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County of Santa Cruz

PLANNING DEPARTMENT

701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060

(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123

ALVIN D. JAMES, DIRECTOR

November 23, 1999

AGENDA: December 7, 1999

Board of Supervisors
County of Santa Cruz
701 Ocean Street
Santa Cruz, CA 95060

RESOLUTION REQUESTING DELETION OF CALIFORNIA SEA LIONS AND PACIFIC HARBOR SEALS FROM THE MARINE MAMMAL PROTECTION ACT

Members of the Board:

The Santa Cruz County Fish and Game Advisory Commission (Commission) has long been concerned with the increase in the populations of California sea lions and Pacific harbor seals. This concern stems from the many interactions between the human fishing population and these species on the Monterey Bay, and concerns that these species may be retarding the recovery of local "threatened" or "endangered" fish stocks (steelhead and coho salmon). On October 7, 1999 the Commission voted unanimously to approve the draft resolution and recommend its adoption by your Board. The Commission also directed staff to include supporting studies and information, copies of which are on file at the Clerk of the Board.

The Commission has been concerned with sea mammal/fisheries interactions for the past seven years and has discussed the issue at many Commission meetings, The Commission advised the Board of their concern in a letter of 12/01/94 (Attachment 2). The Commission has also been active in advocating the study of the issue, as evidenced by the recommendation to your Board to partially fund a study being done by the Moss Landing Marine Laboratories (Attachment 4) that will assess the various interactions and conflicts between sea lions/seals and humans. Your Board has authorized three grants totaling $14,000 for this study.

In February 1999, the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and the National Marine Fisheries Service completed their Report to Congress: "Impacts of California Sea Lions and Pacific Harbor Seals on Salmonids and West Coast Ecosystems" (Report to Congress, Attachment 3). The Report to Congress concludes that:

~ populations of California Sea Lions and Pacific harbor seals are "abundant, increasing, and widely distributed on the West Coast"

~ "many salmonid populations, which are declining due to a host of factors, are being preyed upon by pinnipeds."

~ conflicts exist with commercial and recreational fishing, including damage to docks and boats, human safety issues

The Report concluded that "because pinnipeds are protected under the Marine Mammal Protection Act, State resource management agencies are unable to resolve many otherwise routine wildlife problems that involve pinnipeds."

The recommendations of the Report to Congress include:

~ site-specific management of California sea lions and Pacific harbor seals, including lethal take under specific situations, such as those involving predation on 'listed' salmonids

~ the development of safe, effective non-lethal deterrents

~ selective reinstatement of the authority for lethal take by commercial fishers to protect gear and catch

~ further studies to better evaluate and monitor impacts on fisheries and coastal ecosystems, including river specific studies of salmonid populations and pinniped predation and socioeconomic impacts of pinniped predation on various commercial and recreational fisheries

In addition to requesting the Board's support for the recommendations of the Report to Congress, the Santa Cruz County Fish and Game Advisory Commission also recommends that your Board support the deletion of California sea lions and Pacific harbor seals from the Marine Mammal Protection Act, as one means to assist the recovery of the coho salmon and steelhead fishery.

It is, therefore, RECOMMENDED that your Board consider adoption of the attached Resolution, as recommended by the Fish and Game Advisory Commission.

Sincerely,

ALVIN D. JAMES
Planning Director

RECOMMENDED:

SUSAN A. MAURIELLO
County Administrative Officer

Attachments: 1. Resolution Requesting Deletion of California Sea Lions and Pacific Harbor Seals From the Marine Mammal Protection Act.

2. Letter to the Board of Supervisors from the Fish and Game Advisory Commission dated

3. Report to Congress: Impacts of California Sea Lions and Pacific Harbor Seals on Salmonids and West Coast Ecosystems, February 10, 1999.

4. Report by Moss Landing Marine Laboratories: Food Habits of California Sea Lions and Their Impact On Salmonid Fisheries in Monterey Bay, California, February 1999.

5. Agenda and Minutes of 10/7/99 Fish and Game Advisory Commission Meeting.

(the following attachments are on file with the Clerk of the Board)

6. Prevalence of Marine-Mammal Tooth Claw Abrasions on Adult Anadromous Salmonids Returning to the Snake River, North American Journal of Fisheries Management, August 1994.

7. Review and Evaluation of Pinniped Predation on Salmonids In the Columbia River Basin, National Marine Fisheries Service, June 1993.

8. Impact of Sea Lions and Seals on Pacific Coast Salmonids, NOAA-NWFSC Tech Memo-28

9. San Jose Mercury News, March 29, 1997.

10. Pinniped Populations, Eastern North Pacific: Status, Trends and Issues, A Symposium of the American Fisheries Society 127th Annual Meeting, August 28, 1997.

11. Monterey Bay Salmon and Trout Project 1994-1995 Coho Surveys.

12. Pros and Cons of Pinniped Management Along the North American Coast to Abet Fish Stocks, NOAA, NMFS, 1992.

cc: Santa Cruz Fish and Game Advisory Commission

ATTACHMENT 1

0536

BEFORE THE BOARD OF SUPERVISORS
OF THE COUNTY OF SANTA CRUZ, STATE OF CALIFORNIA

RESOLUTION NO. _____

On the Motion of Supervisor
Seconded by Supervisor
The following resolution is adopted

RESOLUTION REQUESTING DELETION OF
CALIFORNIA SEA LIONS AND PACIFIC HARBOR SEALS
FROM THE MARINE MAMMAL PROTECTION ACT

WHEREAS, the Santa Cruz County Fish and Game Advisory Commission is a public commission authorized by the State of California and created by the Board of Supervisors to make recommendations regarding the conservation and propagation of fish and wildlife, consistent with the regulations of the California Department of Fish and Game, and to advise the Board of Supervisors on any matters pertaining to fish and game in the County; and

WHEREAS, Santa Cruz County includes the northern half of Monterey Bay, which is important for salmon fisheries including commercial and sport fishing, tourism and various related activities such as seafood restaurants, seafood sales and seafood processing; and

WHEREAS, there has been tremendous increase in the number of California sea lions and Pacific harbor seals in the Monterey Bay and the State of California over the past 10 years, with their numbers increasing from 80,000 animals to over 250,000 animals; and

WHEREAS, there have been extensive studies done by the Moss Landing Marine Lab and the National Marine Fisheries Service, and as a result of over sixteen public meetings from the period of 1992 through the present of the Santa Cruz County Fish and Game Advisory Commission, extensive interaction between California sea lions and Pacific harbor seals has been documented; and

WHEREAS, the marine mammals have contributed to the reduction in the number of salmon and are responsible for a large percentage of salmon that are hooked by both commercial and sport fisherman being lost, and documentation has substantiated over 60% of the catch being taken by marine mammals; and

WHEREAS, additional studies within streams and rivers of Santa Cruz County, supported by photographic evidence, have revealed a large number of returning steelhead and salmon bear injuries and scars from marine mammals, constituting approximately 30% to 60% of total fish surveyed from 1994 to 1998, depending on the conditions of the various streams and rivers surveyed; and

WHEREAS, the Santa Cruz County Fish and Game Advisory Commission has considered

the Report to Congress on the Impacts of California Sea Lions and Pacific Harbor Seals on Salmonids and West Coast Ecosystems (herein referred to as "the Report"), and supports the conclusions and recommendations of the Report; and

WHEREAS, the Santa Cruz County Fish and Game Advisory Commission recommends that the Board of Supervisors consider the Report and the Commission's recommendation to implement the conclusions and recommendations of the Report, including the removal of California sea lions and Pacific harbor seals from the protection of the Marine Mammal Protection Act.

NOW, THEREFORE, BE IT RESOLVED THAT the Santa Cruz County Board of Supervisors requests additional studies by the National Marine Fisheries Service and the California Department of Fish and Game on the interaction and effect of California sea lions and Pacific harbor seals on the continued decline of salmonids in the State of California; and

BE IT FURTHER RESOLVED THAT the Santa Cruz County Board of Supervisors concurs with the conclusions and endorses the recommendations of the Report to Congress, as recommended by the Santa Cruz County Fish and Game Advisory Commission, and further, requests the deletion of California sea lions and Pacific harbor seals from the protection of the Marine Mammal Protection Act.

PASSED AND ADOPTED by the Board of Supervisors of the County of Santa Cruz, State of California, this _____ day of _____ 1999, by the following vote:

AYES: SUPERVISORS
NOES: SUPERVISORS
ABSENT: SUPERVISORS
ABSTAIN: SUPERVISORS

ATTEST: _____
Clerk of the Board

_____
Chairperson of the Board

APPROVED AS TO FORM:

_____
County Counsel

cc: Fish and Game Advisory Commission
County Counsel
Planning Department

COUNTY OF SANTA CRUZ, CALIFORNIA

ATTACHMENT 2

FISH & GAME ADVISORY COMMISSION SANTA CRUZ, CALIFORNIA 95064 0538

December 1, 1994

Santa Cruz County Board of Supervisors
Santa Cruz County Governmental Center
701 Ocean Street
Santa Cruz, CA 95060

Dear Supervisors:

Re: Negative Impact of Marine Mammals on Monterey Bay Coho Salmon

Over three years ago (199 1), the Santa Cruz County Fish & Game Advisory Commission was alerted to the alarming decline of native salmon runs in county waterways, and more specifically in Scott and Waddell Creeks. After considerable study, public hearings and the assembly of myriad evidences, the Commission proposed to the State Fish & Game Commission the listing of coho salmon in Scott and Waddell Creeks as threatened and endangered.[1] In turn, the State Commission identified that salmon species as a candidate for such listing and further investigation by the State Department of Fish & Game is now underway. Though the salmon runs in Santa Cruz County are now a fraction of what they historically have been, only minor in-stream problems (e.g. erosion, siltation) have been identified in Scott and Waddell Creeks. On the other hand, sandbar barriers in the mouths of those waterways could be found during critical times of the year. In general, these watersheds represent undisturbed (undeveloped) habitat. At the same time, however, it has become very apparent that there is an ever increasing impact of the Monterey Bay pinniped (sea lion, harbor seal) population on the surviving salmon. A growing percentage of returning fish to Scott and Waddell Creeks display marine mammal bite marks; ever more commerical and sports fishermen report an increasing number of salmon taken from their lines by marauding sea lions; and the population of pinnipeds, especially that of sea lions, is noticeably growing from year to year. The County Fish & Game Advisory Commission feels that sufficient information and evidence have now been accumulated to warrant an interim report to the Board of Supervisors on what appears to be a signifcant factor limiting the recovery of native salmon runs in Santa Cruz County waterways.

[1] Much of the evidence was gathered and presented by Commissioner Dennis Murphy, who worked long and hard detailing the growth of our marine mammal populations and the impact that increase is having on the recovery of the Monterey Bay salmonid stocks.

Our survey of Monterey Bay marine mammal (pinnipeds) studies has revealed that over the 0539 past 47 years the California populations of these animals have increased over fifty-fold, from 4,000 animals in 1947 to over 200,000 in 1994; sea lions alone have increased over forty-fold (from 3,500 to 150,000) and harbor seals some 100-fold (from 500 to 50,000)![2] At the same time, due to Federal control of all marine mammal populations in United States territorial waters, there is no scientifically based management plan for marine mammals, including sea lions and harbor seals, in place. Furthermore, in the recent (1994) reauthorization of the Marine Mammal Protection Act, Congress saw fit to exclude California from any Federal funding to support the study of marine mammals and their impact on the recovery of salmonid species; in contrast, Washington and Oregon received such funding.

The Commission is persuaded that there is no biological reason to prohibit the management and limitation of marine mammal populations, including hunting them. Local indigenous peoples certainly hunted them over the course of several thousand years, and in some coastal areas marine mammals apparently constituted a major portion of the animal protein consumed by them. The disappearance of the indigenous peoples, however, as a limiting factor of marine mammal populations together with the extinction of natural predators such as grizzly bears and the reduction of others such as great white sharks, means that for all practical purposes, there is no population control of marine mammal populations along the California coast.

In addition to the likely impact of increasing marine mammal numbers on ever-decreasing numbers of endangered salmon species, there are also considerable economic consequences. The consumption of salmon by marine mammals is enormous. For example, the average sea lion weighs ca. 400 lbs. and is known to consume 10% or more of its body weight each day in food. Thus at certain times of the year a sea lion may consume up to 40 Ibs. of salmon per day![3] With their rapidly increasing numbers, sea lions may well consume a large portion of the commerical and sport fishing catch, and above all a growing portion of the declining returning salmon. The State of Michigan has studied the role of salmon in the Great Lakes for Michigan's economy. The result has been that the cost benefit ratio for planted w&t coast salmon and steelhead trout can be pegged at 89 to 1. In other words, for each dollar spent planting west coast salmon and steelhead trout, $89 were returned to the local economy![4] Clearly such levels of consumption as displayed by sea lions and harbor seals can have a marked economic impact on income from salmonid harvest in California.

In fact, testimony presented to the County Fish & Game Advisory Commission shows that many rogue sea lions follow sport, party and commercial fishing boats from both the Santa Cruz harbor and the Wharf to take hooked salmon. It is frequently the case that a large percentage of those fish hooked by sport fishermen are taken by sea lions. For the commercial fishermen, the scene is even worse: many report losing up to 90% of their hooked salmon to sea lions! More devastating, sea lions and harbor seals have been observed at the mouths of the San Lorenzo River, Scott, and Waddell Creeks preying on returning salmon and steelhead attempting to make

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[2] These are annual census figures assembled by the California Department of Fish & Game from 1947 to 1994, as found in the Department's official journal *California Fish & Game*. See the attached graph.

[3] These figures were obtained from sea lions in captivity. There is every likelihood that lions in the wild consume even more.

[4] *See* the *Review of Salmon and Trout Management in Lake Michigan,* Michigan Department of Natural Resources, April 1990.

their runs over shallow sandbars. As noted earlier, the Monterey Bay Salmon and Trout Project, through its hatchery on Scott Creek, has observed marine mammal predation scars on a majority of those salmon and steelhead able to reach the upper reaches of that waterway. Those scars indicate that very likely much larger numbers of salmon and steelhead were consumed by the marine mammals at the Creek's mouth.[5]

At last month's meeting of the State Fish & Game Commission in Monterey (November 3), Dennis Murphy, a member of the County Fish & Game Commission but appearing as a private citizen, presented many of these facts and conclusions to the State Commission. As a result, the Commission asked the Department to pursue this issue, and above all to investigate what is necessary for the State of California to apply under provisions of the newly reauthorized Marine Mammal Protection Act for permission to manage, and in some cases harvest, marine mammals that endanger or impede the recovery of threatened salmonid stocks.

In the judgment of your Fish & Game Advisory Commission, the populations of marine mammals in California, and more specifically in Monterey Bay, are out of balance with the salmonid populations; indeed in some cases these marine mammal populations are out of control. Such an imbalance between prey and predator species can have a serious, perhaps even decisive negative effect upon efforts to aid an endangered species such as the coho salmon native to Santa Cruz County waters in recovering viable numbers. We will continue to urge the State Fish & Game Commission and Department to do all it can under the Marine Mammal Protection Act to achieve control over the management of'pinniped populations in California, up to and including the harvest of surplus sea lions and harbor seals. It is our fervent hope that the Santa Cruz County Board of Supervisors will support these efforts.

Sincerely,

Gary Lease

Chair
Santa Cruz County
Fish & Game Advisory Commission

cc: County Fish & Game Commissioners
State Fish & Game Commission
State Department of Fish & Game

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[5] The California Fish & Game Department conducted a preliminary study of such scars on fish in the lower reaches of the Russian River. The most recent study, however, comes from the Snake River, where scientists from the National Marine Fisheries Service established evidence that pinnipeds may well be "an important mortality factor" for spring-summer chinook salmon in the Snake River. See J. Harmon, et al: "Prevalence of Marine-Mammal Tooth and Claw Abrasions on Adult Anadromous Salmonids Returning to the Snake River," in: *North American Journal* of *Fisheries Management 14* (1994), *661-663.*

POPULATION GROWTH OF MARINE MAMMALS IN CALIFORNIA[1]

	1947	1972	1992	1994
Harbor seals	500	18,000	45,000	50,000
Sea lions	3,500	50,000	120,000	150,000

[1] taken from annual census figures published by the California Department of Fish & Game in its journal *California Fish & Game.*

ATTACHMENT 3

0542

REPORT TO CONGRESS

IMPACTS OF CALIFORNIA SEA LIONS AND PACIFIC HARBOR SEALS ON SALMONIDS AND WEST COAST ECOSYSTEMS

Prepared by

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

February 10, 1999

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1335 East-West Highway
Silver Spring, MD 20910
THE DIRECTOR

ATTACHMENT 3

0543

FEB 10 1999

The Honorable Don Young
Chairman, Committee on Resources
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I am pleased to submit the enclosed report prepared by the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration, Department of Commerce, in accordance with section 120 (f) of the Marine Mammal Protection Act (MMPA).

Although some populations of marine mammals remain critically endangered, numbers in others have increased and conflicts are now apparent between these expanding populations and other marine resources or human activities. The protections given to marine mammals under the MMPA limit somewhat the strategies that resource management agencies can use to resolve this conflict between abundant pinniped populations and certain salmonid stocks or human activity.

The recommendations contained in the enclosed report to Congress were based upon the findings of the supporting scientific investigation report and upon discussions with the Pacific States Marine Fisheries Commission and representatives from resource agencies in California, Oregon, and Washington. NMFS would assist as requested in developing the appropriate mechanisms to implement these recommendations.

Sincerely,

Rolland A. Schmitten

Enclosure

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1335 East-West Highway
Silver Spring, MD 20910
THE DIRECTOR

ATTACHMENT 3

0544

FEB 10 1999

The Honorable John McCain
Chairman, Committee on Commerce,
Science and Transportation
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

I am pleased to submit the enclosed report prepared by the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration, Department of Commerce, in accordance with section 120(f) of the Marine Mammal Protection Act (MMPA).

Although some populations of marine mammals remain critically endangered, numbers in others have increased and conflicts are now apparent between these expanding populations and other marine resources or human activities. The protections given to marine mammals under the MMPA limit somewhat the strategies that resource management agencies can use to resolve this conflict between abundant pinniped populations and certain salmonid stocks or human activity.

The recommendations contained *in* the enclosed report to Congress were based upon the findings of the supporting scientific investigation report and upon discussions with the Pacific States Marine Fisheries Commission and representatives from resource agencies in California, Oregon, and Washington. NMFS would assist as requested in developing the appropriate mechanisms to implement these recommendations.

Sincerely,

Rolland A. Schmitten

Enclosure

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

ATTACHMENT 3

0545

REPORT TO CONGRESS

IMPACTS OF CALIFORNIA SEA LIONS AND PACIFIC HARBOR SEALS ON SALMONIDS AND WEST COAST ECOSYSTEMS

February 10, 1999

ATTACHMENT 3

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INTRODUCTION

In accordance with Section 120(f) of the Marine Mammal Protection Act (MMPA), this report follows the scientific investigation conducted by the National Marine Fisheries Service (NMFS) into the impacts of California sea lion and Pacific harbor seal predation on salmonids and other impacts of these pinnipeds on the coastal ecosystems of Washington, Oregon, and California (Scientific Investigation Report (NMFS 1997)). This report provides the results of discussions between NMFS and the Pacific States Marine Fisheries Commission (PSMFC) and representatives of the Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW) and California Department of Fish and Game (CDFG). The discussions were held to (1) address the issues and problems identified as a result of the scientific investigation, and (2) develop recommendations to address such issues or problems. The Scientific Investigation Report was released to the public in March 1997. The draft recommendations based on these discussions were made available to the public for review and comment for a period of 90 days. The recommendations are hereby submitted to the House of Representatives Committee on Resources and to the Senate Committee on Commerce, Science, and Transportation in accordance with P.L. 103-238 - Marine Mammal Protection Act Amendments of 1994.

Two pinniped issues were identified from the Scientific Investigation Report. These issues, along with a summary of the information from the scientific investigation are provided in the pinniped issues section of this report. Four recommendations were developed by the PSMFC, the state resource agencies in Washington, Oregon, and California (the States), and NMFS. The issue of greatest concern is the potential impact of pinnipeds on the recovery of salmonids that are listed, proposed for listing, or candidates for listing under the Endangered Species Act (ESA). NMFS, PSMFC, and the States acknowledge that there are a suite of factors that have caused the decline of salmonids on the West Coast. Although predation by pinnipeds was not a principal factor in the listing or proposed listing under the ESA of any salmonid populations, it is now a.factor that may affect recovery of depressed salmonid populations, and it is the specific factor that Congress requested be the focus of this report. The problems created by expanding pinniped populations, the need for management options, and the rationale for specific recommendations are provided in the discussion section of this report. Several specific management actions are included in the recommendations section of this report. The appendix of this report contains a summary of public comments on the draft recommendations and NMFS' responses to these comments.

PINNIPED ISSUES

California sea lion and Pacific harbor seal issues identified in the Scientific Investigation Report are: (1) the impacts of pinniped predation on salrnonids, and (2) the impacts of pinnipeds on West Coast ecosystems. Impacts on ecosystems are separated into two components: impacts on human activities, and impacts on other components of the ecosystems. This separation reflects the interpretation that the major ecosystem conflict with increasing pinniped populations (other than conflicts with depressed salmonid populations) is socioeconomic and is related to pinniped

interference with human activities or competition with humans for marine resources. The background information for each issue is derived from the Scientific Investigation Report. Citations and references for the specific information from the Scientific Investigation Report are not repeated in this report.

1. Pinniped Impacts on Salmonids

Issue: California sea lion and Pacific harbor seal populations on the West Coast are increasing while many salmonid populations are decreasing. Salmonid populations that are depressed and declining, especially those that are listed, proposed to be listed, or candidates for listing under the ESA, can be negatively impacted by expanding pinniped populations and attendant predation.

Status of Pinnipeds and Salmonids

The scientific information clearly indicates #at West Coast populations of California sea lions and Pacific harbor seals are healthy and robust, and have increased at average annual rates of five to eight percent per year since the passage of the MMPA in 1972. The current populations of California sea lions and Pacific harbor seals may be larger than at any other time in the past several centuries, and their ranges and areas of common occurrence have expanded. California sea lions, for example, are now found in increasing numbers in northern waters, in inland waters, and upriver in freshwater in many West Coast river systems. They are also now found near man-made structures such as dams or fish passage facilities with increasing frequency. Their use of docks, piers, and other man-made structures as haul-out sites has increased as well. In California, the number of areas used by harbor seals as haul-out sites has doubled since 1982. The increased abundance and expanded distribution of both pinniped populations has resulted in more frequent contact with humans and increased interactions with human activities such as fishing, The presence of large numbers of pinnipeds in estuaries during salmonid migrations raises concerns for local impacts of pinniped predation on depressed salmonid populations. Despite their current high abundance levels, the Scientific Investigation Report (NMFS 1997) did not find conclusive evidence that either of these marine mammal populations had reached its optimum sustainable population (OSP) level. Preliminary analyses of more recent survey data on the coastal harbor seal populations of Washington and Oregon indicates that they may be at OSP; further analysis and preparation of manuscripts for peer review are currently underway. Unless the pinniped populations are demonstrated to be within their OSP level, management actions, such as a waiver of the MMPA moratorium on taking marine mammals or transfer of management authority to the states for the effective resolution of many pinniped-fishery resource conflicts, cannot be taken under the MMPA.

While pinniped populations have increased, many marine and anadromous fish populations have declined. Many salmonid populations have decreased to levels resulting in ESA listing, or proposals for listing as threatened and endangered species. As of January 1999, fifteen populations of Pacific salmonids have been listed under the ESA, and NMFS is considering listing additional populations

of coho salmon, chinook salmon, chum salmon, sockeye salmon, steelhead and cutthroat trout. These and other salmonid populations also have been identified as critical or of special concern by state resource management agencies.

Pinniped Food ~~Habits~~ Information

The food habits of pinnipeds have been a subject of scientific interest for many years, primarily because these animals have long been viewed as competitors with humans for a variety of fish species. Research has shown that California sea lions and Pacific harbor seals are opportunistic feeders, with diets consisting primarily of prey that are seasonally and locally abundant. Such studies indicate that these pinnipeds frequently consume salmonids when they are available.

Most pinniped food habit studies were not designed to determine the impact that pinniped predation may have on a specific salmonid population. The majority of studies of pinniped foraging on salmon were conducted on an opportunistic basis, as pinnipeds became available for examination or as other food habit samples were collected for analysis. Each study is subject to its own biases, making quantification of the salmonid contribution to pinniped diets difficult. Identification of prey hard parts from fecal samples can be biased by variations in ingestion and digestion of identifiable parts of different prey. Most older studies relied primarily on the recovery and identification of fish otoliths (ear bones) for prey identification, while most current studies use many other prey hard parts such as vertebrae, gill rakers, skull bones, teeth, 'and other mouth parts. Reanalysis of material from past studies using these new techniques often shows an increase in the occurrence of salmonids in the diet of pinnipeds. Direct observations of pinnipeds catching and consuming fish at the surface are usually biased toward larger prey species (e.g., salmonids) that are tom apart and consumed at the surface. Nonetheless, surface observations can provide data for estimates of removals by pinnipeds of migrating adult salmonids from specific populations in site-specific situations. Lastly, direct lethal collection of pinnipeds for examination of gastrointestinal tracts provides an effective means to quantify prey consumption rates. Examination of freshly killed pinnipeds that were actively foraging or had recently fed allows a direct assessment of species consumed, by number, weight, and volume. Such data from direct lethal takes are also critical to developing accurate quantitative estimates of various prey species consumed and to validate estimates generated from examination of fecal samples. However, the MMPA prohibits the issuance of research permits that allow marine mammals to be killed unless the applicant demonstrates that a non-lethal method of conducting the research is not feasible. Because the feasibility of alternative methods is usually subject to intense debate, no research permit applications for lethal takes for food habits studies have been pursued in recent years on the West Coast.

Salmonid consumption by pinnipeds differs from one geographic area to another in response to changes in oceanic conditions, salmonid run strength, abundance levels of other desirable prey species, changes in local predator abundance (daily, seasonal and year-to-year), prey vulnerability, and other factors. In addition, the techniques currently available to identify prey hard parts cannot always be used to identify salrnonid parts to the species level (e.g., identifying steelhead versus

cutthroat trout). For these reasons, attempts to estimate the contribution of salmonids to the overall diet of pinnipeds by expanding the results of the few site-specific studies to larger geographic areas or time periods are not likely to result in statistically valid or useful estimates.

Pinniped Predation on Salmonids

A number of factors have caused the decline of salmonid populations, and many of those are still affecting salmonid recovery on the West Coast. Although pinniped predation also is a factor affecting the recovery of some salmonid populations, there have been no specific studies that demonstrate a cause-effect relationship between increases in pinniped numbers and declines in salmonid populations, and no such direct relationship is implied here. Rather than an issue due strictly to pinniped population size, the impact on salmonids is likely due to opportunistic behavior by certain individual pinnipeds that have learned to exploit situations where salmonids are concentrated and particularly vulnerable. As the number of pinnipeds increases, the likelihood of more pinnipeds discovering these situations increases, as does the opportunity to pass on such learned behavior to other pinnipeds.

Pinniped predation on small salmonid populations, especially at areas of restricted fish passage, can have negative impacts on the recovery of depressed salmonids. Seasonal predation by pinnipeds on some salmonid populations has been observed, and a significant negative impact on one salmonid population has been documented (i.e., winter steelhead migrating through the Ballard Locks at Seattle, WA). The Pacific Scientific Review Group, established under the 1994 Amendments to the MMPA as a scientific advisory body to NMFS, identified the impact of pinniped predation on the decline or recovery of certain salmonid populations as a major issue for management of pinniped interactions with various fisheries and fish stocks.

Pinniped predation on free-swimming salmonids in open water occurs, but successful. predation is more likely in nearshore areas and in rivers where salmonids are concentrated. Of particular concern are areas in bays and rivers where adult fish passage is impeded by natural or artificial barriers, such as river restrictions, falls, fish ladders, dams, and other barriers. Outmigrating salmonid smolts are also preyed upon by pinnipeds in these areas. In some areas, these conflicts are seasonal. Although harbor seals are year-round residents in all coastal waters, the number of California sea lions increases seasonally in northern waters as juveniles and adult males migrate north after the breeding season in late-summer and fall, The process is reversed on the southern migration to the breeding rookery areas in spring and early summer. Reports of the most severe conflicts between pinnipeds and salmonid populations in northern areas often coincide with the California sea lion migration.

Although pinniped presence and foraging can affect salmonid passage in estuaries and riverine areas in Washington, Oregon, and California, most of the sites of pinniped and salmonid co-occurrence have yet to be studied in detail. Due to ongoing budget limitations in resource agencies, only the most visible of these situations have been studied or managed in some fashion. The most familiar example of pinniped impacts on salmonid passage and spawning escapement involves California sea

lion predation on winter steelhead at the Ballard Locks in Seattle, WA. This situation has been well documented since the mid- 1980s and authority to lethally remove sea lions was provided by NMFS to WDFW under MMPA Section 120 in 1995. It has been necessary to invest a considerable amount of time, effort, and resources, however, in attempting to resolve impacts of California sea lions on salrnonid passage and escapement at this one location. During this time, the affected steelhead population has been reduced to remnant levels. WDFW characterized the lethal authorization process as cumbersome and restrictive and found that the provisions of Section 120 of the MMPA have not provided an efficient or effective system for dealing with pinniped problems of this critical nature.

In recent years, a new conflict between California sea lions and salmonids that is similar to the Ballard Locks situation has developed 128 miles upriver from the Pacific Ocean at a fish passage facility at Willamette Falls in Oregon City, OR. Since 1990, at least one to three California sea lions have been observed foraging on salmonids seasonally in freshwater near the fish passage facility at the Falls. ODFW began monitoring this conflict in 1995 and found four to six sea lions were foraging at this site from February through May, where the sea lions consumed steelhead and spring chinook salmon in the area below the falls. ODFW conducted some initial testing with non-lethal deterrents without success in 1996. Based on the experience with sea lions at the Ballard Locks, resource managers predict that this situation is likely to worsen, with increasing numbers of sea lions and increased predation on salmonids at this site in coming years. Willamette River winter steelhead and spring chinook salmon numbers have declined in recent years, and unabated pinniped foraging at this critical fish passage site is unacceptable to ODFW.

A number of other locations where pinnipeds also may be affecting salmonids and potentially inhibiting fish passage are identified in the Scientific Investigation Report. Indirect evidence of pinniped predation also is available from federal and state hatcheries in Washington and Oregon, and from private hatchery facilities in California, where returning salmonids show a high incidence of scarring caused by pinniped predation attempts. These data indicate that pinnipeds are present at many sites where salmonids are vulnerable to predation.

Currently, to obtain authority for lethal removal of pinnipeds at sites with salmonid conflicts, a state is required under Section 120 of the MMPA to demonstrate that individual pinnipeds are having a significant negative impact on salmonid populations that are listed or proposed for listing under the ESA. Quantification of the impacts to the extent required in the MMPA would mean collecting new, extensive and highly detailed information specific to each site. In some cases, the salmonid populations may not yet be depressed to near the threatened or endangered level required under Section 120 of the MMPA. In others, the cost of conducting the level of detailed investigation necessary to meet the requirements of Section 120 at each site would be prohibitive. Current food habit collection and analysis techniques may also be inadequate to precisely determine and quantify pinniped impacts on salmonids of concern. While time and resources are expended attempting to fully assess the effects of predation, depressed salmonid populations at some sites could continue to decline due to pinnipeds, even if other sources of mortality may have been curtailed.

2. Pinniped Impacts on West Coast Ecosystems 0552

Issue: Increasing California sea lion and Pacific harbor seal populations and their expanding distribution are negatively impacting commercial and recreational fishing, damaging private property, and posing public safety threats.

Impacts on Fisheries and Other Human Activities

Increasing pinniped populations have several direct impacts on human activities such as fishing. Commercial and recreational fishing are important social and economic assets in Washington, Oregon, and California. In many situations, California sea lions and Pacific harbor seals are causing economic impacts of undetermined magnitude on both commercial and recreational fishing industries in these states. In the commercial fisheries, California sea lions and Pacific harbor seals depredate catch and damage gear in the salmon troll and gillnet fisheries; near-shore gillnet fisheries; herring, squid, and bait purse seine and round-haul fisheries; and trap and live bait fisheries. Commercial fishers lose income because they are unable to catch, land, and sell fish. Reductions in commercial landings result in economic loss to coastal communities, and reverberate through related industries such as dock facilities, fuel docks, wholesale and retail fish markets, restaurants and the trucking industry. State agencies responsible for managing commercial fisheries lose revenue due to fewer commercial landings. This reduces funds available for monitoring, research and management of marine resources.

Commercial salmon net-pen facilities, live-bait, hatchery, enhancement and fish farming operations also are affected by both California sea lions and Pacific harbor seals. Pinnipeds break into containments; bite, injure, kill, and consume fish; and damage facility and containment structures. Shellfish harvesting sites have been closed in one area because of high concentrations of fecal coliform bacteria from large numbers of pinnipeds on nearby haul-outs.

Both California sea lions and Pacific harbor seals are involved in interactions with recreational fisheries coastwide. In California, for example, charterboat skippers report that they are losing their customers because of continual interactions with California sea lions. Sea lions interact by consuming bait and chum, and depredating fish that have been caught and are being reeled in. Fish may stop feeding or may be scared away by the presence of sea lions. In addition, when sea lions are present, skippers frequently have to move their boats to other, sometimes less productive, fishing areas, incurring additional fuel costs and loss of fishing time. Despite these efforts, sea lions often follow the boats to these new locations. Similar problems also are experienced with harbor seals coastwide.

Predation by pinnipeds in recreational and commercial salmon fisheries reduces the accuracy of fishing mortality estimates. When California sea lions or Pacific harbor seals remove a fish from a line (hook) or net, fishing mortality is effectively increased. Commercial fishers (operating under a quota or harvest guideline) and recreational anglers normally will continue fishing to replace those

depredated fish. Although management agencies account for fishery harvests and escapement, removals by pinnipeds are poorly documented and usually are considered in the general category of natural mortality. The rates of removal by pinnipeds are largely unpredictable, and will often vary depending on the season or year during which the fishery takes place. In addition, current estimates of natural mortality were developed from earlier years when there were fewer pinnipeds, and when fishers were able to use lethal deterrence to protect their catch. The full extent of current pinniped depredation is unknown, but has likely increased with expanding pinniped populations and less effective deterrence alternatives. This means that in some cases, current expectations for natural mortality may be low, increasing chances for management error and possibly allowing levels of harvest that are too high.

There are human health, safety, and property issues associated with the increasing pinniped populations as well. Increasing numbers of California sea lions are hauling-out on docks, piers, private boats, and other man-made structures, Their weight can damage structures while their fecal wastes foul the site. At some sites, California sea lions routinely haul-out on docks and react aggressively toward people who approach. Boat owners have been prevented from accessing their vessels. Coastwide, there are reports of California sea lions climbing into boats, stealing fish laid out on docks, intimidating people at marinas, and biting through landing nets in attempts to take fish. Human injury has resulted from some of these confrontations. Although many of these situations may be viewed as "normal" wildlife problems, state resource agencies often are unable to deal with pinnipeds as they would other wildlife species due to restrictions in the MMPA.

The 1994 Amendments to the MMPA granted new authority for private boat and dock owners to deter marine mammals, provided the method does not seriously injure or kill or have a significant adverse effect on marine mammals. The Amendments also imposed a new prohibition on the intentional lethal take of pinnipeds by commercial fishers to protect gear and catch. Prior to the 1994 Amendments, MMPA regulations allowed commercial fishers to use lethal methods to protect catch and gear if non-lethal steps had proven ineffective. Currently, no safe, effective deterrent devices or techniques that provide long-term resolution have been identified to prevent pinnipeds from interfering with commercial and recreational fishing or to keep them away from aquaculture, live-bait, hatchery, and fish farming operations.

Many devices and non-lethal techniques have been tested at the Ballard Locks, but none has been totally successful because some California sea lions eventually "learned" to tolerate or avoid the effects of all of them. Those sea lions that were unaffected by the non-lethal efforts were responsible for much of the resulting predation on steelhead at the Ballard Locks. Similar testing of non-lethal deterrence techniques on Pacific harbor seals and California sea lions in other areas and situations also has-shown them to be of limited effectiveness. PSMFC and the States believe that NMFS research on pinniped deterrence and on the effects of expanding pinniped populations on coastal ecosystems has been inadequate. However, they acknowledge that NMFS has had to focus marine mammal research on stock assessments because Sections 117 and 118 of the MMPA require current

population size estimates for all marine mammal populations and estimates of fishing mortality in order to manage the incidental taking of marine mammals during commercial fishing operations.

Impacts on the Marine Ecosystem

At this time, there is insufficient information available to evaluate whether foraging by pinnipeds may be affecting the abundance of human-exploited marine species other than salmon, and/or the abundance of fish that are the prey of salmonids. Food habits studies on California sea lions and Pacific harbor seals indicate a broad range of prey species are consumed. Because pinnipeds are opportunistic predators, food habits change dramatically over areas, seasons, and years in response to changes in abundance of different species in the prey assemblage. Thus, determining impacts of these predators on fishery stocks and the coastal ecosystem requires specific knowledge about a variety of subjects, including (1) feeding behavior; (2) prey selection and consumption rates; (3) population dynamics of predator and prey; and, (4) the variability in abundance of both pinnipeds and their prey over time and space. The ecological interactions between pinnipeds and fishery resources are complex and are further complicated because some pinniped prey species are also the predominant prey of small cetaceans, sea birds, fish, and squid.

It also is difficult to determine ecosystem level impacts due to the overall limited understanding of ecosystem functions. For example, it is unclear whether prey abundance or availability causes the predator to switch prey species, or whether they change prey in response to changes in the energy content of prey over the season. To estimate the impacts of pinniped predation on commercial fish stocks, food habits information should be collected during the fishing season concurrently with assessments of prey availability and prey quality. There are both methodological and conceptual difficulties in estimating impacts of marine mammal predation on prey stocks. To estimate the quantity consumed would require more knowledge of the population dynamics and behavior of predator/prey species than is currently available. Ecological models to quantify the effects need to be developed. Research on West Coast ecosystems could provide information to evaluate whether increasing pinniped populations can be expected to consume more from fisheries stocks which are currently managed to optimize economic yield.

DISCUSSION

NMFS is given responsibility to regulate the use of living marine resources under a number of statutes, such as the ESA, MMPA, and the Magnuson-Stevens Fishery Conservation and Management Act. Each of these statutes contains provisions to govern the conservation and utilization of one or more living marine resource, Because there is no clear legislative guidance on the use or non-use of these resources and interactions between them, conflict has arisen among these laws (Eagle et al, 1998). An example of this conflict is between the ESA and the MMPA regarding appropriate steps to protect listed species of salmon from predation by expanding California sea lion and Pacific harbor seal populations.

A guide for developing a policy regarding conflicts between protected species may be found in Mange1 et al. (1996), which examined and suggested revisions to Holt and Talbot's (1978) principles for the conservation of wild living resources. Mange1 et al. (1996) included a principle stating that the goal of conservation should be to secure present and future options by maintaining biological diversity at genetic, species, population, and ecosystem levels. Following this principle, management decisions should be directed toward minimizing risks to biodiversity. In the case of expanding pinniped populations that may be having an impact on depressed.salmonid populations, particularly those that are listed, proposed for listing, or candidates for listing under the ESA, the loss of individuals from such salmonid populations would be a greater risk to biodiversity than removing relatively small numbers of individual pinnipeds from robust populations. Although the 1994 Amendments to the MMPA allow states to request authority for the lethal removal of certain pinnipeds to protect salmonid populations, this authority is limited to those cases where it can be clearly demonstrated that individually identifiable pinnipeds are having a significant negative impact on the status or recovery of a particular salrnonid population. The PSMFC and the States have characterized the authorization process as cumbersome and believe the amount of evidence needed to establish that specific pinnipeds are indeed having such an impact on a given salmonid population is exceedingly time-intensive, difficult, and expensive to obtain as illustrated by the California sea lion conflict with steelhead at the Ballard Locks. There is no provision in the MMPA to accommodate normal or expected uncertainties in the determinations, and this reduces the ability of resource managers to enhance biodiversity in the affected system by protecting listed salmonids.

Garrott et al. (1993) described the successful recovery of many populations of wild animals fi-om depletion and noted that there is no management criterion describing a goal for recovery nor what to do to avoid or mitigate conflict with other resources when they occur. Garrott et al. (1993) observed that most of the earth is not in a pristine state, with species confined to limited spaces with artificial boundaries. Species that can thrive in human-altered habitats (e.g., California sea lions and Pacific harbor seals) will increase and may overwhelm more sensitive species (e.g., salmonids), which, in turn, leads to areas of decreased diversity. These species will also increasingly come into conflict with humans, such as is now occurring with pinnipeds on the West Coast. Both Garrott et al. (1993) and Aplet et al. (1992) predict that active management of populations will become more important as common species displace more sensitive species and disperse from remote or protected areas into the unprotected, semi-natural matrix of suburban, agricultural, and nonagricultural areas (as has been observed with expanding pinniped populations). These and other authors note that management actions to control abundant populations will not be popular with much of the public. When uncertainty regarding the need or benefits of such actions are added to the decision-making process, these decisions will be even more difficult. Nonetheless, postponing management decisions until scientific certainty is reached leads to management failure (Mange1 et al. 1996, MacCalll996).

Mange1 et al. (1996) note that sociological and economic impacts of management alternatives should be explored, and Wagner (1996) added that society's values should guide natural resource policy and management decisions. Wagner (1996) also notes that many ecosystems have been perturbed far beyond the boundaries of natural variation, and that the increasing human population will result in

these ecosystems being subjected to additional perturbation to support that human population. NOAA (1996) noted that over 50 percent of the U.S. population inhabits the 10 percent of the land area that is coastal, and that coastal populations are growing at a faster rate than those inland. Therefore, human conflicts with other coastal inhabitants (e.g., California sea lions and Pacific harbor seals) are likely to increase in the future. A sound and consistent policy for making management decisions for conserving coastal resources and resolving human conflicts with these resources is imperative.

The legislative history of the MMPA includes provisions for management of marine mammals from its inception. The reports accompanying initial passage of the MMPA contain discussion of population management principles. These reports, however, stressed that management of marine mammal populations be done with the interest of the marine mammal as the prime consideration. While recognizing that it was not in an individual animal's interest to be removed from the population, the reports suggested that it could help an entire population to remove excess members.

The early management provisions, however, necessitated a determination that the affected marine mammal population must be within its OSP level and that management measures would not reduce the population below the OSP level. The functional definition of "optimum" is based upon historic abundance, or upon the inherent productivity of the population and the ability of its environment to support the population. The statutory definition of OSP requires that stocks of marine mammals be above the maximum net productivity level, which, in turn, requires knowledge of the history of human-caused mortality or some sensitive measure that density dependent factors related to carrying capacity are affecting population growth rates. Such a determination is not likely in the near future for California sea lions and for all of the Pacific harbor seal populations. The Scientific Investigation (NMFS 1997) found that available scientific evidence did not conclusively demonstrate that these pinniped stocks are above the maximum net productivity level and, therefore, would not support an OSP determination in the immediate future, even though the populations are robust and increasing, and clearly continue to be functioning elements of the ecosystem. Preliminary analyses of more recent data indicate that the coastal harbor seal populations in Washington and Oregon may be at OSP; further analysis and preparation of manuscripts for peer review are currently underway.

The 1994 Amendments to the MMPA recognized an alternative to OSP determinations as a mechanism to authorize the taking of marine mammals under certain circumstances. The MMPA now allows taking to occur incidental to commercial fishing operations so long as such taking do not exceed the "Potential Biological Removal" (PBR) level for a marine mammal population. PBR is defined as the maximum number of individuals that can be removed annually from a population, by other than natural causes, and allow that population to reach or maintain its OSP. As long as the total of human-caused mortality was below the calculated PBR level, such mortality would not prevent the affected populations from reaching and remaining within its OSP and remaining as a functional element of its ecosystem. Therefore, this approach could allow lethal removals of pinnipeds for management purposes at such a level that would not disadvantage the affected stock

(i.e., the total takes are below PBR), even if that population's OSP cannot be estimated quantitatively.

Historically, the MMPA and associated regulations have allowed lethal measures to solve management problems involving selected individual marine mammals. Humane euthanasia by government officials has been allowed to protect the public health and welfare or for the protection or welfare of the mammal. With implementation of the 1994 Amendments to the MMPA, citizens now may use lethal measures to protect human life from immediate danger. Prior to the 1994 Amendments, lethal measures by commercial fishers were authorized in cases where pinnipeds were damaging gear and catch and could not be deterred by non-lethal means. However, the intentional killing of marine mammals in the course of commercial fishing operations was explicitly prohibited in the 1994 Amendments to the MMPA. Accompanying the prohibition on intentional killing, Congress included deterrence provisions that allow the public to use non-lethal measures to deter marine mammals from damaging private property, including fishing gear and catch. Unfortunately, available non-lethal measures have not proven reliable in all situations. CDFG notes that this situation has resulted in frustration and distrust by many recreational and commercial fishers.

Through the MMPA, marine mammals were reserved a special status among wildlife species. The conditions under which marine mammals could be removed were severely limited upon passage of the MMPA. The authority of state resource agencies was restricted, and these agencies often could not use routine wildlife management measures to resolve pinniped conflicts. However, the 1994 Amendments to the MMPA, specifically the provisions of Section 120, suggest that the concept of complete protection for abundant, expanding populations of pinnipeds may need re-evaluation. In addition to allowing the lethal removal of certain individual pinnipeds, Section 120 of the MMPA brings attention to conflicts arising between humans and the increasing populations of California sea lions and Pacific harbor seals. These provisions recognize that certain populations of marine mammals have recovered from past depletion and are causing conflict with human use of other resources in marine ecosystems. The conflicts are often exacerbated by-human modification of coastal ecosystems.

CONCLUSIONS

California sea lions and Pacific harbor seals are abundant, increasing, and widely distributed on the West Coast. Many salmonid populations, which are declining due to a host of factors, are being preyed upon by pinnipeds. This predation often occurs in areas where depressed, threatened or endangered populations of salmonids must pass to reach spawning areas as adults or the sea as smolts. Where salmonid passage conflicts have been adequately documented, such as at the Ballard Locks, there is sufficient evidence to show that pinnipeds can have a significant negative impact on a salmonid population. The Scientific Investigation Report indicates that there are a number of sites along the West Coast where there is a high potential for pinniped impacts on salmonid populations.

Although the scientific information on the nature and extent of conflicts between pinnipeds and other elements of West Coast ecosystems is limited, it is clear that there are a number of places where these conflicts do exist, and reports of them are increasing in frequency and degree as the pinniped populations grow. Existing food habit information, and that which is likely to be collected in the near future, will not be sufficient to determine highly precise levels of impacts to individual salmonid populations from pinniped predation. The question then to be asked is, "How precise must information be in order to support management actions that protect important declining or listed fish resources (e.g., salmonids) from predation by limited numbers of individual pinnipeds?" Given the depressed and often critical status of some salmonid populations on the West Coast and the robust status of California sea lion and Pacific harbor seal populations, salmonids need to be given precedence when conflicts arise between these protected species. In areas where predation on depressed salmonid populations is found to be frequent and common, reasonable options must be made available to managers to implement actions that protect critical resources, without striving to obtain "perfect" and largely unobtainable information in every case. Although additional information can and should be collected in these instances, remedial action must be taken in certain situations where thorough documentation may be lacking in order to preserve an array of options for salmonid recovery. While this need is not as immediate where the status of salmonids is only depressed and not critical, it should not be necessary for a salmonid population to reach ESA-listing status before action is taken to remove individual pinnipeds that are affecting recovery.

Pinnipeds also conflict with human use of other marine resources, such as commercial and recreational fishing, cause damage to docks and boats, and create human safety issues. In most cases, accurate or comprehensive assessments of the extent or impact of these conflicts have not been completed. Incomplete documentation makes these conflicts no less real, however, and some are imposing economic hardship on fisheries and affiliated enterprises and communities. Unfortunately, safe and effective deterrence alternatives are not likely to become available in the near future unless additional funding is devoted to new research and development.

Resolving pinniped conflicts with human activities is controversial, Because pinnipeds are marine mammals, there are public perception and legal problems in treating them similar to other wildlife species. Because the MMPA offers protections for all stocks of marine mammals, some members of the public do not distinguish between the level of protection needed for abundant, increasing stocks of marine mammals, such as California sea lions and Pacific harbor seals, and those that are truly endangered, such as North Atlantic right whales. Therefore, when conflicts develop between fishers and pinnipeds, some people will often argue for protection of the pinnipeds regardless of the damage and economic losses incurred in fisheries. Further, because pinnipeds are protected under the MMPA, state resource management agencies are unable to resolve many otherwise routine wildlife problems that involve pinnipeds. For example, over-abundance of deer in a particular area is usually handled by removing a portion of the herd. Nuisance predators such as bears and mountain lions can be lethally removed by state resource agencies before they pose an immediate threat to human safety. However, state agencies may lethally remove a pinniped only if it is sick or diseased or if it is involved in an immediate human safety problem. Although resource agencies may

use non-lethal measures on pinnipeds, there is no authorization under the MMPA to allow state or federal resource agencies to take immediate lethal action with a strictly "nuisance" pinniped, even if such action is clearly warranted to prevent a more serious problem in the future.

RECOMMENDATIONS

In those cases where enough is known about pinniped affects on other living marine resources to raise valid concerns, management action should not be delayed while waiting for precise scientific documentation that eliminates all uncertainty. Delaying management decisions in those situations where there is an immediate need for action only increases the risk of losing present and future options. In that regard, these risks have been evaluated, and the following recommendations were developed to address issues regarding California sea lion and Pacific harbor seal impacts on salmonids and, more broadly, on human activities in coastal ecosystems. These recommendations are conservative in that they only recommend **lethal** taking of individual pinnipeds (rather than large-scale removal or population culling programs) and such taking are limited to specified sites and situations. Congress should work with PSMFC, the West Coast States, NMFS, other federal agencies, and the public to consider legislation where necessary to implement the following recommendations.

A. Implement Site-specific Management for California Sea Lions and Pacific Harbor Seals

Congress should consider a new framework that allows state and federal resource management agencies to immediately address conflicts involving California sea lions and Pacific harbor seals. This framework should provide a streamlined approach for federal and state resource management agencies to take necessary and appropriate action with pinnipeds that are involved in resource conflicts. The framework should provide procedures for lethal removal of California sea lions or Pacific harbor seals where these species are impacting severely depleted salmonids, such as those listed under the ESA. In addition, the framework should provide procedures for lethal removal where these pinniped species are adversely impacting salmonid populations identified as being of special concern by states, or where these pinniped species are in conflict with human activities.

Under this framework, state and federal resource management agencies would have a general authorization to lethally remove California sea lions and Pacific harbor seals, under the conditions described below, to immediately resolve certain resource conflict issues. State agencies would report any **lethal** takes of pinnipeds to NMFS within 72 hours, and NMFS would manage these takes, in addition to all other sources of human-caused mortality, so these removals would remain within the PBR level for the involved pinniped population. Lethal methods would be discontinued once safe, effective, and long-term non-lethal methods are developed for the specific situations. Agency personnel who participate in lethal removal activities would be trained, or demonstrate the ability,

to distinguish among California sea lions, Pacific harbor seals, and other pinniped species that may be present in the area, in order to avoid accidental removals of other pinniped species.

The three components of this framework are as follows:

(1) In situations where California sea lions or Pacific harbor seals arepreying on salmonids that are listed or areproposed or candidates for listing under the ESA, immediate use of lethal removal by state orfederal resource agency officials would be authorized, This authorization would only apply to those areas where resource agencies have determined that there is an urgency to immediately remove pinnipeds lethally, without having to expend resources on non-lethal methods that are not likely to provide immediate resolution to the confl ict. This authority would be exercised only if (1) salmonid conservation or recovery plans are in place or in development, (2) recovery efforts on other factors affecting salmonid status are underway, and (3) lethal removal of pinnipeds is consistent with salmonid conservation/recovery plans. Under this authorization, lethal removal would occur only in specific areas where the conflicts occur, such as locations where salmonid passage is restricted or impeded and only during the period when affected salmonids are migrating through the area. It would be inappropriate to use this approach, for example; to remove pinnipeds in lower estuary areas when the actual predation problem clearly occurs upstream at a fish passage restriction. In addition, this immediate lethal authorization should not apply uniformly to every river system within the range of a listed salmonid population. Lethal removal would be inappropriate in cases where a particular salmonid run in a river system within the listed salmonid population is doing relatively well, and resolving predation at that site is not a recovery need.

(2) In situations where California sea lions or Pacific harbor seals are preying on salmonid populations of concern or are impedingpassage of these populations during migration as adults or smolts, lethal takes by state orfederal resource agency officials would be authorized if (a) non-lethal deterrence methods are underway and are not fully effective, or (b) non-lethal methods are not feasible in the particular situation or have proven ineffective in the past. This authorization would apply to those areas where (1) pinnipeds are preying on state-listed "depressed," "critical," "sensitive," or similarly identified salmonids, (2) recovery efforts on other factors affecting salmonid status are underway, and (3) removal of pinnipeds is consistent with salrnonid conservation/recovery planning. It also would apply to situations where pinnipeds are impeding passage during migration of these populations. Lethal removal would occur only when and where sahnonids are present and only after non-lethal measures have been considered and applied to the extent practicable. Non-lethal means could first be used to drive pinnipeds out of an area, for example, but those few individuals that remain and successfully prey on salmonids could be lethally removed. It would not be necessary to repeat tests of non-lethal methods that have proven ineffective in similar situations in other areas.

(3) In situations where California sea lions or Pacific harbor seals conflict with human activities, such as *at fishery sites and marinas, lethal removal by state or federal resource agency officials would be authorized after non-lethal deterrence has been ineffective.* Lethal removal would be used

only in those few situations when (a) an individual pinniped is repeatedly involved in a conflict situation, such as an individual sea lion that regularly interferes with fishing operations, repeatedly raids bait barges or fish pens, or frequently blocks access to a marina; and (b) non-lethal deterrents that have been applied to the individual pinniped have not been effective. Two types of pinniped behavior would indicate ineffective use of non-lethal deterrence, which are characterized in the following examples: (1) a sea lion *or* seal is on a dock and does not leave when non-lethal measures are attempted and (2) an individual pinniped reacts to deterrence measures by leaving a dock and returns repeatedly after the person who has used the deterrence has left the immediate site. Under this authorization, the use of non-lethal methods would be required at the outset, and would be the primary method of response. This authorization would allow state and federal resource agencies to more effectively resolve specific pinniped conflict situations where pinnipeds may not respond to non-lethal deterrents.

B. Develop Safe, Effective Non-lethal Deterrents

Effective non-lethal deterrence methods may be the key to resolution of many conflicts involving humans, pinnipeds, and other marine resources on the West Coast. California sea lions and Pacific harbor seals have demonstrated a remarkable ability to adapt to, avoid or circumvent most types of non-lethal deterrents. Where that is true, lethal removal remains the only effective alternative until satisfactory deterrence measures are developed. Satisfactory deterrence methods are those that would be effective in resolving the immediate conflict and would not have detrimental incidental effects.

In order to provide a broader array of options than lethal removal, there is a pressing need for research on the development and evaluation of deterrent devices and further exploration of other non-lethal removal measures such as the use of emetics for behavior modification. All potential options need to be evaluated in a concerted, adequately funded effort to address this issue. Impediments to testing non-lethal deterrent technologies need to be removed. Because there is a shortage of expertise in deterrence technologies within NMFS due to continuing research needs for stock assessments, other development alternatives (e.g., external grant programs) need to be considered. Research and development of pinniped deterrence methods should be a research priority for addressing expanding pinniped populations on the West Coast. Investigating innovative new techniques will require adequate funding.

C. Selectively Reinstate Authority for the Intentional Lethal Taking of California Sea Lions and Pacific Harbor Seals by Commercial Fishers to Protect Gear and Catch

Congress should reconsider authorizing the use of intentional lethal taking of California sea lions and Pacific harbor seals until such time that effective non-lethal methods are developed for their specific situation. Prior to the 1994 Amendments to the MMPA, commercial fishers were allowed

to kill certain pinnipeds as a last resort in order to protect their gear or catch. Although the 1995 NMFS legislative proposal recognized that there was a need for such authority in certain situations, this authority was not included in the 1994 Amendments to the MMPA. It was replaced with authority to use deterrence measures that do not kill or seriously injure marine mammals. Non-lethal authority has proven to be of little use because no effective long-term deterrence methods are known. Conflicts between fishers and pinnipeds have become more frequent, and the economic losses due to pinnipeds have increased. This has also placed increased pressure on federal and state resource agencies to take action to resolve the problems. 562

These authorizations should be based on a demonstrated need, and be limited to specified areas and fisheries. Fishers who receive such authorizations should be trained, or demonstrate the ability, to distinguish among California sea lions, Pacific harbor seals, and *other* pinniped species that may be in the area, to prevent accidental takes of other pinniped species. From a biological perspective, the limited return of lethal deterrence should not be a problem for either California sea lion or Pacific harbor seal populations. The lethal removals that were authorized prior to 1994 did not prevent either population from increasing at five to eight percent per year. Similarly, a limited restoration of this authority would not be expected to adversely affect the continued growth of either population, because it would affect only those individuals that have learned to target commercial fishing operations as an easy source of food. Reporting such takes would be required, and the PBR approach used for incidental taking under Section 118 would be used to limit all removals to biologically sustainable levels.

D. Information Needs

Although there is sufficient information to warrant action to remove pinnipeds from areas where they co-exist with and prey on salmonid populations of concern, there is an array of additional information needed to evaluate and monitor California sea lion and Pacific harbor seal impacts on salmonids and other components of the West Coast ecosystems. These information needs include:

- Conducting site-specific investigations on pinniped predation impacts on various salmonid populations. This would include quantifying composition of the diet and food habits requirements, based on age/sex class information appropriate for the area of concern, and considering site-specific predator abundance temporally and spatially.

- Conducting state-by-state and river-by-river investigations on salmonid populations that are vulnerable to pinniped predation.

- Conducting studies of comparative skeletal anatomies of different salmonid species, so that specific prey species may be identified in food habits studies using scat and gastrointestinal tract analyses.

- Conducting research on site-specific seasonal abundance and distribution of California sea lions and Pacific harbor seals north of Point Conception.

- Conducting research to assess and evaluate potential impacts of pirmipeds on specific fisheries and fishing areas.

- Conducting socioeconomic studies on impacts of pinnipeds on various commercial and recreational fisheries.

- Conducting ecosystem research where the impacts of pinniped predation on non-salmonid resources can be addressed, beginning with small systems such as Puget Sound and expanding those studies to larger West Coast ecosystems,

- Collecting unbiased samples for food habit studies. This may require the direct lethal collection of pinnipeds for analysis of stomach contents.

Research in the above areas is needed, but completion of such research should not be viewed as a prerequisite to undertaking necessary actions and recommendations to address existing pinniped conflict situations identified in this report.

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APPENDIX

Summary of Public Comments and Responses

A draft of this report was made available to the public for comment for 90 days. Notice of availability of the draft report along with the supporting Scientific Investigation Report was published in the *Federal Register* (62 FR 14889) on March 28, 1997 and the public comment period closed on June 26, 1997. NMFS also issued a press release on March 28, 1997, announcing the availability of these reports. Copies of the draft report were distributed widely to encourage public review and comment. Over 300 letters with comments on the report were received. In addition, over 3,000 postcards (all with the same comment) were received.

Comment 1. The report does not fully discuss the extent to which salmon habitat degradation and loss, restricted fish passage, and overfishing have contributed to declines in salmonid populations and what is being done to address these other factors.

Response. The effects of habitat degradation, restricted fish passage, and overfishing on salmonids are well documented in the scientific literature and other NMFS documents relative to ESA listings of salmon and consultations under Section 7 of the ESA. These documents, in addition to habitat conservation plans prepared under Section 10 of the ESA, include many of the salmon conservation and recovery efforts underway to recovery salmonid populations. For instance, there are numerous federal, state and local efforts underway to restore, improve and protect salmon habitat, to improve fish passage through barriers, and to prevent harvests of weak stocks of salmon. These efforts are also well documented in State conservation plans, forestry plans, fishery management plans, and basin specific plans such as those prepared for the Columbia River basin by the Northwest Power Planning Council. Inclusion of all of the salmon recovery and conservation efforts currently underway would expand the length of this report many-fold and detract from the Congressionally-mandated scope of this report which is to specifically address pinniped impacts on declining salmonid populations. Nonetheless, the recommendations were modified to emphasize that recovery efforts addressing factors other than pinniped predation would be considered in management actions.

Comment 2. Pinnipeds and salmon have co-existed for hundreds of years, and lethal removal of pinnipeds from river mouths is not warranted. Habitat degradation and loss, logging, water diversion, overfishing, coastal development and over-population of people are the causes for salmon decline, not pinniped predation.

Response. NMFS agrees that pinnipeds were not a major factor in the coastwide salmonid population declines on the West Coast. However, now that some salmon populations are depressed and listed under the ESA, pinnipeds can affect recovery and can cause the further decline of small salmonid populations in certain situations. The potential for pinniped impacts on salmon also is now greater than the past because pinniped populations have increased to historically high levels and their ranges have expanded. Habitat alterations, which have affected natural river flow patterns and

impeded or modified fish passage inriver, also may have contributed to improving pinniped foraging efficiency, thereby further increasing the potential for pinniped impacts on salmonids.

Comment 3. The problems with pinnipeds do not justify a coastwide pinniped cull program.

Response. The recommendation would not establish a coastwide culling program. The recommendation is to establish a framework to authorize a limited, selective removal of individual pinnipeds in certain situations such as where pinnipeds are impacting depressed salmonids that are listed, proposed for listing, or candidates for listing under the ESA. The following conditions would apply to the authority: (1) salmonid recovery or conservation plans are in place or are being developed; (2) salmonid recovery efforts on other non-pinniped factors are underway; (3) lethal removal of pinniped is consistent with such recovery/conservation plans; (4) lethal removal is limited to individual animals only at the specific sites where conflicts occur; (5) lethal removal is limited to only the period when affected salmonids are migrating through the site; (6) resource management agencies report lethal removals within 72 hours of the taking; and (7) lethal removals would not exceed the PBR level for California sea lions or harbor seals. See response below to Comment #13 for further elaboration on NMFS views on a culling program.

Comment 4. Seals and sea lions should not be intentionally killed.

Response. NMFS acknowledges that non-lethal methods are the preferred approach, but in some situations, lethal removal is the only remedial approach available to protect other resources from negative impacts from California sea lions and Pacific harbor seals. With the critically depleted status of many salmonid populations, the risk-averse approach to eliminating impacts on these populations warrants the need to kill pinnipeds in certain situations where the pinniped are adversely affecting the salmonid populations. California sea lion and Pacific harbor seal populations are robust and healthy and would not be negatively affected by the low levels of lethal removal in the recommendations. The recommendations also specify that lethal methods are to be discontinued once safe, effective, and long-term non-lethal methods are developed for the specific situations.

Comment 5. The problem with lethal taking (from a biological perspective) is not with the California sea lion or harbor seal populations, it is the potential impact of indiscriminate or inadvertent taking of other marine mammals, such as Steller sea lions (Eastern Stock) on the West Coast and southern sea otters, which are both listed as threatened under the ESA.

Response. The recommendations apply only to California sea lions and Pacific harbor seals. The prohibitions on the taking of Steller sea lions and sea otters would not change. Recommendation A, which is to "Implement Site-specific Management for California Sea Lions and Pacific Harbor Seals," applies only to state and federal resource management agency officials. There would be no indiscriminate or inadvertent lethal taking of other marine mammals under this recommendation because only those resource agency officials who are experienced and trained in identifying pinnipeds would be involved in any lethal removal of Pacific harbor seals or California sea lions. Recommendation C, which is to "Selectively Reinstate Authority for the Intentional Lethal Taking of California Sea Lions and Pacific Harbor Seals by Commercial Fishers to Protect Gear and Catch" would only apply to certain fishers in certain circumstances in designated fisheries and areas that are authorized to use lethal removal as a last resort. In the process of determining

what fishery, area and circumstances that this authority would apply, NMFS would definitely consider potential impacts on other species especially Steller sea lions and sea otters, For example, in situations where fishers may encounter both California sea lions and Steller sea lions and may not be able to distinguish each species, an authorization for lethal removal would be conditioned or not issued. 0567

Comment 6. In most cases, reduction of pinniped predation by itself will not bring about the recovery of depressed salmonid stocks. The full range of factors that have brought about the decline of salmonid stocks (and may be impeding their recovery) must be identified and addressed to achieve recovery within a reasonable time frame.

Response. NMFS agrees and has modified the recommendation accordingly. The recommendations in this report are now conditioned on salmonid conservation and recovery efforts being underway to address other factors affecting the recovery for each salmonid population where actions may be considered to remove pinnipeds. The recommendations have also been modified to specify that salmonid conservation and recovery plans must be in-place, or under development, in those systems where lethal removal of individual pinnipeds may be considered to protect and recover salmonid populations and that removal of pinnipeds is consistent with recovery/conservation plans.

Comment 7. The Scientific Investigation Report concludes that it cannot be determined if pinnipeds have had a significant negative impact on any wild salmonid population, except for California sea lion impacts on Lake Washington steelhead. With the lack of scientific substantiation, the recommendations for lethal removal are not justified or warranted.

Response. NMFS agrees that the Scientific Investigation Report concludes that it cannot be determined if pinnipeds have had a significant negative impact on any wild salmonid population on the West Coast, except for California sea lion impacts on Lake Washington steelhead. However, the Scientific Investigation Report also concludes that in areas of co-occurrence of pinnipeds and salmonids, pinniped predation on small salmonid populations, especially at areas of restricted fish passage, can have negative impacts on the recovery of depressed salmonids. The recommendations were developed to address those situations where lethal removal of a small number of pinnipeds may be necessary to complement other recovery efforts for depressed salmonid populations.

Comment 8. The conclusion that pinniped predation could have a significant impact on a number of depressed salmonid stocks no doubt is valid. However, the report provides no evidence that pinniped predation is actually impeding recovery of any depleted salmonid stocks other than the Lake Washington winter steelhead population that migrates through the Ballard Locks.

Response. This report summarizes information from the Scientific Investigation Report, which provides the scientific basis for the determination that pinniped predation can impair the recovery of ESA-listed salmonids in certain situations.

Comment 9. NMFS should evaluate and assess the level of pinniped predation on salmonids and pursue the research recommendation contained in the Scientific Investigation Report before recommending management measures.

Response. Recommending strong management measures are far less controversial when management agencies have reliable scientific information supporting them because there is less risk of management error. Such information does not exist in most instances to assess the affect of pinniped predation on salmonids. NMFS evaluated the risk to the affected populations of removing a few California sea lions or Pacific harbor seals against continued predation on critically depleted salmonid runs. As a result of that evaluation, NMFS believes that management error favoring salmonids is preferable to management error favoring the pinnipeds in certain situations. Postponing management actions until resource agencies collect sufficient information to address the conflict with scientific certainty leads to management failure (as noted in the report); therefore, the recommendation for site-specific management measures remains in the final report.

Comment 10. Salmonids do not make up an important component of the harbor seal diet.

Response. Research illustrates that California sea lions and Pacific harbor seals are opportunistic feeders, with diets consisting primarily of prey that are seasonally and locally abundant. In the Columbia and Rogue River systems, which have been studied most extensively and recently, salmon occurred in 43% to 60% of harbor seal scat samples during autumn when adult salmon are returning to spawn; in the spring, when juvenile fish are exiting the rivers as smolts, the frequency of occurrence of salmon in harbor seal scat samples ranged from 20% to 33%. In seasons when adult salmon are not entering the rivers or juveniles leaving the river, the frequency of salmon in harbor seal diets falls to zero. Similarly, in areas where California sea lions are concentrated at the mouths of rivers or in the estuaries, they can be effective predators of adult and juvenile salmon. Salmon appeared in 5% to 50% of sea lion scat or stomach samples collected in or near rivers along the West Coast, but do not occur in any of the food habits samples of males collected from large hauling grounds on islands, such as the Farallons or Año Nuevo Islands in central California. The Scientific Investigation Report noted seasonality in the occurrence of salmonids in harbor seal and sea lion food habits, and when salmon are available, they may constitute an important component of these animals' diets. However, the frequency in which salmon remains are found in sea lion or harbor seal scat samples is a poor measure of the affect on salmon runs. Where predation occurs on critically depleted salmon runs, the removal of only a relatively few returning adults may have a severe impact on the entire year class.

Comment Il. The recommendations will not improve or enhance salmonid populations, but rather will harm salmonids by diverting attention away from the major problems affecting salmon such as habitat degradation and loss.

Response. NMFS modified the recommendation so that the lethal taking of pinnipeds would be authorized only if a recovery or conservation plan for the affected salmonid stock exists or is under development. Therefore, these recommendations would not affect the aggressive position that NMFS maintains on restoring and improving salmon habitat and resolving other factors affecting salmon recovery. The recommendations would promote a comprehensive approach to salmon recovery and conservation by providing a mechanism to address pinniped predation, which also can affect salmonid recovery in certain situations.

Comment 12. Only the negative impacts of predation by pinnipeds and the negative impacts pinnipeds have on the ecosystem are described. The report should acknowledge the complexity of

the ecosystem and describe the beneficial role of pinniped predation on other fish predators (such as lamprey) as part of the larger interrelationship between pinnipeds and salmonids. Other direct benefits, such as beneficial effect of carcasses and feces as a nutrient in the ecosystem and availability as prey to larger, and possibly threatened or endangered predators, should be included in the report. 0569

Response. The purpose of this report as stipulated in the MMPA is to "address the issues and problems identified as a result of the scientific investigation, and develop recommendations to address such issues or problems." The complexity of the ecosystem and the role of pinnipeds, including beneficial aspects, are included in the Scientific Investigation Report; however, the focus of this report is on the problems identified from the Scientific Investigation Report with pinniped impacts on salmonids and the ecosystem and, therefore, is consistent with the pertinent mandate in the MMPA.

Comment 13. Current pinniped population levels are causing significant damage to, and prohibiting the recovery of, salmon and marine species that have previously been reduced by a variety of impacts. Pinniped population levels should be reduced, at least temporarily. This will allow these species to continue to be viable components of a functioning ecosystem and would allow growth of pinniped populations as salmon and other species rebuild. Many West Coast salmonid stocks are depressed and could benefit from reduced pinniped populations.

Response. The recommendations would apply only to removal of individual pinnipeds at specific sites where conflicts occur. The recommendation is not to reduce the overall abundance of pinniped populations; the selective taking would be limited and capped below the potential biological removal (PBR) level for each species so that the MMPA goal for achieving optimum sustainable population (OSP) levels for all marine mammal populations could be met. Pinniped population reduction or culling programs are not an appropriate means of addressing the site-specific pinniped problems *that* are identified in this report because a culling program may not remove the individual animal or animals that are causing the problems.

Comment 14. The application of the concept of OSP for California sea lions and Pacific harbor seals has failed to adequately consider the other impacts to the ecosystem, as required by the MMPA. This is due to the variability of the populations themselves, and also the NMFS desire to allow the populations to expand to levels beyond carrying capacity to better define the population curve. Unfortunately, this population level causes significant damage to other components of the ecosystem prior to being able to quantify OSP.

Response. The concept of OSP is fundamental to the MMPA, and these recommendations would not change that, The MMPA states that OSP determinations must keep in mind the carrying capacity of the habitat and the health and stability of marine ecosystems, and it also states that management decisions must be made on the best available scientific information. As stated in the Scientific Investigation Report, scientific information related to pinniped effects on the ecosystem has not been collected and analyzed; therefore, NMFS cannot adequately consider such impacts. The recommendations are a means to address the ecosystem objective in the MMPA, but they are limited to addressing the specific problems identified as a result of the scientific investigation requested by Congress. The recommendations would address these specific situations without changing the OSP

goal in the MMPA. See response above to Comment #13 regarding the limits on taking and population reduction.

Comment 15. Marine mammal populations are an important part of the West Coast wildlife heritage, however management responsibilities include the responsibility to control those parts of wildlife population which are in conflict with other parts of an ecological system. The protections for pinnipeds under the MMPA have created an imbalance which benefits pinnipeds but is costly to other species.

Response. The recommendations were developed with the intent to balance the maintenance of sustainable pinniped populations while allowing actions to be taken to remove pinnipeds where they impact the viability of other components of the ecosystem. NMFS recognizes that various constituents disagree on the use of lethal methods to address human/pinniped conflict, and this disagreement is intensified by highly polarized viewpoints among constituencies, the lack of a consistent, unifying federal policy on natural resource use or non-use, and the lack of clear acceptance on the role of human activity (commercial and recreational) in marine ecosystems. The MMPA favors protection of marine mammals, and these recommendations would continue such protections; however, the recommended course of actions would allow more flexible management actions that would not affect the ability of marine mammal stocks to achieve and maintain OSP levels.

Comment 16. California sea lions and Pacific harbor seals are over-populated and must be substantially reduced to allow for recovery of threatened and endangered species. Pinniped populations need to be brought in line with other components of the ecosystem. NMFS should start a program of eliminating the over-population of pinnipeds.

Rksponse. The concept of over-abundant populations is not clearly understood on either the scientific or management levels. The scientific literature contains many references to this concept, and over-abundance has been categorized according to the level of impact the affected population of animals is having with human activity or other components of the affected ecosystem; these categories include situations in which some animals conflict with human life and livelihood to situations in which one populations causes a permanent change in an ecosystem. California sea lion and Pacific harbor seal populations have not been conclusively determined to have reached or exceeded the carrying capacity of the ecosystem, which is the upper end of the OSP range for marine mammals. Preliminary analyses of more recent data indicate that the coastal Pacific harbor seal populations in Washington and Oregon may be at OSP; further analysis and report preparation for peer review is currently underway. The MMPA does have provisions for waiver of the moratorium on taking if a marine mammals population has been demonstrated to be at or above OSP. Furthermore, a population reduction program would not resolve site-specific problems (see responses to Comment #'s 13 and 14).

Comment 17. Not all pinniped stocks are increasing along the West Coast and weakening the protections currently contained in the MMPA may seriously impact these populations.

Response. Ten pinniped populations occur off Washington, Oregon and California. Their status, as reported in the most recent NMFS Stock Assessment Report, is as follows:

Steller sea lion, eastern stock	Population size: 23,900 Status: increasing trend since the 1970's; listed at threatened
Northern elephant seal, CA breeding stock	Population size: 84,000 Status: 8% annual increase
Northern fur seal, eastern Pacific stock	Population size: 1,019,192 Status: stable, had decreased to depleted levels in mid-1970s to early 1980s
Northern fix seal, San Miguel Island stock	Population size: 10,536 Status: about 8% annual increase, 1965-1996
Guadalupe fur seal	Population size: 7,408 Status: 13.7% annual increase, mid-1970's-1993; listed as threatened
California sea lion, U.S. stock	Population size: 167,000-188,000 Status: about 5% annual increase, 1975-1995
Harbor seal, California stock	Population size: 30,293 Status: 3.5% realized rate of increase, 1982-1995
Harbor seal, WA/OR coastal stock	Population size: 27,131 Status: 7.7% annual increase, 1978-1993
Harbor seal, WA Inland Waters	Population size: 16,253 Status: increasing annually

0571

However, the recommendations only apply to the California sea lion and Pacific harbor seal stocks. As described in the response above to Comment #5, the implementation of these recommendations are conditioned to ensure other pinniped populations would not be affected.

Comment *18*. The recommendations appear to consider only the motives, interests, and values of PSMFC and fishing interests. Both consumptive and non-consumptive values and impacts must be recognized when maintaining the ecosystem. The report should address non-consumptive values.

Response. The MMPA required that NMFS develop the recommendations in conjunction with PSMFC on behalf of the three West Coast States. The state resource agencies, which form the PSMFC, are responsible for the preservation of natural resources and consideration of non-consumptive views of the public, and this played a significant role in the development of the recommendations. It should be noted that the recommendations retain the OSP goal of the MMPA, and this concept is not fully supported by fishing interests. It should also be noted that some fishing interests advocated a population reduction program, which also is not included in the recommendation. The recommendations provide a balance between maintaining viable populations of pinnipeds while addressing the conflicts associated with California sea lions and Pacific harbor seals.

Comment 19. The Scientific Investigation Report and the Draft Report to Congress were prepared in violation of the Federal Advisory Committee Act (FACA), portions of the Report constitute an unlawful lobbying effort, and portions of the report exceed the mandates of Congress. Congress

itself violates FACA because the legislation mandates meetings between NMFS and PSMFC without fair representation of differing points of view, i.e., conservation groups were excluded. The working group that prepared the Scientific Investigation Report included officers of three different states and the PSMFC, and meets the FACA definition of a federal advisory committee. Therefore, the committee was required to follow the mandates of FACA which include advance public notice and open meetings. The meetings with PSMFC to discuss the results of the scientific investigation also violate FACA because 1) no conservation groups were represented in the discussions, and 2) the States of California, Oregon, and Washington participated in the discussions in spite of the Congressional mandate that NMFS meet with PSMFC on *behalf of* the States. 0572

Response. The Working Group that prepared the Scientific Investigation Report was a technical committee consisting of experts in the field of West Coast pinnipeds and pinniped interactions with salmonids and the ecosystem, and the group compiled existing information and completed analyses rather than providing advice or recommendations to the government. FACA does not apply to such meetings. The meetings with the PSMFC to develop the report, which does include recommendations, were in accordance with the MMPA mandate and included state representatives to enhance and expedite the PSMFC role in acting on the behalf of the States. The meetings among NMFS, state resource management officials, and officials of PSMFC, which is an interstate compact that operates as a state agency, falls under the exception to the FACA established in the Unfunded Mandates Act; therefore, the discussions were not open to the public. NMFS believed, however, that the public should have full opportunity to express its views on recommendations that could be considered controversial, and the long period for public review and comment provided such an opportunity.

Comment 20. The recommendations for lethal removal will undermine the other recommendations for developing safe and effective non-lethal deterrents and responding to information needs. It is unlikely that lethal methods would be discontinued once safe, effective, and long term non-lethal methods are developed. There would be virtually no incentive to develop these alternatives if killing animals is allowed.

Response. The need to conduct research on the development of effective non-lethal deterrents is a common thread throughout the recommendations. Recommendations for use of lethal removal are conditioned with initial use of non-lethal methods in all cases except where ESA listed salmonids are involved, and state or federal authorities determine the need to immediately lethally remove individual pinnipeds. The recommendations specify that lethal removal authority would cease when effective non-lethal deterrents are available.

Comment 21. Other sensitive species, such as Steller sea lions may be impacted by a resumption of lethal taking in fisheries, because fishers are unlikely to distinguish between the sea lion species.

Response. As described in the response above to Comment #5, the implementation of these recommendations are conditioned to ensure other pinnipeds are not affected.

Comment 22. Documentation on the significance of economic impacts to commercial and recreational fisheries and on the trend of such impacts should be provided before allowing the resumption of lethal taking for protection of gear and catch.

Response. A description of economic impacts from limited studies on some fisheries are presented in the Scientific Investigation Report. The recommendations would require that intentional lethal take of California sea lions or harbor seals be based on a "demonstrated need" by each fishery that requests this authority.

Comment 23. Component one of the framework should be modified to allow more flexibility. The phrase "such as locations where salmonid passage is restricted or impeded" should be deleted because even undisturbed estuaries and lower river stretches create situations conducive to high predation.

Response. The phrase describes an example of situations where salmonids are more vulnerable to pinniped predation and is not intended as a restriction on application.

Comment 24. Given the abundant and growing pinniped population, the risk-averse course is to remove individual salmon-eating pinnipeds in the vicinity of depleted and/or declining salmon runs.

Response. NMFS agrees, and the recommendations were designed as a risk-averse approach to resource management.

Comment 25. The fact that pinnipeds are at historically high population levels coupled with the fact that some salmon populations are at very low levels, makes pinniped predation a high priority issue. To ignore the known negative impacts of increasing sea lion and harbor seals is unacceptable. While it is true that more research is necessary to scientifically assess the magnitude of that negative impact, it is also necessary to provide legislative authorization for immediate action in certain situations. This legislative authority is one critical component to the success of the Oregon Coastal Salmon Restoration Initiative.

Response. The recommendations do address the need for resource agencies to have authority to take immediate action in situations where pinnipeds are impacting depressed salmonids so long as there is a salmonid conservation or recovery plan (such as the Oregon Plan) in place to address other factors affecting salmonids in the system.

Comment 26. Since site-specific investigations on pinniped predation impacts are long-term and expensive, they should be structured to apply to a broad category of similar sites. Variability of diets throughout a complete year at a single site(s) is necessary to determine impacts not only on salmonids, but also on marine species of concern.

Response. NMFS agrees, and this would be addressed when studies- are designed.

Comment 27. The issues and language contained in the report represent a consensus of the concerns and needs expressed by the respective agencies and provide reasonable management options for dealing with and resolving these concerns. As such, there is strong support for the recommendations as written in the report and NMFS should submit the report as written to Congress as a final report.

Response. Change to the recommendations include modifying Recommendation A to specify that salmonid conservation and recovery efforts must be in place, or under development, that other salmon recovery efforts are underway, and that lethal removal of individual pinnipeds will be consistent with such plans in those watersheds where pinnipeds and salmonids co-occur. 0574

Comment 28. The actions taken at the Ballard Locks, while they did offer some relief, were costly and cumbersome. And many sea lions simply moved to other areas, causing similar problems elsewhere, Therefore, state and federal agencies need more effective authority for dealing with interaction problems.

Response. The recommendations would provide a more streamlined process that allows immediate action by resource agencies in certain situations to remove California sea lions or harbor seals causing impacts on depressed salmonids.

Comment 29. Only a few individual seals or sea lions are responsible for the predation at any given location, meaning that only those individuals actually preying on salmon at a particular location should be removed.

Response. NMFS agrees, and several studies cited in the Scientific Investigation Report support this observation.

Comment 30. NMFS should modify the Potential Biological Removal (PBR) process to allocate lethal removals for management purposes. Resource management agencies could then respond to situations of concern in a timely and efficient manner. Resource agencies would have the ability to take actions and, due to the inherent conservative nature of the PBR process, continue to ensure that the goals and objectives of the MMPA would still be met.

Response. The recommendations would require that lethal taking be within the PBR, but do not propose any type of allocation of the PBR for this and other purposes.

Comment 31. NMFS should give total ownership of the seals and sea lions to the states, giving control for lethal removal of pinnipeds to the states.

Response. Although the MMPA includes a provision for transfer of management authority to the states of those species at OSP, the MMPA does not provide for a transfer of ownership of marine mammals. The recommendations do not affect the MMPA procedures for transfer of management authority to the states for species at OSP.

Comment 32. Treaty Indian tribes in Washington and Oregon are co-managers of treaty resources and as such should be afforded recognition in the recommendations section.

Response. Consistent with administration policy, the Department of Commerce recognizes the unique status of treaty Indian tribes. NMFS is committed to implementing Departmental policy regarding treaty Indian tribes. Although not specifically stated in the recommendations of this report, NMFS will involve tribes and seek tribal input at the'appropriate level on policies, rules, programs, and issues that may affect a tribe.

Comment 33. In most situations where agencies may have to deal with pinniped predation on salmonid runs of concern, the existing Section 120 process is unworkable. This was demonstrated when the Section 120 process was used to protect the winter steelhead run from California sea lion predation. Reasonable methods are needed to deal with pinniped predation to recover salmonid runs, particularly when runs are small and every fish is important to the rebuilding process.

Response. The recommendations are to establish a framework that would allow resource agencies to deal quickly with pinniped conflicts where salmonid resources are severely depleted; it would not require completion of the process required by Section 120 for each situation.

Comment 34. The report clearly recognizes the need for site-specific management of pinnipeds from healthy and abundant populations that are preying on threatened, endangered, or otherwise depressed fish stocks. The ability to take rapid and effective action to remove predators at sites where fish passage is restricted by natural barriers, falls, fish ladders, and other structures may be essential to the successful recovery of many salmonid populations. Rapid removal of a small number of animals could reduce the loss of many fish and may prevent the escalation of minor problems to major resource conflicts.

Response. NMFS agrees.

Comment 35. The MMPA currently has provisions to allow mortalities of California sea lions and Pacific harbor seals associated with a variety of human activities (e.g. commercial fishing, subsistence harvest, etc.), while still ensuring that their populations remain within the goals of the MMPA. A similar provision for limited takes by federal and state resource management agencies to protect at-risk salmonid stocks would in no way approach the levels currently authorized under the NMFS Potential Biological Removal process.

Response. Due to the relatively low level of incidental mortality and serious injury of California sea lions and harbor seals in commercial fishing operations and other sources of human-caused removal, NMFS does not anticipate that the potential level of removal under the recommendations would ever approach the PBR levels for these pinniped populations. The recommendations require that pinniped removal authority be under the current PBR process.

Comment 36. Until effective nonlethal removal techniques are developed, it is necessary to allow fishers in certain circumstances to prevent economic loss due to pinniped interactions, as long as all removals are restricted to biologically "safe" levels under the MMPA.

Response. This opinion is consistent with the recommendations.

Comment 3 7. Additional resources and effort should be invested to develop effective non-lethal options to deter or discourage problem animals involved in fisheries interactions. *This* includes continued work on acoustic alarms or "pingers" to warn marine mammals of fish gear to reduce incidental takes, as well as developing other non-lethal deterrence methods that actually work to protect gear and catch. The development of safe, non-lethal deterrents is most important in the short term, until the MMPA is amended to allow more active management of the increasing pinniped populations.

Response. NMFS agrees.

Comment 38. Development of a device that allows the sportfishing fleet to deter pinnipeds should be a top priority. 0576

Response. NMFS recommended development of effective non-lethal deterrence devices that may be applicable in many situations.

Comment 39. Federal grant money should be made available for research on the development of non-lethal deterrent technologies to resolve resource conflicts involving pinnipeds on the West Coast, since expanding pinniped populations have demonstrated the ability to adapt to, avoid, or circumvent existing non-lethal deterrent techniques.

Response. When specific funding for research grants for this purpose is appropriated, NMFS will work actively with the scientific and technical communities to request research proposals. Results of past efforts with non-lethal deterrents will be used to guide the development of effective non-lethal technologies. In addition NMFS has made such topics a priority in existing competitive , grants programs.

Comment 40. The need to collect sufficient information on the impact of pinniped predation is urgent. Congress should identify funding to be made available to the states to assist in the collection of up-to-date data on interactions between pinnipeds and salmonid stocks and on the significant interactions between pinnipeds and recreational and commercial fisheries.

Response. Federal funding is being provided to the states in FY98 to begin addressing the information needs identified in this report.

Comment 41. Lack of federal funding and current policy implementation of the MMPA has not been effective in the management of predatory pinnipeds. Congress must streamline the process in which the taking of harbor seals and California sea lions is authorized for fisheries conservation purposes.

Response. The framework in Recommendation A would streamline the process for state and federal resource agencies to take actions where necessary for salmonid conservation and recovery and to address other resource conflicts,

Comment 42. Congress should enact the recommendation to selectively reinstate authority for intentional lethal taking of California sea lions and Pacific harbor seals by commercial fishers to protect gear and catch. Until effective nonlethal techniques are developed, it is necessary to allow fishers in certain circumstances to prevent economic loss due to pinniped interactions as long as all removals are restricted to biologically safe levels under the MMPA.

Response. This comment is consistent with the recommendations.

Comment 43. The definition of commercial fisheries should be expanded to include charterboat captains and bait business owners.

Response. Charterboat and bait operations are included in the current List of Fisheries under the MMPA.

Comment 44. California's salmon trollers are being forced to fish 20-30 miles offshore to avoid sea lions which puts fishers at a greater risk due to weather and sea conditions.

Response. The recommendations would allow fishers in certain selected fisheries to use lethal means as a last resort to deter California sea lions and Pacific harbor seals; however, this authority was available to California salmon troll fishers prior to 1994, and it may not affect the incidence of nearshore interactions with sea lions. The recommendations do not propose to reduce the sea lion populations.

Comment 4.5. Conflicts among existing federal statutes (ESA, MMPA, Magnuson-Stevens Fishery Conservation and Management Act) are apparent when issues of resource conservation are raised. Integrating legislative policy is needed to provide clear direction and authority for those who are charged with addressing the salmonid-pinniped interaction problems.

Response. The need to address apparent legislative conflicts is included in this report.

Comment 46. Because of the difficulty of making observations, it will very often be impractical to clearly document the effects of predation or the effectiveness of removals. Even under nearly ideal conditions, documentation of effects at the Ballard Locks cost well over $1 million (possibly as much as $3 million) and took more than a decade. There is neither time nor money enough to completely document each situation where pinniped predation may be significantly affecting depleted salmon runs.

Response. NMFS agrees.

Comment 47. The recommendations overlook promising solutions to fish passage problems in lieu of scapegoating pinnipeds. The recommendations should be modified to focus on making artificial structures and habitats more fish friendly to reduce human-induced salmonid vulnerability to pinniped predation.

Response. The recommendations for lethal removal of pinnipeds at specific sites where pinnipeds may impact ESA salmonids are intended to complement other recovery efforts. Recovery of salmonid populations will require that fish passage or other factors affecting conservation and recovery of depressed salmonids be addressed.

Comment 48. Any lethal removal proposal will be reactive, temporary, and ineffective because it will not address the more significant problems of pollution, recreational and commercial fishing, and natural population fluxes. In addition, we do not understand the predator/prey relationship in the context of these factors.

Response. The recommendations for lethal removal of pinnipeds at specific sites where pinnipeds may impact ESA salmonids are intended to complement other recovery efforts and are not intended as the sole means for addressing salmonid recovery. Given the size and continuing increase

of pinniped populations, the small number of pinnipeds that might be removed would not be at high enough levels to cause any changes in the ecosystem. 0578

Comment 49. The report should recommend that Congress provide authorization to take such steps as may be needed to reduce pinniped predation when: (1) the proposed action is part of a comprehensive plan to restore one or more specified salmonid stocks; (2) the plan has been made available for public review and has been approved by NMFS; and (3) there is adequate monitoring to determine whether the steps taken are in fact contributing to the recovery of salmonid stocks.

Response. The recommendations were modified to specify that a salmon conservation or recovery plan is in place or in development. The plan should include address all factors affecting recovery including pinniped predation. Such plans have been made available for public comment (e.g., Oregon plan, draft Recovery plans). As stipulated in the recommendations, any taking would have to be reported to NMFS and would be considered in evaluation of recovery efforts.

Comment 50. The report does not describe what has been done to implement MMPA Section 101 (a)(4) which authorizes non-lethal, non-injurious deterrence of pinnipeds by members of the public and agency officials for the protection of property or fishing gear. Since the Report recommends that government officials and fishers be authorized to kill pinnipeds to protect property, fishing gear, and catch, this suggests that NMFS has determined that non-lethal deterrents are unlikely to be effective or too costly to implement.

Response. Government officials and commercial fisheries had authority to use non-lethal measures to deter marine mammals prior to the MMPA Amendments of 1994. The provisions of Section 101 (a)(4) extended this type of authority to the general public. NMFS' recommendation to use lethal means to control property damage was based largely upon NMFS experience over many years prior to 1994 with non-lethal deterrence at the Ballard Locks, attempts at other sites along the West Coast to resolve conflict with nuisance pinnipeds, and from repeated complaints from fishers attempting to use non-lethal means to protect their gear and catch. NMFS and state officials (as indicated in discussions leading to this report) believe that current non-lethal deterrence technologies will not solve pinniped conflicts in every situation. Therefore, the recommendations in this report acknowledge NMFS' 1992 proposal that situations will arise in which lethal deterrence may be necessary and that Congress should reconsider the prohibition on lethal deterrence in commercial fisheries.

Comment 51. The recommendation to authorize lethal removals by commercial fishers should be deferred until it can be shown with certainty that pinniped problems cannot be addressed effectively using practical, non-lethal means.

Response. The recommendation to selectively reinstate lethal authority would require a demonstration by the fisher that lethal removal is necessary. The authorization would be issued only in those situations where available non-lethal measures are not totally effective. NMFS, however, has clarified the recommendation that Congress reconsider the NMFS proposal of 1992. NMFS believes that such reconsideration would include an open debate in which the various view-points on this controversial topic would be aired.

Comment 52. Research and implementation of viable non-lethal deterrence measures, such as those made by the Pinniped-Fishery Interaction Task Force on the sea lion-steelhead conflict at the Ballard Locks and others, are being ignored and rejected by NMFS and state resource agencies. 0579

Response. The utility and effectiveness of non-lethal measures used or considered for use at the Ballard Locks and other sites were reviewed in the Scientific Investigation Report and provided the basis for Recommendation B to develop safe, effective non-lethal deterrents. The need for research on non-lethal measures is not rejected or ignored; rather, the report supports the need for further research.

Comment 53. Pinnipeds should be kept off docks by constructing railings and providing other, more desirable places to haul-out. Those who own boats and berth them in public and private facilities would likely be willing to pay a little more to protect their investments in a non-lethal manner.

Response. Marina and dock owners currently are encouraged to keep pinniped off docks non-lethally to avoid further conflicts with the, pinnipeds.

Comment 54. Fish farmers should install anti-predator nets and devices to keep pinnipeds away instead of killing animals.

Response. A number of salmon net pen facilities on the West Coast utilize predator nets, acoustic devices and other non-lethal measures to repel pinnipeds. The recommendation for selective reinstatement of lethal authority requires use of non-lethal measures before lethal taking as a last resort.

Comment 5.5. The report makes a scientifically unsubstantiated leap in recommending management actions for pinniped species. The Scientific Investigation Report recommends additional research to close identified data gaps rather than proposing that management actions be taken.

Response. The Scientific Investigation Report documents the potential negative effects that pinnipeds can have on salmonids at areas of co-occurrence. The Report does recommend further research to determine the specific levels of impacts in various systems, but not at the risk of adversely affecting ESA-listed salmonids. The management measures recommended take a risk-averse approach by allowing lethal removal of individuals in pinniped populations that. have been increasing for many years.

Comment 56. The report mischaracterizes the current understanding of pinniped interactions and the effectiveness of existing deterrent devices and efforts.

Response. The report summarizes information from the Scientific Investigation Report, which documents the best available scientific information on pinniped interactions and the effectiveness of existing deterrent technologies to reduce them.

Comment 57. Additional restrictions on commercial and recreational fisheries, removing barriers to fish passage, and restoring spawning habitat to conserve biodiversity should be considered instead

of penalizing seals and sea lions for eating salmon. Habitat degradation is the single most likely cause for salmon stock declines, not sea lion predation, Until NMFS has effectively addressed human causes of salmonid declines, or until salmonid stocks are threatened with extinction by sea lion predation, there is not adequate basis for the proposed lethal removal measures. 05580

Response. Successful recovery of salmonid populations requires that all factors affecting recovery, including pinniped predation, must be addressed. The recommended measures to control pinniped predation in certain situations where salmonids are at-risk will complement efforts to resolve human-caused and other factors for the decline of salmonid populations. See response to Comment #1.

Comment 58. There appears to have been no consideration given to the possibility that some pinniped problems may be caused by social facilitation (i.e., animals that have learned that certain *areas are* particularly good for finding and catching prey at certain times of the year attract other animals to those areas). Keeping animals out of such areas or removing the first "problem" animals before they attract others may reduce the number of animals that eventually would have to be killed.

Response. Although not specifically mentioned in the report, "problem" animals serving to attract naive animals was a subject of the discussions in developing the recommendations. Problem animals serving as an attractant was also noted in the 1996 EA prepared by NMFS in conjunction with the authorization for lethally taking California sea lions at Ballard Locks. NMFS expects that these types of problems would be addressed by the recommendations.

Comment 59. The report does not provide any substantiating data to support the statement that "as the number of pinnipeds increase, the likelihood of more pinnipeds discovering these [predation] situations increases, as does the opportunity to pass on such learned behavior to other pinnipeds."

Response. Pinniped-salmonid conflicts at the Ballard Locks, Willamette Falls and other sites were found to have begun after the numbers of sea lions migrating into the Northwest increased. At the Ballard Locks, for example, the occurrence of sea lions was rarely observed until the early 1980s when the seasonal sea lion population increased in Puget Sound. Studies conducted at the Ballard. Locks on the California sea lion-steelhead conflict indicate that predation at this site in spite of deterrence appears to be a "learned" behavior.

Comment 60. Pinniped issues should not be viewed solely from the perspective that pinnipeds are competing for fisheries resources and therefore must be "managed" to ensure optimized economic yield for fisheries. NMFS should reevaluate the fishery management allocation system and consider providing an allocation to predators whose survival is more inextricably linked to that fishery resource.

Response. The recommendations are based on an ecosystem view that provides for the MMPA goal of achieving and maintaining OSP for all marine mammals. Management of pinnipeds becomes appropriate for consideration when resource conflicts involving a few individual animals can be resolved by removing the involved pinnipeds. The recommendations are not for a pinniped population reduction program to benefit fisheries. In regard to fisheries management, predator

(mammals, seabirds, other fish, etc.) removals of fish species are included in stock assessments as natural mortality.

Comment 61. Interaction problems including health and safety concerns and damage to gear and catch were resolved by the 1994 MMPA Amendments which provided greater flexibility for dealing with these problems without the necessity for lethal removal. NMFS should continue to use the existing authorizations in the MMPA, such as Section 120, until significant impacts by pirmipeds can be demonstrated, and prohibitions on intentional shooting marine mammals should be strictly enforced.

Response. The 1994 Amendments to the MMPA prohibited the intentional lethal taking of pinnipeds interacting with commercial fishing operations; the non-lethal measures used by fishers were not affected. Discussions among NMFS, PSMFC and state representatives included the provisions of Section 120 and their implementation at Ballard Locks. In those discussions, participants stated that the process was too complex and extensive to be effective in the most critical situations.

Comment 62. The first trial of the Section 120 authorization process (the Ballard Locks sea lion-steelhead interaction) is an insufficient basis upon which to recommend that Congress amend this process and create a blanket authorization to the States for lethal removal authority. This one trial does not justify characterizing the Section 120 process as cumbersome and restrictive. The Section 120 authorization process provides both the flexibility to conserve salmonid stocks while requiring the necessary burden of proof the pinnipeds are indeed having a significant negative impact on the decline or recovery of salmonid fishery stocks. NMFS and the West Coast states should work with the conservation community to reevaluate the process and develop means, that do not involve changing the law, to make Section 120 more responsive and effective.

Response. The Section 120 process was designed to address the situation at the Ballard Locks (i.e., the Ballard Locks are directly cited in the law). In spite of over 10 years of data and observations on the affects on the steelhead population by a few sea lions, a number of groups have disagreed that the data are sufficient to demonstrate that sea lions are having significant negative impacts on the status and recovery of steelhead and have litigated. The State of Washington, as the applicant and recipient of the authority, found the process to be cumbersome and unnecessarily restrictive. The recommendations are designed to provide a more streamlined process that would allow immediate authority for resource agencies to take action where necessary.

Comment 63. The report does not correctly describe the intent or usefulness of Section 120 to effectively conserve salmonid populations. First, the provisions of Section 120 were specifically included in the MMPA in recognition of the importance of conserving salmonid populations. Second, the provisions do not require perfect or largely unobtainable information as evidenced by the fact that information provided in the Ballard Locks situation was sufficient for NMFS to authorize lethal removal in that instance. Thirdly, Section 120 is precautionary and does not require that salmonid populations be driven to an ESA listing before action can be taken.

Response. The Section 120 process requires a finding that individually identifiable pinnipeds are having a significant negative impact on the status or recovery of a salmonid population that is

listed as threatened or endangered under the ESA, or approaching such status, or that migrate through the Ballard Locks. As illustrated by the process for the Section 120 authorization issued for sea lions at the Ballard Locks, a large body of data collected over a number of years, including considerable effort identifying individual pinnipeds and a substantial monitoring program, may be needed to support an appropriate finding under Section 120.

Comment 64. State and federal resource managers have broad authority pertaining to lethal and non-lethal removal of nuisance animals. The MMPA allows lethal removal of nuisance animals for human health and welfare concerns. Neither NMFS nor state agencies are in need of additional authority under the MMPA.

Response. The MMPA does not provide for the lethal removal of nuisance animals and currently does not provide sufficient authority for resource agencies to respond quickly to resource conflicts, which may involve immediate action to protect ESA-listed species.

Comment 65. The proposed. action would eliminate the safeguards contained in the MMPA by eliminating the evidence needed to prove that a lethal take will actually benefit salmonids. The lack of research funding to collect this evidence does not negate its biological importance.

Response. The lethal removal authorizations recommended include safeguards for pinnipeds including a limitation on takes to ensure that all human removals are below PBR levels and specific conditions on the use of this authority to ensure that removals would benefit salmonids.

Comment 66. The report has presented an unbalanced view of the economic impact of pinnipeds. If economic impacts are to be included as part of the ecosystem impacts, then reference should be made to tourism revenues generated by pinnipeds in coastal areas benefited by their presence.

Response. The report focuses on negative pinniped interactions because they are the problems for which Congress requested input and recommendations.

Comment 67. The report indicates that the 1994 MMPA Amendments, which established a regime to govern the incidental take of marine mammals in commercial fishing, could be used to allow lethal removals of pinnipeds for management purposes if such takes have no adverse biological effect on the population. This is an incorrect interpretation of the Amendments. The 1994 Amendments address the incidental take of marine mammals in the course of commercial fishing, not the direct lethal take of pinnipeds for management purposes.

Response. Although Section 118 applies only to the taking of marine mammals incidental to commercial fishing operations, Congress could extend the PBR approach to other sections of the MMPA. PBR is defined and calculated as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its OSP. Therefore, if the total human-caused mortality for a stock subjected to lethal management actions were below PBR, then such taking would not prevent that stock from reaching and maintaining OSP levels. NMFS recommends that Congress consider the use of PBR as a biological standard to limit lethal removals of California sea lions and Pacific harbor seals. Lethal removals would be restricted to certain situations involving conflicts with depleted salmonid stocks

or human activities, as explained in the report, Even with expanded lethal removal authority, it is very unlikely that removals from all sources would approach PBR levels for these pinniped stocks. Nonetheless, NMFS recommends that this biological standard be extended to apply to lethal removal situations to ensure that the recommended lethal removals would not interfere with the stock's ability to achieve or maintain OSP.

Comment 68. Section 118 of the MMPA, which governs incidental take of marine mammals in fisheries, contains as a goal, the reduction of incidental mortality and serious injury of marine mammals taken in the course of commercial fishing operations to insignificant levels approaching a zero mortality and serious injury rate. NMFS cannot achieve the "zero mortality rate goal" (ZMRG) if it permits the lethal removal of pinnipeds

Response. Under Section 118, the ZMRG must be reached by the year 2001 and applies to serious injury and mortality of marine mammals incidental to commercial fishing operations. Because intentionally killing marine mammals in the course of fishing operations is currently prohibited, NMFS believes that such incidental serious injury or mortality includes only accidental taking. The MMPA does not apply this goal to other types of takings, such as directed takes. In addition, the MMPA does not define ZMRG quantitatively nor give consistent guidance on an interpretation of what constitutes an insignificant level of mortality or serious injury. NMFS is still evaluating precisely how this term should be defined and applied. Moreover, NMFS recognizes there are some situations in which removals of individuals pinnipeds from a robust and increasing population would be justified even if the removals might not be insignificant, provided that in all cases the removals would not exceed PBR over an extended period. Those situations are summarized in this report. If the recommendations are adopted, Congress may want to consider the scope of situations to which the ZMRG would apply.

Comment 69. Research and development are necessary for non-lethal deterrent measures that are not injurious and do not have detrimental incidental effects. Pinniped deterrence devices should be a research priority and receive adequate funding. In the interim, however, lethal removal should not be considered the only effective alternative because existing deterrent devices have limited or short term effectiveness.

Response. The recommendation is for development of effective non-lethal deterrents. However, in the interim, there is a need to address site specific problems caused by individual pinnipeds that do not respond to existing non-lethal methods.

Comment 70. The recommendation gives fishers *carte blanche* to systematically eliminate any pinniped they deem fit to destroy because there is little chance of enforcement and plenty of opportunity for abuse. The proposal could result in an open season for harbor seals by fishers instead of controlled taking of problem animals at river mouths by state officials who know the difference between species.

Response. NMFS' 1992 legislative proposal included a provision to continue the authority for lethal removal, as a last resort, only to certain fisheries where there is a demonstrated need and a finding that use of such methods could be monitored and would not be abused.

Comment 71. Lethal removal of pinnipeds will have negative impacts on the ecosystem because of the potential benefits that pinnipeds have on fish stocks due to their role in the food web. 0584

Response. The number of pinnipeds that may be lethally removed would be well below the PBR for each species thereby allowing the populations to continue to increase to their OSP level and remain viable components of the ecosystem.

Comment 72. Lethal removal should not be recommended because this level of management is scientifically unsound, giving unfair and disproportionate bias toward fishing interests. The lethal removal recommendation does not adequately represent those citizens who do not believe that individual animals from non-threatened populations are expendable. Even though harbor seals and California sea lions are not threatened or endangered, individual animals and site specific sub-populations are important to the public and possibly to the ecosystem.

Response. The recommendations address a number of resource conflicts. One of the principal conflict issues that is of concern to the overall general public, not just the fishing industry, is the affects of pinniped predation on depressed salmonids that are listed or proposed for listing under the ESA. Many management decisions are not scientific decisions; rather, they reflect the values of society. NMFS bases its management decisions on sound science; however, some risk-averse management decisions must be made even when little scientific information is available. The recommendations are based upon, the PBR approach to ensure that pinniped stocks are not adversely affected, and this approach is well supported by sound science.

Comment 73. There is insufficient data to adequately determine historic "highs" for populations of harbor seals and California sea lions. These populations are known to have been reduced by commercial harvests, bounty programs, etc., earlier this century. The "dramatic" increases in numbers of California sea lions and harbor seals on the West Coast represent recovery of heavily exploited populations and are not indicative of historically high levels.

Response. NMFS agrees that historic data are lacking, However, sea lion remains recovered from middens on the Channel Islands indicate that the species were exploited well before this century. The Scientific Investigation Report indicates that the populations have increased substantially and their range has expanded since passage of the MMPA in 1972. Current population numbers are higher than ever recorded, and many human-pinniped conflicts have occurred concurrently with this increase.

Comment 74. Comparing "nuisance" pinnipeds to deer and bear is a flawed comparison because it has not been scientifically demonstrated that pinnipeds are over-abundant, or that over-abundance is jeopardizing the health of the pinniped population thus requiring management action.

Response. The comparisons to deer and bear relate to wildlife management measures used with "nuisance" terrestrial mammals, not over-abundance, Individual terrestrial mammals are regularly removed from conflict situations, and in situations where these mammals continually return, they may be killed as a part of routine management measures.

Comment 75. A number of members of the Ballard Locks Pinniped-Fishery Interaction Task Force did not agree that the available data supported the assertion that sea lion predation has exerted a significant negative impact on the Lake Washington steelhead population.

Response. Based on the best scientific information available from over 10 years of studies at the Ballard Locks, NMFS has determined that California sea lions have had significant negative impact on the status and recovery of the Lake Washington winter steelhead population. The Ballard Locks Pinniped-Fishery Interaction Task Force agreed with this finding and recommended lethal removal of California sea lions at the Ballard Locks with conditions. A minority of the Task Force did not agree with the recommendation for lethal removal.

Comment 76. The example of sea lion foraging at the Willamette Falls is another case involving a few individual animals at a man-made barrier: This situation may fit the Ballard Locks model, but the Ballard Locks is more likely an exception rather than the rule. Interactions are more likely to occur at river mouths where very little research has been conducted to document predation levels, impacts, or assess the effectiveness of non-lethal deterrents.

Response. The vulnerability of salmonids to pinniped predation at barriers and other sites where fish passage is impeded is addressed in the report. Many river mouths are identified as sites of co-occurrence of pinnipeds and salmonids, and further research at these sites is recommended. However, risk-averse management requires that actions are taken before scientific certainty is achieved especially when dealing with salmonids approaching listing under the ESA.

Comment 77. The lethal take of harbor seals from the San Francisco Bay regional population may seriously impact a population that is struggling to maintain viability. Radiotelemetry studies indicate only limited exchange between harbor seals in the Bay and nearby coastal seal populations.

Response. NMFS disagrees that harbor seals inhabiting San Francisco Bay are a separate population or stock under the MMPA. The NMFS Stock Assessment Reports, which consider genetic uniqueness and other factors in determining populations or stocks, list one California population of harbor seals. Although harbor seal movements between some sites may be minimal, that factor by itself is not sufficient for a scientific determination of a population or stock.

Comment 78. The finding that depressed salmonid populations at some sites could continue to decline due to pinniped predation, even if other sources of mortality may have been curtailed is purely hypothetical. With the exception of the Ballard Locks, it has not been determined that pinnipeds have had a significant negative impact on any wild salmonid population. Therefore, to state that an impact which may not exist is expected to continue is speculative.

Response. The Scientific Investigation Report indicates that pinniped predation can adversely affect small, depressed salmonid populations, The intent of the recommendations is to provide a risk-averse approach to dealing with pinniped-salmonid conflicts and rather than waiting for definitive proof that an impact has occurred before taking action to protect and recover depressed salmonid populations.

Comment 79. There are no quantitative assessments of pinniped impacts on the West Coast aquaculture industry upon which to base the contention that the industry is being negatively impacted. When such an assessment was made by the Gulf of Maine Aquaculture-Pinniped Task Force, they concluded that fish farms in Maine had not taken adequate precautions to exclude pinnipeds. It is possible that a review of practices on the West Coast would reach similar conclusions.

Response. Information in the Scientific Investigation Report from salmon aquaculture facilities in the Northwest indicated that such facilities were experiencing economic losses due to pinniped attacks on net pens. Several facilities invested in predator nets, but damage has continued.

Comment 80. It is premature to recommend killing pinnipeds without funding the studies necessary to identify non-lethal solutions to the problems of concern.

Response. A number of non-lethal deterrents have been tested on California sea lions at the Ballard Locks, and none were found to be totally effective over the long term. The recommendations do include further testing on non-lethal deterrents and lethal removal would be authorized only until such time that effective non-lethal deterrents are developed.

Comment 81. In regard to non-lethal deterrents, the report states that some sea lions have "learned" to tolerate or avoid the effects of "all" deterrent devices. There is no evidence to support this, particularly in the case of underwater explosive devices (seal bombs). Some salmon growers in Maine choose not to use seal bombs because of concerns about consequent deafness making seals unresponsive to other acoustical deterrents.

Response. Observations of California sea lions at the Ballard Locks indicate that some sea lions did "learn" to tolerate or avoid deterrence efforts. Although there were concerns over the use of firecrackers causing sea lions to go deaf, several sea lions that were exposed to underwater firecrackers were subsequently observed with no apparent hearing impairment.

Comment 82. A Masters Thesis study "The Foraging Ecology of Harbor Seals, *Phoca vitulina*, and California sea lions, *Zalophus californianus*, at the Mouth of the Russian River, California" does not support the view that predation by seals was a serious threat to steelhead and salmon populations, making lethal action unnecessary.

Response. The Masters Thesis by Hanson (1993) documented food habits of harbor seals based upon collection of 155 scat over a years time. She reports frequency of occurrence ranging up to 20% salmonids during winter. Most of the predation was reportedly on hatchery fish. Lethal removal of seals and sea lions is not proposed to protect hatchery stocks, rather it is recommended when pinniped predation may inhibit recovery of seriously depleted wild or ESA-listed stocks. Hanson reported that in 213 hours of observation, 56 adult salmon were observed captured and consumed by pinnipeds (0.26 salmon per hour of observation). The data and results of this study were considered and cited in the Scientific Investigation Report, which concluded that pinniped predation could retard the recovery of endangered salmonids.

Comment 83. The recommendations are made without demonstrating consideration of the intricacies of sea lion ecology, except as a predator, The report should be expanded to include a multi-species assessment rather than focusing only on pinnipeds. 0387

Response. The recommendations are based upon the conclusions of the Scientific Investigation Report in which it was concluded that in most instances it is small numbers of individual male sea lions which have learned to exploit the concentrations of returning adult salmon that are likely to cause impacts on endangered salmonids in river systems along the West Coast. This means that the majority of the California sea lion population conducts itself as a healthy population contributing to the health and stability of the coastal marine ecosystem. The assessments are limited to California sea lions and Pacific harbor seals because those are the species which have been implicated in potentially severe interactions with salmonids on the West Coast. Multi-species assessments were for this reason not undertaken.

Comment 84. The Mange1 et al. principles of wildlife conservation cannot be cited at all when the primary threats to fisheries are not being addressed by NMFS, and non-lethal alternatives are not being reasonably explored. The one relevant principle from Mange1 et al., requires that conservation management "avoid disruption of food webs, especially removal of top or basal species."

Response. The second principle included in Mange1 et al. states that we must secure present and future options by maintaining biodiversity at several levels, The recommendation for site specific management is consistent with this principle and with the precautionary principle, both of which are sound principles of wildlife management. The precautionary principle maintains that uncertainty should benefit the resource. Which is a greater risk to biodiversity, the removal of a few individual pinnipeds from stocks from abundant, robust populations or the removal of a few individuals fi-om the critically depleted salmonid run? In the case of California sea lions and Pacific harbor seals preying upon critically depleted salmonid runs, NMFS believes that salmonids are the resource that should be favored in the face of uncertainty.

Comment 85. The 1994 MMPA Amendments called for an investigation into whether pinnipeds are having broader impacts on the coastal ecosystem on the West Coast. This was clearly intended to require a review on the affects of pinnipeds on marine biodiversity and health of the marine habitat, not on private property (docks and piers, etc.), which was a focus of the report. The issues of pinniped interactions with humans, human activities and property were resolved during the 1994 reauthorization.

Response. The Scientific Investigation Report reviewed pinniped interactions with ecosystems, and ecosystems are interpreted to include humans and human activities such as fishing. The 1994 Amendments to the MMPA expanded the authority for non-lethal deterrence to private citizens, but this did not resolve the problems concerning the effectiveness of deterrence measures identified in the Scientific Investigation Report.

Comment 86. Data from "lethal" food habits research is not critical and should be stricken from the report unless substantiating data for use of this technique is included.

Response. Lethal food habits research methods have many advantage over indirect methods such as scat analysis which is the method most commonly used today. The collection of animals for food habits studies allows for assessment of all the food types which an animal has eaten, not just those which have hard parts which pass through the digestive tract. It also allows for quantification of the volume of pinniped meals which is needed to estimate the amount of food consumed by a population of animals. It is a scientifically valuable method of studying food habits.

Comment 87. As a result of the increasing number of pinnipeds, a resident harbor seal colony of 50 seals now resides at Children's Pool Beach (CPB) in La Jolla, California, which was created specifically to allow children to learn to swim and snorkel. As a result, children are not utilizing CPB as often as in the past.

Response. Although for several decades harbor seals have hauled-out at Seal Rock near downtown La Jolla, California, for the past four years, harbor seals have also been using nearby CPB as a haul-out. Over 140 harbor seals were observed on CPB in June 1996. The City of San Diego closed the beach to swimming in September 1997 due to high counts fecal coliform bacteria. The City of San Diego is investigating whether seals are responsible for the contamination at CPB. If the seals are responsible for the high bacterial counts, the City of San Diego may initiate non-lethal measures under current provisions of the MMPA to deter the animals from hauling-out at CPB. Under the recommendations, non-lethal measures must be attempted before lethal options could be considered.

Comment 88. There are concerns about personal safety while swimming and body surfing near La Jolla Cove because of the "over-population" of seals. The scent of seals and sea lions is bait for sharks and killer whales. Furthermore, killer whales have been observed feeding on seals in Boomers Beach just north of CPB and great white sharks have been reported in La Jolla.

Response. A goal of the MMPA is that marine mammal populations achieve or maintain their OSP level and the recommendations do not alter that. At this time, the harbor seal population in California has not been determined to be at OSP. Although there have been a number of media reports that increased attacks on humans by the great white shark are related to increased numbers of pinnipeds in coastal areas, there is little scientific information on this issue.

Comment 89. Blaming logging, farming, fishing, etc. for the decline of salmon without controlling the over-population of pinnipeds will cause the recovery program to all be in vain.

Response. NMFS agrees that a salmon recovery program must address all factors, and the recommendations provide a means to address pinniped predation to complement other efforts. The report, however, does not recommend a pinniped population control program.

Comment 90. Removal of pinnipeds in Oregon and Washington would not remedy the salmonid-pinniped crisis unless similar measures were adopted in British Columbia, Canada.

Response. The recommendations apply only to site-specific situations on the West Coast of the U.S. The recommendations do not apply to altering the overall population of pinnipeds and, therefore, would have no direct effect on pinniped movements into Canada. However, it should be

noted that the Canadian government has undertaken lethal removal measures to resolve site-specific pinniped conflicts with salrnonids in the Puntledge River in British Columbia.

Comment 91. Research into pinniped interactions is needed, but too often an issue is studied to death, delaying action on the issue.

Response. Research on pinniped conflicts is needed, but completion of such research would not be a prerequisite to the recommendations for undertaking necessary actions to address existing pinniped conflict situations. The recommendations acknowledge that sufficient information is available to warrant action to address pinniped conflicts in certain situations,

Comment 92. NMFS should submit the recommendations report as written, and indicate to the Congress the major economic consequences that will befall the West Coast recreational and commercial fishing industries if Amendments to the MMPA are not implemented to recognize and address the robust population of pinnipeds that now exist in California and along the entire West Coast.

Response. The substance of the report remains as proposed. Changes in the final version clarify specific points and would require that site-specific management measures would apply only if (1) salmonid conservation or recovery plans are in place or in development, (2) recovery efforts on other factors affecting salmonid status are underway, and (3) the removal of pinnipeds is consistent with salmonid conservation/recovery plans.

Comment 93. Recommendations for lethal removal are unnecessarily inhumane, potentially harmful to the public. If firearms are used, there could be danger to the public or other fishers in the area. Indirect risks include an increase of carcasses on public and private beaches and distress to private citizens.

Response. Any undertaking of lethal removal would be conducted as humanely as possible. Taking by state or federal resource agency officials would be immediately recovered and the carcasses used for science. Authorizations to commercial fishers would be restricted to minimize the potential for carcasses washing-up on beaches.

Comment 94. In most cases, reduction of pinniped predation by itself will not bring about the recovery of depressed salmonid stocks, The full range of factors that have brought about the decline of salmonid stocks (and may be impeding their recovery) must be identified and addressed to achieve recovery within a reasonable time frame.

Response. NMFS agrees,

Comment 95. Sea lions or seals should be killed only in cases where animals are a threat to human life.

Response. The MMPA does provide an exception to the moratorium on taking of marine mammals in situations where the taking is imminently necessary in self defense or to save the life

of a person in immediate danger. However, NMFS does not agree that this is the only situation where lethal removal of sea lions or seals may be necessary. See response to comment #4. 0590

Comment 96. Before 1994, when fishers were allowed to use lethal means to protect their gear and catch, sea lions and seals continued to increase at a healthy rate. Therefore, reinstating the right to lethally remove pinnipeds would not impact the pinniped populations. Furthermore, this would reintroduce a learned behavior (fear of man) that would tend to keep pinnipeds away from fishing activities.

Response. NMFS agrees that pinniped populations increased through the years that fishers had authority to lethally take marine mammals as a last resort. Thus, the recommendation is for consideration of reinstatement of the authority to fishers. However, the authority would not be broad-based, only selected fisheries would have such authority, and only if there is a demonstration of economic impacts from pinnipeds.

Comment 97. The report mischaracterizes the views of the Pacific Scientific Review Group (PSRG) when it indicates that the Group identified the impact of pinniped predation on the decline or recovery of certain salmonid populations, as a major issue for management of pinniped interactions with various fisheries and fish stocks. In the "1996 Draft U.S. Pacific Marine Mammal Stock Assessments" the PSRG stated that increased predation on salmonids by increasing numbers of California sea lions may affect recovery of depressed salmonid population and may be one of the causes of decline in some populations,

Response. The stock assessment document and the statement on increased predation by California sea lions was prepared by NMFS, not the PSRG. The PSRG view on pinniped predation was expressed in PSRG meetings and is correctly characterized in the report. Also, the PSRG advised NMFS by letter of its support of three of the recommendations in the draft report, including site specific management, developing deterrence technologies, and additional research on pinniped effects on salmonids and the ecosystem,

Comment 98. NMFS should work with the respective resource management agencies, using the PSMFC as an interagency liaison, to secure adequate funding from Congress to carry out the described activities and recommendations.

Response. The FY98 appropriations include new funding for studies on the impacts of California sea lions and harbor seals on salmonids and West Coast ecosystems. NMFS will work with PSMFC and the states in implementing a program for these studies.

Comment 99. Commercial and recreational fishers have lost catch to pinnipeds in many areas along the West Coast. Pinnipeds have been reported to take fish off lines, follow boats, attack nets, and damage crab pots in many areas including Monterey Bay, Umpqua River estuary, San Francisco/Half Moon Bay, Cowlitz River, Alsea River, and Yaquina Bay.

Response. These observations are consistent with the information in the Scientific Investigation Report.

Comment 100. Pinnipeds have been observed consuming salmonids in many areas throughout the West Coast including the Columbia River, Ballard Locks, San Lorenzo River, the mouth of Siletz Bay, Nehalem River, Siuslaw Bay, Alsea Bay, Yaquina Bay, and Lower Umpqua River. The evidence of pinniped predation (tooth and claw marks) has been observed on fish passing through fish ladders at Winchester Dam, Willamette Falls, and Ballard Locks.

Response. These observations are consistent with the information in the Scientific Investigation Report.

Comment 101. Once data on levels of predation are known, predation should be compared with impacts of other user groups, including commercial and recreational fishers, dam operations, silviculture, and agriculture practices. Actions should be developed to mitigate the decline of salmonid stocks by all sources.

Response. NMFS agrees that all sources affecting recovery of salmonids must be addressed. Comparisons of relative contributions of various recovery efforts will be conducted when data and models for such are available.

Comment 102. The terms "healthy" and "robust" should not be used to describe pinniped populations until the prevalence of disease in these populations is better documented and the potential contributions of human activities to the incidence of marine mammal diseases are better understood.

Response. The terms are appropriately used as they apply to the status of the population and not the condition of individual animals. Additionally, NMFS recognizes that individuals within populations that are at the upper end of OSP (near carrying capacity) may be diseased; in fact, disease may be one of the mechanisms by which nature limits population growth. Such a population, however, would be considered healthy and robust relative to its OSP.

Comment 103. NMFS should submit the report to Congress as soon as possible so that Congress can act on this issue promptly. Congress needs to recognize the significant impact pinniped predation is having on salmonid populations and authorize the recommendations.

Response. This report will be submitted in time for Congress to consider it in the reauthorization of the Marine Mammal Protection Act in 1999.

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0592

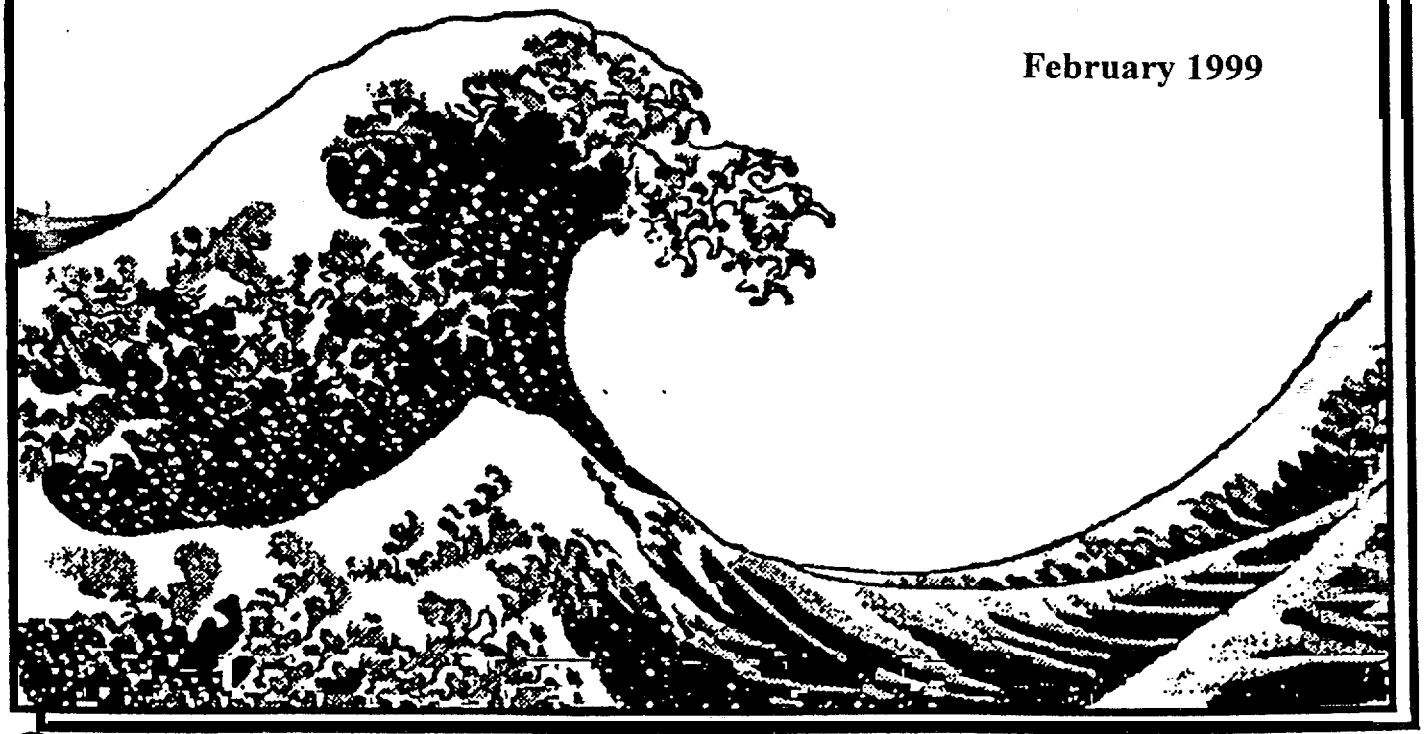
Food Habits of California Sea Lions (*Zalophus californianus*) and Their Impact On Salmonid Fisheries in Monterey Bay, California

Michael J. Weise and Dr. James T. Harvey

Report Submitted to:

Fishermen's Alliance of California - Monterey Bay Chapter
885 Abrego Street
Monterey, California 93940

MLML Technical Publication No. 99-01



February 1999

ATTACHMENT 4

ABSTRACT

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In the ocean commercial troll and recreational salmon fishery in Monterey Bay Calfiornia, California sea lions (Zalophus californianus) will swim near or follow fishing boats and will depredate fish once hooked. The objectives of the study were to determine the percentage of salmon taken by pinnipeds in commercial and recreational fisheries: identify relative importance of prey items seasonally consumed by sea lions, and determine the proportion of salmonids in the sea lion diet on a seasonal basis. From April 1997 through September 19981041 hours of onboard and dockside surveys of the commercial and recreational salmon fisheries were conducted at the three ports in Monterey Bay, California. Sea lions depreadated 7.9 % of the fish hooked in the commercial fishery in 1997 and 28.6 % in 1998, 8.4 % (1997) and 18.3 % (1998) of the CPFV fishery, and 15.6 % (1997) and 17.5 % (1998) of the private skiff fishery. Increased depredation rates in both the commercial and recreational salmon fisheries in 1998 were most likely the result of the large El Niño Southern Oscillation event that occurred in 1997-J 998 during which a greater number of sea lions were present in central California. Prey hardparts identified in sea lion fecal samples collected in Monterey Bay indicated that schooling fishes were the predominant prey fish species, such as market squid *(Loligo opalescens*), Pacific sardine *(Sardinops caeruleus*), northern anchovy (*Engraulis mordax*), and rockfish (*Sebastes* sp.). Sea lions consumed similar prey species in the summer and fall 1997, winter 1997-98, and spring 1998 (PSI > 70.0) with market squid and northern anchovy being the dominant prey species. However, prey composition changed significantly during the summer 1998 and fall 1998 (PSI < 46.0) because of the increased importance of sardine and rockfish in the diet and the decreased importance of market squid. This report does not intend to imply that salmonids are not a prey species for pinnipeds in the Monterey Bay region, but highlights the difficulties encountered in establishing the role of salmonids in the pinniped diet when analyzing fecal samples.

ATTACHMENT 4

0594

Food Habits of California Sea Lions (*Zalophus californianus*) and Their Impact On Salmonid Fisheries in Monterey Bay, California

Report Submitted to:

Fishermen's Alliance of California - Monterey Bay Chapter
885 Abrego Street
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Contract Number: 23-1509-7400

Submitted by:

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3 February 1999

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Acknowledgments

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We extend special thanks to the commercial, charter boat, and personal skiff fishers, deckhands-and captains for their cooperation, this research would not have been possible otherwise. Also thanks to the Santa Cruz muncipal wharf, United States Coast Guard, California State Parks for allowing us access to pinniped haulouts.

This project was supported by funding from the Fishermen's Alliance of California - Monterey Bay Chapter. Many thanks to members Russ Colwell, Rich Hughett, and Jack Harrell for their assistance in coordinating many aspects of this project.

INTRODUCTION

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California sea lion (*Zalophus californianus*) interact with almost all commercial and recreational fisheries along the California coast causing entanglement and damage to fishing gear and loss of catch (Beeson and Hanan 1996, NMFS 1997). The prey of these pinnipeds has been of interest for years because they have been viewed as competitors with humans for a variety of fish species. Historically, this competition between pinnipeds and fisherman was of limited importance because both fish and pinnipeds were harvested. However, the increasing specialization of the fishing industry during the twentieth century coupled with the changing attitudes toward pinnipeds have intensified this competition (Harwood and Croxall 1988). Since the passage of the Marine Mammal Protection Act (MMPA) in 1972, populations of California sea lions have increased along the West Coast (NMFS 1997). This increase in pinniped populations has resulted in an increase in the number of reports of pinnipeds interacting with fishing boats and depredating the catch in salmonid fisheries along the West Coast in recent years (Beeson and Hanan 1996, NMFS 1997).

California sea lions occur from the offshore islands of Mexico north to Vancouver Island, British Columbia. The California sea lion population has increased dramatically this century with an average annual rate of increase of greater than 5% since the passage of the MMPA in the early-l 970s. Recent population estimates range between 161,066 and 18 1,355 individuals in 1994 (Barlow et al. 1995). California sea lions give birth from late May through late June each year, and mating occurs in July at breeding rookeries in southern California and western Baja California (NMFS 1997). Following the breeding season, most adult and subadult males migrate northward to central and northern California, Oregon, Washington, and British Columbia (Beeson and Hanan 1996, NMFS 1997). In the spring, most adult and subadult males migrate south to the breeding rookeries. Females and young animals either remain on or near the breeding grounds throughout the year with some animals moving southward (King 1983).

In the ocean commercial troll and recreational salmon fishery, sea lions will swim near or follow fishing boats and will depredate fish once hooked. To date, several studies have been conducted in the Monterey Bay region. Briggs and Davis (1972) reported depredation rates (number of salmon taken by sea lions above and below the surface of the water relative to the total angler landings) by California sea lions of 4.1 % for all the ‘salmon hooked during the 1969

commercial and sport salmon season. Miller et al. (1983) reported rates of 3.0 % for the commercial salmon fishery, and Beeson and Hanan (1996) found rates of 15 % for the commercial fishery in 1995. Miller *et al.* (1983) reported depredation rates of 5.2 % for the CPFV salmonid fishery in Monterey Bay in 1980 and approximately 1.4 % for the personal skiff fishery. According to Beeson and Hanan (1996), Monterey Bay and San Francisco dominated the recreational ocean salmon landings in 1995 and experienced the greatest degree of sea lion predation with depredation rates of 10.5 % of the legal catch for the 1995 recreational fishery season (CPFV and private skiff combined).

Pinniped food habit studies provide information on seasonal prey selection, feeding locations, and prey availability. There is little doubt that pinnipeds are feeding on salmonids, and there is a growing concern about the increasing rate of pinniped interaction with recreational and commercial salmon fisheries. California sea lions are opportunistic feeders, whose diets consist primarily of prey that are seasonally and locally abundant (Fiscus and Baines 1966, Fiscus 1979, Jones 1981, Bailey and Ainley 1982, Hawes 1983, Antonelis et al. 1984, Lowry et al. 1986, Nicholson 1986, Lowry and Folk 1987, Lowry et al. 1990, Lowry et al. 1991, Hanson 1993). Sea lions prey heavily on schooling prey, such as market squid (*Loligo opalescens*), northern anchovy (*Engraulis mordax*), rockfish (*Sebastes* sp.), jack mackerel (*Trachurus symmetricus*) and Pacific hake (*Merluccius productus;* Lowry et al. 1990).

The objectives of the study were to : (1) determine the percentage of salmon taken by pinnipeds in commercial, Commercial Passenger Fishing Vessels (CPFV), and private skiffs salmon fisheries in Monterey Bay, CA; (2) identify and determine the relative importance of prey items seasonally consumed by California sea lions in Monterey Bay, California; and (3) determine the proportion of salmonids in the California sea lion diet on a seasonal basis in the Monterey Bay region.

METHODS

Fisherv Interactions

Field observations were conducted onboard boats and dockside at the three major ports in the Monterey Bay region: Santa Cruz, Moss Landing, and Monterey (Fig. 1). Salmon fishing operations included the commercial troll fishery, and the recreational fishery, consisting of

CPFVs and private skiffs. The commercial troll fishery included both day-trip boats and multiple-day trip boats. This study included fishing areas from Pt. Sur north to and including the entire Monterey Bay, and north along the coast to Año Nuevo Island. Sampling days and ports were randomly selected, but onboard surveys were limited by crew cooperation and space availability.

Dockside surveys were conducted in order to achieve a higher sampling effort than only onboard observations. Onboard surveys were conducted to test the reliability of the dockside surveys, and to ensure that investigators fully understood the nature of the interaction. Small biases have been observed using this method of combining onboard and dockside surveys, but were attributed to choices of random samples in areas where interaction was more prevalent (Miller *et* al. 1983).

Sampling was stratified by month with an equal number of dockside and onboard surveys being conducted on a monthly basis. The 1997 commercial salmon season was May 1-3 1, June 23-July 18, and the month of September, whereas the 1998 commercial season was May 1 - 31, and June 15 - September 30. Sampling dates for the dockside and onboard surveys of the commercial fishery were randomly selected from all possible days during both seasons. The sampling period was a four-hour period in the mid to late afternoon with the intent of sampling the majority of boats returning to a given port. The 1998 recreational salmon season was March 15 - September 30. For the charter boats, which run virtually every day but have a greater number of overall boats and overall passengers on the weekends, two-thirds of the sampling dates were randomly selected from possible weekend dates and one-third of the sampling dates were randomly selected from all possible weekday dates. The sampling period for CPFVs was a 2-3 hour period in the early afternoon in an effort to sample every boat out of a given port on the survey date. In the private skiff fishery the preponderance of activity is on the weekends, therefore, approximately three-quarters of the sampling dates were on weekends, and one-quarter of the sampling dates were weekdays. The survey period was 2 hours in the late morning and early afternoon when the majority of fisherman typically return to a given port.

Information collected dockside included port of call, sea state, swell height, and weather conditions, number of fish landed, number of fish taken by pinnipeds at the surface, species of marine mammal involved in the take, number

of takes below the surface, number of fish released, number of released fish taken by marine mammals. fishing locations, time of takes, number of boats in the area of the takes. Onboard surveys included all of the same information collected dockside, and the standard length of all fish landed. and any marine mammal bite and scratch marks on each fish. The field data were collected at three different ports in the region, but fisherman from all three ports typically fish wherever fish are being caught, therefore, the data were pooled.

A surface take or a definite take was defined as the loss of a hooked salmon when the depredation was observed and the species and number of marine mammals involved in the depredation could be determined. Additionally, a surface take was recorded when a fish was hooked and then the action of the line indicated that a fish was no longer hooked, and a pinniped surfaced immediately with a fish in its mouth. A take below the surface or a probable take, was defined as when a fish was hooked followed by a heavy tug of the line, and sea lions were in the immediate area, but no sign of depredation was witnessed. Two types of takes were designated because takes below the surface were not witnessed, and other predators including sharks, also take fish from lines or the fish may have escaped. The sighting of a pinniped consuming a salmon at the surface was noted but not logged as a take because the fish may have been taken from the line of another boat, or a weakened fish released earlier in the day.

The total catch was defined as the total number of fish hooked, which included all legal fish, depredated fish, and undersize fish. The legal catch only included fish legally landed by the anglers. Mean percentage of fish taken by sea lions relative to the total catch for the commercial, CPFV, and personal skiff fishery were compared using a two-sample t-test when sea lions were present versus when the majority of sea lions were on their southern breeding rookeries. Presence and absence, or low number of sea lions was determined using aerial and ground count data.

Food Habits

Information on prey composition and temporal changes in the diet of pinnipeds in the Monterey Bay region were obtained through the examination and identification of prey hardparts found in fecal samples. Only fresh fecal samples were collected biweekly at sites used exclusively by California sea lions. Samples were categorized as being collected in the summer (May, June, July), autumn (August, September, October), winter (November, December,

January), or spring (February, March, April). Sufficiency of the number of samples for each season was evaluated by plotting cumulative numbers of prey taxa against randomly chosen fecal samples.

Scat samples were collected using hand-trowels, spoons, tweezers, and sponges. Water bottles were used to wash between rocky crevices to ensure the collection of all hardparts. Each sample was then placed in a zip-lock storage bag and labeled with the date and location. Samples were frozen and stored for later analysis. Scat samples were processed by thawing the samples and allowing them to soak in soap and water until soft. The sample and water were then placed in an enclosed elutriator, which operates on the principal that the soluble and flocculent components of the scat can be separated from the potentially identifiable undigested elements by differences in their densities (Bigg and Olesiuk 1990). The remaining solution was poured into a 0.5 mm mesh sieve and all prey hardparts were removed using forceps. Fish hardparts were placed dry in vials, cephalopod hardparts were placed in vials with a 50% isopropyl alcohol solution.

All identifiable prey hard parts, including numerous skeletal bones, otoliths, cartilaginous parts, eye lenses, teeth, and cephalopod beaks were separated from each sample. Otoliths and beaks were used to preliminarily identify prey species, and all other hardparts were saved for later analysis. Otoliths and beaks were identified and enumerated using illustrations and pictures (Morrow 1979, Wolfe 1982, Clarke 1986, Canon 1987, and Harvey et al. in press), and a reference collection at Moss Landing Marine Laboratories (Harvey 1987). Otoliths and cephalopod beaks were counted and the greatest number of right or left otoliths, and upper or lower beaks were used to determine a minimum number of individuals (MNI).

The percentage number of prey occurrences (%N) was calculated for each prey species and averaged for a seasonal value. Prey species composition and abundance were compared for each season using a percentage similarity index (PSI, Silver 1975):

$$PSI = \sum \text{minimum } P1_i P2_i$$

where $P1_i$ and $P2_i$ are the relative abundances of species i from seasons "1" and "2", respectively. The index ranges from zero, no similarity, to 1 .OO, identical species composition. The percent similarity index significance level was arbitrarily set at 0.65 (Oxman 1995, Trumble 1995).

RESULTS

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Fisherv Interactions

From April 1997 through September 1998, 1041 hours of onboard and dockside surveys of the commercial and recreational salmon fisheries were conducted at the three ports in Monterey Bay, California. From April 20 through September 30 1997, a total of 337 hours of onboard and dockside surveys were conducted with 144 hours in the commercial fishery, 103 hours in CPFVs fishery, and 90 hours for the skiff fishery. Onboard and dockside hours surveyed for the commercial, CPFV, and skiff fishery were 44 hours and 100 hours, 32 hours and 71 hours, and 23 hours and 67 hours, respectively. From March 15 through September 30 1998, 704 hours of onboard and dockside surveys were conducted with 370 hours in the commercial fishery, 270 hours in the CPFV fishery, and 64 hours in the private skiff fishery. In an effort to increase the onboard survey sample size effort was concentrated in the commercial and CPFV fisheries. Onboard and dockside surveys of the commercial, and CPFV fishery were 214 hours and 156 hours, 175 hours and 95 hours, respectively. In the 1998 private skiff fishery, 64 hours of dockside surveys were conducted (Table 1).

In the commercial fishery in 1997, 253 boats were surveyed dockside accounting for 17,580 hooked salmon. And in 1998,286 boats were surveyed dockside accounting for 15,446 hooded salmon (Table 2). The mean percentage of takes based on dockside surveys were significantly greater in 1998 (mean=3 1.58%, SD=1 6.05) than in 1997 (mean=12.07, SD=1 6.33; t-test: P=O.OOO). A significantly greater mean percentage of takes occurred in 1997 (mean present=26.65, SD=16.42, mean absent=5.82, SD=1 1.67, t-test: P=O.OOO) and 1998 (mean present=33.14, SD=1 5.18, mean absent=28.28, SD=1 7.37, t-test: 0.015) when sea lions were present versus when they were absent or in low numbers. Sea lion presence and absence or low number was based on ground and aerial count data. In 1997, sea lions were present April, May, August, and September and absent or in low numbers in June and July. In 1998, sea lions were present in March-June 20, August, September and absent or in low numbers in June 21 - June 30, and July. The percentage of pinniped takes relative to the total catch were high early in the season in both May 1997 (20.5 %) and May 1998 (32.2 %). The decline in the percentage of takes was later and less severe in 1998, with 22.8 % in June dropping to only 17.9 % in July, compared to 1997 with 0.9 % for June and 3.2 % in July (Fig. 2). Late in the season in both 1997

and 1998. surveys were conducted but little to no fishing effort was present. The percentage of below surface takes in 1997 (5.6 %) and 1998 (27.9 %) were greater than the surface takes in 1997 (2.3 %) and 1998 (0.6 %).

In the CPFV fishery in 1997, 139 boats were surveyed dockside accounting for 5 168 hooked salmon. And in 1998. 182 boats were surveyed dockside accounting for 4692 hooked salmon (Table 3). The mean percentage of takes for dockside surveys were significantly greater in 1998 (mean=20.56%, SD=17.40) than in 1997 (mean=9.77%, SD=14.30; t-test: P=O.OOO). A significantly greater mean percentage of takes relative to the total catch occurred in 1997 (t-test: P=0.027) and 1998 (t-test: 0.001) when sea lions were present versus when they were absent or in low numbers. Again the decline in the percentage of takes relative to the total catch was later and less severe in 1998, with 23.8 % in June dropping to 7.0 % in July, compared to 1997 with 2.7 % for June and 10.7% in July. Late in both 1997 and 1998, surveys were conducted but little to no salmon fishing effort was present because most boats targeted albacore tuna. Surface takes in 1997 (4.8 %) and 1998 (6.5 %) were not greatly different than below the surface takes in 1997 (3.6 %) and 1998 (11.7 %; Fig. 3).

In the private skiff fishery in 1997, 725 boats were surveyed dockside accounting for 2926 hooked salmon. And in 1998,530 boats were surveyed dockside accounting for 1564 hooked salmon (Table 4). The mean percentage of takes relative to the total catch for dockside surveys were significantly greater in 1997 (mean=10.62%, SD=2 1.20) than in 1998 (mean=8.36%, SD=19.04; t-test: P=0.048). Again a significantly greater mean percentage of takes relative to the total catch occurred in 1997 (t-test: P=O.OOO) and 1998 (t-test: 0.050) when sea lions were present versus when they were absent or in low numbers. And the decline in the percentage of takes was later in 1998, with 24.5 % in June dropping to 8.6 % in July, compared to 1997 with 3.3 % for June and 5.8 % in July. Late in both 1997 and 1998, surveys were being conducted but little to no salmon fishing effort was present because the remaining boats targeted albacore tuna. Surface takes in 1997 (10.3%) and 1998 (6.3 %)were not greatly different than below surface takes in 1997 (5.2 %) and 1998 (11 .1 %; Fig. 4).

In 1997, 4 onboard commercial surveys, 4 onboard CPFV surveys, and 5 onboard private skiff surveys were conducted. And in 1998, 22 onboard surveys were conducted in both the commercial and CPFV fishery (Table 5). There were no significant differences in the mean

percentage of fish taken by pinnipeds for onboard and dockside surveys in the commercial, CPFV, and private skiff fisheries for 1997 (commercial, t-test: P=0.402; CPFV, t-test: P=0.329; skiff, t-test:P=0.959) and 1998 (commercial, t-test: P=0.453; CPFV, t-test: P=0.646; Fig. 5). The lack of significance was marginal in 1997, therefore, sample sizes were increased and concentrated in the commercial and CPFV fisheries for 1998.

Food Habits

Sixty-five scat collections from California sea lions yielded 503 samples, of which 69.4% (349) contained identifiable prey hardparts. Twenty-five taxa were identified to species, 1 to genus, and 3 to family. Of the 4,876 prey occurrences, 59.1% (2882) were cephalopods and 40.9% (1994) were fishes. Market squid (*L. opalescens*) was the predominant cephalopod prey species (58.0%), and octopus *(Octopus* sp.) was the other cephalopod species consumed (1.1%). Schooling fishes were the predominant prey fish species, such as Pacific sardine *(Sardinops caeruleus;* 16.3%), northern anchovy (*Engraulis mordax;* 7.7%), rockfish (*Sebastes* sp.; 6.1%), and Pacific hake (*Merluccius productus; 5.0%;* Fig. 6).

Cumulative species curves indicated that approximately 43 fecal samples were required to adequately assess prey consumed by California sea lions (Fig. 7). Because 133 fecal samples were collected in the summer and fall 1997, 81 in winter 1997-98, 125 in spring 1998, 85 in summer 1998, and 79 in fall 1998, we assumed an adequate number of samples were collected for comparing prey species number and composition among seasons. Fecal sample collection began in the late summer of 1997 yielding an inadequate number of samples for the season, therefore samples were pooled with the fall 1997 data.

Percent similarity indices indicated that sea lions consumed similar prey species in the summer and fall 1997, winter 1997-98, and spring 1998 (PSI > 70.0; Fig. 6, Table 2) with market squid and northern anchovy being the dominant prey species. However, prey composition changed significantly during the summer 1998 and fall 1998 (PSI < 46.0; Fig. 6, Table 2) because of the increased importance of sardine and rockfish in the diet and the decreased importance of market squid.

DISCUSSION

The growing awareness that human activity can have direct and indirect effects on the marine environment are reflected in such legislation as the MMPA and the Endangered Species Act. Managers of marine resources are directed through such legislation to consider the health and stability of the ecosystem in developing management practices. Management of marine mammals must take into account their numerical and functional relationships with other components of the marine ecosystem. Furthermore, to effectively manage fish populations and to regulate the influence of fishing activities on marine mammal populations and vice versa, an understanding of the trophic ecology of marine mammals is necessary.

Fishery Interactions

The conflict between pinnipeds and fisheries is well documented in California (Briggs and Davis 1972, Fiscus 1979, Ainley et al. 1982, Herder 1983, Miller et al. 1983, Hanan et al 1989, Beeson and Hanan 1996, NMFS 1997). California sea lions are the primary pinniped species involved in depredating ocean commercial and recreational salmon fisheries (Miller et al. 1983, Hanan et al 1989, Beeson and Hanan 1996). To date, several studies have been conducted in the Monterey Bay region. In comparing present results with past studies it is imperative to distinguish between the percentage of salmon taken by pirmipeds relative to the total number of angler landings or legal catch versus the number of pirmiped takes relative to the total number of fish hooked or total catch. The former presents inflated percentages by not including undersize and depredated fish in calculating the percentage of takes, while the latter includes all fish that are hooked in the calculation and assumes all fish, regardless of size, have an equal probability of being depredated.

Depredation rates by pinnipeds in the commercial salmon fishery have increased dramatically in the last several decades, up to a 67 % increase in the depredation of the legal catch since the 1970's and 1980's. Briggs and Davis (1972) reported depredation rates by California sea lions of 4.1 % for all the salmon hooked during the 1969 commercial and sport salmon season, Miller et al. (1983) reported depredation rates of 3.0 % for the legal catch in the commercial salmon fishery, and Beeson and Hanan (1996) found depredation rates of 15 % of the legal catch in the commercial fishery in 1995. The present study found depredation rates of

7.9 % for the total commercial catch or 11.5 % of the legal catch in 1997, and 28.6% of the total commercial catch or 71.1% of the legal catch in 1998. The greatest depredation rates occurred in the spring of each year corresponding with the southern migration of sea lions to their breeding grounds in the Channel Islands. The 1997 depredation rates dropped significantly following a high in May (20.5 %). However in 1998, the southern migration appeared to have been delayed with high depredation rates occurring in May (32.2 %), June (22.8 %), and July (17.9 %). Briggs and Davis (1972), Miller et al. (1983), and Beeson and Hanan (1996) found similar results with the greatest number of salmon being depredated in the spring in the commercial and recreational salmon fisheries. Depredation rates were greater in June and July in all three fisheries in 1998, but the commercial fishery had the highest sustained depredation rates. Commercial fisheries also have a greater proportion of below surface takes as a result of the large amount of trolling gear used and the time required to pull the gear. It was not uncommon on onboard surveys for fishers to take up to 10 minutes to pull a hooked fish, allowing ample time for sea lion takes. Less gear and perhaps different types of gear that can be pulled faster may reduce the high below the surface and overall depredation rates.

Depredation rates of the legal catch by pinnipeds on the CPFV salmon fishery have experienced up to a 21 % increase since 1983, and close to 16 % since 1995. Miller *et al.* (1983) reported depredation rates of 5.2 % for the CPFV legal catch in Monterey Bay, and Beeson and Hanan (1996) reported depredation rates of 10.5 % of the legal catch for the 1995 recreational fishery season (CPFV and private skiff combined). The present study found depredation rates of 8.4 % of the total catch or 13.7 % of the legal catch in 1997, and 18.3 % of the total catch or 26.3 % of the legal catch in 1998. Again, the greatest depredation rates of the total catch occurred in the spring of both years coinciding with the male sea lion southward migration. Peaks in depredation rates occurred in May (20.6 %) of 1997, and later in May (22.7 %) and June (23.8 %) 1998. Later in 1997, depredation rates of the total catch were high in August (28.3 %), concurrent with greater abundance of animals returning to the region on the male sea lion northward migration. Surface and below surface takes occurred in approximately equal proportions resulting from the ability to pull hooked fish quickly with rod and reel fishing gear.

In the personal skiff portion of the recreational salmon fishery, depredation rates of the legal catch have increased over 29 % since 1983 and over 20 % since 1995. Miller et *al.* (1983)

reported depredation rates of 1.4 % for the private skiff legal salmonid catch in Monterey Bay, and Beeson and Hanan (1996) reported depredation rates of 10.5 % of the legal catch for the 1995 recreational fishery season (CPFV and private skiff combined). We found depredation rates of 15.6 % of the total catch or 27.7 % of the legal catch in 1997. and 17.5 % of the total catch or 3 1 .0% of the legal catch. Again, the greatest depredation rates occurred in the spring of both years, May (22.2 %) in 1997 and April (20.6 %), May (24.4 %), and June (24.5 %) 1998, coinciding with the male sea lion southward spring migration.

Increased depredation rates in both the commercial and recreational salmon fisheries in 1998 were most likely the result of the large El Niño Southern Oscillation event that occurred in 1997-1998. The 1997-98 El Niño event was one of remarkably large anomalies in physical and biological conditions in the coastal waters off California resulting in above average seasonal norms in sea surface temperatures and large displacements in the distribution of many fish species (Lynn et al. 1998). A combination of factors during a large El Niño events contribute to increased depredation of salmon catches. These factors include a decrease in sea lion prey populations, a shift in sea lion prey composition, an increasing number of sea lions in the region, a decrease in the number of salmon being landed, and a decrease in fishing effort by commercial and recreational salmon fishers. Commercial gill net fishers report that pinniped depredation is more intense during El Niño events (Beeson and Hanan 1996). This increased intensity in depredation by pinnipeds may be indicative of decreased foraging success resulting from shifts in prey availability and abundance. Food habit data indicated a significant shift in sea lion diet from market squid and northern anchovy to Pacific sardine and rockfish. Additionally, the commercial squid and herring fisheries were virtually nonexistent from the fall of 1997 through the summer of 1998. It is, therefore, reasonable to assume that sea lions were probably stressed with the lack and change in prey items, and would find a netted halibut or a hooked salmon an attractive and easy meal. Sea lion numbers along the central coast increased during the 1983 and 1992 El Niiio events due to the enhancement of the normal northward migration resulting from poor food availability in the Southern California Bight (Sydeman and Allen 1997). Sea lion pup mortality was extremely high in May and June 1998, presumably because schooling prey fish were less abundant in the Southern California Bight (Lowry, pers. comm. September 1998). During the winter of 1997-98, abnormally high water temperatures associated with El Niño

conditions caused a drastic decline in squid abundance in southern California waters (CalCOFI 1998). Aerial survey data on sea lion abundance along the central California coast was not of sufficient duration to detect an increase in abundance from before to after El Niño conditions occurred. However, given the lack of schooling prey and declines in commercial fisheries in southern California. it is reasonable to assume that greater numbers of animals moved northward to the central coast during the 1997-98 El Niño event.

Commercial and recreational landings in number of salmon and fishery effort were down in 1998 versus 1997, presumably as a result of El Niño conditions. Dockside surveys indicated the catch per unit of effort (CPU) of the legal salmon catch declined in all three salmon fisheries in 1998. The commercial salmon fishery experienced a precipitous decline in the CPU from 47.7 fish per boat in 1997 to 21.7 fish per boat in 1998. The recreational salmon fishery CPU also declined with the CPFVs' dropping from 22.7 fish per boat in 1997 to 18.2 fish per boat in 1998, and private skiffs went from 2.3 fish per boat to 1.7 fish per boat in 1998. Fishery effort is based on the number of salmon boats sampled per hour (bph) dockside. In the commercial fishery, the fishery effort declined from 2.5 bph in 1997 to 1.8 bph in 1998. The recreational fishery also declined in fishery effort from 1997 to 1998, with CPFV declining from 2.0 bph to 1.9 bph and private skiffs declining from 10.8 bph to 8.3 bph.

Limitations encountered in this study may affect the depredation rates reported for the commercial and recreational salmon fisheries in Monterey Bay. The lack of direct validation for information received on dockside surveys had unknown impacts on depredation rate estimates. Data collection began in late April of 1997, missing approximately 5 weeks of the recreational season, which may underestimate the overall depredation rates for the season because of the high interaction typically occurring in the spring. Additionally, commercial and private skiff salmon boats bypass the sampling docks with unknown impacts on depredation rates. Commercial boats would bypass the sampling dock if the catch was sold to a private dealer, the catch was kept by the fisher, or if no fish were landed. Private skiffs that docked in slips in the harbor would bypass the boat launching dock. The sample size for onboard surveys for both the commercial and recreational fishery in 1997 were low making it difficult to validate the findings on the dockside surveys. Boat surveys were limited by crew cooperation, therefore, not all fishing styles and locations were sampled with unknown impacts on depredation rates. Boat surveys were also

limited to day trips because multiple day trip boats often fished outside the study area during the course of a trip.

Food Habits

Pinniped food habit studies provide information on seasonal prey selection, feeding locations, and prey availability. There is little doubt that pinnipeds are feeding on salmonids, and there is a growing concern about the declining stocks of salmonids in the Pacific Northwest. But determining the impact of pinniped foraging on these depressed stocks is difficult. Pinnipeds are opportunistic predators switching prey species depending on the availability of fish (Fiscus and Baines 1966, Fiscus 1979, Jones 198 1, Bailey and Ainley 1982, Hawes 1983, Antonelis et al. 1984, Lowry et al. 1986, Nicholson 1986, Lowry and Folk 1987, Lowry et al. 1990, Lowry et al. 199 1, Hanson 1993), such as salmon, when they are abundant (Briggs and Davis 1972, Miller et al. 1983, Hanan et al. 1989, Beeson and Hanan 1996, and NMFS 1997).

California sea lions using the Monterey Bay region in 1997-98 consumed a variety of prey species, consisiting primarily of fish and cepholopods species as indicated by the presence of cephalopod in 59.1 % of scats and fish in 40.9 % of scats. Sea lions were opportunistic predators feeding on a variety of prey species, primarily schooling prey such as squid, sardines, anchovy, and rockfish. Twenty-five taxa were consumed by sea lions and identified to species, 1 to genus, and 3 to family. At San Miquel Island, Antonelis et al. (1984) found sea lions preying upon 15 species of fish and 6 species of cephalopod, Hawes (1983) found sea lions on San Nicholas Island consumed 15 species of fish and 7 species of cephalopods, Nicholson (1986) reported sea lions on the Coast Guard jetty in Monterey consumed 6 species of fish and 1 species of cephalopod, and Lowry et al. (1990) found that California sea lions on San Clemente Island consumed 44 species of fishes and 5 species of cephalopods.

The prevalence of squid in the sea lion diet early in the study, summer and fall of 1997, is not surprising since market squid dominated the commercial fishery landings in the Monterey Bay region at that time of year. However, squid remained dominant in the sea lion diet through spring 1998. while commercial landing stopped abruptly in the end of September of 1997 until the present time a result of the 1997-98 El Niño event (CalCOFI 1998, Bob Leos pers. comm. January 1999). The El Niiio event in 1991-92 also resulted in below average yields of

commercially harvested market squid (CDF&G 1993). The presence of market squid in the diet of California sea lions through the spring of 1998 indicates the availability of the prey to sea 0612 lions, despite the low commercial harvest.

Pacific sardines were an increasingly important prey item found in scat samples during all seasons, becoming the dominant prey item in the summer and fall of 1998. Sardine populations have rebounded as indicated by the rebuilding of the sardine fishery, which in 1997 reported the greatest total landings since the reopening of the directed fishery in 1986 (CalCOFI 1998). Sardines schools occur up to 300 miles offshore, moving inshore to spawn in late winter through early summer (Love 199 1). Sardine egg distribution differed sharply in 1997 with a broad offshore extension compared to a narrow, northward, near-shore pattern in 1998 (Lynn et al. 1998). The increase in dominance of sardines in the sea lion diet from 1997 to 1998 was concurrent with the seasonal spawning movement of sardines, and more importantly, the apparent concentrating effect on sardines in the central California coast region as a result of oceanographic patterns during the 1997-98 El Niño event.

Northern anchovies occurred in approximately equal numbers throughout the study period. However, thedecrease in the presence of market squid in the summer and fall of 1998 increased the relative importance of anchovies. Anchovies are an important commercial species in the Monterey Bay, ranking third highest in commercial landings in 1997, behind sardine and squid.

Rockfish occurred in increasingly larger numbers throughout the study, becoming one of the predominant prey items in the summer and fall of 1998. This increased importance of rockfish in the sea lion diet coincides with their increased abundance in the summer as aggregations of juvenile rockfish move into shallow water (Loeb et al. 1996). The estimated standard lengths of rockfish indicate that most of the rockfish consumed by sea lions were juvenile. While reported commercial rockfish catches encompass an extensive array of fish species, and inter-annual variability exists in the composition of this array, the overall commercial catch in 1997 was high. In contrast, Lynn et al. (1998) recorded the lowest pelagic-young-of-the-year rockfish catch rate in the history of the survey in their May 1998 survey. This remarkable decline in young-of-the-year rockfish does not effect the occurrence of rockfish in the

sea lion diet. but may do so when this size-class reaches the juvenile stage, apparently preferred by sea lion.

There are numerous limitations and potential biases associated with the use of fecal samples in the investigation of pinniped food habits described in the literature (Pitcher 1980, Hawes 1983, DaSilva and Neilson 1985, Harvey 1989, Cottrell et al. 1996). The differential recovery rates of fish hard parts varies with prey species. The preliminary analysis of fecal samples presented in this study only includes the use of fish otoliths and cephalopod beaks to determine the relative importance of prey items in the sea lion diet. The frequency and number of individual prey have been reported as at least two times greater for most prey taxa when prey structures in addition to otoliths were identified (Browne, pers. comm. October 1998). Large fishes are typically underestimated because they are less likely to be consumed whole, and their otoliths may not appear in fecal samples (Pitcher 1980). Harvey (1989) noted in captive feeding experiments that recovery rates of otoliths from fecal samples varied greatly among prey species and individual seals. Additionally, fishes with small, or less robust, otoliths tended to have lower recovery rates due to the increased probability of complete digestion. The difficulty in describing the role of salmonids in pinniped food habits is compounded by their large body size and comparatively small otolith size.

Cephalopod beaks are often retained in the stomach and regurgitated en masse after accumulation, rather. than being passed through the intestinal tract (Pitcher 1980). Therefore, cephalopod beaks can be substantially under estimated in fecal samples, biasing estimates of number, biomass, and relative importance. In this study, the relative importance of squid in the diet on a seasonal basis would not be significantly affected by the loss of squid beaks during regurgitation, although squid may have dominated the diet from the summer of 1997 through spring 1998 to a greater extent than indicated by fecal samples.

This report does not intend to imply that salmonids are not a prey species for pinnipeds in the Monterey Bay region, but highlights the difficulties encountered in establishing the role of salmonids in the pinniped diet when analyzing fecal samples. Salmon otoliths do not occur in large numbers in fecal samples, but occur regularly and may represent a larger portion of the biomass consumed. Furthermore, salmon are regularly taken by sea lions in the commercial and recreational fisheries. Therefore, salmon may be an important component in the sea lion diet.

ADDITIONAL RESEARCH

Pinnined Abundance

Since the passage of the MMPA in 1972, populations of California sea lions and Pacific harbor seals *(Phoca vitulina richardsi)* have experienced an average annual rate of increase of greater than 5% along the West Coast (NMFS 1997). Seasonal and within season distribution and abundance of California sea lions and Pacific harbor seals at haul-out sites (areas where pinnipeds come ashore to rest) along the California coast is essential in the assessment and evaluation of their potential impact on declining salmonid populations and fisheries. Pinniped census flights were conducted once a month from May 1997 through September of 1998 using a single engine, high wing plane (Cessna 172) going approximately 80 knots at an altitude of 600 m (the legal altitude within the Monterey Bay National Marine Sanctuary) from Pt. Sur north to Año Nuevo Island. General trends corresponded with other coast-wide surveys indicating that many adult male, subadult, and juvenile sea lions migrate northward from breeding grounds on the Channel Islands and islands in northern Baja to central and northern California. Peak abundances of animals occurred in the Monterey Bay region as early as the beginning of August and lasted through November. In the spring, peak abundance counts occurred in April through June corresponding to the southward sea lion migration as they return to their breeding grounds.

Pinniped Predation on San Lorenzo River

The San Lorenzo River is a major river drainage flowing into the Monterey Bay and is home to the largest stock of steelhead (*Oncorhynchus mykiss*) in the region. The annual winter upstream spawning migration of steelhead coincides with peak abundances of Pacific harbor seals hauling out on rocks in the river lagoon (Harvey and Weise 1997). Scars attributed to predation attempts by harbor seals and California sea lions have increased from 15 % in 199 l-92 to greater than 50 % per year in 1995-96 and 1996-97. Foraging behavior was monitored for 205 hours at the mouth of the San Lorenzo River in January through March 1998. No predation events were observed, but 22 foraging behaviors were recorded on 21 % of the observation days. The Monterey Salmon & Trout Project trapped migrating steelhead at the Felton Diversion Dam in 1998 recording pinniped scarring on 18.8 % of the fish in January, 28.9 % in March, and 38 % in April.

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Table 1. Allocation of survey effort in hours for the recreational and commercial salmon fishery in 1997 and 1998 in Monterey Bay, California

	Commercial Fishery	CPFV Fishery	Private Skiff Fishery
1997			
Dockside Surveys	44	32	23
Onboard Surveys	100	71	67
Total	144	103	90
1998			
Dockside Surveys	156	95	64
Onboard Surveys	214	175	0
Total	370	270	64

Table 2. Monthly catch statistics and estimates of the number and percentage of salmon depredated by pinnipeds in the commercial salmon fishery during dockside surveys in 1997-98

			Catch Statistics				Number Takes		Percentage Takes	
		Number boats sampled	Total number fish hooked	Number legal fish landed	Number undersize fish		Number fish taken at surface	Number fish taken below surface	Total % of legal catch lost	Total % of total catch lost
1997	May	73	5354	4031	223		220	880	27.3	20.5
	June	72	4705	3318	1345		14	28	1.3	0.9
	July	112	7521	4744	2534		167	76	5.1	3.2
	TOTAL	257	17580	12093	4102		401	984	11.5	7.9
1998	May	181	10741	4376	2910		71	3384	79.0	32.2
	June	50	2296	955	817		22	502	54.9	22.8
	July	55	2409	875	1102		4	428	49.4	17.9
	TOTAL	286	15446	6206	4829	0	97	4314	71.1	28.6

Table 3. Monthly catch statistics and estimates of the number and percentage of salmon depredated by pinnipeds in the CPFV salmon fishery during dockside surveys in 1997-98

			Catch Statistics			Number Takes		Percentage Takes	
		Number boats sampled	Total number fish hooked	Number legal fish landed	Number undersize fish	Number fish taken at surface	Number fish taken below surface	Total % of legal catch lost	Total % of total catch lost
1997	April - May	37	486	379	29	57	21	20.6	16.0
	June	44	2184	1738	387	37	22	3.4	2.7
	July	50	2325	980	1097	130	118	25.3	10.7
	August	8	173	60	64	23	26	81.7	28.3
	TOTAL	139	5168	3157	1577	247	187	13.7	8.4
1998	March	27	244	190	15	29	10	20.5	16.0
	April	46	1175	830	115	89	141	27.7	19.6
	May	32	970	687	63'	49	171	32.0	22.7
	June	33	1241	742	204	116	179	39.8	23.8
	July	42	1062	818	170	22	52	9.0	7.0
	August	2	0	0	0	0	0	0.0	0.0
	TOTAL	182	4692	3267	567	305	553	26.3	18.3

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Table 4. Monthly catch statistics and estimates of the number and percentage of salmon depredated by pinnipeds in the private skiff salmon fishery during dockside surveys in 1997-98

			Catch Statistics			Number Takes		Percentage Takes	
		Number boats sampled	Total number fish hooked	Number legal fish landed	Number undersize fish	Number fish taken at surface	Number fish taken below surface	Total % of legal catch lost	Total % of total catch lost
1997	April - May	504	1754	1078	286	264	126	36.2	22.2
	June	84	399	263	123	6	7	4.9	3.3
	July	83	669	277	353	20	19	14.1	5.8
	August	43	97	22	62	13	0	59.1	13.4
	September	1 1	7	3	4	0	0	0.0	0.0
	TOTAL	725	2926	1643	828	303	152	27.7	15.6
1998	March	98	199	150	24	23	2	16.7	12.6
	April	111	399	205	112	27	55	40.0	20.6
	May	71	192	122	41	11	18	23.8	15.1
	June	132	453	244	98	37	74	45.5	24.5
	July	108	302	148	128	1	25	17.6	8.6
	August	10	19	13	6	0	0	0.0	0.0
	TOTAL	530	1564	882	409	99	174	31.0	17.5

0522

Table 5. Seasonal composition of prey species composition from California sea lion fecal samples collected during 1997 and 1998 in Monterey Bay, California based on percent similarity idex (PSI). Dashes (-) indicate redundant comparisons. 0623

	Winter 1997-98	Spring 1998	Summer 1998	Fall 1998
Summer & Fall 1997	87.8	77.3	20.1	22.2
Winter 1997-1998	*	70.1	14.1	15
Spring 1998	*	*	45.4	35.5
Summer 1998	*	*	*	83.5

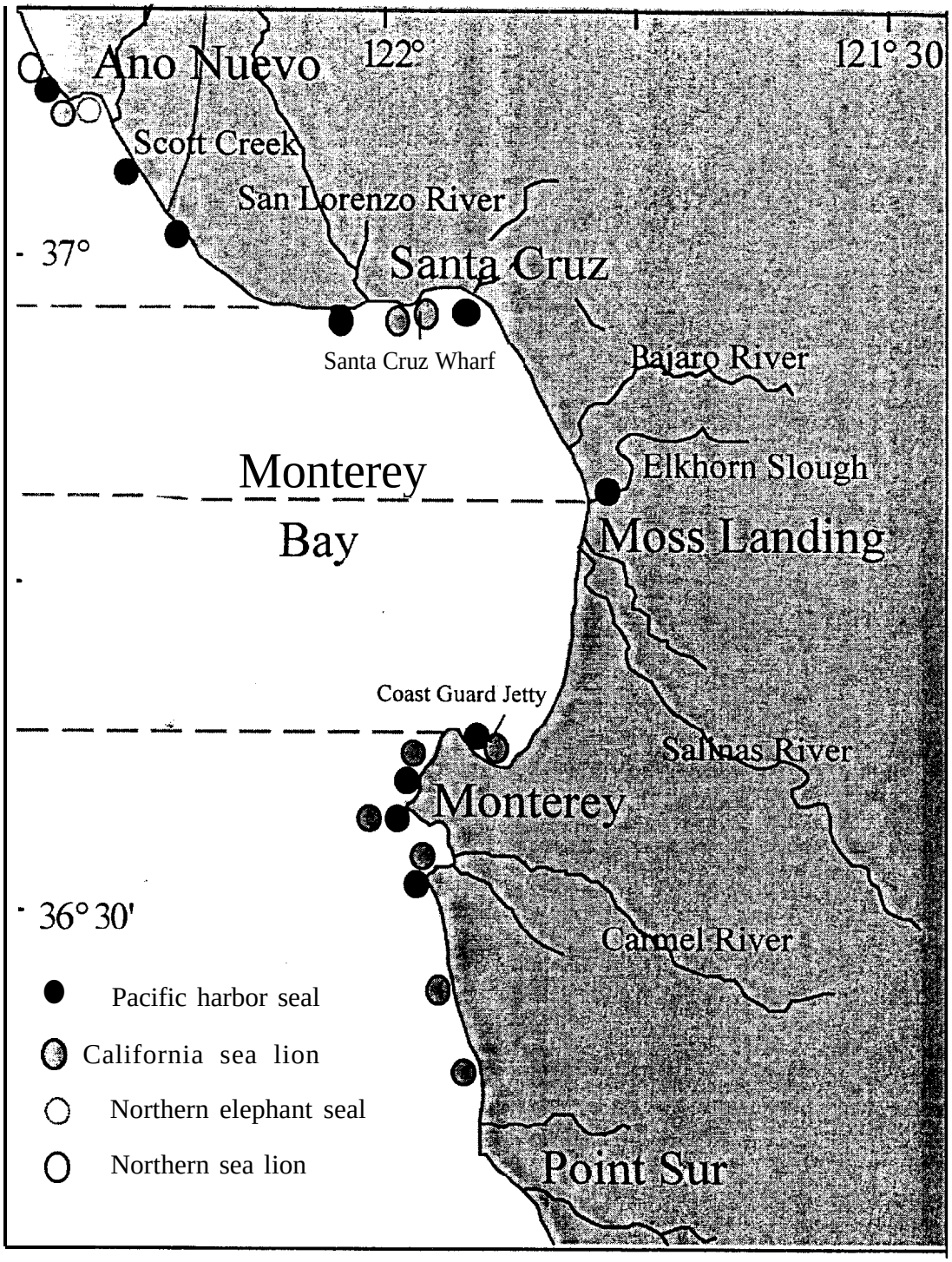

Figure 1. Pinniped haulout sites and scat collection sites within the study region. Counts of sea lions and scat collection were conducted in 1997 and 1998.

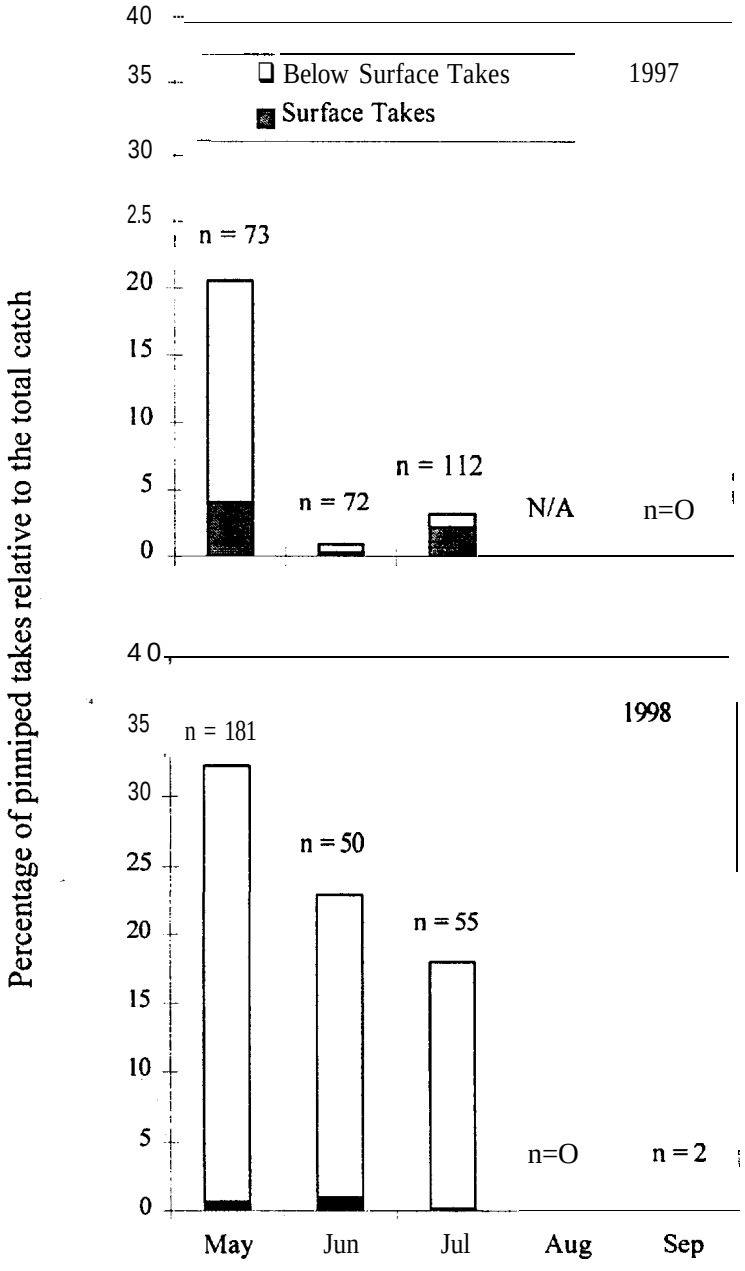

Figure 2. Percentage of pinniped takes relative to the total number of salmon hooked in the commercial fishery based on dockside surveys in 1997 and 1998 in Monterey Bay, California. Sample size (n) is listed for each month.

0626

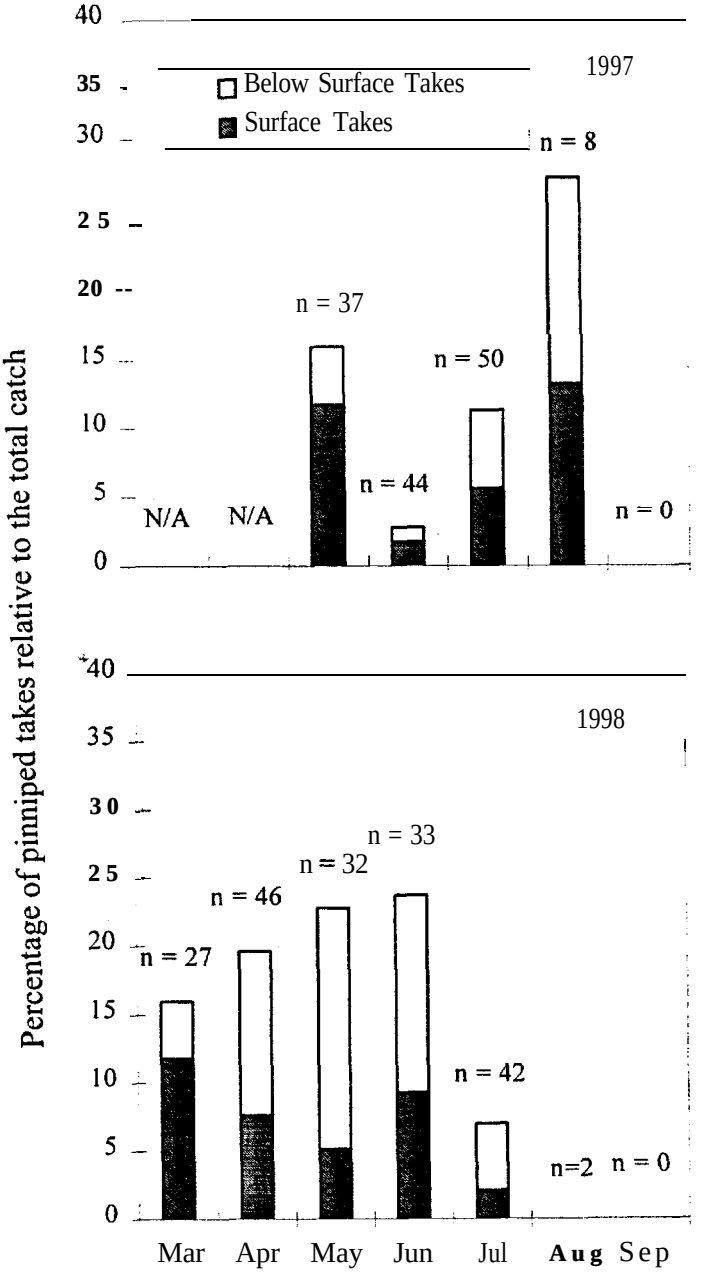

Figure 3. Percentage of pinniped takes relative to the total number of salmon hooked in the CPFV salmon fishery based on dockside surveys in 1997 and 1998 in Monterey Bay, California. Sample size (n) is listed for-each month.

0627

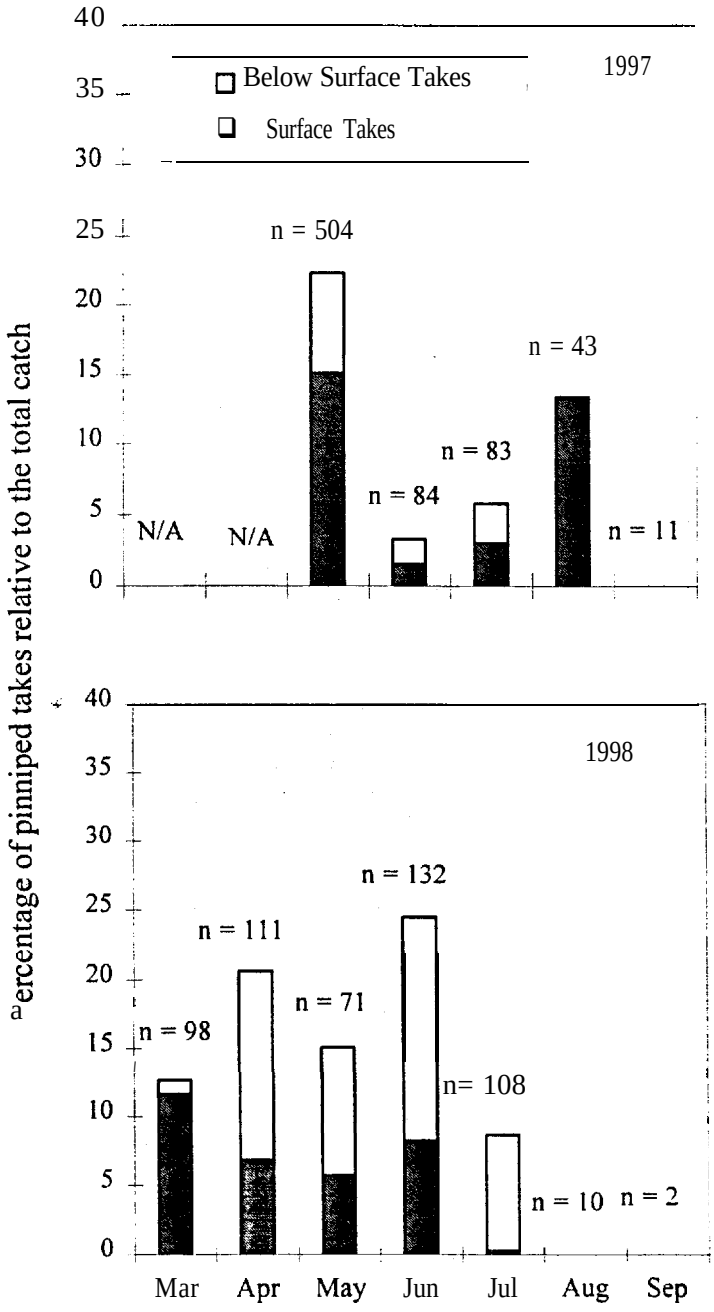

Figure 4. Percentage of pinniped **takes** relative to the total number of salmon hooked in the private skiff salmon fishery based on dockside surveys in 1997 and 1998 in Monterey Bay, California. Sample size (n) is listed for each month.

0628

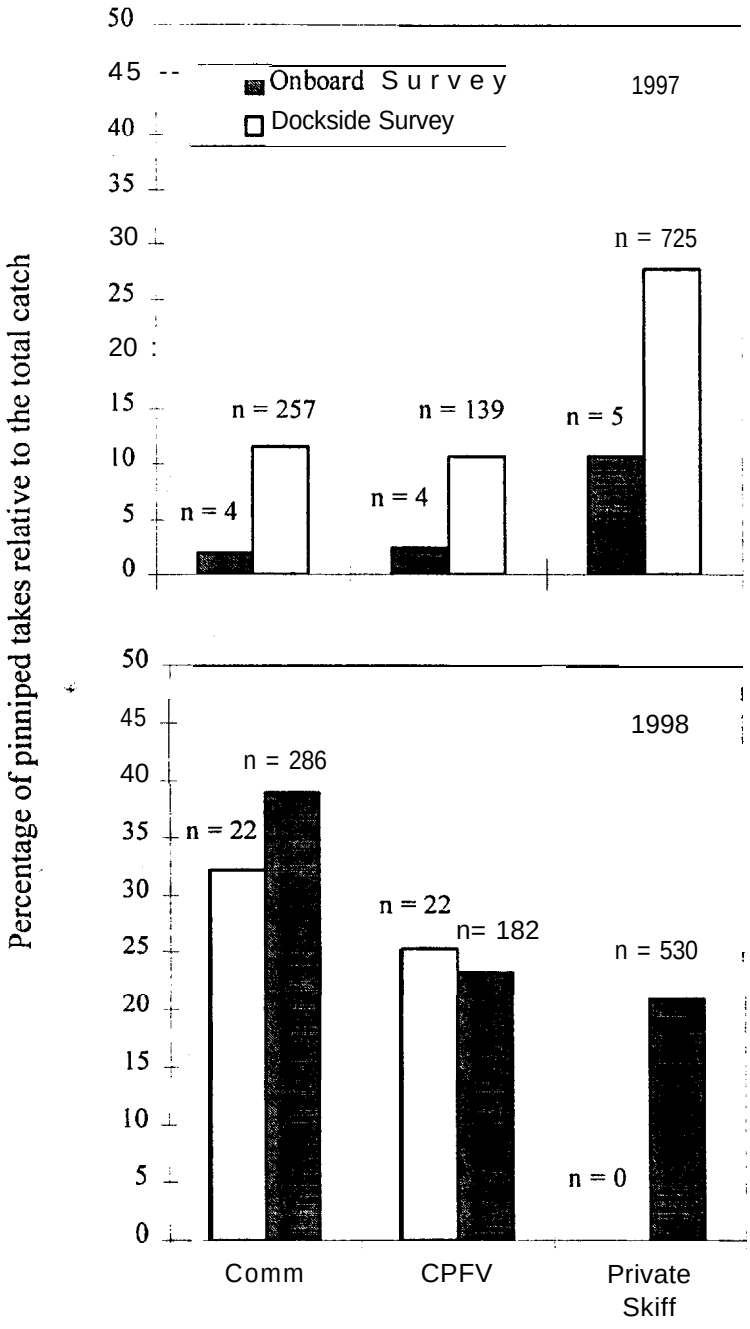

Figure 5. Comparison of dockside and onboard surveys for the percentage of pinniped takes relative to the total number of salmon hooked for the commercial, CPFV, and personal skiff fisheries in Monterey Bay, California in 1997 and 1998. Sample size (n) is listed for each month.

0629

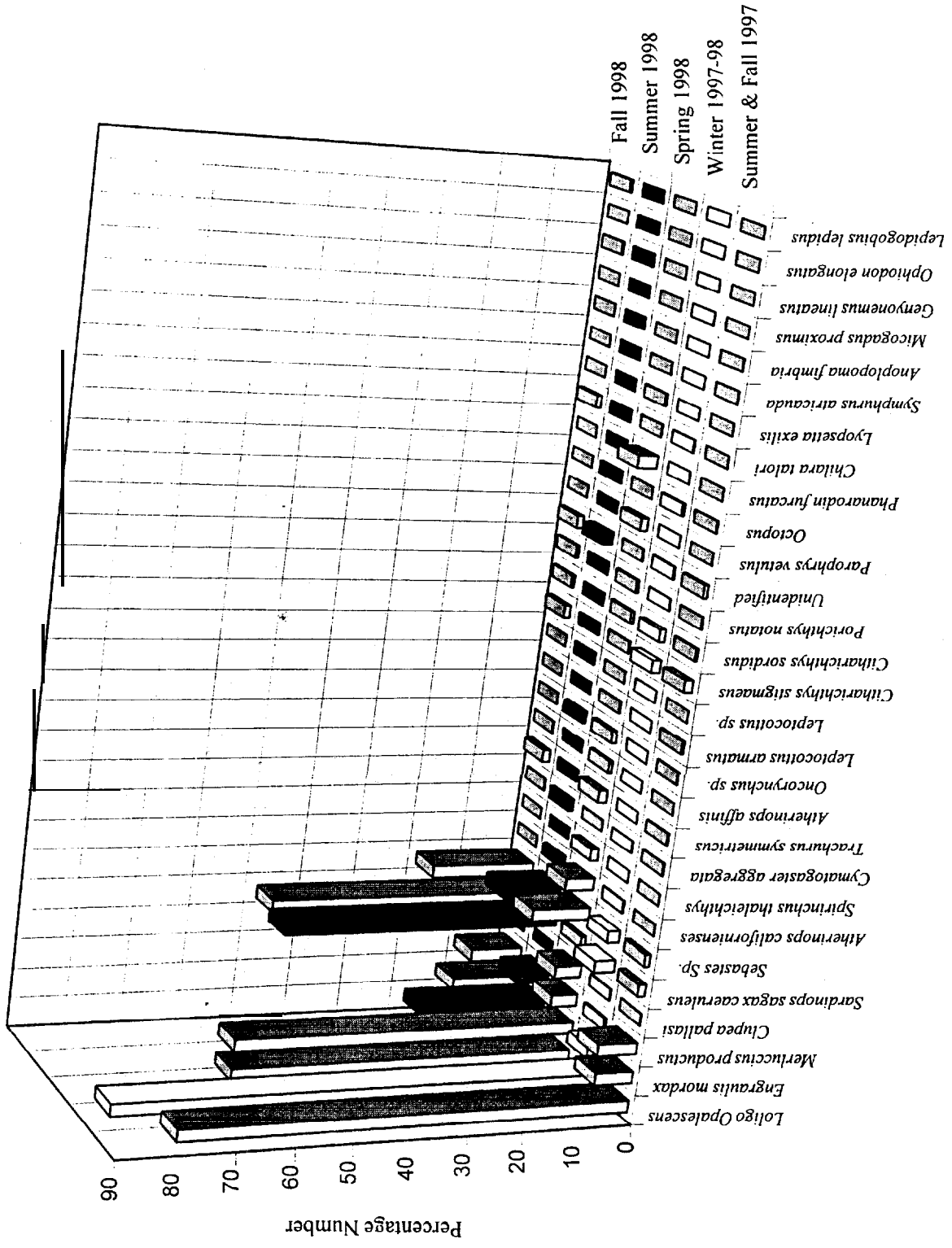

Figure 6. Comparison among seasons using percentage number of prey species identified in California sea lion fecal samples collected in Monterey Bay, California in 1997 and 1998.

0630

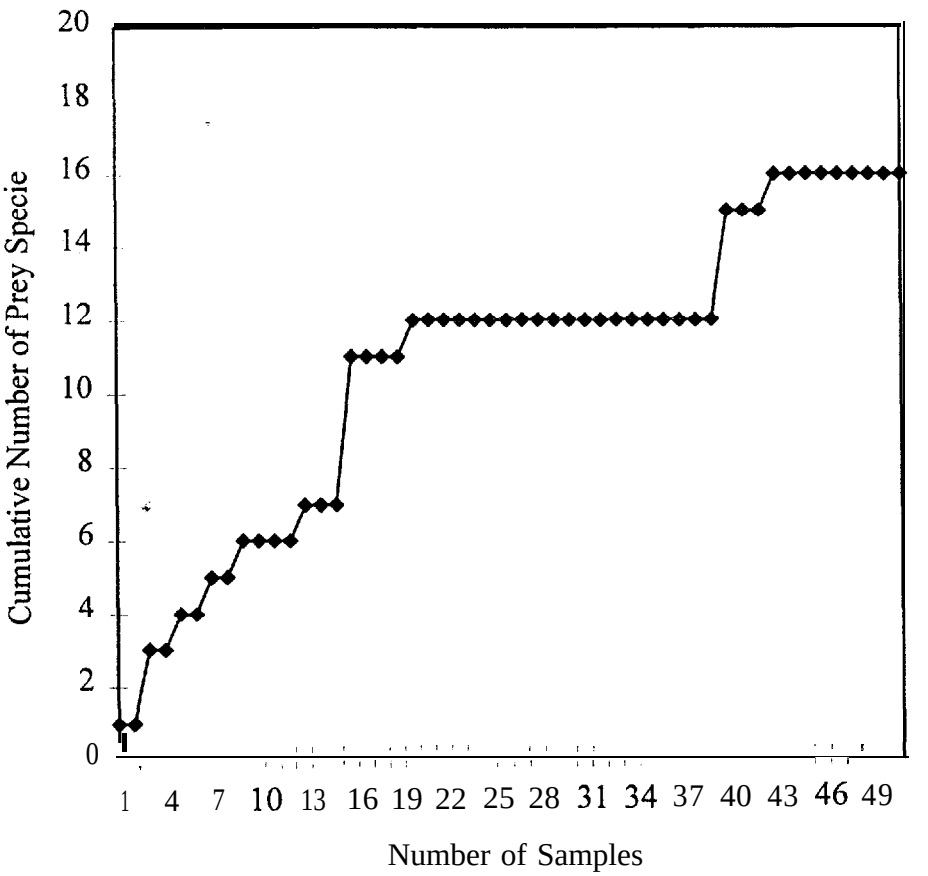

Figure 7. Cumulative number of prey species per fecal sample collected during spring (February, March, April) 1998 in Monterey Bay, California.

FISH AND GAME COMMISSION

GOVERNMENTAL CENTER

COUNTY OF SANTA CRUZ

701 OCEAN STREET, ROOM 400, SANTA CRUZ, CALIFORNIA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123

FISH AND GAME ADVISORY COMMISSION

AGENDA

Santa Cruz County Governmental Center
Planning Department Conference Room
701 Ocean Street
Santa Cruz CA 95060

October 7, 1999
7:00 P.M.

1. CALL TO ORDER

2. ROLL CALL

3. APPROVAL OF MINUTES

4. GUEST INTRODUCTIONS

5. ORAL COMMUNICATIONS

6. OLD BUSINESS

   A. Review revised format of proposed resolution regarding sea mammal/fisheries interactions to be forwarded to the Board of Supervisor's prior to U.S. Congress review of the Marine Mammal Act.

7. NEW BUSINESS

   A. Review draft of letter to Senator Mc Pherson regarding a Senate Bill which will provide funding for watershed and habitat improvemnet. Commissioner Murphy to present draft.

   B. Discussion of ocean salmon regulations, specifically circle hooks versus "j" hooks.

   C. Discussion regarding purchase of signs for placement along local waterw ays detailing endangered species, and seasons for sport fishing. Commissioner McCrary was particularly concerned with summer fishing which is illegally taking place.

8. ADDITIONS / PRESENTATIONS BY COMMISSIONERS

9. **STAFF REPORTS / ANNOUNCEMENTS**

10. **ADJOURNMENT:**

MATT BALDZIKOWSKI
Administrative Staff
(831) 454-3165

FGAGEN

County of Santa Cruz

0633

FISH AND GAME ADVISORY COMMISSION

701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060

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Fish and Game Advisory Commission

MINUTES

Santa Cruz County Governmental Center
Planning Department Conference Room
Santa Cruz, CA 95060

October 7, 1999

1. CALL TO ORDER The meeting was called to order at 7: 15 P.M.

2. ROLL CALL Present: Commissioners Smith, Peterson, Murphy, Ritchey, Gallagher, McCrary
Excused: Commissioners Frediani, Lease
Absent: Commissioners North. Estrada

3. APPROVAL OF MINUTES The minutes of the September 2, 1999, Commission meeting were approve, with the addition of the word 'previously' into the first line of page 2, after "Commissioner Ritchey'.

4. GUEST INTRODUCTIONS
Travis Semmes, Jeanine DeWald, Larry Wolfe

5. ORAL COMMUNICATIONS

Harlie Peterson expressed his concern regarding the permitting procedures necessary to deal with feral pigs. Jeanine DeWald indicated that she would provide the Commission with information regarding the current regulations governing hunting feral pigs. Harlie related that his friend had used blood meal to discourage the pigs.

6. OLD BUSINESS

A. Review of Resolution regarding; marine mammals. The Commission unanimously approved submittal of the revised Resolution to the Board of Supervisors for their consideration, along with supporting documentation, in November.

7. NEW BUSINESS

A. Watershed and habitat improvement funds for fish rearing facilities. Discussion of potential sources of grant funds for fish rearing facilities. Larry Wolfe expressed his frustration with the process, especially with the SB 271 review process. As fish rearing is not eligible for SB 271 funds, Larry felt that the State had misled them regarding where to file for funds. Information was distributed regarding the Coastal Resource Grant Program. The Commission voted unanimously to send a resolution to Senator McPherson, Assembly Member Keeley and Supervisor Almquist in support of future funding for the Monterey Bay Salmon and Trout Project. Commissioner Ritchey indicated that he would prepare the resolution.

B. Ocean Salmon Regulations. The Commission discussed new ocean fishing regulations, Jeanine DeWald indicated that she would provide additional information at the next meeting for the Commission's discussion.

C. Coho/steelhead Signs. The Commission discussed the need for new posting of the signs informing fisherman of the Endangered Species Act listing of Coho salmon and steelhead. Staff indicated that, while it would take some time to prepare new signs, a good number of the older signs were available for immediate use. Staff indicated that signs could be obtained from Matt Baldzikowski.

8. PRESENTATIONS

A. The Commission expressed an interest in exploring alternative sources of funds for their project grants. One idea was to enter into an agreement with Big Trees to harvest the large firs along their rail corridor and to use any of the excess funds for Commission grants. Next Agenda.

B. The Commission discussed the problem with Mergansers 'harvesting' juvenile fish.

9. STAFF REPORTS/ANNOUNCEMENTS None

10. ADJOURNMENT The meeting was adjourned at 8:35 p.m.

Note: Next meeting is November 4, 1999.

Submitted by M. Deming