Revised Final
Reasonable and Prudent Alternatives
for the Pollock Fisheries in the Bering Sea and Aleutian Islands and Gulf of Alaska
with Supporting Documentation

prepared by: the National Marine Fisheries Service, Alaska Region

October, 1999

I. Executive summary

On December 3, 1998, the Office of Protected Resources of the National Marine Fisheries Service (NMFS) issued a Biological Opinion on three federal actions proposed for 1999 to 2002. The actions were authorization of the Atka mackerel fishery of Bering Sea/Aleutian Islands, authorization of the pollock fishery of the same region, and authorization of the pollock fishery of the Gulf of Alaska. The Opinion evaluated the best scientific data available to determine if (1) the proposed fisheries could reasonably be expected to appreciably reduce the likelihood survival and recovery of the western population of Steller sea lions in the wild by reducing their reproduction, numbers, or distribution or (2) the proposed fisheries could reasonably be expected the appreciably diminish the value of critical habitat for the survival and recovery of Steller sea lions.

The Steller sea lion was listed as threatened in 1990. The listing followed severe declines of the species throughout the Gulf of Alaska and Aleutian Islands region, which was the center of its range in the North Pacific. In the 1990s, the species has continued to decline and, since the late 1970s, counts of Steller sea lions in this region have dropped by more than 80%. In 1997, NMFS recognized that the Steller sea lion consisted of two distinct populations, split at the 144°W long. line, and reclassified the western population as endangered.

A number of factors are either known to have contributed to the recent decline, or are suspected of having done so. The leading hypothesis has been that sea lions have recently declined due to factors causing nutritional stress, which adversely affects the growth and condition of animals, and their probabilities of reproduction and survival. Nutritional stress may result from a range of factors that could affect the availability of sea lion prey. Changes in prey availability may occur through natural causes, such as changes in environmental or oceanographic conditions, or as a result of human activities such as commercial fisheries, or through some combination of these factors.

The Biological Opinion concluded that the Atka mackerel fishery was not likely to jeopardize the continued existence of the western population of Steller sea lions or adversely modify its critical habitat. However, the Opinion also concluded that both of the pollock fisheries, as they had been proposed in 1998, were likely to jeopardize the continued existence of the endangered western population of Steller sea lions and adversely modify critical habitat designated for this sea lion population.

The jeopardy and adverse modification conclusions were reached for the same fundamental reason: the two pollock fisheries would compete with Steller sea lions by removing their food from important foraging areas at crucial times of the year. The fisheries are concentrated spatially in Steller sea lion critical habitat, and temporally during the winter period when sea lions (especially adult females with pups, pups, and juveniles) are likely to be particularly sensitive to reductions in prey availability.

When NMFS issues a “jeopardy” biological opinion, the Endangered Species Act requires NMFS to provide reasonable and prudent alternatives (RPAs) that identify ways to modify proposed actions to avoid the likelihood of jeopardizing listed species and adversely modifying critical habitat. NMFS used the RPAs of its December 3, 1998, Biological Opinion, to developed a framework that avoided the likelihood of jeopardizing Steller sea lions or adversely modifying their critical habitat while providing the North Pacific Fishery Management Council (Council) flexibility to develop specific management measures for the fisheries based on current assessments of the pollock stock and the fishing fleet.

The framework established by the RPAs was built on three principles following directly from the analyses in the Opinion and its conclusions. Those analyses indicated that while the overall removals of pollock from the Bering Sea and Gulf of Alaska were considered safe for the pollock stocks, concentration of the fisheries over time and space increased the potential for localized depletion of prey relative to the needs of sea lions; i.e., competition. The principles, then, were established to 1) preclude fisheries competition for prey resources around rookeries and major haulouts (Principle 1), 2) disperse the fisheries temporally to minimize the likelihood of locally-depleting the pollock resource (Principle 2), and 3) disperse the fisheries spatially to further minimize the likelihood of locally-depleting the pollock resource (Principle 3). The principles did not include a reduction in the catch quotas for these

two fisheries, but rather dispersed them in time and space to avoid jeopardy and adverse modification.

The RPA framework also provided guidelines for management measures required to achieve these principles. The guidelines were listed in the Biological Opinion, along with examples of management measures intended to meet those guidelines. The Council initially provided recommendations for management measures at its December 1998 meeting. NMFS evaluated those recommendations and incorporated them, with some modification, into the RPAs of the Biological Opinion and into an emergency rule regulating the fisheries for the first half of 1999. At its June 1999 meeting, the Council made additional recommendations for an extension of the emergency rule to cover the later half of 1999, and for a permanent rule for 2000 and beyond.

The Biological Opinion was challenged in the United States District Court for the Western District of Washington. The Court upheld the conclusions of the Opinion, but ruled that the RPAs were arbitrary and capricious, for lack of sufficient explanation. The Court remanded the Opinion back to NMFS for analysis and explanation of a set of Revised Final Reasonable and Prudent Alternatives (RFRPAs)

To comply with the Court's Order, NMFS conducted additional analyses and considered recommendations from the Council to develop RFRPAs. NMFS believes these RFRPAs, taken together, address the Court's concerns and will avoid the likelihood of jeopardizing the western population of Steller sea lions or adversely modifying its critical habitat in conjunction with the pollock fisheries.

The RFRPAs reflect a hierarchy of concerns about the potential effects of the pollock fisheries on Steller sea lions. Those concerns are greatest with respect to critical habitat areas around rookeries and major haulouts, intermediate in special foraging areas of critical habitat, and least for areas outside of critical habitat. Overall, the RFRPAs are consistent with the original principles and guidelines, although several of them differ from the original RPAs for reasons that will be explained in this document.

Consistent with the principles and the hierarchy of concerns, the overall strategy of the RFRPAs is to protect prey resources around rookeries and major haulouts and to avoid competition between the pollock fisheries and key segments of the sea lion population within critical habitat. First, the RFRPAs protect the prey resources around 123 rookeries and haulouts in the Gulf of Alaska, Bering Sea, and Aleutian Islands (Principle 1) by excluding or severely restricting the pollock fishery from these areas. Second, the RFRPAs prohibit trawling for pollock from November 1 to January 20 in both the Bering Sea and Gulf of Alaska, a time when sea lions are thought to be especially sensitive to competition, and disperse the fisheries by establishing four fishing seasons in the Gulf of Alaska and Bering Sea CHCVOA (Principle 2). Third, the RFRPAs distribute the pollock catch according to the distribution of the stock, establish the Shelikof Strait management area in the Gulf of Alaska, and reduce catch from the critical habitat/catcher-vessel-operation-area (CHCVOA) in the Bering Sea (Principle 3). Also, the Aleutian Islands area was closed to directed fishing for pollock. This closure was recommended by the Council and accepted by NMFS as a general precautionary measure. As such, this closure may have significant conservation benefits for a large area where 45% of the sea lion population was found before its decline.

The efficacy of these RFRPAs is revealed by harvest rates observed in 1999 and expected in 2000 and beyond. With very limited exception (explained in the document), harvest rates around rookeries and major haulouts of sea lions will be zero. The harvest rate from November 1 to January 20 will be zero. For the fished part of the year, local harvest rates each season will be consistent with an overall harvest rate dispersed temporally and spatially in the areas most important to sea lion foraging. Through such dispersal of these fisheries, NMFS has eliminated the excessive localized harvest rates that were the basis for its determination that concentration of the fisheries in time and space is likely to lead to detrimental competition between sea lions and the fisheries.

NMFS considers these RFRPAs to be extensive and comprehensive. They affect major changes to dynamic fisheries that have been managed in a conservative fashion. And, importantly, these RFRPAs will continue to be evaluated over time to insure that they are sufficient and successful in avoiding jeopardy and adverse modification.

Therefore, NMFS believes that with these RFRPAs, the pollock fisheries in the Bering Sea and Gulf of Alaska will not jeopardize the continued existence of the western population of Steller sea lions or adversely modify its designated critical habitat.

Table I - Summary of Revised Final Reasonable and Prudent Alternatives			
Guideline in Biological Opinion	Council recommendation	NMFS action	Rationale
Principle: Protection of prey resources around rookeries and major haulouts			
Required spatial separation of pollock trawl fishing and Steller sea lion foraging areas adjacent to rookeries and haulouts.	Council recommended: - closure of 25 rookeries and haulouts in the Bering Sea, - closure or partial closure of 44 rookeries and haulouts in the Gulf of Alaska, with nine sites open or partially closed, and - closure of Aleutian Islands area (45 sites).	NMFS will: - close 25 rookeries and haulouts in the Bering Sea, - close 48 rookeries and haulouts in the Gulf of Alaska, with five sites remaining open to limited fishing (two sites in waters of the State of Alaska, two sites where research on fishery effects will be conducted, and one site with alternative protective measures), and - close Aleutian Islands area.	Action necessary to prevent competition between pollock fisheries and sea lions (especially adult females, pups, and juveniles), around the areas most essential to population recovery.
Established criteria for identification of sites to be protected: - Nov 1 to June 1 - at least 75 sea lions in a single count since 1979 - June 1 to Nov 1 - at least 200 sea lions in a single count since 1979.	Council's motion based on criteria established in Biological Opinion.	NMFS action based on criteria established in Biological Opinion.	Criteria necessary to identify important rookery and haulout sites based on distribution, foraging, and hauling patterns of adult females, pups, and juveniles.
Established the size of protection zones around rookeries and haulouts in the Bering Sea (20 nm), Gulf of Alaska (10 nm), and Aleutian Islands (entire area).	Council's motion based on criteria established in Biological Opinion, plus the overall closure of Aleutian Islands area.	NMFS action based on criteria established in Biological Opinion, plus the Council recommended closure of Aleutian Islands area.	Action based on observations of foraging range of sea lions (adult females, pups, and juveniles). Necessary to protect prey resources for these essential elements of the sea lion population.

Table I - Summary of Revised Final Reasonable and Prudent Alternatives			
Guideline in Biological Opinion	Council recommendation	NMFS action	Rationale
Principle: Temporal dispersion of pollock fisheries			
Required prohibition on all pollock trawling fisheries in the period from November 1 through January 20 and extend to the Gulf of Alaska.	Council continued prohibition of fishing during November 1 to January 20 period in Bering Sea, and extended prohibition to Gulf of Alaska.	NMFS continued prohibition of fishing during November 1 to January 20 period in Bering Sea, and extended prohibition to Gulf of Alaska.	Action based on greater sensitivity of sea lions to competition and reductions in prey availability in winter period, particularly for lactating and pregnant adult females, pups learning to forage and weaning (or weaned and juveniles with limited foraging experience.
Distribute the pollock trawl harvest into at least four seasons (two in the period from January through May and two in the period from June through October).	Council motion established four seasons for Gulf of Alaska, four seasons for catcher/processor and inshore sectors of Bering Sea, and two seasons for mothership and the Community Development Quota (CDQ) sectors of Bering Sea.	NMFS establishes four seasons for Gulf of Alaska, four seasons inside the critical habitat catcher vessel operation area (CHCVOA) in the Bering Sea, and two seasons outside the CHCVOA in the Bering Sea.	Action disperses the fisheries from two major pulses in the late winter/spring and fall into four seasons distributed more evenly through the year to avoid temporal concentration of the fisheries and the increased probability of localized depletion resulting from such concentration.
Limit combined total allowable catch (TAC) in the winter and spring period to a maximum of 45% of the annual TAC.	Council recommended reducing the portion of the annual TAC taken in the winter and spring period to 40%.	NMFS action reduces the portion of the annual TAC taken in the winter and spring period to 40%.	Precautionary reduction in the portion of the TAC taken during the period when sea lions (especially adult females with pups, pups, and juveniles) may be especially sensitive to reductions in available prey.
Allocate single-season TACs to be no more than 30% of the annual TAC.	Council recommended limiting the portion of the annual TAC taken in each fishing season to no more than 30%.	NMFS action uses the 30% cap each season in the Gulf of Alaska and inside the CHCVOA in the Bering Sea.	Action necessary to ensure the integrity of the four-season system and temporal dispersion in areas most important for sea lion foraging.

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Guideline in Biological Opinion	Council recommendation	NMFS action	Rationale
Prevent concentration of pollock catch at the end of one season and the beginning of the next season which, in effect, could result in a single pulse of fishing.	Council recommended separation of fishing seasons based on brief stand-down periods in the Bering Sea and relatively longer stand-down periods in the Gulf of Alaska.	NMFS action establishes evenly spaced seasons in the CHCVOA of the Bering Sea to ensure temporal dispersion in areas most important to sea lions, while allowing greater flexibility for industry in areas outside the CHCVOA in areas of less importance to sea lions. NMFS action also adopts seasonal schedule for Gul f of Alaska as recommended by Council.	Additional action by NMFS ensures that the fishing seasons are well-dispersed throughout the fished part of the year, thereby avoiding temporal concentration which can lead to localized depletion.
Limit rollover of portions of seasonal TACs to situations only where necessary to account for premature fisheries closure resulting from inaccuracies associated with monitoring of seasonal catches.	Council recommended allowance for rollovers as long as the seasonal caps and areal apportionments are observed.	NMFS action allows for rollovers as long as seasonal caps and areal apportionments are observed.	Action ensures the integrity of the four-season system and prevents disproportionate shifting of TAC into one season.

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Guideline in Biological Opinion	Council recommendation	NMFS action	Rationale
Principle: Spatial dispersion of pollock fisheries			
Allocate percent TAC to areas defined by critical habitat (CH) and broad management districts based on the pollock biomass distribution.	Council recommended: - 15% and 25% caps in the C and D seasons (respectively) of Bering Sea, and - creation of Shelikof Strait management area in the Gulf of Alaska, to utilize existing information on stock distribution in the Gulf.	NMFS action establishes: - 15% and 25% caps in the C and D seasons (respectively) of the Bering Sea, and - Shelikof Strait management area in the Gulf of Alaska.	Action prevents spatial concentration of the fisheries in a manner inconsistent with the distribution of the stock. Disproportionate harvesting can lead to localized depletion relative to the needs of Steller sea lions.
Absent good scientific estimates of pollock biomass distribution, place a maximum limit on the percent of TAC allocations from CH areas for each season.	Council recommended a cap of 50% in the CHCVOA during the A and B seasons in the Bering Sea (when biomass distribution not known).	NMFS establishes a cap of 50% in the CHCVOA during the A and B seasons in the Bering Sea (when biomass distribution not known).	Action implements a precautionary cap to prevent excessive harvesting in the CHCVOA.
Allow for the possibility of further reduction of percent of TAC in specific critical habitat areas.	No Council recommendation.	The percentage of TAC is fixed inside and outside critical habitat to minimize competition between Steller sea lions and the pollock fisheries. Changes will only occur based on the equivalency principle of protection.	Action, if necessary, would prevent excessive competition in critical areas.
Prevent redistribution of TAC from areas outside of critical habitat to areas inside of critical habitat.	No Council recommendation.	The percentage of TAC is fixed inside and outside critical habitat to minimize competition between Steller sea lions and the pollock fisheries. Changes will only occur based on the equivalency principle of protection.	Action, if necessary, would prevent excessive competition in critical areas during the A and B seasons.

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Guideline in Biological Opinion	Council recommendation	NMFS action	Rationale
Base spatial distribution of the TAC on existing study or management areas. In addition, in the southeastern Bering Sea, the CVOA and southeastern Bering Sea foraging area should be combined to form one CVOA-CH complex.	Council recommended spatial distribution of catch based on areas inside and outside the CHCVOA in the Bering Sea and using existing management areas plus a new Shelikof Strait area in the Gulf of Alaska. Council declined to disperse catch spatially outside of the CHCVOA in the Bering Sea.	NMFS action disperses catch spatially inside and outside the CHCVOA in the Bering Sea and uses existing management areas plus a new Shelikof Strait area in the Gulf of Alaska. NMFS believes that spatial dispersion outside the CHCVOA will occur as a function of general fishing practices as modified by the American Fisheries Act.	Action disperses catch more in accord with stock distribution to buffer against local depletion.

II. Introduction

A. The North Pacific fisheries

The fisheries in the North Pacific, including the Bering Sea, are the largest in the United States and amongst the largest in the world. This mirrors the fact that continental shelves off Alaska make up about 74% of the total area (845,734 nm^2) of the United States continental shelf. These fisheries exist because of the massive size of the resource in this area. Pollock, one of the dominant species in the fisheries, are also one of the dominant species in the ecosystem. Over the last 20 years, the biomass of this resource off Alaska has varied from between approximately 8 million and 16 million mt. While the biomass has been at the lower end of this range in recent years, pollock stocks are increasing in the Bering Sea but decreasing in the Gulf of Alaska due to natural fluctuations. This is an extremely diverse ecosystem comprised of huge abundances of a myriad of species from the lower end of the food chain, phytoplankton, to the upper end with the top predators including marine mammals and man. This system has consistently produced yields to commercial fisheries of around 5 billion lbs of fish per year for some 30 years.

B. Commercial fisheries management off Alaska is conservative

This sustainable production has in large measure been due to the productivity of the environment coupled with a conservative approach to management of these harvests. In the past 20 years, harvests of all species, including pollock, have been strictly regulated by a system of quotas supported by an intensive monitoring program of in-season data collection backed up by an extensive observation program including 100% coverage by NMFS-certified observers on larger vessels. This quota system and monitoring is unprecedented in fisheries management across the United States.

One measure of the success of this system has been the way in which resources are monitored and quotas are set. Total removals of groundfish including pollock are controlled by conservative catch quotas that incorporate uncertainty and take into account factors such as predator consumption and ecosystem concerns. The quota setting procedures incorporate safeguards against overly aggressive harvest rates, particularly under conditions of high uncertainty. For example, in 1999, the North Pacific Fishery Management Council recommended and NMFS implemented an acceptable biological catch (ABC) level for Bering Sea pollock of 992,000 mt which is 27% lower than the maximum ABC of 1,370,000 mt that would have been permissible under management formulas contained in the fishery management plan. The fact that pollock is a primary prey source of Steller sea lions was cited as one reason for adopting a more conservative ABC. Over the past 20 years, harvest rates could have been 20% or more higher if Alaska pollock stocks were managed using less conservative but acceptable harvest rates comparable to those currently used to manage similar gadid stocks elsewhere in the world.

C. Steller sea lion decline

The decline of the Steller sea lion[1] began in the Aleutian Islands region and spread eastward and westward through the late 1970s and early to mid 1980s, but was most severe in the mid-1980s. This decline began and continued during periods of high pollock abundance and long before the commercial pollock fisheries began to concentrate in areas of critical habitat. Consequently, NMFS does not believe that the decline of Steller sea lions over this period was caused by overexploitation of pollock stocks or excessively high exploitation rates within critical habitat areas. However, when this consultation began in 1998, NMFS was faced with a proposed 1999 fishery that, without further regulation, could have concentrated all of the A season (winter) pollock fishery and approximately half of the B season (summer/fall) fishery into an intensive race for fish within Steller sea lion critical habitat areas in the Bering Sea, and that could have concentrated much of the Gulf of Alaska pollock

[1] For the remainder of the document, all references to Steller sea lions and their critical habitat pertain to the western population only, unless stated otherwise.

harvest from areas adjacent to Steller sea lion haulouts and rookeries. In fact, during the period 1991-1998 some of this concentration occurred and increased in some areas.

In the absence of regulatory action, the 1999 Bering Sea pollock fishery could have harvested up to 446,400 mt (all of the A season quota) from Steller sea lion critical habitat during a single intense A season fishery, and up to 327,000 mt (60% of the B season quota) from critical habitat during a single intense B season. In total, nearly 75% of the 992,000 mt Bering Sea pollock TAC could have been taken from Steller sea lion critical habitat. Had the 1999 Bering Sea pollock TAC not been reduced by 27% from maximum sustainable levels in part due to concerns about Steller sea lion foraging needs, potential harvest levels in critical habitat could have been higher still. In the Gulf of Alaska, 10 nm no-trawl zones around nine sea lion rookeries have been in place since 1992. The 1999 pollock fishery could have proceeded unrestricted in areas adjacent to 44 haulouts that have been identified as critical habitat in the Gulf of Alaska.

In making a jeopardy determination for the proposed 1999 pollock fisheries, NMFS considered the potential magnitude of the fishery within critical habitat as identified above, and a trend of increasing pollock harvests within critical habitat in both the Bering Sea and Gulf of Alaska throughout the 1990s. The resulting RPAs were designed to disperse the fishery away from critical habitat areas and limit the potential for the fishery to cause localized depletions of pollock stocks in areas of foraging importance to Steller sea lions.

D. Recently implemented measures to reverse the Steller sea lion decline

In 1999, a number of significant changes occurred which greatly modified temporal and spatial distribution of the fishery. Under the 1999 RPA emergency rule recommended by the Council and promulgated by NMFS, the A season TAC allocation was reduced from 45 to 40% (a 50,000 mt reduction). Removals from the Bering Sea critical habitat/catcher vessel operational area (CHCVOA) were limited to 62.5% of the A season TAC and broken up into two seasons. During the first two seasons in 1999, the fishery actually harvested 221,804 mt (or 58%) of the A season TAC from CHCVOA compared to the 446,000 mt that could have been taken in the absence of RPA measures. Further measures were taken to reduce the amount of harvest during the B/C season period in the CHCVOA from a potential of 327,000 to 166,500 mt. In addition, the entire Aleutian Islands management area was closed to pollock fishing, an area over 700 nm long which was epicenter of the Steller sea lion decline in the 1970s and 80s. This was a significant action given that the Aleutian Islands management area contains 19 Steller sea lion rookeries and 31 important haulouts and was home to approximately 45% of the pre-decline western population of Steller sea lions. Finally, 36 of 44 sea lion haulouts in the Gulf of Alaska were closed to pollock fishing within 10 nm (with the intent to phase-in protection measures for the remaining eight sites for 2000 and beyond). Additional measures such as trip limits, separate quotas for Shelikof Strait, and the use of four instead three seasons were used to further disperse the Gulf of Alaska pollock fishery temporally and spatially.

E. The American Fisheries Act

Implementation of the American Fisheries Act (AFA) which began in 1999, also has had a profound effect on the conduct of the Bering Sea pollock fishery and a lesser effect on the Gulf of Alaska pollock fishery. Under the AFA the catcher/processor sector was reduced from 30 to 21 vessels, a 30% reduction in potential harvesting capacity relative to 1998. And, the catcher/processor sector has made further reductions in fleet size through cooperative agreements. In 1999, only 16 vessels participated in the first two seasons and only 12 vessels have participated to date in the third and fourth seasons which means that the 1999 catcher/processor fleet was approximately half its pre-AFA size. The effect has been an elimination of the Olympic-style race for fish and a dramatic moderation of daily catch rates for the catcher/processor sector of the fleet, which takes 40% of the Bering Sea pollock quota.

The provisions of the AFA affecting the inshore and mothership sectors of the fleet will not be fully implemented until 2000 and are expected to have a similar dramatic effect on the prosecution of the pollock fishery in those sectors. Regulations are currently under development, and are intended to be in place in 2000, that would

facilitate the formation of fishery cooperatives in the inshore and mothership sectors of the Bering Sea pollock industry. If the inshore and mothership sectors of the industry are able to successfully form cooperatives in 2000, we anticipate a significantly greater temporal dispersion of the fishery, especially during the summer and fall months as the Olympic-style race for fish is eliminated. The moderation of aggregate daily catch rates is expected to be most dramatic during the summer and fall months because some inshore processors traditionally convert to salmon processing during the summer months and will wish to delay pollock operations until late summer, after the salmon fishing seasons are over. However, other inshore processors are not geographically situated to process salmon and have indicated an interest in beginning their pollock operations much earlier in the summer. Consequently, the formation of cooperatives in the inshore sector is expected to provide for a more natural dispersion of inshore pollock operations over time and space as the different inshore operations pursue different business objectives and chose to fish at different times of the year.

To prevent a spillover of effort from the Bering Sea to the Gulf of Alaska, the AFA places limits on the ability of Bering Sea vessels to fish in the Gulf of Alaska. Under the AFA, the Council has recommended a complex suite of restrictions on Bering Sea catcher vessels in the Gulf of Alaska pollock fisheries. In addition, under the Steller sea lion RPAs, the Council has recommended additional restrictions such as trip limits and a prohibition on crossing between the Bering Sea and Gulf of Alaska during the same fishing season. The combined effects of all of these measures is expected to significantly slow the pace of the Gulf of Alaska pollock fisheries in a manner consistent with the RPA principle of temporal dispersion. While it is difficult to project with precision the effects these changes will have on the pace of Gulf of Alaska pollock fisheries, the possible magnitude of such changes can be estimated. The combined effects of the Council's recommendations with respect to limiting participation by Bering Sea vessels in the Gulf of Alaska is expected to discourage or prevent all but a few Bering Sea-based catcher vessels from continuing to fish in the Gulf of Alaska. Historically (in 1995-1997) Bering sea-based catcher vessels have accounted for approximately 75% of the pollock landings in areas 610 and 620 of the GOA, and more than 50% of pollock landings in area 630 and 640. If the bulk of this effort is removed from the Gulf of Alaska due to the combination of AFA and Steller sea lion measures, pollock seasons in the western half of the Gulf of Alaska (610 and 620) could last 2 to 3 times longer than in prior years and pollock seasons in the eastern half of the Gulf of Alaska (areas 630 and 640) could double in length.

F. Summary Of 1999 changes to avoid jeopardy

In summary, the changes implemented for the 1999 pollock fishery under the RPA-mandated emergency rule and AFA include:

- Establishment of a 23,749 nm^2 CHCVOA conservation zone in the Bering Sea and the restriction of pollock harvests in that area to approximately 388,000 mt compared to potential harvests of 773,000 in the absence of such regulation. In 2000, revised RPAs will further limit that harvest to 297,000 mt, and spread the harvest seasons in the CHCVOA even more dramatically.

- Closure of entire Aleutian Islands management area to pollock fishing. This area is over 700 nm long and contains 19 Steller sea lion rookeries and 31 important haulouts and was home to approximately 45% of the entire western population of Steller sea lions during the pre-decline period.

- The establishment of four instead of two fishing seasons for the major sectors of the Bering Sea pollock fishery and the establishment of four instead of three fishing seasons in the Gulf of Alaska. For 2000, the revised RPAs further separate the fishing seasons within the CHCVOA area in the Bering Sea.

- The closure of 52 haulouts in the Bering Sea and Gulf of Alaska which added marine areas totaling 9,926 nm^2 to Steller sea lion fishery closures. As a result, the total area affected by Steller sea lion trawl closures after the January 1999 emergency rule is the sum of 15,008 nm^2 (closed to all trawling around rookeries since 1993), plus the additional area closed to pollock fishing around haulouts (9,926 nm^2) and one rookery (289 nm^2), for a total of 25,223 nm^2. These rookery and haulout closures represent 24% of the critical habitat designated for the western stock of Steller sea lions.

- The reduction of the active Bering Sea catcher/processor fleet by approximately 50%.

- The elimination of the Olympic style race for pollock in the catcher/processor sector in 1999 and the potential for similar rationalization of the remaining sectors of the Bering Sea pollock industry by 2000.

G. Measures Implemented To Reverse The Decline

Since the initial listing of the species under the ESA, NMFS implemented a number of management measures to reverse the decline of sea lions and recover the species. With the initial listing, NMFS instigated:

- Monitoring of incidental kill in observed fisheries
- Aggressive enforcement of protective regulations
- Establishment of a Recovery Team
- Prohibition of shooting at or within 100 yards of sea lions
- Establishment of 3-nm buffer zones around principle rookeries
- Reduction of the allowable incidental kill quota from 1,350 to 675.

In addition to measures implemented since the initial listing, NMFS took additional actions through the remainder of the 1990s that could affect the decline of Steller sea lions and, either directly or indirectly, facilitate their recovery, as follows:

- In 1991, NMFS issued regulations to prevent wasteful roe-stripping and to allocate the pollock total allowable catch (TAC) in the Bering Sea and the Gulf of Alaska to two and four seasons, respectively.

- NMFS also split the pollock TAC for the combined western/central regulatory areas of the Gulf of Alaska into two areas, limited rollovers of pollock TAC, and prohibited fishing with trawl gear within 10 nm of 14 Steller sea lion rookeries.

- In 1992, NMFS implemented regulations to prohibit trawling year-round within 10 nm of 37 sea lion rookeries in the Bering Sea/Aleutian Islands region and Gulf of Alaska, expanded the protected zone to 20 nm for 5 of these rookeries during the period from January 1 to April 15, and established three management districts in the Gulf of Alaska.

- In 1993, NMFS published a Recovery Plan for the Steller Sea Lion, designated critical habitat, and expanded the no-trawl zone around Ugamak Island to 20 nm during the January 20 to April 15 period.

- NMFS also implemented regulations dividing the Aleutian Islands into three management districts, and initiated a status review on the Steller sea lion.

- In 1998, NMFS issued regulations creating a special forage fish species category in the fishery management plans for the Bering Sea and Aleutian Islands region and the Gulf of Alaska, and prohibited directed fishing on those forage fish in Federal waters. This step was a pro-active measure to prevent the development of fisheries on prey species important to sea birds and marine mammals, including Steller sea lions.

- NMFS also reduced the portion of the seasonal pollock allowance in the winter period (combined in 1996) in the Gulf of Alaska from 50% of the annual TAC to 40%, as a precautionary measure for avoiding adverse effects on Steller sea lions.

- NMFS and the North Pacific Fishery Management Council (Council) developed a set of precautionary measures to reduce the probability of fishery-induced localized depletion of Atka mackerel in Steller sea lion critical habitat.

H. Future Measures to be Implemented

NMFS intends to promulgate proposed and final rulemaking to implement the RFRPAs during the 2000 pollock fishery to conserve Steller sea lions. It is anticipated that alternative measures to the ones provided in the RFRPAs will be suggested during public comment. NMFS will analyze those suggestions for compliance with the jeopardy and adverse modification standards of the ESA and applicable regulations. If the alternative measures comply with the applicable standards of the ESA and other applicable law, NMFS may implement those measures.

III. The Biological Opinion

On December 3, 1998, the Office of Protected Resources of the National Marine Fisheries Service (NMFS) issued a Biological Opinion on three federal actions proposed for 1999 to 2002. The actions were 1) authorization of the Atka mackerel fishery of Bering Sea/Aleutian Islands, 2) authorization of the pollock fishery of the same region, and 3) authorization of the pollock fishery of the Gulf of Alaska. The Opinion focused on the potential effects of these fisheries on the western population of Steller sea lions.

The section 7 consultation on these fisheries, and resulting Opinion, did not address the TAC-setting process. The consultation accepted that the overall harvest rate for pollock is conservative and therefore maintains the pollock stock at a high sustainable biomass level. This conclusion is based on extensive scientific analyses presented in the Fishery Management Plans. Rather, the consultation and Opinion focused on the implementation and conduct of those fisheries in these two regions, and their potential impact on Steller sea lions. The major findings of the Biological Opinion were as follows.

- The leading hypothesis for the decline of the western population of Steller sea lions is related to nutritional stress.
- The available evidence suggests nutritional stress may reduce growth, condition, juvenile survival, and reproduction.
- Pollock are a major prey of the western population of sea lions.
- Pollock are also the target of the groundfish fisheries in the Bering Sea/Aleutian Islands and the Gulf of Alaska.
- Competition between sea lions and the fisheries occurs because they both target pollock of overlapping sizes, at overlapping depths, in the same regions, and during seasons when sea lions may be particularly sensitive to competition and reductions in pollock availability.
- These pollock fisheries are concentrated in time, particularly during the winter period when sea lions, especially young animals and adult females either pregnant or lactating or both, may be particularly sensitive to reductions in prey availability.
- The pollock fisheries are concentrated in space, particularly in areas designated as essential to the conservation of the western population largely on the basis of the prey located in those areas.
- Concentration of the pollock fisheries leads to localized harvest or removal rates that exceed those assumed to be safe when dispersed over time and space. Excessive local harvesting may reduce pollock availability to levels that are depleted with respect to the needs of foraging sea lions.
- The pollock fisheries occur in waters off rookeries and haulouts where considerable sea lion foraging is thought to occur. In these areas, such fishing is particularly likely to result in significant detrimental competition,

especially with adult females with pups, pups, and juveniles.

On the basis of this information, the environmental baseline, and the cumulative effects predicted for Steller sea lions, NMFS concluded that the pollock fisheries of the Bering Sea and Aleutian Island region and the Gulf of Alaska, as proposed in 1998, were likely to jeopardize the continued existence of the western population of Steller sea lions and adversely modify its designated critical habitat.

Pursuant to 50 CFR § 402.14(h)(3), a "jeopardy" biological opinion shall include reasonable and prudent alternatives (RPAs), if any, to the proposed action. Rather than provide explicit RPAs, the December 3, 1998 Biological Opinion established an RPA "framework" to avoid the likelihood of jeopardizing the continued existence of Steller sea lions or adversely modifying their critical habitat. The framework included guidelines (ranging from specific to general) for management measures to achieve three principles: 1) protection of waters adjacent to rookeries and haulouts, 2) temporal dispersion of the pollock fisheries, and 3) spatial dispersion of the fisheries. These three principles followed directly from the major findings of the Biological Opinion and, in combination, were intended to modify the fisheries to avoid jeopardy and adverse modification. The purpose of the framework was to allow input from the North Pacific Fishery Management Council (Council) and the public as to the best measures to avoid jeopardy and adverse modification, but also avoid unnecessary changes to the fisheries. On December 13, 1998, the Council recommended to the Secretary of Commerce management measures for the two pollock fisheries to comply with the framework established in NMFS's December 3, 1998, Opinion.

On December 16, 1998, NMFS adopted the measures recommended by the Council (with modifications) into the Biological Opinion as part of an RPA for the fisheries.[2] In NMFS's opinion, the management measures recommended by the Council (and after modification) did not completely avoid jeopardy and adverse modification for fishing seasons that would occur after June 1999. Therefore, NMFS returned to the Council at its February, April, and June meetings for further input into the measures required to avoid jeopardy and adverse modification. At its June meeting, the Council again recommended a set of management measures aimed at the pollock fisheries of the Bering Sea and Aleutian Islands region and the Gulf of Alaska for the latter half of 1999 (an extension of the emergency rule) and for 2000 and beyond (a permanent rule).

The Biological Opinion was challenged in the United States District Court for the Western District of Washington.[3] On July 9, 1999 (amended July 13, 1999) the Court upheld the no-jeopardy conclusion for the Atka mackerel fishery and the jeopardy conclusion for the pollock fisheries. However, the Court also found that "the Reasonable and Prudent Alternatives . . . were arbitrary and capricious . . . because they were not justified under the prevailing legal standards and because the record does not support a finding that they were reasonably likely to avoid jeopardy" (Court order, July 9, 1999; page 42).

On August 6, 1999, the Court remanded the Biological Opinion back to NMFS with the following instructions.

> *The December 3, 1998 Biological Opinion, as revised on December 16, 1998, is REMANDED to the National Marine Fisheries Service (NMFS). NMFS shall prepare and issue Revised Final Reasonable and Prudent Alternatives (RFRPAs) for that document consistent with this Court's July 13, 1999 Amended Order. Specifically:*
>
> *1. In accordance with the Section 7 of the Endangered Species Act and 50 C.F.R. § 402.02, NMFS shall*

[2] For the remainder of this document, all references to a Biological Opinion (or Opinion) refer to the December 3, 1998 Opinion, as revised on December 16, 1998.

[3] Plaintiffs are Greenpeace, the American Oceans Campaign, and the Sierra Club. Intervenors are the Aleutians East Borough, Westward Seafoods, Inc., Wards Cove Packaging Company, North Pacific Processors Inc., Nelbro Packaging Company, Unisea Inc., Peter Pan Seafoods Inc., Kodiak Salmon Packers Inc., Alyeska Seafoods Inc., Western Alaska Fisheries Inc., Kanaway Seafoods Inc., Royal Viking Inc., Morning Star LP, Great Pacific Limited Partnership, Alaskan Command Company, Pacific Knight LLC, the city of Unalaska, United Catcher Boats, and At-Sea Processors Association.

analyze and explain how the December 3, 1998 RPAs and the December 16, 1998 Revised RPAs will avoid the likelihood of jeopardizing the continued existence of the western population of Steller sea lions or adversely modifying their critical habitat.

   a. *If NMFS concludes, based on the above analysis, that the December 3rd and December 16th RPAs do not comply with Section 7 of the Endangered Species Act and 50 C.F.R. § 402.02, then NMFS shall issue Revised Final RPAs which NMFS believes are in compliance with the applicable law.*
   b. *Alternatively, if NMFS concludes that the December 3rd and December 16th RPAs fulfill the mandates of the ESA, NMFS shall explain this conclusion, and these RPAs shall constitute Revised Final RPAs.*

2. *NMFS shall analyze jeopardy and adverse modification separately, or provide an explanation of why the two may be treated together.*
3. *NMFS shall analyze and explain how the individual management measures avoid jeopardy or adverse modification, or how the various management measures work together to avoid jeopardy or adverse modification.*
4. *NMFS shall analyze and explain how the management measures will accomplish the principles of temporal dispersion, spatial dispersion, and protection of rookeries and haulouts.*
5. *NMFS shall analyze and explain how the management measures fulfill the four-part definition of RPAs found at 50 C.F.R. § 402.02.*
6. *If, when preparing the RFRPAs, NMFS is faced with a range of possible measures that are consistent with the requirements of 50 C.F.R. § 402.02, NMFS can recommend the adoption of certain measures based on other factors, including effects on the fishing industry.*
7. *NMFS will issue the RFRPAs on or before October 15, 1999.*
8. *On the date of their issuance, the RFRPAs will supersede in their entirety the RPAs contained in the December 3, 1998 Biological Opinion as revised on December 16, 1998.*
9. *Within three days of the issuance of the RFRPAs, a copy of the RFRPAs will be filed with the Court and served on all parties. The Court schedules a status conference for October 29, 1999, at 9 a.m., to determine the parties' intent to pursue further motions and relief in this action, including challenges to the remanded Biological Opinion. At that status conference, the Court will determine appropriate times of filing of further administrative records and schedule any briefing and hearing(s) on remaining issues.*

To comply with the Court's order, this document provides the revised final reasonable and prudent alternatives (RFRPAs) with an explanation for how these avoid jeopardy and adverse modification. The explanation will describe the merits of individual RFRPA measures. For example, the Aleutian Islands closure prevents competition between Steller sea lions and pollock fisheries throughout the central and western Aleutian Islands where about 45% of the original western sea lion population resided. This measure is also conservative of the pollock stock, and may provide an important control area for investigation of the long-term effects of pollock fishing on Steller sea lions. The explanation will also describe the merits of combinations of measures to achieve temporal and spatial dispersion of the fisheries to lower local harvest rates and reduce the probability of localized depletion.

Overall, the RFRPAs are consistent with the original RPA guidelines, and with recommendations by the Council both for 1999 and for 2000 and beyond. However, the RFRPAs do differ from the original RPA guidelines and from the Council recommendations in several respects. The differences are explained in detail below and reflect NMFS's most current analyses and thinking about the RFRPAs and the measures necessary to avoid jeopardy and adverse modification. The differences are apparent with respect to measures that affect all three principles. With respect to protection around rookeries and major haulouts, the differences pertain only to several exceptions where NMFS will 1) work cooperatively with the State of Alaska to develop the necessary protection measures, 2) allow for experimentation to study fisheries effects around two adjacent haulout sites only if the experiment can be conducted in a manner that does not jeopardize Steller sea lions or adversely modify their critical habitat, and 3) evaluate an alternative measure for protection that extends the protected area around one haulout site from 10 nm radius out to 20 nm, while allowing for fishing only by vessels less than 60 ft (18.3 m).

With respect to spatial and temporal dispersion, the RFRPAs are based on a better defined hierarchy of concern that

is, in fact, expressed throughout the RFRPAs. That hierarchy reflects the greatest level of concern for critical habitat areas immediately around rookeries and major haulouts, an intermediate level for special foraging areas of critical habitat, and a reduced level of concern for areas outside critical habitat. This hierarchy of concern is consistent with the definition of critical habitat as essential to the survival and recovery of the species. The differences between the RPA guidelines in the 1998 Opinion, the Council recommendations, and the RFRPAs are explained in more detail later in this document (see the section on modification of the RPAs).

IV. Standards

The standards used to prepare the remainder of the document are section 7 of the Endangered Species Act of 1973, as amended [ESA; 16 U.S.C. 1536 and 16 U.S.C. 1539, respectively], regulations promulgated to implement section 7 of the ESA [50 CFR Part 402], and applicable agency policy. In addition, as presented above, the Court's remand of August 6, 1998 provided explicit and specific instructions on the explanations required for the RFRPAs to the pollock fisheries. The standards are:

A. Section 7(a)(2) of the ESA requires Federal agencies to utilize the best scientific and commercial data available when insuring that their actions are not likely to jeopardize the continued existence of listed species in the wild or destroy or adversely modify designated critical habitat.

B. Section 7 regulations (50 CFR 402.02), define reasonable and prudent alternatives (RPAs) as alternatives to a proposed action that must comply with four standards:

1. <u>They can be implemented in a manner consistent with the intended purpose of the action</u>.

   The proposed federal actions in question would authorize pollock fisheries under the Bering Sea/Aleutian Islands and Gulf of Alaska Groundfish Fishery Management Plans. As such, the intended purpose of these actions is to permit these fisheries to proceed in a manner consistent with the conservation and management principles prescribed by the Magnuson-Stevens Fishery Conservation Management Act (16 U.S.C. § 1801 et seq.) and other applicable law. In general, the RFRPAs consist of time and area closure management measures intended to protect key areas and time periods, and disperse the fisheries temporally and spatially so as to avoid jeopardizing the endangered sea lion population or destroying or adversely modifying their critical habitat. Such time and area measures have long been used in the management of these fisheries. Although the RFRPAs constrain the times and areas under which these fisheries may proceed, they in no way preclude the fisheries from occurring and, indeed, will allow the fisheries to proceed with no reduction in TAC. For all these reasons, the RFRPAs are fully consistent with the intended purpose of the proposed actions.

2. <u>They can be implemented in a manner consistent with the scope of the Federal agency's legal authority and jurisdiction</u>.

   The RFRPAs consist of time and area closure management measures which NMFS has authority to implement under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq.) and/or Endangered Species Act (16 U.S.C. § 1531 et seq.). As such, the RFRPAs can be implemented consistent with the scope of NMFS's legal authority and jurisdiction.

3. <u>They are economically and technologically feasible</u>.

   The RFRPAs are comprised of time and area closure measures. As noted above, such measures have long been used in the management of these fisheries. The RFRPAs are not expected to present any new or unusual economic or technological challenges in their implementation by NMFS, and their implementation is possible economically and technologically. Also, in preparing these RFRPAs, NMFS considered the economic effects on the fishing industry only when faced with a range of possible

measures that are consistent with the requirements of 50 CFR 402.02. The conduct of the fishery in 1999 indicates that the RFRPAs were also economically and technologically feasible for the industry, and it appears that the entire TAC will be taken. NMFS expects the same in 2000.

4. <u>They avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat</u>.

The remainder of this document pertains to the specific question of how the RFRPAs avoid jeopardy and destruction or adverse modification.

C. The Consultation Handbook prepared jointly by the U.S. Fish and Wildlife Service and NMFS provides additional guidance on the preparation of RPAs (page 4-41). The Handbook states that

> *When a reasonable and prudent alternative consists of multiple activities, it is imperative that the opinion contain a thorough explanation of how each component of the alternative is essential to avoid* ***jeopardy*** *and/or* ***adverse modification****. The action agency and the applicant (if any) should be given every opportunity to assist in developing the reasonable and prudent alternatives. Often they are the only ones who can determine if an alternative is within their legal authority and jurisdiction, and if it is economically and technologically feasible.* (emphasis in original)

V. Application of the Standards to the Biological Opinion

A. Jeopardy and adverse modification

If a biological opinion concludes that an action is likely to jeopardize the continued existence of a listed species *and* destroy or adversely modify designated critical habitat, it usually provides both reasonable and prudent alternatives that avoid the likelihood of jeopardy and reasonable and prudent alternatives that avoid the likelihood of destroying or adversely modifying designated critical habitat. However, this Biological Opinion reached its "jeopardy" and "adverse modification" conclusions for the same fundamental reason: the two pollock fisheries would compete with the Steller sea lion by removing their food from important foraging areas at crucial times of the year.

In the Opinion, NMFS concluded that it would be reasonable to expect this competition to appreciably diminish the value of critical habitat for both the survival and recovery of the Steller sea lion, *and* appreciably reduce their likelihood of survival and recovery in the wild. That is, the Opinion concluded that the fishery reasonably could be expected to diminish the value of the designated critical habitat in a way that appreciably reduced the likelihood of the sea lions' survival and recovery in the wild.[4] Because of this relationship between the reduction in habitat quality and expected population response, RPAs that protect the value of Steller sea lion foraging habitat would be expected to also protect the sea lions from related population declines that would reduce their

[4] The relationship between changes in habitat quantity, quality, and connectivity and plant and animal populations has long been the subject of extensive scientific research and publication (for example, see Gentry 1986; Gilpin and Soule 1986; MacArthur and Wilson 1967; Nicholson 1954; Odum 1971; and Soule 1986, 1987). The most basic relationship between habitat and populations is embodied in the concept of *carrying capacity*, which recognizes that a specific area of land or water can support a finite population of a particular species because food or other resources are finite (Odum 1971). When a population is limited by food or resources, decreasing the amount or quality of those resources available to the population reduces the number of individuals the habitat can support (i.e., lowers the environmental carrying capacity). In a complex ecosystem, a variety of mechanisms may determine the relationship between reductions in carrying capacity and the population's response. Every organism needs some form of nourishment to become sexually mature and reproduce; some organisms also need shelter and cover to complete their maturation and reproductive processes and to rear their offspring. At some point, the supply of food or other resources available to plants and animals falls below the demand for those resources; when this occurs, individual plants or animals (Steller sea lions, in this case) fail to reproduce or die and their populations decline.

likelihood of survival and recovery in the wild.[5]

B. RPA framework

To avoid jeopardy and adverse modification, NMFS developed an RPA framework. The framework consists of four main parts, as defined below.

1. Goal: The overriding goal of the ESA, the section 7 consultation summarized in the Biological Opinion, and the RPAs is to protect or conserve the ecosystem upon which the Steller sea lion depends, and to insure that Federal actions (in this case the pollock fisheries) do not jeopardize the continued existence of the western population of Steller sea lions or adversely modify its critical habitat.

2. Principles: Three RPA principles were established based on the information assessed in the Opinion. These principles were: 1) protection of waters and prey resources around rookeries and major haulouts for Steller sea lions throughout the Aleutian Islands, Bering Sea, and Gulf of Alaska; 2) temporal dispersion of the fishery; and 3) spatial dispersion of the fishery.

3. Guidelines: The Framework incorporated fourteen different guidelines intended to achieve the RPA principles. Three guidelines pertained to protection of waters and prey resources around rookeries and major haulouts, six guidelines pertained to temporal dispersion, and five pertained to spatial dispersion.

4. Management measures: NMFS sought ideas and recommendations from the Council and public for management measures that would achieve the purposes of the fourteen RPA guidelines. Examples of management measures were included in the Biological Opinion in section 8.4 beginning on page 120.

These four parts to the framework represent a continuum from the specific management measures to the ultimate goal of avoiding jeopardy and adverse modification. To accomplish this goal, management measures must meet the guidelines, guidelines must achieve the principles, and the principles must insure that the pollock fisheries conducted in 1999 to 2002 avoid 1) jeopardy to the Steller sea lion and 2) adverse modification of its designated critical habitat.

C. Assessment approach

To assess the RPAs, NMFS used an "additive" approach. This approach starts with the default condition of a sea lion population and its habitat unaffected by fishing. The only way to be certain that the pollock fisheries do not cause jeopardy and adverse modification is to prohibit all fishing. In fact, such prohibitions have been implemented spatially in the form of no-trawl zones and no-pollock-trawl zones around rookeries and haulouts, temporally in the form of a prohibition of pollock trawling from November 1 to January 20, and both temporally and spatially through the closure of the Aleutian Islands management region.

But the additive approach also recognizes that this default position would be unnecessarily protective if applied to all areas and all seasons. The removal of a single fish, a single haul, and so on to some point, should not compromise Steller sea lion foraging. Therefore, NMFS reasonably assumed that some level of fishing outside the prohibited time periods and areas could be added without causing jeopardy and adverse modification. To determine the amount of fishing that could be added and its effects, the ideal information would include knowledge of:

[5] This relationship does not imply, however, that jeopardy and adverse modification are always linked. For example, analyses later in this document point out that closure around one haulout site is necessary even if fishing in that area does not result in jeopardy to the existing population. Such fishing would adversely modify critical habitat, reducing the chance for recovery in that area.

- The abundance and composition of a recovered population of Steller sea lions.
- The energetic and nutritional needs of such a recovered population.
- A detailed and reliable characterization of the prey field available in the areas and times where and when Steller sea lions forage.
- The foraging patterns of sea lions and their interaction with the prey field.
- The nutritional and energetic costs to sea lions foraging in an unperturbed (i.e., unfished) prey field.
- The direct and indirect effects of fishing on the prey field and on sea lion foraging behavior and success.
- Changes in vital rates resulting from greater energetic or nutritional costs associated with foraging in a prey field altered by fishing, and changes in sea lion population trends due to changes in vital rates.
- Changes in the above as may occur through interactions of fishery effects with the effects of other phenomenon that influence the prey field or Steller sea lion foraging.

With this information, scientists would be able to fully characterize the effects of fishing at various levels on the energetic and nutritional budgets of sea lions, and determine what degree of change to the sea lion prey field is tolerable before the overall effect leads to diminished vital rates and population decline.

For the most part, this level of information is not available. The scientific programs that NMFS conducts to support fisheries management and sea lion recovery neither provide this level of detail nor address all of these issues. Efforts to evaluate the potential for competition between the pollock fisheries and the Steller sea lion have been confounded by the lack of information on the above research topics. For example, efforts to evaluate the relation between the decline of sea lions and the prey available to them have been severely limited by inadequate information on prey availability at the appropriate spatial and temporal scales. The scientific programs provide stock-wide estimates of biomass at one time of year, but little information on biomass distribution or seasonal changes in distribution. Without this information, the conflict between sea lions and the fisheries can not be evaluated directly, as implied by the ideal information listed above.

Therefore, NMFS began with the assumption that the overall harvest rate is safe for pollock. The substantial basis for this assumption comes from the scientific literature on sustainable harvest rates (e.g., Beddington and Cooke, 1983, Clarke 1991, Sissenwine and Shepherd 1987) which indicates that the overall harvest rate is quite conservative and is unlikely to deplete the pollock population as a whole. NMFS then further assumed that the same harvest rate could also be safe for Steller sea lions if the harvest is well dispersed temporally and spatially. That is, if local harvest rates are reduced to a level equivalent to the overall harvest rate by appropriate temporal and spatial dispersion of the fisheries, then such harvest should not adversely affect sea lion foraging success. This assumption is significant for two reasons. First, for the Bering Sea and the Gulf of Alaska, this assumption effectively excluded changes of the total allowable catch (TAC) from further consideration. Second, it provided a basis for the conclusions of jeopardy and adverse modification. Importantly, then, it also provides the basis for determining when jeopardy and adverse modification have been avoided.

However, the Biological Opinion provided considerable evidence that the overall harvest rate of pollock is not a good indicator of the harvest rate on local spatial and temporal scales important to sea lions. The harvest was concentrated in Steller sea lion critical habitat and in two seasons in January-February and September-November. Such concentration can theoretically lead to areas and periods of localized depletion of pollock. “Localized depletion” is a relative term; the availability of pollock is reduced below the needs of Steller sea lions foraging in a particular time and area. While the scientific and commercial data available is sufficient to demonstrate that the harvest rate is not well dispersed over time and space, it is not sufficient to document and describe in detail how,

when, and where localized depletion occurs[6].

Without such crucial information, fisheries managers are data-limited in their ability to understand and avoid the problem of localized depletions of pollock and the implications for Steller sea lions and their critical habitat. Management would place an enormous burden of proof on sea lions if it implemented protective measures only when available data are sufficient to prove adverse effects. The data to describe in detail the interaction between sea lions and fisheries are simply not available. Furthermore, the same management agency, NMFS, is responsible for providing the information necessary to evaluate such interactions. Therefore, as managers are data-limited, they must, at some point, rely on management principles to achieve their management goal.

Based on analyses in the 1998 Biological Opinion, NMFS identified the three principles of 1) protection of waters around rookeries and haulouts to prevent localized depletion of prey and the potential for competition, 2) temporal dispersion of the pollock fisheries to reduce the probability of localized depletions by pulsed or derby fishing, and 3) spatial dispersion of the fisheries to reduce the probability of localized depletions from concentration of catch in local areas. NMFS then used these three principles as the foundation for its RPA framework to avoid jeopardy and adverse modification. Their intent was to avoid competition in certain key time period and areas, and disperse the fisheries outside of those time periods and areas to ensure that local harvest rates were consistent with the overall harvest rate. This, then, provides a basis for evaluation of the RFRPAs.

This assessment will start by focusing on those three principles. First, each principle will be analyzed and explained separately. These analyses will identify some areas where the guidelines and management measures are not sufficient to achieve the principles. Remedies (with explanations) will be presented next, followed by a listing of the RFRPAs. Finally, the document considers the combined effects of all three principles, as achieved by the RFRPAs, and how the whole set of measures avoids jeopardy of the western population of Steller sea lions and adverse modification of their critical habitat.

VI. Protection of prey resources adjacent to rookeries and haulouts

A. Purpose

The purpose of this principle was to preclude the potential for competition between pollock fisheries and certain segments of the sea lion population for prey resources around rookeries and major haulouts.

B. Why is protection required?

Long-used rookery sites were likely selected by sea lions for a variety of reasons, including substrate and terrain, protection from land-based and marine predators, protection from harsh wave or surf conditions, and local availability of prey. Successful reproduction for the species depends on the availability of rookery sites where animals can aggregate for sufficiently long periods of time to give birth, mate, and raise their young until the

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[6] The evidence for localized depletion is based primarily on the concentration of harvesting in Steller sea lion critical habitat (the southeastern Bering Sea special foraging area), where over 40% of the exploitable pollock biomass has been removed in some seasons. Under ideal conditions, data would be available to evaluate the development of localized depletion on smaller scales. Catch-per-unit-effort (CPUE) was used with the Atka mackerel fishery to illustrate localized depletions, but CPUE is not a good measure of biomass or relative abundance for the pollock fishery. Atka mackerel do not have swim bladders and are not visible on sonar "fish finders." Therefore, the fleet tends to fish in traditional areas without technology to locate their target. In effect, they sample the same areas over and over again, until the CPUE drops to such a level that fishing is no longer profitable. Thus, the fishing pattern for Atka mackerel is like a sampling experiment to estimate abundance or biomass of fish. In contrast, pollock are visible on fish finders, and vessels can search for concentrations or densities of fish that are suitable for trawling. That is, they are able to search until they have found conditions that will keep their CPUE at a required level. Therefore, pollock fishing vessels do not randomly sample their environment, but rather fish when CPUE is expected to exceed a particular threshold.

young are able to survive at sea. As the reproductive period requires at least several months, food supplies in the vicinity of the rookeries must be sufficient to meet the energetic needs of animals involved in reproduction (adult females and males and pups[7]). Once the reproductive season and the need for social aggregation is over, and pups have gained sufficient competence at sea, then animals (including mothers with pups) may or may not disperse to other haulout sites. Throughout the remainder of the year, the local availability of prey remains a crucial factor (probably the most important factor) in determining their movements and distribution. Mothers with dependent pups are still likely to be constrained in their foraging distribution. All pups are susceptible because they have limited reserves compared to adult animals. Pups in the process of weaning are likely poor foragers that must be highly susceptible to reductions in prey availability. Weaned pups are likely dependent on nearshore prey resources while they make the difficult transition to independent foraging. Juveniles, older but still immature, must continue to develop their foraging skills over time, but probably remain particularly sensitive to reductions in available prey. Like other, older animals, they may range more widely, but their distribution and haulout patterns must be determined, in large part, by the availability of prey.

The foraging success of these animals, whether based on rookeries or haulouts, is determined by their ability to balance the gains from foraging with the costs of daily activities, including the act of foraging itself. If the prey resources around rookeries and haulouts are reduced or depleted relative to their needs, then they are forced to increase the time and energy expended to find sufficient prey. As a result, they are more likely to fail in securing the resources necessary for growth, reproduction, and survival. As reproduction by adult females and survival of young animals to maturity are essential for population recovery, and both reproduction and survival depend on successful foraging, the Biological Opinion concluded that prey resources should not be reduced by pollock fisheries around rookeries and major haulouts.

C. Which specific sites should be protected and when?

The selection of sites for protection was based on the ESA directive to provide the protection necessary for recovery and conservation of the population. Therefore, the protected sites were based on the information available to indicate important rookeries and haulouts for a recovered population[8]. The available information consists of limited numbers of counts of animals at sites across their range. Counts were initially conducted in the 1950s, but counting methods were standardized (and are considered more reliable) since the 1970s. The decline of the population was thought to have begun some time in the 1970s, or perhaps earlier, but the best indication of habitat use by a healthy population is from the late 1970s.

Based on this information, NMFS designated a particular site for protection if the number of animals using the site at any one time since 1979 exceeded a seasonal threshold. NMFS used a count of 200 as the threshold for determining whether a site was sufficiently important to warrant protection from June 1 to November 1, and a count of 75 as the threshold for protection in the from November 1 to June 1. Two thresholds were used because haulout use patterns change between these periods. The number 200 had already been used by Steller Sea Lion Recovery Team as a criterion for identifying major sites to be included in critical habitat. Their concern was related, in part, to a judgement that to remain viable, a subpopulation of animals at a particular site should contain 50 or more adult females, which was not likely unless the entire subpopulation consisted of at least 200 animals. The threshold for the period from November 1 to June 1 was lowered to 75 animals for the following reasons. First, sea lions are more likely to be susceptible to reductions of prey availability in winter. Second, sea lions

[7] A variety of terms are used to refer to young sea lions. To avoid confusion, the term “pup” will be used to refer to animals from birth to the next reproductive period (i.e., until they reach age one). The term “juvenile” will be used to refer to sea lions older than one year of age but still sexually immature. The term “adult” will refer to sexually mature sea lions.

[8] The definition of “recovered” has not been determined for the western population of Steller sea lions. An earlier effort to define recovery by the Steller Sea Lion Recovery Team was rejected by NMFS, and another attempt will be made with the revision of the Recovery Plan. Given the trend of the population, the definition of recovery is less urgent than halting the decline.

disperse more widely in winter to find sufficient prey and, on average, aggregations are likely to be smaller. Third, they may be required to spend more time at sea and less time at haulouts where they would be counted. And fourth, only three counts have been conducted during this period, and those counts were conducted in recent years (1993, 1994, and 1999).

The counts are the best available data for assessing the potential importance of haulout sites. Nevertheless, they are also sparse and limited, and may underestimate the value of haulout sites to sea lions.

- Surveys were not conducted every year. Summer surveys were conducted in 1979, 1985, 1989, 1990, 1991, 1992, 1994, 1996, and 1998. Partial intermittent surveys were conducted in 1981-1984 and 1986-1988. As noted above, surveys during the November 1 to June 1 period were conducted only in 1993, 1994, and 1999. In general, surveys were less common during the 1980s (when the population was larger) than in the 1990s (after the steepest part of the decline). Therefore, these data would be more likely to miss important sites.

- Surveys did not include every site. Earlier surveys were focused primarily on rookeries. Consequently, important haulout sites may have been missed. For example, a total of 1,913 sea lions were counted at Cape Ikolik in 1976 (before the starting date for this criterion), and this site was not counted again until 1992 (64 animals). Had Cape Ikolik been counted between 1979 and 1992, it almost certainly would have qualified for summer closure under these criteria. Since it was not counted in that period, it was not included in the list of sites to be closed in the summer.

- In almost every year in which a survey was conducted, only a single count was made. Literally, that count represents a snapshot of a haulout at a particular time. If the count occurred at an important site when few animals were ashore (due to weather or other factors), then the value of the haulout would not have been reflected in the count. For example, the summer counts at Cape Barnabas have revealed zero or one sea lion on the site since 1989. However, incidental counts at Cape Barnabas in December 1993 and March 1994 revealed 124 and 31 animals, suggesting considerable variation in the use of sites within the year (and indicating that this is still an important site to sea lions). Such within-year variation is not measured when counts are conducted once a year.

- The main counting period (about two weeks in late June and early July) was selected because the counts on rookeries are thought to be at their maximum during that brief period. Therefore, these counts are not particularly good indicators of the importance of haulout sites that are in use the remainder of the year.

Therefore, while these counts are the best available data for the purpose of identifying important haulout sites, they are both limited and biased. The tendency of these data would be to under-represent the importance of haulout sites to sea lions and, on that basis, should not be considered overly conservative.

The concept of protecting haulout sites where few or even no animals have been counted in recent years has been questioned throughout the consultation process. In fact, protection of these sites is essential and is based on the general importance of habitat conservation to the recovery of protected species. Recovery can not occur if the habitat essential to support a recovering or recovered population is not available. That is, the essential habitat must be available before recovery can occur. The importance of habitat protection is underscored by the requirements of the ESA. The ESA recognizes the crucial link between habitat and recovery, and therefore requires that every federal agency not only avoid jeopardy to such species, but also avoid "destruction or adverse modification of critical habitat." The notion of delaying protection of habitat until after a species has recovered is therefore inconsistent with our understanding of the link between a species and its habitat, with our understanding of the recovery process, and with the requirements of the ESA.

Finally, factors other than the decline could have altered the distribution patterns of Steller sea lions and the relative importance of their haulouts. However, the best available scientific and commercial data are not sufficient to describe such a change in hauling patterns as a result of changes in oceanographic parameters or changes in composition of the prey community. As described above, the existing data on hauling patterns is

sufficient to indicate some hauling sites that have been or are currently important to sea lions, but not sufficient to detect shifting patterns of use that could be attributed to any general factor such as the regime shift. The overwhelming factor determining the trends observed at the different haulout sites is the decline in the number of animals in the population.

D. What is the appropriate size for no-pollock-trawl zones?

The size of the no trawl zones should be determined by the foraging distribution of the animals to be protected, the relation of these protective closures to other RPAs and principles, and the potential impact of the fishery on sea lion foraging.

The best indication of the at-sea distribution for Steller sea lions in the Bering Sea and the Gulf of Alaska is probably from sea lion sightings from the platform-of-opportunity program (POP; Fig. 1). This database compiles historical sightings from ships at sea (e.g., by observers on fishing vessels). It is biased by the distribution of sighting effort (i.e., where the ships traveled), and should not be used to indicate the relative importance of foraging in different areas. The database also does not include information on age and sex of the animals sighted. Nevertheless, it still indicates that sea lions use large areas in the Bering Sea and Gulf of Alaska, with a potential propensity to rely more heavily on particular area nearshore or near the continental shelf break. Thus, it provides a context for evaluation of their overall foraging patterns.

Using a maximum swim speed of about 5 nm/hr and assuming an average trip duration of 24 hours, sea lions on rookeries or haulouts could potentially make foraging trips of 60 nm (one-way). But such trips would leave no time for foraging and would require straight line travel to and from a single destination. The limited information available suggests such trips are unlikely. Relatively little information has been published on the foraging distances of sea lions from rookeries and haulouts, and that information has been based on a small number of animals. Merrick (1995; also reported in Merrick and Loughlin, 1997) studied five adult females in summer, five adult females in winter, and five pups (instrumented when they were 5 to 9 months of age). These animals were from the Gulf of Alaska and eastern Aleutian Islands. For trip length (distance from the land base [i.e., rookery or haulout] to the farthest point detected by satellite telemetry), the following statistics were reported.

	Trip length (nm)	
Group	Mean[9] ± 1 standard deviation	Range
Summer adult females	9.2 ± 5.5	1.6 - 26.5
Winter adult females	71.8 ± 72.4	2.7 - 293.2
Winter pups	16.2 ± 17.5	0.6 - 172.8

Loughlin et al. (1998) reported trip lengths on eight adult females from the Kuril Islands in 1991. The data were from June, and therefore only pertain to the summer months; similar winter data are not available for these

[9] The choice of foraging statistics for establishing protection zones depends on the intent of the zones. If the intent is to protect out to the most frequently used distance, then the mode would be the preferred statistic. If the intent is to protect the distance which would cover half of the trips, then the median would be the appropriate statistic. Protection based on the average foraging trip would be based on the mean trip distance. Protection of the entire foraging distribution would be based on the maximum distance observed, and protection of some portion (say, 90 percent) would be based on the 90th percentile. Unfortunately, the reliability of each of these statistics as a reflection of population patterns is limited by the small number of animals sampled and the small number of trips for each animal. The best statistic is also determined by the shape of the distribution of trip distances, and those distributions are poorly defined with such small sample sizes. Mean values are reported here. But again, other statistics may be more useful depending on the intent of the zones and the characteristics of the foraging patterns (to be determined with further studies).

animals. For these eight animals, 73 locations were detected during a total of 63 trips (i.e., mean of 1.16 locations per trip). Of these locations, 94% were within 5.4 nm of the location where they were instrumented, although trips ranged up to 142 nm from the island.

Other published records of Steller sea lion foraging illustrate the variability observed in the foraging patterns of individual animals (Merrick 1995, Merrick et al. 1994, Merrick and Loughlin 1997, Calkins 1996, 1997). The animals in these studies ranged over tens to hundreds of nautical miles during foraging trips, illustrating variation by individual, season, area, and size/sex class.

Unpublished summer data from six pups and four juveniles instrumented in the Gulf of Alaska and Aleutian Islands reveal a pattern of expanding foraging range as animals become more independent. The pups stayed within 19 nm of the haulout (with a mean trip length of 4.4 nm), whereas the juveniles ventured out as far as 82 nm (with a mean trip length of 14.9 nm).

The data cited above suggest a pattern of larger foraging trips in winter than summer. This pattern may result from a number of factors, including greater dispersal of prey, greater food requirements, decreasing dependence of pups on mothers, and expanding foraging capacity of pups.

These data should be viewed with caution. These samples were collected to investigate the foraging patterns of individual animals and to begin to characterize the foraging distribution of populations of animals. Extrapolating individual results to entire populations is difficult due to the multiple sources of variability in foraging patterns, including (but not limited to) age/size, sex, physical condition, reproductive condition, area, season, prey availability, and potential sources of disturbance. To characterize distributions of foraging patterns for segments of the populations, sample sizes should be in the hundreds, rather than the small numbers seen here. The data are also biased for determining trip distance. For many trips studied, few locations were available while the instrumented animal was at sea (see Loughlin et al., 1998, where only one location was observed per trip for many of the trips). When trip distance is estimated from a single location during that trip, the length of the trip is unlikely to represent the farthest distance of the animal from the haulout; thus, the results would tend to under-estimate trip distance. Similarly, animals that tend to make shorter trips may spend more time on land; if that is the case, they may be more likely to be captured for telemetry studies. These and other considerations suggest that scientists are just beginning to understand the foraging patterns of these animals, and that our view of their foraging patterns is likely to expand as more studies are conducted.

With these caveats, the available data suggest that sea lion foraging patterns may be divided into at least two categories: 1) foraging that occurs around rookeries and haulouts and that is crucial for adult females, pups, and juveniles, and 2) foraging that may occur over much larger areas where these and other animals may range to find the optimal foraging once they are no longer tied to rookeries and haulouts for reproductive or survival purposes. The data also suggest that zones of 20-nm radii could completely preclude fisheries competition with adult females, pups, and juveniles around rookeries and haulouts. The data should be viewed with caution in the Gulf of Alaska however, where the shelf area is likely the major determinant of the overall foraging range of sea lions. As the shelf is considerably smaller in the Gulf of Alaska than in the Bering Sea, foraging area is correspondingly limited (Fig. 1). Therefore, compared to 20-nm zones in the Bering Sea, 10-nm zones in the Gulf of Alaska should protect an similar portion of the overall foraging area.

E. Can areas be left open as an adaptive management strategy?

In June, 1999, the Council recommended that nine sites be left open for fishing. One justification they offered for leaving these nine sites open has been to include them in an adaptive management strategy. The proposed idea would be to close other sites and leave these sites open for some period and then measure the overall success or failure of that strategy using some pre-determined criterion (or criteria) such as sea lion trends. The adaptive management strategy is used in situations when the best management approach for achieving a particular goal is not clear. Some measure of success/failure is determined and one of the possible approaches is tried. After a

period of time, the success or failure of that approach is assessed based on the criteria, and if the criteria are not satisfied a second approach is tried.

This approach may have merit in the context of managing interactions between sea lions and fisheries. However, with respect to these nine sites, and the goal of the RPAs, this approach would be premature. The goal of the RPAs is to avoid jeopardy and adverse modification. Therefore, experimental approaches should be attempted, but only after management can insure that jeopardy and adverse modification have been avoided. The management alternative most likely to avoid jeopardy and adverse modification is known, and it requires closure of these sites. This approach does not exclude all pollock fishing, but only excludes pollock fishing in these areas. Leaving these sites open is more likely to perpetuate past trends than encourage recovery. In addition, the interpretation of the success/failure criterion for an adaptive management approach is severely confounded. For example, the observed increase in counts at Mitrofania might be interpreted to mean that fishing in that region is not a problem, when in fact it might only indicate that prey availability is better around that site and sea lions are aggregating to take advantage of the prey. Finally, if this type of approach were to be used, then the appropriate method of selecting sites would not be to pick those that the industry most wants to fish. Site selection would have to be based on considerations pertinent to the experimental design.

Again, these arguments do not imply that the adaptive management strategy should not be explored as a means for managing interactions between sea lions and fisheries. But they do indicate that in the context of the nine contended sites in the Gulf, the proposed adaptive management strategy is not sufficient to avoid jeopardy and adverse modification.

F. Are the guidelines sufficient to achieve the principle?

This principle was not intended to provide full protection of all possible feeding areas. Rather, the principle was intended to provide protection for the areas immediately around rookeries and haulouts - areas vital to segments of the population that are essential to recovery. The guidelines require the separation of fishing and foraging around rookeries and major haulouts, identify criteria for selection of major haulouts, and determine the size of the protection zones. Therefore, the guidelines achieve the principle of protection of prey resources around rookeries and major haulouts.

G. Do the management measures meet the guidelines?

Three guidelines were established to achieve the principle of protecting prey resources around rookeries and haulouts.

1. Guideline: Spatial separation of pollock trawl fishing and Steller sea lion foraging areas adjacent to rookeries and haulouts.

   Purpose: The purpose of this guideline is to require the separation of fishing and foraging areas necessary to eliminate competition around all rookeries and major haulouts.

   Council recommendation(s)/emergency rule: For 1999, the Council recommended closure of all rookery and major haulout sites except Cape Sarichef in the Bering Sea and eight sites in the Gulf of Alaska: Pt. Elrington, The Needles, Rugged Island, Cape Barnabas, Gull Point, Point Ikolik, Mitrofania Island, and Sea Lion Rocks. The emergency rule for 1999 left the eight sites in the Gulf open, but closed Cape Sarichef out to a radius of 10 nm. The December 16, 1998 modification to the December 3, 1998 Biological Opinion stated that all these areas would be protected in 2000 and beyond, absent compelling and equivalent (in terms of sea lion protection) alternatives. For 2000 and beyond, the Council recommended that Cape Sarichef be closed to a radius of 20 nm, but that nine sites (the original eight plus Spitz Island) be left open to varying degrees during the year and with varying levels of fishing restrictions. Specifically, those exceptions were 1) Pt. Elrington, Rugged Island, and the Needles would be closed to pollock fishing from May 1 to January 20; 2) Sea Lion Rocks would stay open with a 60-

foot boat limit; and 3) Spitz Island and Mitrofania Island would remain open January 20 to April 30 and September 1 to November 1 with a 60-foot boat limit. Cape Barnabas, Gull Point, and Point Ikolik would remain open year round.

Analysis/discussion: The Biological Opinion allowed incremental or phased implementation of a management measure as long as the implementation was not drawn out (suggested limit of 2 years) and a significant portion of the measure was accomplished in the first year. In 1999, a total of 24 sites were closed to 20 nm in the Bering Sea, and Cape Sarichef was closed to 10 nm. Cape Sarichef will be closed to 20 nm in 2000 and beyond. In the Aleutian Islands, 45 sites (18 rookeries and 27 haulouts) met the criteria for protection either year-round (all rookeries and 12 haulouts) or seasonally (15 haulouts) had not the entire management area been closed through a recommendation of the Council.

In the Gulf of Alaska in 1999, a total of 45 sites were closed to 10 nm, with 8 sites left open. In June 1999, the Council recommended that Spitz Island be added to the list of sites it had already recommended remain open.

As reviewed above, the need to protect the sites in question is based on 1) the evidence that the decline and failure to recover is related to nutritional stress, 2) the life history of sea lions and the importance of prey availability in the waters around rookeries and haulouts, 3) the resulting potential for detrimental competition with fisheries in these areas, 4) the demonstrated importance of these sites based on earlier counts, and 5) the clear decline revealed by more recent counts. The counts for these sites since 1979 are listed in the table below. Counts at Point Elrington and The Needles have declined relatively steadily since 1989. At Point Elrington, the counts dropped from 487 to 231 (a 53% drop) in seven years. At The Needles, the counts dropped 81% in the same seven year period. Counts at Rugged Island have declined since 1989, but dropped most sharply between 1995 and 1996. The count at this site in 1996 was about 16% of the count in 1989. Summer counts at Cape Barnabas dropped 100% after 1983 and the counts reported below suggest that this haulout is functionally extinct. December 1994 and March 1999 counts revealed 124 animals and 31 animals, respectively, so this site is still being used by sea lions. Counts at nearby Gull Point have also declined sharply (75%) since the mid 1980s. Counts at Cape Ikolik have varied around 64 to 50 since 1992, except in 1996, but these counts represent a severe loss of animals from a total of 1,913 in 1976. Counts at Mitrofania have increased over the last decade, but the trend at this site may simply reflect movement of animals from neighboring Spitz Island, where counts have dropped severely (96% since 1985). Finally, counts at Sea Lion Rocks have also dropped 70% since 1985.

	Summer counts by haulout site (winter counts in parentheses)											
Site	1983	1985	1989	1990	1991	1992	1993	1994	1996	1997	1998	1999
Pt. Elrington			487		316	332	(513)	299	231			
The Needles			668		430	242	(258)	260	126			
Rugged Island			190		128	153	(368)	157	30			
Cape Barnabas	694	107	0	1	0	1	(0)	(124)	0	0	0	(31)
Gull Point		281	0	91	81	46	(0)	111 (85)	40	87	70	(100)
Cape Ikolik*						64		62 (90)	105	56	50	(130)
Mitrofania I.				70	148	112	(176)	192 (174)	188	266	247	(123)
Spitz Island		645	156	126	88	3	(1)	20 (0)	110	21	27	(72)
Sea Lion Rocks	508	377	96	84	138	149		219	192	174	152	

* 1976 count at Cape Ikolik was 1,913 sea lions.

Counts at individual sites must be evaluated with caution, as animals move among sites in response to factors such as weather, disturbance, and prey availability. For example, the increasing counts of sea lions at Mitrofania Island does not necessarily mean that the local population is growing through better survival and reproduction. Instead, conditions at that site may simply be better than neighboring sites (e.g., Spitz Island) and the larger counts of sea lions at Mitrofania may simply indicate that sea lions in that region are taking advantage of greater availability of prey. Leaving such a site open to fishing might deplete such prey resources.

As sea lions may move among sites to find better prey conditions, combined counts for a region provide a better index of the status of the population in this region. In the western Gulf of Alaska, counts declined from 6,275 in 1985 to 3,361 in 1998, with most of the decline occurring in the period from 1985 to 1989. In the central Gulf of Alaska, Counts declined from 19,002 in 1985 to 8,552 in 1989, followed by a further drop to 3,346 in 1998 (a 61% decline in the last ten years). In the eastern Gulf of Alaska, counts have declined from 7,241 in 1989 to 2,133 in 1996 (a 70% drop in seven years).

Data from these surveys indicate that a little over half of the animals counted were on rookeries. Adults on rookeries represent the portion of the population involved in reproduction, which is essential to population growth and recovery. Recent analyses conducted on the annual counts indicate that in all three regions of the Gulf of Alaska (eastern, central, and western), the counts of adults on rookeries continue to decline, albeit at a slower rate than occurred in the late 1980s.

The remaining animals were on haulouts. In 1994 and 1996, the counts of animals at the nine contended sites in the Gulf of Alaska represented approximately 20% to 25% of the animals on haulouts. Similarly, these nine sites represent about 20% of the haulout sites in the Gulf of Alaska that meet the criteria for protection. If the animals counted on rookeries disperse in a pattern similar to the animals counted on haulouts, then, at any one time, these haulout sites may be used by as much as 20% to 25% of the

population. However, because individual sea lions move among areas over time, these nine sites actually may be used by a larger portion of the Gulf population.

These nine sites were specifically chosen for exception by the Council and fishing industry because of the availability of pollock at these sites and the industry's desire to fish those pollock. The industry also argued that these sites are important for safety of the small boat fleet, as they provide sites near ports and in more or less protected waters that small boats could fish under rough conditions. NMFS considers the safety of fishery participants to be a very important concern. However, time is as important as space in determining when a vessel can fish safely. The AFA required that NMFS limit participation in the Gulf of Alaska by Bering Sea processors. These restrictions are expected to reduce the number of catcher vessels that participate in the Gulf of Alaska fishery and eliminate the competitive, more dangerous nature of this fishery. The smaller boats in the Gulf of Alaska will be able to choose their opportunities for fishing during good weather without losing catch to larger vessels that can fish independent of weather. Therefore, NMFS is concerned about the safety of all fishery participants, but also recognizes that other considerations may weigh more heavily in some management decisions.

Given the above information and the intent of the RPA principle for protecting the prey resources around all rookeries and major haulouts, NMFS will protect the nine contended haulout sites in 2000, with exceptions at Point Elrington, The Needles, (possibly) Cape Barnabas, Gull Point, and Sea lion Rocks. These exceptions will be explained in a later section on modifications to the RPAs.

Conclusion: NMFS believes that guideline one pertaining to protection around rookeries and haulouts has been met.

2. Guideline: Protection of all rookeries and haulouts used by significant numbers of animals since the beginning of the decline in the 1970s.

   Purpose: The purpose of this guideline is to insure that the protection provided is sufficient to allow for recovery of the population. The guideline focuses on the criteria for selection of sites to be protected.

   Council recommendation(s)/emergency rule: See the description of the Council's recommendation and measures imposed by the emergency rule (under guideline 1, page 23).

   Analysis/discussion: This guideline requires a determination of a "significant" number of animals and a determination of the appropriate starting date for evaluation of counts.

   Given that the abundance of sea lions in the central part of its range has declined by about 80% or more, it is not surprising that certain areas are no longer used or are used less frequently and by smaller numbers of animals. The decrease in use, however, does not necessarily indicate that these areas are no longer important, but rather, the decrease in use should be expected based on the decline alone. The adverse modification of those habitats through removal of prey may preclude the use of those habitats for continued survival and recovery of the sea lion in this region. NMFS must insure that resources in those areas, especially those areas determined to be critical habitat, can sustain the needs of a recovered sea lion population.

   As reviewed above, the criteria used for identifying haulouts to be protected were based on counts of animals since 1979. A haulout was considered important for the June 1 to November period (or November 1 to June 1 period) if at least one count at the site exceeded 200 (or 75) animals in any year since 1979. The rationale for the criteria of 200 and 75 animals since 1979 were discussed above. The exclusion of the nine sites in the Gulf of Alaska would effectively impose another selection criterion that is based on their importance to the fishery rather than to sea lions. Therefore, with the exceptions discussed above, NMFS will protect these sites to meet the guidelines of this principle.

Conclusion: Guideline two for protection of waters and prey resources around all major rookeries and haulouts has been met.

3. Guideline: Protection zones in the eastern Bering Sea must have a minimum radius of 20 nm, and 10 nm in the Gulf of Alaska and Aleutian Islands.

   Purpose: The purpose of this guideline is to set a minimum level of protection for the areas around rookeries and haulouts. The no-trawl zones were designed to protect feeding areas used by females with dependent nursing pups, and feeding areas important to pups and juveniles with less foraging experience.

   Council recommendation(s)/emergency rule: See the description of the Council's recommendation and measures imposed by the emergency rule (under guideline 1, page 29).

   Analysis/discussion: For 1999 in the Bering Sea, the Council's motion did not include closure of Cape Sarichef. The emergency rule did include closure of Cape Sarichef out to a radius of 10 nm. For 2000, the Council's motion includes closure out to 20 nm. In the Gulf of Alaska, the sites recommended for protection by the Council and included in the emergency rule were all closed to 10 nm. Again, all but eight areas were closed in 1999, and the Council recommended that nine areas remain fully or partially open in 2000 and beyond. The sizes of the conservation zones recommended by the Council and implemented in the emergency rule (and extension) were consistent with the guidelines in the Biological Opinion.

   The Council did not recommend specific areas for protection in the Aleutian Islands. Rather, consistent with this guideline, the Council recommended and the emergency rule (and extension of the rule) contained a management measure closing the Aleutian Islands to directed fishing for pollock. The Council made this recommendation for important reasons pertaining both to the health of the pollock stock in this region, and the potential effects of natural and fishery-related stock reduction on Steller sea lions.

   Since the mid 1980s, survey estimates of pollock in the Aleutian Islands region has declined from about 500,000 to less than or about 100,000 in 1994 and 1997 (see the Table below). This decline is qualitatively similar to the decline observed in the Aleutian Basin-Bogoslof Island area, which was closed to fishing in 1992. Catches in the Aleutian Islands region during the last two decades have ranged from 9,504 mt to 81,834 mt, but have been reduced in recent years. Pollock stock structure, status, and dynamics in this region are not well understood, and these pollock may be from the eastern Bering Sea (i.e., the stock that is the primary focus of the pollock fishery). In recent years, the fishery in the Aleutian Islands has moved further west to find suitable catch. The catch has been taken primarily by catcher/processors and, in recent years, most of the catch has been taken by a small subset of the vessels that fish in the Bering Sea. For the above reasons, a precautionary approach to management of this fishery is justified.

Year	Biomass (mt)	Catch (mt)	Year	Biomass (mt)	Catch (mt)
1979	-----	9,504	1989	-----	15,531
1980	252,013	58,156	1990	-----	79,025
1981	-----	55,516	1991	179,653	78,649
1982	-----	57,978	1992	-----	48,745
1983	495,982	59,026	1993	-----	57,132
1984	-----	81,834	1994	86,374	58,637
1985	-----	58,730	1995	-----	64,429
1986	448,138	46,641	1996	-----	29,062
1987	-----	28,720	1997	105,600	25,478
1988	-----	30,000	1998	-----	21,945

In addition, the Council recommended closure of the Aleutian Islands fishery based on concerns related to Steller sea lions. In general, most of the pollock caught in the Aleutian Islands subarea has come from critical habitat. In 1998, approximately 80% of the observed pollock catch in the Aleutian Islands subarea was taken within 10 nm of major haulouts identified for closures. From Yunaska Island to Attu Island, 18 rookeries and 27 major haulouts met the criteria for protection under the RPAs. The Aleutian Islands subarea corresponds approximately to the areas labeled as the central and western Aleutian Islands during Steller sea lion counts. In the central region, counts of nonpup animals have fallen from 36,632 in 1979 to 5,705 in 1998. In the western region, counts of nonpups have fallen from 14,011 in 1979 to 1,913 in 1998. Prior to the decline, approximately 45% of the entire (U.S.) western population occurred in this region, so this closure affects a very significant portion of the population that is essential to recovery. The declining abundance of pollock in this region has important implications for sea lion foraging and recovery. Therefore, the closure of the Aleutian Islands pollock fishery is justified not only as a pollock conservation measure, but also as a Steller sea lion recovery measure consistent with the RPAs.

Finally, the Council also recommended that NMFS evaluate the potential of this region for use as a control site to investigate fishery effects. One of the fundamental obstacles to evaluating the effects of fisheries on sea lions is the difficulty of separating fishery effects from other effects. One possible method of distinguishing those influences is to establish an experimental design with fished (i.e., treated) areas and unfished (i.e., control) areas. Large areas would be required because of the dynamic nature of sea lion prey and sea lion foraging patterns. Establishment of such a control in the central and western Aleutian Islands would cause less disruption to fisheries than the use of other suitably large areas in the eastern Aleutians or the Gulf of Alaska. This region is also remote and less likely to be affected by human activities other than fishing, which could otherwise confound an assessment of fishing effects. For all these reasons, the Council recommended to NMFS that this region be closed to pollock fishing.

Conclusion: The incremental implementation of the no-trawl zone around Cape Sarichef, and haulout sites in the Gulf of Alaska is acceptable under the Biological Opinion, which allowed for the phasing in of management measures. The exceptions to closures of these sites in the Gulf of Alaska are considered to be either equivalent in the protection they offer, or beneficial if they will provide better information on fishery effects around a haulout site. The closure of the Aleutian Islands was based on multiple management concerns, including the health of the pollock stock in that region. With respect to sea lions, the closure is viewed as a precautionary measure with important conservation benefits for an area where 45% of the pre-decline western population of Steller sea lions was found. The closure of the Aleutian Islands area can be justified on the basis of these two reasons alone. The closure also may provide an important site for experimental evaluation of pollock fishery effects. Therefore, guideline three for protection of prey resources around rookeries and major haulouts has been met.

H. Has the principle of protection around rookeries and haulouts been achieved?

The above analysis indicates that the management measures are and will be in place to meet the RPA guidelines and the guidelines are sufficient to achieve this principle. For 2000 and beyond, a total of 25 sites will be protected in the Bering Sea, and 51 sites will be protected in the Gulf of Alaska. In the Gulf, the only sites not fully closed include two where NMFS will work cooperatively with the State to evaluate alternative protective measures, one where the closure may be lifted to allow experimental evaluation of fishery effects, and one where protective measures have reduced the size of vessels allowed to fish within a larger area than originally required in the Biological Opinion. In addition, the closure of the Aleutian Islands region to pollock fishing provides protection to another 45 rookeries and major haulouts. Therefore, NMFS believes that the RPA principle for protection of prey resources around rookeries and major haulouts has been achieved.

VII. Temporal dispersion

A. Purpose

The purposes of this principle are to 1) prevent competition between the pollock fishery and the Steller sea lion during part of the late fall/winter period (November 1 to January 20) when sea lions may be particularly sensitive to reductions in prey availability, and 2) to insure that the harvest is well dispersed throughout the remainder of the year to reduce the probability of short-term (within-year) depletions of prey resulting from concentrated or pulsed fishing.

B. Why is temporal dispersion necessary?

The prey field --- The foraging success of sea lions is dependent on the characteristics of the prey field where they forage and the factors that influence that prey field. In a particular area, the prey field consists of multiple prey species, each with its own abundance or biomass, behavior, and distribution and dispersion patterns (e.g., dispersed versus aggregated or schooled). Over time, the prey field changes or shifts as a function of natural life history patterns of each prey species; i.e., individual growth, reproduction and recruitment, mortality, migration into the area, and migration out of the area. These changes may be more or less predictable, such as those resulting from the cyclic annual period, or they may relatively unpredictable, such as the regime shift. As a species, sea lions have persisted because they have developed successful foraging strategies or patterns for these prey fields as they have changed over time.

Fisheries alter these prey fields. They may have long-term consequences (over multiple years) such as changes in the local composition of biological communities. They also have immediate or short-term (within-year) consequences related simply to removal of prey. The fundamental assumption of the Biological Opinion was that the fisheries removal of pollock throughout the course of a year would not appreciably diminish the prey field if the catch was well distributed in time and space so that the local harvest rate was the same as the overall harvest rate where sea lions forage. If the catch was not well distributed in time and space, then the concentrated removal of pollock from the sea lion prey field could result in localized depletion.

Localized depletion --- As noted earlier, “localized depletion” is a relative term: the depletion is relative to the needs of individual foraging sea lions. An individual sea lion must be able to satisfy its nutritional and energetic needs by balancing gains from foraging with the costs of daily activities, including the act of foraging itself. When a fishery operates within the sea lion prey field, the prey field must be diminished by removal of fish - in this case, pollock. That such diminution occurs is clear. Vessels fish an area until the density or availability of pollock is such that it is no longer profitable to continue fishing on the same school or aggregation, then search for another pollock aggregation of suitable size or density. Such diminution occurs not only on the scale of individual fish patches, but also over larger scales. The evidence presented in the Biological Opinion and in the EA for the extension of the emergency rule indicates that the harvest rate in some areas (e.g., the CHCVOA) and some seasons (historical B seasons) has exceeded 40% of the available exploitable biomass. Thus, the prey field

must be diminished.

A central assumption of fisheries management is that the prey field recovers. Assuming this to be the case, the prey field must recover at some rate that is dependent on the amount of prey taken, the amount available for recovery, the effect of the fishing activity on prey aggregation and density, and the life history of the prey, including their behavior and movements during and after the period of fishing. The available information on these fisheries and prey communities is not sufficient to describe the recovery process. Under conditions typical of the Bering Sea and Gulf of Alaska, the rate of recovery must be slower than the rate of removal. Otherwise, fishing vessels in an area would not be required to search for pollock after they had found their first suitable fishing target; recovery would keep pace with removal. This is not the case. Recovery may take days, weeks, months, or longer.

The status of the prey field at any given moment, then, is dependent on its original or unfished state, and the balance between removal and recovery processes. If these two processes are concurrent, the balance will be determined by the rate at which prey are removed versus the rate of recovery. The larger the discrepancy between removal and recovery, the more likely that prey availability will be reduced to sea lions. Or, conversely, the slower the removal rate, the less likely that prey availability will be diminished appreciably to sea lions (Fig. 2).

This need to balance removal with recovery provides much of the rationale for dispersing the catch over time. By slowing the fisheries, management provides a greater opportunity for recovery to mitigate or balance the effects of removal (Fig. 2). With a slower-paced fishery, more prey biomass is available to sea lions and other consumers on a day-to-day basis, and localized depletions are less likely to occur. The Biological Opinion assumed that the TACs for the pollock fisheries of the Bering Sea and Gulf of Alaska were safe, if the fisheries were well dispersed over time to avoid such localized depletions relative to the needs of sea lions. In the absence of the information necessary to evaluate the local effects of such fishing, the fisheries should be managed in a precautionary manner. The Biological Opinion did not require reduction of the TAC, but did require dispersion of the fisheries by time and area to avoid the potential for localized depletion.

Sea lion life history and the winter period --- In addition, the needs of Steller sea lions must change during the year, due to requirements imposed by the annual reproductive cycle, changes in environmental conditions, and natural changes in the availability of prey. The reproductive cycle starts with the annual birth of a cohort in late May to early July. Parturient females mate one to two weeks later, but implantation of the blastocyst (an early developmental stage of next year's pup) is delayed until September or October. Delayed implantation is an element of the reproductive life history of this species. However, this delay also has the important indirect effect of limiting the demands on the adult female during the early stages of lactation when she must support both herself and the developing pup just born. Lactation and nursing may occur for months or years, but weaning may be most common in the spring before the next pupping and mating season. The weaning process may be gradual or abrupt. At that time, pregnant females must devote considerable resources to their developing fetus. Thus, great physiological demands may be imposed on adult females throughout the year if they are able to sustain consecutive pregnancies. Observations of high fetal mortality rates for females collected in the 1970s and 1980s may be indicative of the severe physiological burden placed on adult females, particular during the winter.

The "winter" period may be especially stressful for Steller sea lions. Without better information on their life history strategy, environmental conditions, and changes in the distribution, abundance, and availability of prey, it is difficult to define this period and its limits. Studies of three captive Steller sea lions held in Holland (Kastelein et al. 1990) indicated a consistent increase in food intake in late fall and early winter, and the primary Steller sea lion strategy for winter may be to focus on preparation by accumulating fat for insulation and energy reserve. Thus, additional energetic and nutritional needs for sea lions may begin in the late fall months (e.g., October and November). Environmental conditions, on the other hand, may be most harsh in mid or late winter (January to February), and some conditions may have their greatest impact even later (e.g, ice coverage reaches its peak in March or April). Changes in condition, availability, and behavior of sea lion prey must also affect foraging by sea lions in winter. In general, the availability of prey during these periods is poorly understood. If some species are more dispersed, then the energetic costs of foraging may increase. On the other hand, pollock in reproductive

condition (i.e., bearing roe — toward the end of the winter) are presumably of greater nutritional value to sea lions (for the same reasons that the fisheries would rather take roe-bearing pollock than pollock "spent" after the spawning season). The winter occurrence of roe-bearing pollock in aggregations may reduce sea lion energetic costs associated with foraging on this species. Pollock aggregations appear to be relatively predictable in Shelikof Strait and the southeastern Bering Sea, which supports the idea that these are important foraging areas for sea lions. Undisturbed access to such prey aggregations may be essential for sea lions attempting to survive the winter period and (for adults) recover their condition in time for the spring/summer reproductive period.

Adult females may be stressed by winter conditions if they are supporting themselves, a young pup, and a developing fetus. Pups may also be stressed, particularly if they have weaned or started the process of weaning and are becoming more dependent on their own elementary foraging skills. The pups' lack of foraging skill and experience must limit their foraging success, while at the same time their small size and harsher environmental conditions must increase their energetic and nutritional needs. Winter also presents an additional challenge for animals that are in poor condition, for whatever reason. Large animals in good condition may have the physiological reserves and resources to deal with winter condition with relatively little stress. But animals that are debilitated due to disease, injury, or other reasons may not have that physiological reserve and therefore may be more vulnerable to winter conditions.

Thus, the winter period must exaggerate the sensitivity of sea lions to localized depletions of prey that are more likely to result if fishing is not sufficiently dispersed.

C. What is the appropriate model for temporal dispersion?

The purpose of this principle is to reduce the probability of short-term (within-year) depletions of pollock resulting from concentrated fishing by dispersing the fisheries within the period from January 20 to November 1. This purpose, the conceptual model depicted in Figure 2, and the best available scientific and commercial data suggest the following argument.

- If the annual TAC is assumed safe, so that the objective is to avoid localized depletions of pollock,
- if the best available scientific and commercial data are not sufficient to determine at what point such depletions occur on a scale relevant to sea lions, and
- if the probability of localized depletion decreases as dispersion of the fishery increases, then
- the probability of localized depletion is least when the fishery is evenly dispersed throughout the period from January 20 to November 1.

If these arguments are correct, this model for temporal dispersion should require fishery removals uniformly dispersed through this period. Again, this precautionary approach does not require a reduction in the TAC, but only requires that the catch be well dispersed over time.

Two considerations suggest the need for some modification of this model of uniform dispersal. First, the probability of localized depletion is a function not only of removals, but also of the needs of sea lions. In Figure 2, the probability of localized depletion is determined by the difference between available biomass and the depletion threshold for sea lions. If the depletion threshold occurs at higher biomass levels in the winter period, then removals from this period might be reduced relative to other seasons. In fact, winter removals have been reduced by the prohibition of fishing during the period from November 1 to January 20 and by the limit on portion of annual TAC taken out of the first fishing seasons of the year (e.g., the guideline limiting the first two seasons to 45% of the annual TAC).

The second consideration is related to the nature of competition and localized depletion of prey. The most obvious effect of fisheries on prey availability is through removal of prey (i.e., exploitative competition), which

was the primary concern of the Biological Opinion. But as the Opinion pointed out, fisheries may also affect sea lions through interactive competition. Interactive competition occurs when the presence of fishing vessels, gear, and activities 1) disturb sea lions to the extent that they abandon or fail to use resources that would otherwise be available, or 2) disturb or redistribute prey so that they are less available. The sensitivity of some sea lions to disturbance may effectively preclude them from using resources near human activities.

Based on the above considerations and on descriptions of the pollock fisheries in the Bering Sea and Gulf of Alaska, six RPA guidelines were developed in the Opinion to temporally disperse the fisheries. The guidelines are illustrated in Figure 3. In general, the guidelines divide the year into parts and then limit the TAC that can be taken during each part of the year. The first guideline prohibits fishing during the period from November 1 to January 20, to preclude fishery competition when sea lions may be particularly sensitive to reductions in prey availability. The second guideline divides the remainder of the year into two periods (January 20 to June 1 and June 1 to November 1) with two seasons in each period. The third guideline limits the total TAC allocations for the first two seasons combined (i.e., the first period) to 45% of the annual TAC. The fourth guideline limits each season to no more than 30% of the annual TAC. The fifth guideline was intended to prevent aggregation or clumping of any two seasons that would reduce the model from four effective fishing seasons to three or less. The sixth guideline was intended to limit redistribution of TAC from one season to the next unless the first season was closed prematurely by management.

D. Are the guidelines sufficient to achieve the principle?

The question to be addressed in this section of the analysis is whether these guidelines are sufficient to achieve temporal dispersion in a manner sufficient to avoid jeopardy and adverse modification. For a given annual TAC, four specifications are required to achieve temporal dispersion: the number of fishing seasons, the catch per season, the distribution of catch within a season, and the distribution of seasons throughout the year.

Number of fishing seasons --- If exploitative competition were the only concern, a single fishing season with a near-uniform distribution of catch would minimize the probability of localized depletion. However, as interactive competition may also occur, NMFS preferred division of the year into multiple seasons with the potential for intermittent breaks or stand-downs to avoid interactive competition. A total of four seasons was suggested to reduce the pulsed nature of the fisheries and allow for stand-down periods, particularly to keep seasons from being concentrated together. The number of seasons (four) are specified in guideline two for temporal dispersion.

Catch per season --- The guidelines limited the amount of catch from each season to no more than 30% of the annual TAC, and the amount from the first two seasons combined to no more than 45% of the annual TAC. In addition, rollover of catch from one season to the next can occur only if these limits are not exceeded. By themselves, these limits do not guarantee dispersal of catch, but they insure that at least four seasons are required to take the entire TAC. In general, fishing pulses in the Bering Sea and Gulf of Alaska should be reduced by one half to one third, respectively. These catch limits are specified in guidelines three, four, and six.

Distribution of catch within each season --- The distribution of catch within a season is determined by the fishing patterns of fishery participants. At present, few mechanisms have been developed to manage the catch rate or the distribution of catch during a season. The American Fisheries Act (AFA) offers realized and potential mechanisms for slowing the fisheries within a season:

- The AFA reduced the catcher/processor sector from 30 to 21 vessels, a 30 percent reduction in potential harvesting capacity relative to 1998. The catcher/processor sector has made further reductions in fleet size through cooperative agreements: in 1999, only 16 vessels participated in the first two seasons and only 12 vessels have participated to date in the third and fourth seasons. As a consequence, the catcher/processor fleet is operating in 1999 with approximately one-half the capacity with which it operated in previous years.

- The AFA fixed the number of vessels (by name) that can participate in the fishery and therefore prevented further growth of each sector.

- The AFA established guidelines for the creation of fishery cooperatives in the catcher/processor, mothership, and inshore industry sectors. Under a fishery cooperative, the members of a cooperative divide up the available TAC among themselves in a legally binding contract. The formation of fishery cooperatives has the potential to change the character of the Bering Sea/Aleutian Islands pollock fishery from that of an Olympic-style race for fish among competing vessels to a more rational fishery in which each vessel operator has a guaranteed share of the harvest and is able to conduct fishing operations in the most economically rational manner. Under the AFA, the catcher/processor sector was able to form a fishery cooperative for the 1999 fishing year. The inshore and mothership sectors will have the same opportunity for 2000 and beyond.

- The AFA requires that NMFS grant individual allocations of the inshore pollock TAC to individual cooperatives of inshore catcher vessels. Vessels choosing not to join a fishery cooperative would remain in the "open access" inshore pollock fishery. Under this provision of the AFA, the inshore sector of the pollock fishery, which fished for it's 50 percent TAC allocation in a single Olympic-style race for fish in 1999, could be subdivided into as many as eight separate co-ops with each co-op fishing under a separate allocation. With each co-op receiving a guaranteed allocation of pollock TAC from NMFS based on the 1995-1997 catch history of its member vessels, the catcher vessels in the inshore sector of the Bering Sea/Aleutian Islands pollock fishery would no longer be engaged in competition with each other for the inshore pollock harvest.

- The AFA required that NMFS establish harvest restrictions on catcher/processors and catcher vessels in the Bering Sea pollock fishery to prevent or limit participation in the Gulf of Alaska pollock fishery. These harvest restrictions are expected to reduce the number of catcher vessels that participate in Gulf of Alaska pollock fisheries in the year 2000 and beyond. As a consequence, the total number of vessels and the rate of harvest in year 2000 Gulf of Alaska pollock fisheries is expected to be significantly lower than has been the case in recent years.

The effects of the AFA are expected to manifest themselves over a two-year period. The provisions of the AFA which authorized fishery cooperatives for the catcher/processor sector of the fleet took effect January 1, 1999 and the catcher/processor sector of the fleet did form a cooperative to govern fishing for 1999. As a result, excess effort and the race for fish have been reduced significantly in this sector as noted above. However the provisions of the AFA that provide for the development of cooperatives in the mothership and inshore sectors of the fleet do not take effect until January 2000. Consequently, the full effects of the AFA on fishing patterns in the inshore and mothership sectors of the fleet are unknown at this point, but can be expected to follow a similar pattern to that found in the catcher/processor and CDQ sectors.

From 1992-1998, the CDQ sector of the pollock industry received a 7.5 percent allocation of the Bering Sea/Aleutian Islands pollock TAC, which was further allocated among the six different CDQ groups. Under the AFA, this allocation was increased to 10 percent for 1999-2004. Under the CDQ program, each CDQ group has a guaranteed allocation of pollock TAC and has the flexibility to deploy its affiliated vessels in whatever manner it sees fit within certain season and area constraints. Because CDQ groups are not racing against each other for their catch, the CDQ fishery has traditionally been a slow-paced fishery lasting over many months.

Figure 4c shows the temporal dispersion of all four sectors of the Bering Sea/Aleutian Islands pollock fishery during the first two seasons of 1999. The results illustrate the moderating effect the AFA has had on daily catch rates in the catcher/processor and CDQ sectors. Prior to 1999, the catcher/processor sector exhibited daily catch rates that were approximately double that of the inshore sector and fishing seasons that were slightly more compressed in time.

Regulations are currently under development that would facilitate the development of cooperatives in the inshore sector by granting exclusive allocations of pollock to individual cooperatives that organize around each inshore processor. If the inshore sector of the industry is able to successfully form cooperatives in 2000, significantly greater spatial dispersion of the fishery should occur, especially during the summer and fall months. This dispersion is expected because some inshore processors have traditionally been dedicated to salmon processing

during the summer months and will wish to delay pollock operations until late summer, after the salmon fishing seasons are over. However, other inshore processors are not geographically situated to process salmon and have indicated an interest in beginning their pollock operations much earlier in the summer. Consequently, eliminating the race for fish in the inshore sector is expected to result in a more natural dispersion of inshore pollock operations over time and space as the different inshore operations pursue different business objectives.

For the Gulf of Alaska, the Council has recommended and NMFS has implemented a variety of additional measures to slow the pace of the pollock fishery. The 1999 emergency rules contained a trip limit of 300,000 lbs (136 mt) for all vessels fishing for pollock in management areas 610, 620, and 630. While this limit does not affect smaller catcher vessels with hold capacities of less than 300,000 lbs (136 mt), it does significantly slow the pace of fishing by the fleet of larger Bering Sea-based catcher vessels that have traditionally fished in the Gulf of Alaska when Bering Sea fishing seasons were closed. Many of these larger catcher vessels have hold capacities exceeding 1 million lbs. In the past, the entry of large numbers of Bering Sea-based catcher vessels has lead to short-term pulse fisheries in the Gulf of Alaska with attendant concerns about localized depletions of pollock populations.

The Council also has recommended regulations that would prohibit catcher vessels from fishing in both the Gulf of Alaska and Bering Sea during the same fishing season, and regulations that would prohibit tendering[10] of pollock in the management areas 620 and 630. These new regulations are expected to have the additional effect of slowing the pace of Gulf of Alaska pollock fisheries by reducing the expected number of vessels that will be deployed in any one area. Finally, the AFA places additional restrictions on Bering Sea-based catcher vessels as noted above. The combined effects of all of these measures is expected to significantly slow the pace of the Gulf of Alaska pollock fisheries in a manner consistent with the RPA principle of temporal dispersion. While it is difficult to project with precision, the effects these changes will have on the pace of Gulf of Alaska pollock fisheries, the possible magnitude of such changes can be estimated. The combined effects of the Council's recommendations with respect to limiting participation by Bering Sea-based vessels in the Gulf of Alaska is expected to discourage or prevent all but a few Bering Sea-based catcher vessels from continuing to fish in the Gulf of Alaska. Historically (in 1995-1997) Bering Sea-based catcher vessels have accounted for approximately 75 percent of the pollock landings in areas 610 and 620 of the Gulf of Alaska, and more than 50 percent of pollock landings in area 630 and 640. If the bulk of this effort is removed from the Gulf of Alaska due to the combination of AFA and Steller sea lion measures, pollock seasons in the western half of the Gulf of Alaska (610 and 620) could last 2 to 3 times longer than in prior years and pollock seasons in the eastern half of the Gulf of Alaska (areas 630 and 640) could double in length. However, these projections assume that the reduction in effort by Bering Sea-based catcher vessels will not be made up by the entry of new vessels to the Gulf of Alaska pollock fishery that have not traditionally fished for pollock in the Gulf of Alaska.

While the above expected and implemented changes to the fisheries have the potential to slow the pace of each season, such a difference was not realized to the extent expected in 1999. A comparison of the 1998 A season with the 1999 A and B seasons[11] (Bering Sea) suggests that the realized temporal dispersion was limited simply to the imposition of the 5-day stand-down (Fig. 4d). The results in Figure 4 suggest that the difference between these two periods of fishing was due to factors other than temporal dispersion (primarily spatial dispersion, as seen in Figure 4a and b, and discussed below). The portion of catch per day was otherwise fairly similar between

[10] The term “tendering” refers to the fishing practice where one boat (the tender) takes the catch from a second fishing boat and transports the catch to port. This practice allows the fishing boat to resume fishing without the delay associated with transport to port and return to the fishing area. One tendering vessel may service multiple fishing vessels.

[11] The change from two to four seasons in the Bering Sea and three to four seasons in the Gulf of Alaska has resulted in considerable confusion due to different terminology for seasons in these two regions. Previously, the four new seasons in the Bering Sea region have been referred to as A1, A2, B, and C seasons, and in the Gulf of Alaska, A, B, C, and D seasons. To end such confusion, this document refers to seasons in both regions as A, B, C, and D, and will use those names when referring to fishing in 1999, 2000, and beyond.

the two years. The effect of the offshore cooperative was apparently not sufficient to overcome the fishery pattern of the other sectors in the Bering Sea, particularly in 1999. Therefore, the temporal changes anticipated on the basis of the AFA are yet to be realized.

Distribution of seasons within the year --- The Opinion contained three guidelines pertaining to the distribution of seasons within the year. The first guideline prohibits fishing from November 1 to January 20. The second guideline requires that two of the four seasons occur during the period from January 20 to June 1 and the other two seasons occur from June 1 to November 1. The fifth guideline requires that two seasons not be aggregated in such a manner as to result in one effective pulse of fishing effort. These guidelines were not sufficient to insure dispersion of the catch throughout the year. The fifth guideline, in particular, fails to provide specific definitions for aggregation or clumping and fails to describe how its intent should be accomplished. Thus, the A and B seasons could be condensed into a very short period of time if the fishery could take the catch that quickly. The Court noted this problem in its July 9, 1999 ruling, by pointing out that the first two seasons in 1999 did not appear to represent any significant improvement in dispersal compared to 1998 (Fig. 5). A similar problem could occur if a season is scheduled to start "X" days after the closure of the previous season but no constraints are placed on the length of the first season (e.g., the C and D seasons in the Gulf of Alaska in 1999 and the recommended C and D seasons in the Bering Sea for the inshore sector for 2000 and beyond). This approach encouraged temporal concentration, particularly in a derby-style fishery: The faster the catch of the first season is taken, the sooner the second season can begin.

Each of the above parameters (the number of seasons, the catch per season, the distribution of catch within each season, and the distribution of seasons within the year) should be specified to insure temporal dispersion of the catch within a year. The first two (number of seasons and catch per season) were specified in a manner consistent with temporal dispersion. Methods to distribute the catch within a season were not originally expected as fishery management does not traditionally determine the pattern of catch within a season. Nevertheless, the catch within a season may be altered considerably in the Bering Sea if the remaining sectors form cooperatives, and several mechanisms have been put in place to slow the fishery in the Gulf of Alaska.

The fourth factor, distribution of the seasons within the fished part of the year, was specified in part, but was not specified in a manner that insured better distribution of the catch throughout the year. Due to incomplete specification, then, these guidelines, by themselves, were not sufficient to insure temporal dispersion of the fisheries. NMFS's remedy for this situation is described in a later section on modification of the RPAs.

E. Do the management measures meet the guidelines?

Six guidelines were established in the Opinion to achieve the principle of temporal dispersion.

1. Guideline: Continue current prohibition on all pollock trawling fisheries in the period from November 1 through January 20 and extend to the Gulf of Alaska.

   Purpose: The purpose of this guideline is to eliminate competition between Steller sea lions and pollock fisheries during a period when sea lions may be particularly sensitive to reductions in the availability of prey.

   Council recommendation(s)/emergency rule: For 1999, the Council recommended and the emergency rule included (with two exceptions) closure of pollock trawl fishing in the Bering Sea and the Gulf of Alaska from November 1 to January 20. The two exceptions allowed the mothership to continue to fish in the Bering Sea until November 11 and the Community Development Quota (CDQ) sector to continue to fish until December 31. For 2000 and beyond, the Council recommended prohibition of pollock trawling by all sectors in the Bering Sea and Gulf of Alaska between November 1 and January 20.

   Analysis/discussion: Council recommendations and the emergency rule achieves the purpose of this guideline in an incremental manner. The prohibition will be in place by 2000.

Conclusion: Guideline one for temporal dispersion has been met.

2. Guideline: Distribute the pollock trawl harvest into at least four seasons (two in the period from January through May and two in the period from June through October).

   Purpose: The purpose of this guideline is to better disperse both the Bering Sea/Aleutian Islands and Gulf of Alaska pollock fisheries through the remainder of the year (January 20 to November 1) to reduce the potential for temporary localized depletion of prey for sea lions.

   Council recommendation(s)/emergency rule: For 1999, the Council recommended and the emergency rule included the following seasons and dates for the Bering Sea and Gulf of Alaska pollock fisheries.

Bering Sea, 1999			
Fishing season	Industry sector		
	Inshore and catcher/processor	Mothership	Community development quota
A	Jan. 20 - Feb. 15	Feb. 1 - Apr. 15	Jan. 20 - Apr. 15
B	Feb. 20 - Apr. 15		
C	Aug. 1 - Sep. 15	Aug. 1 - Sep. 15	Apr. 15 - Dec. 31
D	Sep. 15 - Nov. 1	Sep. 15 - Nov. 1	

Gulf of Alaska, 1999		
Fishing season	Start dates	End dates
A	Jan. 20	Apr. 1
B	Jun. 1	Jul. 1
C	Sep. 1	Date of closure of a statistical area (610, 620, 630) to directed fishing, or October 1, whichever comes first.
D	Five days after the date of closure of a statistical areas (610, 620, or 630) to directed fishing in the C season.	Nov. 1

For 2000 and beyond, the Council recommended the following dates.

Bering Sea, 2000 and beyond				
Fishing season	Industry sector			
	Inshore	Catcher/ processor	Mothership	Community development quota
A	Jan. 20-Feb. 15	Jan. 20-Feb. 15 Stand-down 7 days in CHCVOA; no stand-down outside CHCVOA with max daily catch rate of 2,000 mt from Feb. 15-22.	Feb. 1-Apr. 15 Stand-down 7 days in CHCVOA; no stand-down outside CHCVOA with max daily catch rate of 2,000 mt from Feb. 15-22.	Jan. 20-Apr. 15 Stand-down 7 days in CHCVOA; no stand-down outside CHCVOA with max daily catch rate of 2,000 mt from Feb. 15-22.
B	Feb. 22-Apr. 17	Feb. 22-Apr.17		
C	Jun. 1 if co-operatives in place, August 1 if no co-operatives	Jul. 10-Aug. 31 no stand-down	Sep. 1-Nov. 1	Apr. 15-Nov. 1
D	C closure plus 7 days to Nov. 1	Sep. 1-Nov. 1		

Gulf of Alaska, 2000 and beyond		
Fishing season	Start dates	End dates
A	Jan. 20	Mar. 1
B	Mar. 15	June 1
C	Aug. 20	Sep. 15
D	Oct. 1	Nov. 1

Analysis/discussion: For the Gulf of Alaska, the Council's recommendations and the emergency rule did not achieve this dispersion in 1999: three seasons were in the period from June to October, and one was in the period from January to May. This discrepancy was corrected in the Council's recommendations for 2000.

For the Bering Sea, seasons were set or recommended by sector. The Council's recommendations and the emergency rule allowed two sectors to fish in two rather than four seasons. Motherships and CDQ, which together get 20% of the annual TAC, were allowed to fish in two seasons rather than four in 1999, and will be so allowed in 2000 if the Council's recommendations are incorporated into the regulations. This deviation from the guideline was deemed acceptable if the catch per season stayed within the 30%

cap.

Conclusion: NMFS believes that guideline two for temporal dispersion is satisfied, with the exception of the two season allocation for CDQ and motherships. This exception will be discussed later in the section on modification of the RPAs.

3. Guideline: Limit combined TAC in the winter and spring periods to a maximum of 45% of the annual TAC (the current limit on the existing winter season).

   Purpose: The purpose of this guideline is to insure that the pollock catch in the period from January 20 to June 1 did not exceed 45% of the annual TAC. Again, this guideline was to disperse the fishery throughout the year and, in particular, avoid concentration of catch in the winter period when sea lions may be especially sensitive to availability of prey and in the spring period when the spawning condition of pollock may make them especially valuable prey for sea lions.

   Council recommendation(s)/emergency rule: For 1999, the Council recommended and the emergency rule included a reduction in the winter/spring portion (A+B combined) of the TAC from 45% to 40% of the non-CDQ TAC for all non-CDQ fisheries in the Bering Sea. For a non-CDQ TAC of about 900,000 mt, this 5% reduction amounts to 45,000 mt of pollock shift from the A+B seasons to the C+D seasons. The CDQ sector was limited to 45% of its annual TAC during this period. For 1999, the Gulf pollock fishery was limited to 30% of its annual TAC in the Gulf A season, the only season scheduled to occur in period from January to May. For 2000, the Council recommended a 40%/60% split between the combined A+B seasons and the combined C+D seasons in the Bering Sea. For the Gulf of Alaska, the Council did not specifically recommend a split between winter and other seasons, but apportioned TAC among the seasons in a manner than included 30% in the A season and 15% in the B season, which results in a total of 45% in the combined A+B seasons.

   Analysis/discussion: In both the Bering Sea and the Gulf of Alaska, the Council recommendations and the emergency rule are consistent with the purpose of this guideline for 1999 and for 2000 and beyond.

   Conclusion: Guideline three for temporal dispersion has been met.

4. Guideline: Allocate single-season TACs to be no more than 30% of the annual TAC.

   Purpose: The purpose of this guideline is to maintain the integrity of the four-season system by insuring that the annual fishing effort would be relatively evenly dispersed throughout the period from January 20 to November 1.

   Council recommendation(s)/emergency rule: On both December 13, 1998 and June 14, 1999, the Council recommended seasonal limits of 30% of the annual TAC. The emergency rule incorporated this recommendation.

   Analysis/discussion: This guideline was included to insure that fishing effort was not effectively concentrated into three or fewer seasons by apportioning more than 30% of the TAC to selected seasons. (For example, a seasonal limit of 35% could have reduced the year to three seasons: 35% + 35% + 30%.) A cap of 30% was chosen to allow some flexibility relative to an even fixed distribution of 25% in each of four seasons. This cap has been recommended and implemented. No further analysis is required.

   Conclusion: Guideline four for temporal dispersion has been met.

5. Guideline: Prevent concentration of pollock catch at the end of one season and the beginning of the next season which, in effect, could result in a single pulse of fishing. Mechanisms for limiting such concentration might include inter-seasonal no-fishing periods, or limits on the proportion of a seasonal

TAC that can be taken in the latter part of a season. Other measures to spread or reduce effort may be necessary.

Purpose: The purpose of this guideline is to prevent the effective collapse of two consecutive seasons into one single intense pulse by concentrating fishing effort at the end of the first period and the beginning of the second period. Again, the purpose was to maintain the integrity and purpose of the four-season system (i.e., distribute the catch to reduce the potential for localized depletion). Possible mechanisms for preventing such a concentration include no-fishing periods between seasons and mechanisms to distribute catch within each season.

Council recommendation(s)/emergency rule: Stand-down periods were used to separate seasons in both the Bering Sea and the Gulf of Alaska. The following table summarizes the stand-down periods in 1999 and 2000 for these regions.

Area, year	Seasons	Stand-down interval
Bering Sea, 1999	A to B	S 5-day stand-down inshore and offshore sectors S no stand-down mothership or CDQ sectors
	B to C	S 3.5-month stand-down inshore, offshore, mothership sectors S no stand-down CDQ sector
	C to D	no stand-down all sectors
Bering Sea, 2000	A to B	S 7-day stand-down inshore sector S 7-day stand-down inside CHCVOA for offshore and mothership sectors with no stand-down outside CHCVOA if max daily catch rate of 2,000 mt from Feb. 15-22 S no stand-down CDQ
	B to C	S 43- or 104-day stand-down inshore sector S 84-day stand-down offshore sector S no stand-down mothership or CDQ sectors
	C to D	S 7-day stand-down inshore sector inside CHCVOA, no stand-down outside CHCVOA S no stand-down offshore, mothership, and CDQ sectors
Gulf of Alaska, 1999	A to B	2-month stand-down
	B to C	2-month stand-down
	C to D	5-day stand-down
Gulf of Alaska, 2000	A to B	15-day stand-down
	B to C	81-day stand-down
	C to D	16-day stand-down

Analysis/discussion: From the perspective of the Bering Sea fishing fleet, the preferred seasonal configuration would be short stand-downs between the A and B seasons (in the winter/spring period during the roe fishery), long stand-downs between the B and C seasons, and short stand-downs between

the C and D seasons in the late summer and fall. This arrangement is essentially the same as in 1998 in the Bering Sea (Fig. 4), with the exception that a short break is imposed in the middle of what was then a single A season in the winter and a single B season in the fall. Such short breaks are not likely to allow full recovery of the prey field or sea lions compromised by competition with fisheries. These recovery processes can not be described with the best available scientific and commercial data, but considerably better temporal dispersion is possible using evenly dispersed seasons.

In 1998, the Gulf of Alaska fleet took 25% of the annual TAC in late January, then had a long stand-down until June 1, when the second season opened for 35% of the annual TAC, and finally the third season began on September 1 for 40% of the TAC. Under the four season requirement, the Gulf of Alaska fishery will be better dispersed, particularly when compared to the Bering Sea fishery. The seasons in the Gulf of Alaska are not evenly dispersed, but the TAC in the Gulf of Alaska is divided into more time/area combinations (14 time/area releases), compared to the Bering Sea (8 time/area releases). Given the much smaller TAC in the Gulf of Alaska, this fishery is better dispersed through time/area combinations.

Conclusion: Guideline five for temporal dispersion was met for the Gulf of Alaska but not met for the Bering Sea. This issue will be addressed below in the section on modification of the RPAs.

6. Guideline: Limit rollover of portions of seasonal TACs to situations only where necessary to account for premature fisheries closure resulting from inaccuracies associated with monitoring of seasonal catches.

   Purpose: The purpose of this guideline is to prevent fisheries from concentrating catch in a season by lowering the catch well below the TAC in one season and then rolling over the portion of the TAC not caught to the next season. This guideline was considered necessary to maintain the integrity of the four-season approach and distribute the catch throughout the period from January 20 to November 1.

   Council recommendation(s)/emergency rule: The Council recommended that rollovers be allowed consistent with seasonal caps and areal (CHCVOA) apportionments.

   Analysis/discussion: In the past, NMFS adjusted for overages and underages of seasonal TAC allowances in both the Bering Sea/Aleutian Islands and Gulf of Alaska pollock fisheries. Such adjustments were generally made to account for management imprecision in closing open access fisheries. However, as stated in the Environmental Assessment prepared for the Council in 1999, "industry has indicated interest in strategically timing fishing activity inside and outside the CHCVOA conservation zone so that effort occurs in each area when fishing is most productive."

   Prior to 1999, only two seasons existed in the Bering Sea subarea and A season overages or underages were simply subtracted or added to the B season TAC allowance. In the western/central Gulf of Alaska, three or four seasons existed and overages or underages in one season were proportionately deducted from or added to the subsequent fishing seasons in the same fishing year. The January 20, 1999, emergency rule (50 CFR 679.20 (a)(5)(iii)) provides that:

   > "Within any fishing year, underage or overage of a seasonal allowance may be added to or subtracted from subsequent seasonal allowances in a manner to be determined by the Regional Administrator provided that overall pollock removals from all sectors during a fishing season do not exceed 30% of the combined annual TAC of pollock."

   This language accommodates seasonal TAC rollovers consistent with the RPA guideline that no more than 30% of the annual TAC be taken during any single season. Two forms of overages and underages are possible. First, during a particular season, a sector may underharvest or overharvest its overall seasonal TAC allowance. Second, a sector may underharvest or overharvest a CHCVOA catch limit.

TAC rollovers --- With respect to underharvest or overharvest of the overall seasonal TAC allowance due to management imprecision, routine adjustments in subsequent fishing seasons are possible under the RPA guidelines as long as the resulting "adjusted" seasonal allowances do not violate any of the RPA guidelines for temporal dispersion.

CHCVOA rollovers --- Under the emergency rule, NMFS views CHCVOA catch limits to be caps and not separate TAC allowances. In other words, each sector receives a single TAC allowance per season of which no more than a specified percentage can be taken inside the CHCVOA conservation zone. However, there is no limit on the percentage of a seasonal TAC allowance that can be taken outside the CHCVOA should participants decide to deploy greater effort outside the CHCVOA conservation zone than is strictly required. Consequently, if a sector reaches a seasonal TAC allowance without reaching its CHCVOA limit, then no rollover is possible because the entire seasonal allowance has been taken. For this reason, rollover of CHCVOA limits may be possible only when both the seasonal TAC allowance and the CHCVOA limit have not been reached during a particular season. In such instances, any rollover of a CHCVOA limit may be possible so long as such adjustments do not result in a violation of any of the guidelines for spatial and temporal dispersion.

Specifically, rollover of seasonal TAC and catch inside the CHCVOA are acceptable within the following limits (for all sectors combined):

- the 30% cap for each seasonal TAC must not be exceeded,
- uncaught portions of TAC from areas outside the CHCVOA in one season can not be rolled over into the CHCVOA in the next season,
- uncaught portions of TAC from within the CHCVOA in the A season can be rolled over into the CHCVOA for the B season as long as the amount taken from the CHCVOA during the B season does not exceed 50 % of the sum of the original B season TAC plus the total amount rolled over from the A season,
- uncaught portions of TAC from within the CHCVOA in the B season can be rolled over into the CHCVOA for the C season as long as the amount taken from the CHCVOA during the C season does not exceed 15% of the sum of the original C season TAC plus the total amount rolled over from the B season, and
- uncaught portions of TAC from within the CHCVOA in the C season can be rolled over into the CHCVOA for the D season as long as the amount taken from the CHCVOA during the D season does not exceed 25% of the sum of the original D season TAC plus the total amount rolled over from the C season.

Due to other guidelines and management measures that maintain the integrity of the four-season system, this guideline was considered to be redundant as long as the above restrictions on rollovers are observed. The above restrictions prevent catch from being redistributed from outside critical habitat or the CHCVOA to inside those regions, they prevent the catch in any particular season from exceeding the 30% cap, and they prevent the catch within critical habitat or the CHCVOA from exceeding seasonal limits.

Conclusion: The purpose of this RPA guideline has been accomplished by restrictions on rollovers combined with measures implemented under other RPA guidelines. Under the December 16, 1998 modifications to the Biological Opinion, rollovers meeting the above conditions were considered acceptable. Therefore, guideline six for temporal dispersion has been met.

F. Has the principle of temporal dispersion been achieved?

The original RPA guidelines and management measures were not sufficient to insure temporal dispersion of the pollock fisheries. The guidelines and measures failed to provide sufficient dispersal of seasons within the fished part of the year, and the CDQ and mothership sectors in the Bering Sea were allowed to fish during two seasons

only. NMFS will provide remedies for these problems in a later section on modification of the RPAs.

VIII. Spatial dispersion

A. Purpose

The purpose of this principle is to insure that the harvest is distributed over space in accordance with the distribution of the stock in all areas outside of those protected by the no-pollock-trawl or no-trawl zones. If the harvest is distributed in such a manner, then local harvest rates should be the same as the overall harvest rate and the potential for localized depletion should be correspondingly reduced.

B. Why is spatial dispersion required?

Management of the pollock fisheries in the Bering Sea and the Gulf of Alaska is based largely on a single-species approach which relies on stock-wide measures of stock status and fisheries effects (e.g., total biomass and overall harvest rate). This single-species approach is extended during the TAC-setting process to account for ecosystem concerns related to removal of the stock. Nevertheless, this approach may have serious ecosystem effects if it fails to account for the spatial and temporal dynamics of the pollock stock and harvesting. Considerably more attention has been paid to the distribution of pollock stock and harvesting in the Gulf of Alaska than in the Bering Sea. Still, in both areas, harvesting patterns have not been consistent with stock distribution, and local harvest rates have exceeded overall harvest rates by significant amounts. Excessive localized harvest rates may lead to localized depletion relative to the needs of Steller sea lions and other consumers in the ecosystem.

The distribution of pollock fishing has changed over time in both the Bering Sea and the Gulf of Alaska. The changes that have occurred are likely due (at least to a considerable degree) to the evolution from a foreign fleet to foreign-domestic joint venture operations and finally to an entirely domestic fleet. With this shift in the composition of the fleet, the fishery has become more concentrated in nearshore waters, including Steller sea lion critical habitat. As such, the propensity for competition with Steller sea lions and other nearshore feeders increases. In the Bering Sea, the most recent step in this progression has occurred through sector allocations, with a larger portion of the catch going to the inshore sector.

In the Gulf of Alaska, management areas have been established to distribute the catch throughout the region in a manner more consistent with the distribution of the stock. However, the development of a small boat fleet has led to a limited catch distribution that is not consistent with the distribution of the stock in the winter and spring periods. Further measures are required to better distribute catch during the roe season when better information is available on the distribution of the stock. In the 1980s, the pollock fishery rapidly became concentrated in the Shelikof Strait area after the discovery of the large spawning aggregation in that area. More recently, however, this area has not been fished to the extent that would be expected on the basis of the distribution of the stock during winter and spring. From 1994 to 1997, for example, the harvest rate in this area was less than 3%. If a large portion of the pollock stock is found in this region and that portion is under-utilized relative to the overall harvest rate, then portions of the stock outside of Shelikof Strait must be over-utilized to maintain the overall harvest rate. Therefore, the measures required in the Gulf of Alaska were intended to insure that portions of the stock in the Shelikof Strait area are not under-utilized at the expense of the stock and associated consumers outside this area.

For the Bering Sea, analyses of stock distribution, catch, and harvest rates indicate that since the early 1990s, an average of about 15% of the pollock stock was in the CVOA during the summer survey. By comparison, 36% to 50% of the B-season catch came from this region in the years 1992 to 1997. Thus, harvest rates in the CVOA were significantly greater than harvest rates observed in other regions. In the A season, 53% to 89% of the catch was taken from critical habitat from 1992 to 1997. The discrepancy provides additional evidence of local harvesting at a rate that exceeds the overall harvest rate, and therefore may cause localized depletion relative to the needs of Steller sea lions. On an annual basis, the catch from critical habitat in the Bering Sea has ranged

from about 45% to nearly 70% of the total catch since 1987 (with the exception of 1990).

The uneven distribution of harvest in the Bering Sea reflects a scalar mismatch between the stock as assessed for the purposes of setting the TAC, and the stock as a resource to be fished. Through 1998, virtually all of the pollock TAC could have been taken within the CHCVOA (Fig. 6). Yet, the CHCVOA is about a tenth the size of the entire eastern Bering Sea shelf, the area over which the stock is assessed for the purpose of determining the TAC. This scalar mismatch is crucial because ecosystem effects will be determined not only by the total catch, but also by the distribution of the catch over area occupied by the stock. The Biological Opinion concluded that the harvest rate may be safe when dispersed over the range of the assessed stock. But the Opinion did not consider local harvest rates to be safe if they exceeded the overall harvest rates, creating areas of potential localized depletion. All of this information suggests that the overall annual harvest rate for the eastern Bering Sea (i.e., 15-20%) was not a good indicator of (1) the harvest rate on smaller spatial and temporal scales, (2) possible ecosystem effects, and (3) possible effects on Steller sea lions, in particular. To be consistent with the assumption that the overall harvest rate is safe, fisheries management must insure that the harvest is distributed spatially in accordance with the distribution of the stock.

C. What areas should be used?

As just noted, the pertinent portion of the Gulf of Alaska is already divided into three areas for the purposes of spatially distributing the annual TAC (areas 610, 620 and 630). The Shelikof Strait area falls within areas 620 and 630. To insure that this area is not under-utilized at the expense of other areas, Shelikof Strait should be established as a fourth management area with its own seasonal TAC during the period when pollock are known to be aggregated there (the winter/spring period). Guidelines were included for this purpose.

Four main areas were considered for spatially dispersing catch in the Bering Sea (excluding the central and western Aleutian Islands area): the CVOA, critical habitat (southeastern Bering Sea foraging area), and east and west of the 170°W long. line outside of critical habitat (Fig. 6). The CVOA was established in 1992 to separate pollock fishing effort by sector, and insure a fishing area and portion of the TAC for the inshore fleet. The CVOA was in force only during the B season, when the offshore and mothership sectors were required to fish outside the boundaries of this region. The southeastern Bering Sea foraging area was included when critical habitat was designated in 1993. The 170°W long. line has been used as the border between the eastern Bering Sea and the Aleutian Islands region south of 56°N lat. This line also divides the eastern Bering Sea shelf and the pollock stock approximately in half. Alternative spatial areas were allowed by guidelines in the Biological Opinion and sought through discussions with the Council and public. The only alternative measure put forth was a possible buffer zone around the southeastern Bering Sea special foraging area of critical habitat. The intent of the buffer zone was to prevent a concentration of fishing on the border of critical habitat, as has been observed in other fisheries and may occur in the Bering Sea pollock fishery.

Given our current limited understanding of the pollock distribution and the recognition that their distribution changes seasonally, and (to some degree) annually, broad management areas were considered appropriate and prudent. Analyses in the environmental assessment for the extension of the emergency rule indicate that from 1982 to 1998, an average of 62% (range 49% to 78%) of the exploitable pollock biomass was distributed west of the 170°W long. line in summer months (Table 3-4 in the assessment). From 1991 to 1998, the average dropped to 55%. Estimated harvest rates in this region were less than 10% in all years except 1991 (19%), compared to harvest rates commonly over 20% and exceeding 40% in the CHCVOA (Figure 3-21 in the assessment). Sea lions forage on both sides of the line (Fig. 1), but it is not clear that this area is critical to survival of the species; this area was not included in Steller sea lion critical habitat. Furthermore, the data depicted in Figure 1 do not indicate the relative importance of any particular area as sightings were collected over a 40-year period and sighting results are biased by the location of sighting effort.

The entire southeastern Bering Sea special foraging area (critical habitat) and the entire CVOA are located east of this line. These areas are considered important to sea lion foraging and their prey, and these areas must be used to disperse catch spatially. The southeastern Bering Sea special foraging area and the CVOA overlap considerably

and the guidelines in the Biological Opinion required that they be combined for the purpose of distributing the pollock TAC. Only two regions of the CVOA fall outside of the special foraging area in the southeastern Bering Sea and are affected: the northwest corner of the CVOA and the eastern section that falls neither in the special foraging area nor in the critical habitat area around Sea Lion Rock (next to Amak Island) (Fig. 6). The Council recommended that the northwestern corner not be combined with critical habitat for this purpose, but recommended that the eastern area be combined. The emergency rule (and its extension) excluded the northwestern area because typically, it has not been fished for pollock in the 1990s, and its inclusion is not necessary.

The emergency rule (and its extension) did include the eastern portion of the CVOA between the southeastern Bering Sea special foraging area and the critical habitat area around Sea Lion Rock. This area was combined with critical habitat for the purposes of distributing the pollock TAC. The purpose was to further the principle of distributing the catch according to the distribution of the stock. If this area was not combined, then it would have remained open after adjacent areas of critical habitat had been closed and provided a nearshore area where fishing would likely be heavily concentrated and the probability of localized depletion would be increased greatly. Such concentration compressed between the special foraging area and critical habitat around Sea Lion Rock would almost certainly 1) adversely modify prey resources in these two immediately adjacent areas, and 2) defeat the purpose of the spatial dispersion of the catch.

D. When (during what seasons) should these management areas be implemented?

In the Gulf of Alaska, management areas 610, 620, and 630 are in effect year-round, with the distribution of the TAC based on the best available information on stock distribution. The addition of the Shelikof Strait management area is intended only for the winter/spring period when pollock are known to aggregate in this region for spawning. These aggregations have been assessed annually during hydroacoustic surveys. Therefore, for the Gulf of Alaska, spatial distribution of the catch simply requires the addition of the Shelikof Strait management area during winter and spring (which should include two seasons).

In the Bering Sea, ice coverage is generally at its greatest in March/April. Therefore, the distribution of ice in the winter/spring period constrains the areas where sea lions can forage and where vessels can fish for pollock. As the ice edge has occasionally reached as far south as the northern edge of the CHCVOA, the use of two management areas was considered sufficient to distribute catch according to the distribution of the available stock in the winter and spring seasons. These two management areas would be inside the CHCVOA and outside the CHCVOA. Until determination of the importance to foraging sea lions of areas outside critical habitat, the 170°W long. line will not be used to distribute the catch. After further surveys and research, NMFS may determine that this area should also be used.

E. What if the stock distribution is unknown?

The principle of dispersing catch according to the distribution of the stock assumes that the distribution of the stock is known. That is not the case for all seasons, particularly in the Bering Sea where the eastern stock is thought to be relatively mobile. As of 1999, the Bering Sea pollock fishery is split into four seasons, but most of the information available on the distribution of the stock is from summer surveys. The information on pollock stock distribution in the winter and spring period is relatively limited. When these guidelines were developed, little effort had been directed at assessment of the pollock stock in winter. Yet, the fishery has been highly concentrated in the CHCVOA during the winter period. The uncertainty about the distribution of the stock during this season suggested that some precautionary limit needed to be set to avoid disproportionate harvesting until winter surveys could be incorporated into the stock assessment. A guideline was added to the Biological Opinion to set a precautionary limit for the harvest of pollock in the CHCVOA until better information was available. However, the lack of information about pollock stock distribution throughout the year is a significant impediment to efforts to understand and resolve potential interactions between sea lions and the fisheries, and argues strongly for more seasonal stock assessment surveys.

F. Are the guidelines sufficient to achieve spatial dispersion?

The principle protecting prey resources around rookeries and haulouts had already identified key areas where the potential for competition must be avoided completely. The purpose of this principle of spatial dispersion was to insure that in the areas that are fished, the catch is distributed according to the distribution of the stock. Such dispersion is intended to insure that local harvest rates are consistent with overall harvest rates and, therefore, less likely to lead to localized depletion of prey resources for Steller sea lions. The guidelines incorporated into the Biological Opinion 1) required that this principle be observed in both the Bering Sea and Gulf of Alaska, 2) established management areas to be used in the summer/fall period and the winter/spring period, and 3) required a cap on fishing in critical habitat during seasons when the distribution of pollock is unknown. The guidelines also 4) prevented redistribution of the TAC from areas outside of critical habitat to areas inside of critical habitat as a function of unexpected circumstances (e.g., extreme ice coverage). Finally, the guidelines 5) provided for the possibility that even with appropriate spatial dispersal of catch, the catch in critical habitat may require further reduction. This guideline was included because the fundamental assumption that the harvest level safe for the pollock stock is also safe for Steller sea lions may be wrong. Therefore, some further reduction of catch in critical habitat may be required.

Based on the available information, NMFS believes these guidelines insure spatial dispersion of the catch according to the distribution of the stock. The single difference between these guidelines and the RFRPAs is the decision to spatially distribute catch in the Bering Sea C and D seasons inside and outside the CHCVOA only. This decision will be addressed below in the section on modification of the RPAs.

G. Do the management measures meet the guidelines?

Five guidelines were established to achieve the principle of spatial dispersion.

1. Guideline: Allocate percent TAC to areas defined by critical habitat (CH) and broad management districts (see guideline 5 below) based on the pollock biomass distribution.

   Purpose: This guideline requires spatial dispersion of the pollock catch based on pollock biomass distribution. The intent of this guideline was essentially the same as the principle: to prevent depletion of pollock stocks (relative to the needs of Steller sea lions) in local areas due to harvesting in excess of the overall harvest rate.

   Council recommendation(s)/emergency rule: For the Gulf of Alaska, management areas were already established for dispersion of catch. An additional measure was required to establish Shelikof Strait as a management area with an allocated seasonal TAC for the winter/spring seasons, and that measure was included in the Council's recommendation for 2000.

   For the Bering Sea, the Council recommended and the emergency rule contained TAC allocations inside and outside of the CHCVOA for the winter/spring (A,B) seasons, as required by guideline 5 below. For the C and D seasons, the Council declined to allocate TAC in the management areas indicated in guideline 5 below and also declined to offer substitute management areas for dispersion of catch according to the distribution of the stock in the C and D seasons. NMFS has determined that further evaluation of the areas outside of the CHCVOA is necessary before implementing the 170°W long. line, or any other measure to further disperse the catch spatially.

   Analysis/discussion: Management measures have been recommended and implemented to distribute catch in the Gulf of Alaska, including the addition of one new management area for the A and B seasons. For the Bering Sea, management measures have been recommended and implemented to distribute catch inside and outside of the CHCVOA in the A and B seasons. At present, no measures have been recommended or implemented to fully distribute catch according to the distribution of the stock in the C

and D seasons in the Bering Sea. Therefore, existing and recommended management measures are not yet sufficient to meet this guideline.

Conclusion: NMFS believes that guideline one under spatial dispersion has been met, and that sufficient dispersion of the Bering Sea catch will be achieved by focusing only on areas inside and outside of the CHCVOA.

2. Guideline: Absent good scientific estimates of pollock biomass distribution, place a maximum limit on the percent of TAC allocations from CH areas for each season. A cap of 50%, for example, is consistent with past fishing practices, but still leads to meaningful reduction in the percent of TAC from CH.

   Purpose: The purpose of this guideline is to limit the catch in designated Steller sea lion critical habitat for periods when the fishing occurs in the absence of reliable information on the distribution of the pollock stock. Specifically, this guideline was developed to limit catch in critical habitat during the winter/spring period in the Bering Sea.

   Council recommendation(s)/emergency rule: The Council recommended and the emergency rule contained a management measure to reduce the portion of the A and B seasonal TACs taken in the Bering Sea CHCVOA to 62.5% in 1999. The effects of this reduction are illustrated in Figure 4. The Council also recommended that this limit be reduced to 50% in 2000 and beyond.

   Analysis/discussion: The management measures recommended by the Council and implemented in the emergency rule establish a cap on the portion of the catch from the CHCVOA in the A and B seasons. The cap was implemented in an incremental manner, which is consistent with the guidance given in the Biological Opinion.

   Conclusion: Guideline two of spatial dispersion has been met.

3. Guideline: Allow for the possibility of further reduction of percent TAC in specific critical habitat areas.

   Purpose: The purpose of this guideline is to provide a mechanism for further reduction of catch in specific critical habitat areas. "Further reduction" was intended to mean reduction below the harvest level that would occur if the catch were distributed according to the distribution of the stock, as required by the first guideline under spatial dispersion. The first guideline is based on the assumption that the overall harvest rate assumed safe for the target species is also safe for the ecosystem and protected species such as the Steller sea lion. This third guideline was included because that assumption may not be correct, in which case a lower level of harvest would be required.

   Council recommendation(s)/emergency rule: While the Council did not address this guideline directly, it did recommend closure of the Aleutian Islands, which is consistent with this guideline. In effect, this closure reduces the harvest rate of pollock in the Aleutian Islands (including the areas designated as critical habitat in this region) to the level required for bycatch only. No directed fishing will occur for pollock in this region.

   Analysis/discussion: This guideline allows reduction of TAC if it is determined that the current overall harvest rate is not safe for Steller sea lions, even when distributed spatially and temporally. The guideline was developed with the expectation that a consistent harvest rate would first be accomplished through spatial and temporal dispersion of the catch. If the harvest rate resulting after spatial and temporal dispersion was determined to be too high, then this guideline allowed for further reduction in the harvest rate. An immediate management response was not expected under this guideline.

   Conclusion: Guideline three of spatial dispersion has been met.

4. Guideline: Prevent redistribution of TAC from areas outside of critical habitat to areas inside of critical habitat.

   Purpose: The purpose of this guideline is to prevent concentration of catch in critical habitat by shifting apportionments of TAC from outside of critical habitat to inside of critical habitat. Such redistribution might be considered, for example, if ice formation limited the geographic region of fishing to a relatively small area that consisted largely of Steller sea lion critical habitat. In such a case, the TAC that was apportioned to regions outside of critical habitat should not be taken from within critical habitat. The reason for this guideline is that sea lions would be effectively limited to the same geographic restrictions, and prey resources within critical habitat would be excessively reduced for sea lions with such redistribution of catch.

   Council recommendation(s)/emergency rule: The Council did not make recommendations and the emergency rule did not contain measures specific to this particular guideline.

   Analysis/discussion: No immediate management measure or response to this guideline was expected.

   Conclusion: Guideline four of spatial dispersion has been met.

5. Guideline: Base spatial distribution of the TAC on existing study or management areas. In addition, in the southeastern Bering Sea, the CVOA and southeastern Bering Sea foraging area should be combined to form one CVOA-CH complex. Additional or alternative areas may be suggested but should not lead to further spatial concentration of catch. Alternative areas must distribute TAC in a manner that is equivalent to or better (for sea lions) than would be accomplished by the following set of management areas.

   Eastern Bering Sea:
   Winter - CVOA-CH, and outside CVOA-CH
   Summer - CVOA-CH, outside of CVOA-CH east of 170˚W, and west of 170˚W
   Gulf of Alaska:
   Winter - Shelikof Strait (621, 631 combined), 610, 620, 630
   Summer - 610, 620, and 630
   Aleutian Is.: All districts - 541, 542, and 543

   Purpose: The purpose of this guideline is to provide a minimum standard for distribution of catch according to the distribution of the stock. The areas chosen were based on current study and management areas. The guideline allowed for consideration of alternative areas or methods for distributing catch if they distributed catch in a manner commensurate with the overall distribution of pollock biomass in the Bering Sea/Aleutian Islands and Gulf of Alaska regions and were at least equally protective of sea lions. No such alternatives were suggested.

   Council recommendation(s)/emergency rule: The Council recommendations included separation of the catch by area in the winter/spring periods for the Bering Sea and Gulf of Alaska, as described above. The establishment of the Shelikof Strait management area will occur in 2000. The Council declined to make a recommendation pertaining to the spatial distribution of the catch outside of the CHCVOA in the Bering Sea during the C and D seasons, as required by the guideline.

   Analysis/discussion: The single difference between this fifth guideline and the Council recommendation or the emergency rule (and extension) is the lack of a regulatory measure to distribute the catch outside of the CHCVOA in the C and D seasons of the Bering Sea fishery. NMFS maintains that the foraging areas outside of the CHCVOA are important, but that spatial dispersion of the fishery will be achieved through non-regulatory mechanisms as a result of the implementation of the AFA.

Conclusion: NMFS concludes that sufficient spatial dispersion can be achieved without the use of the 170°W long. line in the Bering Sea. This conclusion will be considered in more detail in the section on modification of RPAs. NMFS believes that guideline five of spatial dispersion has been met.

H. Has the principle of spatial dispersion been achieved?

Spatial dispersion of the catch in the Gulf of Alaska has been achieved by the addition of the Shelikof Strait management area during the A and B seasons. This additional management area, plus existing areas in the Gulf of Alaska appear to be sufficient to disperse the catch according to the distribution of the stock. At this time, the distribution of the stock is this region is not sufficiently well understood for finer dispersal of the catch.

Spatial dispersion of the catch in the Bering Sea has been achieved by reducing the portion of each seasonal catch to a level commensurate with the distribution of the stock. As the distribution of the stock is not known with confidence in the A and B seasons, the catch in the CHCVOA has been capped at 50%. For the C and D seasons, marked reductions of the portion of catch from the CHCVOA are being required to match the distribution of the stock.

On the basis of these management measures, NMFS believes that the catch has been distributed according to the distribution of the stock in all areas known to be important to foraging sea lions.

IX. Modification of the RPAs

The management measures either recommended by the Council or approved and implemented by NMFS are consistent with the requirements of the Biological Opinion with three exceptions. In this section, these exceptions are analyzed and explained.

NMFS intends to promulgate proposed and final rulemaking to implement the RFRPAs during the 2000 pollock fishery to conserve Steller sea lions. It is anticipated that alternative measures to the ones provided in the RFRPAs will be suggested during public comment. NMFS will analyze those suggestions for compliance with the jeopardy and adverse modification standards of the ESA and applicable regulations. If the alternative measures comply with the applicable standards of the ESA and other applicable law, NMFS may implement those measures.

A. Protection of prey resources around rookeries and haulouts in the Gulf of Alaska

In the Gulf of Alaska, waters out to 10 nm of all rookeries and major haulouts were to be protected to prevent competition between the pollock fishery and certain segments of the Steller sea lion population dependent on those waters for successful reproduction and survival. A total of 53 areas (9 rookeries and 44 haulouts) qualified for closure based on the criteria established in the Biological Opinion. In compliance with the Biological Opinion, which allowed for closures of these areas in an incremental manner, all but eight haulout sites were closed in 1999. NMFS also allowed for the possibility of keeping these or other sites open if alternative measures could be found that provided equivalent or better protection for sea lions.

Alternative measures were recommended by the Council for nine haulout sites in the Gulf of Alaska. As described above, these alternatives were: 1) Pt. Elrington, Rugged Island, and The Needles would be closed to pollock fishing from May 1 to January 20; 2) Sea Lion Rocks would stay open with a 60-foot boat limit; 3) Spitz Island and Mitrofania Island would remain open January 20 to April 30 and September 1 to November 1 with a 60-foot boat limit; and 4) Cape Barnabas, Gull Point, and Point Ikolik would remain open year round. NMFS's analysis of these recommendations is summarized as follows.

1. *Pt. Elrington and The Needles* --- These sites occur in waters managed by the State of Alaska. While NMFS believes that it has the authority to close these sites under the ESA, the Agency will discuss this matter further with the State to evaluate possible equivalent alternatives. If such alternatives can not be

found, then these waters will be closed in 2001. NMFS does not believe that a delay of one additional year at these two sites will cause jeopardy or adverse modification. NMFS does believe that the success of protection measures at these sites will depend, in part, on NMFS's ability to cooperate with the State of Alaska to find adequate long-term solutions. Therefore, NMFS will allow for a reasonable period of time (one year) to find such a solution. This action is consistent with the incremental approach identified in the Biological Opinion.

2. *Rugged Island* --- While the Council recommended that Rugged Island be closed to pollock fishing from May 1 to January 20, the best available data suggests that this area is only fished in January and February. This haulout site meets the criteria for closure during the winter/spring period (i.e., from November 1 to June 1), indicating the importance of this site to sea lions during this period. Therefore, closure from May 1 to January 20 does not provide equivalent protection to sea lions, and this site will be closed during the November 1 to June 1 period as required by the Biological Opinion.

3. *Sea Lion Rocks* —-- Only vessels that are less than or equal to 60 ft (18.3 m) will be allowed to fish within the 10-nm protected zone. Vessels longer than 60 ft (18.3 m) must fish beyond 10 nm. Within this protected zone, the effect of the vessel size limitation will be to exclude the fleet of vessels over 60 ft (18.3 m), which historically has accounted for 72% of total harvests in this area over the most recent 5-year period (1994-1998). Vessels under 60 ft (18.3 m) typically have less catching capacity due to less horsepower and therefore the inability to tow larger nets. This measure to exclude boats over 60 ft is anticipated to significantly reduce harvesting capacity and the potential for localized depletion. Assuming that the catch rate by vessels under 60 ft (18.3 m) does not increase, the result of this action will be to significantly reduce pollock removals near this haulout (by approximately 72%). Such a reduction is sufficient to avoid localized depletion and, when viewed in the context of Steller sea lion conservation measures in the Gulf of Alaska as a whole, allows limited fishing to occur that is consistent with the mandate of the ESA, and does not force small vessels into unsafe situations.

4. *Spitz and Mitrofania Islands* --- Spitz Island meets the criteria for closure in the summer only (June 1 to November 1), whereas Mitrofania qualifies for year-round closure. Leaving Mitrofania open during a portion of the year does not offer protection equivalent to year-round closure. Therefore, Mitrofania must be closed. Spitz Island is primarily a summer fishing site, and (like Rugged Island) closure during a period when relatively less fishing occurs does not provide equivalent protection at this site. Therefore, Spitz Island must be closed from June 1 to November 1, in accordance with the Biological Opinion.

5. *Cape Barnabas and Gull Point* --- Cape Barnabas and Gull Point will be closed, but allowance may be made for reopening these sites to conduct experiments on the effects of fishing in nearby waters. An experimental design is being developed for this purpose, and may begin as early as 2000. This experiment will require cooperation from the fishing industry. The potential for reopening these sites for experimental purposes is deemed important for improving our understanding of sea lion/fisheries competition and the effects of fisheries on sea lion prey. Such an experiment should increase management's ability to avoid jeopardy and adverse modification in the future. This experiment may require multiple years to complete, but the sites would not be left open other than for purposes related to this research. NMFS will evaluate the experimental design to ensure that any permitted experiment does not cause jeopardy and adverse modification.

6. *Point Ikolik* --- The Council recommended leaving this site open to fishing. However, Point Ikolik meets the criteria for closure in the Biological Opinion. No alternatives have been suggested that are equivalent in terms of protection of prey resources adjacent to Point Ikolik for sea lions, and NMFS will close this site.

With these modifications, rookery and major haulout sites in the Gulf of Alaska will be protected in 2000.

B. Temporal dispersion in the Bering Sea

The above comparison of the RPA guidelines for temporal dispersion with the recommended and implemented management measures for the Bering Sea suggest two inconsistencies: the guidelines failed to insure adequate dispersal of the seasons within the fished part of the year, and two sectors were allowed to fish in two, rather than four, seasons. The second of these is not a serious concern because, on average, the fleet as a whole is expected to stay within the 30% cap for each season, and any deviations would likely be small. These two sectors are allocated a considerably smaller portion of the annual TAC, and their pattern of fishing will have considerably less effect on the overall dispersal of the fishery.

The lack of dispersion of the seasons throughout the year is a serious problem, as illustrated by the aggregation of the first two seasons in 1998 (before the RPAs) and in 1999 (after the RPAs established four seasons). The aggregation of the A and B seasons and the C and D seasons, particularly in the Bering Sea, prevented the intended effect of establishing four seasons. Such concentration of removals increases the probability of localized depletions, particularly inside the CHCVOA and at times when sea lions may be especially sensitive to reductions in prey availability. Such concentration of catch is not consistent with temporal dispersion.

To achieve the necessary temporal dispersion, NMFS will establish an alternative schedule consisting of four seasons in the CHCVOA of the Bering Sea. The best possible dispersion will occur if these seasons are evenly spaced, and starting dates will be January 20, April 1, June 10, and August 20. Stand-downs will not be required. Stand-downs were originally suggested to prevent potentially long periods of interactive competition, and insure the seasons were well dispersed. Many of the management measures already recommended or implemented should reduce the potential for both kinds of competition (i.e., no fishing around rookeries and haulouts, and no fishing from November 1 to January 20). In addition, if the seasons are well dispersed, then stand-down periods may occur as a consequence of the fishing pattern of the fleet. The capacity of the fishing fleet is such that they are fully able to catch entire seasonal TACs in a period of 71 days (i.e., the length of each season if four seasons are evenly dispersed from January 20 to November 1). Therefore, if the four seasons are evenly dispersed and the fleet as a whole does not slow down the rate of catch per day, then they are left with a de facto stand-down period at the end of each season simply because they have not spread the catch through the season. The faster the TAC is taken, the longer the stand-down until the following season. This correspondence between rate of catch and de facto stand-down is consistent with the model illustrated in Figure 2: The faster the rate of removal, the longer the required recovery.

The 30% limit on seasonal allocations will be used to determine a seasonal cap inside the CHCVOA. That is, the CHCVOA cap for each of the four seasons will be determined as the product of 1) the annual TAC (minus bycatch allocations), 2) a seasonal multiplier ranging from 0.1 to 0.3 (i.e., the 30% cap) for each season and totaling 1.0 for all seasons, and 3) the portion of the stock expected or known to be in the CHCVOA during each particular season (i.e., 50% during the A season, 50% during the B season, 15% during the C season, and 25% during the D season). The fishery will be allowed to take the TAC allocated to the A and B seasons at any time from January 20 to June 10 outside the CHCVOA. A and B seasonal allocations will not exceed 40% of the annual TAC. The 40% cap (rather than 45%) is intended to 1) provide an additional level of protection against competition in the winter/spring periods, and 2) reduce the potential for the fishery to become concentrated outside the CHCVOA during the early part of the year. If the fishery is allowed to take all of it's a and B season quota outside the CHCVOA any time from January 20 to June 1, vessels may tend to concentrate their catch in late January to early March. Such potential concentration is not expected to approach that observed in recent years because of changes in the fishery due to the AFA (i.e., cooperatives established within the different sectors should result in a slower and more rational fishery.) Similarly, TAC allocated to the C and D seasons can be taken at any time from June 10 to November 1 outside the CHCVOA. But here, too, cooperatives should result in a slower, more rational

fishery. All sectors in the Bering Sea are expected to conform to these seasons and seasonal TACs and caps.

Finally, NMFS has determined that four seasons are not necessary outside critical habitat and the CHCVOA. In general, the RPAs attempt to provide a level of protection commensurate with the importance of habitat to foraging sea lions (e.g., full protection around rookeries and haulouts and during the November 1 to January 20 period, and full dispersal of catch over time [January 20 to November 1] and space inside critical habitat and the CHCVOA. NMFS believes, therefore, that four seasons are not necessary outside of critical habitat.

C. Spatial dispersion in the Bering Sea

The Bering Sea pollock biomass is distributed along the Bering Sea continental shelf in densities that vary by season. The total exchange within this population is not completely understood but is thought to result in significant interchange generally north to south and back again relative to spawning aggregation which primarily occurs in the February - March period. This evidences itself in migration in and out of the CHCVOA and relatively low densities of pollock in this area in the summer/early fall period. The only consistent biomass distribution survey data is from NMFS trawl and acoustic surveys usually occurring in the July/August period. At this time, pollock biomass is generally distributed about equally on either side of the 170° longitude line. Very low densities of pollock in the CHCVOA in this period are evidenced by low CPUE by the commercial fleet in this area and have been addressed in RPAs requiring reduction in C and D season harvest in 2000 of about 91,000 mt less than occurred in 1998.

The 170° line itself was previously a management area boundary between the Aleutian Island and Bering Sea areas. It was not intended to distribute Bering Sea harvest but was a line of record for monitoring past harvests. The rate of migration across the 170° line and into critical habitat is unknown as is the degree this migration is affected by fishing concentrated anywhere above the CHCVOA or even just west of 170°. NMFS level of concern about competition between sea lions and the Bering Sea pollock fishery is greatest around rookeries and haulouts and in the special foraging areas of the CHCVOA and less outside critical habitat. The marine areas included in critical habitat were identified based largely on their estimated importance to sea lion foraging success.

Additionally, in the absence of specific regulations, the current summer fishery as managed under the AFA is dispersing widely east and west of 170° as shown in Figure 7. During the 1999 C season fishery, the catcher/processor and CDQ sectors representing over 50% of the TAC conducted virtually all of their fishing activity along the continental shelf west of 170° over a broad area extending towards the border of the Russian EEZ. The inshore sector C season fishery was distributed between the CHCVOA and the area outside the CHCVOA and east of 170° such that the combined activity of all three sectors resulted in a broad distribution of fishing effort between these three areas. The preliminary 1999 C season catch distribution between all three areas is as follows:

Inside CHCVOA: 23% (RPA maximum was 25%)
East of 170°: 37%
West of 170°: 42%

These percentages are based on preliminary data for the C season (August 1 - September 15). The D season fishery which is still underway appears to be distributing itself in a similar manner. Of particular note is the fact C season CHCVOA harvests were actually below the RPA mandated cap of 25% for the 1999 B season fishery. The fact that this type of spatial distribution occurred east and west of 170° in the absence of regulation may be attributed in part to the AFA which has eliminated the race for fish in the catcher/processor sector and has allowed this sector to disperse and search for pollock in a more deliberative manner than would have been possible under the previous Olympic-style management regime.

While NMFS still believes areas outside of critical habitat are important to consider in their effect on Steller sea lion recovery, examination of all the above factors leads us to believe that the implementation of a 170° split is not warranted at this time and, in fact, further research of pollock migration and sea lion distribution may lead us to different solutions in the future. In the mean time, actions taken in the CHCVOA, and AFA changes which will result in better distribution of harvest effort in 2000 for all sectors, convince us that we will have avoided jeopardy with the proposed mix of RPAs, including taking a more refined approach that does not include the 170°W long. line at this time.

X. Revised Final Reasonable and Prudent Alternatives

The ecosystems in which Steller sea lions and pollock interact is complex and dynamic, as is our understanding of it. Research and evaluation of existing information is providing new insights daily, as is public input on alternatives to achieve our objective of halting and reversing the decline and recovering this species. These alternatives are our best estimate of what is needed at this time. Equivalent or improved measures may be suggested and adopted in future years and possibly even for 2000. NMFS will keep the Court informed of our progress and involved in the decision process.

A. Bering Sea

1. Pollock no-trawl zones

a. Waters around Steller sea lion rookeries and major haulouts will be closed to pollock trawling out to 20 nm. This measure does not affect existing no-trawl and no-entry zones that apply to all groundfish fisheries. Specific sites, location, the size of closure around each site, and the period of closure are listed in the following table.

Bering Sea management area/island/site	Boundaries* to				Directed fishing for pollock prohibited within . . . (nm)	
	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Nov 1 - Jun 1	Jun 1 - Nov 1
Walrus	57°11.00'	169°56.00'	-----	-----	20	20
Uliaga	53°04.00'	169°47.00'	53°05.00'	169°46.00'	-----	20
Chuginadak	52°46.50'	169°42.00'	52°46.50'	169°44.50'	-----	20
Kagamil	53°02.50'	169°41.00'	-----	-----	-----	20
Samalga	52°46.00'	169°15.00'	-----	-----	-----	20
Adugak	52°55.00'	169°10.50'	-----	-----	20	20
Umnak/Cape Aslik	53°25.00'	168°24.50'	-----	-----	20	20
Ogchul	53°00.00'	168°24.00'	-----	-----	20	20
Bogoslof/Fire Island	53°56.00'	168°02.00'	-----	-----	20	20
Emerald	53°17.50'	167°51.50'	-----	-----	-----	20
Unalaska/Cape Izigan	53°13.50'	167°39.00'	-----	-----	20	20
Unalaska/Bishop Point	53°58.50'	166°57.50'	-----	-----	20	20
Akutan/Reef-lava	54°07.50'	166°06.50'	54°10.50'	166°04.50'	20	20
Old Man Rocks	53°52.00'	166°05.00'	-----	-----	20	20
Akutan/Cape Morgan	54°03.50'	166°00.00'	54°05.50'	166°05.00'	20	20
Rootok	54°02.50'	165°34.50'	-----	-----	-----	20
Akun/Billings Head	54°18.00'	165°32.50'	54°18.00'	165°31.50'	20	20
Tanginak	54°12.00'	165°20.00'	-----	-----	20	-----
Tigalda/Rocks NE	54°09.00'	164°57.00'	54°10.00'	164°59.00'	20	20
Unimak/Cape Sarichef	54°34.50'	164°56.50'	-----	-----	20	20
Aiktak	54°11.00'	164°51.00'	-----	-----	20	-----
Ugamak	54°14.00'	164°48.00'	54°13.00'	164°48.00'	20	20
Round	54°12.00'	164°46.50'	-----	-----	-----	20
Sea Lion Rock (Amak)	55°28.00'	163°12.00'	-----	-----	20	20
Amak+rocks	55°24.00'	163°07.00'	55°26.00'	163°10.00'	20	20

* Where two sets of geographic coordinates are given, the baseline extends in a clock-wise direction from the first set of coordinates along the shoreline at mean lower-low water to the second set of coordinates. Where only one set of coordinates is listed, that location is the base point.

2. Temporal dispersion

a. The period from November 1 to January 20 will be closed to all pollock trawling.

b. Inside the CHCVOA, the period from January 20 to November 1 will be divided into four seasons with starting dates of January 20, April 1, June 10, and August 20. Stand-down periods will not be required.

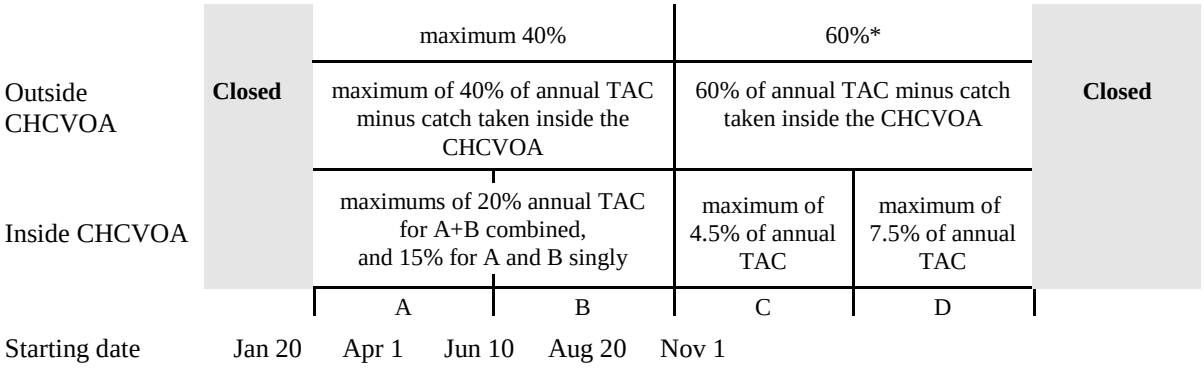
c. Outside the CHCVOA, the period from January 20 to November 1 will be divided into two seasons beginning January 20 and June 10. Stand-down periods will not be required.

d. The apportionment of catch to the A and B seasons combined can not exceed 40% of annual TAC allocated to directed fishing. Unused reserves set aside for bycatch during these two seasons may be reallocated to the C and D seasons.

e. Inside the CHCVOA, no more than 20% of the annual TAC can be taken in the combined A+B seasons, and no more than 15% of the annual TAC can be taken during either the A or B season. In the C and D seasons, a maximum of 4.5% and 7.5% of the annual TAC, respectively, can be taken from inside the

CHCVOA.[12] Remaining portions of the TAC must be taken outside the CHCVOA.

These allocations are illustrated graphically as:



* Slight modification of the 60% to this period will be allowed to accommodate for management imprecision and bycatch adjustments.

f. NMFS will announce the closure of the CHCVOA conservation zone to catcher vessels over 99 ft (30.2 m) length overall before the inshore sector limit is reached with the intent of leaving remaining quota within the CHCVOA sufficient to support directed fishing for pollock by vessels less than or equal to 99 ft (30.2 m) length overall for the duration of any seasonal opening.

3. Spatial dispersion

a. A Steller sea lion conservation area will be established consisting of the southeastern Bering Sea special foraging area (also known as the Bogoslof foraging area) and the catcher-vessel-operation-area of the eastern Bering Sea. This Steller sea lion conservation area will be used to disperse catch in the Bering Sea. The CHCVOA will include the portion of the CVOA that extends eastward from the special foraging area. Specifically, it will consist of the area of the Bering Sea between 170°00'W long. and 163°00'W. long, south of straight lines connecting the following points in the order listed:

55°00'N lat., 170°00'W long.
55°00'N lat., 168°00'W long.

[12] These allocations are based on the limit of 30% TAC per season multiplied times the portion of the stock expected to be inside the CHCVOA during a particular season. For the A season, for example, 50% of the stock is expected to be in the CHCVOA. The product of 50% times 30% is 15%. Analyses reported in the environmental assessment for the extension of the emergency rule indicate that in the C and D season, approximately 15% and 25% of the pollock stock is in the CHCVOA. Therefore, for the C season, 30% times 15% is 4.5% of the annual TAC and, for the D season, 30% times 25% is 7.5% of the annual TAC. As these limits for the CHCVOA are based on the portion of the stock either known or expected to be within the CHCVOA, these allocations will be modified as better information becomes available on stock distribution.

55°30'N lat., 168°00'W long.
55°30'N lat., 166°00'W long.
56°00'N lat., 166°00'W long.
56°00'N lat., 163°00'W long.

b. TAC allocations to this area will be as described under temporal dispersion for the Bering Sea (above).

B. Gulf of Alaska

1. Pollock no-trawl zones

a. Waters around Steller sea lion rookeries and major haulouts will be closed to pollock trawling out to 10 nm. This measure does not affect existing no-trawl and no-entry zones that apply to all groundfish fisheries. Specific sites, location, the size of closure around each site, and the period of closure are listed in the table on the following page.

b. Three exceptions to these closures are:

1) *Pt. Elrington and The Needles* --- NMFS will work with the State of Alaska to consider alternative measures for these sites. If equivalent alternatives can not be identified and implemented by 2001, these sites will be closed.

2) *Cape Barnabas and Gull Point* --- These sites may be opened for the purpose of conducting experiments to determine the effects of the pollock fisheries on prey resources in this area.

3) *Sea Lion Rocks* --- This site will be open out to 10nm for vessels less than or equal to 60 ft (18.3 m) length overall.

Gulf of Alaska management area/island/site	Boundaries* to				Directed fishing for pollock prohibited within . . . (nm)	
	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Nov 1 - Jun 1	Jun 1 - Nov 1
Bird	54°40.50'	163°18.00'	-----	-----	10	10
South Rocks	54°18.00'	162°41.50'	-----	-----	10	10
Clubbing Rocks	54°42.00'	162°26.50'	54°43.00'	162°26.50'	10	10
Pinnacle Rock	54°46.00'	161°46.00'	-----	-----	-----	10
Sushilnoi Rock	54°50.00'	161°44.50'	-----	-----	-----	10
Olga Rocks	55°00.50'	161°29.50'	54°59.00'	161°31.00'	10	10
Jude	55°16.00'	161°06.00'	-----	-----	10	10
Sea Lion Rocks**	55°05.00'	160°31.00'	-----	-----	10	10
The Whaleback	55°16.50'	160°06.00'	-----	-----	10	10
Chernabura	54°47.50'	159°31.00'	54°45.50'	159°33.50'	10	10
Castle Rock	55°17.00'	159°30.00'	-----	-----	-----	10
Atkins	55°03.50'	159°19.00'	-----	-----	10	10
Spitz	55°47.00'	158°54.00'	-----	-----	-----	10
Mitrofania	55°50.00'	158°42.00'	-----	-----	10	10
Kak	56°17.00'	157°51.00'	-----	-----	-----	10
Lighthouse Rocks	55°47.50'	157°24.00'	-----	-----	10	10
Sutwik	56°31.00'	157°20.00'	56°32.00'	157°21.00'	-----	10
Chowiet	56°00.50'	156°41.50'	56°00.50'	156°42.00'	10	10
Nagai Rocks	55°50.00'	155°46.00'	-----	-----	10	10
Chirikof	55°46.50'	155°39.50'	55°46.50'	155°43.00'	10	10
Puale Bay	57°41.00'	155°23.00'	-----	-----	10	10
Point Ikolik	57°17.00'	154°48.00'	-----	-----	10	-----
Takli	58°03.00'	154°27.50'	58°02.00'	154°31.00'	-----	10
Cape Gull	58°13.50'	154°09.50'	58°12.50'	154°10.50'	-----	10
Sitkinak/Cape Sitkinak	56°34.50'	153°51.50'	-----	-----	10	10
Kodiak/Cape Ugat	57°52.00'	153°51.00'	-----	-----	10	10
Kodiak/Cape Barnabas**	57°10.00'	152°53.00'	-----	-----	10	10
Kodiak/Gull Point**	57°21.00'	152.36.00'	-----	-----	10	10
Shakun Rock	58°32.50'	153°41.50'	-----	-----	10	10
Twoheaded Island	56°54.50'	153°33.00'	56°53.50'	153°35.50'	10	10
Cape Douglas	58°51.50'	153°14.00'	-----	-----	-----	10
Latax Rocks	58°42.00'	152°28.50'	58°40.50'	152°30.00'	10	10
Ushagat/SW	58°55.00'	152°22.00'	-----	-----	-----	10
Ugak	57°23.00'	152°15.50'	57°22.00'	152°19.00'	-----	10
Sea Otter Island	58°31.50'	152°13.00'	-----	-----	10	10
Long	57°47.00'	152°13.00'	-----	-----	10	-----
Kodiak/Cape Chiniak	57°37.50'	152°09.00'	-----	-----	10	10
Sugarloaf	58°53.00'	152°02.00'	-----	-----	10	10
Sea Lion Rocks (Marmot)	58°21.00'	151°48.50'	-----	-----	10	10
Marmot	58°14.00'	151°47.50'	58°10.00'	151°51.00'	10	10
Perl	59°06.00'	151°39.50'	-----	-----	10	10
Outer (Pye) Island	59°20.50'	150°23.00'	59°21.00'	150°24.50'	10	10
Steep Point	59°29.00'	150°15.00'	-----	-----	-----	10
Chiswell Islands	59°36.00'	149°34.00'	-----	-----	10	10
Rugged Island	59°50.00'	149°23.00'	59°51.00'	149°25.00'	10	-----
Point Elrington**	60°07.00'	148°15.00'	-----	-----	-----	-----
Wooded Island (Fish)	59°53.00'	147°20.50'	-----	-----	10	10
The Needles**	60°07.00'	147°36.00'	-----	-----	-----	-----
Glacier Island	60°51.00'	147°09.00'	-----	-----	10	10
Seal Rocks	60°10.00'	146°50.00'	-----	-----	10	10
Cape Hinchinbrook	60°14.00'	146°38.50'	-----	-----	-----	10
Hook Point	60°20.00'	146°15.50'	-----	-----	-----	10
Cape St. Elias	59°48.00'	144°36.00'	-----	-----	10	10

** See exceptions below.

2. Temporal dispersion

a. The period from November 1 to January 20 will be closed to all pollock trawling.

b. The pollock fishery of the Gulf of Alaska will be divided into four seasons with the following TAC apportionment, and start and end dates.

Season	TAC apportionment	Start date	End date
A	30%	Jan 20	Mar 1
B	15%	Mar 15	May 31
C	30%	Aug 20	Sep 15
D	25%	Oct 1	Nov 1

c. Catch during any one season will be limited to 30% of the annual TAC.

d. Catch during the combined A+B seasons will be limited to 45% of the annual TAC.

e. Individual catcher vessel trips in the western, central, and eastern Gulf of Alaska will be limited to 136 mt (300,000 lbs).

f. Tendering will be prohibited in areas 620 (east of 157°W long.), 621, 630, 631, and 640. In area 610 and 620 (west of 157°W long.), tendering vessels will be limited to 272 mt (600,000 lbs) per trip.

g. Catcher vessels will be subject to a seasonal exclusive-area requirement. Vessels will be prohibited from directed fishing for pollock in both the Bering Sea and the Gulf of Alaska during the same season (A, B, C, or D). Vessels less than 125 ft (38.1 m) will be exempted from this seasonal exclusive-area requirement in area 630 and east of 157°W long. in area 620.

3. Spatial dispersion

a. A Shelikof Strait conservation area is established comprised of areas 621 and 631. Specifically, this conservation area is defined as the area bound by straight lines and shoreline connecting the following coordinates in the following order:

58°51'N lat., 153°15'W long.;
58°51'N lat., 152°00'W long.; and the intersection of 152°00'W long., with Afognak Island; aligned counterclockwise around the shoreline of Afognak, Kodiak, and Raspberry Islands to
57°00'N lat., 154°00'W long.;
56°30'N lat., 154°00'W long.;

56°30'N lat., 155°00'W long.;
56°00'N lat., 155°00'W long.;
56°00'N lat., 157°00'W long.; and the intersection of 157°00'W long. with the Alaska Peninsula.

b. TAC apportionments will be made to areas 610, 620 (outside the Shelikof Strait conservation zone), 630 (outside the Shelikof Strait conservation zone), and the Shelikof Strait conservation zone during the A and B seasons. TAC apportionments will be made to areas 610, 620, and 630 during the C and D seasons.

c. TAC apportionments will be made on the basis of the most recent stock surveys and model estimates. The TAC apportioned to the Shelikof Strait conservation area during the A and B seasons will be determined as the seasonal TAC apportionment multiplied by the quotient of the most recent estimate of biomass in the conservation area divided by the most recent estimate of the total biomass in the Gulf of Alaska.

C. Aleutian Islands

The Aleutian Islands region will be closed to all directed fishing for pollock.

XI. RFRPAs and jeopardy/adverse modification

NMFS believes that RFRPA principles taken together will avoid jeopardy and adverse modification.

Scientists and managers are data-limited in their ability to understand and resolve this issue. The evidence is sufficient to illustrate a strong likelihood of competition, but the degree of protection necessary to remove that threat is largely unknown. Therefore, NMFS constructed a model that served as the basis for the jeopardy/adverse modification conclusion of the Biological Opinion, and should also serve as the basis for the determination of whether the RFRPAs have avoided jeopardy and adverse modification.

NMFS's additive approach assumes a default condition of a Steller sea lion population unaffected by fishing. This approach then protects key areas and time periods to prevent competition for certain segments of the population around rookeries and haulouts, and during the period of time when sea lions are thought to be particularly susceptible to reductions in prey availability.

Next, this approach allows fishing in remaining areas and time periods where NMFS believes a certain level of fishing and pollock removal will not cause jeopardy or adverse modification. The fundamental difficulty with the addition of fishing is the lack of information on the effects of different levels of fishing on sea lions. The management and research programs conducted in support of the fisheries do not provide the level of detail necessary to understand and resolve the matter of competition at local scales appropriate to sea lion foraging. Until such time as the appropriate information is available, efforts to resolve this issue of competition will depend largely on the conceptual model NMFS uses to provide the necessary level of protection for sea lions.

NMFS's model assumes that the current level of fishing (i.e., as determined by the TAC-setting process) and the overall harvest rate are safe for the pollock stocks. As pointed out earlier in this document, this assumption is supported by extensive literature on the management and harvesting of gadoid stocks and other groundfish. In the Biological Opinion, NMFS extends that assumption to the ecosystem at large, and to Steller sea lions in particular, if the fisheries are dispersed in time and space to the extent that local harvest rates are commensurate with the overall harvest rate. That is, the conclusions of the Biological Opinion were based on the fact that harvests had become concentrated in space and time and as a result, local harvest rates far exceeded the overall harvest rate in some

seasons (particularly fall and winter periods) and some areas (Steller sea lion critical habitat). Such concentration of catch and high harvest rates are more likely to result in localized depletion of prey relative to the needs of Steller sea lions.

The issues, then, are 1) whether the RFRPAs provide the appropriate level of protection around rookeries and haulouts, and for the winter period, and 2) whether the allowed level of fishing outside these areas and this time period is sufficiently dispersed over time and space so that the local harvest rates are commensurate with the overall harvest rate and, therefore, less likely to result in localized depletion. Given the existing data, harvest rate is the best available measure for evaluation of the RFRPAs and the dispersion of the fisheries. The criterion for the evaluation will be whether the observed harvest rates by season and area are consistent with a target harvest rate expected on the basis of the RFRPAs. This approach is depicted in Figure 8, which illustrates the combined effects of the three principles of the RPA framework.

A. The target harvest rate should be 0% around rookeries and haulouts, and during the period from November 1 to January 20.

This target harvest rate will be achieved by the appropriate prohibitions on pollock fishing in these areas and during this period. The principles, guidelines, and management measures will establish the necessary constraints on fishing to ensure that competition does not occur between the pollock fisheries and Steller sea lions in these key areas and during this important period.

B. Seasonally-specific harvest rates should not exceed a target rate determined by the product of the overall harvest rate and the portion of the annual TAC taken per season.

If a safe level of harvesting is established by the TAC-setting process, then the seasonal harvest rate should be determined as the product of the overall harvest rate and the portion of the annual TAC to be taken in that season. For example, if the overall harvest rate is 20% and the portion of the TAC taken per season is 25%, then the target harvest rate would be 0.20*0.25 = 0.05, or 5%. These target harvest rates have been achieved through guidelines and management measures setting a seasonal cap of 30% of the annual TAC. In addition, the first two seasons will be limited to a combined total of 40% of the annual TAC to provide additional protection for the winter/spring period.

C. The target harvest rate should be observed in each of the management areas used in a given season.

In the Bering Sea, the target harvest rate should be observed inside and outside of the CHCVOA. Without better information, the distribution of the pollock stock in the Bering Sea in the A and B seasons is assumed to be 50% inside the CHCVOA and 50% outside the CHCVOA. Therefore, harvest rates and catches inside and outside the CHCVOA should be equivalent to achieve the target harvest rate. In 1998 (Fig. 8), 88% of the (single) A season harvest was taken from the CHCVOA, and the harvest rate inside the CHCVOA was estimated to be 17%. In 1999, 73% of the A season harvest was taken from the CHCVOA (exceeding the 62.5% limit), and 32% of the B season harvest was taken from the CHCVOA. The estimated harvest rate inside the CHCVOA dropped to 5.1% for the A season and 1.2% for the B season. For 2000, the A and B season catches should each be split with no more than 50% from inside the CHCVOA and at least 50% outside the CHCVOA. As a result of the seasonal caps and the dispersal of the catch inside and outside of the CHCVOA, harvest rates should remain equally low in these two areas.

For the 1999 C and D seasons in the Bering Sea, the portions of the harvests taken inside the CHCVOA were lowered to 25% and 35%, respectively, as an incremental step toward the target rates of 15% and 25% in 2000. The dispersal of catch will match the distribution of the stock, and will therefore keep the harvest rates inside and outside of the CHCVOA low and approximately

equivalent.

In the Gulf of Alaska, the target harvest rate for the first two seasons (A and B) should be observed in the three management areas (610, 620, and 630) plus the Shelikof Strait area (combined 621 and 631). In the C and D seasons in the Gulf of Alaska, the target harvest rate should be observed for 610, 620, and 630 (Shelikof Strait is not used as a management area in the C and D seasons). The distribution of the harvest among these areas is based on the most recent trawl and hydroacoustic surveys and model estimates of biomass. The measures required to disperse the catch accordingly have been in place since the establishment of the management areas, with the exception of the Shelikof Strait area, which will be added in 2000.

D. The seasons must be dispersed throughout the fished part of the year if harvest rates per individual season are to have meaning relevant to temporal dispersion.

To achieve temporal dispersion, the harvest rate within seasons must be held to their respective caps and the seasons must be dispersed. In 1999, when four seasons were required, the first two seasons in the Bering Sea occurred within a period of about two months (or about 20% of the fished part of the year). The portion of the annual TAC taken from these combined seasons was reduced to 40% (from 45% in 1998), but the first two seasons effectively constituted one season where 27.5% of the TAC was taken, followed by a five-day pause, and then 12.5% of the TAC was taken. Similarly, the C and D seasons were separated in time only because the catch was taken more quickly than expected in the C season and a defacto stand-down was imposed until the D season started. In the Gulf of Alaska, the D season was set to start only 5 days after the closure of the C season or October 5, whichever came first. In both regions, the seasons were poorly dispersed throughout the fished portion of the year, negating the value of the 4-season approach.

For 2000 and beyond, the dispersion of seasons will prevent the aggregation of seasons in the Gulf of Alaska and the CHCVOA of the Bering Sea. In both cases, the seasons divide the fished portion of the year (January 20 to November 1) into four equal seasons. By allowing two seasons outside the CHCVOA in the Bering Sea, the RFRPAs will allow flexibility to the different sectors of the fleet to determine how and where they will fish. Stand-downs are not required in either region, and the fleets are able to exert considerable control over their pattern of fishing within a season. The expectation is that fishing with each season will be slowed through both management measures required by the RPAs and through cooperative efforts of the various fishing sectors (i.e., through cooperatives).

X. Conclusion

Based on the above, NMFS believes that the RFRPAs, taken together, 1) provide the necessary protection for prey resources around rookeries and major haulouts, and for the winter period, and 2) disperse the fisheries over the remaining time and areas in a manner sufficient to maintain local harvest rates commensurate with the overall annual harvest rate. NMFS believes that such dispersal significantly reduces the probability of localized depletion of pollock for Steller sea lions. Therefore, NMFS also believes that the RFRPAs are sufficient to avoid jeopardizing the continued existence of the western population of Steller sea lions and destroying or adversely modifying its designated critical habitat.

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Figure 1. Distribution of sightings of Steller sea lions using platforms of opportunity, 1958-1995.

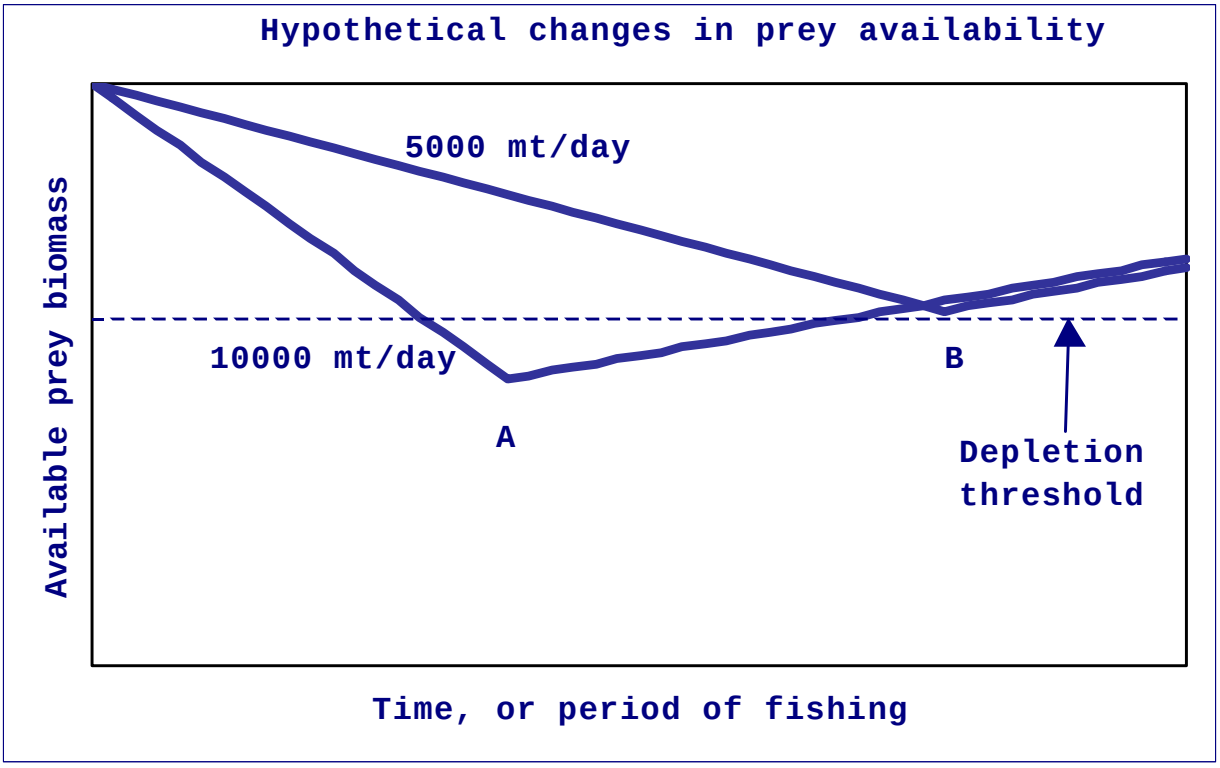

Figure 2. Hypothetical model of fishing effects on local biomass of prey. Two fishing strategies are depicted, both of which remove the same total biomass from the location. One involves removal of 5000 mt per day and the other removes 10,000 mt per day. Both assume that through recruitment or fish movement, local recovery occurs at 2000 mt per day. The dashed horizontal line is a hypothetical depletion threshold for sea lions: reduction of biomass below this threshold causes significant declines in foraging success accompanied by failing condition and declining likelihood of reproduction and survival. Points A and B indicate the end of the season when fished at 10,000 mt per day and when fished at 5,000 mt per day, respectively. This simple model serves two useful purposes. First, it illustrates the potential advantage of a slower fishing rate. The slower the location is fished, the less likely it is that available biomass will drop below a depletion threshold, even when the same total biomass is removed. Second, it illustrates how little is known about the effects of fishing on a local area. Our best available information is often not sufficient to determine biomass in local areas, the rate and nature of fish stock recovery, nor the depletion threshold for sea lions. Furthermore, these values change seasonally (e.g., the depletion threshold for sea lions may be higher in winter). The available information is sufficient to suggest the direction of those seasonal changes, but it is not sufficient to describe their magnitude.

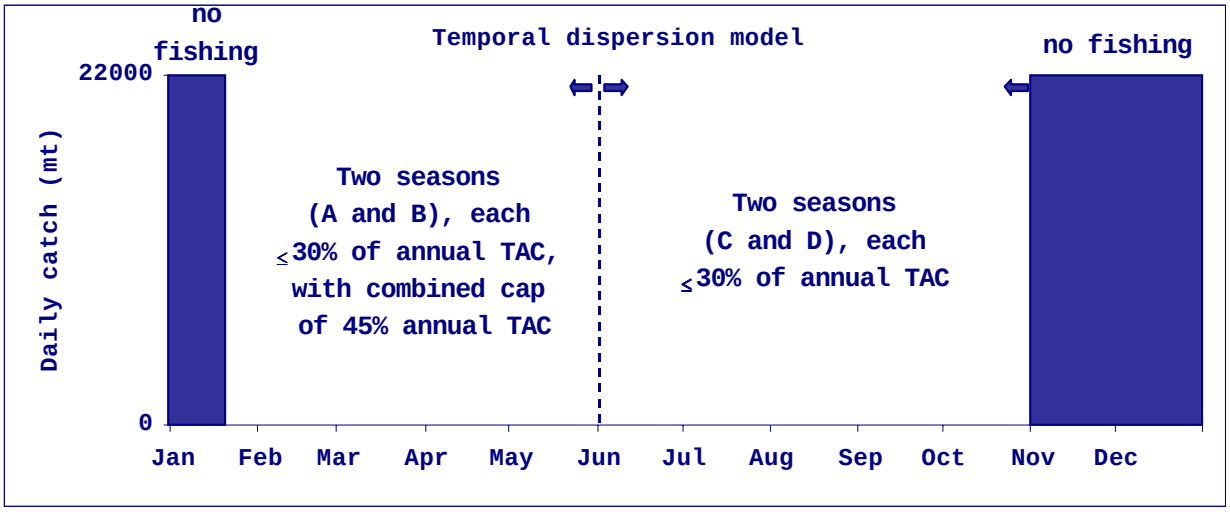

Figure 3. A model for temporal dispersion of pollock fisheries in the Bering Sea and Gulf of Alaska, based on the six guidelines incorporated into the Biological Opinion. See text for discussion.

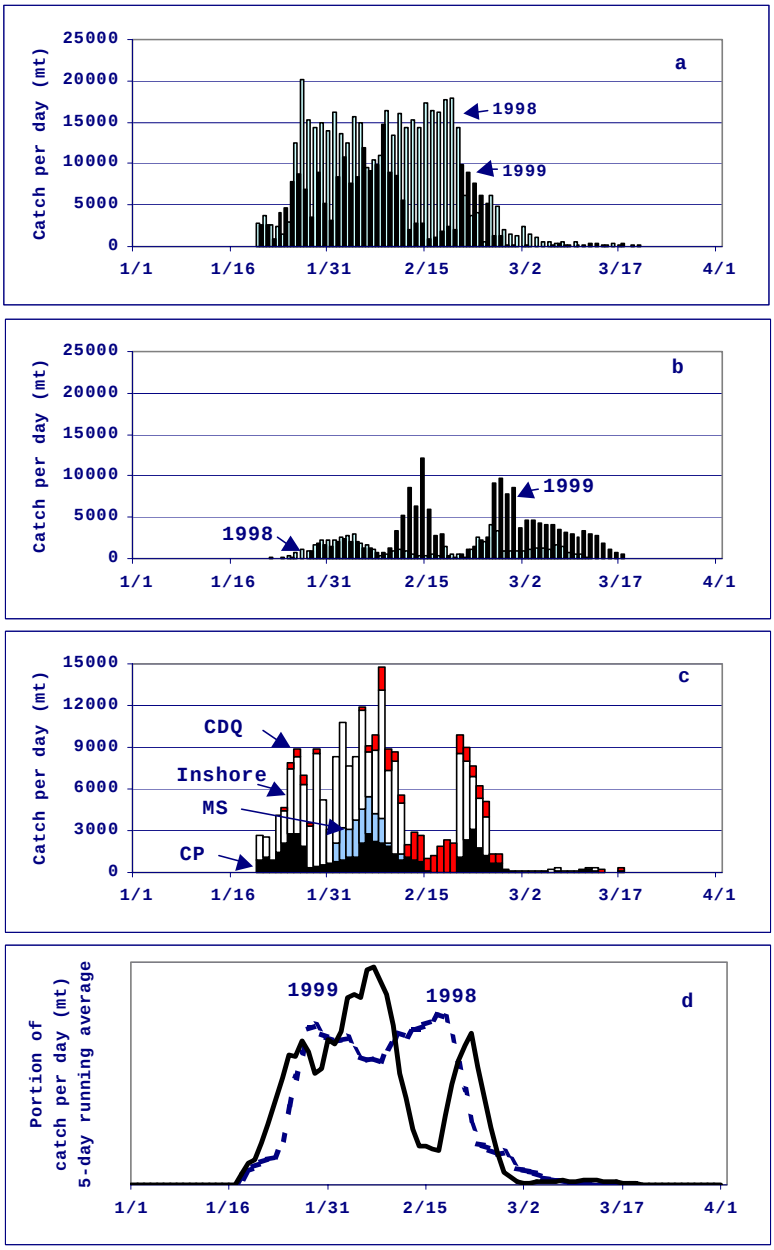

Figure 4. Dispersion of the 1998 and 1999 A and B seasons in the Bering Sea. a) Catch per day inside the CHCVOA. b) Catch per day outside the CHCVOA. c) Catch per day inside the CHCVOA by sector (CDQ = community development quota, MS = motherships, inshore = catcher vessels, and CP = catcher/processors). d) Portion of catch per day inside the CHCVOA. Panels a and b illustrate the shift of catch from inside to outside of the CHCVOA. Panel c illustrates the temporal dispersion achieved by the catcher-processor sector. Panel d indicates that for all sectors combined, the improvements achieved in 1999 were due more to spatial dispersal than temporal dispersion.

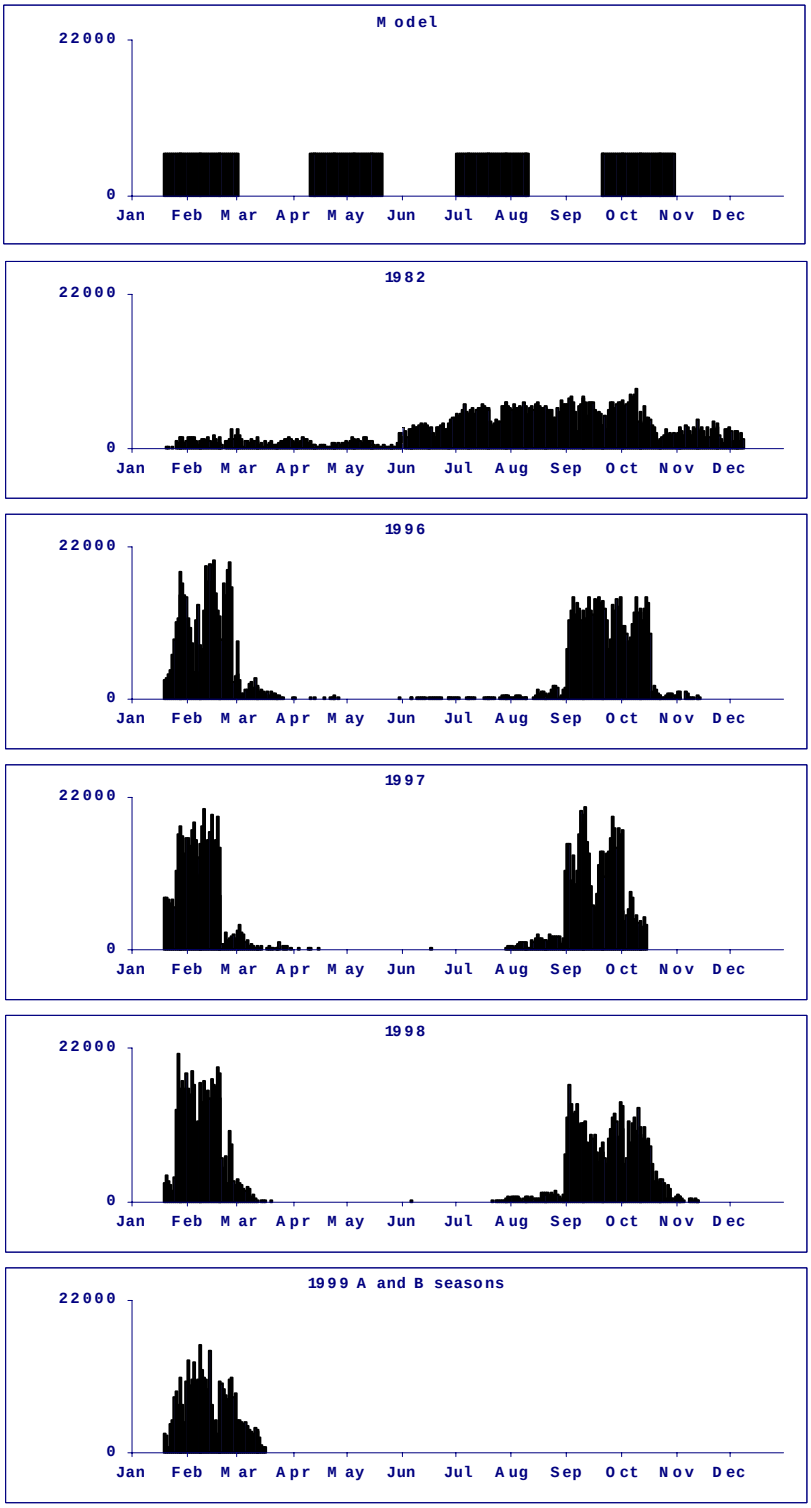

Figure 5. Temporal distribution of pollock seasons in the Bering Sea as depicted in a model with even distribution in four seasons and for the years 1982, 1996, 1997, 1998, and 1999 (first two seasons only). The Y axis is daily catch rate.

Figure 6. Map of the Bering Sea showing critical habitat, the CVOA, and the 170°W long. line. The portion of the CVOA added to the special foraging area in the Southeastern Bering Sea is the crescent-shaped area between the special foraging area and the critical habitat area (coincides with the pollock trawl exclusion zone) around Sea Lion Rock and Amak Island.

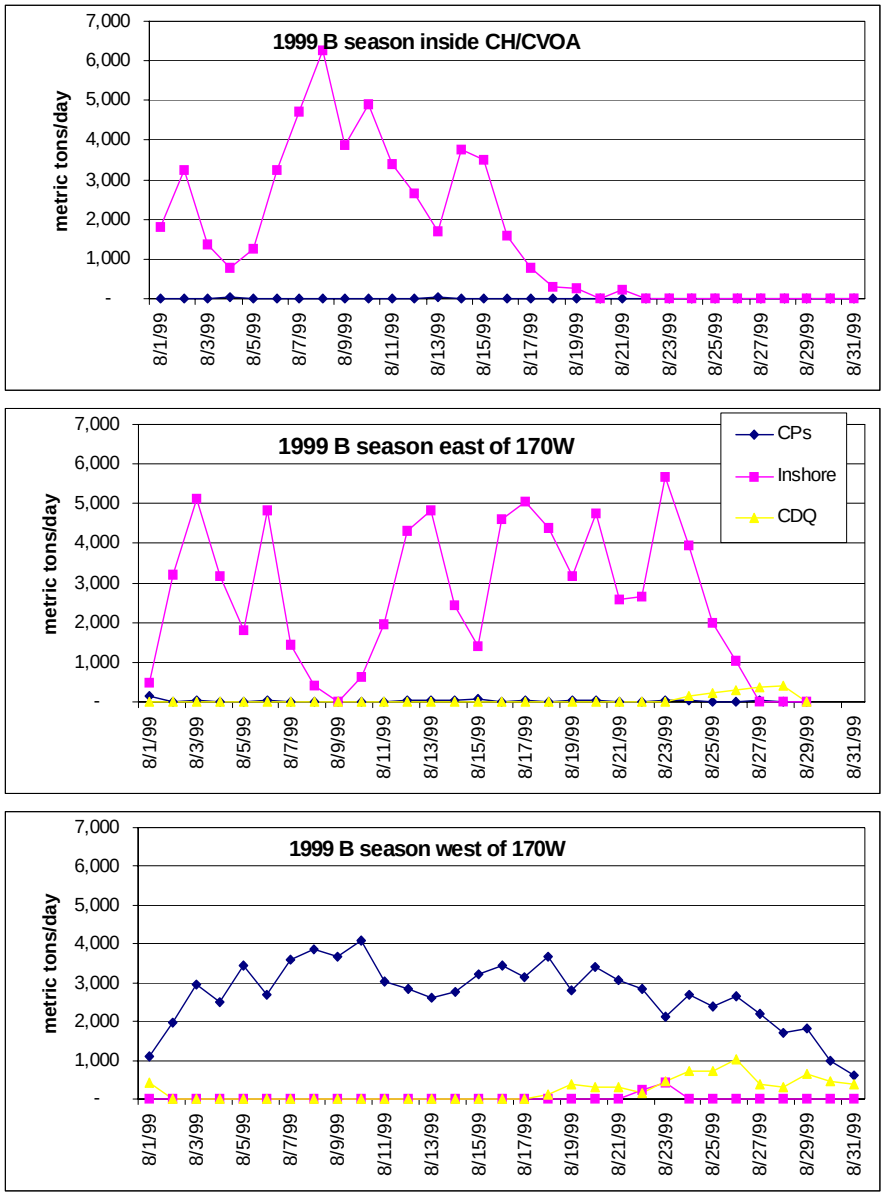

Figure 7. Catch per day by catcher/processor (CPs), inshore sector, and CDQ during the 1999 C season (August), inside the CHCVOA (top), outside the CHCVOA east of 170°W long. line (middle), and west of the 170°W long. line (bottom).

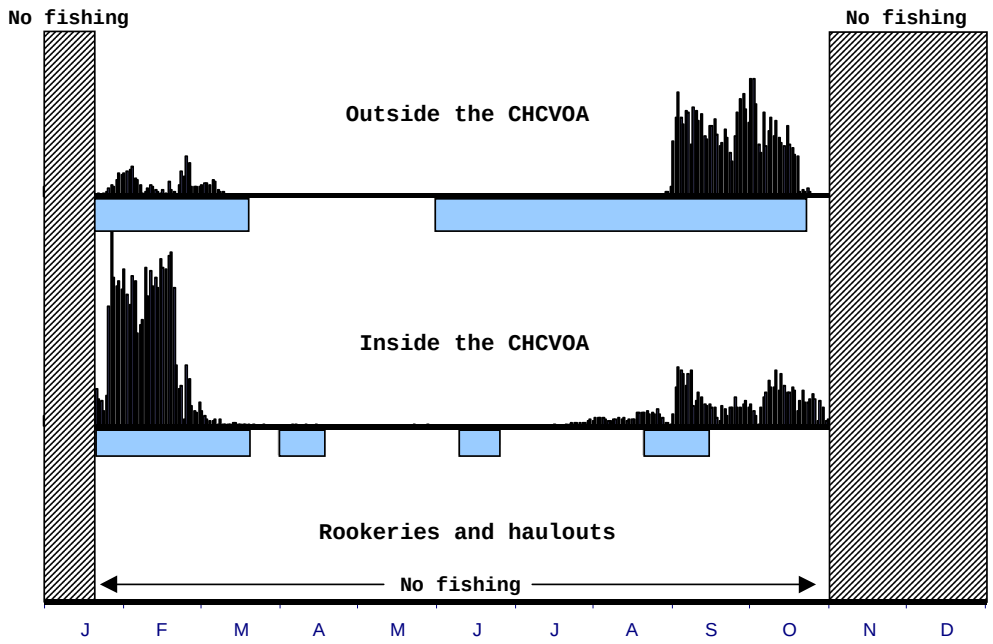

Figure 8. A model of spatial and temporal dispersion of the pollock fishery in the Bering Sea. The X-axis is time, from January 1 to December 31. The Y-axis is space or area. Fishing is prohibited in the period from November 1 to January 20 and around rookeries and haulouts. The histograms above each horizontal (X) axis represent the 1998 catch for each period and area. The shaded rectangles below each horizontal axis represent the distribution of a similar TAC taken in 2000 as it might have been taken in accordance with the RFRPAs: 1) inside the CHCVOA, the annual TAC is apportioned into four seasons starting January 20, April 1, June 10, and August 20 with 15%, 5%, 4.5%, and 7.5% of the annual TAC taken in each season, respectively; 2) outside the CHCVOA the catch is taken in two seasons with 20% of the annual TAC taken from January 20 to June 1 and 48% of the annual TAC taken from June 1 to November 1; and 3) catch is taken at 3000 mt/day inside the CHCVOA and 3500 mt/day outside the CHCVOA, beginning the first day of each season. The actual catch taken in 1998 reveals the extent of fishery concentration at the beginning and end of the period from January 20 to November 1 (particularly in the A season in the CHCVOA) and the lack of catch during the intermediate period from March to August or September. This model shifts significant portions of the catch to this period, to avoid the temporal concentration of catch as depicted in Figure 5.