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114:9

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Special Committee on Fisheries

March 26, 1999

TO: Fisheries Committee
FR: Liz Cabrera, Committee Aide
RE: Overview: Steller Sea Lion

The issues surrounding listing of the Steller Sea Lion under the Endangered Species Act and the resulting restrictions on the pollock fishery and other trawl fisheries in the Bering Sea, Aleutian Islands, and Western Gulf of Alaska are complex. This memo is an attempt to provide you with background information and a basic overview of the salient points.

I. BACKGROUND:

In 1990, the National Marine Fisheries Service (NMFS) listed the Steller sea lion as a threatened species under the Endangered Species Act of 1973 (ESA). At that time, NMFS identified critical habitat areas for the sea lion to include marine waters within 20 nautical miles of major rookeries and haulouts in western Alaska (west of 144 degrees longitude) and implemented "no-trawl" zones in some of these areas.

In 1993, a study by the National Marine Mammal Laboratory indicated that if the downward population trend continued, there was a very high probability that sea lions would be extinct in Alaska from Prince William Sound westward within 100 years.

In 1997, NMFS recognized two separate populations of sea lions and reclassified the western population as endangered and kept the eastern population listed as threatened.

In April 1998, NMFS was sued by a coalition of environmental organizations for failing to "take a comprehensive look at the impacts of commercial groundfish fisheries in Alaska for almost two decades, despite dramatic downward changes in the ecosystem" and "failing to protect... the Steller sea lion -- and its critical habitat from overfishing of groundfish species, as required by the ESA."

In December of 1998, NMFS issued a Biological Opinion as required by the ESA. The Biological Opinion concluded that the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) pollock trawl fisheries, as currently managed, are likely to

- (1) jeopardize¹ the continued existence of the western population of the Steller sea lions and
- (2) adversely modify its critical habitat².

¹ "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02)

The Biological Opinion also concluded that the Atka mackerel fishery, as modified by recent regulatory changes, is not likely to jeopardize the continued existence of Steller sea lions or their critical habitat.

The Biological Opinion concluded that, to avoid the likelihood of jeopardizing the continued existence of the western population of Steller sea lions, reasonable and prudent alternatives to the existing pollock trawl fisheries in the BSAI and GOA must accomplish three basic principles:

1. Temporal dispersion of fishing effort;
2. Spatial dispersion of fishing effort; and
3. Pollock trawl exclusion zones around Steller sea lion rookeries and haulouts.

In December, 1998, the North Pacific Fishery Management Council voted to adopt a series of emergency measures to protect Steller sea lions and allow for the pollock fishery to begin in January of 1999. Without these measures, NMFS has stated that it would be required, under its Biological Opinion finding of "jeopardy", to prohibit pollock fishing.

II. ISSUES:

A. Cause of Decline:

Probably the only aspect of this issue that is not under dispute is that the Steller sea lion population has indeed declined in recent years. According to NMFS, counts of adults and juveniles in the western population of Steller sea lions declined from about 110,000 to about 30,500 between the late 1970's and 1990, a decline of 72%. The decline has continued with counts of adults and juveniles dropping 27 percent from 1990 to 1996, and an additional 9 percent from 1996 through 1998. Similarly, counts of pups dropped by 19 percent from 1994 through 1998.³

The exact cause of the decline is the subject of extensive research and debate, but short on conclusive results. Varying perspectives follow:

NMFS Biological Opinion. "Multiple factors have contributed to the decline, but considerable evidence indicates that lack of available prey is a major problem. Foraging studies confirm that Steller sea lions depend on pollock as a major prey source, and sea lions may be particularly sensitive to the availability of prey during the winter. The significance of pollock in the diet of sea lions may have increased since the 1970s due to shifts in the Bering Sea ecosystem related to oceanographic changes. Pollock are also the target of the largest commercial fisheries in Alaska, fisheries that have grown increasingly concentrated in time and space. This concentration of effort occurs largely in areas designated as Steller sea lion critical habitat and may reduce prey availability at critical times in the life history of sea lions. Therefore, NMFS concluded that it is reasonably likely that the pollock fishery contributes to the decline and impedes the recovery of Steller sea lions."

Draft Minutes of the Scientific and Statistical Committee, NPFMC, December 1998.⁴ "The SSC (Scientific and Statistical Committee) again shares the general discomfort over the large amount of uncertainty in the data and large data gaps. Uncertainty allows many approaches and interpretations,

² "adversely modify its critical habitat" means "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical" (50 CFR 402.02).

³ NMFS, Biological Opinion, Federal Register, Vol. 64, No. 14, January 22, 1999, page 3438

⁴ The 13 member Scientific and Statistical Committee act as scientific advisory body to the North Pacific Fishery Management Council.

none of which can be overwhelmingly supported by rigorous science at this time. However, the basic facts remain: 1) the Western Steller Sea Lion numbers are greatly reduced, 2) the stock has been listed as endangered, 3) pollock forms a large part of their diet, and 4) pollock fisheries remove potential prey. These facts have led to the formation of the working hypothesis that competitive interactions between the fishery and the Steller sea lions somehow make survival for this endangered species more difficult. There is a lack of data with which to test this hypothesis. The findings in the Biological Opinion rely on various correlations. Simple correlations do not by themselves establish causation. ...The SSC also notes, that although the original cause of the decline is of interest scientifically, it may be irrelevant in this process."

Letter from Steller Sea Lion Recovery Team to NMFS. "With regard to pollock, the Recovery Team is very concerned about the large amounts of fish being taken from areas designated as critical habitat for Steller sea lions. While we do not have the data to assess the specific importance of each critical habitat area for sea lion feeding, large removals of pollock (or other important prey) from relatively nearshore areas could have a detrimental effect on sea lion nutrition. Therefore, it is the opinion of the Recovery Team that management options for the pollock fishery that reduce fishing in areas close to rookeries and important haulouts during critical periods might be beneficial. The Recovery Team thinks that the precautionary principle should be employed where possible to try and ensure that commercial fishing is not causing the sea lion population to continue its decline, and is not impeding its recovery. But, assessing what, where, and when the problems are is very difficult and we continue to be limited in what we can say by lack of data."

Letter from Susan Sabella, Greenpeace and Michael Barnette, American Oceans Campaign to NMFS. "It also is well-established that pollock, Atka mackerel, and other groundfish targeted by the fisheries are the primary prey of sea lions...these giant fisheries have become concentrated in sea lion critical habitat, to the point where about 80% of the pollock catch in the Bering Sea, and about 70% of the total groundfish catch occurred in critical habitat. Moreover, these fisheries are concentrated into a few months, including the crucial winter period, heightening their likely adverse effects."

Letter from Walter Perya, Ph. D. to NMFS. "recent papers by Alverson, Merrick, Trites, Boyd and others, have convinced us that the dramatic decline in SSL [Steller sea lions] is not an indirect result of the pollock fishery, but rather the cumulative impact of other factors over time. Those of particular note are the substantial reduction in the availability of small forage species, such as herring and capelin, together with a shift in the sea lion's diet to pollock, which has a much lower nutritional value; a general reduction in diet diversity; SSL removals by killer whales; and subsistence harvest which have remained high despite the decline in sea lion stocks."

Letter from Joe Plesha, American Seafoods Company to NMFS. "1. The pollock fishery targets pollock larger than the size preferred by sea lions. Harvest of small pollock by the fishery is insignificant. 2. The pollock fishery trawls at depths greater than the shallow depths at which sea lions dive and forage. 3. Removing larger pollock reduces the possibility of cannibalism of younger, smaller pollock preferred by sea lions. 4. Lack of evidence to suggest that localized fishing effort have resulted in negative impacts on the sea lion population. 5. Inadequate consideration of recent research that indicates diversity of diet is the most important factor in the sea lion's diet, not availability of pollock."

B. Reasonable and Prudent Alternatives:

Based on the principles supplied by NMFS, the North Pacific Fishery Management Council recommended a series of management measures. In January 1999, NMFS published an emergency rule containing specific restrictions:

1. Close the Aleutian Islands Subarea to directed fishing for pollock with a recommendation to reduce the allowable catch to 2,000 metric tons.
2. Prohibit directed fishing for pollock within either 10 or 20 nautical miles of rookeries and haulouts in the Bering Sea Subarea and Gulf of Alaska.
3. Divide the pollock season into four sections in the Bering Sea.
4. Reapportion the harvest so each opening harvests no more than 30 percent of the total catch
5. Establishes critical habitat/catcher vessel operational conservation zone and restricts harvests within zone.
6. Establishes new fishing seasons and pollock allowable catch for Western and Central Gulf of Alaska
7. Limits removals from Shelikof Strait during the first part of the season.
8. Establishes 300,000-lb trip limits for vessels harvesting pollock in the Western or Central Gulf of Alaska.

III. THE NEXT STEP:

The above regulations are established under emergency rule authority; they expire in 180 days. Therefore, North Pacific Council will again address this issue in the coming months. In light of that, they have made the following requests:

1. The Council requests that NMFS, in consultation with the Council, the Marine Mammal Commission, ADF&G, and other relevant management agencies, coordinate an independent scientific review of the biological data, Biological Opinion, and other relevant information relating to factors affecting Steller sea lions and their prey. The purpose of the scientific review is to provide guidance to the Council as it prepares to address the long-term aspects of the Steller sea lion situation through the plan amendment process. The Council requests that the scientific peer review be completed by April 1, 1999.
2. The Council requests that NMFS reconstitute the Steller Sea Lion Recovery Team to address concerns such as those expressed by the SSC to ensure that the Council has an appropriate additional source of advice as the Council prepares for long-term treatment of Steller sea lion issues.
3. The Council requests that NMFS prepare and submit a budget proposal for the FY 2000 budget for a sustained research program to investigate: the efficacy of the emergency actions adopted by the Council; sea lion dietary and foraging patterns; sea lion/fishery interactions; and current trends in sea lion population dynamics

The North Pacific Council will consider the Steller sea lion issue at their upcoming meetings in April and June.

time to prepare for coming into compliance making a thirty-day delay in effective date unnecessary.

The President has directed Federal agencies to use plain language in their communications with the public, including regulations. To comply with that directive, we seek public comment on any ambiguity or unnecessary complexity arising from the language used in this emergency interim rule.

List of Subjects in 50 CFR Part 679

Alaska, Fisheries, Recordkeeping and reporting requirements.

Dated: January 15, 1999.

Andrew A. Rosenberg,
Acting Assistant Administrator for Fisheries,
National Marine Fisheries Service.

For reasons set out in the preamble, 50 CFR part 679 is amended as follows:

50 CFR CHAPTER VI

PART 679—FISHERIES OF THE EXCLUSIVE ECONOMIC ZONE OFF ALASKA

1. The authority citation for part 679 continues to read as follows:

Authority: 16 U.S.C. 773 *et seq.*, 1801 *et seq.*, and 3631 *et seq.*

2. In § 679.2, a definition of "American Fisheries Act" is added in alphabetical order to read as follows:

§ 679.2 Definitions.

* * * * *

American Fisheries Act (AFA) (applicable through July 19, 1999) means Title II—Fisheries, Subtitles I and II, as cited within the Omnibus Appropriations Bill FY99 (Pub. L. 105-277).

* * * * *

3. In § 679.20, paragraph (d)(1)(iv) is added to read as follows:

§ 679.20 General limitations.

* * * * *

(d) * * *

(1) * * *

(iv) *American Fisheries Act harvest limitations* (applicable through July 19, 1999). (A) If the Regional Administrator determines that any harvest limitation of groundfish other than pollock, established under section 211(b)(2) (A) or (C) of the American Fisheries Act for catcher/processors identified in section 208(e)(1) through (20) of that Act, has been or will be reached, the Regional Administrator may establish a directed fishing allowance for the species or species group applicable only to those identified catcher/processors.

(B) In establishing a directed fishing allowance under paragraph (d)(1)(iv)(A) of this section, the Regional

Administrator shall consider the amount of the harvest limitation established under section 211(b)(2) (A) or (C) of the American Fisheries Act that will be taken as incidental catch by those catcher/processors identified in section 208(e)(1) through (20) of that Act in directed fishing for other species.

4. In § 679.21, paragraphs (e)(3)(v) and (e)(7)(ix) are added to read as follows:

§ 679.21 Prohibited species bycatch management.

* * * * *

(e) * * *

(3) * * *

(v) *American Fisheries Act prohibited species catch limitations* (applicable through July 19, 1999). The aggregate amounts of any crab, halibut or herring trawl PSC limit caught by the catcher/processors identified under section 208(e)(1) through (20) of the American Fisheries Act and counted against the bycatch allowances specified for the fishery categories defined under paragraphs (e)(3)(iv)(B) through (E) of this section shall be limited to the amounts established under section 211(b)(2)(B) of that Act and published in the *Federal Register* under paragraph (e)(6) of this section.

* * * * *

(7) * * *

(ix) *Closures under the American Fisheries Act prohibited species catch limitations* (applicable through July 19, 1999). When the Regional Administrator determines that the catcher/processors identified under section 208(e)(1) through (20) of the American Fisheries Act have caught the amount of any crab, halibut, or herring prohibited species catch limitation specified under paragraph (e)(3)(v) of this section, directed fishing for groundfish by those vessels will be prohibited in the applicable area defined under this paragraph (e)(7), except for pollock with pelagic trawl gear.

* * * * *

5. In § 679.50, paragraph (c)(5) is added to read as follows:

§ 679.50 Groundfish Observer Program applicable through December 21, 2000.

* * * * *

(c) * * *

(5) *Observer coverage under the American Fisheries Act* (applicable through July 19, 1999). Any catcher/processor listed under section 208(e)(1) through (20) of the American Fisheries Act is required to have two observers aboard the vessel any day it harvests, receives, or processes groundfish. One of the two observers must meet the

qualifications described at paragraph (h)(1)(i)(D) of this section.

* * * * *

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 679

[Docket No. 990115017-9017-01; I.D. 011199A]

RIN 0648-AM08

Fisheries of the Exclusive Economic Zone Off Alaska; Steller Sea Lion Protection Measures for the Pollock Fisheries Off Alaska

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Emergency interim rule; revision to 1999 interim harvest specifications; technical amendment to Steller sea lion no-trawl zones; request for comments.

SUMMARY: NMFS issues an emergency interim rule implementing reasonable and prudent alternatives to avoid the likelihood that the pollock fisheries off Alaska will jeopardize the continued existence of the western population of Steller sea lions or adversely modify their critical habitat. This emergency rule would implement three types of management measures for the pollock fisheries of the Bering Sea and Aleutian Islands Management Area (BSAI) and Gulf of Alaska (GOA): Measures to temporally disperse fishing effort, measures to spatially disperse fishing effort, and pollock trawl exclusion zones around important Steller sea lion rookeries and haulouts. These emergency measures are necessary and must be effective before the start of the BSAI and GOA pollock fisheries on January 20, 1999, or NMFS will be obligated under the Endangered Species Act to close all fishing for pollock until such measures are in place.

DATES: Effective January 20, 1999, through July 19, 1999. Comments must be received by February 22, 1999.

ADDRESSES: Comments may be sent to Sue Salvesson, Assistant Regional Administrator, Sustainable Fisheries Division, Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802, Attn: Lori Gravel, or delivered to the Federal Building, 709 West 9th Street, Juneau, AK. Copies of the Biological Opinion

(BO) on the pollock fisheries of the BSAI and GOA and the Atka mackerel fishery of the Aleutian Islands Subarea, and the Environmental Assessment/Regulatory Impact Review (EA/RIR) prepared for the emergency rule may be obtained from the same address. The BO is also available on the Alaska Region home page at <http://www.fakr.noaa.gov>.

FOR FURTHER INFORMATION CONTACT: Kent Lind, 907-586-7228 or kent.lind@noaa.gov.

SUPPLEMENTARY INFORMATION: NMFS manages the groundfish fisheries in the exclusive economic zone off Alaska under the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area and the Fishery Management Plan for Groundfish of the Gulf of Alaska (FMPs). The North Pacific Fishery Management Council (Council) prepared the FMPs under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), 16 U.S.C. 1801, *et seq.*, implemented by regulations appearing at 50 CFR part 679. Regulations governing U.S. fisheries and implementing the FMPs appear at 50 CFR parts 600 and 679 respectively.

Purpose and Need for Action

NMFS issued a BO dated December 3, 1998, and revised December 16, 1998, on the pollock fisheries of the BSAI and GOA and the Atka mackerel fishery of the Aleutian Islands Subarea. The BO concluded that the BSAI and GOA pollock trawl fisheries, as currently managed, are likely to (1) jeopardize the continued existence of the western population of Steller sea lions and (2) adversely modify its critical habitat. The clause "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). The clause "adversely modify its critical habitat" means "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical" (50 CFR 402.02). The BO also concluded that the Atka mackerel fishery, as modified by recent regulatory changes, is not likely to jeopardize the

continued existence of Steller sea lions or their critical habitat.

In 1990, NMFS designated the Steller sea lion as a threatened species under the Endangered Species Act of 1973. The designation followed severe declines throughout much of the GOA and Aleutian Islands region. In 1993, NMFS defined critical habitat for the species to include (among other areas), the marine areas within 20 nautical miles (nm) of major rookeries and haulouts of the species west of 144° W longitude. In 1997, NMFS recognized two separate populations, and reclassified the western population (west of 144° W longitude) as endangered. Counts of adults and juveniles in the western population of Steller sea lions declined from about 110,000 to about 30,500 between the late 1970s and 1990, a decline of 72 percent. The decline has continued, with counts of adults and juveniles declining 27 percent from 1990 to 1996, and an additional 9 percent from 1996 through 1998. Similarly, counts of pups dropped by 19 percent from 1994 through 1998. The absolute magnitude of the decline has been smaller in recent years because the western population is already at a severely reduced level. However, the continued decline remains a serious problem.

Multiple factors have contributed to the decline, but considerable evidence indicates that lack of available prey is a major problem. Foraging studies confirm that Steller sea lions depend on pollock as a major prey source, and sea lions may be particularly sensitive to the availability of prey during the winter. The significance of pollock in the diet of sea lions may have increased since the 1970s due to shifts in the Bering Sea ecosystem related to oceanographic changes. Pollock are also the target of the largest commercial fisheries in Alaska, fisheries that have grown increasingly concentrated in time and space. This concentration of effort occurs largely in areas designated as Steller sea lion critical habitat and may reduce prey availability at critical times in the life history of sea lions. For these reasons, the BO concluded that the pollock fisheries of the BSAI and GOA may compete with sea lions and either contribute to their decline or impede their recovery. Additional information on Steller sea lions and the pollock fisheries of the BSAI and GOA is contained in the BO and in the EA prepared for this action (See **ADDRESSES**).

The BO concluded that, to avoid the likelihood of jeopardizing the continued existence of the western population of Steller sea lions or of adversely

modifying its critical habitat, reasonable and prudent alternatives to the existing pollock trawl fisheries in the BSAI and GOA must accomplish three basic principles: (1) Temporal dispersion of fishing effort, (2) spatial dispersion of fishing effort, and (3) pollock trawl exclusion zones around Steller sea lion rookeries and haulouts. The BO also contained examples of specific management measures that would implement the three basic principles.

At its December, 1998 meeting, the Council deliberated on various management measures to implement the principles described in the BO. After significant debate and public comment, the Council voted to adopt a series of emergency measures to protect Steller sea lions. After review, NMFS has determined that the Council's recommended measures, with certain modifications, adhere to the principles identified in the BO. The Council's motion forms the basis for the management measures contained in this emergency rule.

Elements of the Emergency Rule

Aleutian Islands Closure

The emergency rule closes the Aleutian Islands Subarea to directed fishing for pollock. This closure, recommended by the Council as part of its emergency rule recommendation, is consistent with the principles contained within the BO. In light of its recommendation to close the Aleutian Islands Subarea to directed fishing for pollock, the Council also recommended that the pollock total allowable catch (TAC) for the Aleutian Islands Subarea be reduced to 2,000 metric tons (mt) to provide for incidental catch of pollock by vessels participating in other groundfish fisheries. This TAC recommendation, if approved by NMFS, will be published in the final 1999 BSAI harvest specifications.

Pollock Trawl Exclusion Zones

This emergency rule prohibits directed fishing for pollock within either 10 or 20 nm of rookeries and haulouts in the Bering Sea Subarea and GOA. The location, size, and period of each exclusion zone are set out in the Tables 12 and 13 of 50 CFR part 679 of the codified text. The size of the exclusion zones in each area reflects the relative widths of the continental shelf. In the Bering Sea Subarea, the shelf is relatively wide and exclusion zones have radii of 20 nm. In the GOA, the shelf is narrower and exclusion zones have radii of 10 nm.

NMFS approved these sites on the basis of ten Steller sea lion counts

conducted since 1979 during the reproductive season (summer) and non-reproductive season (winter). NMFS used the following criteria to identify and approve sites that require exclusion zones and to determine the period of the closure:

1. Rookeries

All rookery sites have 10 or 20 nm year-round pollock trawl exclusion zones.

2. Summer Haulouts

Haulouts with greater than 200 sea lions in a summer survey since 1979 and less than 75 sea lions in winter surveys since 1979 have 10 or 20 nm pollock trawl exclusion zones effective May 1 through October 31.

3. Winter Haulouts

Haulouts with less than 200 sea lions in summer surveys since 1979 and greater than 75 sea lions in a winter survey since 1979 have 10 or 20 nm pollock trawl exclusion zones effective November 1 through April 31.

4. Year-Round Haulouts

Haulouts with greater than 200 sea lions in a summer survey since 1979 and greater than 75 sea lions in a winter survey since 1979 have year-round 10 or 20 nm pollock trawl exclusion zones.

The Council's emergency rule recommendations contained all of the pollock exclusion zones put forth by

NMFS in the BO with one exception in the Bering Sea Subarea and eight exceptions in the GOA.

In the Bering Sea Subarea, the Council recommended no closure for a proposed 20 nm exclusion zone around the Cape Sarichef haulout. The BO states that "some of the principles identified above may be accomplished by an incremental or phased approach if the incremental approach does not jeopardize the continued existence of the western population of Steller sea lions. The phase in of any reasonable and prudent alternative must not be drawn out, and two years is a general guideline with a significant portion occurring in year one."

Consistent with the BO, and based on the above criteria, NMFS has decided to phase in the exclusion zone around this haulout with a 10 nm exclusion zone in 1999 and anticipates extending the exclusion zone to 20 nm for 2000 and beyond.

In the GOA, the Council recommended no closures around Cape Barnabas, Gull Point, Rugged Island, Point Elrington, Cape Ikolik, Needles, Mitrofanina, and Sea Lion Rocks. Based on the above criteria, NMFS has decided to implement a 1 year phase-in period for these locations. For 1999, NMFS has decided not to implement exclusion zones at these locations, and anticipates phasing-in 10 nm exclusion zones for 2000 and beyond. The extension of exclusion zones for Cape Sarichef and

the eight locations in the GOA would be accomplished through separate rulemaking.

Although the Council's recommended measures included pollock trawl exclusion zones in the Aleutian Islands Subarea, implementation of these exclusion zones becomes unnecessary with the closure of the Subarea to directed fishing for pollock. This emergency rule does not affect existing no-trawl and no-entry zones that apply to all groundfish fisheries. The new exclusion zones established by this emergency rule prohibit directed fishing for pollock only.

Bering Sea Management Measures

1. Fishing Seasons

This emergency rule establishes new fishing seasons for the four sectors of the Bering Sea pollock fishery that are defined in the American Fisheries Act (AFA). These new fishing seasons are summarized in Table 1. This emergency rule also repeals existing fair start provisions that required vessels fishing for pollock in the Bering Sea Subarea to cease fishing for groundfish during the week leading up to each pollock season or face a mandatory stand down period during the first week of the pollock season. The Council has determined that these fair start requirements are no longer necessary given the protections for other fisheries that are contained within the AFA.

TABLE 1.—BSAI POLLOCK FISHING SEASONS BY SECTOR

Fishing season ¹	Industry sector		
	Inshore and catcher/processor	Mothership	Community development quota (CDQ)
A1 Season	Jan. 20–Feb. 15 ...	Feb. 1–April 15	Jan. 20–April 15.
A2 Season	Feb. 20–April 15 ...	Feb. 1–April 15	Jan. 20–April 15.
B Season	Aug. 1–Sept. 15 ...	Aug. 1–Sept. 15 ...	April. 15–Dec. 31.
C Season	Sept. 15–Nov. 1 ...	Sept. 15–Nov. 11 ..	April 15–Dec. 31.

¹ The time of all openings and closures of fishing seasons, other than the beginning and end of the calendar fishing year, is 1200 hours, Alaska local time (A.l.t.).

2. Seasonal Apportionment of TAC

The pollock TAC allocated to each industry sector will be apportioned to the fishing seasons previously identified

according to the following formula set out in Table 2. Overages and underages may be "rolled over" to subsequent fishing seasons during the same year,

except that the combined fishing activities of all sectors during a fishing season may not exceed 30 percent of the annual TAC.

TABLE 2.—BSAI SEASONAL APPORTIONMENTS OF POLLOCK TAC

Fishing Season	Industry Sector (in percent)		
	Inshore and Catcher/processor	Mothership	CDQ
A1 Season	27.5	40	45
A2 Season	12.5	40	45
B Season	30	30	55

TABLE 2.—BSAI SEASONAL APPORTIONMENTS OF POLLOCK TAC—Continued

Fishing Season	Industry Sector (in percent)		
	Inshore and Catcher/processor	Mothership	CDQ
C Season	30	30	55

3. Critical Habitat/Catcher Vessel Operational Area (CH/CVOA) Conservation Zone

This emergency rule establishes a combined CH/CVOA conservation zone for the purpose of regulating total removals of pollock. This CH/CVOA conservation zone includes the portion of Bering Sea critical habitat known as the Bogoslof foraging area and the

portion of the CVOA that extends eastward from the Bogoslof foraging area. The CH/CVOA conservation zone consists of the area of the Bering Sea Subarea 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.;

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.

This emergency rule restricts pollock harvests within the CH/CVOA conservation zone during the A1 and A2 seasons to a percentage of each sector's seasonal TAC apportionment according to the percentages displayed in Table 3.

TABLE 3.—TAC LIMITS WITHIN THE CH/CVOA CONSERVATION ZONE

Fishing season	Industry sector (in percent)			
	Inshore	Catcher/processor	Mothership	CDQ
A1 Season	70	40	50	100
A2 Season	70	40	50	100
B Season		[reserved]		
C Season		[reserved]		

NMFS will monitor catch by each industry sector and close the CH/CVOA conservation zone to directed fishing for pollock by sector when NMFS determines that the specified CH/CVOA limit has been reached. The Council intended that inshore catcher vessels less than or equal to 99 ft (30.2 m) length overall (LOA) would be exempt from CH/CVOA closures from September 1 through March 31 unless the 70 percent cap for the inshore sector has been reached. NMFS will announce the closure of the CH/CVOA conservation zone to catcher vessels over 99 ft (30.2 m) LOA before the inshore sector 70 percent limit is reached. NMFS will implement the closure in a manner intended to leave remaining quota within the CH/CVOA that is sufficient to support directed fishing for pollock by vessels less than or equal to 99 ft (30.2 m) LOA for the duration of the current inshore sector opening.

An emergency rule implemented pursuant to the Magnuson-Stevens Act must not remain in effect for more than 180 days. This emergency rule will expire on July 19, 1999, and does not specify a spatial distribution of pollock TAC for the B and C seasons in the Bering Sea Subarea. NMFS has determined that the spatial dispersion scheme recommended by the Council for the B and C seasons does not adequately meet the principles for reasonable and prudent alternatives outlined in the BO. If the Council submits revised recommendations in a timely manner, NMFS will consider implementing them. In the absence of further recommendations by the Council that provide protections equivalent to or exceeding the principles contained in the BO, NMFS anticipates implementing through subsequent emergency rule the B and C season spatial allocation scheme contained in the BO. Under this scheme, the B and C season TAC allocations would be apportioned

among the following three areas based on distribution of exploitable biomass as determined by summer surveys: (1) CH/CVOA conservation zone, (2) east of 170° W long. and outside of the CH/CVOA conservation zone, and (3) west of 170° W long. and north of 56° N lat.

Gulf of Alaska Management Measures

1. Fishing Seasons and TAC Apportionments

This emergency rule establishes new fishing seasons and pollock TAC apportionments in the Western and Central (W/C) Regulatory Areas of the GOA. These new fishing seasons are summarized in Table 4. The TAC for pollock in the combined W/C Regulatory Areas will continue to be apportioned among Statistical Areas 610, 620, and 630 in proportion to the distribution of the pollock biomass as determined by the most recent NMFS surveys. The pollock fishing season in the Eastern Regulatory Area will be unchanged.

TABLE 4.—POLLOCK FISHING SEASONS AND SEASONAL TAC APPORTIONMENTS FOR THE WESTERN AND CENTRAL REGULATORY AREAS OF THE GULF OF ALASKA

Fishing season	TAC apportionment (percent)	Dates ¹	
		From	To
A Season	30	January 20	April 1.

TABLE 4.—POLLOCK FISHING SEASONS AND SEASONAL TAC APPORTIONMENTS FOR THE WESTERN AND CENTRAL REGULATORY AREAS OF THE GULF OF ALASKA—Continued

Fishing season	TAC apportionment (percent)	Dates ¹	
		From	To
B Season	20	June 1	July 1.
C Season	25	September 1	The date of closure of a statistical area (610, 620, 630) to directed fishing, or October 1, whichever comes first.
D Season	25	Five days after the date of closure of a statistical area (610, 620, 630) to directed fishing in the C season.	November 1.

¹ The time of all openings and closures of fishing seasons, other than the beginning and end of the calendar fishing year, is 1200 hours, A.L.T.

2. Limits on Pollock Catch Within Shelikof Strait

To prevent localized depletions of pollock within Shelikof Strait, an important winter foraging area for Steller sea lions, the emergency rule limits removals from within Shelikof Strait during the A season. For the purpose of this emergency rule, a Shelikof Strait conservation zone 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.

This area overlaps portions of statistical areas 620 and 630. The Shelikof Strait conservation zone catch limit is not a separate TAC for this area, but a limit on allowable removals from this area. Either one or both of the statistical areas could be closed to directed fishing upon attainment of the specific TACs before the Shelikof Strait catch limit is reached.

NMFS will determine the A season catch limit for the Shelikof Strait conservation zone by calculating a ratio equal to the most recent estimate of pollock biomass in Shelikof Strait divided by the most recent estimate of

total pollock biomass in the GOA.

NMFS will then multiply by the overall pollock TAC for the GOA and further multiplied by the A season apportionment of 30 percent. For 1999, NMFS has specified an interim Shelikof Strait catch limit of 15,857 mt (see the revised 1999 interim specifications below). When NMFS determines that the A season pollock removals from within the Shelikof Strait conservation zone have reached this specified limit, NMFS will prohibit directed fishing for pollock in Shelikof Strait.

3. W/C GOA Trip Limits

The Council recommended that NMFS establish a 300,000 lb trip limit for catcher vessels harvesting pollock in the directed pollock fisheries of the Western or Central Regulatory Areas of the Gulf of Alaska (W/C GOA). However, NMFS' recordkeeping and reporting requirements currently require that catch and landings be reported in metric tons (mt). NMFS is, therefore, rounding the Council's recommended 300,000 lb trip limit to the nearest equivalent in mt and establishing a trip limit of 136 mt. The emergency rule prohibits the operator of a catcher vessel fishing for groundfish in the W/C GOA from retaining on board more than 136 mt of pollock harvested in the W/C GOA. In addition, to prevent the large scale use of tender vessels to avoid the trip limit restriction, this rule also prohibits vessels operating as tenders from retaining on board more than 272 mt (the equivalent of 2 fishing trips) of unprocessed pollock that was harvested in the W/C GOA. This 136 mt trip limit does not exempt vessels from existing regulations that require 100 percent retention of pollock when directed

fishing for pollock is open. A vessel operator must cease fishing for pollock during a fishing trip before the 136 mt trip limit is reached in order to avoid a violation of either the 136 mt trip limit or the 100 percent retention requirement for pollock.

Revised 1999 Interim Harvest Specifications for Pollock in the BSAI and GOA

The regulatory changes in this emergency rule require revision of the 1999 interim specifications of pollock TAC for the BSAI and GOA. Existing regulations at 50 CFR 679.20(c)(2) do not require that interim harvest specifications for pollock in the BSAI and GOA be temporally or spatially dispersed. However, the BO concluded that the current program for managing the BSAI and GOA pollock fisheries could jeopardize Steller sea lions or their critical habitat. Therefore, to allow the Bering Sea and GOA pollock fisheries to commence on January 20, 1999, this emergency rule also adjusts the 1999 interim specifications for pollock to comport with the reasonable and prudent management measures outlined above.

The specifications for Bering Sea Subarea pollock in Table 1 of the 1999 interim harvest specifications (64 FR 50, January 4, 1999) are replaced by the following Table 6. The interim specifications for pollock were changed for two reasons: (1) To comport with the temporal and spatial dispersions required by the BO, and (2) to incorporate the Council's final 1999 TAC recommendations for pollock, which are reduced from the 1999 proposed specifications.

TABLE 6.—REVISED INTERIM 1999 TAC AMOUNTS FOR POLLOCK IN THE BERING SEA SUBAREA

Species and component	Area	A1 Season ¹		A2 Season	
		Interim TAC	CH/CVOA limit	Interim TAC	CH/CVOA limit
Pollock:					
Inshore	BS	115,394	² 80,776	52,452	² 36,716
Offshore catcher/processor and catcher vessel total	BS	92,316	36,926	41,962	16,785
Listed catcher/processors ³	BS	84,469	33,787	38,395	15,358
Listed catcher vessels ³	BS	7,847	3,139	3,567	1,427
Mothership	BS	33,569	16,785	n/a	n/a
CDQ	BS	44,640	44,640	n/a	n/a

¹ The mothership and CDQ sectors have a single A season apportionment equal to 40 and 45 percent of their annual TAC allocations, respectively.

² Under the emergency rule, NMFS will close the CH/CVOA conservation zone to inshore vessels greater than 99 ft (30.2 m) LOA while maintaining a sufficient CH/CVOA allowance to support fishing activities by inshore catcher vessels under 99 ft (30.2 m) LOA for the duration of the current opening. However, once the specified CH/CVOA limit is reached, all inshore vessels will be prohibited from engaging in directed fishing for pollock inside the CH/CVOA conservation zone.

³ Section 210(c) of the AFA requires that not less than 8.5 percent of the directed fishing allowance allocated to listed catcher/processors shall be available for harvest only by eligible catcher vessels delivering to listed catcher/processors.

The first seasonal allowances for W/ C GOA pollock in Table 1 of the 1999 Interim Harvest Specifications (64 FR 46, January 4, 1999) are replaced by the following Table 7:

TABLE 7.—REVISED FIRST SEASONAL ALLOWANCES OF POLLOCK IN THE WESTERN (W) AND CENTRAL (C) REGULATORY AREAS OF THE GULF OF ALASKA (GOA)

Species and area	Interim TAC
Pollock:	
W (610)	6,936
C (620)	11,652
C (630)	9,156
W/C Subtotal	27,744
Shellkoff Strait Subtotal ¹	15,857

¹ The pollock catch limit for the Shellkoff Strait conservation zone is determined by calculating the ratio of the most recent estimate of pollock biomass in Shellkoff Strait (489,900 mt) divided by the most recent estimate of total pollock biomass in the GOA (933,000 mt). This ratio will then be multiplied by the overall pollock TAC for the GOA (100,920 mt) and multiplied by the A season apportionment of 30 percent.

Technical Amendment to Steller Sea Lion No-Trawl Zones

This emergency interim rule also makes technical changes to the existing no-trawl zones set out in Tables 4 and 6 50 CFR part 679 by suspending them and by adding Tables 13 and 14 to 50 CFR part 679.

Classification

The Assistant Administrator for Fisheries, NOAA (AA), has determined that this emergency interim rule is necessary to respond to an emergency situation and that it is consistent with

the Magnuson-Stevens Act and other applicable laws.

This emergency interim rule has been determined to be not significant for purposes of E.O. 12866.

Failure to have the measures contained in this rule in place by January 20, 1999, would force delay of the start of the pollock fisheries of the BSAI and GOA with significant costs to industry. This would occur because without these measures, the December 16, 1998, BO would require that to protect Steller sea lions, no pollock fishing occur. Thus, notice and comment procedures for this rule would prevent NMFS from performing its necessary function of allowing the fishery to be prosecuted while protecting this endangered species. As such, NMFS finds that the immediate need to effect the provisions of this rule by January 20, 1999, constitutes good cause to waive the requirement to provide prior notice and an opportunity for public comment pursuant to authority set forth at 5 U.S.C. 553(b)(B), as such procedures would be impracticable and contrary to the public interest. The need for these measures to be in place by January 20, 1999, as explained above, constitutes good cause under authority contained in 5 U.S.C. 553(d)(3) to waive the requirement for a 30-day delay in effective date.

Because prior notice and opportunity for public comment are not required for this rule by 5 U.S.C. 553, or any other law, the analytical requirements of the Regulatory Flexibility Act, 5 U.S.C. 601 et seq., are inapplicable.

The President has directed Federal agencies to use plain language in their communications with the public, including regulations. To comply with that directive, we seek public comment on any ambiguity or unnecessary

complexity arising from the language used in this emergency interim rule.

List of Subjects in 50 CFR Part 679

Alaska, Fisheries, Recordkeeping and reporting requirements.

Dated: January 15, 1999.

Andrew A. Rosenberg,
Deputy Assistant Administrator for Fisheries,
National Marine Fisheries Service.

For reasons set out in the preamble, 50 CFR part 679 is amended as follows:

50 CFR CHAPTER VI

PART 679—FISHERIES OF THE EXCLUSIVE ECONOMIC ZONE OFF ALASKA

1. The authority citation for part 679 continues to read as follows:

Authority: 16 U.S.C. 773 et seq., 1801 et seq., and 3631 et seq.

2. In § 679.7, paragraph (b) is suspended and paragraph (i) is added to read as follows:

§ 679.7 Prohibitions.

* * * * *

(i) *Prohibitions specific to the GOA (applicable through July 19, 1999)—(1) Southeast Outside trawl closure (applicable through July 19, 1999). Use any gear other than non-trawl gear in the GOA east of 140° W long.*

(2) *Western/Central GOA Pollock trip limit (applicable through July 19, 1999). Retain on board a catcher vessel at any time, more than 136 mt of unprocessed pollock, or retain on board a tender vessel at any time, more than 272 mt of unprocessed pollock, harvested in the Western or Central Areas of the GOA.*

3. In § 679.20, paragraphs (a)(5)(i)(A) and (a)(5)(ii)(B) are suspended, and new paragraphs (a)(5)(i)(C) and (a)(5)(ii)(C) are added to read as follows:

§ 679.20 General limitations.

* * * * *

(a) * * *

(5) * * *

(i) * * *

(C) *BSAI seasonal allowances (applicable through July 19, 1999)*—(1) *Inshore*. The portion of the Bering Sea Subarea pollock TAC allocated to the inshore component under Section 206(b) of the American Fisheries Act will be divided into four seasonal allowances corresponding to the four fishing seasons set out at § 679.23(e)(4)(i), as follows: A1 Season, 27.5 percent; A2 Season, 12.5 percent; B Season, 30 percent; C Season, 30 percent. 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 percent of the combined annual TAC of pollock.

(2) *Catcher/processor*. The portion of the Bering Sea Subarea pollock TAC allocated to the catcher/processor component under Section 206(b) of the American Fisheries Act will be divided into four seasonal allowances corresponding to the four fishing seasons set out at § 679.23(e)(4)(ii), as follows: A1 Season, 27.5 percent; A2 Season, 12.5 percent; B Season, 30 percent; C Season, 30 percent. 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 percent of the combined annual TAC of pollock.

(3) *Mothership*. The portion of the Bering Sea Subarea pollock TAC allocated to the mothership component under Section 206(b) of the American Fisheries Act will be divided into three

seasonal allowances corresponding to the three fishing seasons set out at § 679.23(e)(4)(iii) as follows: A Season, 40 percent; B Season, 30 percent; C Season, 30 percent. Within any fishing year, underage or overage of any 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 percent of the combined annual TAC of pollock.

* * * * *

(ii) * * *

(C) *GOA seasonal allowances (applicable through July 19, 1999)*. Each apportionment established under paragraph (a)(5)(ii)(A) of this section will be divided into four seasonal allowances corresponding to the four fishing seasons set out at § 679.23(d)(3) as follows: A Season, 30 percent; B Season, 20 percent; C Season, 25 percent; D Season, 25 percent. 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 a revised seasonal allowance does not exceed 30 percent of the annual TAC apportionment.

* * * * *

4. In § 679.22, paragraphs (a)(7) and (b)(2) are suspended and (a)(11) and (b)(3) are added to read as follows:

§ 679.22 Closures.

(a) * * *

(8) * * *

(iv) *Pollock closure (applicable through July 19, 1999)*. Directed fishing for pollock is prohibited at all times within the Aleutian Islands Subarea.

* * * * *

(11) *Steller sea lion protection areas, Bering Sea Subarea and Bogoslof District (applicable through July 19, 1999)*—(i) *Year-round trawl closures*. Trawling is prohibited within 10 nm of

each of the eight Steller sea lion rookeries shown in Table 12 to this part.

(ii) *Seasonal trawl closures*. During January 1 through April 15, or a date earlier than April 15, if adjusted under § 679.20, trawling is prohibited within 20 nm of each of the four Steller sea lion rookeries shown in Table 12 to this part.

(iii) *Pollock closures (applicable through July 19, 1999)*. Directed fishing for pollock is prohibited within 10 or 20 nm of each of the 25 Steller sea lion haulout and rookery sites shown in Table 12 to this part. The radius in nm and time period that each closure is in effect are shown in Table 12 to this part.

(iv) *Critical Habitat/Catcher Vessel Operational Area (CH/CV/OA) conservation zone (applicable through July 19, 1999)*—(A) *General*. Directed fishing for pollock by vessels catching pollock for processing either by the inshore, offshore catcher processor, or mothership component is prohibited within the CH/CVOA conservation zone for the duration of a fishing season when the Regional Administrator announces by notification in the **Federal Register** that the criteria set out in paragraph (a)(7)(iv)(C) of this section have been met by that industry component.

(B) *Boundaries*. The CH/CVOA conservation zone consists of the area of the Bering Sea Subarea 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.;
55°30' N lat. 168°00' W long.;
55°30' N lat. 166°00' W long.;
56°00' N lat. 166°00' W long.; and,
56°00' N lat. 163°00' W long.

(C) *Criteria for closure*—(1) *General*. The directed fishing closures identified in paragraph (a)(7)(iv)(A) of this section will take effect when the Regional Administrator determines that the harvest of a seasonal allowance of pollock reaches a percentage specified in the following table:

Fishing season	Industry component (in percent)		
	Inshore	Catcher/processor	Mothership
A1 Season	70	40	50
A2 Season	70	40	50
B Season		[reserved]	
C Season		[reserved]	

(2) *Inshore catcher vessels greater than 99 ft (30.2 m) LOA*. The Regional Administrator will close directed fishing to inshore catcher vessels greater than 99 ft (30.2 m) LOA prior to

reaching the inshore CH/CVOA limit to accommodate fishing by vessels less than or equal to 99 ft (30.2 m) LOA inside the CH/CVOA conservation zone for the duration of the inshore seasonal

opening. During the A1 and A2 seasons, the Regional Administrator will estimate how much of the inshore A1 and A2 seasonal allowance is likely to be harvested by catcher vessels less than

or equal to 99 ft (30.2 m) LOA and reserve a sufficient amount of the inshore CH/CVOA allowance to accommodate fishing by such vessels after the closure of the CH/CVOA conservation zone to vessels greater than 99 ft (30.2 m) LOA. The CH/CVOA conservation zone will be closed to directed fishing for all inshore catcher vessels when the inshore limit specified in paragraph (a)(7)(iv)(C)(I) of this section has been met.

(b) * * *

(3) *Steller sea lion protection areas—(applicable through July 19, 1999)—(i) Year-round trawl closures.* Trawling is prohibited in the GOA within 10 nm of the nine Steller sea lion rookeries shown in Table 13 to this part.

(ii) *Pollock closures (applicable through July 19, 1999).* Directed fishing for pollock is prohibited within 10 nm of each of the 45 Steller sea lion haulout and rookery sites shown in Table 13 to this part. The radius in nm and time period that each closure is in effect are shown in Table 13 to this part.

(iii) *Shelikof Strait conservation zone (applicable through July 19, 1999).*—(A) *General.* Directed fishing for pollock is prohibited within the Shelikof Strait conservation zone during the A season defined at § 679.23(d)(3) when the Regional Administrator announces through notification in the **Federal Register** that the A season catch of pollock from within the Shelikof Strait conservation zone reaches the amount determined by paragraph (b)(2)(iii)(C) of this section.

(B) *Boundaries.* The Shelikof Strait conservation zone consists of 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.

(C) *Determination of catch limit.* The pollock catch limit for the Shelikof Strait conservation zone will be published in the annual specifications under § 679.20(c) and is determined by calculating a ratio equal to the most recent estimate of pollock biomass in Shelikof Strait divided by the most recent estimate of total pollock biomass in the GOA. NMFS will then multiply by the overall pollock TAC for the GOA and further multiplied by the A season apportionment of 30 percent.

* * * * *

5. In § 679.23, paragraphs (d)(2) and (e)(2) are suspended, and new paragraphs (d)(3) and (e)(4) are added to read as follows:

§ 679.23 Seasons.

* * * * *

(d) * * *

(3) *Directed fishing for pollock (applicable through July 19, 1999).* Subject to other provisions of this part, directed fishing for pollock in the Western and Central Regulatory Areas is authorized only during the following four seasons:

(i) *A season.* From 1200 hours, A.I.t., January 20, through 1200 hours, A.I.t., April 1;

(ii) *B season.* From 1200 hours, A.I.t., June 1, through 1200 hours, A.I.t., July 1;

(iii) *C season.* From 1200 hours, A.I.t., September 1, within a statistical area until the date of closure of the statistical area to directed fishing, or 1200 hours, A.I.t., October 1, whichever comes first.

(iv) *D season.* From 1200 hours, A.I.t., five days after the closure of the C season in a statistical area until 1200 hours, A.I.t., November 1.

(e) * * *

(4) *Directed fishing for pollock in the Bering Sea Subarea (applicable through July 19, 1999).*—(i) *Inshore and offshore catcher/processor components.* Subject to other provisions of this part, directed fishing for pollock by vessels catching pollock for processing by the inshore component and by the offshore catcher processor component in the Bering Sea Subarea is authorized only during the following four seasons:

(A) *A1 season.* From 1200 hours, A.I.t., January 20, through 1200 hours, A.I.t., February 15;

(B) *A2 season.* From 1200 hours, A.I.t., February 20, through 1200 hours, A.I.t., April 15;

(C) *B season.* From 1200 hours, A.I.t., August 1, through 1200 hours, A.I.t., September 15; and,

(D) *C season.* From 1200 hours, A.I.t., September 15, through 1200 hours, A.I.t., November 1.

(ii) *Mothership component.* Subject to other provisions of this part, directed fishing for pollock by vessels catching pollock for processing by the offshore mothership component in the Bering Sea Subarea is authorized only during the following three seasons:

(A) *A season.* From 1200 hours, A.I.t., February 1, through 1200 hours, A.I.t., April 15;

(B) *B season.* From 1200 hours, A.I.t., August 1, through 1200 hours, A.I.t., September 15; and,

(C) *C season.* From 1200 hours, A.I.t., September 15, through 1200 hours, A.I.t., November 1.

* * * * *

6. Tables 4 and 6 to 50 CFR part 679 are suspended and Tables 12 and 13 are added to read as follows:

TABLE 12 TO 50 CFR PART 679

[Steller sea lion protection areas¹ in the Bering Sea Subarea² are identified in the following table. Where two sets of coordinates are given, the baseline extends in a clock-wise direction from the first set of geographic 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.]

Management area/island/site	Boundaries to				Directed fishing for pollock prohibited within . . . (nm)		Trawling prohibited within . . . (nm)	
	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Nov. 1 through April 31	May 1 through Oct. 31	Jan. 1 through April 15	Year-round
Bering Sea								
Walrus	57°11.00'	169°56.00'	.....	.....	20	20	.....	10
Ullaga	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	.....	10
Umnak/Cape Aslik	53°25.00'	168°24.50'	.....	.....	20	20	.....	.....

TABLE 12 TO 50 CFR PART 679—Continued

[Steller sea lion protection areas¹ in the Bering Sea Subarea² are identified in the following table. Where two sets of coordinates are given, the baseline extends in a clock-wise direction from the first set of geographic 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.]

Management area/island/site	Boundaries to				Directed fishing for pollock prohibited within . . . (nm)		Trawling prohibited within . . . (nm)	
	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Nov. 1 through April 31	May 1 through Oct. 31	Jan. 1 through April 15	Year-round
Ogchul	53°00.00'	168°24.00'	.....	.....	20	20	.....	10
Bogoslof/Fire Island	53°56.00'	168°02.00'	.....	.....	20	20	.....	10
Emerald	53°17.50'	167°51.50'	.....	.....	.....	20	.....	.....
Unalaska/Cape Izigan	53°13.50'	167°39.00'	.....	.....	20	20	.....	.....
Unalaska/Bishop Pt	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	20	10
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	20	10
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'	.....	.....	10	10	.....	.....
Alitak	54°11.00'	164°51.00'	.....	.....	20	.....	.....	.....
Ugamak	54°14.00'	164°48.00'	54°13.00'	164°48.00'	20	20	20	10
Round	54°12.00'	164°46.50'	.....	.....	.....	20	.....	.....
Sea Lion Rock (Amak)	55°28.00'	163°12.00'	.....	.....	20	20	20	10
Amak-rocks	55°24.00'	163°07.00'	55°26.00'	163°10.00'	20	20	.....	.....

¹ Three nm NO TRANSIT ZONES are described at 50 CFR 227.12(a)(2) of this title.

² Closure zones around many of these sites also extend into statistical area 610 of the Gulf of Alaska Management Area.

TABLE 13 TO 50 CFR PART 679 (EFFECTIVE THROUGH JULY 19, 1999)

[Steller sea lion protection areas¹ in the Gulf of Alaska² are identified in the following table. Where two sets of coordinates are given, the baseline extends in a clock-wise direction from the first set of geographic 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.]

Management area/island/site	Boundaries to				Directed fishing for pollock prohibited within . . . (nm)		Trawling prohibited within . . . (nm)	
	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Nov. 1 through April 31	May 1 through Oct. 31	Jan. 1 through April 15	Year-round
Gulf of Alaska								
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	.....	10
Pinnacle Rock	54°46.00'	161°46.00'	.....	.....	.....	10	.....	10
Sushilnoi Rocks	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	.....	.....
The Whaleback	55°16.50'	160°06.00'	.....	.....	10	10	.....	.....
Chemabura	54°47.50'	159°31.00'	54°45.50'	159°33.50'	10	10	.....	10
Castle Rock	55°17.00'	159°30.00'	.....	.....	.....	10	.....	.....
Atkins	55°03.50'	159°19.00'	.....	.....	10	10	.....	10
Spitz	55°47.00'	158°54.00'	.....	.....	.....	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	.....	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	.....	10
Puale Bay	57°41.00'	155°23.00'	.....	.....	10	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 Ukat	57°52.00'	153°51.00'	.....	.....	10	10	.....	.....
Shakun Rock	58°32.50'	153°41.50'	.....	.....	10	10	.....	.....
Twoheaded Island	58°54.50'	153°33.00'	58°53.50'	153°35.50'	10	10	.....	.....
Cape Douglas	58°51.50'	153°14.00'	.....	.....	.....	10	.....	.....

TABLE 13 TO 50 CFR PART 679 (EFFECTIVE THROUGH JULY 19, 1999)—Continued

[Steller sea lion protection areas¹ in the Gulf of Alaska² are identified in the following table. Where two sets of coordinates are given, the base-line extends in a clock-wise direction from the first set of geographic 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.]

Management area/island/site	Boundaries to				Directed fishing for pollock prohibited within . . . (nm)		Trawling prohibited within . . . (nm)	
	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Nov. 1 through April 31	May 1 through Oct. 31	Jan. 1 through April 15	Year-round
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	.....	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	.....	10
Peri	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	.....	10
Steep Point	59°29.00'	150°15.00'	.....	.....	.....	10	.....	.....
Chiswell Islands	59°36.00'	149°34.00'	.....	.....	10	10	.....	.....
Wooded Island (Fish)	59°53.00'	147°20.50'	.....	.....	10	10	.....	.....
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	.....	.....

¹ Three nm NO TRANSIT ZONES are described at 50 CFR 227.12(a)(2) of this title.

² Additional closures along the Aleutian Island chain that extend into statistical area 610 of the Gulf of Alaska are displayed in Table 13 to this part.

[FR Doc. 99-1378 Filed 1-15-99; 5:01 pm]
BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 679

[Docket No. 981021264-9016-02; I.D. 092998A]

RIN 0648-AL29

Fisheries of the Exclusive Economic Zone Off Alaska; Season and Area Apportionment of Atka Mackerel Total Allowable Catch

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule; 1999 interim Atka mackerel specifications.

SUMMARY: NMFS issues regulations that divide the Atka mackerel total allowable catch (TAC) specified for the Aleutian Islands Subarea (AI) into two seasonal allowances; reduce the percentage of Atka mackerel TAC harvested from Steller sea lion critical habitat (CH) over

a 4-year period in the Western and Central Districts of the AI; and extend the seasonal no-trawl zone around Seguam and Agligadak rookeries in the AI Eastern District into a year-round closure. This action is necessary to avoid potential jeopardy to the continued existence of Steller sea lions due to fishery-induced localized depletions of Atka mackerel, a primary prey species for Steller sea lions. This action is intended to foster the recovery of Steller sea lions and to further the conservation goals of the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area (FMP).

DATES: Effective January 19, 1999.

ADDRESSES: Copies of the Environmental Assessment/Regulatory Impact Review/Final Regulatory Flexibility Analysis (EA/RIR/FRFA) prepared for this action may be obtained from the Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802, Attn: Lori J. Gravel, or by calling 907-586-7228.

FOR FURTHER INFORMATION CONTACT: Jay Ginter, 907-586-7228.

SUPPLEMENTARY INFORMATION: NMFS manages the groundfish fisheries in the

Bering Sea and Aleutian Islands Management Area (BSAI) pursuant to the FMP. General regulations governing U.S. fisheries appear at 50 CFR part 600. The FMP is implemented by regulations appearing at 50 CFR part 679 issued under authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The North Pacific Fishery Management Council (Council) prepared the FMP under authority of the Magnuson-Stevens Act. Fishing for Atka mackerel (*Pleurogrammus monopterygius*) is governed by the FMP and its implementing regulations.

Background

The purpose and need for this action were described in the preamble to the proposed rule published on November 9, 1998 (63 FR 60288). That document and the EA/RIR/FRFA describe the conservation and management events leading to this action. In summary, the number of Steller sea lions (*Eumetopias jubatus*) west of 144°W. long. in the Gulf of Alaska (GOA) and the BSAI has declined severely during the last several decades. In 1997, NMFS recognized these animals as a separate and endangered population. NMFS has

**WRITTEN TESTIMONY FOR THE HOUSE SPECIAL COMMITTEE ON FISHERIES
MARCH 29 HEARING ON ENDANGERED STELLER SEA LIONS**

**SUBMITTED BY CHRIS BLACKBURN, DIRECTOR,
ALASKA GROUND FISH DATA BANK**

Thank you Mr. Chairman for the opportunity to represent Alaska's shoreside pollock industry. We appreciate the opportunity to inform the committee on the threat to the pollock dependent Alaska communities of Kodiak, Seward, Cordova, Sandpoint, King Cove, Dutch Harbor and Akutan as well as the many CDQ villages along the Bering sea coast.

As you undoubtedly know the ability for shorebased catcher vessels to catch pollock is in jeopardy as the result of a law suit filed by a consortium of environmental organizations. This is not the first time the Alaska pollock fishery has been attacked in court by the environmental community. In 1992 a suit was filed by Greenpeace alleging that National Marine Fisheries Service has failed to update its Environmental Impact Study and failed to take measures to stop the decline of the Steller sea lion in the Gulf of Alaska. Greenpeace requested a reduction of the Gulf pollock quota.

The community of Kodiak with the help of shorebased processors in Dutch Harbor and Akutan raised the money to hire a lawyer to intervene and did prevail in the courts -- in the 9th District court, in the Appeals Panel and before the full Appeals Court. The Court did recommend that National Marine Fisheries Service update its EIS which the agency failed to do.

Between 1992 and 1998 the Steller Sea Lions' status has changed from "threatened" to "endangered" which opened the way for the current lawsuit under the Endangered Species Act.

The pollock industry does not feel that National Marine Fisheries Service has been negligent. The cause of Steller sea lion decline remains elusive. The rate of decline has mitigated dramatically during the 1990's. There was no science to suggest a course of action other than the closure of rookeries and continued research. Research which has included the Department of Fish and Game and the University of Alaska Fairbanks as well as Andrew Trites, National Marine Fisheries Service and other scientists from outside Alaska to the degree budgets allowed.

The pollock industry itself has raised considerable funds to support research. Since the Endangered Species Act does not appear to require science but only that something be done that impacts humans since nature cannot be

controlled, I will move on to the impact on our pollock dependent Alaskan communities.

SAFETY OF OUR FLEET AND FISHERMEN

The new Steller Sea Lion protective measures close 10 mile areas around 44 sea lion rookeries, some which have not been used by sea lions for a decade. Restrictions on the amount of pollock which can be taken from the waters near Dutch Harbor also forces Bering Sea pollock catcher vessels offshore.

Pollock is a winter fishery. As all of you know, Alaskan winter weather is storm driven, wind blown and sprayed with ice. The smaller the vessel -- and in the pollock fishery a 99-foot vessel is considered small -- the greater the jeopardy to the boat and the crews -- the greater is the danger to our neighbors, our friends and our relations.

ECONOMICS OF THE FLEET

All catcher vessels face reduced income from pollock due to the additional cost in fuel, maintenance and lost fishing time due to having to run farther from port to find an area to fish pollock. Smaller vessels will have to choose whether to risk weather or lose fishing days and income.

EFFECT ON QUALITY

Currently pollock catcher vessels are required to return to port two to three days after the first fish is taken onboard. As the fleet is pushed further offshore and forced to hunt for pollock, it will become increasingly difficult to assure a quality product and a profit for the vessel.

ECONOMICS OF THE ALASKA POLLOCK DEPENDENT COMMUNITIES

Pollock built the Alaskan shorebased groundfish fishery. In Kodiak pollock provides most of the early winter fishery -- work that keeps the processing plants and their employees working year round and makes Kodiak the only Alaskan port with a year round resident processing workforce. Pollock put shorebased plants in Dutch Harbor and Akutan and created viable communities. Pollock gives winter work to the communities of Seward and Cordova.

Pollock money flows through the communities supporting a variety of small businesses. It is not just fishermen and processors who are impacted, but the whole community -- home owners concerned that the value of the home will be devalued, small businesses serving the community are concerned about a reduction in customers, municipalities worry about the effect on their tax base and the maintenance of the community infra-structure.

IMPACT ON OTHER FISHERIES

Boats unable to move offshore to fish pollock will look for other options. Alaska no longer has undeveloped fisheries. Any vessel that changes fisheries is impacting the traditional fishermen in those fisheries and reducing their income.

Over the years the pollock fleet has worked to reduce bycatch with pelagic trawls, by setting seasons when salmon are least likely to be taken as bycatch and by moving if they encounter salmon or herring. The reduction in pollock fishing areas jeopardizes the ability to practice "clean fishing".

SOCIAL IMPACTS

Every fishing dependent community has years when fishing is poor and the community is financially troubled. As a former City Council member I know the cost of these times in human terms -- alcoholism, divorce and the impact on the children. We cannot change what nature does, but to deliberately create the same problems seems unconscionable.

FISHING COMMUNITY ATTITUDE

Everywhere I go in Kodiak I hear from fishermen, business owners and employees "if we had any reason to think the pollock fishery was the cause of the sea lion decline we would do what we needed to do". We live here and care for our resources whether its a sculpin, a salmon or a sea lion. The animals, marine and terrestrial, are our legacy for our children and for their children. Kodiak is no different from any other fishery dependent community. There are sea lions on all our docks, killer whales coming by to teach their young to catch sea lions or just dropping in for a munch.

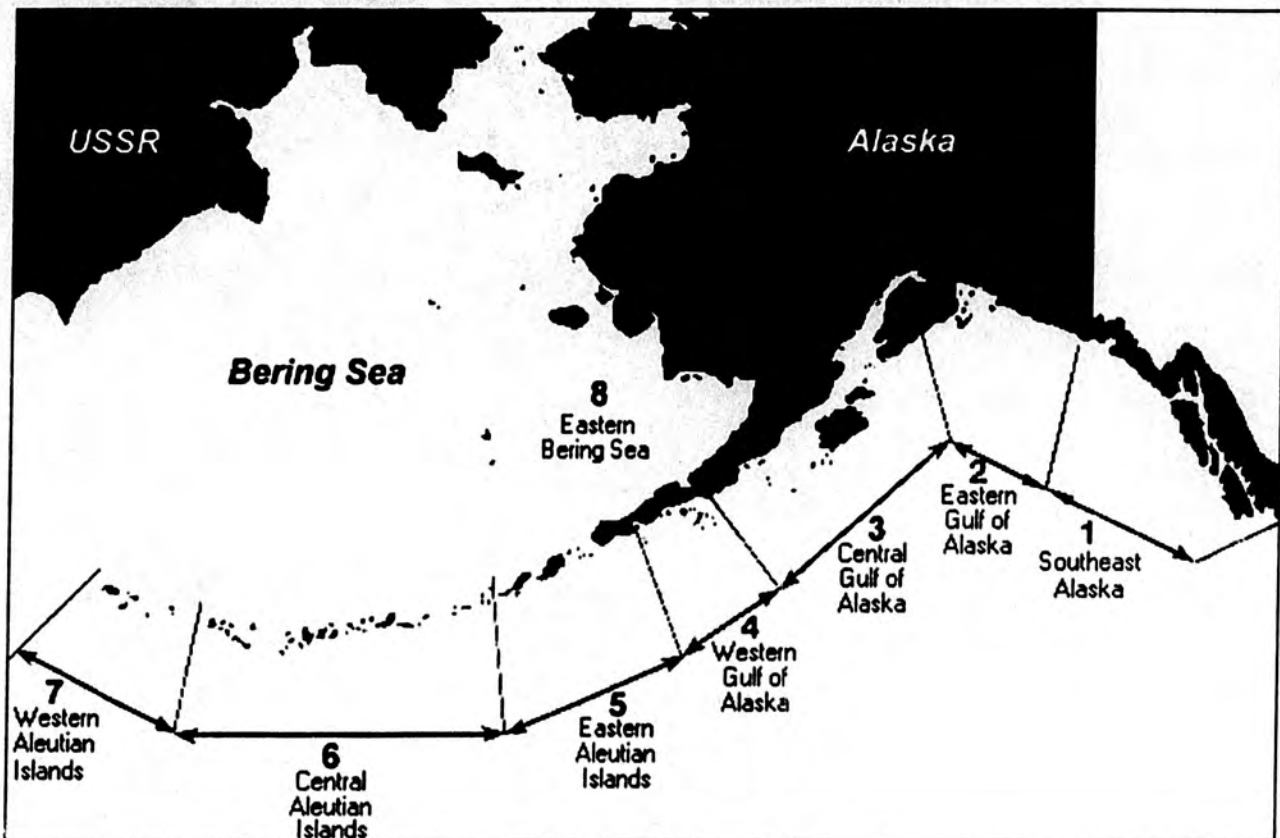
HOW CAN THE ALASKA LEGISLATURE HELP

Everyone I've talked to is pleased that the Alaska House of Representatives are paying attention and are concerned. If nothing else this hearing certainly boosts morale. We would like to see the State of Alaska play a large role in sea lion research. Alaska has wonderful facilities and institutions including the Seward Sea Life Center, the Prince William Sound Science Center, the University of Alaska Fairbanks School of Fisheries and Ocean Sciences and the Institute of Marine Science. and the new Kodiak Fisheries Research Building -- a research facility funded by the community of Kodiak with a lot of help from Senator Ted Stevens.

These facilities have been poorly funded and somewhat ignored. We would like to see all the institutions and facilities form a task force and research plan and the legislature assist with a portion of the funding needed to implement the plan.

Steller Sea Lion Distribution

The Steller sea lion is distributed around the North Pacific Ocean rim from northern Hokkaido, Japan through the Kuril Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea, southern coast of Alaska and south to the Channel Islands, California.



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This page was last modified on Thursday, November 12, 1998.

Location of Sea Lion Rookeries

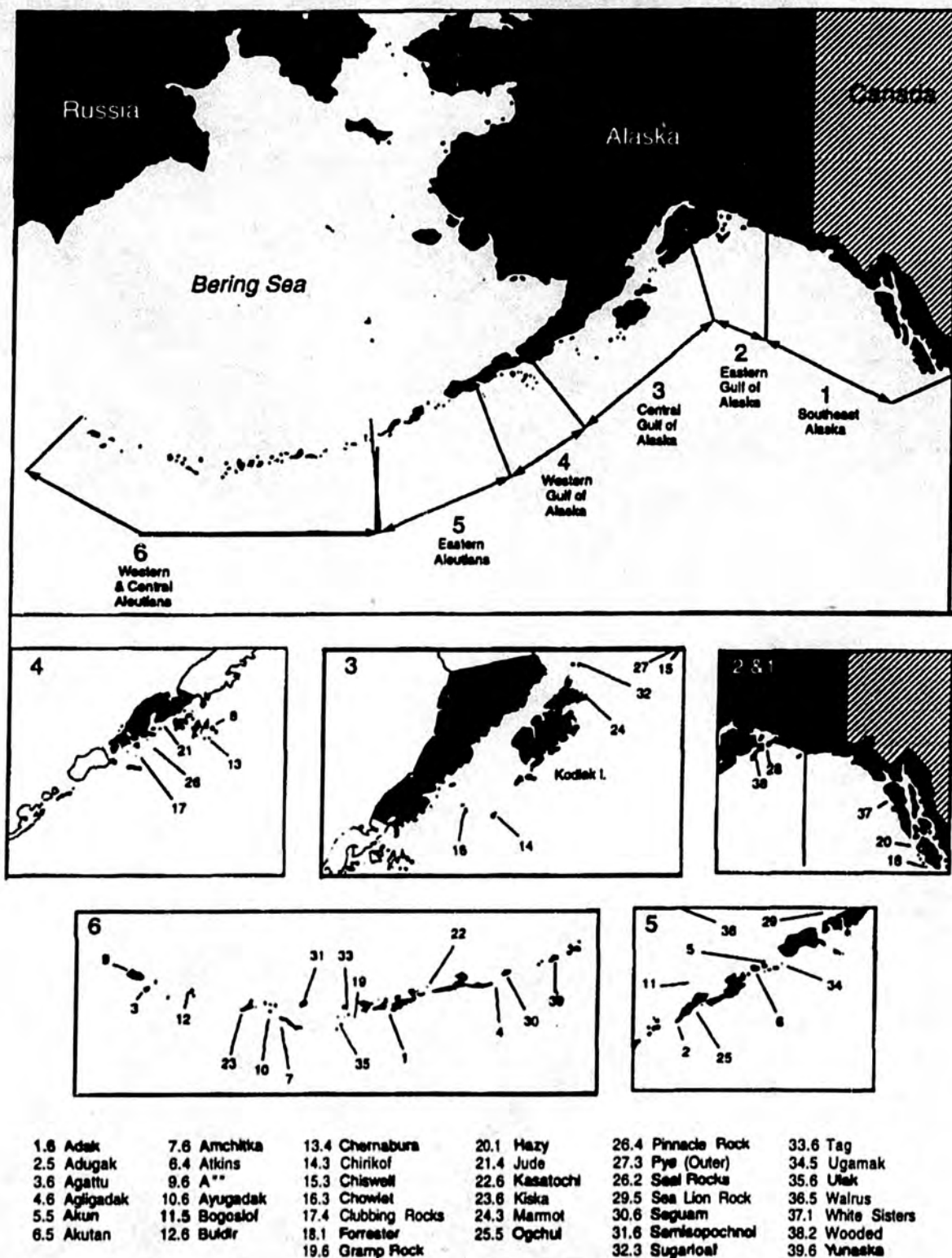


Figure 1. Steller sea lion rookeries in the six study areas of the Gulf of Alaska and Aleutian Islands (adapted from Merrick *et al.*, 1988, and Loughlin *et al.*, 1992). The geographic split between eastern and western stocks is shown by the line separating Areas 1 and 2. Number prefixes of names designate the rookery; suffixes identify the areas in which the rookeries are found.

from Trites, A. and LARKIN, P "Changes in the Abundance of Stellar sea lions in Alaska from 1986 - 1992: how many were there?" 1996.

Steller Sea Lions (*Eumetopias jubatus*): Causes for their Decline and Factors Limiting their Restoration

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October 29, 1998

Introduction

Most researchers believe that food shortages are the most likely cause of the decline of Steller sea lions (ASG 1993 - "Is it Food? Conference"). Poor nutrition caused by a lack of abundance, availability or appropriateness of prey can reduce birth rates and increase mortality through disease, predation and starvation. Major changes in the quantity and quality of Steller sea lion prey appear to have been affected by natural changes in the ecosystem, not by fishing activities. Recent results from ecosystem models of the eastern Bering Sea, comparisons of sea lion diets across time and space, and environmental and biological time series data show the following:

- The composition of the Bering Sea changed from an ecosystem dominated by marine mammals, crabs, shrimp and pelagic fishes (e.g., herring and sandlance) in the 1950s to one now dominated by pollock and large flatfish.
- The diet of Steller sea lions changed between the 1950s and 1990s as their populations declined in the Aleutian Islands and Gulf of Alaska. The change in sea lion diet matches the reported change in prey species available in the Bering Sea and Gulf of Alaska.

- Steller sea lion population declines correlate with diet diversity. The greatest declines of Steller sea lions occurred in areas where sea lions consumed a low diversity of prey. Pollock dominate the diet in the Gulf of Alaska. The increasing Steller sea lion populations in southeast Alaska have the most diverse diet of all regions of Alaska.
- There is no evidence that sea lions are competing with fisheries for pollock. Juveniles, the most vulnerable segment of the Steller sea lion population, eat small immature pollock at shallow depths. In contrast, the fishery takes large mature pollock at deeper depths.
- Captive studies and other empirical evidence suggest that sea lions that eat too much pollock may suffer negative health consequences.
- Recovery of Steller sea lions appears linked to their eating a more diverse diet containing a higher proportion of fattier fishes.
- Environmental data suggest the abundance of key species of North Pacific fish was altered by a climatic regime shift that occurred in the mid to late 1970s. Ecosystem modeling supports this explanation. Regime shifts may occur every 18-60 years and may occur soon again. Such a regime shift is likely to restore the fattier fishes that sea lions seem to thrive upon.
- Pollock is currently an important prey in the Aleutians and Gulf of Alaska only because of its dominance in the ecosystem and the apparent lack of other prey types at this time.
- Juvenile Steller sea lions consume juvenile pollock and presumably benefit from the removal of adult pollock. Reducing the cannibalistic adult stock through fishing should result in more juvenile pollock being available to juvenile Steller sea lions.
- Changing the amount and timing of commercial catches of pollock can have unexpected and undesirable consequences for Steller sea lions. The most precautionary action for Steller sea lions may be to protect the fattier fishes and maintain a status quo on catching adult pollock.

The following provides details of these observations and conclusions. Information is presented on how the diets of Steller sea lions have changed over time as the species composition of the Bering Sea also changed. The survival and reproductive consequences for Steller sea lions of changing their diet from a diverse diet with fatty fishes to one dominated by pollock are discussed. The extent of direct competition between sea lions and fisheries is also examined. The review concludes

by considering measures that might restore Steller sea lions to their former level of abundance.

Changes in Steller Sea Lion Diets

Stomach contents and fecal analysis show that Steller sea lions eat a wide range of species such as walleye pollock, Pacific cod, octopus, squid, salmon, Pacific herring, Pacific sandlance, capelin, flatfish, rockfish and Atka mackerel (NMFS 1992). These analyses further suggest distinct regional differences in the diversity and types of prey currently being consumed. The most notable difference between Steller sea lion populations in the Bering Sea and Gulf of Alaska was the dominance of pollock in the diets of animals breeding in the Aleutian Islands, where the sharpest population declines have occurred. This contrasts with the high diversity of prey consumed in Southeast Alaska, where the population has increased (Lowry *et al.* 1989, Merrick and Calkins 1996, Merrick *et al.* 1997, Trites and Calkins - unpubl. data). Merrick *et al.* (1997) found a significant negative correlation between the diversity of diet and the rate of the Steller sea lion population decline across the Aleutian Islands and Gulf of Alaska ($r = -0.949$). They concluded that the sharpest population declines occurred in areas with the lowest diversity of diet, and that sea lions need a variety of prey.

Dietary information collected for half a century is summarized in Table 1. The occurrence of gadids (mostly walleye pollock) in stomachs and fecal remains (scats) from the declining sea lion population in the Kodiak Island area increased from 32% in 1976-78, to 60% in 1985-86, and 85% in 1990-93 (Merrick *et al.* 1997). Consumption of flatfish (another low fat fish) also increased in the same area from 0% to 13% from 1976-78 to 1990-93. The occurrence of small schooling fatty fishes (pelagics such as herring, sandlance, capelin and smelt) in scat and stomach samples decreased from 61% in 1976-78, to 18% in 1990-93 (Merrick *et al.* 1997). Looking back further in time to the 1950s and early 1960s shows that Steller sea lions consumed few if any pollock or flatfish (Wilke and Kenyon 1952, Mathisen *et al.* 1962, Thorsteinson and Lensint 1962, Tikhomirov 1964, Fiscus and Baines 1966). Instead, stomach contents reveal that the animals were eating a more diverse diet of capelin, sandlance, herring, smelt, rockfishes, greenlings, crabs, and squid (see review by Alverson 1992). It is these species, not pollock, that Steller sea lions were eating while their populations increased to the highest levels recorded in this century (Trites and Larkin 1996).

Seals and sea lions are generally thought to be good at sampling the marine environment. Thus, changes in the diet of seals and sea lions likely indicates the types and relative abundance of prey present. The story they are telling is that the pollock stock (followed by flatfish stocks) increased between the mid 1960s and late 1970s, while stocks of pelagic fishes (herring, sandlance, capelin, etc.) decreased. These conclusions are

consistent with stock assessments conducted by the Soviet Union and the U.S. National Marine Fisheries Service (see Alverson 1992, Trites *et al.* 1998a).

Table 1. Changes in the frequency of occurrence of major prey types in the diets of Steller sea lions in the Gulf of Alaska.

Years	Gadids	Flatfish	Pelagics
1950-60s	few	none	mostly
1976-78	32%	0%	61%
1985-86	60%	5%	20%
1990-93	85%	13%	18%

Except for herring, there were no commercial fisheries on other fatty pelagic fishes such as capelin, sandlance, and smelt. The decline of these pelagic fishes appears to be natural. Their reduction in the ecosystem may be linked to the rise in pollock and large flatfish that now dominate the Bering Sea and Gulf of Alaska.

Results from a recently completed ecosystem model of the Eastern Bering Sea (Figure 1) reflect the change in diversity of prey, which moved from fatty pelagic species to pollock and large flatfish. The model suggests that pollock consumed over 50% of the prey eaten by all mid-trophic level species¹ during the 1980s compared to only 10% during the 1950s (see Trites *et al.* 1998a for details). In contrast, pelagic fishes (such as herring, sandlance and capelin) contributed nearly 50% of the flow of energy at this level in the 1950s. Dominance of the mid-trophic level appears to have switched from pelagic fishes to pollock. At higher trophic levels (see Figure 1), large flatfish contributed over 60% of the total energy flow during the 1980s, compared to the 1950s when there was a more even distribution of consumption among the flatfish, seals, sea lions, and toothed whales.

Large flatfish and adult pollock may be significant competitors of seals and sea lions, given the large overlaps in their diets (38-50%). There are also significant overlaps in the diets of pollock and baleen whales (73-86%). Thus, competition for food with pollock and flatfish may be a factor impeding the recovery of seals and sea lions. Changes in the

¹ Trophic levels are a way of classifying organisms according to their feeding relationships in a food chain. As shown in Figure 1, the first trophic level includes plants, the second herbivores, and so on. Adult and juvenile pollock share the third trophic level with pelagics, small flatfish and jellyfish.

biomass of large flatfish and adult pollock may also influence the abundance of pelagic fishes.

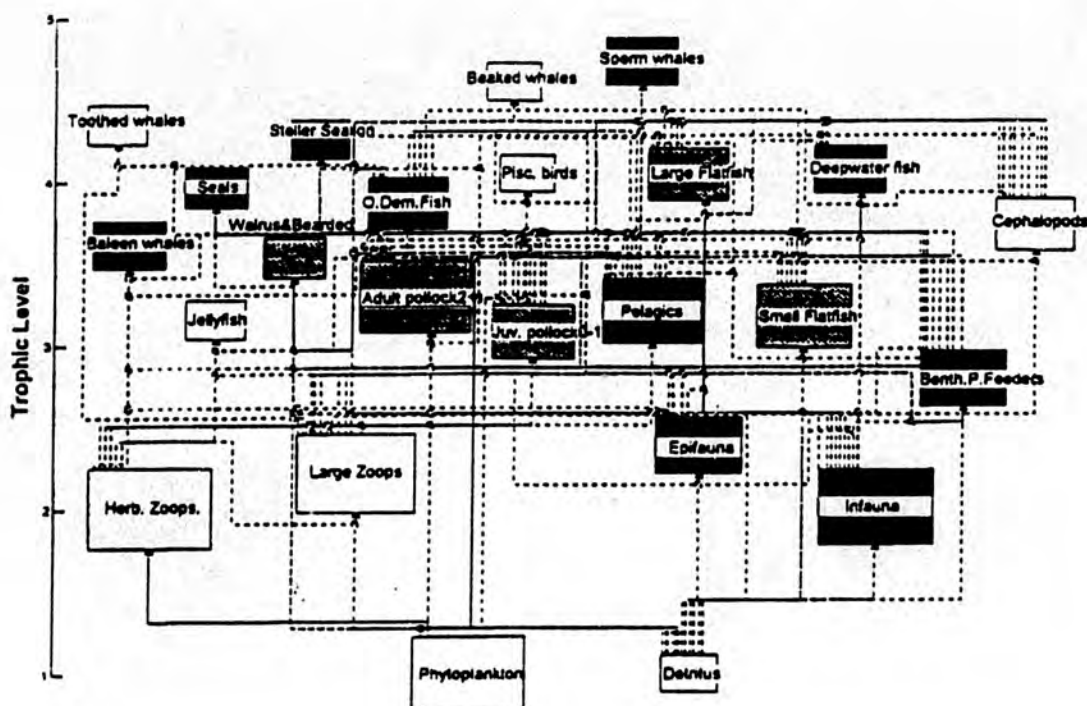


Figure 1. Flowchart of trophic interactions in the eastern Bering Sea during the 1980s. The black boxes indicate which groups declined in abundance between the 1950s and the 1980s, and the gray boxes show which species increased between the two time periods. Connecting lines show the major flows of energy between groups of species. Minor flows were omitted. From Trites *et al.* (1998a).

Competition?

There is no question that pollock is currently the most important prey of Steller sea lions in the Aleutian Islands in terms of numbers consumed. There is also no doubt that the pollock fishery is one of the most important fisheries in Alaska and harvests fish at sustainable levels. What is not clear is whether the fishery and the sea lions are competing in a manner that impedes the recovery of Steller sea lions.

The sizes (length distributions) of pollock eaten by Steller sea lions have been compared to the sizes of fish commercially caught in 1981 and 1985 (Fritz *et al.* 1995). That comparison shows that Steller sea lions consume primarily small pollock (mean size = 27.1 cm) while the fisheries take primarily large pollock (mean size = 33.7 cm). Mean size of all pollock in the population was 29.4 cm.

There is little overlap in the size of fish caught commercially and the size of fish eaten by juvenile sea lions. Greater overlap occurs between fisheries and adult sea lions. Adult sea lions can capture all sizes of pollock (9–56 cm), but seem to prefer the smaller juvenile sizes (Merrick and Calkins 1996). However, juvenile sea lions appear to rarely capture pollock longer than 25 cm and eat relatively more juvenile pollock than adult sea lions (see Figure 3 in Merrick and Calkins 1996). Average sizes eaten in 1985 were 20.8 cm (by juvenile sea lions) and 27.1 cm (by adult sea lions). Thus, the length-frequency data suggest limited competition between fisheries and juvenile sea lions (the segment of the sea lion population thought to be most at risk), but potentially greater competition with adult sea lions.

The fact that there is an overlap in the size of pollock taken by fisheries and adult sea lions does not necessarily mean that the two are competing. Competition occurs if the resource they are seeking is limited. There is no evidence to suggest that sea lions are not getting enough pollock to eat or that pollock stocks have been depleted by fisheries. There are no reports of sea lions stealing pollock from nets because they cannot capture fish on their own. Furthermore, modelling work by Shima (1996) has shown that the abundance of pollock is sufficient to feed the population of Steller sea lions, and that there is no lack of prey (pollock) biomass. This is consistent with the significant increases reported in the abundance of pollock in the Gulf of Alaska between 1984 and 1990 (Fritz *et al.* 1993). During this time, pollock increased and sea lions declined.

It is also significant that commercial fisheries typically capture pollock at depths far deeper than Steller sea lions dive. Samples of fish caught in trawl fisheries show that pollock typically occurred at depths of 50–500 meters (Fritz *et al.* 1998). The frequency of occurrence of pollock was significantly less in trawls pulled at 1–49 meters. Adult Steller sea lions have been observed diving to a median depth of 21 meters in summer and 24 meters in winter (Merrick and Loughlin 1997). This is in sharp contrast to juvenile Steller sea lions that dove to a median depth of 9 meters. The deepest dive recorded for juvenile sea lions was only 72 meters, with 89% of their dives between 4–10 m and 11% at 10–50 m (Merrick and Loughlin 1997). Adult females had 35% of their dives at 4–10 m, 61% at 10–50 m, and 3% at >50 m. The deepest female dive recorded was over 250 m. Thus, these data suggest that juvenile sea lions do not dive as deep as adults, and that fisheries catch fish at deeper depths than sea lions, thereby limiting any potential direct competition between them.

Quantity versus Quality of Prey

Discussions of fisheries and Steller sea lions tend to only emphasise the quantities of individual fish species available to sea lions, or the quantity removed from their ecosystem. Little or no consideration is given to the diversity or quality of prey available.

Pollock appear to be abundant and available to Steller sea lions. However, pollock, the dominant prey being consumed in the areas of sharpest population decline of sea lions, are generally poor in energy and nutritional content. They have about half the energy content of herring (Perez 1994). They also have less usable energy due to the greater difficulty of digesting pollock (Rosen and Trites unpubl. data). The overall quantity of pollock present or removed by fisheries is, by itself, an inappropriate unit for distinguishing impacts of fisheries on Steller sea lions or other marine mammals.

As noted above, fatty fishes have traditionally been the dominant component of the diets of Steller sea lions and other pinnipeds. Fatty fishes provide higher food energy (per unit weight) than pollock or flatfish (Alverson 1992). Differences in energy content would require a Steller seal lion to consume 35–50% more pollock than herring to achieve the same gross energy intake (Rosen and Trites, unpubl. data). Moreover, captive feeding trials with pollock have shown that Steller sea lions lose three ways when they eat pollock and that the sea lions must actually compensate by eating 50–65% more pollock than herring to maintain similar net energy intakes. First, the pollock contain less energy than the herring. Second, the sea lions burn more energy digesting pollock than herring. Third, it costs a sea lion more energy to digest the larger quantity of fish needed to compensate for the lower energy content (Rosen and Trites 1997).

A further complication for Steller sea lions eating pollock, beyond the lower net energy gain they receive, is the possibility that gadid fish, such as pollock, hake or cod, adversely affect the health of pinnipeds if consumed in large amounts (Thompson *et al.* 1998). Anderson (1966) and Geraci (1975) have suggested that the composition of gadids (e.g., amino acids, vitamins and minerals) may lead to health problems in marine mammals, such as iron deficiency. Such abnormal blood chemistries have also been reported in harbor seal populations and are thought to be linked to gadid diets (Thompson *et al.* 1997). Similar phenomena were observed when another mammalian species, mink, were fed gadids (Stout *et al.* 1960). The gadid diet resulted in mink having poor quality fur, low birth rates and high mortality rates.

Questions about the composition of pollock and the nutrition that Steller sea lions can derive from it are under investigation at the Vancouver Aquarium and the University of British Columbia. Tests showed that feeding Steller sea lions (age 0.9 – 4.5 years) only pollock for short periods (9 – 23 days) caused them to lose an average of 0.55 kg per day (Rosen and Trites 1998). The 6 animals under study lost an average of 6.2% of their initial body mass over an average feeding trial of 14.5 days (initial mass averaged 125 kg). The animals were allowed to eat as much pollock as they wanted but did not increase their food intake to compensate for the low energy they were receiving. The sea lions that ate pollock showed progressive metabolic depression (i.e., they lowered their metabolism to survive longer) as they lost body mass and would have presumably eventually reached a steady but sub-optimal body mass on a pollock-only diet. This has serious implications for Steller sea lions that eat primarily pollock in the Aleutians and Gulf of Alaska.

The pollock fed to the Steller sea lions by Rosen and Trites (1998) had an energy density ranging from 4.54–4.72 kilojoules-per-gram (kJ/g). Fadely *et al.* (1994) found pollock with average lengths of 25.4 and 28.6 cm length had similar energy densities of 4.40 and 4.80 kJ/g, respectively. Smith *et al.* (1988) found that ripe, mature male and female pollock (93.6 and 96.2 cm, respectively) had energy densities of 3.68 and 4.03 kJ/g, respectively, while spent adult males and females had an energy density of 3.41 and 3.27 kJ/g. Thus, it would appear from these limited samples that young pollock may contain more energy than the roe bearing adults.

The feeding studies conducted to date, and observations from other species, suggest that a diet dominated by pollock may be unhealthy for Steller sea lions. It suggests that the problem facing Stellers is not that they cannot get enough pollock to eat, but that they may be consuming too much. This is not to say that Steller sea lions should not eat pollock, because it is clearly part of a balanced diet as shown by the range of species, including pollock, that are consumed by the increasing population of Steller sea lions in Southeast Alaska (Trites and Calkins, unpubl. data).

The high proportion of pollock in the diets of Steller sea lions in the Gulf of Alaska and Aleutian Islands suggests that pollock are readily available to them, but that other prey types are not. Unfortunately, eating too much pollock likely stunts growth, increases susceptibility to disease and predation, and raises the likelihood of reproductive failure (e.g., reabsorptions / abortions). Thus, the return of Steller sea lions to higher population levels in the Gulf of Alaska and Bering Sea is probably linked to consuming more fatty fishes and fewer pollock.

Ecosystem Change: What Happened?

Two useful approaches have been taken to glean some insight into the current state of the Gulf of Alaska and Bering Sea. The first constructed an ecosystem model of the eastern Bering Sea, explored how the system differed between the 1950s and 1980s, and considered the mechanisms that might have changed the ecosystem (Trites *et al.* 1998a). The second approach contrasted the Gulf of Alaska ecosystem to three other ecosystems in other parts of the world that supported large trawl fisheries, but also had large pinniped populations (Shima 1996). The goal of that approach was to understand what was different about the Gulf of Alaska.

Trites *et al.* (1998a) used their ecosystem models to test whether commercial whaling was responsible for the build up of pollock stocks (the theory being that pollock are eating the zooplankton and other prey once consumed by baleen whales). They also considered whether changes in the ecosystem were caused by fishing or natural environmental factors (i.e., a regime shift).

The models indicate that removing whales from the Bering Sea would have resulted in more pollock, but nothing near the magnitude of what was observed. Similarly, the model showed that fishing at commercial levels could not change the ecosystem from its 1950s state to its 1980s state. Overall, the simulations were unable to account for changes that occurred between the 1950s and the 1980s through trophic interactions alone (i.e., by manipulating the abundance of predators and prey). Instead, the most likely explanation for the build-up of flatfish and pollock, and the decline of pelagic fishes was environmental change. However, whaling or fisheries (such as for herring) may have intensified the speed and magnitude of the observed changes. Changes in the abundance of key species can in turn affect the abundance of other species in the food web, such as has been recently observed when killer whales began reducing sea otter populations following declines of their major prey – seals and sea lions (Estes *et al.* 1998).

The ecosystem models developed by Trites *et al.* (1998a) are based on the best available data and have been used in a simple and rigorous modeling framework (Ecopath) that has a number of checks and balances to ensure consistency (Christensen and Pauly 1993, 1995, Pauly and Christensen 1996, Walters *et al.* 1997). Thus, sound conclusions can be drawn about some of the general and fundamental properties of the Bering Sea, despite incomplete knowledge of the past and present (Trites *et al.* 1998b). For example, the models imply that the Bering Sea may be relatively resilient and resistant to change over long

periods of time compared to more tropical ecosystems (see Vasconcellos *et al.* 1997). However, the Bering Sea also appears to be a system that is susceptible to dramatic and sudden decadal shifts. The models further suggest that the Bering Sea is a system where the cumulative effects of changes in the abundance of one species on others are sluggish and may be small compared to the magnitude of change that the environment can produce on recruitment or primary production. They also provide a good means of contrasting the striking differences in the abundance of different fish and mammal species present in the 1950s and 1980s.

The second means of gaining insight into the Bering Sea and Gulf of Alaska ecosystems is to compare them to other ecosystems that have significant marine mammal populations and large trawl fisheries. Shima (1996) compared the Gulf of Alaska with three similar ecosystems – the Barents Sea (north of Norway), the California Current (California), and the Benguela Current (off the southwest coast of Africa). Seals are currently abundant in all of these ecosystems except in the Gulf of Alaska. It is also interesting to note that seals are abundant in Atlantic Canada (a system which she did not compare) where cod fish (another gadid) have declined due to over-fishing. Shima found harvest levels of groundfish were at the low end of the scale in the Gulf of Alaska compared to the Barents Sea and Benguela Current. She also found that direct interactions (shootings and entanglements) between Stellers and fishing boats in the Gulf of Alaska were negligible in comparison with the other ecosystems.

The most significant difference Shima found between the ecosystems she compared concerned the diversity of prey eaten by the pinnipeds in each system. Only in the Gulf of Alaska was the diet dominated by a single prey (pollock). Elsewhere, the pinnipeds consumed a variety of prey such as cod, herring and capelin in the Barents Sea. These findings further support the view that diversity of diet and consumption of fatty fishes are central to maintaining large pinniped populations.

Reduced Carrying Capacity

There is mounting evidence that the carrying capacity of Steller sea lions and other pinnipeds in the Bering Sea and Gulf of Alaska is considerably lower today than it was during the 1950s and 1960s. What appears to be limiting the size of their populations is a shortage of fatty pelagic fishes. The biomass of pollock is high but does not appear to be of sufficient quality to support large populations of pinnipeds.

Counts of sea lions at rookeries in the western Gulf of Alaska and eastern Aleutian Islands indicate that the population decline has slowed since

1989, and suggest that the population may be approaching a lower level of carrying capacity (Trites and Larkin 1996). Indications that the carrying capacity of Steller sea lions dropped through the 1980s come from reduced body growth, a drop in birth rates, and an apparent reduction in the survival of young sea lions. These changes are consistent with density dependent responses reported in several pinniped species (see review in Trites 1990). They are also consistent with the sequential changes that Eberhardt (1977) predicted would occur as populations rise and fall. He speculated that behavioral modification (feeding time, aggressive behavior) should be the first population characteristic altered by abundance, followed by individual characteristics (body growth, incidence of diseases and parasites), reproductive effects (birth rates, age of first reproduction), and finally population aspects (survival rates, distribution).

Calkins and Goodwin (1988), Castellini and Calkins (1993) and Calkins *et al.* (1998) concluded that Steller sea lions were physically smaller in the mid 1980s compared to sea lions sampled in the mid 1970s. Their conclusion was further supported by morphometric measurements (body lengths and weights) of sea lions caught in the Gulf of Alaska (Perez and Loughlin 1991). These studies indicate that sea lions may not have obtained adequate nutrition during the 1980s, and give credence to the hypothesis that Steller sea lions are limited by food.

Pregnancy rates, another density dependent response to lower carrying capacity, also dropped as the Steller sea lion population declined. Samples of sexually mature females shot in the 1970s and 1980s were nearly all (97%) pregnant during early gestation (Pitcher *et al.* 1998). However, by late gestation, pregnancy rates had declined due to abortions and re-absorptions. Birth rates were approximately 67% in the 1970s and dropped to 55% in the 1980s. Low pregnancy rates were associated with poor body condition (low weights and thin blubber layers). Pitcher *et al.* (1998) concluded that the drop in pregnancy rates was because the prey base was inadequate to support the Steller sea lion's "energetically expensive reproductive strategy". Steller sea lions presumably need to consume more of the scarcer, fattier pelagic fishes, and less of the abundant but nutritionally poor pollock.

The third significant change that appears to have occurred as the sea lion population declined concerns an increase in the mortality of young sea lions. York (1994) examined the difference in the age structure of the samples of sea lions taken in the 1970s and 1980s. She concluded that the most likely explanation for the change in age was due to a higher mortality of young sea lions during the 1980s compared to the 1970s.

The lowering of Steller sea lion birth and survival rates, and the stunting of body growth, are indicative of a population that is at the limit of the ability of the environment to support it (i.e., at carrying capacity). Steller sea lions are not alone in this regard. Northern fur seals and harbor seals also declined at the same time as Steller sea lions (Pitcher 1990, Trites 1992) and also appear to be at new and lower levels of carrying capacity (Figure 2). Interestingly, all three species declined at roughly the same time (Figure 2) suggesting they are linked by a common factor—the naturally occurring regime shift of the late 1970s (see below).

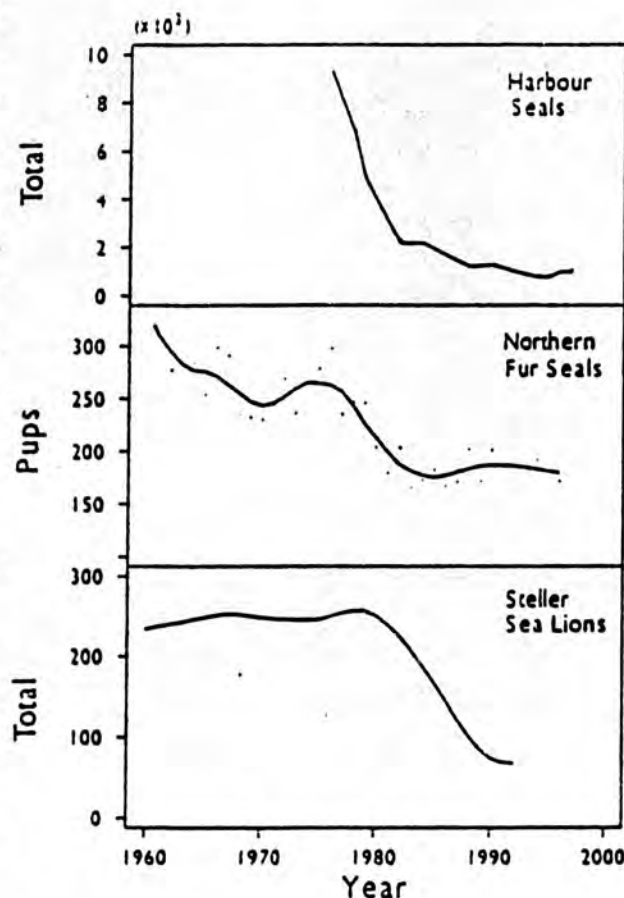


Figure 2. Pinniped population trends in the Gulf of Alaska. Numbers of harbor seals were counted on Tugidak Island by the Alaska Department of Fish and Game. Changes in the size of the western stock of Steller sea lions were estimated by Trites and Larkin (1996) from aerial survey data. Pup counts of northern fur seals are from the St. Paul Island and were estimated by the National Marine Fisheries Service.

Northern fur seals, like Steller sea lions, are showing signs of stunted growth not seen since the 1950s when the population had peaked at twice its current level (Trites 1998). Pollock biomass was low and fatty pelagic fish abundance was high in the 1950s compared to now when pollock dominate and pelagic fishes are relatively scarce. This presumably means that the North Pacific could support more northern fur seals in the 1950s than now. There are also reports from Alaskan native hunters that harbor seals have much thinner blubber layers now than in the past (Monica Riedel, Alaska Harbor Seal Commission, pers. comm.). Other evidence of reduced carrying capacity in the North Pacific comes from the stable isotope studies conducted on the baleen of bowhead whales, and the whiskers, tissues and bones of pinnipeds. (Hirons and Schell 1998a,b; Schell 1998).

The changes observed in Steller sea lions, northern fur seals and harbor seals suggest that the carrying capacity for these species has been

reduced by 50% or more in the Gulf of Alaska and Bering Sea. The timing of these changes corresponds to the mid to late 1970s and has not been related by any researchers to fishing. Instead, the available data have led an increasing number of researchers to conclude that cascading effects have occurred due to a major natural oceanic regime shift (Francis and Hare 1994, NRC 1996, Piatt and Anderson 1996, Springer 1998, Trites 1998, Pitcher *et al.* 1998) based on a long time series of oceanographic and atmospheric data (Kerr 1992, Ebbesmeyer *et al.* 1991, Trenberth and Hurrell 1995, Ware 1995).

In this regard, a variety of evidence, including air and water temperature, atmospheric dust levels, carbon dioxide concentrations, and ice cover suggests that the Gulf of Alaska and Bering Sea experienced a stepwise environmental shift sometime in the late 1970s. This has been referred to as a climatic regime shift. A number of studies (see the recently published review by Francis *et al.* 1998), have related environmental regime shifts to changes in most of the major components of the North Pacific marine ecosystem – primary and secondary producers, forage species and several levels of predators (Brodeur and Ware 1992, Beamish 1993, Polovina *et al.* 1995, Roemmich and McGowan 1995, Brodeur *et al.* 1996; forage species: Hollowed and Wooster 1992, 1995; McFarlane and Beamish 1992, Beamish and Bouillin 1993, Hare and Francis 1995, Wooster and Hollowed 1995 Anderson *et al.* 1997; and predators: Springer 1992, ASG 1993, Piatt and Anderson 1996, Hunt *et al.* 1996, Pitcher *et al.* 1998, Trites 1998).

Springer (1998), in summarizing recent research into regime shifts, notes a "recurring pattern of climate variability over the Pacific Ocean that includes an alternation of the Aleutian low pressure system between two quasi-stable states of intensity and location lasting between about 15-30 years. Transitions between regimes are rapid and are associated with a wide variety of equally rapid physical and biological responses in ecosystems." The strength and position of the Aleutian low may affect ocean properties and circulation, and create conditions that lead to more or less primary and secondary production across a broad region of the North Pacific. Sea surface temperature may also cycle between warmer and cooler conditions every 6-15 years and create another layer of environmental instability. Francis *et al.* (1998) note that "the kind of decadal-scale atmospheric forcing in the North Pacific that we have seen during the 20th century has probably persisted for centuries."

Mitigating the Sea Lion Decline

People would like to do something to reverse the decline of Steller sea lions. One of the means that has been proposed is to reduce the amount of pollock caught by fishermen if that would make more pollock available to Steller sea lions. Another is to alter fishing effort to produce more of the fatty fishes that sea lions seem to thrive on. There are few other options beyond altering or not altering fishing rates and/or the timing and location of fishing. Possible consequences of such actions can be explored with mathematical ecosystem models.

Ecosystem models can be used to consider what might happen to other species, such as sea lions or pelagic fishes, if fishing pressure on pollock was changed. They are tools to ask "What if?" questions. Trites *et al.* (1998a) explored what might happen to the eastern Bering Sea if the amount of pollock caught was changed. They considered how the ecosystem might respond if the proportion of adult pollock taken by fisheries was increased over a range of 10 – 50%. They also considered what might happen if pollock were over-fished to the point that all the juvenile and adult pollock were removed. Finally, they considered how the Bering Sea ecosystem might look if pollock were not caught at all. All simulations were run over 30 years.

The simulation results suggest that increased fishing pressure on pollock would have only a small effect on the future adult pollock biomass due to a continuous replenishment from the juvenile stock. Juvenile pollock benefit from reduced cannibalism (by removing adult pollock). System-wide effects are minimal because the size of the adult pollock stock does not change appreciably. However, the model predicts that seals, sea lions and fish-eating birds would respond favorably to an increase in the abundance of juvenile pollock.

Overfishing pollock to the point of extinction would lead to an increase in the abundance of pelagic (fatty) fishes, but a decline in seabirds consuming juvenile pollock if they did not switch to eating pelagic fishes. However, the model predicts that reducing the biomass of just adult pollock by 50% would have a positive effect on seals, sea lions and fish-eating birds because the abundance of juvenile pollock, which they consume, increases as cannibalism by adult pollock is reduced. It also results in a small increase in pelagic fishes because more zooplankton, previously consumed by pollock, would be available to them. Major system-wide effects are minimal because the adult pollock stock does not change appreciably.

Stopping pollock fishing results in a larger adult population and a smaller juvenile pollock population. Reducing the juvenile pollock

population has a negative effect on seabirds and a small negative effect on marine mammals.

Results from these three simulations highlight how changing fishing could have unexpected and unwanted results for Steller sea lions. It also provides some insight into how important cannibalism by adult pollock on juvenile pollock might be to the dynamics of pollock in areas designated as Steller sea lion critical habitat. The model gives credence to the view that high harvest rates of adult pollock in critical habitat areas should result in more prey being available to Steller sea lions. If depletion of adult pollock occurred, it should reduce cannibalism and increase the abundance of juvenile pollock that sea lions could consume. Attempts to create a better mix of prey species (i.e., more fatty fishes) for Steller sea lions by manipulating trophic interactions in the model through fishing failed to produce significantly more fattier fishes and fewer gadids (Trites *et al.* 1998a). It appears that the most powerful operating force in the Bering Sea is nature, not man.

None of the evidence suggests that the availability of pollock to Steller sea lions is limited, or that adding more pollock to the system will improve things for Steller sea lions. The environmental shift that is thought to be responsible for the high abundance of pollock and large flatfish, and the low abundance of fattier pelagic fishes, may flip in the next few years. If the theories are correct, the species composition will change again in favor of Steller sea lions and other mammals.

Trawling for pollock at greater depths than those used by juvenile sea lions is one means of ensuring minimal competition between the two. Steller sea lions would also presumably benefit by actions that increase the abundance and availability of fattier fishes, such as herring. Ultimately, however, the solution to restoring the numbers of Steller sea lions is probably out of human control.

It is important that people do not make the situation worse by tinkering with things we do not understand. The most precautionary action that we could take might be to maintain the status quo. Moving fisheries in time and space might, for example, lead to high by-catches of herring and other fattier fishes that are more critical to sea lion survival than pollock. It is thus important to consider the other components of the ecosystem and the uncertainty that our actions may produce. As noted by Boyd (1995), management measures have as much chance of being harmful to Steller sea lions as they do of aiding recovery. It is, therefore, important to proceed cautiously.

Conclusions

Hatch, quoted by Francis *et al.* (1998), states that "the principal factor responsible for unfavorable trends in marine birds and pinnipeds in the Gulf of Alaska is availability of suitable food resources. Food limitation, in turn, may be caused by recent climatically driven ecosystem shifts forcing increased production of pelagic and demersal predatory fish (e.g., adult pollock, cod, salmon, and various flatfishes, especially arrow tooth flounder and halibut) at the expense of forage species (capelin, sandlance, juvenile pollock, herring, and myctophids) on which marine bird and mammal species depend." Reviewing the available information concerning Steller sea lions supports this view and provides no indication that Steller sea lions are limited because they cannot get enough pollock to eat. The data indicate the following:

- The composition of major predator and prey populations in the Gulf of Alaska and Bering Sea underwent a rapid change beginning in the mid 1970s.
- The diet of Steller sea lions reflects this change in prey available to them and shows a relationship between high rates of decline and consumption of large amounts of pollock.
- There is no evidence that pollock are in short supply for either fisheries or sea lions, or that the two are competing. Catching adult pollock appears to reduce cannibalism and results in more juvenile pollock being available to Steller sea lions and other top predators.
- There appear to be negative health consequences for Steller sea lions if they eat primarily pollock.
- Recovery of Steller sea lions will probably occur if they can obtain a more diverse diet of fattier fishes. This appears to be a function of natural changes in the marine environment and not something that can be controlled by humans.
- Changes that people can invoke by altering amounts of pollock caught in time and space can have unexpected and undesirable results.

Literature Cited

- ASG [Alaska Sea Grant]. 1993. Is it food?: Addressing marine mammal and sea bird declines. Workshop Summary, Alaska Sea Grant Report 93-01, University of Alaska Fairbanks, Fairbanks, AK.
- Alverson, D.L. 1992. Commercial fisheries and the Steller sea lion (*Eumetopias jubatus*): the conflict arena. *Rev. Aquat. Sci.* 6:203-256.
- Anderson, P.J., J.E. Blackburn, and B.A. Johnson. 1997. Declines of forage species in the Gulf of Alaska, 1972-1995, as an indicator of regime shift. In *Forage fishes in marine ecosystems*. Alaska Sea Grant, University of Alaska Fairbanks, Fairbanks, AK, pp. 531-543.
- Anderson, S. 1966. The physiological range of the formed elements in the peripheral blood of the harbour porpoise, *Phocoena phocoena* (L) in captivity. *Nord. Veterinarmed.* 18: 51-65.
- Beamish, R.J. 1993. Climate and exceptional fish production off the west coast of North America. *Can. J. Fish. Aquat. Sci.* 50: 2270-2291.
- Beamish, R.J. and Bouillin, D.R. 1993. Pacific salmon production trends in relation to climate. *Can. J. Fish. Aquat. Sci.* 50: 1002-1016.
- Boyd, I.L. 1995. Steller sea lion research - A report prepared for the U.S. National Marine Fisheries Service, National Marine Mammal Laboratory, Seattle.
- Brodeur, R.D. and D.M. Ware. 1992. Long-term variability in zooplankton biomass in the subarctic Pacific Ocean. *Fish. Oceanogr.* 1: 32-38.
- Brodeur, R.D., B.W. Frost, S.R. Hare, R.C. Francis, and W.J. Ingraham Jr. 1996. Interannual variations in zooplankton biomass in the Gulf of Alaska, and covariation with California current zooplankton biomass. *California Cooperative Oceanic Fisheries Investigations Reports*. 37: 80-99.
- Calkins, D.G. and E. Goodwin. 1988. Investigation of the declining sea lion population in the Gulf of Alaska. Unpubl. Rep., Alaska Dep. Fish and Game, 333 Raspberry Road, Anchorage, AK 99518. 76 pp.
- Calkins, D.G., D.C. McAllister, K.W. Pitcher, and G.W. Pendleton. 1998. Steller sea lion status and trend in Southeast Alaska: 1979-1997. *Marine Mammal Science*. *in press*.
- Castellini, M.A., and D.G. Calkins. 1993. Mass estimates using body morphology in Steller sea lions. *Marine Mammal Science* 9: 48-54.
- Christensen, V. and D. Pauly (Editors). 1993. Trophic models of aquatic ecosystems. *ICLARM Conference Proceedings No. 26*, 390 p.
- Christensen, V. and D. Pauly. 1995. Fish production, catches and the carrying capacity of the world oceans. *Naga, the ICLARM Quarterly* 18(3):34-40.
- Ebbesmeyer, C.C., D.R. Cayan, D.R. McLean, F.H. Nichols, D.H. Peterson, and K.T. Redmond. 1991. 1976 step in the Pacific climate: forty environmental changes between 1968-1975 and 1977-1984. P. 115-126. In J.L. Betancout and V.L. Tharp (eds.). *Proc. Seventh Annual Pacific Climate*

- (PACLIM) Workshop, April 19980. Edited by Calif. Dep. Water Resour. Interagency Ecol. Stu. Program Tech. Rep. No. 26.
- Eberhardt, L.L. 1977. "Optimal" management policies for marine mammals. Wild. Soc. Bull. 5: 425-428.
- Estes, J.A., M. T. Tinker, T. M. Williams, and D. F. Doak. 1998. Killer whale predation on sea otters linking oceanic and nearshore ecosystems Science 282: 473-476.
- Fadely, B. S., Zeligs, J. A., and Costa, D. P. 1994. Assimilation efficiencies and maintenance requirements of California sea lions (*Zalophus californianus*) fed Walleye pollock (*Theragra chalcogramma*) and herring (*Clupea harengus*). National Marine Mammal Laboratory, National Marine Fisheries Service, Final report
- Fiscus, C.H., and G.A. Baines. 1966. Food and feeding behavior of Steller and California sea lions. J. Mammal. 47:195-200.
- Francis, R.C., and S.R. Hare. 1994. Decadal-scale regime shifts in the large marine ecosystems of the Northeast Pacific: A case for historical science. Fisher. Oceanog. 3: 279-291.
- Francis, R.C., and S.R. Hare, A.B. Hollowed, and W.S. Wooster. 1998. Effects of interdecadal climate variability on the oceanic ecosystems of the NE Pacific. Fish. Oceanogr. 7: 1-21.
- Fritz, L.W., V.G. Wespestad, and J.S. Collie. 1993. Distribution and abundance trends of forage fishes in the Bering Sea and Gulf of Alaska. Pp. 30-43. In Is it food?: addressing marine mammal and sea bird declines. Workshop Summary, Alaska Sea Grant Report 93-01, University of Alaska Fairbanks, Fairbanks, AK.
- Fritz, L.W., R.C. Ferrero, and R.J. Berg. 1995. The threatened status of Steller sea lions, *Eumetopias jubatus*, under the Endangered Species Act: effects on Alaska groundfish fisheries management. Marine Fisheries Review 57: 14-27.
- Fritz, L.W., A. Greig, and R.F. Reuter. 1998. Catch-per-unit-effort, length, and depth distributions of major groundfish and bycatch species in the Bering Sea, Aleutian Islands, and Gulf of Alaska regions based on groundfish fishery observer data. NOAA Tech. Memo. NMFS-AFSC-988.
- Geraci, J. R. 1975. Pinniped nutrition. Rapports et Proces-verbaux des Reunion Conseil International pour l'Exploration de la Mer. 165: 312-323.
- Hare, S.R. and R.C. Francis 1995. Climate change and salmon production in the northeast Pacific Ocean. In Climate Changes and Northern Fish Populations. R.J. Beamish (ed.). Can. Spec. Publ. Fish. Aquat. Sci. 121: 357-372.
- Hirons, A.C., and D.M. Schell. 1998a. A 47-year record of isotope ratios in North Pacific pinnipeds: evidence of environmental change. World Marine Mammal Science Conference, Monaco (January 20-24, 1998). [abstract]. p. 64.

- Hirons A. C. and D. M. Schell. 1998b. Temporal variation in the $\delta^{13}C$ of North Pacific pinnipeds: indication of environmental change? pp 55-64 in *Testing Conceptual Models of Marine Mammal Trophic Dynamics Using Carbon and Nitrogen Stable Isotope Ratios*. Final Report to the University of Alaska Coastal Marine Institute, OCS Study MMS 98-0031. Available from the U.S. Minerals Management Service, 949 E. 36th Ave, Anchorage AK 99508-4363.
- Hollowed, A.B. and W.S. Wooster. 1992. Variability of winter ocean conditions and strong year classes of Northeast Pacific groundfish. *ICES Mar. Sci. Symp.* 195: 433-444.
- Hollowed, A.B. and W.S. Wooster. 1995. Decadal-scale variations in the eastern Subarctic Pacific: 2. Response of northeast Pacific fish stocks. In *Climate Changes and Northern Fish Populations*. R.J. Beamish (ed.). *Can. Spec. Publ. Fish. Aquat. Sci.* 121: 373-385.
- Hunt, G.L., M.B. Decker, and A. Kitaysky. 1996. Fluctuations in the Bering Sea ecosystem as reflected in the reproductive ecology and diets of kittiwakes on the Pribilof Islands, 1975 to 1990. In *Aquatic Predators and their Prey*. S.P.R. Greenstreet and M.L. Tasker (eds). Oxford: Fishing News Books.
- Kerr, R.A. 1992. Unmasking a shifty climate system. *Science* 255: 1508-1510.
- Lowry, L.F., K.J. Frost, and T.R. Loughlin. 1989. Importance of walleye pollock in the diets of marine mammals in the Gulf of Alaska and Bering Sea and implications for fishery management. *Proc. Int. Symp. Biology and Management of Walleye Pollock*.
- McFarlane, G.A., and R.J. Beamish. 1992. Climatic influence linking copepod production with strong year-classes in sablefish, *Anoplopoma fimbria*. *Can. J. Fish. Aquat. Sci.* 49: 743-753.
- Mathisen, O.A., R.T. Baade, and R.J. Lopp. 1962. Breeding habits, growth, and stomach contents of the Steller sea lion in Alaska. *J. Mammal.* 43:464-477.
- Merrick, R., P. Gearin, S. Osmek, and D. Withrow. 1988. Field studies of northern sea lions at Ugamak Island, Alaska during the 1985 and 1986 breeding seasons. NOAA Tech. Memo. NMFS F/NWC-143.
- Merrick, R.L., and T.R. Loughlin 1997. Foraging behavior of adult female and young-of-the-year Steller sea lions in Alaskan waters. *Can. J. Zool.* 75: 776-786.
- Merrick, R.L. and D.G. Calkins. 1996. Importance of juvenile walleye pollock in the diet of Gulf of Alaska Steller sea lions. In *Ecology of juvenile walleye pollock (Theragra chalcogramma)*. Edited by R.D. Brodeur, P.A. Livingston, R.R. Loughlin, and A.B. Hollowed. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 126.
- Merrick, R.L., T.R. Loughlin, and D.G. Calkins. 1987. Decline in abundance of the northern sea lion, *Eumetopias jubatus*, in Alaska, 1956-86. *Fish. Bull.*, U.S. 85:351-365.
- Merrick, R.L., M.K. Chumbley, and G.V. Byrd. 1997. Diet diversity of Steller sea lions (*Eumetopias jubatus*) and their population decline in Alaska: a

- potential relationship. Canadian Journal of Fisheries and Aquatic Science 54: 1342-1348.
- NMFS [National Marine Fisheries Service]. 1992. Recovery Plan for the Steller sea lion (*Eumetopias jubatus*). NMFS, 120 pp.
- NRC [National Research Council]. 1996. The Bering Sea ecosystem. National Academy Press, Washington DC.
- Pauly, D. and V. Christensen (Editors). 1996. Mass-Balance Models of North-Eastern Pacific Ecosystems. Fisheries Centre Research Reports 4(1), 131 p.
- Perez, M.A. 1994. Calorimetry measurements of energy value of some Alaskan fishes and squids. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-32, 32 p.
- Perez, M.A. and T.R. Loughlin. 1991. Incidental catch of marine mammals by foreign and joint venture trawl vessels in the U.S. EEZ of the north Pacific, 1973-88. U.S. Dept. Comm., NOAA Tech. Rep. NMFS 104, 57 pp.
- Piatt, J.F., and P. Anderson. 1996. Responses of common murrelets to the Exxon Valdez oil spill and long-term changes in the Gulf of Alaska marine ecosystem. Am. Fish. Soc. Symp. 18: 720-737.
- Pitcher, K.W. 1990. Major decline in number of harbor seals, *Phoca vitulina richardsi*, on Tugidak Island, Gulf of Alaska. Mar. Mamm. Sci. 6: 121-134.
- Pitcher, K.W., D.G. Calkins and G. Pendleton. 1998. Reproductive performance of female Steller sea lions: an energetics-based reproductive strategy? Canadian Journal of Zoology. *in press*.
- Polovina, J.J., G.T. Mitchum, and G.T. Evans. 1995. Decadal and basin-scale variation in mixed layer depth and the impact on biological production in the Central and North Pacific, 1960-88. Deep-Sea Res. 42: 1701-1716.
- Roemmich, D. and J.A. McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267: 1324-1326.
- Rosen, D. A. S., and Trites, A. W. 1997. Heat increment of feeding in Steller sea lions, *Eumetopias jubatus*. Comp. Biochem. Physiol. 118A: 877-881.
- Rosen, D. A. S., and Trites, A. W. 1998. Scope of metabolic depression in Steller sea lions, *Eumetopias jubatus*. World Marine Mammal Science Conference, Monaco (January 20-24, 1998). [abstract]. p. 117.
- Schell, D. M. 1998. Isotope ratio evidence of declining primary productivity in the Bering Sea. pp.65-71. *in* Testing Conceptual Models of Marine Mammal Trophic Dynamics Using Carbon and Nitrogen Stable Isotope Ratios. Final Report to the University of Alaska Coastal Marine Institute, OCS Study MMS 98-0031. Available from the U.S. Minerals Management Service, 949 E. 36th Ave, Anchorage AK 99508-4363.
- Shima, M. 1996. A study of the interaction between walleye pollock and Steller sea lions in the Gulf of Alaska. Ph.D. thesis, University of Washington, Seattle, WA, 196 pp.

- Smith, R. L., Paul, A. J., and Paul, J. M. 1988. Aspects of energetics of adult walleye pollock, *Theragra chalcogramma* (Pallas), from Alaska. *J. Fish. Biol.* **33**: 445-454.
- Springer, A.M. 1992. A review: Walleye pollock in the North Pacific -- how much difference do they really make? *Fisher. Oceanog.* **1**:80-96.
- Springer, A.M. 1998. Is it all climate change? Why marine bird and mammal populations fluctuate in the North Pacific. *In* Biotic impacts of extra tropical climate change in the Pacific. 'Aha Huliko'a proceedings, University of Hawaii. *In press*.
- Stout, F. M., J.E. Oldfield, and J. Adair. 1960. Nature and cause of the "cotton fur" abnormality in mink. *J. Nutr.* **70**: 421-426.
- Thompson, P.M., D.J. Tollit, H.M. Corpe, R.J. Reid and H.M. Ross. 1998. Fish induced anemia in Scottish harbour seals; a clue to declines in Bering Sea pinniped and seabird populations? World Marine Mammal Science Conference, Monaco (January 20-24, 1998). [abstract]. p. 133.
- Thompson, P.M., D.J. Tollit, H.M. Corpe, R.J. Reid and H.M. Ross. 1997. Changes in haematological parameters in relation to prey switching in a wild population of harbour seals. *Functional Ecology* **11**: 743-750.
- Thornsteinson, F.V. and C.J. Lensint. 1962. Biological observations of Steller sea lions taken during an experimental harvest. *J. Wild. Manage.* **26**:353-359.
- Tikhomirov, E.A. 1964. Distribution and biology of pinnipeds in the Bering Sea. From materials of first expedition in Soviet Investigations in the Northeast Pacific, Part III. U.S. Dept. Interior. Translation 1968.
- Trenberth, K.E., and J.W. Hurrell. 1995. Decadal coupled atmospheric ocean variation in the North Pacific Ocean. *in*. Climate changes in northern fish populations. *edited by* R.J. Beamish. Canadian Special Publication Fisheries and Aquatic Science **121**: 15-24.
- Trites, A.W. 1990. The northern fur seal: biological relationships, ecological patterns and population management. Ph.D. thesis, University of British Columbia, Vancouver Canada. 330 pp.
- Trites, A.W. 1992. Northern fur seals: Why have they declined? *Aquat. Mamm.* **18**:3-18.
- Trites, A.W. 1998. Northern fur seals: changes in body length and carrying capacity in the Bering Sea and Gulf of Alaska. World Marine Mammal Science Conference, Monaco (January 20-24, 1998). [abstract]. p. 136.
- Trites, A.W., and P.A. Larkin. 1996. Changes in the abundance of Steller sea lions (*Eumetopias jubatus*) in Alaska from 1956 to 1992: how many were there? *Aquat Mamm.* **22**:153-166.
- Trites, A.W., P. Livingston, M.C. Vasconcellos, S. Mackinson, A.M. Springer, and D. Pauly. 1998a. Ecosystem change and the decline of marine mammals in the Eastern Bering Sea: testing the ecosystem shift and commercial whaling hypotheses. Fisheries Centre Report. Under review.

- Trites, A.W., P. Livingston, M.C. Vasconcellos, S. Mackinson, A.M. Springer, and D. Pauly. 1998b. Ecosystem considerations and the limitations of ecosystem models in fisheries management: Insights from the Bering Sea. Proceedings of the Lowell Wakefield Symposium: Ecosystem Considerations in Fisheries Management. (submitted October 1998).
- Vasconcellos, M., S. Mackinson, K. Sloman and D. Pauly. 1997. The stability of trophic mass-balance models of marine ecosystems: a comparative analysis. *Ecological Modelling* 100:125-134.
- Walters, C. V. Christensen and D. Pauly. 1997. Structuring dynamic models of exploited ecosystems from trophic mass-balance assessments. *Rev. Fish Biol. Fish.* 7:139-172.
- Ware, D.M. 1995. A century and a half of change in the climate of the NE Pacific. *Fisher. Oceanog.* 4: 267-277.
- Wooster, W.S., and A.B. Hollowed 1995. Decadal-scale variations in the eastern subarctic Pacific. 1. Winter ocean conditions. *In* *Climate Changes and Northern Fish Populations*. R.J. Beamish (ed.). Can. Spec. Publ. Fish. Aquat. Sci. 121: 81-85.
- Wilke, F. and K.W. Kenyon. 1952. Notes on the food of fur seals, sea lions and harbor porpoises. *J. Wildlife Management* 16: 396-397.
- York, A.E. 1994. The population dynamics of northern sea lions, 1975-85. *Mar. Mamm. Sci.* 10:38-51.