DRAFT

Area-specific Management for the Aleutian Islands Discussion Paper

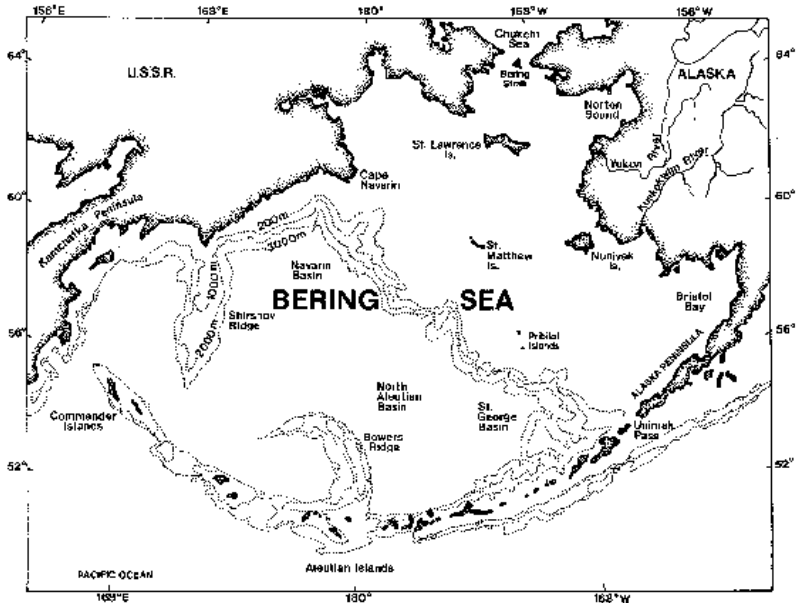
This paper is organized as follows:

1 Introduction

The Aleutian Islands represent the central and eastern portion of the Aleutian-Komandorski (Commander) archipelago that extends from the Alaska Peninsula across the U.S.-Russian boundary to the Kamchatka Peninsula (see Figure 1). Numerous straits and passes through the Aleutian Islands connect the Bering Sea to the North Pacific Ocean. The islands are volcanic, with a narrow shelf descending to a steep dropoff. Rich in marine life, the Aleutian Islands are home to seabirds, marine mammals, sessile invertebrates, and fish stocks. The Aleut peoples have inhabited the islands for over 10,000 years and subsisted on the marine bounty.

In recent years, the Aleutian Islands have been at the forefront of many issues before the North Pacific Fishery Management Council (Council). The Aleutian Islands area has figured in focused measures to protect Steller sea lions and seabirds, conservation of benthic habitats that support coral and other special resources of public interest, and allocation issues related to the Aleutian Islands pollock and Pacific cod fisheries. With national interest on ecosystem-based management of fisheries heightened through recent Ocean Commission reports and other national-level panels, the Aleutian Islands area has been recognized by the Council as meriting consideration as a candidate for special management focus, perhaps as a special management unit, or an ecosystem-based fishery plan.

Figure 1 Bathymetric map of the Bering Sea, showing the Aleutian-Commander archipelago (Sayles 1979).



In June 2004, the Council tasked staff to prepare a discussion paper that evaluates the Aleutian Islands for designation as a special management area, or separation from the Bering Sea area, as a separate FMP. The paper was to include a discussion of the current biological, social, economic, and management issues specific to the Aleutian Islands area, as well as an overview of ongoing research in the Aleutian Islands, and provide recommendations for potentially developing an ecosystem-based fishery plan for this region. In addition, the paper was to examine the need to alter FMP provisions and regulations which apply in both areas.

This draft discussion paper addresses the Council's request in several parts. The first part (Section 2) describes an ecosystem approach to fisheries, and explains the components of an ecosystem-based fishery management. Section 3 looks specifically at the Aleutian Islands, and discusses whether its unique characteristics might lead fishery managers to consider the area as a discrete ecosystem. Section 4 proposes two purpose and need statements for an Aleutian Islands area-specific management action. Section 5 addresses boundary issues related to the Aleutian Islands, and Section 6 examines the types of area-specific management that could be applied to the Aleutian Islands, and considers benefits and disadvantages of each. Section 7 considers next steps the Council might take to address this issue. While the Council's request was made under a groundfish agenda item, and this paper largely focuses the discussion on management options for the Aleutian Islands groundfish fisheries, the principles contained herein could apply to other fisheries.

2 What is an Ecosystem Approach to Fisheries?

An ecosystem approach to fisheries (EAF) considers interactions among physical, biological, and human components of the ecosystem, while ensuring the overall health of each component, including the sustainability of managed species. EAF recognizes the interconnectedness among ecological, institutional, economic, and social systems. The concept has gradually evolved from an understanding that single-species management, that is, managing individually for the sustainability of target species without explicit consideration of the interactions of predators and prey or the interactions of fisheries with other species, is not holistic. Research has shown that fishing can have considerable impacts on the marine environment

by altering benthic habitat, food webs, and the diversity of living organisms. Table 1 is a schematic comparison of traditional fishery management and an ecosystem approach to fisheries.

Table 1 Schematic comparison of fisheries and ecosystem management[1].

Criteria		Fisheries management	Ecosystem management
Paradigm		Sector-based. Vertically integrated. Focusing on target resource and people.	Area-based. Holistic. Loosely cross-sectoral. Focusing on habitats and ecosystem integrity.
Governance	**Objectives**	Not always coherent or transparent. "Optimal" system output. Social peace.	A desired state of the ecosystem (health, integrity).
	Scientific input	Formalized (particularly in regional commissions). Variable impact.	Less formalized. Less operational. Often insufficient. Stronger role of advocacy science.
	Decision-making	Most often top-down. Strongly influenced by industry lobbying. Growing role of environmental NGOs.	Highly variable. Often more participative. Strongly influenced by environmental lobbies. Stronger use of tribunals.
	Role of the media	Historically limited. Growing as fisheries crisis spreads.	Stronger use of the media.
	Regional and global institutions	Central role of the Food and Agriculture Organization of the UN and regional fishery bodies.	Central role of United Nations Environment Programme (UNEP) and the Regional Seas Conventions.
Geographical basis		A process of overlapping and cascading subdivision of the oceans for allocation of resources and responsibilities.	A progressive consideration of larger-scale ecosystems for more comprehensive management, e.g. from specific areas to entire coastal zones and Large Marine Ecosystems (LME).
Stakeholder and political base		Narrow. Essentially fishery stakeholders. Progressively opening to other interests.	Much broader. Society-wide. Often with support from recreational and small-scale fisheries.
Global instruments		1982 Law of the Sea Convention, UN Fish Stock Agreement and FAO Code of Conduct.	Ramsar Convention, UN Conference on Environment and Development and 1992 Agenda 21, Convention on Biological Diversity and Jakarta Mandate.
Measures		Regulation of human activity inputs (gear, effort, capacity) or output (removals, quotas) and trade.	Protection of specified areas and habitats, including limitation or exclusion of extractive human activities. Total or partial ban of some human activities.

Specifically, an ecosystem approach to fishery management would take into account such factors as[2]:

- environment and climate regimes,
- habitat that may be affected by fishing,
- non-fishing impacts on living marine resources, particularly fishery target species,
- bycatch management,
- endangered or threatened species or depleted marine mammal stocks,
- uncertainty and risk in fishery management decisions, and
- scientific needs.

The above are recommended elements of an ecosystem approach to fisheries. These elements are already acknowledged and considered as part of the Council's approach to management of the fishery resources under its authority. Given that, why should the Council want to move any further along the path to incorporating an ecosystem approach? One answer might be that the process will allow the Council to

[1] From Garcia, S.M, Zerbi, A., Aliaume, C., Do Chi, T., Lasserre, G. 2003. The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. No. 443. Rome, FAO. 2003. p.4.

[2] Adapted from a presentation by Dr. Michael Sissenwine at the January 2005 Conference on Marine Science in the North Pacific, Anchorage.

better integrate environmental variables in fishery management decisions to improve fishery yield and sustainability. Another answer might be that the Council wishes to put greater emphasis on its marine resource stewardship responsibility, and as such, the Council will be able to more deliberately consider ecosystem processes and the effects of fishery removals on ecosystem productivity and sustainability. Or there may be other answers or variations on these concepts. Moving further down the path, then, the Council could implement an EAF using the Aleutian Islands area as a means to test an approach that eventually could be applied more broadly to the Bering Sea and Gulf of Alaska.

What will an EAF in the Aleutian Islands have to consider?

NOAA Fisheries' recommendations are to include in an EAF such parameters as habitat, climate and regime shifts, bycatch, endangered or threatened species, uncertainty and risk, scientific issues, and non-fishing impacts on target resources.

When applying some of NOAA's recommendations in light of some of the unique characteristics of the Aleutian Islands, the Council will likely have to consider some of the following elements as it makes decisions on fishery management issues:

- trophic interactions – this may include plankton production, forage fish, managed species, competitors, predators including marine mammals and seabirds
- energy flow in the marine food web – this may include potential effects of energy removal (from fish harvest) or energy additional (offal and discards) in time and space, and energy redistribution (harvest offshore with onshore processing and coastal waste discharges
- trophic dynamics in a fished ecosystem – understanding of how energy flows in a system set to a new steady state under annual fishery removals (and discards) and effects of changes in fishery removals (and discards) on the food web in a fished ecosystem
- environment and climate regimes – this may include seasonal shifts in precipitation and wind patterns, oceanographic factors (salinity and temperature regimes, current patterns, fronts, jets)
- anthropogenic influences – this may include community waste and discharges, fishing and fish processing wastes, transshipment of potentially hazardous materials, military pollutants
- other habitat alterations – this may include volcanism and other tectonic activity, vessel accidents
- target species management – this may include future examination of Steller sea lion protection measures and a new Biological Opinion, Aleut Corporation pollock fishery, possible new State of Alaska fishery development, adaptive management principles
- bycatch management – this may include incidental seabird take avoidance, marine mammal entanglement research, issues with rockfish bycatch in trawl fisheries, coral protection, fishing gear research and modification
- endangered species – this may include monitoring population trends for some species of seabirds (short-tailed albatross, Steller's eiders) and marine mammals (Endangered Species Act-listed whales, possibly sea otters)
- scientific needs – this may include placement of ocean monitoring buoy systems, expanded target species stock assessments, academic research activities for education, acoustic detection of marine mammals, movement patterns of fur seals and northern right whales, coral and other essential fish habitat exploration and protection
- stakeholder goals – this may include Adak development, military presence and expansion, other offshore and nearshore national security activities, scientific research, seabird management, marine mammal management, tourism and recreational development, avoidance of rat infestation, marine debris reduction and removal

- future considerations – this may include ecotourism opportunities, national conservation interests
- monitoring and performance evaluation – how to monitor the process of ecosystem management, what indicators of success might be developed, etc.

3 Does the Aleutian Islands area merit area-specific management?

The Aleutian Islands region is a unique and, to many, a mystifying place. The Aleutian Islands form an archipelago that extends 1000 miles across the North Pacific and lies along the great circle routes used by vessels and aircraft transiting from the U.S. west coast to eastern Russia, Korea, and Japan. This island chain possesses special characteristics that set it apart from other areas in the North Pacific. It experiences some of the worst weather on the planet, it harbors abundant and diverse bird and mammal populations, and has an historic and cultural heritage that dates back to the last ice age when the region was likely colonized by peoples that crossed the Bering Land Bridge.

The Aleutian Islands themselves provide habitat for many species of nesting seabirds, rookery and haulout habitat for several species of marine mammals, and a migratory path for great whales, other marine mammals, and seabirds that occupy this region seasonally for feeding, nesting and fledging chicks. The region has a rich cultural heritage, and is poised to change as military, shipping, fishery, and community development proceeds in the coming decade.

The Aleutian Islands area possesses some unique environmental attributes that may reinforce other reasons for considering area-specific management. These attributes are discussed in more detail below.

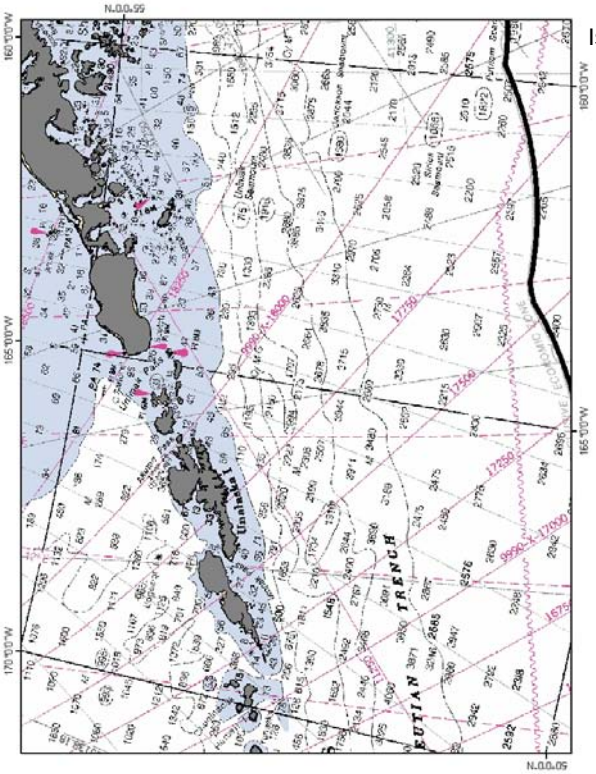
3.1 Physical and Biological Characteristics

The Aleutian Islands area or “ecosystem” possesses unique abiotic and biotic environmental features and an interdependent web of energy flow from terrestrial and marine primary production through top level consumer organisms in an island-dominated geographic region. The island chain forms a boundary between the open North Pacific Ocean and its Bering Sea, although the boundary is highly permeable with many inter-island passes that are pathways for water exchange and movement of marine organisms (Figure 2). The Aleutian Islands mark the furthest southward extent of seasonal sea ice of the Bering Sea, although in recent years warming trends have minimized formation of ice in the more southerly portions of the Bering Sea.

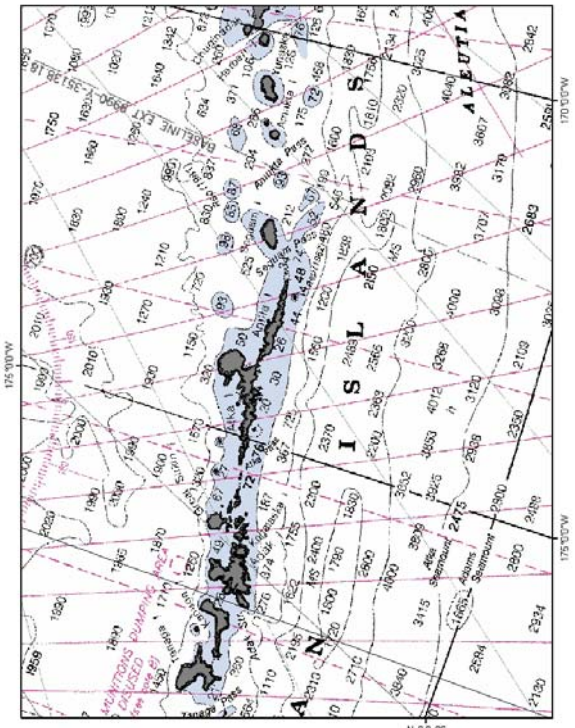
From 4,000 ft mountain peaks to the 24,000 ft depths of the Aleutian Trench, the Aleutian Islands offer a unique and dramatic diversity in landforms. Many of the Aleutian Islands are crests of submerged volcanoes. The region is highly volcanic and seismically active because of the tectonic convergence of the Pacific Plate and the North American Plate; the Aleutian Trench marks the convergent boundary of these plates. The region spawns some of the intense weather systems that greatly affect the oceanography and biological productivity in the North Pacific Ocean. The region supports a wide diversity of organisms, some in large numbers, including millions of seabirds, thousands of marine mammals, and abundant fish species, some of which support commercial fisheries.

The climate of the Aleutians is maritime and characterized by frequent cyclonic storms and high winds, and during calm periods the region often is covered by dense fog. Marine water flows through the various passes between islands, providing nutrients to fuel the productivity of the region and the adjacent Bering Sea. The Bering Sea and Aleutian Islands region is one of the most productive marine systems in the world. Plankton and forage fish species provide a nutritional base for millions of seabirds and marine mammals as well as abundant pelagic and demersal fish species.

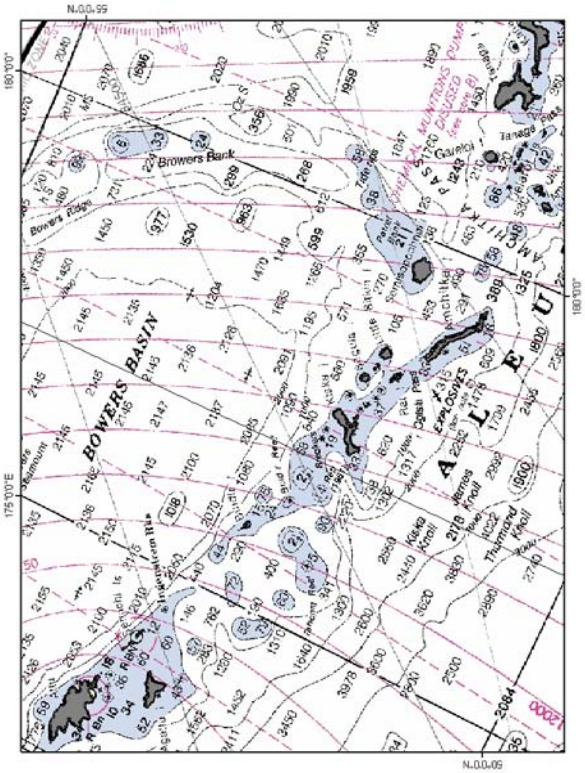
Figure 2 Map of the Aleutian Islands



Islands of Four Mountains to Unimak Island



Tanaga Island to Islands of Four Mountains



Attu Island to Tanaga

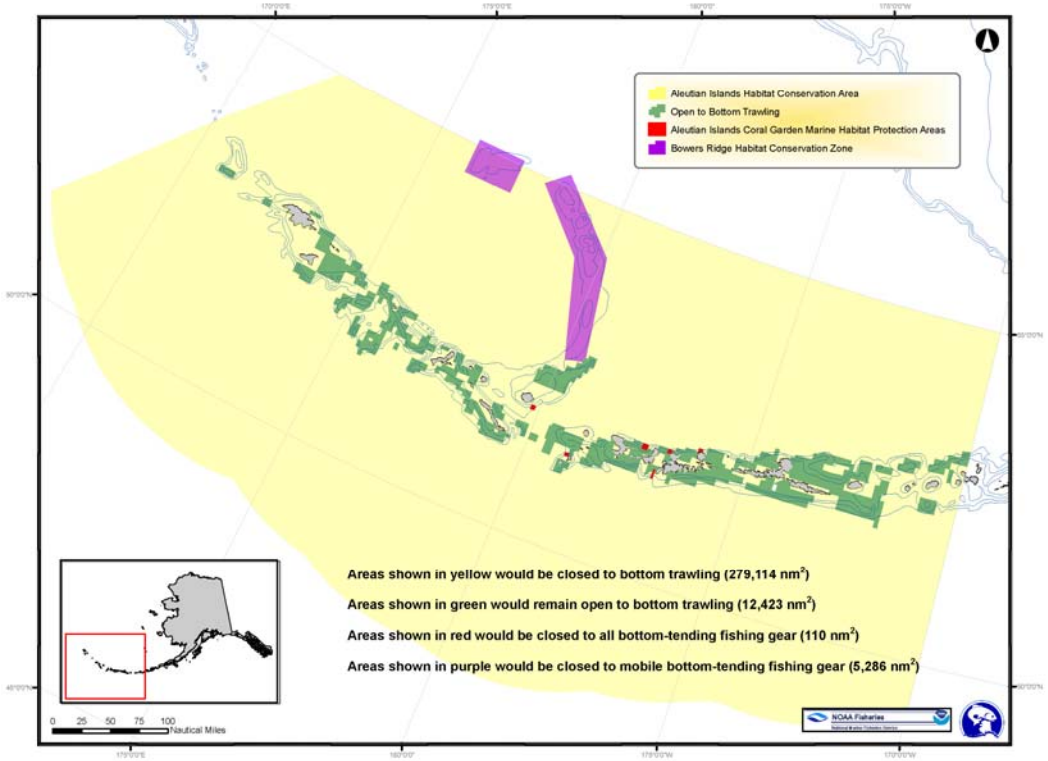
The Alaska Fisheries Science Center's Resource Ecology & Ecosystem Modeling group researches food web models for Alaska region waters. Models have been in development for the eastern Bering Sea and the Gulf of Alaska for some time, however the unique characteristics of the Aleutian Islands require an area-specific food web model. Using ECOPATH/ECOSIM, a model is currently being developed for the Aleutian Islands.

Benthic Habitat

The continental shelf in this area extends only a small distance offshore, then breaks to an edge and slope descending to a seafloor that in some areas sustains unique assemblages of cold water corals, sponges, bryozoans, and other sessile invertebrates. Unlike the Bering Sea, the distribution of sediment type and texture is not known for the Aleutian Islands (NMFS 2004b), and these habitats have only recently been documented. The Aleutian Islands is thought to harbor the highest abundance and diversity of cold water corals in the world. Such benthic habitats and the fish and other organisms that associate with this habitat will likely be the focus of continued future research and observation, particularly using new submersible technology.

Under the Council's Essential Fish Habitat program, much of the Aleutian Islands area and several Habitat Areas of Particular Concern (HAPCs) have received special protection from fishing activities (Figure 3). In February 2005, the Council approved closing large areas in the Aleutian Islands to bottom trawling to protect unique seafloor biological assemblages, especially beds of cold water corals, sponges, bryozoans, and other associated organisms. These closed areas include six Aleutian Islands coral gardens, which are closed to all bottom contact gear, and Bowers Ridge, which is closed to mobile bottom contact gear that includes pelagic trawls that contact the sea floor, non-pelagic trawls, dredges, and troll gear that contacts the sea floor (including dinglebar gear).

Figure 3 Essential Fish Habitat mitigation areas and Habitat Areas of Particular Concern designated by the Council in February 2005

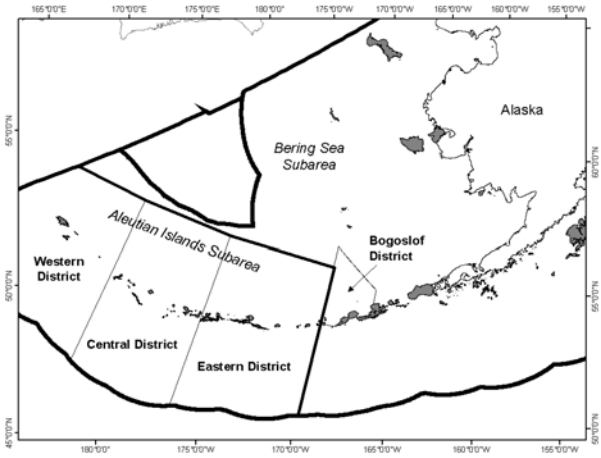


3.2 Fisheries

There are four federal fisheries that occur in the Aleutian Islands, for groundfish, halibut, scallops, and crab. The State of Alaska manages parallel and state-water fisheries for Pacific cod, salmon, herring, and black rockfish. Subsistence fisheries also occur for many marine species. Recreational fishing effort is small in the area.

Federal Groundfish Fisheries

Figure 4 Aleutian Islands subarea of the BSAI Groundfish FMP



Aleutian Islands groundfish fisheries are managed by the Council and the National Marine Fisheries Service (also referred to as NOAA Fisheries or NMFS) under the Bering Sea and Aleutian Islands (BSAI) Groundfish Fishery Management Plan (FMP). The Aleutian Islands is a subarea defined in the FMP as that area of the EEZ that is west of 170º W. longitude and south of 55º N. latitude, and it is divided into three districts (Figure 4).

Table 2 lists the species managed under the BSAI Groundfish FMP, and the catch in 2003 for those species in the Aleutian Islands and Bering Sea subareas. For comparison, catch is also indicated for these groundfish in the western GOA regulatory area (which encompasses waters west of 170º W. longitude, to the south of the eastern Aleutian Islands) and the remainder of the GOA regulatory areas. Catches in the Aleutian Islands subarea (AI subarea) have always been much smaller than those in the Bering Sea subarea. Total catches from the AI subarea in recent years have been just over 100,000 mt annually, compared to over 1.8 million mt in the Bering Sea subarea. The historical species composition for each subarea is illustrated in . Management of these Federal fisheries is complex given the geographic size and extent of the region, its distance from research and management facilities, and enforcement and safety concerns.

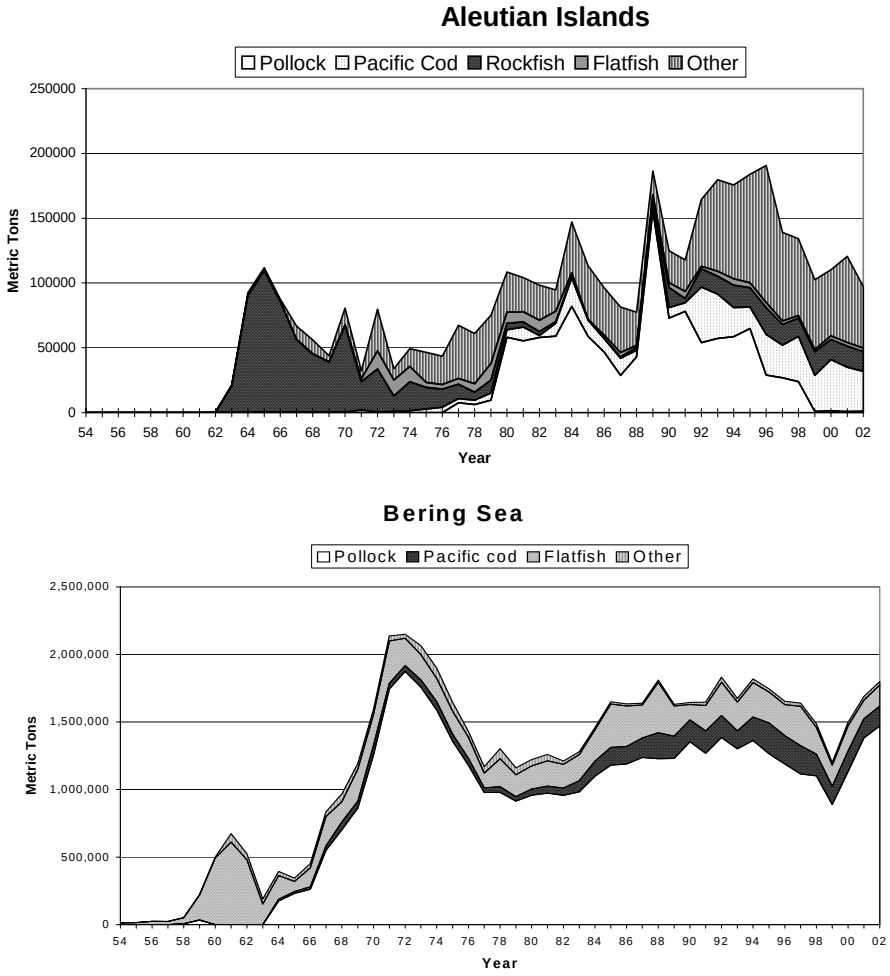
Table 2 Catch, in mt, of groundfish FMP-managed species in Alaska, in 2003.

BSAI Groundfish FMP managed species	Aleutian Islands	Bering Sea	Western GOA	Other GOA
Pollock	1,653	1,489,997	16,508	33,008
Pacific cod	32,455	176,659	16,189	24,831
Sablefish	1,119	969	2,110	8,912
Atka mackerel	51,742 [4]	5,368 [4]	578 [5]	-- [5]
Yellowfin sole	0	79,961	4 [6]	55 [6]
Greenland turbot	993	2,515	8 [6]	5 [6]
Rock sole	972	35,003	196 [6]	3,186 [6]
Arrowtooth flounder	987	12,292	8,201	30,705
Flathead sole	0	13,792	515	1,910
Other flatfish [1]	81	3,137	788 [6]	1,967 [6]
Alaska plaice	0	9,964	1 [6]	13 [6]
Pacific ocean perch	12,760	1,151	2,149	8,712

BSAI Groundfish FMP managed species	Aleutian Islands	Bering Sea	Western GOA	Other GOA
Northern rockfish	4,582	72	533	4,810
Shortraker and rougheye rockfish	230	90	225	1,177
Other rockfish [2]	411	328	664	4,621
Squid	36	1,198	na [7]	na [7]
Other species [3]	1,411	26,305	na [7]	na [7]

[1] Includes starry flounder, rex sole, longhead dab, butter sole, and all species of flatfish caught in the management area, other than flathead sole, Greenland turbot, rock sole, yellowfin sole, arrowtooth flounder, and Alaska plaice.
[2] Includes light dusky rockfish, shortspine thornyheads, and all species of Sebates and Sebastolobus caught in the management area, other than Pacific ocean perch, northern rockfish, rougheye rockfish, and shortraker rockfish.
[3] Includes sculpins, skates, sharks, and octopus.
[4] Atka mackerel for the combined Eastern Aleutian Islands district and Bering Sea subarea was 11,010 mt in 2003; it is reported under the Aleutian Islands.
[5] The Atka mackerel TAC is for the whole GOA, but is mostly caught in the western GOA.
[6] Flatfish categories differ in the GOA; for flatfish catch breakdown, see Turnock et al. 2003; data is for 2003 through October.
[7] Breakdown not available for squid and other species in the GOA; GOA-wide total catch was 6,339 mt.

Figure 5 Groundfish catch by subarea, Bering Sea and Aleutian Islands, 1954-2002.



Although the BSAI groundfish fisheries are managed under a single FMP, many of the management measures apply at a subarea level. Table 3 describes those FMP measures that are specific to the Aleutian Islands subarea, and those that apply to the management area as a whole.

Table 3 Current management measures in BSAI groundfish fisheries that apply across the management area, and those that are AI subarea-specific

Issue	FMP measures that apply BSAI-wide	FMP measures that apply to the Aleutian Islands only
Allocation	AI TAC + BS TAC ≤ 2 MMT AI Fisheries with BSAI TAC: • Directed: Pacific cod • Incidental: Northern, shortaker and rougheye rockfish, flatfish, squid, other species	AI Fisheries with AI subarea TAC: • Directed: Pollock (as of 2005), Pacific ocean perch (by district), Atka mackerel (by district, jig 1% in Eastern AI/BS district), sablefish (trawl 25%, fixed gear 75%), Greenland turbot • Incidental: 'other rockfish'
Permit	BSAI license • certain vessels exempted: vessels fishing only in State waters, vessels less than 32' LOA, or jig gear vessels less than 60' LOA with specific effort restrictions.	Must have AI subarea endorsement
Closures/gear restrictions	Steller sea lions: • 3 nm no-transit zones around rookeries, no trawling for pollock, Pacific cod, or Atka mackerel within 20 nm of rookeries and haulouts during some or all seasons Prohibited species • Attainment of PSC limits for crab, salmon, and herring closes areas Gear: • Non-pelagic trawl gear prohibited in directed pollock fishery	Steller sea lions • Many of the rookeries and haulouts in the AI EFH and HAPC: • Council has designated various AI EFH and HAPC areas with protections such as no bottom-trawling Prohibited species: • One closure area in the AI: Chinook Salmon Savings Area 1.
Prohibited species and bycatch	Halibut, herring, salmon, king crab, and tanner crab are prohibited species. • BSAI-wide halibut PSC limit for trawl fisheries (3,675 mt)	• PSC limit for Chinook salmon in AI pollock trawl fisheries
Share-based programs	• Fixed-gear sablefish fishery is IFQ program. • some CDQ allocations BSAI-wide	• Directed pollock fishery in the AI subarea is fully allocated to the Aleut Corporation. • AI subarea-specific CDQ fisheries for pollock (as of 2005), POP, Atka mackerel, sablefish, Greenland turbot, rockfish;
Monitoring and Reporting	• 100%/30%/0% on vessels >125'/60-124'/<60' LOA • Fish tickets, C/P and processor reports	• 200% observer coverage on AFA vessels harvesting AI pollock

Historically, groundfish fisheries prosecuted in the AI subarea have included Atka mackerel, Pacific cod, sablefish, flatfish, and rockfish. Prior to 1999, pollock were harvested in this area. Pollock in the Aleutian Islands region is considered to be a separate stock from the eastern Bering Sea pollock, with a tentative boundary identified at 174º W. longitude, although there is some exchange between the stocks. From 1999 through 2004, the directed fishery was closed. Some pollock are harvested incidentally in other target fisheries (e.g., Atka mackerel, Pacific Ocean perch); in 2003, pollock bycatch in other directed fisheries was 1,653 mt.

Beginning in 2005, the Council has authorized allocation of pollock quota in a directed pollock fishery in the Aleutian Islands (Amendment 82). The allocation is to the Aleut Corporation per recent Congressional action (PL 108-199). The annual quota for this fishery currently is set at no more than 19,000 mt, less the CDQ apportionment and incidental catch allowances for other directed groundfish fisheries. The Council intends to re-visit this quota level and other aspects of the fishery in June 2006. Historically, harvests in the AI subarea pollock fishery have occurred in several areas of concentration, including areas north of Atka Island, northwest of Adak Island, and east of Attu Island and north of Shemya Island.

The Pacific cod fishery is managed under a quota apportioned to the entire BSAI management area, and there is no evidence of stock structure within the management area. Pacific cod catch statistics for the AI subarea for the period 2000-2003 showed harvests ranging from 28,649 to 39,684 mt (average 33,335 mt; Thompson and Dorn 2003). This fishery has historically occurred around Adak and Atka islands. Since 1999, when the AI subarea was closed to a directed pollock fishery, the Pacific cod fishery has been prosecuted under Steller sea lion (SSL) protection measures that allow Pacific cod fishing to occur closer to shore than a directed pollock fishery would be allowed. During 1997-2001, the AI subarea accounted for an average of about 16% of the BSAI Pacific cod quota.

The Atka mackerel fishery harvested 54,287 mt in 2003. The center of abundance of Atka mackerel appears to be the Aleutian Islands, although their distribution ranges from the Kamchatka peninsula to the Gulf of Alaska. The harvest quota has been distributed across the AI subarea districts since 1992, to minimize the risk of localized depletion. Although the fishery takes place primarily in the AI subarea, the fishery also occurs north of Akutan Island in the Bering Sea subarea. Areas of harvest concentration in the AI subarea in 2003 were south of Amukta and Tanaga passes, east of Attu Island, and scattered in the Rat Islands area (Lowe et al. 2003).

The sablefish fishery in 2003 harvested 1,008 mt, almost all of which from longline and pot fisheries. The population is considered to be a single stock throughout Alaska and northern British Columbia. The directed fishery is entirely under an IFQ management system and is prosecuted with fixed gear; a small amount is taken incidentally in some trawl fisheries (35 mt in 2003). The locations of the sablefish harvests from 1995-2003 suggest most of the fishing effort in the AI subarea occurs within 100 nm of Adak and Atka. This fishery is not under special restrictions for SSL protection, and occurs in waters within 20 nm of shore in the AI subarea.

The AI subarea rockfish fisheries include catch of Pacific ocean perch (POP), northern rockfish, shortraker and rougheye rockfish, and other rockfish. Rockfish harvested in the AI subarea in 2003 totaled 17,973 mt. Only the fishery for POP is directed, due to small harvest quotas; the other species are caught incidentally, primarily in the Atka mackerel and POP fisheries. 90% of northern rockfish are caught incidentally in the Atka mackerel fishery (Spencer and Ianelli 2003b). The Pacific ocean perch stock is spatially distributed in the AI subarea, where approximately 84% of the population is concentrated, according to survey data (Spencer and Ianelli 2003a). The fishery historically has occurred throughout the AI subarea with some concentration of harvests between Kiska and Agattu islands, around Amchitka Island and Petrel Bank, north of Atka Island, and in Amukta Pass. Shortraker and rougheye rockfish are caught incidentally in a variety of target fisheries. The majority of 'other rockfish' catch is light dusky rockfish and shortspine thornyheads. In the AI subarea, these species are mainly caught incidentally in the Atka mackerel trawl fishery, for light dusky rockfish, and in sablefish, grenadier or skate longline hauls or the POP trawl fishery, for shortspine thornyheads. 'Other rockfish' are also distributed in the Bering Sea subarea, north of Unalaska and Akutan Islands and on the slope (Reuter and Spencer 2003).

Most flatfish species are concentrated on the continental shelf of the Bering Sea, and have low abundance in the AI subarea. The only target flatfish fishery in the AI subarea is for Greenland turbot. About 25% of the Greenland turbot biomass is located in the area, and in 2003, the harvest total was 960 mt, mainly by hook and line gear. The fishery has historically occurred primarily within 100 nm of Adak and Atka islands.

Squid and other species (sculpins, skates, sharks, and octopi) are caught incidentally in other directed fisheries. Squid are caught primarily in the pollock trawl fishery. Skates represent the majority of the other species catch (over 21,000 mt for the BSAI in 2002), and are caught in the hook-and-line Pacific cod fishery (Gaichas et al. 2004).

CDQ fisheries occur in the AI subarea for sablefish, Atka mackerel, Greenland turbot, Pacific ocean perch, northern rockfish, shortraker and rougheye rockfish, and other rockfish. In 2005, there will also be a CDQ AI subarea pollock fishery. CDQ groups partner with commercial fishing corporations to harvest these allocations. Most of the CDQ groups have ownership interest in the partner corporations.

The Aleutian Islands has been surveyed biennially by bottom trawl since 2000, and was mostly surveyed triennially from 1980 to 1997. The 2002 survey area extends from Unimak Pass (165º W. longitude) to Statemate Bank (170º E. longitude), including Petrel Bank and Petrel Spur, and covers the continental shelf and upper continental slope to 500 m. The aims of the survey are to provide distribution and relative abundance data for the principal groundfish and commercially or ecologically important invertebrate species in the Aleutian Islands, and to collect data to define biological parameters such as growth rates, length-weight relationships, feeding habits, and size, sex, and age compositions. The most abundant species in the area are Atka mackerel, POP, northern rockfish, walleye pollock, Pacific cod, arrowtooth flounder, and giant grenadier. However, fish populations, such as many rockfish, which extend into areas that are either untrawlable with the survey gear or further up in the water column are not fully represented.

The Aleutian Islands has also been surveyed biennially by longline since 1996. Surveyed depths vary from 200m to 1000m. Survey objectives are to determine the relative abundance and size composition of sablefish, shortspine thornyhead, rougheye and shortraker rockfish, Pacific cod, arrowtooth flounder, grenadiers, and Greenland turbot. Tags to determine migration patterns of sablefish, shortspine thornyhead, and Greenland turbot are also implanted, and data to determine age composition of sablefish.

Ongoing groundfish research projects in the Aleutian Islands address the reproductive ecology of Atka mackerel, and the value of habitat, particularly coral and sponge habitat, to juvenile rockfish in the area.

Other Federal Fisheries

The halibut stock is managed by the International Pacific Halibut Commission (IPHC). Two of the IPHC statistical areas for the halibut fishery encompass portions of the Aleutian Islands, Areas 4A and 4B (Figure 6). Over the last five years, approximately 8,028,000 lb annually, or 14% of the Alaska halibut quota, have been allocated to these areas. Halibut allocations in Alaska are managed under an individual fishing quota program and a community development quota program.

The Federal scallop fishery is managed by the State of Alaska with Federal oversight. The Aleutian Islands scallop fishery is managed under registration Area O (Dutch Harbor). Area O extends from Scotch Cap Light (164º 44’ W. longitude) to the Maritime Boundary Agreement Line that separates U.S. and Russian waters, and encompasses both State and Federal waters. Scallop fishing in Area O generally occurs in the far east, to the north and south of Umnak Island (polygons marked on Figure 7). Area O was closed in 2000 due to management concerns over localized depletion. In 2002, the area was reopened with a reduced guideline harvest range ceiling of 10,000 lb, of which 61% was harvested. Area O represents approximately 1.5% of the statewide guideline harvest range for scallops.

Figure 6 Halibut Fishery Management Areas in the Aleutian Islands

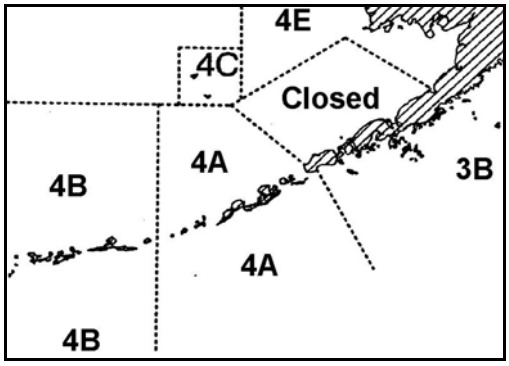
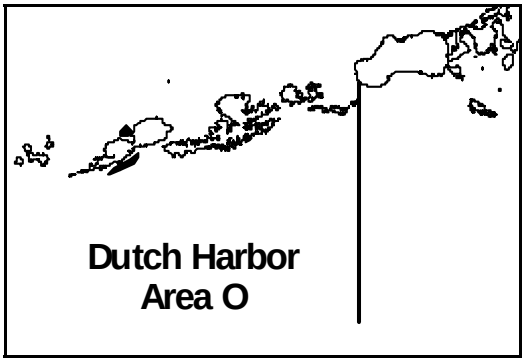
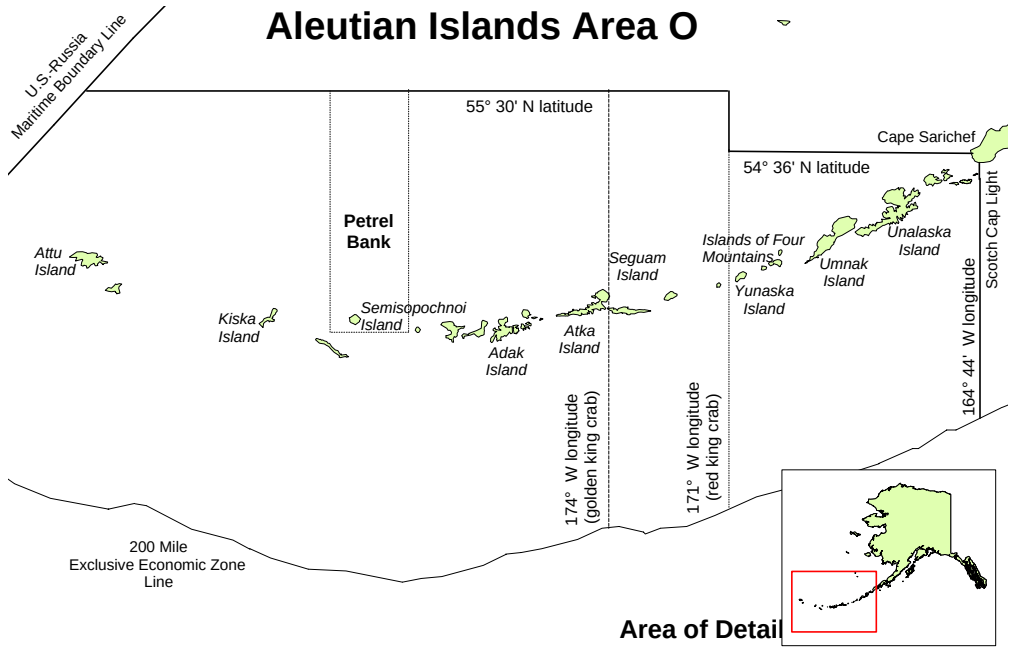


Figure 7 Scallop Registration Area O, with fishing concentration marked by the dark polygons.



The Federal king and tanner crab fishery is also managed by the State of Alaska with Federal oversight. In the Aleutian Islands, king crab fisheries are managed within registration Area O (Figure 8). The primary crab fishery that occurs in the region is the Aleutian Islands golden (brown) king crab fishery. Guideline harvest levels (GHLs), are established for the fishery east and west of 174º W. longitude. While effort and harvest have remained relatively stable in the eastern portion of the fishery, where the GHL for 2003-4 was 3.0 million lb, the western portion has experienced greater variability. The GHL for west of 174º W. longitude was 2.7 million lb, and both GHLs remain unchanged for 2004-5. Seasons in the golden king crab fisheries last several months, in contrast to other Bering Sea crab fisheries.

Figure 8 Aleutian Islands, Area O, king crab management area

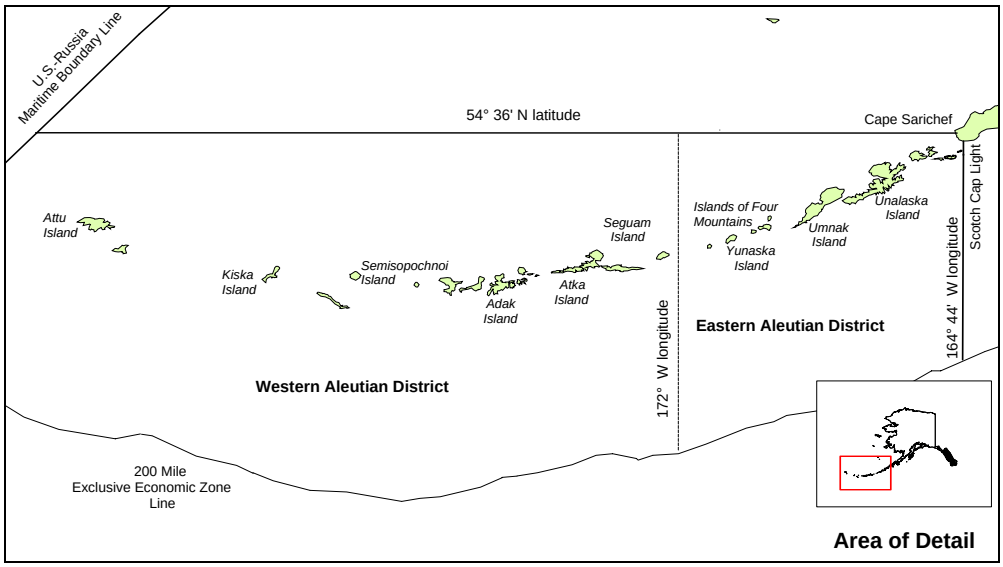


There is also an Aleutian Islands red king crab fishery in Area O. The eastern portion of the red king crab fishery has been closed since 1983, and the western portion, which operates in the Petrel Bank area, has opened sporadically in recent years. The fishery did not open in 2004.

Small tanner crab fisheries in the Aleutian Islands are managed in registration Area J (Figure 9). Tanner crab populations in this area are small, and, when open, are mainly authorized for incidental harvest only.

There are currently no CDQ crab fisheries in the Aleutian Islands. However, under crab rationalization, which will be implemented in 2005, CDQ groups will receive a 10% allocation of the western Aleutian Islands golden and red king crab fisheries.

Figure 9 Tanner crab Registration Area J, with Eastern and Western Aleutian Districts



State Managed or Parallel Fisheries

Future groundfish fishery management in the Aleutian Islands could include expanded parallel fisheries in State waters. Parallel fisheries are managed by the State of Alaska and may occur concurrently with the Federal groundfish fisheries, mirroring the Federal closures and harvest restrictions. Currently, the only directed parallel fishery in the Aleutian Islands occurs for Pacific cod, although other species are taken incidentally.

As outlined in the EA/RIR for Amendment 82 to the BSAI FMP, the potential exists for the State of Alaska to pursue a State-managed or State water pollock fishery in the Aleutian Islands, in which the State regulates the fishery and controls the closures and harvest restrictions. Were the State to initiate such a fishery without adopting the same restrictions as the Federal Steller sea lion protection measures, reinitiation of Section 7 consultation on the Steller sea lion protection measures likely would be required to determine the cumulative effects of the State-managed pollock fishery.

Other State-managed fisheries include sablefish (within State waters), salmon (primarily pink salmon and some sockeye salmon), herring for sac roe or food and bait, and black rockfish. These fisheries are prosecuted wholly within State waters. With increases in human populations in the Aleutian Islands that may accompany military, port, and community development, there may be additional participation in these fisheries and perhaps other, new State fisheries may evolve.

Subsistence and Personal Use Fisheries

The earliest fisheries in the Aleutian Islands were native subsistence fisheries. Today, subsistence fishing takes place in nearshore waters utilizing such species as cod, halibut, rockfish, and other species. These small-scale subsistence fisheries have continued to the present time. Subsistence activities continue to be a central element in contemporary village life and culture, and are also important to many of Alaska's non-Native residents. Total subsistence consumption ranges from about 200 lb per capita to over 450 lb

per capita. Fish, including salmon, halibut, cod, and rockfish, contribute between 57 and 75% of total subsistence resource consumption in the Aleutian Islands. Other subsistence resources include marine and land mammals, seabirds, and marine invertebrates (NMFS 2004a).

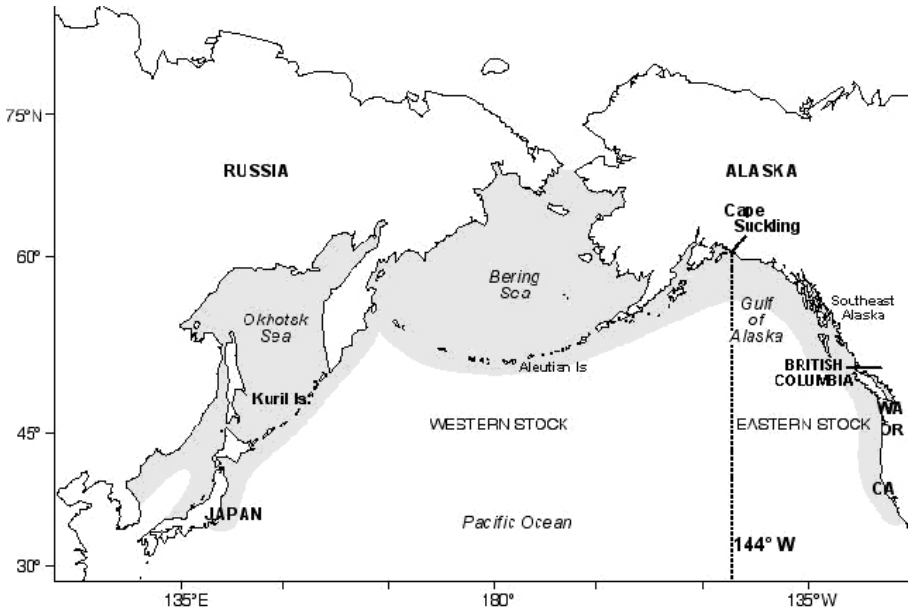
3.3 Marine Mammals and Seabirds

The Aleutian Islands are inhabited by diverse and abundant marine mammal and seabird populations. Many of these species feed on fish harvested in Federal or State fisheries, or otherwise interact with fishing activities, sometimes leading to injury or mortality. In the case of marine mammals, which are afforded special protection under the Marine Mammal Protection Act, any injury or mortality is illegal unless specially permitted. A similar situation exists for many of the seabirds in the area under the Migratory Bird Treaty Act. The Endangered Species Act also has considerable impact on activities in this region given the current listing status of many marine mammal and seabird species. The effects of these laws are magnified in the Aleutian Islands because of the abundance of species inhabiting this region, which are afforded these protections.

Steller sea lions

The Steller sea lion (*Eumetopias jubatus*) inhabits many of the shoreline areas of the Aleutian Islands, using these habitats as seasonal rookeries and year-round haulouts. Steller sea lions feed in the nearshore and offshore waters throughout the Aleutian Islands. The Steller sea lion was listed as threatened under the Endangered Species Act (ESA) on November 26, 1990 [55 FR 40204] and critical habitat for the species was designated August 27, 1993 [58 FR 45269]. In 1997 the SSL population was split into two stocks or Distinct Population Segments (DPS) based on genetic and demographic dissimilarities (Bickham et al 1996; Loughlin 1997)[62 FR 30772]. These are the western and eastern stocks. Because of a pattern of continued decline in the western DPS, the western DPS of SSL (wSSL) was listed as endangered on May 5, 1997 [62 FR 30772] while the eastern DPS remained under threatened status. The wSSL inhabits an area of Alaska approximately from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters (Figure 10).

Figure 10 Distribution of western and eastern distinct population segments of Steller sea lion



Throughout the 1990s, particularly after critical habitat was designated, various closures of feeding areas around rookeries and haulouts, and some offshore foraging areas, were designated to limit commercial harvest of pollock, Pacific cod, and Atka mackerel, which are important components of the wSSL diet. In 2001 a Biological Opinion was released that provided protection measures that would not jeopardize the continued existence of the wSSL nor adversely modify its critical habitat; that opinion was supplemented in 2003, and after court challenge, these protection measures remain in effect today (see Supplemental Figure A).

Over the past decade or more, the western Aleutian Islands wSSL sub-population was of particular concern. Non-pup counts declined from 14,011 in 1979 to just 817 animals in 2002. Although all other sub-populations in the western DPS increased between surveys conducted in 2000 and 2002, the western Aleutian Islands area group decreased by 23.7% in just two years. The cause of the steep decline observed in the area is unknown, although some researchers are finding links between prey composition and area. Other hypotheses involve changes in oceanic conditions such as salinity and temperature. Other possibilities for this sub-population include the taking of animals in Russian fisheries (e.g., herring). In 2004, scientists conducted another wSSL survey, and found that this Aleutian Islands sub-group is no longer declining. The overall wSSL population increased for a second consecutive survey (an increase was observed between the 2000 and the 2002 surveys.)

Because of the past declines observed in the wSSL population, special studies have been initiated in the Aleutian Islands area to determine the efficacy of the protection measures in providing areas closed to fishing where wSSLs can forage and obtain sufficient prey to meet nutritional requirements. These studies have been termed Fishery Interaction Studies, and have focused on fish movement patterns and the effect of commercial fisheries on Pacific cod and Atka mackerel in the Aleutian Islands. While results are very preliminary, no evidence of fishery-related localized depletion of these two species of fish have been detected, although the studies continue. These studies are unique in that they focus exclusively on fishery interactions with target species, with the objective of testing whether geographic closed areas are an appropriate tool for wSSL management.

While recent surveys show some possibility that the decline in abundance of the wSSL DPS may have halted, the entire DPS will be the subject of continued study and monitoring until persistent increases in this population occur. Undoubtedly studies will continue to explore whether geographic closed areas or other wSSL protection measures may be part of this turn around. The Aleutian Islands wSSL population likely will be an integral part of this ongoing work.

Northern fur seal

The Northern fur seal (*Callorhinus ursinus*) seasonally occupies rookeries on the Pribilof Islands for mating and rearing of pups. This marine mammal uses Aleutian Island passes as important migratory pathways to and from the Pribilof Islands. The fur seal is pelagic for the winter months, although its habitat use patterns when not on the Pribilofs is largely unknown. The Northern fur seal has declined considerably in the past decade and is the subject of special study by NMFS and special attention by the Pribilof Islands Collaborative.

Harbor seals

Three separate stocks of harbor seals (*Phoca vitulina richardsi*) are identified in Alaska, with the Gulf of Alaska stock inhabiting the Aleutian Islands (Angliss and Lodge 2003). Ongoing genetic stock identification studies suggest possibly more stock differentiation in the Alaskan harbor seal population, but sufficient data are not available to change the current three-stock structure. Harbor seals have declined in portions of their range in Alaska. The Aleutian Islands group has not been surveyed since 1994, so

trends in the region are unknown. Given the declines in some areas, the use of harbor seals as a Native subsistence food item, and the unclear population structure in Alaska, harbor seals are the focus of ongoing research, most of it by the State of Alaska.

Sea otters

The southwest Alaska distinct population segment of the northern sea otter (*Enhydra lutris*) has been proposed for ESA listing as threatened because of a steep decline in abundance of sea otters, particularly in the Aleutian Islands area. If listed, the USFWS intends to develop criteria for designating critical habitat and to begin the species recovery process. Groundfish fisheries have not been implicated in the decline of sea otters, and interactions between this species and fisheries are not believed to be significant.

The Aleutian Islands area provides important habitat for this coastally-oriented marine mammal, where it remains year-round to feed and rear young. In the 1980s, the sea otter population in the Aleutian Islands ranged from 55,100 to 73,700 individuals (Calkins and Schneider 1985). A 1992 count in the Aleutian Islands area was 8,042 sea otters, and in the spring 2000 surveys the count for this area was 2,442 animals. On February 11, 2004, the USFWS published a Proposed Rule to list the southwest DPS as threatened [69 FR 6600]. The southwest DPS is designated as a strategic stock by the USFWS because of the possible ESA listing, and it is likely that special research and management attention will focus on this species in coming years, particularly in the Aleutian Islands.

Whales

Several species of whales use Aleutian Island passes as migratory pathways to feeding grounds in the Bering Sea and then to return to seasonal wintering and calving areas further south. Of these whales, the endangered North Pacific right whale is perhaps of most concern given its very small known population size. This whale moves through the Aleutian Island region annually to occupy feeding habitat in the eastern Bering Sea; it is very rare, and only up to 25 individuals have been seen annually in recent surveys.

Other whales move through the Aleutian Islands area, including blue whales, sei and minke whales, humpback whales, and gray whales. The blue whale is the subject of more focused acoustic studies designed to determine population size and habitat use patterns; blue whales may inhabit the Aleutian Islands area year-round. Sperm whales also inhabit the Aleutian Islands area, and are known to depredate longline-caught sablefish. Killer whales also have been known to depredate longline catches, and have been implicated as predators of Steller sea lions, sea otters, and other marine mammals in the Aleutian Islands. The extent to which whales utilize the waters around the Aleutian Islands is largely unknown, but the Aleutian Islands area appears to be important whale feeding and migratory habitat for many species.

Short-tailed albatross

The short-tailed albatross (*Phoebastria albatrus*) is listed as endangered [65 FR 46643] under the ESA because of its low population size compared to historic levels throughout its range. This albatross breeds primarily on a small island offshore the east coast of Japan. Telemetry studies indicate that after leaving their breeding and nesting grounds, short-tailed albatross move fairly quickly northward to the North Pacific and into the Bering Sea in spring and summer where these birds feed and may remain year-round. This seabird appears to concentrate particularly in the Aleutian Islands area, feeding on the continental shelf and slope and within passes between islands. Given the importance of the Aleutian Islands region as feeding grounds for this endangered seabird, continued research and management will likely emphasize at-sea capture and tracking movement studies in the Aleutian Islands (Rob Suryan, OSU, pers. comm., Oct. 2004) to better understand its year-round distribution and movement patterns. All longline and trawl

groundfish fisheries managed by the Council are under an incidental take limit. Future groundfish fishery management in the Aleutian Islands area will likely give special attention to these concerns given the prominence of this species in the Aleutian Islands.

Steller's eiders

The Steller's eider (*Polysticta stelleri*) is listed as threatened under the ESA. This species of sea duck molts and then winters in nearshore marine waters throughout the Aleutian Islands where it mixes with the more numerous Russian Pacific population of Steller's eider (USFWS 2003). The species utilizes protected bays and inlets as refuge during a flightless period after molting, and then remains in many of these areas to feed throughout the winter. Causes for their decline are unknown but may include such factors as lead poisoning, predation on breeding grounds, contaminants, and ecosystem change. Concerns have been expressed over disturbance of this bird from vessel traffic or release of petroleum products into the marine environment in coastal areas where this species winters. There will continue to be elevated concerns over any human activity or development in or near Steller's eider habitat in the Aleutian Islands and Alaska Peninsula area.

Other seabirds

Millions of seabirds nest and fledge young from habitats on many of the Aleutian Islands. The Aleutian Islands area is considered one of the most important and significant seabird nesting areas in the North Pacific because of the unique habitats the islands provide. The Aleutian Islands marine waters over the continental shelf and slope and Aleutian Islands passes provide feeding grounds for millions of seabirds. The Aleutian Islands region seasonally supports thousands of cormorants, gulls, kittiwakes, guillemots, and murrelets and millions of storm-petrels, murres, auklets, and puffins. The Aleutian Islands also provide year-round habitat for large numbers of northern fulmar and smaller numbers of shearwaters and Laysan albatross and some black-footed albatross. One of the principal reasons the U.S. Congress established the Alaska Maritime National Wildlife Refuge, which encompasses nearly all land areas of the Aleutian Islands (and also other islands and coastal areas of Alaska; see Section 3.5 below), is because of the very high numbers of seabirds that nest and feed in this region.

Marine Mammal and Fishery Management Issues

Two situations exist in the Aleutian Islands area that may merit special consideration. One is the geographic extent of the SSL protection measure closures. Over 41% of the AI subarea shelf and slope, to 1000 m, is closed to trawl fishing seasonally or year-round (NMFS 2004a). And a second is the potential changes in how pollock stocks are managed, which may have effects on how the AI subarea pollock fishery evolves in future years.

Steller Sea Lion Protection Measures

Steller sea lion protection measures include areas closed to all or some groundfish fisheries around rookeries and many haulouts along the Alaskan coast (see Supplemental Figure). These measures were put in place as a result of the steep decline in the SSL population and the hypothesis that this decline could be from nutritional stress. Fishing for pollock, Pacific cod, and Atka mackerel is restricted in these areas to limit fishing on prey items that are important in SSL diets. Closures are widespread in the Aleutian Islands. Recent concerns over the broad extent of closures, and recent research that suggests other hypotheses for the Steller sea lion decline, have led to public proposals for relaxing these measures and opening some areas to allow fishing.

A large proportion of the historical pollock harvest in the Aleutian Islands has come from waters that are now closed to pollock fishing by SSL protection measures. Under the current SSL protection measures, vessels generally must fish at least 20 miles from shore. The inclement weather conditions prevailing during the winter, when the AI subarea pollock "A" season fishery will occur, will likely impede growth of a small vessel pollock fishery that is a goal of Amendment 82. Proposals to change SSL protection measures in the Aleutian Islands area have been brought to the Council and its Steller Sea Lion Mitigation Committee, but the Council has decided not to pursue such changes at this time until more SSL research information becomes available. Nonetheless, it is likely that this issue will remain a concern given the Council's approval of Amendment 82 and the initiation of a directed pollock fishery.

Evolving Understanding of Pollock Stock Structure in the Aleutian Islands

Aleutian Islands pollock stock assessments are evolving, and in the near future, stock assessment biologists may recommend subdividing the Aleutian Islands subarea for the purposes of pollock management. Barbeaux et al. (2003) have examined the Aleutian Islands pollock stock and have suggested alternative approaches to assessing pollock resources in the AI subarea that account for spatial patterns in stock distribution. The population of pollock west of 174° W. longitude appears different in size structure and abundance, and it may be recommended that it be separated from the pollock stock east of 174° W. longitude. Barbeaux et al. (2003) recommend closing the area east of 174° W. to a directed pollock fishery, to form a contiguous closed area with the Bogoslof District (see Figure 4). This pollock conservation zone would provide a buffer between management areas and address uncertainties regarding stock structure. This proposal was discussed by the BSAI Groundfish Plan Team in 2003 and 2004.

Recent pollock stock assessment analyses have suggested that spatial considerations be reflected in recommending ABC levels. This may result in TAC recommendations for areas smaller than the AI subarea, which, in order to have catch proportional to biomass distribution, could impact the amount of pollock available to harvest in the central Aleutian Islands. There are currently three districts identified within the AI subarea in the BSAI Groundfish FMP (see Figure 4), and the 174° W. longitude line bisects the Eastern Aleutian Islands District. A recommendation for spatial apportionment of the AI pollock TAC is a reasonably foreseeable issue that the Council will need to weigh as decisions are made on future management of fisheries in the Aleutian Islands.

3.4 Cultural Heritage and Human Development Issues

The Aleutian Islands were likely settled by Aleut peoples that moved to Alaska across the Bering Land Bridge perhaps 15,000 years ago. Aleuts subsisted on what the Aleutian Islands and surrounding marine environment provided. With the arrival of Russian explorers and fur traders starting in 1742, the Aleutian Islands became a focus for fur harvests until 1867 when Russia sold Alaska to the United States. U.S. territorial management continued the fur trade and imposed many changes in the region. In the early 1940s, several islands became World War II battlegrounds and staging areas for the U.S. Aleutian Campaign, dramatically changing the landscape on many islands.

Thus the Aleutian Islands have a rich cultural heritage based on the early inhabitant Aleut peoples and subsequent waves of human occupation including the Russian fur trade, management of Alaska as a territory of the U.S., World War II and Japanese occupation, and in past decades a variety of human endeavors including defense installations, atomic energy research and testing, and commercial fisheries. These various human activities have left their mark on the Aleutians in a unique way, providing an historic and archeological heritage found nowhere else in North America.

Development at Adak

Adak Island was the site of a military naval air station until 1997. The site of an early Aleut community, the Aleut Corporation obtained a portion of the island and incorporated the City of Adak in 2001. With passage of PL 108-199 and the Council's recent action to provide for an Aleutian Islands directed pollock fishery, Adak community development will likely increase in the coming years. The Council's action, which allocates AI subarea pollock to the Aleut Corporation, will contribute to the growth of the port and community of Adak. Some connected with the Aleut Corporation have suggested that they would like to see Adak grow from a community of under 200 persons to a community of about 1,000 persons. The City of Adak and the Aleut Corporation are pursuing a wide range of development projects, seeking to take advantage of the facilities (harbor, airport, fuel storage, buildings) left behind by the Navy when the base was closed. Other regional development may result as Adak grows and services in the community expand.

Other Regional Development

In addition to expansion of Adak and growth of a commercial fishery based there, the Aleutian Islands are slated for additional development. Military development in the Aleutian Islands may expand, possibly including missile defense systems in the region; development on Shemya Island, or possible activities on Amchitka Island to mitigate lingering effects of nuclear testing, also may occur. It would be speculative to determine any specific activity, since much of this is anecdotal or militarily classified. However, in April 2003, Adak was selected as the site for a $900 million radar system as part of the national missile defense system. This facility is expected to arrive in Adak by summer 2005. Port expansion is also being proposed in the Dutch Harbor/Unalaska area; the Little South America port facility is being studied and environmental and other studies are still progressing. A new port development at the head of Akutan Bay is the subject of a recent Corps of Engineers EIS; a decision on that development may be made soon. Continuing or new military activity, and these port developments, collectively would add vessel and aircraft traffic in the Aleutian Islands area.

3.5 Research, Scientific Issues, and Public Interest

Alaska Maritime National Wildlife Refuge

Most of the islands in the Aleutian chain are part of the Alaska Maritime National Wildlife Refuge, which is administered by the US Fish & Wildlife Service (Figure 11). The Refuge was established to protect breeding habitat for seabirds, marine mammals, and other wildlife. Some islands hold unique species not found elsewhere. The Refuge hosts seabird populations of national and international significance, providing nesting habitat for an estimated 40 million seabirds representing over half of all the nesting seabirds of the U.S. The Refuge also provides important habitat for Steller sea lions, harbor seals, and sea otters.

Figure 11 Map of the Alaska Maritime National Wildlife Reserve.

The Refuge also was established to make possible a program of scientific research on marine ecosystems. Scientists from the U.S. and other nations frequent the Aleutian Islands to conduct a variety of research projects. The region has high scientific visibility given its unique habitats and plants and animals. The research program and scientific activities within the refuge include the eradication of rats and foxes from the islands, and annual seabird and nesting surveys.

Public Interest and Ecotourism

Conservation organizations have been publicizing the unique environmental attributes of the Aleutian Islands for many years. Dozens of colorful publications, brochures, and website advertisements have highlighted the benthic habitats, coral and sponge assemblages, and fish habitat characteristics of the Aleutian Islands. Cruise ship traffic has increased and brings the public closer to this region than has been the case in the past. Public awareness of these unique aspects of the Aleutian archipelago has increased, and thus the region is now more visible and the focus of public education campaigns for additional conservation, habitat and species preservation movements.

3.6 Conclusions

The sections above highlight some of the unique features of the Aleutian Islands region. The bathymetry, meteorology, and oceanography of the Aleutian Islands is considerably different from the Bering Sea. The area is thought to harbor the highest abundance and diversity of cold water corals in the world. Food web models have been developed for the Aleutian Islands separate from the Bering Sea or the Gulf of Alaska. Different fish species are abundant in the Aleutian Islands versus the Bering Sea, and vice versa. Marine mammals and seabirds inhabit the islands in far greater numbers than in the Bering Sea. Fisheries in the Aleutian Islands must contend with different factors due to the dissimilar habitat and narrow shelf, as compared to the Bering Sea.

Given these features, its fisheries, and the Council's previously-stated interest in this area, the Council may wish to move forward with more focused management of the Aleutian Islands fisheries. Perhaps now

is the time to consider the Aleutian Islands in the context of ecosystem-based fishery management, using this geographic area, its fisheries, and its unique environmental characteristics as the basis for an EAF.

4 Purpose and Need

The Council's Scientific and Statistical Committee (SSC), in their minutes from December 2005, encouraged the Council to develop a statement of goals and objectives for the proposed action. The motivation for selecting the Aleutian Islands as a candidate for special management is discussed in the paper, but a clear statement of what area-specific management is intended to achieve has not yet been developed.

In considering this question, staff has come up with two possible ways to conceive of what the Council may be trying to achieve. Although the two characterizations are closely related, they frame somewhat different problem statements. Is the purpose of the Aleutian Islands action to provide an opportunity for the Council to move forward with an ecosystem approach to fisheries in the North Pacific, or is the purpose of the action to address an issue in the Aleutian Islands?

In the first instance, the Council is faced with a growing national momentum to adopt an ecosystem approach to fisheries (EAF). Appendix A describes an ecosystem approach to fisheries, and the ways it may be incorporated into fishery management. While many of the Council's management actions can arguably be considered to reflect an overall ecosystem approach, there is still progress to be made. There are many ways in which the Council could apply an ecosystem approach in its fishery management; however, much attention has been given to the concept of Fishery Ecosystem Plans (FEPs), or similar ecosystem-based fishery management documents. The Ecosystems Principles Advisory Panel touted FEPs as the way to move forward with ecosystem-based fishery management (EPAP 1999). Various draft legislative documents that have passed through Congress have suggested revisions to the Magnuson-Stevens Act that would require either FEPs or some other type of fishery ecosystem management document. To date, however, there are few examples of such documents, and there is no national template for their implementation, or their relationship to fishery management plans (FMPs).

The Council may believe that applying a more explicit ecosystem approach to fisheries is the appropriate way to move forward in fishery management. With regard to fishery ecosystem planning, the Council has the opportunity to help define the standard for implementing an EAF. As the practicalities of developing a fishery ecosystem planning document have yet to be worked out, the Council may feel it is appropriate to designate an ecosystem area as a test case.

In recent years, the Aleutian Islands have been at the forefront of many issues before the Council. The Aleutian Islands area has figured in focused measures to protect Steller sea lions and seabirds, conservation of benthic habitats that support coral and other special resources of public interest, and allocation issues related to the Aleutian Islands pollock and Pacific cod fisheries. Recent scientific evidence indicates a clear ecological difference between the eastern Bering Sea shelf ecosystem and the western Aleutian Islands archipelago. For these reasons, the Aleutian Islands ecosystem area may merit consideration as a candidate for area-specific management, and could be an appropriate test case for the Council to develop a fishery ecosystem planning document.

However, the Council's purpose in discussing area-specific management in the Aleutian Islands may instead be to recognize and address the uniqueness of the Aleutian Islands area. By its actions to date, the Council recognizes that the Aleutian Islands contain unique ecological values that the Council wishes to preserve. Far less is understood about the ecological interactions in this area than in the eastern Bering Sea, yet the two areas are managed conjointly in all of the Federal fishery management plans. The

Council may wish to consider fishery interactions within this ecosystem more directly, and applying an ecosystem approach to fisheries may promote this goal. To that end, the Council may explore the merits of an area-specific management approach in the Aleutian Islands.

The differences in intent may be subtle, but they create a different context for approaching the Aleutian Islands action. One purpose is the desire to move forward with applying ecosystem-based fishery management principles; the other is a focused concern over the Aleutian Islands area because of its ecological uniqueness and recurrent issues cropping up in that region. The Council's answer to these two intents, though, is essentially the same – to pursue an ecosystem-based management approach in the Aleutian Islands that recognizes the area's distinct ecological relationships.

The Council might phrase two problem statements, or statements of goals and objectives as per the SSC's recommendation, for the action deriving from these two different approaches. Both would engender the same range of alternatives; however, the Council sends a different message about the overall purpose of its action depending on the approach.

In brief, the two statements might be expressed:

1. The Council recognizes that an explicit Ecosystem Approach to Fisheries (EAF) is a desirable process for future management of the marine fishery resources in the Alaskan EEZ and therefore is a concept that it wishes to pursue and eventually implement. A primary component of an EAF is the development of ecosystem-based fishery planning documents, and the Council intends to move forward with such development on a pilot basis. The Council recognizes that the Aleutian Islands ecosystem is a unique environment that supports diverse and abundant marine life, and a human presence that is closely tied to the environment and its resources. In light of these features, the Aleutian Islands ecosystem provides an appropriate area to develop such an approach.

2. The Council recognizes that the Aleutian Islands ecosystem is a unique environment that supports diverse and abundant marine life and a human presence that is closely tied to this environment and its resources. The Council believes that in light of these features a better framework might be employed to guide future fishery management decisions in the Aleutian Islands area. Adopting an ecosystem approach to fisheries in the Aleutian Islands could allow the Council to better focus on the unique features of and interactions within the ecosystem area.

Either of these statements would start the Council on a path toward implementing some kind of ecosystem-based fishery management in the Aleutians. That management process would likely have at least two guiding principles: one, deliberate and intentional consideration of ecosystem variables that Council-managed fisheries affect (how fisheries affect the ecosystem), and two, conscious consideration of ongoing ecological processes that affect fish stocks and fisheries (how the ecosystem affects fisheries).

5 Defining a Boundary for the Aleutian Islands

There are two issues relating to defining a boundary for the Aleutian Islands that are discussed here: the management implications of the Aleutian Islands boundary, and the Aleutian Islands as part of a Large Marine Ecosystem.

Management Implications of the Aleutian Islands Boundary

In considering area-specific management, an important element is to define a boundary for the Aleutian Islands management area. If the purpose is to consider a cohesive Aleutian Islands ecosystem separate

from dissimilar habitat and oceanographic processes of the Bering Sea, the need to appropriately define the extent of the Aleutian Islands ecosystem seems critical. Although it is difficult to define unequivocal lines for an ecosystem, for the purposes of management the Aleutian Islands must have a distinct spatial boundary.

Geographically, the Aleutian Islands archipelago ranges from Attu Island to Unimak Island, approximately from 170º E. to 165º W. longitude (Figure 2, on page 6). The boundary defined for the Aleutian Islands in each of the Federal FMPs, however, is different (see discussion in Section 3.2, above). For groundfish, the BSAI FMP defines the Aleutian Islands subarea as that area of the EEZ that is west of 170º W. longitude and south of 55º N. latitude (Figure 4). This definition means that the Fox Islands, which include Dutch Harbor and Akutan, are not included in the AI subarea.

The subareas and regulatory areas of the BSAI and GOA Groundfish FMPs are based on statistical areas defined by the International North Pacific Fishery Commission (INPFC) in the 1950s. The INPFC Shumagin area (now statistical area 610, see Figure 13) includes waters south of the eastern Aleutian Islands and the Alaska Peninsula, between 170º W. and 159º W. longitude. This area is included in the GOA Groundfish FMP management area.

The BSAI Groundfish FMP originally defined four subareas, all based on INPFC statistical areas (24Figure 13). Areas 1 and 4, now the southern portion of the Bering Sea subarea and the Aleutian Islands subarea, respectively, abut the Aleutian Islands. The four areas are still evident in the statistical areas used by NMFS to monitor groundfish catch in the management area (Figure 14).

Figure 12 Statistical areas for the groundfish fisheries in the GOA

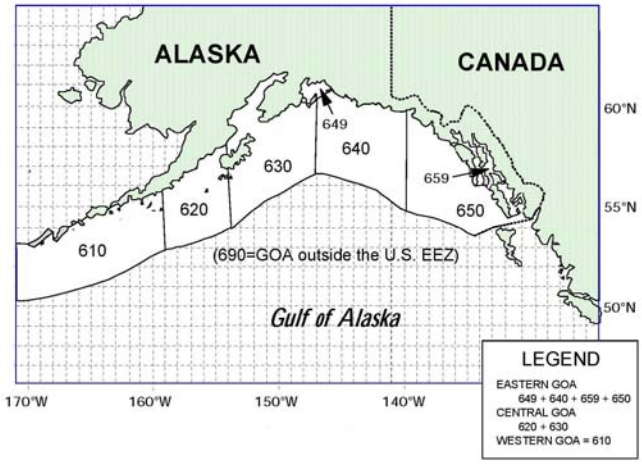


Figure 13 Fishing areas in original BSAI FMP, 1981

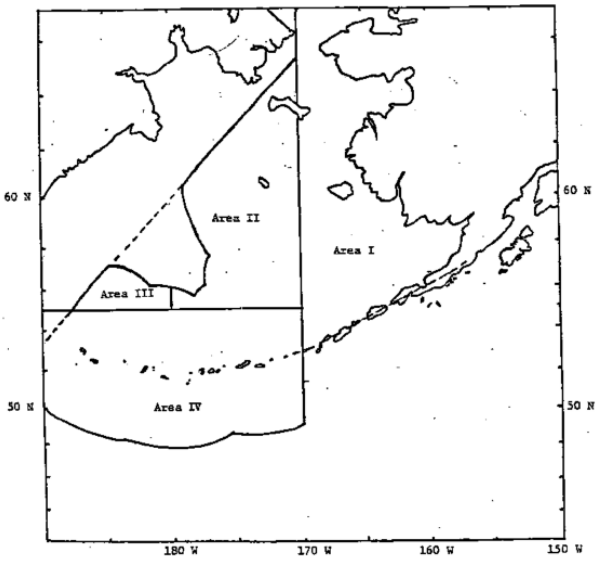
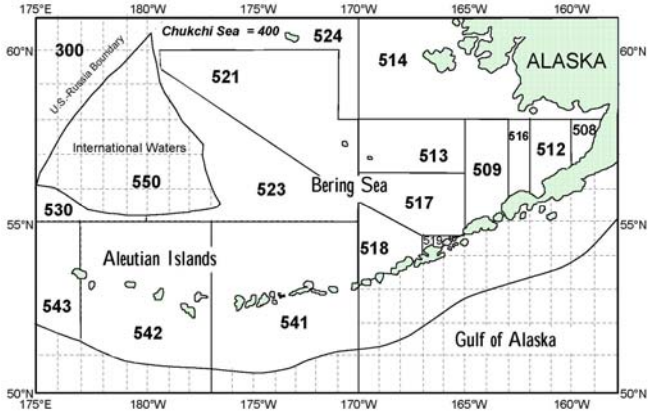


Figure 14 Statistical areas for the groundfish fisheries in the BSAI



None of the existing statistical area boundaries correspond exactly with a geographically-defined Aleutian Islands area. In the BSAI FMP, in addition to the Aleutian Islands subarea, statistical areas 517, 518, 519, and 509 all border the eastern Aleutian Islands to the north (Figure 14). In the GOA management area, the western half of statistical area 610 borders this area to the south (Figure 13).

In considering area-specific management for the Aleutian Islands, the question of an appropriate boundary for the area is a critical one. This is discussed in further detail under each of the management options below. However, it is worth noting some overarching considerations. First, any extension of the Aleutian Islands boundary beyond that of the AI subarea, for management purposes, will create a disconnect between data describing the Aleutian Islands before and after the change. The disconnect would be seriously compounded should the Council draw a boundary that does not correspond to one of the existing statistical areas. Inseason data are collected at many spatial levels, including Federal statistical areas, State of Alaska statistical areas and precise GPS haul locations for some directed fisheries; however, drawing new Federal statistical areas would make historical comparison of data for this area difficult.

The difficulty with managing data should not necessarily prevent the Council from defining an appropriate Aleutian Islands boundary, although it is an important consideration. For some of the management options discussed in this paper, the defined boundary of the Aleutian Islands may be allowed to differ between the area-specific plan and the management measures in the FMP. While such a solution is not ideal, as it increases the probability of confusion, it may provide the Council necessary flexibility.

Evidence of Aleutian Islands Ecosystem Boundaries

An upcoming volume of Fisheries Oceanography is devoted to the marine ecology of the Aleutian Islands, and is based on a series of research cruises along the archipelago. Results from the research indicate that there is evidence of an ecological division at Samalga Pass, which is at 169º W. longitude (Hunt and Stabeno, in prep.; Figure 15).

Figure 15 Eastern end of the Aleutian Archipelago, showing Semalga Pass

East of the Pass, waters from the Alaska Coastal Current predominate, and west of there waters from the Alaska Stream are the prevalent source. Weather east of 170º W. longitude is closely associated with the Aleutian Low Pressure, and to the west weather is more influenced by Asian circulation. Marine ecosystems of the Aleutian Archipelago show a strong discontinuity at Samalga Pass. Deep-water corals, zooplankton, fish, marine mammals, and seabirds show a step change in species composition there. Diets of groundfish, sea lions, and seabirds change there also. Fish growth and tissue composition studies suggest productivity declines westward along the Archipelago. Based on these findings, the authors

suggest that marine waters of the Aleutian Archipelago are divided into at least two different ecological regions, with a break at Samalga Pass (Hunt and Stabeno, in prep.).

The authors also note that there are abrupt changes in the composition of fish communities at several of the major passes, and that Samalga Pass may represent only one of several ecological divisions in the Aleutian waters (Hunt and Stabeno, in prep.).

The Aleutian Islands Region and Large Marine Ecosystems

NOAA has adopted the Large Marine Ecosystem, or LME, concept for approaching regional marine ecosystem management. The agency has identified ten LMEs across the nation, three of which are in Alaska. The three geographic areas in Alaska are the Arctic, the Bering Sea, and the Gulf of Alaska. The Council actively manages fisheries in the GOA and the Bering Sea. No known commercially exploitable fish populations inhabit the Beaufort and Chukchi Seas (comprising the Arctic LME).

The Aleutian Islands do not fit neatly into the proposed LME categorizations. The region lies on the border of the Bering Sea and the GOA LMEs. However, although NOAA's discussions on the practical applicability of the LME concept to ecosystem management have not progressed into actual guidelines, it has been acknowledged that in some instances, subregions may be appropriate to deal with unique areas.

The Council's management of the North Pacific groundfish and shellfish resources of commercial value is centered in three regions, the Gulf of Alaska, the eastern Bering Sea, and the Aleutian Islands. Species complexes, environmental forcing mechanisms, productivity, ocean floor relief, and overall productivity and target species biomass levels are quite different in each of these three areas. Thus current fishery management basically focuses on three ecosystems in the North Pacific, not two. In a practical fishery-management context, the Aleutian Islands region west of about 165º W. longitude extends into an open oceanic environment much of which is distant from the actively fished eastern Bering Sea. The Aleutian Islands have different environmental characteristics than the eastern Bering Sea and the GOA, different target species fisheries, and unique marine mammal and seabird issues that fishery management must consider.

For these reasons, considering the Aleutian Islands as an LME subregion is likely to be compatible with the LME concept.

6 What form should area-specific management take?

If the Council decides to proceed with area-specific management, there are several broad management options to consider. There are four federal fisheries that occur in the Aleutian Islands, for halibut, groundfish, crab, and scallop; however, due to the character of the Council's motion, the discussion of management options focuses on groundfish only.

The following sections each provide an option for Aleutian Islands management: a separate Aleutian Islands Groundfish FMP, a special management area within the BSAI Groundfish FMP, or an Aleutian Islands Fishery Ecosystem Plan.

6.1 Option 1: Create an Aleutian Islands Groundfish FMP

Creating a separate FMP for the Aleutian Islands would require a) defining an Aleutian Islands management area to be the basis for the new FMP; b) defining goals and objectives for the management of the Aleutian Islands groundfish fishery; and c) determining management measures to regulate

groundfish fishing in the management area. Existing management measures would need to be reevaluated for consistency with the goals and objectives of the new FMP. The existing BSAI Groundfish FMP (and potentially the GOA Groundfish FMP) would obviously be affected by such a separation, and would need to be rewritten.

Spatial boundary and application

The management area for an Aleutian Islands (AI) Groundfish FMP would need to be defined by the Council. One option would be to have the FMP encompass only the AI subarea already defined in the BSAI Groundfish FMP. Another option would be to extend the management area to encompass all of the Aleutian Islands, i.e., to incorporate the Fox Islands and surrounding waters. This area is currently part of both the Bering Sea subarea and the Western Gulf regulatory area. Section 5 addresses issues with incorporating the eastern Aleutian Islands into a new Aleutian Islands management area. The new FMP would manage the federal groundfish fisheries in the Aleutian Islands.

Effect on existing FMP measures

The creation of a new AI Groundfish FMP could, in the short term, create disruption to the BSAI groundfish fisheries, and should the boundary extend into the GOA management area as well, also the GOA groundfish fisheries. Effectively, this action would require the development of two new FMPs, as the Bering Sea FMP would also need to be rewritten, and an overhaul of the implementing regulations authorized by the FMPs. Such a wholesale reworking of the regulations is likely to create some, possibly inadvertent, changes to the fisheries.

If the new AI Groundfish FMP adopts the AI subarea as its management boundary, the division of the FMPs will be more straightforward. A general overview of the management measures currently governing the Aleutian Islands groundfish fisheries is contained in Table 3, on page 3. The table distinguishes those measures that apply across the BSAI, and those that are specific to the AI subarea. However, even though many management measures distinguish the AI subarea from the Bering Sea subarea, the division of the BSAI FMP into two separate FMPs would not be simple. The separation would necessarily require new procedures, for example for evaluating stock assessments. An Aleutian Islands Groundfish Plan Team would be created, and stock assessment authors who currently write assessments for the combined areas would need to determine how to separate them. Rewriting of the regulations is bound to create some operational difficulties, where the Bering Sea and Aleutian Islands fisheries cannot clearly be separated in regulation.

If the boundary of the new AI Groundfish FMP extends beyond the AI subarea, disruption to the existing FMP management measures would be compounded. Many of the management measures in the BSAI and GOA Groundfish FMPs are specific to the Bering Sea subarea or the Western Gulf regulatory area. Should these areas be subdivided, in order to apportion some of their area to a new AI Groundfish FMP, management measures in the Bering Sea and the GOA would need to be reconsidered.

Implementation

Once the boundary is determined, the Council would need to develop goals and objectives for the new AI Groundfish FMP. Many of the existing management objectives from the BSAI FMP would likely still apply, but the management approach would need to be revisited to reflect an area-specific focus. Based on the revised goals, the existing management measures for the new Aleutian Islands management area (however broadly defined) would be reevaluated.

Some existing management measures are discrete for the Aleutian Islands, and others are intertwined with measures for other management areas. Procedures for the new Aleutian Islands management area would be developed in the FMP and regulations.

By re-writing the BSAI, and perhaps the GOA, FMPs to excise the Aleutian Islands, the Council would likely need to reconsider those management measures also. Changing the management area is likely to affect the goals and objectives for the FMPs, which would trigger reevaluation of all the FMP measures.

Utility in conserving the Aleutian Islands

The creation of an AI Groundfish FMP would clearly focus future consideration of management measures on the specific issues of the Aleutian Islands. Management of the Aleutian Islands groundfish fisheries would directly address interactions of the fisheries with the unique characteristics of the Aleutian Islands ecosystem. Measures to protect and conserve the Aleutian Islands from potential adverse impacts of the groundfish fisheries could easily be adopted within the FMP framework.

6.2 Option 2: Special management area within the BSAI Groundfish FMP

6.2.1 *What is a Special Management Area?*

The term 'special management area' does not have any specific legal or statutory meaning for the Alaska Region (J. McCabe, pers. comm., March 2, 2005). The Council has the flexibility to define the characteristics of a special management area however it chooses.

'Special management area' has been used to designate terrestrial and aquatic areas throughout the U.S. For example, the Kenai River Special Management Area was designated by the State legislature in 1984 as a unit of the state park system. A comprehensive plan was developed for the area by agencies and a public advisory board. The plan's goal is to protect the natural resources and fish and wildlife habitat, manage the river's recreational and commercial uses, and provide public facilities.

No 'special management areas' have been designated in the EEZ by other Councils, based on a web search. However, there are special management areas designated in the nearshore waters of Guam, and other similarly designated areas off the South Atlantic. Since 1983, the SAFMC has had a program allowing the designation of *Special Management Zones (SMZs)* to provide an incentive for creating artificial reefs and fish attraction devices to increase the numbers of fish in an area and/or create fishing opportunities that would not otherwise exist. Designation of an area as a SMZ allows for gear restrictions in the area to prevent over exploitation. Many of these areas have been established through cooperation with fishing organizations and local governments, and serve as a means to promote localized conservation and positive fishing experiences. A total of 51 SMZs have been designated off South Carolina, Georgia, and Florida.

The Coastal Zone Management regulations provide the following definition of a special management area. "This special management may include regulatory or permit requirements applicable only to the area of particular concern. It also may include increased intergovernmental coordination, technical assistance, enhanced public expenditures, or additional public services and maintenance to a designated area. … Where a State's general coastal management policies and authorities address state or national concerns comprehensively and are specific with respect to particular resources and uses, relatively less emphasis need be placed on designation of areas of particular concern. Where these policies are limited and non-specific, greater emphasis should be placed on areas of particular concern to assure effective management and an adequate degree of program specificity," (15 CFR 923.20).

6.2.2 *An Aleutian Islands Special Management Area*

Lacking direction from the Council as to their intent, and for the purposes of this discussion paper, a Special Management Area is defined as a designation within the groundfish FMP, to apply to the Aleutian Islands subarea. The intent of the designation is to allow the Council to recognize the role of commercial fishing within ecosystem interactions, and the need to balance the impacts of fishing with other ecosystem relationships.

Defining a special management area implies that management will consider the various needs of the area, rather than only the needs of the activity being managed in that area. The Council and NMFS have jurisdiction over fishing activities in the Federal waters around the Aleutian Islands, but to understand and consider the ecosystem of the Aleutian Islands area, the Council must consider the broader interrelationships. As such, for the Council to designate an Aleutian Islands Special Management Area (AI SMA) will require consultation with other expert agencies regarding the state of the area and the impacts of fishing.

In order to monitor and assess the AI SMA, a cross-agency scientific 'team' might be created, under the oversight of the SSC and the Council, that would prepare a baseline assessment of the Aleutian Islands, and provide advice on fishery management actions that affect the Aleutian Islands. The team would function similarly to a Plan Team, and would be comprised of scientists from NMFS, USFWS, the State of Alaska, academia, and other appropriate stakeholders. As the designation would only be in the groundfish FMP, the assessment would not influence the management of other fisheries in the area.

Another interpretation would also designate the AI subarea as a Special Management Area within the groundfish FMP. Ecosystem information, such as would be included in the baseline assessment discussed above, would be included directly in the FMP, and this would be the extent of the action. The Council could, of course, at any time choose to develop specific management measures for the Aleutian Islands.

Spatial boundary and application

A special management area could be applied at many scales. However, as the intent would be for the AI SMA to apply within the BSAI Groundfish FMP, it is likely that such a management measure would be applied to the area defined as the Aleutian Islands within the FMP. As a result, the AI SMA would apply to the AI subarea as defined in the FMP and implementing regulations, and would not include the Fox Islands. Any management measures associated with the AI SMA would apply only to the BSAI groundfish fishery.

Effect on existing FMP measures

Adoption of an AI SMA will not necessarily affect management of the Aleutian Islands groundfish fisheries. The AI SMA will provide the Council a mechanism to consider the ecosystem effects of present and future management actions on the conservation of the Aleutian Islands. Based on this explicit consideration of the Aleutian Islands ecosystem, however, the Council may choose to amend groundfish management in the future.

The BSAI FMP would be amended to reflect the designation of the AI SMA. Depending on the interpretation decided upon by the Council, other information may also be included in the FMP. One interpretation would create an AI SMA 'team' that would create a baseline resource document on the Aleutian Islands, which would be used to advise the Council on Aleutian Islands actions. This document would be separate from the FMP, and would be updated regularly by the team.

Another interpretation would designate an AI SMA in the FMP, and also include an ecosystem assessment in the FMP. This would be the extent of the action, until such time as the Council wishes to reconsider AI SMA management. A disadvantage of including ecosystem information directly in the FMP is that information is constantly changing, as new data emerges to advance our understanding of the ecosystem. It would be very difficult to keep the FMP up to date with the current state of the ecosystem.

Implementation

Under either of the interpretations discussed above, designation of the AI SMA would require the Council to develop goals and objectives for the area. The purpose of the designation would likely be to recognize the unique nature of the Aleutian Islands area, the role of commercial fishing within ecosystem interactions, and the need to balance the impacts of fishing with other ecosystem relationships. The Council would also collect basic ecosystem information about the Aleutian Islands and its ecosystem interactions in order to inform Aleutian Islands management decisions.

Under one of the given interpretations, the Council may choose to create a cross-agency scientific 'team', under the oversight of the SSC and the Council, as an effective way to monitor its objectives for the AI SMA. The AI SMA team could be similar to a Plan team, and would either meet on a regular, periodic basis, or ad hoc at the Council's request. In the Aleutian Islands region, representatives on the AI SMA team could come from several groups based on their activities in the region, special expertise in ecosystem values or functions that should be part of fishery management decision making, or special interests in the outcomes of management decisions. These might include representatives from the U.S. Fish & Wildlife Service, a CDQ group, a consortium of villages and communities, the Aleut Corporation, the University of Alaska Fairbanks, the Environmental Protection Agency or Alaska Department of Environmental Conservation or other entity involved in Amchitka Island research and remediation, the Alaska Fisheries Science Center and National Marine Mammal Laboratory, and NOAA-NOS and NOAA Fisheries. Representatives from these or other groups could be appointed to an AI SMA team.

Should an AI SMA team be created, its initial charge, with the assistance of staff, would be to prepare a baseline assessment of the Aleutian Islands area, to be updated as necessary. Additionally, the AI SMA team would provide advice on Aleutian Islands fishery management decisions facing the Council. The Aleutian Islands resource assessment would be used to evaluate future management actions affecting the AI SMA. The participation of a cross-section of expert agencies would allow the Council to consult on the ecosystem impacts of its actions in the Aleutian Islands.

Utility in conserving the Aleutian Islands

This approach is unlikely to be disruptive to existing fishing practices in the short term. It focuses the Council's attention on the Aleutian Islands independent from the Bering Sea, and sets out specific objectives for the Council to consider when deciding on management actions for the area. If the explicit consideration of ecosystem relationships highlights a need for conservation, the Council may undertake specific mitigation in the FMP, as necessary. By specifically identifying the Aleutian Islands as a unique, 'special' area, the Council publicly highlights its importance.

6.3 Option 3: Develop an Aleutian Islands Fishery Ecosystem Plan

6.3.1 *What is a Fishery Ecosystem Plan?*

The Fishery Ecosystem Plan (FEP) was described in detail in the Ecosystems Principles Advisory Panel (EPAP)'s Report to Congress in 1999. Appendix B contains excerpted material from that report, describing the principles, goals, and policies of ecosystem-based fishery management, and the steps to

develop a FEP. In brief, the FEP is intended to provide the mechanism to integrate the ecosystem goals, principles, and policies into single species or species complex FMPs.

A FEP describes the interactions of the ecosystem, and the degree to which they are considered in conservation and management measures, including the efforts being made to monitor the effects of fishing. In order to address the goal of maintaining ecosystem health and sustainability, the FEP should develop indices of ecosystem health as targets for management.

The FEP is intended to:

- "provide Council members with a clear description and understanding of the fundamental physical, biological, and human/institutional context of ecosystems within which fisheries are managed;
- direct how that information should be used in the context of FMPs; and
- set policies by which management options would be developed and implemented," (EPAP 1999).

Regulatory authority, and interaction with FMPs

FEPs are to be developed for each ecosystem area, and a FEP would likely apply to more than one FMP. In the North Pacific, for example, an Aleutian Islands FEP would apply to the Federal groundfish (BSAI and perhaps GOA, depending on the boundary of the Aleutian Islands ecosystem), king and tanner crab, scallop, and salmon FMPs. There is no explicit discussion in the EPAP report as to the interaction of the FEP with state water fisheries; however, it would be desirable for the Council to coordinate with the State when developing the FEP.

In terms of regulatory authority, the EPAP report generally recommends that specific management measures be included in the FMPs, and that the FEP provide an ecosystem policy and understanding from which management measures could be developed for the individual FMPs as necessary. Yet the report does suggest that those regulations or management measures which extend across individual FMPs be contained in the FEP. The example used is essential fish habitat protection measures, which may apply to all fisheries, and thus including them in the FEP would reduce redundancy.

The intent of the report was for FEPs to eventually become required by law, and to meld with FMPs in the long term. At present, however, there is no authority attached to a FEP, and only the FMP can authorize regulations to implement management measures. Therefore it would not be possible, without a change in statute, for a FEP to authorize regulations. Management measures must be incorporated at the FMP level, not the FEP level.

This means that the influence of the FEP would be to extend an ecosystem policy over the FMPs in the ecosystem area, but not to prescribe management measures. This policy would guide the development of management measures in each FMP. The FEP would also contain an assessment of how to determine whether the goals and objectives of the ecosystem policy are being met.

Examples of Fishery Ecosystem Plans

There are very few examples nationally of Fishery Ecosystem Plans, and they do not provide a clear template of how to do FEPs. The Chesapeake Bay FEP embraces many of the concepts of the Ecosystems Principles Advisory Panel, including developing a strategic plan that accounts for the role of habitat and predator-prey relationships, social and economic considerations, and unpredictable externalities such as climate impacts. The FEP does not specify what measures management agencies should undertake, but instead lays out what is known about the ecosystem, and the kind of research and monitoring needed by

fishery managers. It also includes the impacts of non-fishery activities on, for example, fish habitat. The South Atlantic Council has taken a similar approach in developing their FEP. Their FEP expands upon their existing Habitat Plan to include a characterization of the biological and physical dynamics, an assessment of existing agencies and management institutions, development of a food web model, development of indices of ecosystem health, updated habitat requirements for managed species, determination of total removals, specification of research and monitoring needs, and further development of appropriate management measures.

A different concept was adopted by the Western Pacific Council, with their Fishery Management Plan for Coral Reef Ecosystems of the Western Pacific Region. The 2001 plan is the first ever ecosystem-based plan for fisheries developed in the United States. It incorporates many of the principles and policies recommended by the EPAP. The goal of the FMP is to establish a management regime for the entire Western Pacific Region that will maintain sustainable coral reef fisheries while preventing adverse impacts to stocks, habitat, protected species, or the ecosystem. The FMP measures include the designation of zoned Marine Protected Areas (MPAs) for coral, a recommendation of the EPAP report.

In FY04, Congress allocated $1.98 million for NOAA Fisheries to conduct ecosystem pilot projects in four regions: New England, Mid-Atlantic, South Atlantic, and Gulf of Mexico. The plan is to 1) use a public process to determine management objectives, threats and alternatives, 2) hold technical workshops for establishing guidelines in applying ecosystem principles to fisheries management, and 3) develop quantitative methods and software (models and GIS tools) to aid in evaluating management options and consequences. Each of the four Councils (MAFMC, NEFMC, SAFMC, and GOMFMC) received $225,000 from NMFS to develop their pilot programs. The SAFMC is further along in this project, and is already developing an FEP; the other Councils are focusing on the development of ecosystem-based goals and objectives and for implementing the FEP approach.

BSAI and GOA Groundfish FMPs as an example of a FEP?

The Council's revised BSAI and GOA groundfish FMPs contain many elements of a FEP. The revised management policy, adopted by the Council following the PSEIS analysis, is a broad, ecosystem-based policy. It contains goals and objectives for each of the ecosystem components, and a management approach statement that provides a means to balance ecological, social, and economic objectives. Many of the recommendations of the EPAP are incorporated in the groundfish management program, such as buffers against uncertainty, indices for ecosystem health, long-term monitoring data, and the habitat needs of many of the ecosystem's fish species.

One difference between the groundfish FMPs and a FEP as intended by the EPAP is that the groundfish FMPs apply only to a single species complex in each management/ecosystem area, rather than all fisheries in that area. Also, much of the ecosystem information that is used in managing the groundfish fisheries is not contained in the FMP, but rather is available to managers in supplemental documents such as the SAFE reports, including the annual Ecosystem Considerations appendix. Including such information in the FMP could be restrictive as the knowledge base for such information is constantly expanding, and the formal process for amending the FMP may not be sufficiently efficient as to keep it up to date .

6.3.2 *Fishery Ecosystem Plan for the Aleutian Islands*

A Fishery Ecosystem Plan for the Aleutian Islands would be a stand alone document, developed along the lines of the EPAP. The AI FEP would provide an assessment of the Aleutian Islands ecosystem, and would provide guidance, through goals and objectives, to managers of all fisheries in the Aleutian Islands ecosystem area. The FEP would have no regulatory authority.

The FEP would allow the Council to include a focused consideration of the role of each ecological component of the region (e.g., seabirds, marine mammals, communities, industries) in the sustainability of the whole, when making decisions on Aleutian Islands management actions.

Possible issues that might be addressed under a FEP are briefly listed below.

- For management decisions that result in harvest of non-target species, to what extent are these non-target species important as prey for other fish, seabirds, or marine mammals?
- For management decisions that might result in incidental take of seabirds or marine mammals, what is the current population status of these seabirds and marine mammals? Are the trends up or down? Would the possible incidental take of seabirds or marine mammals, or removals of their prey items, have any measurable effect on their populations?
- For management decisions that result in harvest of target species, what are the population dynamics of those target species and to what extent would harvest change those dynamics? What other species of fish, seabirds, or marine mammals rely on these target species? How might current harvests affect future geographic distribution of target species, spawning locations and success, juvenile production, and recruitment (to both a fishery and to the reproductive segment of the population)? How might fisheries affect the behavior of predators that rely on this target species biomass?
- The Council might consider ecosystem response to biomass (energy) removals by fishing, in time and space, as well as ecosystem response to biomass (nutrient) inputs from offal and discards at sea and point source nutrient input along the Coast (processor waste). In part, this is a redistribution of energy in the ecosystem – how is this affecting the marine system?
- The Council might consider the phenology of both target species and non-target species and how harvest might alter the timing of key events in the life cycle of these species. For example, could spawning be shifted in time because of harvest removals of spawning fish during a particular time period?
- The Council would consider uncertainty in the scientific knowledge of natural mortality for target fish and non-target species, and develop management policies to address uncertainty.
- What process might the Council employ to adaptively learn about ecosystem impacts of fishery management decisions and employ this new knowledge in future decision making? How might the Council adapt management measures to compensate for environmental change or regime shifts?

Spatial boundary and application

The definition of an ecosystem often includes a geographic component, but conspicuous boundaries in marine systems are rarely evident. Because the FEP does not authorize management measures, a specifically delineated boundary that can be charted in regulations is not necessary. Instead, the ecosystem boundary may be specified in other terms.

Recent publications have suggested that the size of an ecosystem might be considered to be the geographic extent of the foraging distances for a top consumer species in that area. Ciannelli et al. (2004) define the aerial extent of the Pribilof Islands ecosystem as that oceanic area that accommodates the energetic demands of the principal predatory species, the northern fur seal – that is, encloses the area of highest energy balance and lowest biomass import (which in this case is approximately a 100 nm radius around the islands). Certainly that boundary is not a precise 100 nm, but rather a less-well-defined boundary based on foraging, which may shift from season to season and year to year. Concepts such as central place foraging may be helpful perspectives in defining an approximate ecosystem boundary for

management decisions. Section 5 discusses recent research on ecological divisions in the Aleutian Islands.

The AI FEP would apply to all fisheries within the Aleutian Islands ecosystem area, not just the BSAI Groundfish FMP. The FEP would consider the interactions of fisheries with each other, as well as with other components of the ecosystem.

Effect on existing FMP measures

The development of the FEP itself would not be disruptive to federal fishery management. Barring a change in statute, a FEP cannot authorize management measures, and such authority would remain vested in the FMPs. The associated paradigm shift that could increase the Council's awareness of the ecological impacts of management actions, however, may result in amendments to the FMPs governing the Aleutian Islands fisheries.

The scope of the FEP is broader than either of the two previously considered options, as it would consider all components of the ecosystem, and provide goals and objectives for managing fishery impacts from all Federal fisheries. As such, fisheries other than the BSAI groundfish fishery may be affected.

The FMPs in the Aleutian Islands area would likely be amended to acknowledge the use of the FEP as a reference for ecosystem considerations, and the guidance of the FEP's ecosystem objectives.

Implementation

The FEP would describe the AI ecosystem, including spatial boundaries, predator-prey interactions, habitat needs of the significant food web components, and current and historic states of the ecosystem. Indices of ecosystem health, such as are included annually in the Ecosystem Considerations chapter of the groundfish SAFE report, would be used to assess all impacts, natural and anthropogenic, on the ecosystem. An excerpt from the EPAP's 1999 Report to Congress (Appendix B) describes the components of a FEP. Goals and objectives for the ecosystem would be developed by the Council.

The development of the FEP would require a cooperative effort among many agencies, as the AI FEP would need to consider impacts from other activities in the Aleutian Islands area relative to fishery impacts. Expert authorities from the State of Alaska, USFWS, and the Aleutian Islands communities would likely all be involved in developing the FEP. A mechanism for periodic re-evaluation of the FEP would also need to be devised.

Utility in conserving the Aleutian Islands

The FEP would give the Council an opportunity to examine and incorporate the impacts from all sources on the Aleutian Islands ecosystem, and take action to balance adverse impacts accordingly.

6.4 Comparison of the Options

Several options for area-specific management of the Aleutian Islands could be considered. Three possible options for facilitating the implementation of an ecosystem approach to fisheries vis-à-vis the Aleutian Islands are 1) developing a new and separate groundfish Fishery Management Plan for the Aleutians that contains EAF elements, 2) establishing the Aleutian Islands subarea as a Special Management Area within the existing BSAI groundfish FMP, or 3) preparing and implementing a Fishery Ecosystem Plan for the Aleutian Islands. The three options are illustrated in Figure 16, and their attributes are compared in Table 4.

Developing a separate FMP for the Aleutian Islands is a process with which the Council is familiar. This would require a multi-year process of extracting, from the current BSAI groundfish FMP, the Aleutian Islands measures and collecting these into a separate FMP. As evidenced in Table 3, many of the management measures in place in the BSAI groundfish fisheries are already specific to the Aleutian Islands.

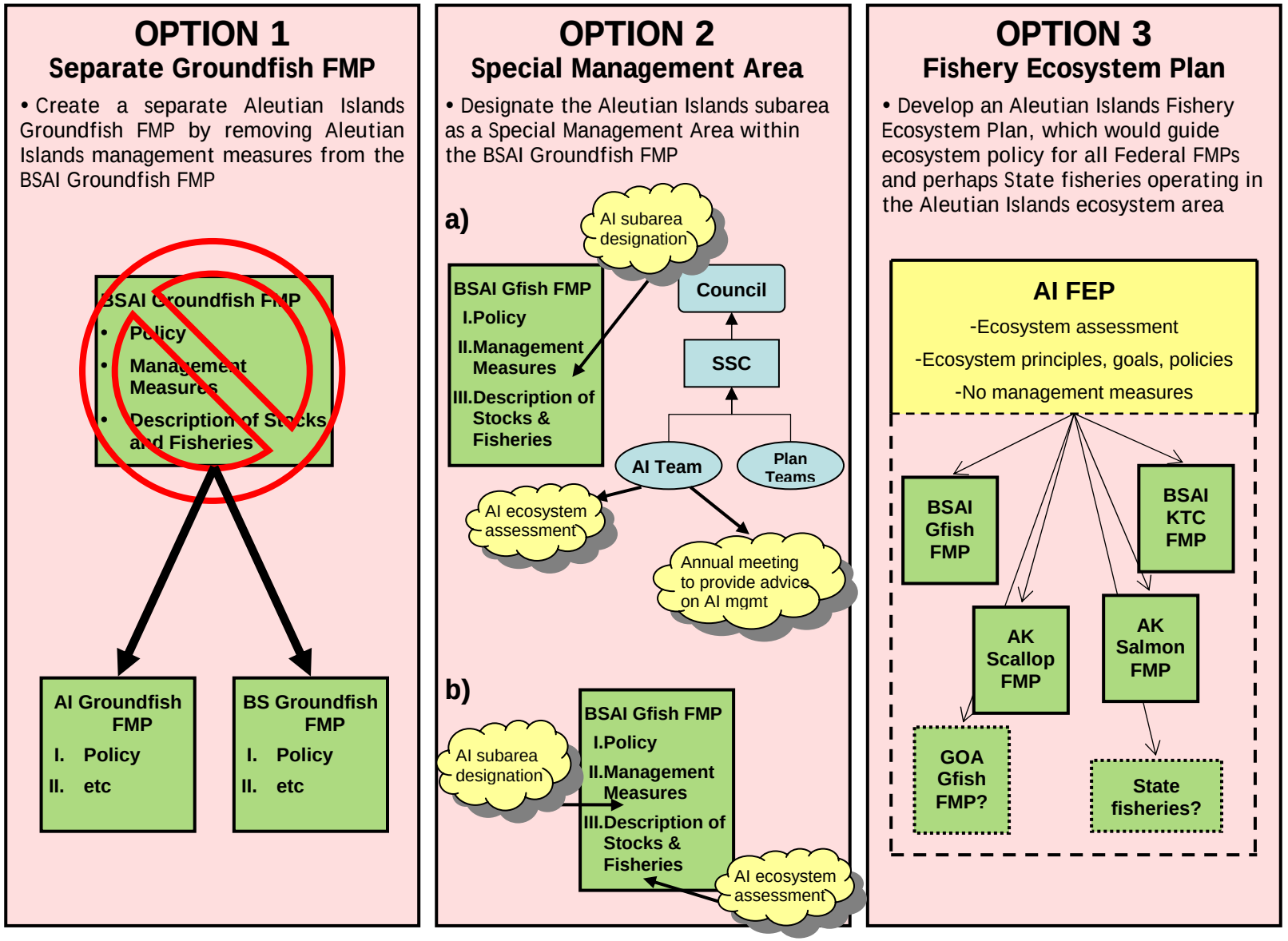
Designating a Special Management Area would involve an amendment to the BSAI groundfish FMP. This would require an assessment of the Aleutian Islands subarea, and potentially development of goals for the Aleutian Islands region. The Council may also choose to create an AI SMA team to provide advice to the Council on issues relating to the Aleutian Islands.

Preparing a Fishery Ecosystem Plan (FEP) would be a comprehensive process of collecting information about the Aleutian Islands ecological interactions, determining indices for monitoring ecosystem health and sustainability, and assessing fishery and non-fishery impacts on the sustainability of fisheries in the ecosystem. The FEP would apply to all Federal fisheries in the ecosystem area, and would provide guidance via ecosystem objectives to the FMPs.

Table 4 Management options for area-specific management in the Aleutian Islands

	Aleutian Islands Groundfish FMP	**Special Management Area within BSAI Groundfish FMP**	**Aleutian Islands FEP**
Boundary	Would need to be defined • likely would include the AI subarea, and could also include parts of the Bering Sea subarea and the Western Gulf regulatory area	Aleutian Islands (AI) subarea	Would need to be defined • e.g., a polygon around the Aleutian Islands that includes the foraging range of AI predators so that their demands are in balance with prey production
Applicability to federal and state fisheries	Federal: groundfish State: parallel fisheries?	Federal: groundfish State: parallel fisheries?	Federal: all (groundfish, halibut, crab, scallop) State: parallel and state water?
Affect on current fishery management measures	Yes • BSAI and perhaps GOA groundfish management measures and regulations rewritten to accommodate new FMP	Perhaps • ecosystem focus could result in amendments to the BSAI Groundfish FMP to enhance conservation of the Aleutian Islands	Perhaps • ecosystem focus could result in amendments to some or all AI FMPs to enhance conservation of the Aleutian Islands

Figure 16 Three options for area-specific management in the Aleutian Islands



7 Conclusions and Next Steps

To the best of our knowledge, current management of the Aleutian Islands is not adversely impacting the sustainability of fish stocks or the environment. A recent programmatic analysis of the BSAI Groundfish FMP concluded that fishery management of the Aleutian Islands groundfish fisheries implements precautionary harvest policies that prevent overfishing of target stocks, reduce the likelihood that stocks will become overfished, and provide additional protection against uncertainty in order to achieve the goal of preserving the food web (NMFS 2004a). When a potentially adverse impact is identified, the Council and NOAA Fisheries act to protect and conserve resources and the environment.

At the same time, there appears to be a disparity between the quality of information available for the Bering Sea and that available for the Aleutian Islands. Far more is known and understood about oceanographic processes of the Bering Sea and the stocks and their habitat. In the Aleutian Islands, scientists have recently discovered an abundance and diversity of sessile invertebrates on the ocean floor beyond what was anticipated. Each subsequent submersible research cruise has discovered new species. Our understanding of oceanographic and geological processes in the Aleutian Islands is currently insufficient to predict where these abundant areas are likely to occur, and the value of these habitats. For these reasons, it may be appropriate to pursue area-specific management for the Aleutian Islands area to give more focus and attention to this region and perhaps to be precautionary in making management decisions. The dissimilarities between the Bering Sea and Aleutian Islands environments, and our knowledge of each, suggest that the two areas should perhaps be considered independently.

Consideration of ecosystem factors reinforces this conclusion. The bathymetry, meteorology, and oceanography of the Aleutian Islands is considerably different from the Bering Sea. Marine mammals and seabirds inhabit the islands in far greater abundance than in the Bering Sea. Ecosystem and food web models have been developed for the Bering Sea for many years, but only recently for the Aleutian Islands. Given the uncertainty surrounding fishery dynamics and ecosystem processes in the Aleutian Islands, area-specific management could be warranted as a precautionary measure.

As presented here, none of the options would require the Council to change any of its current management measures for the Aleutian Islands. The options merely present different ways that the Council might consider focusing attention on the Aleutian Islands, either through a desire to move forward with an ecosystem approach to fisheries, or through a recognition that the unique characteristics of the Aleutian Islands merit consideration separate from the issues of the eastern Bering Sea.

Where do we go from here?

This draft discussion paper explores some of the reasons for initiating area-specific management in the Aleutian Islands, and what kind of management options would accomplish such a management goal.

At the February 2005 meeting, the Council directed its Ecosystem Committee to provide recommendations on the issue of area-specific management for the Aleutian Islands and whether it should be pursued. Based on discussions with the Committee, staff has revised this draft paper, and the Committee will provide its recommendations to the Council at the June 2005 meeting.

To initiate further action on this issue, the Council may do one of two things. The Council may find that the information provided in the discussion paper is sufficient to allow the decision of a course of action. In this case, the Council would direct staff to proceed with the development of one of the options, an AI Groundfish FMP, a BSAI Groundfish amendment to designate a Special Management Area, or the development of an Aleutian Islands Fishery Ecosystem Plan.

Alternatively, the Council may decide to initiate an analysis of multiple options. In that case, staff would proceed with developing each option but in a framework fashion, until such time as the Council is ready to make a decision.

In both scenarios, development of the options will require multiple Council meetings, expert agency and public input, and potentially a NEPA process to implement.

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Appendix A Ways for the Council to move forward with an Ecosystem Approach to Fisheries

One way for the Council to move forward with implementing an ecosystem approach to fisheries is to pursue ecosystem-based fishery management in the Aleutian Islands, as described in the discussion paper. This would allow the Council to test the development of an explicit EAF management strategy. Changing the management focus from individual consideration of, for example, management of groundfish in the Aleutian Islands, to considering the specific ecosystem area as a whole, would be a next step in applying an EAF.

A Fishery Ecosystem Plan is not the only way the Council could move forward with EAF, however. The Council could establish some new protocols for conducting EAF as part of the normal Council process. These might include:

- Holding an annual special "ecosystem" meeting during which the Council hears presentations and updates on the status of the currently-measured components of the ecosystem including ocean temperatures and currents, plankton abundance, other productivity measures, oceanographic anomalies (e.g. coccolithophore blooms, phenology of sea ice advance/retreat), forage fish abundance and distribution, target fish species population ecology, and marine mammal and seabird status. This meeting could be held as a sixth meeting added to the current cycle; or it could be convened immediately prior to a regularly-scheduled Council meeting, and thus lengthen it, potentially appreciably. The intent of this meeting would be to place a prominent focus on ecosystem issues during the Council's annual meeting cycle.
- Another option would be to hold an ecosystem briefing, perhaps a day or so in length, just prior to the beginning of the specifications process. This would place new ecosystem information before the Council as it begins consideration of TACs, bycatch allowances, PSC caps, etc. A special ecosystem briefing could more purposely place ecosystem values into the mindset of the specifications process. Some might consider a shorter briefing of this nature as giving short shrift to ecosystem values.
- Council and NOAA Fisheries staffs might develop an ecosystems briefing book that would accompany the above meetings. This would serve as a reference document the Council uses as fishery quotas or other management decisions are made through the course of the coming year.
- The Plan Teams might prepare an ecosystem assessment, based on the ecosystems considerations chapter in the SAFE; this document would be more of a synthesis of information and would describe known fishery interactions with the various components of the marine environment, outline uncertainty in our knowledge, and list the planned research efforts that will be conducted in the coming year(s) to improve our knowledge of these interactions and relationships.
- And regardless the approach taken, the Council would likely need to develop a process to facilitate additional stakeholder participation in fishery management decisions. The Council also may need to dedicate staff to their ecosystem management efforts.

The purpose in implementing one or more of the above options would be to place before the Council new information on ecosystem functions, and afford the Council a glimpse at the "status of the ocean" so that fishery management decisions might be made with more of a conscious and deliberate inclusion of ecosystem values and elements in that process. The Council also would be provided an expression of uncertainty in our current understanding of ecosystem functions and relationships to fish production, with the end result the Council perhaps being more conservative in making management decisions as uncertainty increases.

It should be noted that humans already possess a great deal of knowledge of the marine systems in the North Pacific, and perhaps one of the Council's objectives in pursuing ecosystem-based fishery management would be the full consideration of this knowledge. At the least, the Council should seek to use what we know about these marine ecosystems, and continually update our knowledge and apply it to fishery management decisions. The key will be to develop a process that can effectively apply this enormous information base to management decisions.

The source of the information used for fishery management should also be consciously considered by the Council. As mentioned above, there exists a large body of data and information products available with which to help make management decisions. One of the findings of the *Managing Our Nation's Fisheries II* national conference was a recognition that the data we have available are not always fully utilized, and should be. Annual scientific surveys, stock assessments, and special environmental studies all contribute, annually or more or less frequently, to the information base used by the Council. Local and traditional knowledge, including ecological knowledge passed through generations of Native inhabitants, should also be included in the process. In using all the information that will be available, the Council might consider in its planning process these various sources of information and the means by which this information would be applied to decision making.

An important perspective on ecosystem-based fishery management is that the ecosystems of the North Pacific are now in a state that reflects current utilization of marine resources. Millions of metric tons of shellfish and groundfish are harvested from these seas annually. Ecological theory often includes definitions of components, relationships, and synergisms in an ecosystem from a pristine perspective. But few marine areas on the planet are now in such pristine state. Many consider the North Pacific relatively "healthy" marine system. It is also a productive ecosystem, from which biomass, and therefore energy, is removed annually. The process of ecosystem-based management should recognize this as part of the baseline, and an EAF likely should evaluate potential future increases or reductions in fish removals in this context. Fisheries must still be considered stressors of the North Pacific's marine environment, but the human presence is part of the ecosystem as it now functions and ecosystem management should be considered in this context.

Appendix B Excerpt from *Ecosystem-based Fishery Management: A Report to Congress by the Ecosystems Principles Advisory Panel*, April 1999

Principles

- The ability to predict ecosystem behavior is limited.
- Ecosystems have real thresholds and limits which, when exceeded, can effect major system restructuring.
- Once thresholds and limits have been exceeded, changes can be irreversible.
- Diversity is important to ecosystem functioning.
- Multiple scales interact within and among ecosystems.
- Components of ecosystems are linked.
- Ecosystem boundaries are open.
- Ecosystems change with time.

Goals

- Maintain ecosystem health and sustainability.

Policies

- Change the burden of proof.
- Apply the precautionary approach.
- Purchase "insurance" against unforeseen, adverse ecosystem impacts.
- Learn from management experiences.
- Make local incentives compatible with global goals.
- Promote participation, fairness, and equity in policy and management.

Recommendations

Develop a Fisheries Ecosystem Plan

- Delineate the geographic extent of the ecosystem(s) that occur(s) within Council authority, including characterization of the biological, chemical, and physical dynamics of those ecosystems, and "zone" the area for alternative uses.
- Develop a conceptual model of the food web.
- Describe the habitat needs of different life history stages for all plants and animals that represent the "significant food web" and how they are considered in conservation and management measures.
- Calculate total removals – including incidental mortality – and show how they relate to standing biomass, production, optimum yields, natural mortality, and tropic structure.
- Assess how uncertainty is characterized and what kind of buffers against uncertainty are included in conservation and management measures.
- Develop indices of ecosystem health as targets for management.
- Describe available long-term monitoring data and how they are used.

- Assess the ecological, human, and institutional elements of the ecosystem which most significantly affect fisheries, and are outside Council/Department of Commerce (DOC) authority. Included should be a strategy to address those influences in order to achieve both FMP and FEP objectives.

Measures to Implement FEPs

- Encourage the Councils to apply ecosystem Principles, Goals, and Policies to ongoing activities.
- Provide training to Council members and staff.
- Prepare guidelines for FEPs.
- Develop demonstration FEPs.
- Provide oversight to ensure development of and compliance with FEPs.
- Enact legislation requiring FEPs.

Research Required to Support Management

- Determine the ecosystem effects of fishing.
- Monitor trends and dynamics in marine ecosystems (ECOWATCH).
- Explore ecosystem-based approaches to governance.