.

Forage Species for Marine Mammals and Seabirds: Data in the observer program data base suggests that bycatch rates of marine mammal and seabird forage species (other than Atka mackerel itself) by the Atka mackerel fishery are very low. Observer data in NORPAC were investigated concerning the bycatch of Pacific sandlance, herring, smelts (capelin, eulachon, and other osmerids), squid and octopus by the Atka mackerel fishery. No data were available concerning the bycatch of Pacific sandlance, herring, and smelts, suggesting that bycatch of these species by the fishery is small. Data on bycatch of pollock (described above) suggests low bycatch rates of this species. Data on size composition of the pollock caught by Atka mackerel trawlers are not available, but are most likely in the same range as the Atka mackerel retained (most > 35 cm; see Section 2.3.4).

Squid and octopus bycatch rates by the Atka mackerel fishery have also been low. Mean squid bycatch rates by foreign and JVP fisheries in all districts were less than 1 kg squid/mt of Atka mackerel, with a maximum annual rate of 5 kg squid/mt. The mean rate was highest in the western district (0.5 kg squid/mt), second highest in the eastern district (0.1 kg/mt) and lowest in the central district (0.04 kg/mt). Squid bycatch rates by the recent domestic fishery have been lower than those of foreign and JVP fisheries, with all less than 0.3 kg/mt, and most less than 0.1 kg/mt.

Annual district octopus bycatch rates by the Atka mackerel fishery (foreign, JVP, and domestic) have been low, with all less than 0.4 kg octopus/mt Atka mackerel (observed in the eastern district). Mean 1977-88 rates for the foreign and JVP fisheries were highest in the eastern district (0.08 kg/mt) and less than 0.01 kg/mt in the central and western districts. During the domestic fisheries of 1990-92, octopus bycatch rates have also been low, with maximum rates of 0.1 kg/mt observed in the eastern district in 1991; all other district octopus bycatch rates from 1990-92 were 0.05 kg/mt or less.

2.4 Marine mammals

There are many cetacean species that occur in Alaskan waters, which have the potential for interaction with groundfish fisheries in the AI. Four species are listed as endangered under the ESA [fin whale (Balaenoptera physalus), sei whale (Balaenoptera borealis), humpback whale (Megaptera novaeangliae), and sperm whale (Physeter macrocephalus)] while the others are small- to medium-sized cetaceans that currently are not listed under the ESA [minke whale (Balaenoptera acutorostrata), killer whale (Orcinus orca), Dall's porpoise (Phocoenoides dalli), harbor porpoise (Phocoena phocoena), Pacific white-sided dolphin (Lagenorhynchus obliquidens, and the beaked whales (e.g., Berardius bairdii and Mesoplodon spp.)].

There are also at least three pinniped species as well as the sea otter (Enhydra lutris) that occur in the AI, which have the potential for interaction with groundfish fisheries. The three pinniped species [Steller sea lions (Eumetopias jubatus), northern fur seals (Callorhinus ursinus), Pacific harbor seals (Phoca vitulina)] have each experienced declines in their population sizes over the last 30 years. The Steller sea lion was listed as threatened under the ESA in 1990.

Of these marine mammals, the sperm whale and the sea otter are unlikely to be affected by the proposed action due to their diet (squid and deepwater fishes for sperm whales; echinoderms and molluscs for otters) and foraging areas (generally in waters deeper (for sperm whales) and shallower (for sea otters) than those fished by the Atka mackerel fishery). The potential interactions between Atka mackerel fisheries and the remaining marine mammals will be discussed after brief reviews of their natural history, and in the case of the Steller sea lion, their recent affects on fisheries management.

Fin Whales: Fin whales range from the North Pacific Ocean to the BS and, rarely, the

Chukchi Sea. The North Pacific population has been estimated from 14,620 to 18,360 individuals (Braham 1984); it is estimated that about 5,000 enter the BS during summer through many of the passes in the Aleutian Island chain (Morris 1981). Fin whales feed by engulfing large concentrations of, among other prey, euphausiids, anchovies, capelin, herring, and juvenile pollock.

Fin whales generally winter off southern California and Baja California, although a few whales overwinter in the GOA and near the Commander Islands (Berzin and Rovnin 1966). Fin whales entering the BS are generally separated into two groups (Nasu 1974). A group consisting mostly of mature males and females without calves migrate along the shelf break to Cape Navarin and more northern waters. A group of lactating females and immature whales summer along the shelf break between the Pribilof Islands and Unimak Pass. Other summer concentrations occur in the GOA and along the Aleutian Chain. Historically, a summer concentration was located between St. Matthew and Nunivak Islands (Berzin and Rovnin 1966). Although the fall migration may begin in September, some fin whales may remain in the AI and the GOA until November and possibly overwinter in these areas.

Sei Whales: Sei whales occur in all the world's oceans. The North Pacific population is estimated at between 22,000 and 37,000 individuals (Braham 1984). The principal food source is copepods, which the sei whale catches by skimming. Other food sources include euphausiids, herring, sand lance, and pollock. They are most commonly found in the GOA and southeast of the Aleutian Chain area during the summer months (May and June) and migrate to southern latitudes during winter. Migration periods and routes are similar to those of the fin whales. Sei whales are rarely seen north of the AI (Rice 1974). Braham et al. (1977) reported one sighting in the Fox Islands and one sighting east of the Pribilof Islands.

Humpback Whale: In the North Pacific, humpback whales are distributed from the tropics north to 70ø N latitude in the Chukchi Sea. In the North Pacific, the humpback population is estimated at <1,200 individuals (Braham 1984), and Morris (1981) estimated that up to 200 humpbacks were distributed throughout the BS in the summer. Humpbacks feed on euphausiids and small schooling fish that they capture through lunging or a modified skim-feeding action. Tomilin (1967) stated that euphausiids, arctic cod, herring, capelin, saffron cod, pollock, mysids, pelagic amphipods, and shrimp were the most important humpback food items (Tomilin 1967), while Frost and Lowry (1981) also included Atka mackerel, sand lance, salmon, and rockfish.

The summer range of humpbacks extends from the coast of California northward to the southern portion of the Chukchi Sea. The whales migrate from wintering grounds off Hawaii and Mexico north to the GOA (early April), the eastern Aleutian Islands (late June), and northward to the Bering and Chukchi Seas (July through September). The whales are found in the BS from May through November; the autumn migration begins in September. Photo-identification of humpbacks indicates that migratory routes exist between Hawaii and Prince William Sound and southeastern Alaska, and between Mexico and California and southeastern Alaska. Soviet and Japanese tagging and whaling records indicate that humpbacks heading for the St. George Basin area migrate between Japan and the southeastern BS (Hameedi 1981). Berzin and Rovnin (1966) postulated that the summering humpbacks along the Soviet coast overwinter off Japan but that some mingling occurs with whales that overwinter around Hawaii and Mexico.

Minke Whale: Minke whales are the smallest of the baleen whales, and inhabit all oceans of the world except equatorial regions. The North Pacific population is classified as abundant, but no precise estimate of the population exists. Minke whales feed locally on abundant fish, euphausiids, and copepods. Euphausiids are the preferred prey in the North Pacific, followed by schooling fish, and copepods. From March through December, minke whales are seen feeding most frequently in the lagoons and coastal waters along the northern shore of the Alaska Peninsula (i.e., Port Moller and Nelson Lagoon).

The species occurs broadly over the North Pacific and into the southern Chukchi Sea during the summer months and migrates to lower latitudes during the winter. Minke whales apparently occur in the BS on a year-round basis, with concentrations near the AI and the Pribilof Islands during the summer. Over 95% of minke whale sightings in the NMFS Platform of Opportunity (POP) data base were within the 200-m isobath, and most were in shallow coastal waters (Morris 1981). However, this distribution may be an artifact of effort distribution in the POP database.

Killer Whale: Killer whales are observed in all major oceans and seas of the world and appear to increase in abundance shoreward and toward the poles of both hemispheres (Mitchell 1975). Killer whales are top-level carnivores of the marine ecosystem with diets that vary regionally (Heyning and Dahlheim 1988). Although primarily fish eaters, killer whales are known to prey on other cetaceans, pinnipeds, and seabirds (Dahlheim 198l). Killer whales have been documented to take significant numbers of fish off longlines in the AI and GOA black cod fisheries.

Killer whales have been observed as far north as the Chukchi and Beaufort Seas (Braham and Dahlheim 1982; Lowry et al. 1987). Year-round occurrence may occur within Alaskan waters; however, their movements are poorly understood (Braham and Dahlheim 1982). Whales are forced southward from the Chukchi and northern BS with the advancing pack ice and, under such circumstances, long-range movements may occur. In ice-free waters, more restricted movements may occur. Killer whale concentrations have been noted in coastal waters, continental shelf waters, and neritic zones. These areas of killer whale abundance are of particular interest as they overlap areas of high abundance of prey. NMFS conducted a vessel survey for killer whales in July-August 1992 in the coastal areas and along the continental shelves of the GOA (Kodiak Island and west), BS (Unimak Pass northwest to the Pribilof Islands) and in the eastern AI as far west as Atka Island (174øW). Using photo-identification techniques, NMFS observed 184 different whales and concluded that the total population in the GOA and BSAI is probably in the hundreds of animals. This population estimate is similar to two others made in the last 10 years in the same area by Leatherwood et al. (1983) and Brueggeman (1987), both of whom conducted aerial surveys.

Dall's Porpoise: This species ranges from Northern Baja California, along the western coast of North America, and across the North Pacific Ocean to the coastal waters of Japan. The estimated size of the North Pacific Dall's porpoise population (not including coastal waters from California to Washington) north of 40o N to the AI is approximately 1,349,000 animals (Turnock 1987; and Bouchet et al. 1986). In the BS the population is estimated to be 212,000 (Turnock 1987). Dall's porpoise feed predominantly on squid and mesopelagic fish, predominately myctophids. Examination of stomach contents of Dall's porpoise incidentally taken in the Japanese high seas salmon fishery in 1978-79 revealed a frequency of occurrence of Atka mackerel of 13% in one year (Crawford 1981). The exact location of collection of the animals is not known, but the Japanese salmon fishery operated in the AI west of 176øE between Buldir Island and the US-Russia convention line along with other areas to the north (in the BS "donut hole") and south.

The northern limit of the species is generally Cape Navarin in the BS, although they have been observed as far north as 66o N latitude (Morris et al. 1983). Dall's porpoise are sighted in Bristol Bay through the year and in the Navarin Basin area from spring through fall (Brueggeman et al. 1984). They can occur in shallow waters but have been most frequently sighted in waters over 100 meters deep. Concentrations occur from June through November along the shelf break from the Pribilof Islands to Cape Navarin. Migratory movements are not well understood, but available information suggests local migrations along the coast and seasonal onshore/offshore movements. However, data from throughout the North Pacific and BS show that Dall's porpoise reproduce annually and seasonally, starting in late July or early August to September (Jones et al. 1985).

Harbor Porpoise: The harbor porpoise is a boreal-temperate species along the North Pacific coast from Point Barrow, Alaska, to central California. Numbers of harbor porpoise in Alaskan waters are unknown. They feed primarily on small gadoid and clupeoid fish, such as cod, herring, and also on mackerel.

Harbor porpoise are generally sighted singly or in pairs. Sightings in the BS are reported in Frost et al. (1982). Neave and Wright (1969) reported that harbor porpoise in the western North Atlantic move north in late May and south in early October. Harbor porpoise are generally seen in coastal environments such as harbors, bays, and the mouths of rivers. Mating probably occurs from June or July through October, with peak calving in May and June.

Pacific White-Sided Dolphin: This species ranges from Baja California to the AI, as well as off the coast of Japan. The numbers of this dolphin found in Alaska is unknown. They are opportunistic feeders that eat a variety of fish and squid. Pacific white-sided dolphin are observed north of the AI, primarily in waters 100 to 200 m deep. Most abundant in the summer months, this species concentrates in areas of high fish abundance, such as along the shelf break. Presumably, the dolphins shift their distribution farther north during the summer season and also may move offshore (Morris et al. 1983). They are frequently observed in groups exceeding 100 individuals; groups of between 500 and 2,000 individuals have been sighted.

Beaked whales - Little is known about the abundances, seasonal distribution, and food habits of the North Pacific beaked whales, such as Baird's beaked whale (Berardius bairdii) or members of the genus Mesoplodon (such as M. hectori, M. ginkgodens, M. carlhubbsi, and

M. stejnegeri). It is thought that most reside in deep, offshore waters, where they feed primarily on squid. However, Baird's beaked whale has been found to feed on various fish species (Nishiwaki and Oguro 1971). Most of what is known about their distribution comes from beach strandings. If they enter the BS during the summer, food availability, particularly schooling fish and squid, in the AI passes in spring and fall may be important.

Steller sea lion - The geographic range of the Steller sea lion extends from Hokkaido, Japan, through the Kuril Islands and Okhotsk Sea, AI and central BS, GOA, Southeastern Alaska, and south to central California. The AI and GOA are the centers of distribution and abundance, respectively, for the species. At least 38 rookeries are located in the AI, Bering Sea, coastal GOA, and southeastern Alaska. Haul outs are rare north of the Pribilof Islands.

Sea lions do not migrate; however, there is a definite dispersal from rookeries following the summer breeding season. At least some adult females (those with dependent offspring and some others as well) remain associated with the summer rookery sites throughout the year, while others may disperse away. The large concentrations of animals found at seasonal haul outs (e.g., Puale Bay in the spring) were probably due to animals moving to those haul outs because of seasonal prey availability nearby. One major difference between summer and winter movements is that females appear to be at sea longer in the winter.

Adult males are completely absent from rookery sites during the nonbreeding season. In late summer and early fall, AI and BS animals reach St. Lawrence Island and the Bering Strait (Kenyon and Rice 1961). Matthew and Hall Islands in summer. Movement of males to the ice edge apparently occurs in winter. In spring (March-April) some sea lions utilize the ice front prior to the disintegration of ice in the central BS, especially in the vicinity of the shelfbreak (Burns et al. 1980; NMFS unpub. data 1983). Seasonal movements of GOA male sea lions are unknown.

Sighting data indicates that many sea lions forage from the continental slope shoreward; however, they have been observed in excess of 150 km offshore (Kajimura and Loughlin 1988). Data from one satellite radio tagged female from Marmot Island indicated that this animal typically foraged 100 km east of the island (on the south edge of Portlock Bank). The destination of one trip was over 200 km offshore (Merrick unpub. data 1990).

Food habits studies indicate that schooling fishes, particularly pollock, herring, capelin and sand lance, are the major prey of Steller sea lions in Alaska, but their diet also includes squid and octopus (Lowry et al. 1982, 1989). Size of pollock consumed by sea lions ranges from age 1 fish to adults greater than age 10, however most of the pollock consumed are ages 1 to 3 and the average size is under 30 cm (Lowry et al. 1989). Recently collected (NMFS, 1990-91) and unpublished data on food habits of sea lions based on analyses of scat collected throughout the AI suggests that Atka mackerel is an important food item, at least during the summer. Scats were collected at 12 locations in 1990-91, nine of which were within the Aleutian management subarea (Yunaska, Amlia, Gramp, Tag, Ulak, Amchitka, Kiska, Buldir, and Agattu). Of the 89 scats collected at the nine sites in 1990, 76 (85%) contained Atka mackerel remains. Data is only available from three of these nine sites in

1991; of the 67 scats collected from Ulak, Buldir and Agattu, 54 (81%) contained Atka mackerel remains. Other prey found in significant numbers in these collections include pollock, herring, and salmon.

Index counts of sea lions from Kenai Peninsula to Kiska Island in the AI declined 76% between 1975-1991 (Merrick et al. 1992). Declines over this 16-year period have been most severe in the central GOA and in the AI, the core of the species' range. Results of the 1992 survey suggest that the decline in sea lion numbers in the eastern AI (in the BS management area) and the western AI may have stopped, but may be continuing in the central AI (Table 2.11). Despite the apparent stabilization of numbers in portions of the AI, the population appears to have declined in the AI by about 80% since 1979, and may be continuing to decline in the central AI. NMFS and Alaska Department of Fish and Game (ADF&G) are currently conducting research on Steller sea lion feeding ecology (satellite telemetry and analysis of scat), the health and number of pups and juveniles (physiological analyses and pup counts) and seasonal distributions of sea lions and their prey (aerial and ship-board surveys of sea lions and fish) to better understand the causes of the decline and monitor the population during its anticipated recovery.

Steller sea lions were listed as threatened under the ESA on an emergency basis on April 5, 1990
(55 FR 12645), and on a final basis on November 26, 1990 (55 FR 49204). The listing included measures that: (1) established 3 nm buffer (=no-entry) zones around major Steller sea lion rookeries in the GOA and BSAI; (2) prohibited shooting at or near sea lions; and (3) reduced the allowable take incidental to commercial fisheries in Alaskan waters. A final Recovery Plan and proposals for designation of critical habitat for Steller sea lions will be released in early 1993.

For the 1992 BSAI groundfisheries, the Secretary implemented Amendment 20 to the BSAI FMP. Regulations have been implemented under the authority of these amendments that (1) geographically separate groundfish fishing from important sea lion foraging habitat, and (2) spread the fishing effort, both geographically and over time, preventing adverse effects that might result from intense fisheries in localized areas. The specific regulations implementing Amendment 20 prohibit trawling within 10 nm of 37 sea lion rookeries in the GOA and the BSAI. In addition (and including regulations implemented in 1993), trawling is prohibited within 20 nm of four sea lion rookeries in the BS management subarea (Sea Lion rocks in Bristol Bay, and Akun, Akutan and Ugamak in the Krenitzin islands east of 170øW), and two rookeries in the AI management subarea (Seguam and Agligadak) during the pollock "A" season, which closes no later than April 15. These regulations create large contiguous areas in which trawling is prohibited during the pollock "A" season. Satellite telemetry data collected during winter 1992 in the Krenitzin islands indicated that the shallow nearshore portions of the shelf were used extensively for foraging, particularly by juveniles who tended to stay within 20 nm of land. The three-20 nm no-trawl zones around Akun, Akutan and Ugamak better encompass the winter distribution (on haul-outs) and protect juvenile foraging areas than the previous management regime. There is no similar satellite telemetry data for the Seguam Pass area for comparison but sea lion foraging behavior there may be similar.

Northern fur seals - The northern fur seal, distributed throughout the BS and north Pacific Ocean, is a pelagic species during most of the year and returns to land (primarily the Pribilof Islands in the eastern BS) to breed in summer. The diet of the northern fur seal in the GOA and the BS has been studied at least since the mid-1950s and has been summarized by Kajimura (1984) and Perez and Bigg (1986). In the BSAI, data exist for the months of June-October, and reveal a varied diet of small schooling fish and squid. Fur seals which had eaten Atka mackerel were collected in the western GOA and eastern BS near Unimak Pass and along the continental shelf to the Pribilof Islands. Atka mackerel comprised between 10-20 percent of the diet during late spring-early summer when fur seals traverse passes in the AI reentering the BS. Atka mackerel may also be important to fur seals when they leave the BS, primarily through passes in the eastern AI, in fall. The availability of Atka mackerel prey resources during spring and fall may be important to fur seals, particularly as pollock stocks in the Aleutian may be declining (B. Sinclair, pers. comm.; Wespestad and Dawson 1992).

The data for northern fur seals, although obtained primarily from females ò 3 years of age, suggests that they ingest smaller fish than Steller sea lions. Perez and Bigg (1986) reported that fur seals collected in the north Pacific Ocean ingested pollock ranging only from 4-40 cm (n=1,721 pollock from 71 stomachs) and Atka mackerel from 15-23 cm (n > 5 Atka mackerel from 5 stomachs). The largest fish consumed by northern fur seals in the collections of Perez and Bigg (n > 3,000 fish) was a 41 cm salmon. Pollock and Atka mackerel fisheries primarily catch fish (target species) larger than 30 and 35 cm, respectively (Hollowed et al. 1991; Lowe 1992; Wespestad and Dawson 1991). Consequently, the overlap between fisheries takes and the preferred fish sizes of northern fur seals is low, a conclusion also reached by Swartzmann and Haar (1983).

Northern fur seals are currently listed as depleted under the Marine Mammal Protection Act (MMPA). Current assessments suggest that the size of the population has been relatively stable since the early 1980s (Antonelis et al. 1990). The decline evidenced in the 1960s and early 1970s was associated with commercial and scientific harvests in the 1950s and early 1960s (Swartzman and Hofman 1991). Cause(s) of the decline observed in the late 1970s are largely unknown, but may be related to entanglement in marine debris and discarded fishing gear, incidental take, or reduced prey availability.

Pacific harbor seals - Harbor seals are found in all coastal areas of the GOA and are widely distributed in nearshore habitats of the BS (Pitcher 1980a; Calkins 1986; Frost and Lowry 1986). Individuals are occasionally observed as far as 100 km offshore (Pitcher 1980a). Only limited information is available on the diet of harbor seals in Alaska. Pitcher (1980a;b) reported that the harbor seal diet in the GOA was composed of at least 27 species of fish, as well as cephalopods (both octopi and squids) and shrimp in 269 stomachs analyzed. The seven principal prey were (in order of frequency of occurrence): pollock (21 percent), octopus (17 percent), capelin (9 percent), herring (6 percent), Pacific cod (6 percent), flatfishes (5 percent) and eulachon (5 percent). There were some significant regional differences in the harbor seal diet throughout the Gulf. Octopus, capelin, and cod were more important components of the diet in the Kodiak area, while pollock was the principal prey in the Prince William Sound area. Harbor seal food habits data from the BS (16 stomachs analyzed by Lowry et al. 1986 from animals collected in Bristol Bay) are much less extensive than for the Gulf. Herring and capelin were the principal components of the diet of harbor seals in Bristol Bay.

Little information is available on the size composition of fish in the diet of harbor seals compared with Steller sea lions and northern fur seals. What is available suggests that harbor seals consume smaller fish than Steller sea lions. Pitcher (1981) found that harbor seals collected from the same area and during the same period as Steller sea lions consumed smaller pollock (mean length of pollock ingested by harbor seals = 19.2 cm; for Steller sea lions, 29.8 cm). This suggests a low overlap in body size between pollock harvested by the fishery and those ingested by harbor seals.

In 1991, NMFS began a 3-year comprehensive population assessment of harbor seals in Alaska. During the first year, surveys were conducted in Bristol Bay, Prince William Sound and in the Copper River Delta. The number of seals in Bristol Bay appears to have remained relatively stable since the mid-1960s, at about 10,000 animals. In the Prince William Sound area, however, counts of harbor seals declined. During 1992, counts were made in the Kodiak Archipelago, the south side of the Alaskan Peninsula, and the Kenai Peninsula. These data indicated that the GOA harbor seal population had declined, possibly as much as 90%, a conclusion first reached by Pitcher (1989) after his surveys on Tugidak Island in the 1980s. In 1993, survey plans include southeastern Alaska and possibly the AI. At present, harbor seals are not listed under the ESA or designated as depleted under the MMPA. After completion of the assessment studies in 1993, NMFS will review harbor seal status in Alaska and consider changes to management as necessary.

Conclusions - The cetacean species discussed above interact with trawl fisheries either through a common prey such as pollock, cod, flatfish or Atka mackerel (Lowry et al. 1989) or by occasionally being caught in trawls, currently at the rate of several per year (NMFS unpublished data). The former would affect all species while the latter only the small to medium sized cetacean species.

Fish comprise varying proportions of the diet of large baleen whales, ranging from approximately 16% of the diet of fin whales, 29% of the diet of humpback whales, and 60% of the diet of minke whales (Perez and McAllister 1988). Fish ingested by the large baleen whales are almost exclusively small schooling fish, such as capelin, herring, and eulachon, or juveniles (not recruited to the fishery) of commercially exploited groundfish species, such as pollock, cod, and Atka mackerel. Atka mackerel has been found to be a food item of only one of the large baleen whales, the humpback whale, but its importance is not known. Based on these data, it can be concluded that direct competition between large baleen whales and Atka mackerel fisheries is probably low.

Since little is known of the seasonal distribution of beaked whales, or the extent of their reliance on commercially exploited fish stocks, the interactions between trawl fishing and beaked whales are difficult to determine. Perhaps at certain times of the year (spring and fall when entering and leaving the BS) and for certain portions of the population (such as females with calves) food availability in shallow waters of AI passes is important.

Fish generally comprise a greater proportion of the diet of the smaller cetaceans and pinnipeds, with over 50% being reported for the killer whale, harbor porpoise, and Dall's porpoise, and between 65-80% for the pinnipeds (Perez and McAllister 1988). These species are considered opportunistic and feed on a wide variety of fish species, including osmerids, clupeoids, gadids, salmonids, myctophids, flatfish, sand lance, and Atka mackerel. Furthermore, although most of these species prefer fish smaller than those caught by commercial trawlers, many, particularly the Steller sea lion, will ingest larger individuals. Therefore, the potential for direct competition between pinnipeds and trawl fisheries is greater than for baleen whales. It was for this reason that annual and seasonal trawl exclusion areas were established around sea lion rookeries. While these were not intended as protection for other pinnipeds, the no-trawl zones prohibit trawling within areas where the vast majority of the harvest of Atka mackerel had previously occurred. It is not known how these management actions will affect fur seals (especially in spring and fall when they leave the BS) or harbor seals.

2.5 Pacific salmon listed under the Endangered Species Act

Five species of Pacific salmon occur off Alaska and might occur as incidental bycatch in groundfish fisheries: chinook salmon, Oncorhynchus tschawytscha; coho salmon, O. kisutch; sockeye salmon, O. nerka; chum salmon O. keta; and pink salmon O. gorbuscha. Of these species, several populations have been listed or are being considered for listing under the ESA. Snake River sockeye were listed as endangered (56 FR 58619, November 20, 1991), and Snake River spring/summer and fall chinook are listed as threatened (56 FR 29542, June 27, 1991; 57 FR 14653, April 22, 1992). A fourth species, winter-run chinook from the Sacramento River, was listed as threatened on November 5, 1990 (55 FR 46515), and are proposed for a change in status to endangered (57 FR 27416, June 19, 1992), but are almost unknown in Alaskan waters.

Although listed wild fish are not marked or directly identifiable, tagged hatchery fish from nearby locations have been used as indicators of the distribution of listed species. Coded wire tag (CWT) recovery data from observed groundfish fisheries suggests that the ocean distribution of these fish may extend into the BSAI, although their occurrence in that area would be extremely rare. Since 1981, no indicator CWT Sacramento River chinook or Snake River sockeye or chinook have been recovered in the BSAI groundfish fisheries.

2.6 Seabirds

Many seabirds occur in Alaskan waters and have the potential for interaction with groundfish fisheries in the AI. The most numerous seabirds in Alaska are northern fulmars, storm petrels, kittiwakes, murres, auklets, and puffins. These groups, and others, represent 38 species of seabirds that breed in Alaska. Eight species of Alaska seabirds breed only in Alaska and in Siberia. Populations of five other species are concentrated in Alaska but range throughout the North Pacific region. Marine waters off Alaska provide critical feeding grounds for these species as well as others that do not breed in Alaska but migrate to Alaska during summer, or that breed in Canada or Eurasia and overwinter in Alaska. Additional discussion about seabird life history, predator-prey relationships, and interactions with the groundfish fishery can be found in an EA prepared for the 1993 Groundfish Total Allowable Catch Specifications (NMFS 1993).

The following summarizes the status of seabirds currently listed, proposed to be listed, or which are candidates for listing, under the ESA:

Status	Category	Species
Listed	Endangered	Short-tailed albatross (Diomedea albatrus)
Listed	Threatened	Spectacled Eider (Somateria fischeri)
Candidate	Category 1	Steller's eider (Polysticta stelleri)
Candidate	Category 2	Marbeled murrelet (Brachyramphus marmoratus)
Candidate (1993)	Category 2	Red-legged kittiwake (Rissa brevirostris)
Candidate (1993)	Category 2	Kittlitz's murrelet (Brachyramphus brevirostris)

2.7 Possible Impacts on the Environment

2.7.1Impacts on the Physical Environment

Under each alternative, physical impacts are those that would be caused by (1) trawl activity disturbing the seabed and associated benthic animals and plants, and (2) deposition of fish wastes from processing activities and discards. Disturbance of the benthos by trawls and fish wastes can alter the abundance and composition of the affected benthic community. The extent of change in the seafloor community and time to recovery will be directly influenced by the frequency and severity of disturbance events. Changes in the benthic community may affect food availability for bottom feeding species. Presently, the actual effects, if any, of trawling and fish waste disposal on the benthic environment of the AI are unknown.
Under Alternative 1, benthic disturbance by trawls and fish waste disposal is likely to be confined to a smaller portion of the AI, namely east of 180øW with the concentration of effort in the typical fishing grounds described in section 2.3.3. Thus, repeated disturbance may affect long-term changes in the composition and abundance of local benthic fauna and flora. Under Alternatives 2 and 3, a larger area would be affected but disturbance is likely to be less frequent at particular sites, potentially allowing more complete benthic recovery to occur. Presently, there is insufficient information available to predict the physical effects of these alternatives on the environment or any differences among them.

2.7.2 Impacts on the Biological Environment

2.7.2.1 Impact on the Atka Mackerel Resource

Under Alternative 1 (status quo), it is likely that the Atka mackerel fishery will continue to be prosecuted east of 180øW on the same fishing grounds described in Section 2.3.3. The fact that the same few locations have been repeatedly fished for at least the last 10 years, suggests that localized depletions on an annual basis or longer time scale have not occurred in these areas. The exploitation rates for Atka mackerel have been estimated to be quite low and under 2.5% in the last 10 years (Lowe 1992). These extremely low exploitation rates appear to be sustainable. It is unknown if the resource will be negatively affected as higher exploitation rates are implemented, but there is a greater risk of adverse impacts if the fishery continues to be prosecuted in the same manner on the same portion of the population.

Atka mackerel are not a highly mobile species and data suggest that they are in fact quite localized; they would be more susceptible to potential localized depletion compared to more mobile fish species.

Under Alternative 2, there would be 2 districts within the AI (split at 177øE), and the BSAI Atka mackerel TAC could be apportioned between the districts. A likely apportionment would be according to the distribution of biomass from the latest most comprehensive AI survey conducted in 1991. Table 2.3 shows that in 1991, 55.5% of the Atka mackerel biomass was detected east of 177øE. If approximately 50% of the TAC is sufficient to support the current Atka mackerel fishery, there may not be a large change in the distribution of fishing effort. However, if 50% of the TAC is an insufficient amount to support the fishery in the usual locations, and/or the availability of a large amount of TAC west of 177øE is an incentive, fishing patterns may change and effort could be spread out along the AI. This could lessen the risk of localized depletion. Spreading out the effort and attempting to distribute the quota as the survey biomass is distributed, is more likely to be beneficial for the resource and reduce the possibility of adversely affecting the resource compared to Alternative 1.

If different fishing grounds are utilized (i.e., west of 180øW), there is the potential for the length composition of the catch to change. Section 2.1.2 discussed the geographic variability in length at age for Atka mackerel. Because the geographic differences have not remained constant over the years, it is difficult to anticipate the impacts on the length composition.

Alternative 3 would create three districts within the AI, thereby providing a mechanism to spatially allocate the Atka mackerel TAC among three districts. An apportionment could be made according to the distribution of biomass from the 1991 survey. This survey detected 10.8% of the Atka mackerel biomass in the eastern AI (170ø-177øW), 44.7% in the central AI (177øW-177øE), and 44.5% in the western AI (177ø-170øE) (Table 2.3).

The impacts under Alternative 3 are the same as those discussed under Alternative 2; however, the creation of three districts within the Aleutian subarea provides the greatest possibility of spreading out the Atka mackerel fishing effort to avoid spatially concentrated harvests. This alternative also provides the greatest potential to lessen the risk of localized depletion. Spreading out the effort and attempting to distribute the quota as the survey biomass is distributed, is more likely to be beneficial for the resource and reduce the possibility of adversely affecting the resource compared to Alternatives 1 and 2.

2.7.2.2 Impacts on Marine Mammals

The 10-mile annual and 20-mile seasonal trawl exclusion areas around Steller sea lion rookeries would be in place regardless of which Alternative is chosen. These create refuges where no trawling can occur in areas where, as recently as 1991, as much as 80% of the Atka mackerel had been harvested. It is not known to what extent these no-trawl areas protect foraging areas for pinnipeds other than Steller sea lions, particularly if the TAC for Atka mackerel is increased under Alternatives 2 and 3. Although intended as a protective measure for Steller sea lions, the no-trawl areas may decrease the interactions between trawl fisheries and other marine mammals, particularly northern fur seals, and harbor seals, which also utilize these areas, but this conclusion is uncertain.

Alternative 1 - The status quo does not allow for any spatial allocation of groundfish TACs within the AI. For Atka mackerel, only the fraction (27%, or 32,000 mt in 1993) of the entire ABC (117,100 mt in 1993) equivalent to the proportion of the biomass that is east of 180øW where the fishery is likely to concentrate, would be available in 1993. This alternative would not likely create localized depletions of Atka mackerel and thus, would probably not be detrimental to marine mammals. However, it would prevent the release of a large quantity (as much as 85,100 mt in 1993) of Atka mackerel to the fishery.

Alternative 2 - The creation of two districts in the AI subarea, 170øW-177øE and 177ø-170øE, would distribute fishing effort if groundfish TACs were so apportioned. The alternative may not adequately protect the eastern Aleutian district, which has had the most fishing effort, particularly trawl effort for harvesting Atka mackerel. This is also the area in which Steller sea lions have continued to decline, while populations to the east and west may have recently stabilized or increased. The large eastern district created by this alternative had approximately 56% of the Atka mackerel biomass in the 1991 survey and would get this percentage of the Atka mackerel TAC. Based on past fishing patterns, most of this TAC would be removed from the Seguam Pass area, which is in a district (170ø-177øW) that had only 11% of the Aleutian Atka mackerel biomass. This alternative is the least favorable to marine mammals since it would not adequately disperse effort for Atka mackerel in the eastern Aleutian district, possibly creating localized depletions of the species in areas through which many marine mammals pass on their way into and out of the BS and where Steller sea lions have continued to decline.

Alternative 3 - The creation of three districts in the AI subarea, 170ø-177øW, 177øW-177øE, and 177ø-170øE, would provide the most potential for disbursement of TACs and fishing effort of the three alternatives. For Atka mackerel, this would result in a distribution of trawl effort in proportion to the best information available about distribution of the species. The eastern area, which has approximately 11% of the Atka mackerel biomass (1991), has yielded between 56-68% of the harvest in the last 3 years. On the other hand, the western area has approximately 44% of the biomass (1991), but yielded 1% or less of the harvest since 1990. Therefore, Alternative 3 is preferred to Alternative 2 since it may decrease the likelihood of localized depletions of important marine mammal prey in areas through which many marine mammals pass on their way into and out of the BS and where Steller sea lions have continued to decline (in the two districts east of 177øE). However, the benefits to marine mammals, if any, of this alternative are uncertain, particularly since the increase in the TAC for Atka mackerel in 1993 and future years is unknown at this time.

2.7.2.3 Impacts on Pacific Salmon Listed under the Endangered Species Act

Sacramento River winter-run chinook salmon and Snake River sockeye salmon, fall chinook and spring/summer chinook salmon are listed as threatened or endangered under the ESA. An informal consultation pursuant to Section 7 of the ESA completed on April 21, 1993 for 1993 groundfish fisheries concluded that listed and proposed species of salmon are not likely to be adversely affected by groundfish fisheries conducted under the FMP. Shifts of fishing effort towards the western AI under Amendment 28 are expected to be beneficial in that the possibility of salmonid mortality in BSAI groundfish fisheries is expected to decrease. A Section 7 consultation for Amendment 28 concluded on June 7, 1993, with the statement that fishing activities conducted under that amendment are not likely to affect listed salmon in a manner not previously considered in the earlier consultation.

Alternatives 2 and 3 of proposed Amendment 28 would create new management districts in the AI, facilitating future apportionment of TAC to the western AI. If TACs are so apportioned, some fishing effort would be displaced to the central and western AI from the eastern AI and perhaps from the Bering Sea. In particular, a potential 85,100 mt increase to the 1993 Atka mackerel TAC would be apportioned to the new Central and Western Districts. Information summarized in section 2.3.5 and table 2.8 illustrate that the overall bycatch rate of salmon, and by inference, of listed salmon, is lower in the western AI groundfish fisheries than in areas currently fished.

2.7.2.4 Impacts on Seabirds

The AI provides breeding and forage sites for a large number of piscivorous marine birds, including northern fulmars, storm petrels, kittiwakes, terns, murres, murrelets, auklets, puffins, albatrosses, cormorants, jaegers, gulls, and guillemots. Fishing interactions include direct effects of entanglements or collisions with fishing gear, or through competition for fish prey; and indirect mortality from encounters with marine debris or pollution, and disruption of the ecosystem from habitat degradation. An assessment of impacts of groundfish fisheries on colonial and pelagic seabirds and migratory birds was prepared as part of the Final EA for 1993 Groundfish TAC Specifications for the BSAI and the GOA. The EA is incorporated by reference, as are informal consultations with the U.S. Fish and Wildlife Service (USFWS): (1) on the 1993 TAC specifications, and (2) for this FMP Amendment 28, and a 1989 biological opinion prepared by the USFWS on the effects of the Interim Incidental Take Exemption Program on seabird species listed as endangered or threatened under the ESA. These documents list the endangered, threatened, proposed and candidate species that may be found within the regions of the BSAI where the groundfish fisheries operate and the potential impacts of the groundfish fisheries on these species. The informal consultation on the 1993 TAC specifications concludes that (1) groundfish operations are likely to result in an unquantified level of mortality to short-tailed albatrosses, a listed species, (2) an anticipated annual incidental take of up to two individual birds will not jeopardize the existence of this species, and (3) the allowable incidental take does not constitute a "significant impact on the human environment" under NEPA. The USFWS cited the aforementioned consultation, and concurred with NMFS that the proposed amendment was not likely to jeopardize the continued existance of listed species under USFWS jurisdiction.

Amendment 28 would create new management districts in the AI, allowing future apportionments of TAC within the AI. A potential long-range effect of such TAC allocation is a decreased fishing effort in the eastern AI and BS and an increased effort in the western AI. The relatively large size of the AI and difficulty of fishing in the western AI would likely result in fishing effort that produces negligible pollution and debris in the proposed districts, and that reduces those problems in the eastern AI. Additionally, because the sum of groundfish allocations is limited to 2 million mt, all of which is currently utilized, any increase in the TAC of one species of groundfish in the central and western AI would be balanced by reductions in apportionments to other areas, or in TACs for other species. For the 1993 Atka mackerel fishery, the current TAC of 32,000 mt has been completed, from the eastern AI. Because that amount exceeds the amount of fish available in the eastern AI, if the AI is subdivided into three districts (the preferred alternative), any additional TAC (potentially 85,100 mt) would be made available only in the new Central and Western Districts.

While little is known of the details of the feeding ecology of many marine birds, most of those listed above eat squid and small forage fish (usually less than 20 cm in length), such as sandlance and juvenile capelin, herring, Pacific cod, and pollock. Small Atka mackerel (between 5-14 cm) were a large component of the food brought to chicks by puffins on Buldir Island in the western district in 1990-91, but were not observed there in 1988-89 (Byrd et al. 1992). Atka mackerel in this size range are considerably smaller than those caught by the commercial fishery (Figure 2.23) or even by survey trawls, and would likely be in waters too shallow for trawls to operate (Figure 2.6). Additionally, the Atka mackerel fishery is conducted with bottom trawl gear, which tends to capture larger fish than trawl towed nearer the surface. Furthermore, bycatch of other small forage fish and squid by the Atka mackerel fishery is very low (see section 2.3.5). Therefore, the potential for direct competition for prey between the Atka mackerel fishery and marine birds appears to be low in the AI. Furthermore, potential interactions between trawl vessels and some birds may be reduced by the 10 nm no-trawl zones around Steller sea lion rookeries, many of which are also nesting sites for marine birds (e.g., Agattu and Buldir Islands in the western district).

Since effects on prey availability for marine birds are probably small, the primary risk associated with trawl fishing is likely to be entanglement in gear, through encounters with discarded plastic debris, or from changes in the ecosystem brought about by degradation of habitat. Most entanglement with fishing gear is associated with gillnets and baited hooks on trolled or longline gear. It is estimated that between 96,000 and 250,000 marine birds were killed each year by the Japanese salmon drift gillnet fishery, which operated in the vicinity of the western AI between 1952-88 (Byrd et al. 1992). Gillnets and troll gear are rarely used in groundfish fisheries, and trawl gear is much more predominant than is longline gear. Bottom trawls are much less likely to capture marine birds than are gillnets.

Even though rates of capture of marine birds in trawl gear are low, disbursement of fishing effort towards the western AI under Alternatives 2 and 3 is expected to increase the potential for capture of seabirds in the western AI, and decrease the potential in the eastern AI. Whether this would represent an overall increase in captures for the BSAI is not predictable. Any increase in availability of Atka mackerel should not significantly increase bird captures, because that fishery is prosecuted with bottom trawl gear. Furthermore, while the proposed amendment could ultimately result either in displacement of fishing effort to the western AI, or in a change to the proportion of allocated groundfish, it would not increase overall availability of groundfish TAC in the BSAI, for which the optimum yield of 2 million mt established by the FMP is currently fully utilized. Additionally, disbursement of fishing effort throughout the AI would be expected to reduce the accumulation of debris and pollution in areas that are at present subject to intense fishing effort. Sufficiently little is known about future groundfish allocations, or the habits and movements of many seabirds, that quantifying these changes and predicting the species affected is not possible at this time.

Given these considerations, the division of the AI into three management districts and potential increase in 1993 Atka mackerel TAC in the western AI are not expected to result in additional impacts on seabirds that have not already been considered in the aforementioned documents.

2.7.2.5 Impact on Bycatch of Prohibited Species, Other Allocated Groundfish and Forage Species

Prohibited Species: The data available suggest that bycatch rates for prohibited species have been highest in the 170ø-177øW district and lowest in the 170ø-177øE district. Shifting effort to the west under either Alternatives 2 or 3 could decrease prohibited species bycatch rates by the Atka mackerel fishery as a whole. However, this is dependent on the domestic fishery finding "clean" grounds similar to those used by the foreign fisheries in the 1970s.

Other Allocated Groundfish: As noted in Section 2.3.5, other allocated groundfish caught by Atka mackerel trawl vessels include Pacific cod, pollock, and rockfish (including Pacific ocean perch). The analysis below suggests that spatial allocation of the Atka mackerel TAC under Alternatives 2 or 3 could reduce the bycatch rates of Pacific cod and pollock. Alternative 3 could increase the bycatch rate of rockfish by the Atka mackerel fishery.

Anticipated impacts on prohibited species and allocated groundfish other than Atka mackerel are as follows:

Pacific cod - The potential bycatches of cod by the 1993 Atka mackerel fishery are shown below and will serve to illustrate the amounts of cod that could be caught as bycatch under each Alternative. These data suggest that shifting effort for Atka mackerel to the west under Alternatives 2 or 3 could decrease the cod bycatch rates of the Atka mackerel fishery as a whole relative to no spatial allocation. Furthermore, dividing the AI into three districts under Alternative 3 could decrease cod bycatch rates relative to Alternative 2.

Alternative 1: with the Atka mackerel TAC remaining at 32,000 mt and based on 1992 district Atka mackerel catch distribution and cod bycatch rates, little or no catch of Atka mackerel would occur west of 177øE:

District	Atka mackerel Catch (mt)	Pacific cod Bycatch Rate	Pacific cod Bycatch (mt)
Eastern	21,152	7.8%	1,650
Central	10,496	4.6%	483
Western	352	.3%	1
TOTAL	32,000	6.7%	2,134

Alternative 2: with the Atka mackerel TAC increased to 117,100 mt and based on the 1992 cod bycatch rate in the 170øW-177øE district and the mean rate from the 1977-88 foreign and JVP fisheries in the 177ø-170øE district:

District	Atka mackerel Catch (mt)	Pacific cod Bycatch Rate	Pacific cod Bycatch (mt)
170øW-177øE	65,010	6.7%	4,356
177ø-170øE	52,090	0.3%	156
TOTAL	117,100	3.9%	4,512

Alternative 3: (Councilþs preferred alternative) with the Atka mackerel TAC increased to 117,100 mt and based on the 1992 cod bycatch rates in the eastern and central districts and the mean rate from the 1977-88 foreign and JVP fisheries in the western district:

District	Atka mackerel Catch (mt)	Pacific cod Bycatch Rate	Pacific cod Bycatch (mt)
Eastern	12,670	7.8%	988
Central	52,340	4.6%	2,408
Western	52,090	0.3%	156
TOTAL	117,100	3.0%	3,552

Pollock - The potential bycatches of pollock by the 1993 Atka mackerel fishery are shown below and will serve to illustrate the amounts of pollock that could be caught as bycatch under each alternative. These data suggest that shifting effort for Atka mackerel to the west under Alternatives 2 or 3 could decrease the pollock bycatch rates of the Atka mackerel fishery as a whole relative to Alternative 1 (no spatial allocation).

Alternative 1: with the Atka mackerel TAC remaining at 32,000 mt and based on 1992 district Atka mackerel catch distribution and pollock bycatch rates; little or no catch west of 177øE:

District	Atka mackerel Catch (mt)	Pollock Bycatch Rate	Pollock Bycatch (mt)
Eastern	21,152	2.9%	613
Central	10,496	3.2%	336
Western	352	.5%	2
TOTAL	32,000	3.0%	951

Alternative 2: with the Atka mackerel TAC increased to 117,100 mt and based on 1992 pollock bycatch rate in the 170øW-177øE district and the mean rate from the 1977-88 foreign and JVP fisheries in the 177ø-170øE district:

District	Atka mackerel Catch (mt)	Pollock Bycatch Rate	Pollock Bycatch (mt)
170øW-177øE	65,010	3.0%	1,950
177ø-170øE	52,090	0.5%	260
TOTAL	117,100	1.9%	2,210

Alternative 3: with the Atka mackerel TAC increased to 117,100 mt and based on the 1992 pollock bycatch rates in the eastern and central districts and the mean rate from the 1977-88 foreign and JVP fisheries in the western district:

District	Atka mackerel Catch (mt)	Pollock Bycatch Rate	Pollock Bycatch (mt)
Eastern	12,670	2.9%	367
Central	52,340	3.2%	1,675
Western	52,090	0.5%	260
TOTAL	117,100	2.0%	2,302

Rockfish - The potential bycatches of all rockfish by the 1993 Atka mackerel fishery are shown below and will serve to illustrate the amounts of rockfish that could be caught as bycatch under each alternative. These data suggest that shifting effort for Atka mackerel to the westernmost district under Alternative 3 could increase the rockfish bycatch rates of the Atka mackerel fishery as a whole relative to Alternative 2 (two districts) or Alternative 1 (no spatial allocation).

Alternative 1: with the Atka mackerel TAC remaining at 32,000 mt and based on 1992 district Atka mackerel catch distribution and rockfish bycatch rates; little or no catch west of 177øE:

District	Atka mackerel Catch (mt)	Rockfish Bycatch Rate	Rockfish Bycatch (mt)
Eastern	21,152	3.5%	740
Central	10,496	8.8%	924
Western	352	4.2%	15
TOTAL	32,000	5.2%	1,679

Alternative 2, with Atka mackerel increased to 117,100 mt, and based on the 1992 rockfish bycatch rate in the 170øW-177øE district and the mean rate from the 1977-88 foreign and JVP fisheries in the 177ø-170øE district.

District	Atka mackerel Catch (mt)	Rockfish Bycatch Rate	Rockfish Bycatch (mt)
170øW-177øE	65,010	5.2%	3,381
177ø-170øE	52,090	4.2%	2,188
TOTAL	117,100	4.8%	5,569

Alternative 3, with Atka mackerel increased to 117,100 mt, and based on 1992 rockfish bycatch rates in the eastern and central districts and the mean rate from the 1977-88 foreign and JVP fisheries in the western district:

District	Atka mackerel Catch (mt)	Rockfish Bycatch Rate	Rockfish Bycatch (mt)
Eastern	12,670	3.5%	443
Central	52,340	8.8%	4,606
Western	52,090	4.2%	2,188
TOTAL	117,100	6.2%	7,237

Forage Species: The little data available on bycatch of forage species (other than Atka mackerel itself) by the Atka mackerel fishery suggests that spatially allocating the Aleutian Atka mackerel TAC under Alternatives 2 or 3 could increase the bycatch rates of squid and decrease the bycatch rates of octopus. However, bycatch rates of both cephalopod groups by this fishery are quite low (1991 and 1992 annual rates of both were less than 0.1 kg/mt Atka mackerel caught) and the fishery should not significantly affect their availability to marine mammals or seabirds.

Table 2.1 Length and weight-at-age for Atka mackerel sampled in six areas (Figure 2.1) of the AI region.

Area	Age (yr)	No. (len)	Length (cm)	No. (wt)	Weight (kg)	Area	Age (yr)	No. (len)	Length (cm)	No. (wt)	Weight (kg)
1	2	5	25.8	3	.257	4	2	8	26.5	8	.246
1	3	83	29.2	71	.287	4	3	35	31.8	31	.429
1	4	112	30.3	48	.311	4	4	41	33.6	21	.472
1	5	104	32.1	43	.374	4	5	77	35.3	11	.541
1	6	76	34.1	20	.415	4	6	20	36.5	7	.604
1	7	29	33.9	17	.391	4	7	4	37.8	4	.617
1	8	27	34.8	4	.428	4	8	3	38.0	3	.698
1	9	5	36.2	2	.512	4	9	1	35.0	1	.418
1	10	7	35.1	0	.000	4	10	1	37.0	1	.567
						5	2	28	24.3	28	.156
2	3	28	31.9	0	.000	5	3	82	29.4	57	.282
2	4	77	33.8	8	.496	5	4	55	33.5	33	.457
2	5	152	35.3	20	.604	5	5	51	35.4	36	.568
2	6	80	35.5	13	.565	5	6	70	36.6	32	.582
2	7	42	36.6	28	.621	5	7	34	36.5	18	.613
2	8	28	36.5	16	.580	5	8	13	37.6	6	.630
2	9	6	37.7	1	.650	5	9	8	38.0	6	.637
2	11	1	40.2	0	.000	5	10	4	41.5	1	1.010
3	2	20	27.4	20	.257						
3	3	69	30.6	68	.349	6	3	20	33.1	2	.540
3	4	108	34.8	21	.453	6	4	51	36.4	14	.819
3	5	155	36.3	13	.556	6	5	83	38.8	9	.926
3	6	62	37.2	5	.690	6	6	116	39.5	23	.967
3	7	38	38.4	18	.669	6	7	44	40.4	15	.968
3	8	20	38.3	9	.632	6	8	86	41.4	36	.946
3	9	5	39.6	2	.690	6	9	47	42.6	31	.991
3	10	1	43.0	1	.940	6	10	14	42.4	11	.983
						6	11	4	43.5	3	1.017
						All	2	61	25.7	59	.208
						Areas	3	317	30.3	229	.326
							4	444	33.4	145	.447
							5	622	35.5	132	.531
							6	424	36.8	100	.642
							7	191	37.5	100	.641
							8	177	38.9	74	.765
							9	72	41.0	43	.884

10	27	40.2	14	.952
11	5	42.8	3	1.017

Data are from survey samples taken from 1980 to 1986. (Area 1 = Stalemate Bank, 2 = Buldir and Tahoma Reefs, 3 = Kiska Island, 4 = Amchitka Island, 5 = Petrel Spur, 6 = Seguam Pass)

Table 2.2Atka mackerel biomass estimates (mt) in each area, subarea and depth strata sampled in bottom trawl surveys of the AI conducted in 1980, 1983, 1986 and 1991. See Figure 2.4 for location of areas and subareas. - indicates no successful sampling in strata.

Area	Subarea	Depth	1980	1983	1986	1991
1	1	1-100 m	96	178	1550	4549
		100-200	20463	93245	12721	79219
		200-300	61	1957	173	11
		300-500	25	148	0	0
		500-900	11	0	0	-
		TOTAL	20656	95528	14444	83779
	2	1-100 m	-	15144	-	87270
		100-200	10638	23712	33342	79717
		200-300	244	130	0	18
		300-500	6	0	0	0
		500-900	0	0	0	-
		TOTAL	10888	38986	33342	167005
	3	1-100 m	-	-	480997	118411
		100-200	45544	855	14657	42985
		200-300	326	1	22	4
		300-500	0	0	14	0
		500-900	0	1	0	-
		TOTAL	45870	857	495690	161400
2	1	1-100 m	-	-	-	19452
		100-200	0	15	1	51303
		200-300	0	166	3	83
		300-500	-	0	0	0
		500-900	-	0	0	-
		TOTAL	0	181	4	70838
	2	1-100 m	-	-	0	6
		100-200	1868	667	4	3
		200-300	3	2	0	0

300-500	0	0	0	0
500-900	0	0	0	-
TOTAL	1871	669	4	9

Table 2.2 (continued).

Area	Subarea	Depth	1980	1983	1986	1991
3		1-100 m	-	65814	33	67624
		100-200	1175	60008	7043	3679
		200-300	73	26	2	0
		300-500	16	0	0	0
		500-900	0	0	0	-
		TOTAL	1264	125848	7078	71303
3	1	1-100 m	-	13482	52	8226
		100-200	-	4105	50	46943
		200-300	1463	27	1	134
		300-500	182	0	0	-
		500-900	-	-	-	-
		TOTAL	1645	17614	103	55303
	2	1-100 m	0	27593	42732	28816
		100-200	382	6	177	3533
		200-300	2	0	0	14
		300-500	0	0	0	0
		500-900	4	0	0	-
		TOTAL	388	27599	42909	32363
4	1	1-100 m	0	22121	-	14760
		100-200	375	131	6644	28253
		200-300	363	2	16	0
		300-500	0	0	1	0
		500-900	0	0	0	-
		TOTAL	738	22254	6661	43013
	2	1-100 m	94	0	0	0
		100-200	5	0	1	5
		200-300	0	0	0	0
		300-500	0	0	-	0
		500-900	-	0	0	-
		TOTAL	99	0	1	5
	3	1-100 m	0	-	1	32
		100-200	46314	13317	33546	2923
		200-300	486	449	179	177
		300-500	290	0	0	0
		500-900	0	0	43	
		TOTAL	47090	13766	33726	3132

Table 2.2 (continued).

Area	Subarea	Depth	1980	1983	1986	1991
1	ALL	ALL	77414	135371	543476	412184
2	ALL	ALL	3135	126698	7086	142150
3	ALL	ALL	2033	45213	43012	87666
4	ALL	ALL	47927	36020	40431	46150
ALL	ALL	ALL	130509	343302	634005	688150

Table 2.3 Percent distribution of Atka mackerel biomass in the AI based on bottom trawl surveys conducted in 1980, 1983, 1986 and 1991. Longitudinal zones include areas both north and south of the island chain. 177/8øE refers to the western border of the easternmost survey subareas in areas 1 and 3. In area 1, the western border of subarea 3 is at 177øE, while north of the island chain in area 3, the western border is at 178øE.

Longitudinal Zones	1980	1983	1986	1991
170ø-174øW	37.05	40.67	6.44	10.82
174ø-177øW	1.51	0.19	0.00	0.00
177ø-180øW	0.57	6.54	1.05	16.54
180ø-177/8øE	35.44	8.29	84.95	28.16
177/8ø-170øE	25.43	44.31	7.55	44.48
170ø-177øW	38.56	40.86	6.44	10.82
177øW-177/8øE	36.01	14.82	86.00	44.70
177/8ø-170øE	25.43	44.31	7.55	44.48

Table 2.4 BSAI Target Fishery Definitions Based on Species Composition of Individual Hauls. Definitions are mutually exclusive and hauls are assigned to each fishery in the following hierarchy:

Target Fishery	Definition
1. Pelagic pollock	Pollock ò 95% of total groundfish
2. Greenland turbot	Greenland turbot ò 35% of retained groundfish
3. Pacific cod	Pacific cod ò 40% of retained groundfish
4. Flatfish	Flatfish ò 40% of retained groundfish
5. Bottom pollock	Pollock ò 20% of retained groundfish
6. Rockfish	Rockfish ò 35% of retained groundfish
7. Sablefish	Sablefish ò 20% of retained groundfish
8. Atka mackerel	Atka mackerel ò 20% of retained groundfish
9. Arrowtooth flounder	Arrowtooth fl. ò 20% of retained groundfish
10. Other	All that do not satisfy any of above

Table 2.5 Observed foreign, joint-venture and domestic Atka mackerel catch distribution (percent of annual total) by
subarea in the Aleutian Islands 170øW - 170øE. Observed total (mt) is total observed directed Atka
mackerel catch in AI district, not total landed catch.

	----------------Foreign------------------				-----------------JV--------------------				--------------Domestic-----------------			
				Observed				Observed				Observed
Year	170ø-177øW	177øW-177øE	177ø-170øE	Total	170ø-177øW	177øW-177øE	177ø-170øE	Total	170ø-177øW	177øW-177øE	177ø-170øE	Total
1977	10.3	6.6	83.0	1,241								
1978	6.2	36.7	57.1	1,855								
1979	87.0	0.1	12.9	2,102								
1980	98.1	<0.1	1.9	336								
1981	100.0	<0.1	0	1,082								
1982	99.9	0	0.1	1,307	100.0	0	0	4,862				
1983	100.0	0	0	105	100.0	0	0	4,558				
1984	100.0	0	0	15	80.1	19.9	0	26,618				
1985					52.9	46.9	0.2	19,503				
1986					67.3	32.7	0	13,165				
1987					26.8	73.2	0	13,735				
1988					0.4	99.6	0	11,522				
1989												
1990									55.7	43.9	0.4	11,877
1991									68.5	31.5	0	15,938
1992									66.1	32.8	1.1	27,040

Table 2.6 Estimated catches (mt) and percent of annual catch of Atka mackerel caught within 10 and 20 nm of Steller sea lion rookeries in the BSAI.

	-- 10 nm --		-- 20 nm --		BSAI
Year	Percent	mt	Percent	mt	Annual Catch
1982	69.1	13,733	91.0	18,085	19,874
1983	76.1	8,923	98.1	11,503	11,726
1984	78.6	28,339	88.0	31,728	36,055
1985	76.6	29,001	83.0	31,424	37,860
1986	81.0	25,912	84.8	27,128	31,990
1987	45.2	13,588	49.7	14,940	30,061
1988	45.1	9,960	46.4	10,247	22,084
1990	73.3	16,276	90.0	19,984	22,205
1991	83.3	20,555	92.6	22,850	24,676
1992	0.0	0	16.7	7,720	46,226

Table 2.7 Quarterly distribution of Atka mackerel harvest in the AI by foreign/JVP (1982-88) and domestic (1990-92) fisheries.

	Percent Caught in Quarter:			
Year	1	2	3	4
1982	2.3	51.5	37.2	9.0
1983	0.1	46.9	53.0	0.0
1984	0.1	55.4	44.4	0.1
1985	0.0	81.2	18.7	0.1
1986	0.0	62.4	37.5	0.1
1987	0.0	54.7	33.2	12.1
1988	0.0	54.1	45.8	0.1
1990	2.0	93.8	1.6	2.5
1991	97.4	2.6	0.0	0.0
1992	63.1	36.7	0.2	---

Table 2.8 Bycatch rates of prohibited species, other allocated groundfish species and forage species for marine mammals and seabirds by foreign and JVP (mean rates by subarea from 1977-88) and domestic (annual rates by subarea from 1990-92) Atka mackerel fisheries in the AI (INPFC district 54). King crab and salmon are listed in number per mt of Atka mackerel caught; all others as kg (prohibited and forage) or mt per mt (groundfish).

I. Foreign and Joint Venture Fisheries, 1977-88

	------------------- Subarea	----------------	
Bycatch Species	170ø-177øW	177øW-177øE	177ø-170øE
Prohibited Species			
Halibut	2.751	1.677	0.068
King crab	0.043	0.007	0.017
Salmon (1982-88)	0.009	<0.001	0.001
Allocated Groundfish			
Pollock	0.079	0.014	0.005
Pacific cod	0.138	0.113	0.003
Pacific ocean perch	0.005	0.004	0.022
All rockfish	0.008	0.021	0.042
Forage Species			
Squid	0.104	0.042	0.517
Octopus	0.076	0.005	0.001

II. Domestic Fisheries, 1990-92

	------------------ Subarea	-----------------	
Bycatch Species	170ø-177øW	177øW-177øE	177ø-170øE
Prohibited Species			
Halibut 1990	3.301	2.306	
1991	0.892	3.176	
1992	1.618	0.539	
King Crab 1990	0.004	0.021	
1991	0.004	0.092	
1992	0.472	0.000	
Salmon 1990	0.031	0.005	
1991	0.002	0.010	

1992	0.001	0.000

Table 2.8 (continued).

II. Domestic Fisheries, 1990-92

Bycatch Species	170ø-177øW	177øW-177øE	177ø-170øE
	------------------ Subarea	-----------------	
Allocated Groundfish			
Pollock 1990	0.029	0.032	
1991	0.007	0.033	
1992	<0.001	0.009	
Pacific cod 1990	0.113	0.144	
1991	0.060	0.084	
1992	0.078	0.046	
POP 1990	0.009	0.010	
1991	0.016	0.007	
1992	0.020	0.016	
All Rockfish 1990	0.025	0.038	
1991	0.028	0.011	
1992	0.035	0.088	
Forage Species			
Squid 1990	0.261	0.078	
1991	0.000	0.000	
1992	0.006	0.009	
Octopus 1990	0.050	0.024	
1991	0.101	0.028	
1992	0.006	0.009	

Table 2.9 Halibut bycatch rates (kg halibut/mt of groundfish) by bottom trawl fisheries for Atka mackerel, pollock, rockfish and Pacific cod in the BSAI in 1991. Data collected by fishery observers.

Fishery	Mean	Median
Atka mackerel	4.38	0.87
Pollock	23.23	11.67
Rockfish	19.03	9.90
Pacific cod	20.92	18.02

Table 2.10North Pacific Fisheries Management Council's recommendations for 1993 Vessel Incentive Program Bycatch rate standards for BSAI fisheries. Bycatch rates are listed as kg (halibut) or number (crabs) per mt of groundfish.

Fishery	Halibut	King Crab
Midwater Pollock	1.0	--
Bottom Pollock	7.5 (1st quarter) 5.0 (2nd quarter)	--
Yellowfin sole	5.0	2.5
Other trawl	30.0	2.5

Table 2.11. Counts of adult and juvenile Steller sea lions at trend rookeries haulouts in the Aleutian Islands during June and July aerial surveys from 1975-1991. The eastern Aleutian area is in the BS fisheries management district, while the central and western Aleutian areas are in the Aleutian Island management district. The central area in this table is equivalent to the eastern (170ø-177øW) and central (177øW-177øE) subareas proposed in Alternatives 2 and 3 of this analysis. The western area in this table is equivalent to the western subarea (177ø-170øE) proposed in Alternative 3 of this analysis.

	------------Aleutian Islands ------------		
Year	Eastern	Central	Western
1975	19,769		
1976	19,743		
1977	19,195		
1979		36,632	14,011
1985	7,505	23,042	
1989	3,032	7,572	2,738
1990	3,801	7,988	2,327
1991	4,231	7,499	2,411
1992	4,839	6,396	2,868
Overall Change	- 76%	- 83%	- 80%

List of Rookeries

------------Aleutian Islands -------------		
Eastern	Central	Western
Adugak	Kiska-2	Attu
Ogchul	Ayugadak	Agattu
Bogoslof	Amchitka-2	Buldir
Akutan	Semisopochnoi-2	
Akun	Ulak	
Ugamak	Tag	
Sea Lion Rks	Gramp Rk	
	Adak	
	Kasatochi	
	Agligadak	

Seguam
Yunaska

3.0 REGULATORY IMPACT REVIEW - ECONOMIC ANALYSIS OF THE ALTERNATIVES

Alternative 1 of this proposed amendment would preserve the status quo; i.e., the AI would continue to be undivided, and groundfish TACs would not be apportioned to areas smaller than the entire subarea. Alternatives 2 and 3 would establish 2 and 3 districts within the AI, respectively. This management tool would allow groundfish TACs to be apportioned to areas smaller than the entire AI for those species for which sufficient biological and economic information exists to establish ABCs for the districts. Stock assessments prepared annually for the Council's September-December specification process will provide information on the efficacy of such TAC apportionments for each groundfish species category; at present, the potential for TAC apportionment within the AI is unknown for most species. For 1993, Atka mackerel is the only candidate for TAC apportionment to districts proposed by this rule. Because the candidates for TAC apportionment within the AI, and the amounts of any species that might be specified for each proposed district are unknown, the following economic analysis is concerned only with Atka mackerel.

Statistical information on production and import/export trade for Atka mackerel tends to be fragmentary in some series. Atka mackerel statistics are often combined with those for true mackerels, but not consistently. Some Atka mackerel data may, instead, appear in "other groundfish" reporting categories. Numbers cited below should be interpreted with these caveats in mind.

3.1 World Markets for Atka Mackerel

According to preliminary trade data and information from industry sources, Atka mackerel markets are principally Asian, with Japan being the largest consumer, followed by South Korea. The Food and Agriculture Organization of the United Nations (FAO) reports that, in 1989 (the latest year for which these data are available) Japanese domestic fisheries were the largest single producer of Atka mackerel in the world, accounting for more than 77% of total world landings of this species in that year. Over the period 1986 through 1989, the Japanese harvest share of total world Atka mackerel landings varied between the mid-60% and mid-70% range. In 1989, the United States was a distant second at just over 12%, followed by the former USSR at 7%, and the Republic of Korea at roughly 3%. Over the same period, the U.S. share of total world Atka mackerel landing declined from just under 23% to the 12% cited for 1989 (FAO Fisheries Yearbook, 1989).

Traditionally, Japanese domestic fisheries supply the vast majority of the Atka mackerel consumed in Japan, with smaller quantities being imported from Korea, the former USSR, and the United States. According to industry sources monitoring groundfish production and trade, in 1992 the Japanese domestic Atka mackerel fishery "failed". A review of preliminary landings data from the Japanese ministry of Agriculture, Forestry, and Fisheries suggest that catches through the first 8 months of 1992 were down nearly 18,000 mt from the equivalent period in 1991.

This unanticipated shortfall of domestic supply in the Japanese market was crucial for U.S.

producers, who, in that year, captured 60,060.7 mt of Atka mackerel in the U.S. EEZ (43,857 mt of which came from the AI). This total catch greatly exceeded the 1991 reported landings of approximately 29,000 mt, and resulted in export sales of approximately 10,000 mt (round product) to Korea, and 17,000 mt (dressed weight), and an additional 3,000 mt of Atka mackerel surimi, to Japan.

Atka mackerel is a dark fleshed, oily, and at present, relatively low valued groundfish. In Japan, Atka mackerel is consumed in a variety of forms, including fresh, fresh/frozen, and salted. In addition, Atka mackerel is one of several alternative fish species, used as an input to low grade surimi-based "neriseihin" products, such as "satsumaage" (fried), and fish sausage, and fish ham (per. com., John Sproul, Hokkaido University, Nov. 1992).

Atka mackerel is also harvested by Korean fisheries for domestic consumption. These supplies are supplemented by imports of Atka mackerel from the United States (and perhaps other sources). For the most part, Korea imports Atka mackerel "in the round", where as, Japan tends to import H&G, Atka mackerel surimi, and some fillets.

Reportedly, some Atka mackerel, exported from the United States to Korea, is reprocessed there for subsequent export to Japanese markets. The amount of fish that enters this supply network is not known; it is assumed to be relatively small.

Sources familiar with the Japanese market for Atka mackerel suggest that the market can be "volatile". The same is likely true of the Korean market. While reliable price series for the Japanese Atka mackerel market for imported products are not readily available, data on the "fresh" market seems to confirm the reported price variability for this species. Note, not only the intra-seasonal change, but the apparent inter-seasonal trend.

Monthly Japanese Landings Market Prices for Atka Mackerel
1983 - 1992, in Yen/kilogram (weighted average)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1983	89	97	105	148	126	146	232	238	162	81	102	59
1984	84	79	127	210	170	201	263	175	179	109	82	59
1985	50	89	122	114	144	147	208	182	78	59	64	56
1986	60	93	93	103	149	99	124	73	86	62	49	55
1987	57	44	54	76	67	45	42	41	36	71	42	50
1988	40	41	80	59	86	63	87	90	44	48	37	33
1989	41	37	42	40	47	36	31	55	46	106	53	44
1990	42	54	45	50	42	48	59	61	57	64	79	85
1991	65	93	111	90	101	120	168	143	93	79	80	57
1992	47	36	65	85	88	91	136	95	na	na	na	na

Source: Monthly Stat. of Agriculture, Forestry, and Fisheries, Stat. and Info. Dept., Ministry of Agriculture, Forestry, and Fisheries, Government of Japan.

October, 1992.

Atka mackerel has several close substitutes, including among others, jack mackerels, horse mackerels, and boarfish. While detailed data on Japanese markets and prices are scarce, information that is available suggests that prices can take wide swings over the course of the year in response to changes in supply and, perhaps, seasonality in demand. For example, the Bill Atkinson News Report (Issue 389, March 1991) indicates that in that year, "(U.S.) DAP landings of atka mackerel... have been earlier than usual. In Japan, the market has gone from a high of 500 yen/kilo ($1.68/lb) last year, to a low of 245 yen/kilo ($0.82/lb) early this year. Prices have improved slightly - to 270 yen/kilo ($0.91/lb)." By July of 1992, Atkinson was reporting that in response to the jump in supply of Atka mackerel to the Japanese market, "Sales are nil, as most of the processors are holding stocks of higher-priced product purchased earlier in the year. Some processors are even selling off inventories at 200 yen/kilo ($0.72/lb) or less."

Atkinson goes on to report that the Atka market is being further impacted by unexpectedly large supplies of competing species. Because of excessive supplies of these substitutes for Atka mackerel, product prices were driven to very low levels. In one specific example, reported in 1992 by Atkinson, "...boarfish fillets (were) competing with Atka mackerel for space on the supermarket counter." Because the market price of these competing species was (relatively) so low, Atka mackerel sales effectively declined to zero.

As noted above, while some U.S. caught Atka mackerel are marketed in Korea, it is the Japanese market into which most of the U.S. catch is, at present, sold. These reports all strongly suggest that the Japanese market for Atka mackerel is relatively price sensitive. Being, far and away, the largest Atka mackerel market, and traditionally the major fishery producer for this species, the Japanese market effectively sets prices for the rest of the world for Atka mackerel. This, and other evidence pertaining to the Japanese market, suggests that significant supply "shocks" in this lower-end seafood commodity group can be expected to seriously impact retail price. In turn, this would be expected to translate into equivalent price responses in the Japanese wholesale and exvessel markets, ultimately affecting prices in the U.S. Atka mackerel fisheries.

3.2 The Economic History of the Proposed Action

As proposed, Amendment 28 to the BSAI Groundfish FMP subdivides the Aleutian groundfish fisheries management subarea into either two or three districts. The practical effect of the amendment will be to provide the Council with a "mechanism" by which it may, in the future, recommend to the Secretary the spatial apportionment of TACs for groundfish (during 1993, a potential increase in Atka mackerel TAC). In order to facilitate an increased 1993 TAC for Atka mackerel, an apportionment from the non-specific operational reserve action that will be considered by the Council at its June 1993 meeting, the proposed amendment includes a revision of the 1993 specifications of ABC and TAC for that species.

Under the status quo, the AI constitutes a single management unit, as part of the BSAI Groundfish FMP. The subarea stretches from 170þW longitude on the east to 170þE longitude on the west, and extends above and below the Aleutian chain.

Atka mackerel are distributed from the Kamchatka Peninsula, throughout the AI, north to the Pribilof Islands in the eastern Bering Sea, and eastward across the GOA to southeast Alaska. They are most abundant in the AI, according to the best available survey data. Once they assume the demersal phase of their life history, Atka mackerel populations appear to be localized (Lowe 1992).

While Atka mackerel are harvested in the U.S. EEZ off Alaska, either as target catch or bycatch, the vast majority of landings are taken from the AI. Historically, the Atka mackerel fishery in the AI was dominated by foreign, and then joint-venture, operations. Throughout the decade of the 1970s and into the early 1980s, the Atka mackerel resource was utilized almost exclusively by the distant-water operations of the U.S.S.R., Japan, and Korea. Beginning in 1980, U.S. joint-venture operations entered the fishery, and over the period 1982 through 1988 came to dominate the harvest. Only since 1989, with the final elimination of direct foreign participation through either TALFF or JVP allocations, has the fishery been exclusively prosecuted by wholly domestic operations.

In the early 1970s, most of the Atka mackerel harvest was reported to have come from the western AI, west of 180þW. By the end of the decade, fishing effort had moved eastward. From 1980 through 1992, as much as 99% of Atka mackerel landings came from east of 180þW, and most of that from the area bounded by 171 degrees W and 174þW. Over each of the last three seasons (i.e., 1990, 1991, 1992), under a wholly domestic fishery, the distribution of landings, 170þW - 177þW and 177þW - 177þE, has been approximately 56%-44%; 69%-31%; and 67%-33%, respectively.

The U.S. domestic Atka mackerel fishery is primarily a trawl fishery, although small amounts of Atka mackerel are also taken by other gear types, including longline, pots, and nets (other than trawl). In 1992, for example, trawlers accounted for 99.88% of the total reported catch of this species in the BSAI fisheries. These trawl fisheries are prosecuted, primarily, by large catcher/processors, although mothership operations have also participated. In 1992, for example, NMFS "Blend" data identified 25 catcher/processors and two motherships recording directed landings of Atka mackerel in the AI fishery. Observer data reported 24 vessels participating that year. [The difference may be in the way a vessel was classified based upon its "target" catch.]

Since 1989, when the fishery became solely domestic, the timing and duration of the fishery has changed. PacFIN landings data for the period 1989 through 1992 demonstrate that in the beginning of this period, the Atka mackerel fishery was characterized by peak landings in July, August, and September. This pattern evolved, with each successive year seeing an earlier peak season of catch. In 1990, for example, the peak months were April, May, and June. In subsequent seasons the domestic fishery has taken place in the winter and early spring, with peak reported landings in January, February, March, and (in 1992) April. Indeed, in 1992, the Atka mackerel TAC of 43,000 mt was obtained early in the year, resulting in the closure of the directed fishery on 16 April. In reality, the TAC was exceeded in that year, with reported catches for the AI reaching 43,857 mt (PacFIN).

In connection with this fishing pattern, as noted above, virtually all of the effort is concentrated in the more easterly segments of the management subarea.

Atka Mackerel Landed Catch (mt) for the Aleutian Area

	Jan.	Feb.	Mar.	Apr.	May	June
1992	2524	4584	19894	15931	479	83
1991	5256	2941	12765	22	20	--
1990	1	--	253	2739	6841	11666
1989	--	--	--	130	655	794
	July	Aug.	Sept	Oct.	Nov.	Dec.
1992	349	14	TR	--	--	--
1991	TR	--	--	--	--	--
1990	224	--	--	1	--	--
1989	2295	7645	3138	83	6	436

Source: PacFIN Report #220, 29 October, 1992

This prevailing fishing pattern, and the nature of Atka mackerel population concentrations, has resulted in concern about the potential for overfishing localized stocks. In response, the Council set the Atka mackerel TAC for the Aleutian subarea at a level which will protect localized stocks from over-exploitation.

In 1992, the potential harvest of Atka mackerel, based upon the size of the available biomass for the Aleutian subarea, was estimated to be 351,300 mt. For a number of reasons, both biological and economic, the Council determined that this entire amount should not be released to the fishery in the first year. Instead, the Council proposed that the TAC increase should be phased in, incrementally, over a 6-year period. This formula, when applied to the 1992 fishing year, produced a TAC of approximately 43,000 mt.

In 1993, the TAC could have risen to 117,100 mt, under the approach proposed by the SSC. But, principally because of concern about overfishing of localized stocks, and the inability of the Council to distribute the TAC (and thus the fishing effort) more broadly across the Aleutian management subarea under the status quo, the proposed TAC was limited to 32,000 mt. This is a harvest level which, according to stock assessment data, can be safely supported by the stocks in the eastern segment of the subarea. This represents only approximately 27% of the potentially available 117,100 mt TAC. Expressed another way, in large part because of conservation considerations, the status quo effectively precludes the release of 85,100 mt of Atka mackerel to domestic fisheries in the AI (i.e., 117,100 - 32,000 = 85,100).

3.2.1 Revenue Implications

At prevailing 1992 average exvessel prices (as reported by PacFIN), this difference in Atka mackerel TAC for the Aleutian management subarea could generate gross exvessel revenues of $23.62 million. This may not be a very useful estimate of the actual economic implications of retention of the status quo because the current Atka mackerel fishery in the Aleutian subarea is almost exclusively prosecuted by catcher/processor vessels. Therefore, the PacFIN exvessel price may not be very indicative.

Sources familiar with the catcher/processors sector suggest that, in 1992, the average processed product price, FOB Alaska, for Atka mackerel produced by U.S. catcher/processors was between $.50/lb and $.80/lb. (This was primarily H&G, round, and surimi. Fillets represented a sufficiently small part of the total output that the numerical example presented below is not seriously harmed by the simplifying assumption that this price range is comprehensive.) Based upon processor product reports for 1992, the weighted average product recovery rate for Atka mackerel, for all products, was just under 63%. Assuming approximately this same product mix in 1993 and beyond, the gross wholesale processed product value, FOB Alaska, of the 85,100 mt TAC difference could be between $59 million and $94 million.

This estimate represents the upper-bound gross economic value of the potential 85,100 mt differential in Atka mackerel TAC, as measured as a first wholesale processed product, FOB Alaska, although for a number of reasons, one would not expect the actual impact to be this large. For one thing, these gross estimates would have to be reduced by the incremental cost incurred to capture and process this additional TAC.

In 1992, for example, NMFS observer data report 24 vessels participated in this fishery. Assuming a catching capacity of 1,000 mt/day for this fleet (based on the approximate daily catch rate recorded in this fishery in 1992), and an average cost of operation per vessel per day of $22,500 (an estimate obtained from several industry sources, as well as, the "Inshore/Offshore" analysis) the estimated cost of harvesting and processing the additional 85,100 mt TAC would be $45.9 million.

This suggest that the net revenues to U.S. operators, as measured at first wholesale FOB Alaska, could be between $13 million and $49 million. It is probable that this still overstates the actual value of this 85,100 mt increment.

3.2.2 Price Effects

Among the most significant reasons for discounting the size of this estimate is the probable price effect that would accompany an increase in supply of Atka mackerel of this magnitude. Very little empirical analysis of the Atka mackerel market is available. However, all indications are that a significant increase in the supply of Atka mackerel from the U.S. fishery would, almost certainly, have a severe negative effect on prices at every level of the market. Some industry sources speculate that, if the quantity of Atka mackerel harvested and marketed by U.S. fisheries increased from the 1992 levels to the potential 1993 TAC of 117,100 mt in a single year, the price of Atka mackerel could be expected to decline sharply. They conclude that the sharpest price declines would likely be in the H&G and "round" product forms, with perhaps less immediate impact on Atka mackerel surimi and fillets.

While no empirical analysis has as yet been undertaken, there is a growing sense that, in the latter half of 1992, the world groundfish market was generally in a depressed state. Under these conditions, it is even more probable that a large and sudden increase in supply of Atka mackerel would have a large adverse effect on price. In this case, it is probable that all producers, no matter what the product form, would experience difficult times, until the market reached a new equilibrium level, and/or alternative markets were developed.

Anecdotal information suggests that prices could decline by perhaps as much as 30% to 40%, in response to sharply increased U.S. catches of Atka mackerel. While no quantitative measure of what constitutes "sharply increased" U.S. catches can be given, it is probable that this threshold exists at levels below the 85,100 mt TAC differential.

Reportedly, intra-seasonal U.S. exvessel and export wholesale prices in 1992 were very sensitive to the volume and timing of landings. One source reported that, while prices were relatively firm at the opening, as supplies began to hit the market, prices softened significantly. In response, catches declined somewhat, and this caused prices to firm. When sizable landings resumed, prices once again declined sharply. If these reports are correct, they suggest that price is highly sensitive in the exvessel market for U.S. Atka mackerel, a finding consistent with earlier reported Japanese and Korean market information.

Presumably, fishing operations would respond to a sharp decline in price by reducing their fishing effort. If price fell sufficiently, the Atka mackerel fishery would cease until prices once again supported profitable operation. One may conclude that the setting of the TAC need not explicitly concern itself with this issue, since the market will, in large part, determine the appropriate catch.

Unfortunately, in an open access management environment, characterized by significant excess capacity and few viable alternatives, short run considerations may induce operators to fish at an economic loss, so long as they believe they will be able to cover variable operating expenses. This behavior could, under one set of assumptions, result in excess capacity remaining in the fishery when, from an economic efficiency perspective, it should be removed. Council consideration of economic market failure in the setting of TAC may be a logical outcome.

3.2.3 Opportunity Costs

In addition, should the Council choose to increase the Atka mackerel TAC to the full extent available under the formula, there would be an implicit "opportunity cost", in the form of foregone catch of some other species, to account for. That is, because the 2 million mt cap in the BS is virtually fully subscribed, a significant increase in the TAC for Atka mackerel could only be achieved by, (1) raising the BS groundfish cap, or (2) reducing the TAC for some other species by an equivalent amount.

It is unlikely the Council would undertake the former, for any number of reasons. This leaves a redistribution of the BS cap among fish species and fisheries. Until the Council makes the explicit decision as to which species TAC, or group of species TACs, it intended to reduce to accommodate the Atka mackerel increase, a quantitative estimate of this opportunity cost cannot be made. It, nonetheless, must be anticipated as a cost of a proposed action which increased the Atka mackerel TAC.

3.3 Economic Assessment of the Alternatives

3.3.1 Alternative 1: The Status Quo

Under this alternative, the AI would remain a single management unit, with one TAC for the entire subarea. The Council has indicated that, in this circumstance, it would maintain the Atka mackerel TAC for the AI at a level that was proportional to the size of the survey biomass found in the eastern half of the subarea (approximately 27%). A fisheries removal of this size, recognizing that the fishery takes place primarily in the eastern segment of the subarea, is assumed to be biologically acceptable and would minimize the risk of localized depletion.

The effect of this decision, in 1993 and beyond, is to remove the vast majority of the potentially available Atka mackerel TAC in the AI from exploitation. In 1993, as noted previously, this potential TAC could reach 117,100 mt. While it is unlikely that the entire TAC would have been taken, even without concerns about localized depletion, it is clear that under the status quo, the opportunity to harvest a larger share of that total could not be afforded the industry.

At the prevailing average exvessel price for Atka mackerel in the U.S. fishery, the total gross value of the 1992 catch was reported to be approximately $12.8 million (PacFIN, 1992). The AI accounted for approximately $12.18 million of this total.

The Council determined that, under the status quo management alternative, the 1993 Atka mackerel TAC for the AI will be limited to 32,000 mt, out of the potential 117,100 mt (a difference of 85,100 mt). In light of the preceding discussion, the cost of retaining the status quo, as measured by the foregone gross revenue to the U.S. groundfish fishing industry could be on the order of $13 to $49 million.

If, however, the price response (discussed above) was on the order of 30% to 40%, the resulting impact estimates would change significantly. At the $.80/lb assumed average weighted price, the cost to U.S. operations of retaining the status quo, with a 30% price decline, would be $20 million. At $.50/lb, average weighted product price, a price decline to $.389/lb would drive net revenues to zero. That is, if price declined by more than 22% from an average $.50/lb base, the additional revenue from harvesting and processing the 85,100 mt TAC differential would not cover the increased cost of doing so.

As noted above, this does not automatically imply that the fishery will cease. Some boats will choose to operate so long as they are able to cover variable costs. But the fishery would produce no net benefit, under this circumstance.

To arrive at an estimate of the aggregate net cost of foregoing the potential increase in Atka mackerel TAC, across all BS groundfish fisheries, it would be necessary to deduct the "opportunity cost", or foregone revenues from fisheries for other species whose TACs were reduced to accommodate the Atka mackerel TAC increase. This is impractical, at this time, because the Council has not determined which other fisheries (nor the amounts of each) it will reduce to accommodate the Atka mackerel increase. One may infer that the Council would be unlikely to "give up" TAC in one or more fisheries to provide TAC to Atka mackerel unless the latter was at least as valuable as the former. In this case, while there would be potential economic distributional implications, the net economic result of transferring TAC from one or more other groundfish species to Atka mackerel would, at worst, be zero.

Therefore, given the earlier cited assumptions, the net cost of retaining the status quo alternative could be as high as $20.22 million in 1993. Assuming the SSC procedure and status quo conditions of the stocks, successive seasons would see this amount rise in direct proportion to the potential increase in Atka mackerel TAC, through 1997. The increase would not be expected to be linear and the price effect could be more or less significant. That is, because of the uncertainty of the size and timing of price effects at various market levels, it would not be correct to extrapolate the 1993 result in a simple linear progression through the 1997 season, when the incremental phase-in of the higher Atka mackerel ABC is completed.

3.3.2 Alternative 2

Under this alternative, the AI would be separated into two districts by dividing the region at 177þE longitude for the purpose of providing a mechanism to spatially allocate TACs.

Adoption of this proposed alternative amendment would have no directly attributable economic or socioeconomic costs. That is, because the proposed action has no management or regulatory effect beyond creating a "districting" line at 177þE longitude, its adoption by the Council carries with it no regulatory costs, other than minor changes in reporting and recordkeeping for operators of those vessels electing to operate in the new districts. Presumably, the difference in reporting costs between having two or three districts will be trivial. Because the Atka mackerel fishery and other fisheries that might be conducted in the western AI are conducted with virtually 100% observer coverage, and because observer costs are included in the estimated average daily operating costs, cited above, there are no significant cost increases anticipated in these categories. Approval of the amendment would enable future apportionments of groundfish to the western AI, given sufficient biological information for a species or species group, and might result in a greatly increased availability of some groups, as is the case for Atka mackerel. Since the total groundfish harvest is limited by the OY cap (2 million mt), allocations to the proposed new Aleutian District could either: (1) replace allocations of that species group in other areas, or (2) replace allocations to other species groups, as would be the case if the Atka mackerel TAC is increased from the non-specific operational reserve in 1993. Whether TACs for any groundfish would be apportioned within the AI in 1994 and later years depends first on the availability of stock information and other biological and ecosystem concerns, and also on market demand for various groundfishes. Although creation of additional management areas, could, in concert with future allocations to those areas, ultimately affect fishing patterns, the number and nature of participants, and the overall value realized from the total groundfish fishery, these apportionments and subsequent effects are not currently known or predictable.

The benefits attributable to adoption of this alternative include providing a mechanism by which the Council may more effectively manage the marine resources of the AI and adjacent areas.

3.3.3 Alternative 3

Under this alternative, the AI would be separated into three districts by dividing the region at 177þE and 177þW longitude for the purpose of providing a mechanism to spatially allocate TACs.

Adoption of this proposed alternative amendment would have similar affects as for adoption of Alternative 2 (i.e., no directly attributable economic or socioeconomic costs, except for slight increases in reporting costs for participants in the new districts). Because the proposed action has no management or regulatory effect beyond creating two "districting" lines at 177þE and 177þW longitude, respectively, its adoption by the Council carries with it no regulatory costs, other than minor changes in reporting and recordkeeping for operators of those vessels electing to operate in the new districts. As discussed under section 3.3.2, creation of additional management areas, could, in concert with future allocations of TAC to those areas, ultimately affect fishing patterns, the number and nature of participants, and the overall value realized from the total groundfish fishery, but such effects are not currently predictable.

The benefits attributable to adoption of this alternative include providing a mechanism by which the Council may more effectively manage the marine resources of the Aleutian Islands and adjacent areas.

4.0 CONCLUSIONS

4.1 Biological Conclusions

If the current low exploitation rate for Atka mackerel is continued, then Alternative 1 (status quo) would not be expected to have any detrimental effects on stocks of the species, on marine mammals, or bycatch of prohibited species, other allocated groundfish, or forage species of marine mammals and seabirds. However, if exploitation rates for Atka mackerel are increased, then Alternative 1 is not acceptable because of the great disparity between the distributions of the species' biomass and trawl fishing effort for it. This could not only create localized depletions of Atka mackerel stocks in the eastern portions of the Aleutian subarea, but also decrease the availability of a valuable forage species, particularly for the threatened Steller sea lion, the depleted northern fur seal, and listed, proposed, and candidate species of seabirds.

If higher exploitation rates for Atka mackerel are implemented, Alternative 3 is preferable to Alternative 2 because of the decreased likelihood of localized depletions of groundfish resources in the area east of 177øE, where the Steller sea lion population has continued to decline since 1975. Alternative 2 may not adequately disperse effort in this eastern district, where most of the fishing would occur between 170ø-174øW (Seguam area), while most of the biomass is located between 180ø-177øE (south of Amchitka Island). Alternative 3, by dividing the Aleutian subarea into three districts for the purposes of spatially allocating groundfish TACs (particularly for Atka mackerel), will provide a mechanism for the Council to distribute (trawl) fishing effort within the subarea. One method to distribute effort within the subarea would be based on distribution of target species biomass in recent surveys. Of all three Alternatives, Alternative 3 provides the best mechanism for decreasing the likelihood of localized depletions of Atka mackerel, both for protection of localized stocks and availability of a valuable forage species for marine mammals and seabirds.

Bycatch rates of prohibited species, and other allocated groundfish, including species of Pacific salmon listed under the ESA, Pacific cod and pollock by the Atka mackerel fishery may be lower under either Alternatives 2 or 3 than Alternative 1, given that their bycatch rates tended to be higher in the eastern portions of the subarea. Bycatch rates of rockfish and squid may be higher under Alternative 3 than either Alternatives 1 or 2 since their bycatch rates tended to be higher in the western portions of the subarea. Total bycatch of the Atka mackerel fishery in the AI will increase directly with the exploitation rate regardless of the Alternatives chosen. However, bycatch rates as a whole tend to be lower under Alternatives 2 or 3, except for rockfish and squid. Furthermore, bycatch rates by the Atka mackerel fishery for most species are low compared to other trawl fisheries.

4.2 Economic Conclusions

Although Amendment 28 contains no formal proposal to redistribute TACs, the SSC did conclude, at the September 1992 Council meeting, that the Atka mackerel fishery in the Aleutian subarea was a prime candidate for such treatment. Specifically, the SSC observed that it was, "... particularly concerned about the need to distribute a greatly increased harvest over the range of the stock in proportion to the distribution of biomass..." (SSC minutes, December 2-5, 1991).

Effectively, if the SSC procedure for allocating TAC is adopted, the selection of either of the two alternatives to the status quo under consideration will result in the same outcome. That is, in the case of Atka mackerel, the ABC will likely be increased in 1993, potentially, although not likely, as high as the ABC (117,100 mt). In subsequent years the TAC may increase further. Increases will be divided between the two or three newly created management districts, likely in proportion to the stock distribution within each.

Under the assumption that, once made available, the TAC would be harvested, the principal difference between the two alternatives to the status quo would be the additional operating costs that might accrue to the fleet, depending upon the specific placement of the district's demarkation line and the district allocation size. For example, if the districting boundary were placed at 177þE longitude (alternative 2), and the TAC was divided 55.5% east of the boundary, 44.5% west, the operating costs imposed on the fleet to harvest the total TAC would be expected to be lower than if the same TAC allocation were divided between three districts bounded at 177þE and 177þW. In the latter case, presumably, the fleet would be required to fish in waters more distant from its normal operating areas and more remote from support facilities and ports. In neither case are the costs expected to be significant.

Adoption of either alternative to the status quo will not have significant impacts on a substantial number of small entities as defined by the RFA. Alternatives 2 and 3 create management districts with the legal status of additional reporting areas and will cause those operators utilizing the new areas to report their catches for the appropriate area. This proposed rule does not apportion groundfish, and is not expected to change participation in groundfish fisheries in the forseeable future. Therefore, there is no disproportionate burden on small entities, as compared to large entities. All reporting burdens attributable to adoption of either of these alternative actions to the status quo are equivalent for all participants, and insignificant.

Enforcement costs should not change perceptively, as current routine procedures should be fully adequate to monitor and enforce fishing regulations in the new districts.

Retention of the status quo (alternative 1), can be expected to impose, potentially, substantial economic costs on the fishery and the nation by reducing management flexibility and by precluding access to a substantial portion of the potential Atka mackerel TAC, and perhaps to other TACs that might be increased if the fishery were spatially disbursed.

5.0 STATEMENT OF FINDINGS

5.1 Effects On Endangered and Threatened Species and on the Alaska Costal Zone

Consultations pursuant to Section 7 of the ESA on the impacts of Amendment 28 concluded that neither alternative to the status quo is expected to adversely affect endangered or threatened species, or their habitat, under the jurisdiction of NMFS or the USFWS, in a manner, or to an extent, not already considered in prior consultations.

Each of the alternatives discussed above would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Zone Management Program within the meaning of section 307(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

5.2 Executive Order 12291 Requirements

Executive Order 12291 requires that the following three issues be considered.

1. Will the amendment have an annual effect on the economy of $100 million or more?

2. Will the amendment lead to an increase in the costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions?

3. Will the amendment have significant adverse effects on competition, employment, investment, productivity, or on the ability of U.S. based enterprises to compete with foreign enterprises in domestic or export markets?

Neither of the proposed alternatives to the status quo impose significant economic costs, nor cause redistribution of costs and benefits.

The amendment would not have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S.-based enterprises to compete with foreign enterprises in domestic or export markets.

The amendment should not lead to a substantial increase in the price paid by consumers, local governments, or geographic regions because the amendment simply provides a management mechanism by which the Council may more effectively manage the marine resources of the AI. It establishes management district boundaries, but contains no other regulatory change.

This amendment will not have an annual effect of $100 million on the U.S. economy.

5.3 Impact of the Amendment Relative to the Regulatory Flexibility Act

The RFA requires that impacts of regulatory measures imposed on small entities (i.e., small businesses, small organizations, and small governmental jurisdictions with limited resources) be examined to determine whether a substantial number of such small entities will be significantly impacted by the measures. Harvesting fishing vessels are considered to be small businesses.

The proposed amendment will establish a management mechanism by which the Council may subsequently choose to geographically apportion TAC. Adoption of this proposal, in and of itself, will have no regulatory effect, and therefore no significant impacts on small entities. The potential increase in the 1993 Atka mackerel TAC made possible by this rule is not anticipated to have a significant economic on a substantial number of small entities because that fishery has been prosecuted almost exclusively by a small number of large catcher/processors and mothership processors, with few small harvesting vessels. While creation of additional management districts, together with future allocations of groundfish TAC to those new districts, could eventually alter fishing patterns, the number and nature of participants, and the overall value realized from the total groundfish fishery, those effects are not currently predictable or quantifiable.

5.4 Finding of No Significant Impact

For the reasons discussed above, implementation of either of the alternatives to the status quo would not significantly affect the quality of the human environment, and the preparation of an environmental impact statement on the final action is not required under Section 102(2)(c) of the National Environmental Policy Act or its implementing regulations.

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Date

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