DEPARTMENT OF COMMERCE
National Oceanic and
Atmospheric Administration
National Marine Fisheries Service

The Marine Mammal Protection Act of 1972 Annual Report

April 1, 1977, to March 31, 1978

The Marine Mammal Protection Act of 1972 Annual Report

April 1, 1977, to March 31, 1978

U.S. DEPARTMENT OF COMMERCE
Juanita M. Kreps, Secretary

National Oceanic and Atmospheric Administration
Richard A. Frank, Administrator

National Marine Fisheries Service
Terry L. Leitzell, Assistant Administrator for Fisheries

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

JUN 2 1 1978

Sirs:

It is my honor to submit the Annual Report of the Department of Commerce on the Administration of the Marine Mammal Protection Act of 1972 for the period of April 1, 1977, through March 31, 1978, as required by Section 103(f) of the Act. The responsibilities of the Department are limited to whales and porpoises of the Order Cetacea and seals and sea lions of the Suborder Pinnipedia.

Sincerely,

Juanita M. Kreps

Enclosure

President of the Senate
Speaker of the House of Representatives

CONTENTS

School of Fraser's Porpoise

Part I - INTRODUCTION

Legislative History of the Marine Mammal Protection Act of 1972

In 1972, when the Marine Mammal Protection Act (the Act) was under consideration by the United States Senate and the House of Representatives, concern was expressed over the future of marine mammals. The Senate Committee on Commerce reported, "man's dealings with marine mammals have in many areas resulted in over-utilization of this precious natural resource. Many of the great whales which once populated the oceans now have dwindled to the edge of extinction. The commercial hunting of whales has reduced these great mammals to the point that many may never be able to return to their original population size and balance in nature." Also, the Committee expressed concern over the incidental killing of thousands of porpoises (dolphins) each year by the U.S. tuna industry.

The proposed legislation included other marine mammals such as manatees, sea otters, seals, polar bears, and walruses. During committee hearings, it was pointed out that one of the major incentives for the purchase of Alaska was the fur seal resource. Prior to 1911, when harvesting became regulated by treaty, this animal was exploited by commercial interests. Although the northern fur seal herd in the Pribilofs seemed to be holding its own at the time of the Senate hearings, controversy remained over the method used to kill the seals.

After public hearings, the Committee determined that "man's hand upon the environment had been severely heavy for some species of marine mammals." The basic issue before the Committee was whether to prohibit the killing of any marine mammal, or whether to continue to allow managed but restricted taking of certain mammals. Strong evidence was presented to the Committee that total and complete protection without scientific management was not the best answer to solving the problems of marine mammals. Therefore, both the House of Representatives Committee on Merchant Marine and Fisheries and the Senate Committee on Commerce recommended legislation that imposed a moratorium for all taking of marine mammals, but with important exceptions. The basic moratorium of the Act does not apply to mammals already managed under international agreements, such as the northern fur seal. The Act allows the Secretary of Commerce or the Secretary of the Interior to make wildlife management decisions concerning exceptions and to issue permits for scientific research or display. Alaska Eskimos, Indians, and Aleuts are allowed to take marine mammals for subsistence. However, the Secretary may limit

or end the native exemption if taking endangers, depletes, or inhibits the restoration of depleted or endangered stocks. Further, the Secretary was allowed to exempt persons from the provisions of the Act, for no more than 1 year, to prevent cases of undue economic hardship. The Act calls for the Secretary of Commerce and the Secretary of the Interior to establish general regulations on taking and importing of marine mammals by species and to invite full public participation in this decision-making process.

The Departments of Commerce and Interior were directed to start immediate research programs on marine mammals. In seeking answers about population sizes and complex questions relating to their environmental health, the Committees found confusion between social decisions and scientific knowledge. They concluded that our knowledge of marine mammals was not great enough for either proper conservation or commercial use.

The Act created a Marine Mammal Commission to review existing and proposed programs and research and a Committee of Scientific Advisors to assist the Commission. The Act requires each Secretary to initiate international negotiations in order to expand the principles of the Act to other countries.

The Committee on Commerce determined that the National Oceanic and Atmospheric Administration (NOAA) was the agency best equipped to deal with marine mammals on an ecosystem basis in the oceans. Therefore, NOAA was given responsibility for the order Cetacea (whales and porpoises) and the Suborder Pinnipedia (seals and sea lions), except walruses. The Department of the Interior is responsible for sea otters, walruses, polar bears, dugongs, and manatees.

Summary: The Marine Mammal Program

After the Act became effective, the Administrator of NOAA gave authority to the Director of the National Marine Fisheries Service (NMFS) to carry out the functions of the Act. In 1976, the Fishery Conservation and Management Act expanded NMFS responsibilities under the Marine Mammal Protection Act to include the 200-mile Fishery Conservation Zone.

The current program includes decisions regarding waivers of the moratorium, issuing permits for scientific research and public display, conducting research on marine mammals, enforcement of the provisions of the Act, publishing the rules and regulations to control the status of marine mammal populations, cooperating with the states, and participation in international activities and agreements to conserve and manage marine mammals. A close working relationship is maintained with the Marine Mammal Commission and its Committee of Scientific Advisors.

From the beginning of the program, the incidental killing of porpoises by commercial fishermen while purse seining for yellowfin tuna has been a dominant issue. (NMFS uses the term porpoise as opposed to dolphin based on a long history of usage and to prevent confusion with the dolphin fish, an object of sport and commercial fishing). Therefore, one of the most significant accomplishments of the current year's program was the publication December 23, 1977, of a final decision on a 3-year program to reduce the incidental mortality of porpoises. The program establishes the number of porpoises by species that can be taken during 1978, 1979, and 1980. The quota will decrease each year; by 1980 the number allowed will be half the 62,429 allowed in 1977. The decision includes an enforcement policy on accidental taking of prohibited species, additions to previous gear and fishing procedure requirements, and provides for observers aboard each purse seine vessel for at least one trip each year. Also, the regulations prohibit importing yellowfin tuna from countries that do not comply with U.S. requirements.

The bowhead whale issue touched on three aspects of the marine mammal program: the exemption for native subsistence, international agreements, and assessment of population stocks. In the past, Alaska Eskimos, Aleuts, and Indians have been exempt from the moratorium of the Act. At the 29th Annual Meeting (June 1977) of the International Whaling Commission (IWC), the IWC Scientific Committee recommended deleting the native exemption to hunt bowhead whales because in the past, the kill rate and struck and lost ratio were too high to sustain the limited bowhead population. However, in recognition of the native cultural need for bowhead whales, NMFS prepared a research and management plan which was reviewed by the IWC at a special meeting in December 1977. The IWC voted to allow the Eskimo hunt in 1978 to have a quota of 12 whales landed or 18 struck, whichever occurs first.

The taking of marine mammals for research and public display has been placed under a successful permit system. Since 1972, 306 applications have been received. During this report period, 42 permits have been processed. The permit program's primary interest is to prevent any significant harmful effect on the populations of marine mammals or their environment when they are removed from the wild and to maintain their health and well-being after they are taken.

On an international level, NMFS continues to work for worldwide acceptance of the Act through participation in various groups including the IWC, the Inter-American Tropical Tuna Commission, U.S.-Mexico Discussions, the Parties to the Antarctic Treaty, the Organization of American States, the North Pacific Fur Seal Commission, and the U.S.-U.S.S.R. Marine Mammal Project.

The General Counsel's office of NOAA was involved in legal actions concerning the importation of baby fur seal skins from South Africa, regulations governing the incidental take of porpoises in commercial

fishing for yellowfin tuna, and enforcement of the Act.

The law enforcement office is responsible for enforcing the provisions of the Act. This year, NMFS initiated 464 investigations into alleged violations of the Act. Most violations involve persons who illegally import or kill marine mammals.

In 1973, the State of Alaska asked the Secretary of Commerce to waive the moratorium on seven species of marine mammals and return their management to the State. In June 1977, an Administrative Law Judge found the Federal proposal acceptable. A final decision will be made by the Administrator of NOAA.

The marine mammal research program is carried out at two NMFS research centers. The research program at the Northwest and Alaska Fisheries Center, Seattle, Wash., includes population stock assessments of the bowhead, gray, humpback, and killer whales, the Hawaiian monk seal, and the California and northern sea lions. The research program at the Southwest Fisheries Center, La Jolla, Calif., is concerned with oceanic porpoise populations and their relation to the tuna fishery.

Bowhead Whale

PART II - PROGRAM ACTIVITIES

April 1, 1977, to March 31, 1978

Bowhead Whales

In 1931, bowhead whales were given protection from commercial whaling by the Convention for the Regulation of Whaling, and later, by the International Convention for the Regulation of Whaling, the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973 (ESA), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora. These Conventions and Acts allowed Eskimos, Aleuts, and Indians to hunt bowhead whales for subsistence needs. However, at the 29th Annual Meeting (June 1977) of the IWC, the Scientific Committee recommended deletion of the native exemption for the killing of bowhead whales. The IWC accepted the recommendation by a 16-0 vote, with the United States abstaining. During the 90-day period when the United States could legally file an objection to the decision, NMFS held informal public hearings in Alaska and Washington, D.C., and issued a Draft and Final Environmental Impact Statement that included domestic, international, and environmental considerations. The United States' decision not to file an objection was challenged in a series of court actions, ending with Supreme Court Justice Warren E. Burger upholding the Secretary of State's determination not to file an objection.

However, in recognition of the native cultural need for hunting bowhead whales, NMFS prepared a research and management plan and recommended a whale harvest for 1978 of 15 landed or 30 struck, whichever occurred first. This plan was submitted to the IWC and reviewed at a special meeting in December 1977. As a result, the IWC voted to allow a quota of 12 whales landed or 18 struck, whichever occurs first, for the Eskimo hunt in 1978. To implement the IWC decision, NMFS published regulations under the Whaling Convention Act of 1949. An extensive 3-year research program on bowhead whales began in early 1978.

Incidental Taking of Marine Mammals in the Course of Commercial Fishing Operations

After October 20, 1974, the Act prohibited the taking of marine mammals in the course of commercial fishing operations without a General Permit and Certificate of Inclusion. Five categories of General Permits were designed to reduce marine mammal mortality and serious injury. Five domestic General Permits were issued to allow marine mammals to be taken in the course of commercial fishing operations through December 31, 1977. Also, eight foreign associations representing fishermen from Bulgaria, East Germany, Japan, Korea, and the U.S.S.R., submitted 10 applications for general permits to take marine mammals during 1977 in

the Fishery Conservation Zone established by the Fishery Conservation and Management Act of 1976. Table 1 illustrates the general permit applications. Public concern over porpoise deaths incidental to tuna purse seining operations reached a peak in 1976. Court actions resulted in a District Court order that prevented permits from being issued until the optimum sustainable population (OSP) of each species or stock of porpoise taken and the effects of taking on these populations had been determined. The District Court directed NMFS to publish and make available, prior to holding public hearings on proposed regulations, the following statements required by the Act:

(1) the estimated existing population levels of the species and stocks concerned;
(2) the expected impact of the proposed regulations on the optimum sustainable population of these species and stocks; and
(3) the evidence upon which the regulations are based.

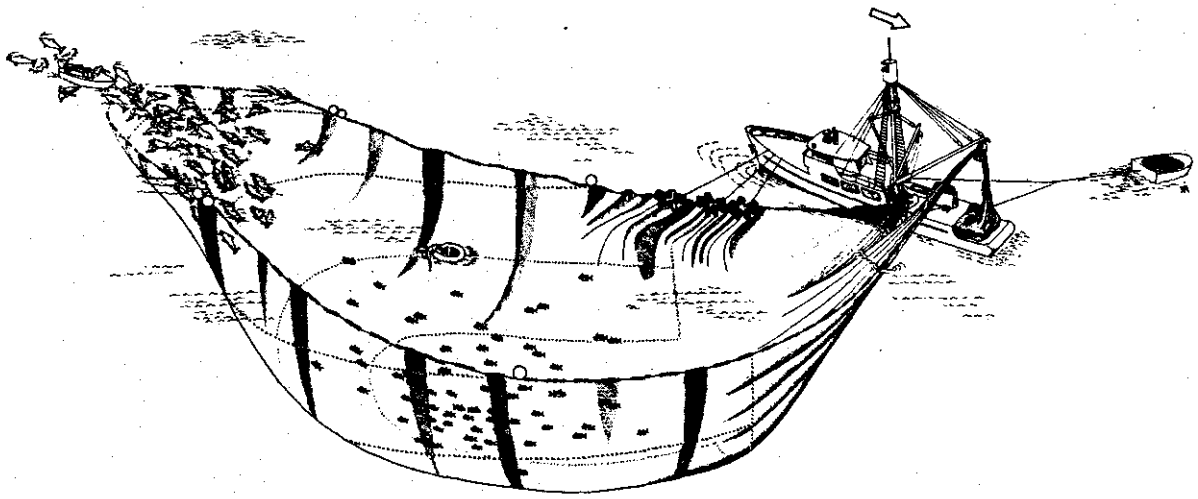
A workshop of prominent international scientists convened in July 1976 to estimate the population levels of the various species and stocks of marine mammals affected by the tuna purse seine fishery. The report of the workshop provided, for the first time, sufficient scientific information concerning optimum sustainable populations to meet the requirements of the Act as interpreted by the District Court. Following the workshop, NMFS published proposed regulations to govern the taking of marine mammals in the course of commercial tuna purse seine fishing. The proposed regulations were extensively reviewed during public hearings before an Administrative Law Judge (ALJ), who gave his recommended decision to the Director of NMFS on January 17, 1977. The Director's decision, based on the ALJ decision and the public hearing record, was published with the final regulations in the Federal Register on March 1, 1977. On April 15, 1977, a general permit was issued to the American Tunaboat Association authorizing fishermen to take incidentally a limited number of porpoises while purse seining for tuna during 1977. The general permit established for the first time limits on all aspects of incidental take, including pursuit and encirclement of porpoise, as well as mortality.

The take and mortality limits set in the general permit were based on specific requirements of the Act, which does not allow a take for species or stocks when adequate data are not available to assess the effect taking would have on the population. Adequate population data were available in 1977 to determine the status of the eastern spinner dolphin stock relative to its optimum sustainable population (OSP). The eastern spinner stock was determined to be at the lower end of OSP. Therefore, for the purposes of a general permit, the species was considered depleted and taking was prohibited.

The tuna industry and environmental groups challenged the regulations and general permit conditions. The industry felt the decision to

consider the eastern spinner dolphin as depleted was overreactive and unsupported by available data. They felt vessel masters would be subject to severe penalties for not detecting a small number of eastern spinners in a large school of other species of porpoises, until the entire group had been encircled. Also, they were concerned about the original quota of 7,840 whitebelly spinners. Most U.S. tuna vessels remained in port until mid-May.

However, NMFS determined that the eastern spinner stock could withstand some mortality without being disadvantaged. Also, unintentional and accidental taking may be unavoidable. Therefore, on May 4, 1977, the Secretary established an enforcement policy statement that said a purely accidental take of eastern spinner, by itself, would not be a cause for issuing a Notice of Violation. Several environmental groups challenged the regulations based on alleged inadequacies in the statements made in compliance with the Act. The U.S. District Court for the District of Columbia denied the motion for a preliminary injunction and commended NMFS for its thorough population analysis.



Tuna-boat equipped with "Super Apron"

Three-year Tuna-Porpoise Management Program

Proposed regulations published July 20, 1977, authorized the taking of porpoises incidental to tuna purse seine fishing for a 3-year period (1978-80). The proposed amendments were designed to authorize issuance of a general permit for a 3-year period rather than 1 year; establish quotas for calendar years 1978, 1979, and 1980; state an enforcement policy regarding accidental takings; amend gear and fishing procedure requirements; and provide administrative procedures for amending the regulations and permit conditions. A Draft Environmental Impact Statement on the proposed regulations was made available for public comment on August 19, 1977. The Final Impact Statement was filed with the Council on Environmental Quality on November 25, 1977. Public hearings were held before ALJ Frank W. Vanderheyden in August 1977 in San Diego, Calif., and in September in Washington, D. C. Further, opening and reply briefs were served and oral arguments heard. The ALJ's Recommended Decision was served on November 4, 1977, and much of it was adopted as the Administrator's (NOAA) final decision. Full details of the final decision were published, along with the final regulations, in the Federal Register December 23, 1977.

The 3-year quota program established the numbers of marine mammals that can be taken during calendar years 1978, 1979, and 1980 by U.S. vessels in the course of commercial fishing operations. Table 2 lists the annual quotas for each species stock. The 3-year general permit system allows continuity in management of the porpoise stocks and at a minimum guarantees a steady reduction in incidental porpoise mortality. The 3-year quotas by species require a 50-percent reduction in the maximum mortality allowable by 1980 from the 1977 aggregate quota level of 62,429. The level has been set at 51,945 in 1978, 41,610 in 1979, and 31,150 in 1980.

A general permit issued to the American Tunaboat Association on December 27, 1977, is valid from January 1, 1978, to December 31, 1980. The Assistant Administrator for Fisheries may, upon receiving new and significant information, propose to modify the quotas. However, these proposals must be published in the Federal Register, along with statements required by the Act. Also, a 30-day public comment period will be allowed.

The new regulations incorporate not only the 1977 enforcement policy for accidentally taking eastern spinner dolphins, but cover other prohibited species as well. The regulations require the same porpoise protection gear as in 1977, with one major addition. The large purse seiners must install a porpoise or "super" apron and make a trial set under NMFS supervision before July 1, 1978. A super apron is a triangular section of 1 and 1/4 inch mesh webbing, approximately 90 fathoms long by 7 fathoms deep and is placed on top of a fine-mesh safety panel (a 180- by 12-fathom insert of 1 1/4-inch webbing). A joint NMFS-industry test

found the apron/chute system superior to the fine-mesh safety panel alone. The apron/chute system is a fine-mesh safety panel plus a trapezoidal shaped super apron topped by an additional 26-fathom long by 5-fathom deep smaller trapezoidal section of fine-mesh webbing. The super apron (a slightly modified apron/chute), if properly installed and operated, should reduce the porpoise mortality rate significantly over the now required fine-mesh webbing system. Other porpoise release gear or procedures remain relatively unchanged.

Observers will be placed on each certificated vessel for at least one trip per year from 1978 through 1980. Observers will monitor individual species and stock quotas, provide a continuing profile of the performance of each individual operator and certificated vessel, and collect data on compliance with the regulations.

Importing Tuna

Regulations govern the importing of fish and fish products caught in connection with marine mammals and allow the Assistant Administrator of Fisheries to permit the importation of yellowfin tuna and tuna products from nations that meet U.S. requirements. These countries may not import tuna into the United States until they have applied for and received a favorable finding from the Assistant Administrator. After a decision is made, the findings are published.

The Assistant Administrator originally identified 14 nations as having tuna purse seine vessels operating in the ETP fishery. Two nations certified that their purse seine vessels had been removed from the ETP. Eight nations provided NMFS with sufficient information to demonstrate that their vessels were operating in substantial conformance with U.S. marine mammal regulations and were exempted from the importation prohibition. Two additional nations operating tuna purse seiners in the ETP were notified that their tuna imports would be prohibited after July 31, 1978, unless they received a favorable finding.

Seven of the nations involved are members of the Inter-American Tropical Tuna Commission (IATTC), an eight-member commission (the United States is the eighth member nation) established under a 1950 treaty to conserve and manage yellowfin tuna stocks in the ETP. The Commission unanimously passed a resolution in June 1977 to establish an international tuna-porpoise research and observer program. This program will provide new data on the involvement of the international purse seine fleet in porpoise-associated tuna fishing.

The IATTC observer program is designed to collect porpoise mortality data and educate all purse seine captains in the latest porpoise release gear and procedures.

Table 3 lists all nations required to obtain a finding, their IATTC membership, and status of a yellowfin tuna import prohibition.

Permits for Public Display and Scientific Research

Although the Act declared a moratorium on the taking or importing of marine mammals and marine mammal products, it included exceptions that allow continuing research on marine mammals and taking of marine mammals for public display. However, the health and well-being of the species and populations involved must not be harmed when the animals are removed from the wild, or while they are captive. Also, the marine ecosystem must not be harmed when the animals are taken or when permitted activities take place in the animals' habitat. Permit applications are reviewed and commented upon by the Marine Mammal Commission and its Committee of Scientific Advisors. Since the Act became effective, NMFS has resolved 306 permit applications. During this reporting period, 42 applications were received; 30 have been resolved and 12 are pending.

Tables 5 through 11, Appendix A, provide an overview of the permit program, both for this year and since the Act became effective. Table 5 lists applications received, the number of marine mammals requested, the actions taken on applications, and the number of marine mammals authorized to be taken and/or imported. Tables 6 and 7 list the number of each species of marine mammals requested in permit applications. Tables 8 and 9 list the number of marine mammals authorized to be taken and/or imported under scientific research and public display permits. Tables 10 and 11 summarize the reported actual take from the wild.

Permit holders are required to submit reports on the progress and results of their research and the health and condition of marine mammals under their care.

A fee is charged to cover the administrative cost of issuing a permit. A public display permit holder fee is $200; a scientific research permit holder fee is $25. Fees are waived for Federal and State agencies. During this reporting year, $6,600 has been collected from permit holders and deposited in miscellaneous receipts of the U.S. Treasury.

Research Permits

The criteria used by the Assistant Administrator for Fisheries to issue a scientific research permit include whether the proposed taking or importing is consistent with the policies and purpose of the Act and whether granting the permit is required to further genuine, necessary, or desirable research. Another consideration is the anticipated benefits from the scientific research and the effects of the proposed taking or importing on the population stock and the marine ecosystem. Most research activities involve marine mammals that are not removed from the ecosystem.

Public display of porpoises - Sea Life Park, Hawaii

Public Display Permits

In determining whether to issue a public display permit, the Assistant Administrator for Fisheries considers: (1) whether the proposed taking or importing will be consistent with the Act's policies and purposes, (2) whether a substantial public benefit will be gained from the display when the manner of the display and the anticipated audience are balanced with the effect of the proposed taking or importing on the population stock of marine mammals and the marine ecosystem, and (3) the applicant's qualifications for the proper care and maintenance of the marine mammal, including adequate holding facilities.

Health and Welfare of Captive Marine Mammals

A major consideration in issuing permits to capture and maintain marine mammals, for either scientific research or public display, is the quality of care provided. Soon after passage of the Act, NMFS developed requirements for marine mammal care and maintenance that are now used as criteria for all permits involving captive marine mammals. These requirements appeared as Appendix C to the July 1973, Report of the Secretary of Commerce on Administration of the Marine Mammal Protection Act of 1972.

Since 1972, NMFS has worked closely with the Marine Mammal Commission, the Fish and Wildlife Service (FWS) of the Department of Interior, and the Animal and Plant Health Inspection Service (APHIS) of the Department of Agriculture, representatives of the marine mammal display industry, and concerned public groups to develop comprehensive standards for the care and maintenance of captive marine mammals. In October 1975, the Marine Mammal Commission prepared a set of recommended standards and guidelines.

The NMFS, FWS, and APHIS are developing ways to implement standards proposed by APHIS under the Animal Welfare Act of 1970.

Beached or Stranded Marine Mammals

The handling of living stranded marine mammals has been a continuing problem since passage of the Act. The inventory of stranded yet healthy marine mammals has increased as knowledge about caring for them has increased; most cannot be successfully returned to the wild. A valid permit holder may substitute a stranded animal for a captured one. A nonpermit holder who takes a stranded marine mammal is bound by conditions similar to a regular permit. Recently, most cases involving beached or stranded animals have been resolved at the regional level.

Authentic Native Articles of Handicrafts and Clothing

Marine mammals can be taken by an Eskimo, Aleut, or Indian to create and sell authentic native crafts and clothing and may be transferred to a registered tannery, either directly or through a registered agent. Examples of traditional native handicrafts include weaving, carving, stitching, lacing, beading, drawing, and painting.

Also, marine mammals taken in Alaska by natives for subsistence may be sent to a registered tannery for processing and then returned to the native. Any tannery or person who wishes to act as an agent within the jurisdiction of the United States may apply for a certificate that will allow the tannery or agent to possess and process marine mammal products for Eskimos, Aleuts, and Indians. Eight tanneries and 23 agents have been granted Certificates of Registration since 1973; 1 tannery and 3 agents were certified this year.

International Programs

The International Marine Mammal program seeks to achieve worldwide cooperation for the conservation and protection of whales, seals, sea lions, and porpoises through involvement with commissions, conventions, meetings, and discussions.

International Whaling Commission (IWC)

At its 29th Meeting in June 1977 and at its Special Meeting in December 1977, the IWC continued to establish catch limits for commercial whaling based on recommendations of the Scientific Committee. The new management procedure was followed without modification. The result of both meetings was a reduction of 4,530 whales from the total allowable catch of the previous year.

The Scientific Committee recommended that all but two stocks of southern hemisphere sei whales should be protected; the IWC reduced the catch allowed from the previous year by 58.5 percent.

The recommendations of the Scientific Committee adopted by the IWC in June 1977 to reduce the allowed catch of 7,200 North Pacific sperm whales in the 1977 season to 763 in the 1978 season was tentatively adopted by the IWC pending review at special meetings in November and December. Based upon a reassessement by the Scientific Committee, the allowable catch limit was raised to 6,444 North Pacific sperm whales for the 1978 season.

At the June meeting, the IWC decided, on the basis of a Scientific Committee recommendation, to prohibit the taking of right whales, including bowheads, by aboriginal people. After the possibility of a special meeting of IWC on North Pacific sperm whales had been established and other issues had been added to the agenda, the United States requested the IWC to reconsider its position on the bowhead whale. The Commission agreed that in 1978 Alaska Eskimos may kill 12 or strike 18 bowhead whales, whichever occurs first, as long as no calves or females with calves are taken.

Most regulations adopted by the IWC encouraged nonmember whaling nations to become members of the IWC. Resolutions seeking cooperation from Chile, Republic of Korea, Peru, Portugal, and Spain were adopted and sent to these nations. Other resolutions stated that IWC member nations should (1) prevent transfer of vessels or gear to nonmember nations, (2) discourage dissemination by their citizens of expertise and assistance necessary to conduct whaling to nonmember nations, and (3) prevent import of whale products from nonmember whaling nations.

U.S. - Mexico Discussions

Discussions were held with officials of the Department of Fisheries of Mexico in Mexico City, January 11 and 12, 1978, to discuss an agreement on the protection and conservation of marine mammals.

Antarctic Living Marine Resources

Due to the increased interest and exploitation of krill in the Antarctic, the Ninth Consultative Meeting of the Parties to the Antarctic Treaty will hold a special meeting to draft a convention on living marine resources. NMFS encourages the establishment of a conservation program for living marine resources in the Antarctic because many marine mammal species, including endangered whales, depend upon krill for food. NMFS took part in a special consultative meeting on this subject, February 27 to March 16, 1978, in Canberra, Australia.

Convention on Nature Protection in the Western Hemisphere, Meeting of Marine Mammal Experts Convened by Organization of American States(OAS)

The OAS will hold five meetings of experts in different areas of nature protection to revitalize the Convention on Nature Protection in the Western Hemisphere. In his environmental message to Congress, May 23, 1977, President Carter said the United States should make use of this Convention, which many Western Hemisphere nations have ratified.

The first expert meeting, held September 1977 in Puerto Madryn, Argentina, was attended by marine mammal specialists from several Western Hemisphere nations, including the United States. The group prepared recommendations on (1) sanctuary areas for marine mammals, (2) priority research on marine mammals, and (3) bilateral or multilateral agreements between Western Hemisphere nations to conserve marine mammals.

Once the five expert meetings are completed, the OAS will hold a conference of the parties to the Convention in late 1979 when they will review the findings and recommendations of the expert groups and make final recommendations to member nations.

Northern Fur Seals

North Pacific Fur Seal Commission

The Twentieth Annual Meeting of the North Pacific Fur Seal Commission in Tokyo, Japan, March 22-25, 1977, considered the reports of the Standing Scientific Committee and the Finance and Administration Committee. There was no change in the prohibition of pelagic sealing for commercial purposes. The United States announced that it would allow 350 fur seals to be taken on St. George Island by the native population for subsistence purposes. The U.S.S.R. announced plans to take 2,500 fur seal pups as an experimental harvest.

The total harvest of fur seals in 1976 was 5,200 by the U.S.S.R. (2,500 on Robben Island and 2,700 on the Commander Islands) and 23,081 by the United States on St. Paul Island.

U.S.-U.S.S.R. Marine Mammal Project, Environmental Protection Agreement

The objective of the U.S.-U.S.S.R. Marine Mammal Project is to develop collaborative research on the biology, ecology, and population dynamics of marine mammals of mutual interest to both nations that will contribute toward sound management and conservation of these animals. The NMFS has the lead role for the United States in this project.

During the first quarter of 1977, two Soviet scientists worked at U.S. laboratories in La Jolla and San Diego, Calif. A. Yablokov worked with W. E. Evans (Hubbs-Sea World Research Institute) in studying basic color patterns of cetaceans for distinguishing between wild populations and between individuals within populations and herds. They studied color

patterns of many specimens of killer and sperm whales and porpoise species and conducted field observations on four species of porpoise during a 3-day trip on a Sea-World research vessel.

A. S. Sokolov worked with W. F. Perrin (NMFS, La Jolla) in examining certain anatomical characteristics of five different genera of porpoises and collected new data for taxonomic and functional morphological studies.

During a 4-week visit in April and May, two U.S. scientists, W. F. Evans and C. Scott Johnson visited laboratories in Moscow, Leningrad, and Batumi, Georgian S.S.R., on the Black Sea. The two scientists conducted numerous discussions on the subjects of cetacean hearing and biosonar work in the U.S.-U.S.S.R. and general acoustic work going on in our countries with regard to marine mammals. They presented seminars in Moscow at the Laboratory of Postnatal Ontogeny and at the Institute of Developmental Biology. They also presented seminars at the Acoustical Institute of the Academy of Sciences of the U.S.S.R. and at the Zoological Institute of Leningrad. They visited the first Russian oceanarium at Batumi on the Black Sea and several academic and research institutions in that region.

In April and May, Serge Birk, NMFS, participated in a cooperative whale tagging and observational cruise aboard the Soviet research whale catcher Zharkii. The purpose of the research cruise was to develop information on cetacean biology, distribution, abundance, and movements in order to formulate rational conservation and management policies. The species of particular concern on this cruise were sperm and Bryde's whales. In addition, the research cruise was interested in observational data on porpoise, although few were sighted during the cruise. The Zharkii surveyed areas around New Hebrides, New Caledonia, and the Fiji Islands. During the 4-week, approximately 5,000-mile survey, 452 sperm whales were observed and 58 were tagged. A great deal of useful information was obtained on the cruise, including data on estimated size, sex, and family groupings. Behavior was observed during tagging efforts.

Two Soviet scientists, V. A. Zemsky and A. A. Berzin, participated in radio tagging experiments on humpback whales in southeastern Alaska. Field tests of the remotely applied radio tags were made in the latter part of July throughout the area of Stevens Passage and Frederick Sound, approximately 50 to 60 miles south of Juneau. This was the second year of a planned 5-year test program to determine the feasibility of radio tagging large whales in oceanic conditions. The scientist implanted five radio tags; four of the transmitters functioned perfectly and enabled scientists from the Marine Mammal Division, Northwest and Alaska Fisheries Center, NMFS, and the Soviet participants to track the whales for several days over a number of miles.

The Soviet scientists had discussions with numerous marine mammal scientists in Alaska and Seattle, Wash., and visited laboratories and museums in the Seattle area.

The U.S. Steering/Planning Committee held a series of meetings in December 1977, and considered: review of the Memorandum of the Joint Committee meeting held on November 15 and 16; discussion of topics to be advanced at the Joint Marine Mammal Project meeting in July 1978; U.S. proposals for future joint research; future walrus surveys by both the Soviet and American sides; various matters concerning structure and functions of the Steering Committee including membership and rotation schedules, the manner of conducting business and incorporating information from the scientific community, our efforts and success in informing the scientific community about the U.S.-U.S.S.R. environmental agreement, necessity for a more formalized record of committee activities; and the difficult questions concerning reciprocity in opportunities for field work on the parts of both the United States and the U.S.S.R.

Inter-American Tropical Tuna Commission (IATTC)

Members of the IATTC met June 27-29, 1977, in San Diego, Calif., to discuss the tuna-porpoise problem. The discussions focused on a Commission staff document entitled "The Tuna-Porpoise Relationship: Research, Management, and Possible IATTC Role." Following a review of the Commission staff's proposal for porpoise research, member countries agreed to undertake research to evaluate the status of the porpoise populations in the eastern tropical Pacific Ocean (ETP). The IATTC authorized a program for porpoise research that will focus primarily on (1) recruitment and training of scientific technicians who will accompany vessels at sea and collect data on the stocks of porpoise in the eastern Pacific and (2) workshops to evaluate and disseminate porpoise-saving techniques and gear technology.

At the IATTC's 1977 Annual Meeting, the budget necessary to implement the international tuna-porpoise program was presented and approved by the commission subject to approval through internal national procedures.

Convention on International Trade in Endangered Species of Wild Flora and Fauna

In an advisory capacity to the Management Authority of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (July 1975), NMFS participated in the development of U.S. policy, regulations, and an identification manual for implementation of the Convention. Implementing regulations were published by the FWS, Department of the Interior (Management Authority), and became effective May 23, 1977. Import, export, re-export, and introduction from the sea of convention animals are controlled by the U.S. Management Authority for the Convention through a system of permits and enforcement. Endangered

species receiving protection under the Convention are listed on Appendix I or Appendix II. Trade is more strictly controlled for Appendix I species.

As a member of the Scientific Authority of the Endangered Species Convention, NMFS evaluated applications for permits to trade in Convention species and participated in the development of U.S. policy for trade under the Convention.

Marine mammals under the protection of the Convention are listed in the section on Laws and Treaties.

Legal Actions

Animal Welfare Institute, et al. v. Juanita Kreps, et al., No. 76-2148 (D.C. Cir. 1977); and Committee for Humane Legislation, Inc., and Friends of Animals, Inc. v. Juanita Kreps, et al., No. 76-2149 (D.C. Cir. 1977).

The above actions are appeals from the United States District Court for the District of Columbia of D.C. Civil Actions Nos. 76-0483 and 76-0484. The District Court held that the plaintiffs lacked standing to challenge a decision by the Government defendants to waive the moratorium imposed by the Marine Mammal Protection Act and allow the United States to import the skins of baby fur seals from South Africa.

On July 27, 1977, the U.S. Court of Appeals for the District of Columbia reversed the decision of the District Court and held that the appellants did have standing, and that the Government's decision to waive the ban on importing the skins of baby fur seals violates the Marine Mammal Protection Act.

On October 25, 1977, the Government respondent filed a Petition for a Writ of Certiorari with the Supreme Court of the United States (No. 77-601). The petition raised two questions: (1) Whether the respondent organizations had standing to challenge the waiver decision and implementing regulations, and (2) Whether the U.S. Court of Appeals for the District of Columbia properly rejected the interpretation by the Department of Commerce of the limitation on importing seals that were less than 8 months old or nursing when taken. The petition was denied.

Committee for Humane Legislation, et al. v. Kreps, et al., No. 77-0564 (D.D.C. June 30, 1977)

On March 30, 1977, the Committee for Humane Legislation (CHL) filed a Complaint and Motion for a Preliminary Injunction in the District of Columbia District Court seeking to prevent implementation of regulations governing the incidental take of marine mammals in commercial yellowfin tuna fishing operations. CHL alleged that the regulations did not

comply fully with the requirements of the Marine Mammal Protection Act. On June 30, the Court upheld the validity of the regulations and dismissed the CHL suit. The Court found that the regulations and general permit complied in all respects with the requirements of the Act.

A suit brought by the American Tunaboat Association (ATA) seeking judicial review of the same regulations was transferred from the District Court in San Diego to Washington, D.C., and joined with the CHL case. In June, the ATA was dismissed from the case because it failed to file an answer.

Legal actions related to law enforcement are discussed in the following section.

Law Enforcement Program

The Law Enforcement Division, NMFS, is responsible for enforcing the provisions of the Act. Most violations of the Act this year involved the alleged illegal importing or killing of marine mammals. In the Southwest Region (California), most law enforcement activities concerned the incidental take of porpoise by tuna fishermen.

During the reporting period, NMFS agents initiated 464 investigations into alleged violations of the Act. Of these, 364 actual violations were documented, and 224 cases were closed by assessing civil penalties and/or forfeiting seized contraband; 2 cases were closed through successful criminal prosecution, and 100 cases were closed as unfounded or for lack of evidence. At present, approximately 164 cases are pending. Of the total investigations initiated, 375 seizures involving 1,061 illegal items were made. Twenty-nine of the alleged violations were tuna-porpoise related. The remaining 89 investigations under illegal takings involved harassment, which generally does concern a tangible, seizable object.

Contracts, which provide funds for enforcement of the Act, were renegotiated with the States of Alaska, California, Florida, Oregon, and Washington at a cost of $443,000. NMFS works closely with the law enforcement agencies of these States to improve their effectiveness in achieving compliance with the Act. During the reporting period, State officers worked 4,297 hours under NMFS contracts. State agencies initiated 65 investigations into possible violations of the Act; 3 cases were referred to NMFS for further action, and 21 were closed. State officials also monitored 44 marine mammal capture operations carried out under permits issued by NMFS and made 30 inspections of marine mammal holding facilities.

U.S. v. Smith, No. 77-94-CR-T-H (M.D. Fla. Sept. 15, 1977)

The U.S. District Court for the middle district of Florida found a resident of that State guilty on October 25, 1977, of unlawfully shooting dolphins from a small boat. This individual was sentenced to 2 years' probation and forfeited to the Federal Government the boat, motor, and trailer used in committing the offense.

U.S. v. Lewis, et.al.

On January 11, 1978, two individuals pleaded guilty to the killing and possession of a dolphin. The U.S. District Court in St. Thomas, V. I. sentenced the parties to $100 fines; one fine was reduced to $25.

U.S. v. Mitchell, 553 F. 2d 996, (S.D. Fla. 1977)

On June 13, 1977, the U.S. Fifth Circuit Court of Appeals in Florida overturned the June 1976 conviction of a U.S. citizen for illegally taking 21 dolphins within the territorial waters of another nation. In handing down its decision, the court stated that the Marine Mammal Protection Act does not specify that the moratorium imposed on the taking of marine mammals applies to the activities of U.S. citizens in the waters of foreign countries. Therefore, the taking of the dolphins was not a violation of the Act. This decision has resulted in NMFS altering its position that the Act applies to U.S. citizens regardless of the location of their marine mammal activities. NMFS does not require permits for U.S. citizens to take marine mammmals within the territorial waters of other countries for public display or scientific research. A permit, however, would be necessary to import these animals.

Marine Wonderland v. Kreps, No. 78-0398 (D.D.C. March 23, 1978)

This suit challenged U.S. jurisdiction under the Act to impose administrative civil penalties. Canadian aquarium owner John Holer and two employees, all of whom have been issued Marine Mammal Protection Act civil penalty notices for their January 1977 importation of eight porpoises, seek injunction against further processing of cases on the grounds that (1) the United States has no personal jurisdiction over them and (2) that the MMPA does not reach the kind of "importation" in question. This case involved the air transportation of porpoises from Mexico to Canada with a scheduled refueling stop in the United States. The District Court dismissed the suit.

Returning Management of Marine Mammals to Alaska

The Act allows return of management to individual States if the States' laws are consistent with the Act and if rules and regulations established by the Federal Government are followed.

In 1973, the State of Alaska applied to the Secretary of Commerce to waive the moratorium on bearded, harbor, ribbon, ringed and spotted seals, northern sea lions, and belukha whales and to return management of these species to the State. A simultaneous request was made to the Secretary of the Interior regarding sea otters, polar bears, and walruses.

The Department of the Interior and the Department of Commerce jointly agreed to propose the waiver by publishing proposed regulations and a draft environmental impact statement. A hearing on the record was held in Alaska and Washington, D.C. in 1976. On June 30, 1977, the Administrative Law Judge recommended to the Directors of NMFS and FWS that subject to certain modifications, a waiver of the moratorium and a return of management to the State would be in accord with the terms and policies of the Act.

On March 27, 1978, the two Departments forwarded to EPA the required final environmental impact statement (FEIS). The next requirement is a final decision based on the hearing record and the ALJ decision which will be made jointly by the Administrator of NOAA and the Director, FWS. Before actual management can be returned, if that is the final decision, the State would be required to comply with certain requirements made by the Federal agencies.

Optimum Sustainable Population

The interrelated concepts of optimum sustainable population (OSP) and optimum carrying capacity (OCC), as used in the Act, are basic elements of a management program to protect and conserve marine mammals. The Act defines OCC as the "ability of a given habitat to support the optimum sustainable population of a species or population stock in a healthy state without diminishing the ability of the habitat to continue that function." The definition of OSP has evolved to mean, a population size that falls within a range from the population level of a given species or stock that is the largest supportable within the ecosystem to the population level that results in maximum net productivity. Maximum net productivity is the greatest net annual increment in population numbers or biomass resulting from additions to the population due to reproduction and/or growth, less losses due to natural mortality.

The lower end of the OSP range is believed to lie between 50 and 70 percent of the initial size of the unharvested population. The working

definition of optimum sustainable population will be modified as knowledge and understanding of the concept grows.

Depleted Species of Marine Mammals

The Act acknowledges that certain species and population stocks of marine mammals are or may be in danger of extinction or depletion as a result of man's activities.

When a species is declared depleted, it comes under a provision of the Act (as amended by the Endangered Species Act of 1973) that states, "Except for scientific research purposes as provided for in paragraph (1) of this subsection, during the moratorium no permit may be issued for the taking of any marine mammal which is classified as an endangered species or threatened species pursuant to the Endangered Species Act of 1973, or has been designated by the Secretary as depleted, and no importation may be made of any such mammal."

Alaska natives are exempt from these provisions of the Act when taking is for subsistence or for creating and selling authentic native articles of handicrafts and clothing and is not accomplished in a wasteful manner. However, the Secretary may regulate the native take of any marine mammal designated as depleted. NMFS declared the Hawaiian monk seal (Monachus schauinslandi) depleted September 1, 1976, and the bowhead whale (Balaena mysticetus) depleted November 25, 1977.

Research and Development Programs

Tuna-Porpoise

The Oceanic Fisheries Resources Division, NMFS, Southwest Fisheries Center, has two marine mammal research programs that are primarily concerned with oceanic porpoise populations and their relation to the tuna fishery. The programs are designed to carry out NMFS responsibilities under the Act and include three basic objectives:

(1) develop and refine methods and technology to reduce further porpoise mortality incidental to yellowfin tuna purse seine fishing;
(2) determine the status of the porpoise stocks; and
(3) monitor incidental mortality by the U.S. fleet throughout the year against established quotas.

A purse seine net "backing down" under a school of porpoise

Mortality Reduction Technology. During 1977, efforts centered on refining the apron concept and introducing it into widespread use by the tuna fleet. Also, analyses were completed on the 1976, 20-vessel test comparing the performance of an apron/chute system atop a double-depth, fine-mesh porpoise safety panel with the performance of a fine-mesh panel alone. The apron/chute system proved superior to others in allowing porpoise release from the seine during backdown. At the end of 1976, a slight modification of the apron/chute system showed promise of allowing even more-efficient porpoise release. This modification, termed the porpoise or super apron, was voluntarily installed on more than 20 U.S. purse seiners and was required for the entire fleet under the 1978 regulations. NMFS technicians supervised installation and alinement of many of these super aprons both in San Diego and Panama and instructed net makers in both locations on construction and installation procedures.

The continuing study of the causes of porpoise mortality has resulted in information helpful to the tuna purse seine fleet leading the SWFC to produce an illustrated pamphlet for the fishermen on improved techniques to avoid killing porpoises during purse seining.

Preliminary data collected during 1977 by NMFS observers on 17 complete trips and 2 incomplete trips aboard seiners carrying the super apron revealed a 1.74 overall kill per set and 0.15 porpoise kill per ton of yellowfin tuna caught with porpoises. These values are about half those for vessels carrying the fine-mesh safety panel without a super apron. Results of seven cruises with the super apron and final analyses of the 1976, 20-vessel test were presented at public hearings in August 1977

and led to the requirement in the new regulations of a super apron for most U.S. purse seiners by July 1978.

A chartered cruise was made in the fall of 1977 aboard a smaller and older purse seiner of the class that does not frequently make intentional sets on porpoise. Sets were made with and without a super apron panel system installed in the net. The cruise results indicate that the apron panel system was operational on this class of vessel and could assist in alleviating problems with the net during backdown.

Field testing of a purse-block suspension system to prevent "rollup" (the purse cable turns and winds up the webbing) started in May 1977. The blocks were fabricated by a private firm and loaned to a vessel with a history of frequent and severe rollups. The blocks are being tested in combination with various types of purse cables, including two sizes of torque-balanced cable and one size of conventional cable. Preliminary results with both types of torque-balanced cable showed a low incidence of rollups.

A second vessel chartered in the fall of 1977 examined the principle of providing panels or flaps of webbing attached at their base to the backdown apex of the net in order to offer minimal resistance to the exit of porpoise while providing a visual barrier that would turn the tuna back into the net during backdown. The visual barrier to the fish was achieved, but the porpoise were reluctant to apply the slight pressure necessary to pass over or through the flaps. Also, the flaps hindered hand rescue in the later stages of backdown; therefore, the idea was abandoned. During this charter, blood samples from live porpoises captured during backdown were collected for examination to establish a method of measuring stress levels in the animals. Preliminary experiments, using bubble screens created with dry ice in the backdown channel, showed some indication that movement of porpoise within the channel may be artificially restricted. The causes of stern away, a net-folding phenomenon during backdown, were examined during this cruise.

A dedicated research vessel secured for 1978, through mutual agreement between NMFS, the MMC, and the United States Tuna Foundation, will be used to pursue in-depth behavioral studies and gear modifications aimed at the prebackdown release of porpoise and testing and development of various stimuli to separate tuna and porpoise.

Biological Stock Assessment Research. Biological research concentrated on estimating the important life history factors of the major porpoise species involved in the tuna fishery. Using specimens and data collected aboard commercial tuna seiners and standard techniques and analyses, the biological studies staff at SWFC completed analysis of growth and reproduction of the whitebelly spinner dolphin. S. longirostris subsp.

Scientists at the Naval Ocean Systems Center completed contract work on growth and reproduction of the common dolphin, Delphinus delphis. Another contractor completed sectioning and reading a backlog of 8,000 teeth from spotted and spinner dolphins sampled from 1973 to 1977.

Additional contracts were let to survey data and specimens of bottlenosed dolphin, Tursiops truncatus, from the eastern Pacific, to study biochemical techniques for age determination, and to develop and test tags and marks designed specifically for small cetaceans.

During 1977, stock assessment activities focused on survey work from aircraft and ships. In the first half of the year, two long-range aircraft searched 32,910 nautical miles off the coast of North and Central America and Hawaii. This was combined with the surveys of the NOAA Ships David Starr Jordan and the Townsend Cromwell. The results of the combined aerial/shipboard survey provided a comprehensive picture of the eastern tropical Pacific during a relatively short time period. The data are being statistically analyzed using line transect theories adapted for the porpoise surveys to produce estimates of stock sizes. Contributions to this work are being made by SWFC staff, scientific representatives of the Marine Mammal Commission, industry, and consulting scientists from academic institutions and outside agencies.

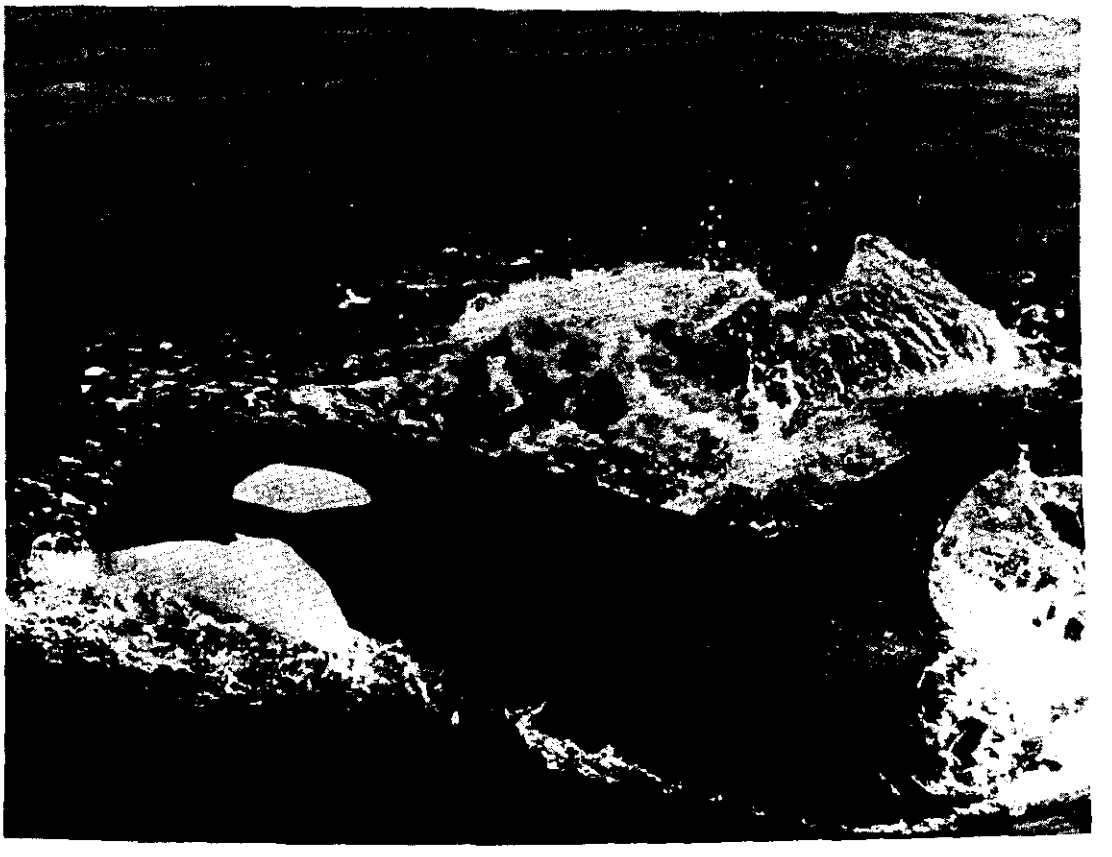
The two shipboard cruises of January and February 1977, as well as another cruise of the David Starr Jordan in October and November, provided additional data on physical oceanographic and faunistic correlations of the occurrence of dolphins and tuna.

Stock assessment has been extended to include a tagging research program. Initially, this research was concerned with developing appropriate marks designed specifically for porpoise, developing apparatus for examining entire schools of porpoise, and placing the marks or tags and design of the statistical experiment in a way that would produce estimates of stock size, vital rates, and migratory patterns independent from other survey methods.

The impact of incidental mortality on the OSP of porpoise stocks was updated using the method given in a workshop report (SWFC, 1976). These methods used the results of aerial and shipboard surveys in 1974-76 to establish stock sizes; then, net reproductive rates and incidental mortality rates were included to predict the change in stock level. Present stock levels were compared to pre-exploitation levels to establish the relationship of the stock to OSP. Results indicated that the spotted and whitebelly spinner dolphins were within the lower limits of OSP, while the eastern spinner dolphin was at or slightly below the lower limit of OSP. Therefore, the intentional capture of eastern spinners in the process of purse seining was prohibited in 1977. Stocks of common dolphin (Delphinus delphis) and striped dolphin (Stenella coeruleoalba) were estimated to be at or above OSP.

Fleet Performance. The new regulations again established a quota on the number of individual species that may be killed by the U.S. fleet during purse-seining operations and requirements for procedures designed to reduce porpoise mortality. Close monitoring of the cumulative mortality of porpoises during 1978 and continual analysis of the kill rate performance by the U.S. fleet will be a continuing program.

A procedure for monitoring mortality was developed to estimate cumulative kill by stock on a weekly basis. It includes radio reports from observers and computer-statistical analysis of the data. Individual quotas for the major stocks were not reached in 1977 partly because the fleet stayed in port for an extended time during the early part of the year. However, the kill rate decreased substantially and is believed to be the primary reason for not reaching the quotas. The preliminary average kill rate for 1977 was 2.95 porpoises per set and the average kill for each ton of yellowfin taken in association with porpoise was 0.25, a 75-percent reduction from 1976 rates. In 1977, the U.S. tuna fleet's estimated porpoise kill was 27,000; their quota was 62,429.



Killer Whale

Northern Fur Seals, Pinnipeds, and Cetaceans

The Marine Mammal Division, NMFS Northwest and Alaska Fisheries Center, has three principal research programs. The northern fur seal program monitors the status and population dynamics of the fur seal herds on the northern Pribilof Islands, as well as biological and ecological research in accordance with the provisions of the Interim Convention for the Conservation of Northern Fur Seals. St. George Island has been established for an indefinite period as a nonharvest research control area for comparative studies with the harvested fur seal population on St. Paul Island.

The pinniped and cetacean programs primarily assess the status of the stocks and obtain life history information about species such as the California and northern sea lions, Hawaiian monk seal, northern elephant seal, and the bowhead, gray, humpback, and killer whales. The population dynamics of commercially harvested species of whales is also emphasized. In addition, information is collected on the distribution and abundance of marine mammals in the Gulf of Alaska and the Bering, Chukchi, and Beaufort Seas. The Marine Mammal Division, NWAFC, also maintains an interest in the progress of other marine mammal research throughout the world.

Northern Fur Seal Program. Long-term objectives of the northern fur seal program are to determine what measures may be necessary to achieve maximum sustainable productivity and to determine the relationship between fur seals and other living marine resources.

Population assessment studies are designed to build a data base on population structure essential to management of the resource. In 1977, for example, counts were made of all adult males on the Pribilof rookeries and hauling grounds in late June and mid-July and all of the pups that had died by mid-August. The age composition of seals harvested on St. Paul Island was determined; the number of pups born on St. George Island was estimated.

Behavioral research on St. George and St. Paul Islands in 1977 emphasized the identification and quantification of behavioral components that may control population size. Observation sites on St. Paul and St. George Islands were occupied continuously by NMFS scientists throughout the reproductive season of the fur seal. During this period, data were collected on the number and density of seals ashore, male and female aggression, number of copulations and births, female feeding cycles, mother-young behavior, and the social behavior of subadult males.

The analysis of pelagic data collected from 1958 through 1974 continued in 1977. Studies of distribution and abundance, feeding habits, age structure and growth, age-specific pregnancy rates, and the intermixture of fur seals of different origins were emphasized.

Physiology and medicine research continued with investigations into fur seal mortality with emphasis on virology, bacteriology, serology, and immunology as keys to learning more about first year mortality at sea.

Three distinct subgroups of pathogenic vesicular virus have been isolated, and serologic evidence indicates that fur seals have been infected with strains not yet isolated, including influenza viruses of human, avian, and swine flu types.

Twenty-six species of bacteria from fur seals were newly isolated and identified. Another 55 species of anaerobic bacteria were isolated, but not yet identified. The immune systems of 80 fur seals ranging in age from full-term, unborn to 4-month old juveniles, and 3- and 4- year-old males have been evaluated.

New parasite work was initiated in mechanism of hookworm and tunic worm (filiarial) transmission, and new information on the life cycle of nasal mites was obtained.

The role of rain and cold temperatures in pup mortality was explored for the second year, and more closely recognized as a secondary mortality factor.

Seal oil obtained from the commercial blubbering process was successfully substituted for whale oil in the formula for artificial seal milk to maintain live pups for parasite transmission studies.

Five subadult fur seals (two males and three females) were well established at the new Seattle Aquarium to support studies of husbandry and marking.

Gross pathology of fur seal pups from the unharvested population on St. George Island was successfully carried out in 1977. Causes of death here will be compared to causes of death among pups on St. Paul Island where a harvest of subadult males is still carried out.

Pinniped Program. Biological and population studies involved the six species of pinnipeds that haul out on San Miguel Island, one of the Channel Islands of Southern California. Special attention was given to determine the cause of premature births in California sea lions. The number of fur seal pups counted in Adams Cover, San Miguel Island, increased to 421, an increase of 4 over 1976. On Castle Rock, 617 fur seal pups were counted, an increase of 96 over the 1976 count.

A long-term study of the Hawaiian monk seal began in 1976. Included were studies of behavior and biology and counts to determine population trends. During that year, 695 animals were counted in two surveys. In 1977, a behavioral study began at Laysan Island, Hawaii. Study teams observed monk seals at Kure and French Frigate Shoals, and 625 animals were counted in a 1977 census of the entire northwestern Hawaiian Islands. Comparisons with past censuses indicate that populations at French Frigate Shoals, Laysan Island and Lisianski Island appeared stable; however, those at Pearl and Hermes Reef, Midway, and Kure have declined since the late 1950's.

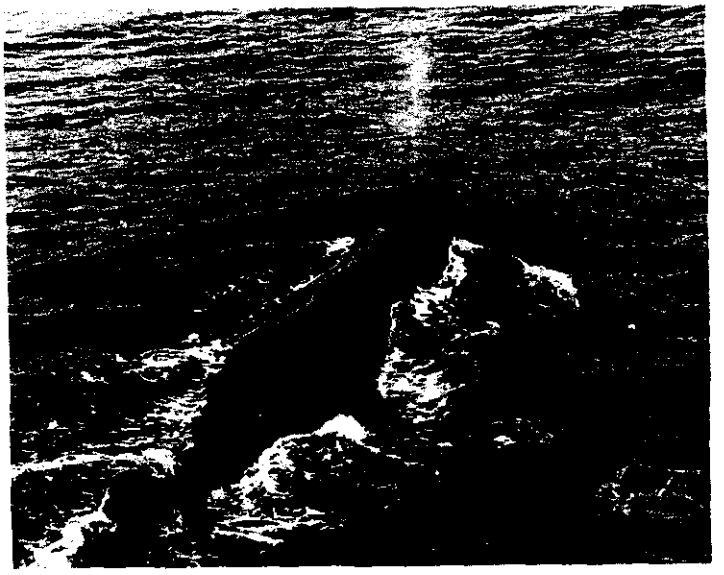
Cetacean Program. An extensive 3-year bowhead whale research program has been implemented to provide a more precise estimate of the Western Arctic population size, recruitment and natural mortality rates, distribution and migration routes, and the effect of the Eskimo harvest on these stocks. This research program consists of aerial and vessel surveys, ice and land camp studies, acoustic and sonar studies, harvest monitoring, biological studies, and examination of historical whaling logbooks.

Population studies of both protected and exploited minke, sei, and sperm whales, especially in the North Pacific Ocean, are made to develop the data base for management recommendations to the International Whaling Commission. Estimates of stock sizes of large whale species are developed through censuses, whale observation and marking cruises, and analysis of catch and effort statistics. The annual gray whale census off Pt. Loma, Calif., the cooperative killer whale survey in Puget Sound, Wash., and humpback whale surveys in southeastern Alaska and Hawaii are made under this program. In 1977, a radio tag for whales was tested in the Frederick Sound area of southeastern Alaska.

Funding

The fiscal year 1978 budget for marine mammals is $5,761,000 and 98 positions. This includes funding under the MMPA, the Endangered Species Act, the Fur Seal Act, and other authorizations.

Funding covers administration of the Washington office, law enforcement that includes State contracts, research at the Northwest and Alaska Fisheries Center and the Southwest Fisheries Center, and the tuna-porpoise observer program. Additional funds in FY '78 have been requested for bowhead whale enforcement and participation in the IATTC observer program.



Sperm Whale

Laws and Treaties Governing the Protection of Marine Mammals

Every marine mammal of U.S. concern is protected by one or more U.S. laws or acts, and the conservation of some species is partially assured by international treaty or law. A summary of laws, conventions, and commissions designed to protect marine mammals follows.

Laws and Treaties Involving the United States

1. Marine Mammal Protection Act of 1972: A U.S. Federal law that prohibits persons under the jurisdiction of the United States from taking, harassing, or importing any marine mammal or its byproducts into the United States, except when authorized to do so by special permit. Eskimos, Aleuts, and Indians of the North Pacific and Arctic Oceans can take marine mammals for subsistence, and for creating and selling handicraft items and clothing as long as the stocks can support the harvest.

2. Endangered Species Act of 1973: The purpose of this U.S. Federal law is to provide a program for the conservation of species that are either endangered (now) or threatened (within the foreseeable future) with extinction and their dependent ecosystems, and to implement international conservation conventions. With limited exceptions, the Act prohibits the taking, importing, exporting, and interstate commerce of any endangered species, as well as their parts or products. Exceptions include: permits for scientific purposes or the enhancement of propagation or survival of the species, economic hardship exemptions, and subsistence taking by Alaska natives. For threatened species, the

Act authorizes the issuance of protective regulations as necessary for their conservation. Furthermore, to assist in accomplishing its purposes, the Act authorizes the acquisition of land; authorizes cooperative agreements with States which have an adequate conservation program, including Federal funding of up to two-thirds (or three-fourths when entered with more than one State); prohibits Federal agencies from taking any action which would jeopardize the continued existence of an endangered or threatened species or result in the destruction or modification of its critical habitat; and provides for civil and criminal penalties. Marine mammals under the jurisdiction of NMFS and listed as endangered species are the blue whale, bowhead whale, fin whale, gray whale, humpback whale, right whales, sei whale, sperm whale, Hawaiian monk seal, and Mediterranean monk seal.

3. Convention on International Trade in Endangered Species of Wild Fauna and Flora: This Convention, which entered into force on July 1, 1975, provides additional protection for the following marine mammals under the jurisdiction of NMFS: Appendix I--blue whale, bowhead whale, gray whale, humpback whale, right whales, certain stocks of fin and sei whales, Ganges River dolphin, Caribbean monk seal, Hawaiian monk seal, Mediterranean monk seal, and northern elephant seal; Appendix II--certain stocks of fin and sei whales, southern elephant seal, Amsterdam Island fur seal, Galapagos fur seal, Guadalupe fur seal, Juan Fernandez fur seal, Kerguelen fur seal, New Zealand fur seal, Southern (South American) fur seal, and South African fur seal. Trade is more strictly controlled for Appendix I animals than for Appendix II animals. The U.S. Management Authority for the Convention (U.S. Department of the Interior) controls the import, export, re-export, and introduction from the sea of convention animals through a system of permits and enforcement. Implementation by regulating commerce began May 23, 1977.

4. International Whaling Convention: The IWC was established under a convention signed in Washington, D.C., in December 1946. The membership includes all countries that catch significant numbers of whales except Chile, Peru, Portugal, and Spain. The IWC is responsible for whale conservation worldwide. Since 1964, the IWC has acted to bring world whaling under control by prohibiting the taking of some species, sharply reducing the authorized catches of species in certain areas, establishing catch quotas by species and stocks, and implementing an international observer plan for checking compliance with quotas and regulations at land stations and on factoryships. The IWC now regulates the harvest of Bryde's, fin, minke, sei, and sperm whales. An IWC subcommittee has been established to review problems relating to cetaceans. The blue, bowhead, gray, humpback, and right whales are completely protected, except for some hunting by aborigines.

5. Whaling Convention Act of 1949: brought into force the International Convention for the Regulation of Whaling signed on December 2, 1946, by the United States and certain other governments. Article III of the International Convention established the IWC.

6. The Whale Conservation and Protection Study Act of 1976: The Act requires the Secretary of Commerce to make a comprehensive study of all whales found in waters subject to the jurisdiction of the United States, including the 200-mile fishery conservation zone. A report that includes suggested recommendations and legislation is due to Congress January 1, 1980.

7. Interim Convention on North Pacific Fur Seals: This convention, ratified in 1957, prohibits most citizens of Canada, Japan, the U.S.S.R., and United States from taking northern fur seals. The exceptions are aboriginal Eskimos, Aleuts, and Indians, who may take them only at sea and by primitive methods. The convention also provides for intensive research on this species by the four countries. The U.S. and U.S.S.R. commercially harvest northern fur seals on their breeding grounds and regulate the kills on a scientific basis.

8. Fur Seal Act of 1966: brought into force the Interim Convention on North Pacific Fur Seals.

9. International Convention for the Conservation of Antarctic Seals, 1972: The purpose of this convention is to safeguard all species of Antarctic seals and to ensure that, if commercial sealing begins on floating ice of the Southern Ocean, the taking of any species will be subject to strict limitations to prevent overexploitation or damage to their ecosystem. Measures adopted under the Antarctic Treaty of 1959 provide only for the protection of seals and other animals around the shoreline of the Antarctic Continent, but not on floating ice. The convention of 1972 may be applicable to crabeater, leopard, Ross, southern elephant, southern fur seals, and Weddell seals south of latitude 60°. The Ross, southern elephant, and southern fur seals are protected species, and no taking is permitted.

Miscellaneous Regulations and Agreements of U.S. Interest

1. International Convention for the Northwest Atlantic Fisheries: Under terms of a convention signed in 1949, ICNAF is responsible for the investigation, protection, and conservation of the fisheries of the Northwest Atlantic in order to make possible the maintenance of a maximum sustained catch from these fisheries. On January 1, 1977, Canada extended its jurisdiction over fisheries to 200 miles. To avoid conflicts in 1977 between Canadian and international regulations, Canada agreed to adopt ICNAF regulations for the 1978 harvest of harp seals and hooded seals.

   An amendment to the ICNAF Convention adopted in December 1976 allows the Commission to give scientific advice for management of fisheries within natural fishery limits if requested by a coastal state that is a party to the Convention. In 1977, Canada requested and received from ICNAF a scientific report on harp and hooded seals.

Following national and international consultations, Canada issued regulations and catch levels for 1978. The total allowable catch for the entire northwest Atlantic was set at 180,000 harp seals; Canada's share was 135,000 with 35,000 for Norway and 10,000 for Greenland, the Canadian Arctic, and Labrador. Canada appears to have completed the transition from international to Canadian management of harp and hooded seals within the limits of Canadian fisheries jurisdiction. The United States withdrew from the ICNAF in December 1976.

2. Canadian-Norwegian Agreement on Sealing: On December 22, 1971, these two governments ratified an agreement on sealing and the conservation of seal stocks in the Northwest Atlantic. The agreement applies to the harp seal, but provision is made for extension to hooded and bearded seals and to the walrus.

3. Harp Seal: The U.S.S.R. and Norway signed an agreement in 1958 entitled "Preservation of Seals in the Greenland Sea." The agreement provides for the regulation of harp seal catches by these two nations. The U.S.S.R., however, has not hunted harp seals since 1965.

4. Gray Seal: The U.S.S.R. has prohibited (since 1970) the hunting of gray seals for sport and by amateurs, but permits the taking of these animals for subsistence. Canada uses an 1886 law for authority in regulating the take of gray seals. England has prohibited the hunting of gray seals on the Farne Islands since 1932 and on Orkney Island since 1923. Norway has forbidden hunting at Sor Trondelag since 1923. Finland and Sweden offer bonuses for gray seals taken.

5. Hooded Seal: Canada and Norway prohibit the taking of hooded seals near Newfoundland before March 10, near Jan Mayen Island before March 13, in Denmark Strait from June 15 to July 15, and in northern waters from March 20 to May 5. The U.S.S.R. and Norway in 1958 agreed to prohibit the harvest of hooded seals near Jan Mayen Island before March 13, and banned hunting in Denmark Strait.

6. U.S.S.R. regulations (from the Russian publication, "Rules for Protecting and Harvesting Marine Mammals," July 11, 1975:
   a. Under these regulations, a series of protective and conservation measures were adopted. Sport and hobby (recreational) hunting of any marine mammal is prohibited everywhere and throughout the year. Rookeries and hauling grounds are protected. Capture by use of poisons, certain firearms, and hook and line gear is prohibited at sea as well as fishing or harassment by vessels or aircraft within certain distances of various islands inhabited by marine mammals. The regulations include other prohibitions designed to protect marine mammals and their ecosystems.

b. The U.S.S.R. has established stringent closed seasons on vessel and shore harvest of ribbon, ringed, and harbor seals (and the ice-dwelling form of the harbor seal, the larhga seal). The regulations allow short periods of harvest of white coats, yearlings, and adults in the Okhotsk and Bering Seas. Short harvest periods are allowed in the northern commercial areas (White, Barents and eastern Arctic sea areas) on harp, hooded, and ringed seals. The harvests in the Jan Mayen area are adjusted by international agreement. Taking of bearded seals and belukhas (white whales) is allowed in Arctic areas primarily for subsistence purposes.

7. Walrus: In 1958, the U.S.S.R. and Norway agreed to ban the hunting of walrus except to satisfy the needs of local groups and expeditions.

8. Guadalupe fur seal: Mexico has safeguarded the breeding grounds of the Guadalupe fur seal on the Guadalupe Islands by making this island a wildlife refuge.

9. South American fur seal: The Uruguayan and Argentinian Governments protect the South American fur seal on land and out to 200 miles at sea. The Uruguayan Government also regulates the harvest by protecting all female seals except the 1-year-olds, controlling take of pups by seasonal restrictions, and imposing quotas in some instances.

10. South African fur seal: The harvest of South African fur seals is largely a state enterprise in South Africa; however, the system includes one of control and leasing of rookeries to private contractors. The South West African Administration has not entered the harvesting business, but licenses private firms, restricts gear to be used, establishes closed seasons, and places limits on sex and condition of catch.

11. Narwhal: Canada allows Eskimos to take five narwhals annually for personal use and issues permits to capture this mammal for exhibition.

12. Killer whale: Canada allows this species to be taken under a permit system.

Northern Sea Lion

Part III. CURRENT STATUS OF THE STOCKS OF MARINE MAMMALS

Introduction

Of the approximately 108 species of pinnipeds and cetaceans throughout the world, status reports have been prepared for 69 species which are of primary concern to the United States and which are the responsibility of the Secretary of Commerce under the terms of the Marine Mammal Protection Act. The Act requires a report not only on the status of each marine mammal species, but also on the population stocks. The population stocks of only a few marine mammals have been delineated, and the effort needed to obtain information on most population stocks is beyond the scope of research being carried out at the present time.

Information about each species is summarized under six major headings. They are distribution and migration, abundance and trends, general biology, ecological problems, allocation problems, and current research. Selected references are listed at the end of each species discussion. Summary information on existing protective regulations for marine mammals also is included.

References are not cited in the report except for the paragraph on abundance and trends. Because of the importance of data on abundance and trends, information in this section is cited and citations are given in the list of references. Data on the abundance of marine mammals are difficult and costly to obtain. Except for a few species which have been harvested commercially, such as large whales and fur seals in the North Pacific Ocean, abundance data are usually inadequate for management purposes.

A list of scientists who have assisted either by providing information or reviewing the status reports is included in this report.

Order Carnivora (incl. "Pinnipedia")

Family Otariidae

Zalophus californianus californianus (California sea lion)
Eumetopias jubatus (northern sea lion)
Callorhinus ursinus (northern fur seal)
Arctocephalus pusillus pusillus (South African (Cape) fur seal)
Arctocephalus australis (South American fur seal)
Arctocephalus philippii (Juan Fernandez fur seal)
Arctocephalus townsendi (Guadalupe fur seal)

Family Phocidae

Phoca largha (largha seal)
Phoca vitulina (harbor seal)
Phoca hispida (ringed seal)
Phoca groenlandica (harp seal)
Phoca fasciata (ribbon seal)
Halichoerus grypus (gray seal)
Erignathus barbatus (bearded seal)
Cystophora cristata (hooded seal)
Monachus tropicalis (Caribbean monk seal)
Monachus schauinslandi (Hawaiian monk seal)
Lobodon carcinophagus (crabeater seal)
Ommatophoca rossii (Ross seal)
Hydrurga leptonyx (leopard seal)
Leptonychotes weddelli (Weddell seal)
Mirounga leonina (southern elephant seal)
Mirounga angustirostris (northern elephant seal)

Order Cetacea, Suborder Mysticeti

Family Eschrichtiidae

Eschrichtius robustus (gray whale)

Family Balaenopteridae

Balaenoptera acutorostrata (minke whale)
Balaenoptera edeni (Bryde's whale)
Balaenoptera borealis (sei whale)
Balaenoptera physalus (fin whale)
Balaenoptera musculus (blue whale)
Megaptera novaeangliae (humpback whale)

Family Balaenidae

Balaena glacialis (black right whale)
Balaena mysticetus (bowhead whale)

Order Cetacea, Suborder Odontoceti

Family Platanistidae

Platanista gangetica (Ganges susu, Ganges river dolphin)
Platanista minor (Indus susu, Indus river dolphin)

Family Delphinidae

Steno bredanensis (rough-toothed dolphin)
Tursiops truncatus (bottlenosed dolphin)
Stenella longirostris (spinner dolphin)
Stenella attenuata [frontalis, graffmani, and dubia (spotted dolphin)]
Stenella plagiodon (Atlantic spotted dolphin)
Stenella coeruleoalba (striped dolphin)
Delphinus delphis (common dolphin)
Lagenodelphis hosei (Fraser's (Sarawak) dolphin)
Lagenorhynchus albirostris (white-beaked dolphin)
Lagenorhynchus acutus (Atlantic white-sided dolphin)
Lagenorhynchus obliquidens (Pacific white-sided dolphin)
Lissodelphis borealis (northern right whale dolphin)
Grampus griseus (Risso's dolphin)
Peponocephala electra (melon-headed whale)
Feresa attenuata (pygmy killer whale)
Pseudorca crassidens (false killer whale)
Globicephala melaena (long-finned pilot whale, pothead, blackfish)
Globicephala macrorhynchus (short-finned pilot whale)
Orcinus orca (killer whale)
Phocoena phocoena (harbor porpoise)
Phocoenoides dallii (Dall porpoise)

Family Monodontidae

Delphinapterus leucas (white whale, beluga, belukha)
Monodon monoceros (narwhal)

Family Physeteridae

Physeter catodon (sperm whale)
Kogia breviceps (pygmy sperm whale)
Kogia simus (dwarf sperm whale)

Family Ziphiidae

Berardius bairdii (Baird's beaked whale)
Ziphius cavirostris (Cuvier's beaked whale)
Hyperoodon ampullatus (Northern bottlenose whale)
Mesoplodon mirus (True's beaked whale)
Mesoplodon europaeus (Gervais' beaked whale)
Mesoplodon ginkgodens (ginkgo-toothed whale)
Mesoplodon carlhubbsi (Hubb's beaked whale)
Mesoplodon stejnegeri (Stejneger's beaked whale)
Mesoplodon bidens (Sowerby's beaked whale)
Mesoplodon densirostris (Blainville's beaked whale)

Status Reports

CALIFORNIA SEA LION

(Zalophus californianus californianus)

Distribution and Migration: This subspecies of the California sea lion ranges along the west coast of Mexico from about lat. 19°N to southern British Columbia, Canada. The California sea lion breeds on some Gulf of California islands northward to San Miguel Island, California, in lat. 34°N. Many adult and subadult males move northward along the California, Oregon, Washington, and British Columbia coasts after the breeding season. Feral animals which have escaped from captivity are being reported in the southeastern U. S. (including the Gulf of Mexico), but there is yet no evidence of breeding (Caldwell, D. K., pers. comm., 1974).

Another subspecies occurs on the Galapagos Islands, and still another, formerly found in Japanese waters, from 34° to 37°N is now extinct.

Abundance and Trends: The California Department of Fish and Game censuses indicate that the California sea lion population reached a low level in the early 1930's in California waters, then made a steady recovery and apparently leveled off about 1961 with little variation in the counts since then (Ripley, Cox, and Baxter, 1962; Carlisle and Aplin, 1971). During the breeding season (May-July) almost the entire population is found south of lat. 34°N. Odell (1971) obtained minimum counts of 34,328 California sea lions on all Channel Islands in June 1964. Peterson and LeBoeuf (1969) estimated that 40,000 animals were ashore on San Nicolas and San Miguel Islands during the 1967 and 1968 breeding seasons. LeBoeuf et al. (1976) completed a photographic count of the Channel Islands area 27-30 June 1975 and found 38,754 animals. Rice, Kenyon, and Lluch (1965) counted 16,150 California sea lions on Guadalupe, San Benito, and Cedros Islands, Mexico, in January and February 1965. Brownell, et al. (1974) made counts in June 1968 of 15,467 on Guadalupe, Islas San Benito, Cedros, and Natividad Islands, Mexico. Orr, Schoenwals, and Kenyon (1970) counted this species in the Gulf of California between 1960 and 1968, and made counts on six islands of about 5,400 animals in April 1966. Mate (1977) in July 1975 counted 9,332 animals on islands in the Gulf of California. During an aerial survey of the entire range (except Guadalupe Island) in July 1975, Mate obtained a count of 75,387 animals. The proceeding figures indicate that the present population may approach 80,000 animals about equally divided between the United States and Mexico.

During the nonbreeding season, 2,500 Z. californianus may be found in Oregon, 500 in Washington, and 1,000 in British Columbia (Mate, 1975).

On 25 February 1972, 430 California sea lions were counted in Barkley Sound off Vancouver Island, 35 on Race Rocks off Victoria, B.C., and 10 in Dodds Narrows (lat. 49°07'N) near Nanaimo, B.C. (Bigg, 1973).

General Biology:

Species Statistics. -- The adult male grows to 2.2 m and 275 kg; the adult female to 1.8 m and 91 kg. Newborn pups are about 0,8 m long and weigh 5 to 6 kg.

Reproductive Data. -- On San Nicolas Islands, the pupping season begins about 15 May and lasts about 5 weeks, with the peak during the first week in June. The females usually breed 15 to 30 days after parturition, and the mother and pup may remain together the first year. The males establish and defend breeding territories on land; the females move about freely.

Age-Growth Data. -- California sea lions have lived 18 to 20 years in captivity.

Feeding Habits. -- The California sea lion's food is squid, octopus, and a variety of fish such as herring, sardines, rockfish, hake, and ratfish.

Parasites and Diseases. -- During the past 2 or 3 years an apparent increase in premature births and in the mortality rate of subadults and young adults has occurred. Three potential causes have been isolated: (1) chemical residues (polychlorinated biphenyls, DDT, and metabolites); (2) a bacterium (Leptospira); and (3) a virus. The greatest single cause of death in wild and captive animals is lungworm. Animals in captivity have also died from pleuropneumonia, pneumonia, and enteric infections, diseases which may also occur in wild populations.

Ecological Problems: Killer whales and large sharks are known to prey upon sea lions. Possibly there is some competition with other otariids for food and hauling grounds. California sea lions associated with certain hauling grounds and rookeries have practically abandoned these areas because of harassment by man. Although most major populations of sea lions are now on sites not easily reached by the public, a few areas, such as the Monterey Bay breakwater in Monterey, California, are used extensively as hauling grounds by California sea lions and are visited frequently by tour boats. The latter sometimes pass within 10 m of the hauling grounds.

Allocation Problems: A history of conflict exists between people for and against complete protection of this species. Some conservation groups would like complete protection for the California sea lion while some fishermen want the number of California sea lions to be controlled. California sea lions are probably the most widely sought-after species of eared seals in the world for public display. In August 1976, North American zoos or oceanaria had 423 California sea lions on public display (Cornell and Aspe, 1976).

Current Research: The National Marine Fisheries Service conducts research on this species on San Miguel Island off California. The following organizations are conducting research on the California sea lion: University of California, Santa Cruz, California; University of California, Berkeley, California; California Academy of Science, San Francisco, California; Humboldt State University, Arcata, California; Fisheries Research Board of Canada, Nanaimo; Naval Ocean Systems Center, San Diego, California; and Navy Bioscience Laboratory, Oakland, California.

References

Banfield, A.W.F. 1974. The mammals of Canada. Univ. Toronto Press, 438 p.

Bigg, M.A. 1973. Census of California sea lions on southern Vancouver Island, British Columbia. J. Mammal. 54:285-287.

Bonnot, P. 1951. The sea lions, seals, and sea otters of the California coast. Calif. Fish Game 37:371-389.

Brownell, R.L., Jr., R.L. DeLong, and R.W. Schreiber. 1974. Pinniped populations at Islas de Guadalupe, San Benito, Cedros, and Natividad, Baja California, in 1968. J. Mammal. 55:469-472.

Carlisle, J.G., and J.A. Aplin. 1971. Sea lion census for 1970, including counts of other California pinnipeds. Calif. Fish Game 57:124-126.

Cornell, L.H. and E.D. Asper. 1967. A census of captive marine mammals in North America. Food and Agric. Organ. U.N. Adv. Comm. Mar. Resource. Res., FAO ACMRR/MM/SC90, p. 18.

Daugherty, A.E. 1972. Marine mammals of California, 2d rev. Calif. Dept. Fish Game, Sacramento, 90 p.

DeLong, R.L., W.G. Gilmartin, and J.G. Simpson. 1973. Environmental pollutant residues in parturient California sea lions: premature vs normal. Science 181: 1168-1170.

Frey, H.W. (editor). 1971. California's living marine resources and their utilization. Sacramento, Calif. Dept. Fish Game, 148 p.

Gilmartin, W.G., R.L. DeLong, A.W. Smith, J.C. Sweeney, B.W. deLappa, R.W. Risebrough, L.A. Griner, M.D. Dailey, and D.E. Peakall 1976. Premature Parturition in the California sea lion. J. Wildl. Disease 12:114-115.

LeBoeuf, B.J., and M.L. Bonnell. 1971. DDT in California sea lions. Nature, 234:108-110.

LeBoeuf, B.J., M.L. Bonnell, M.O. Pierson, D.H. Dettman and B.D. Farrens. 1976. Pinnipedia: Numbers, distribution and movements in the Southern California Bight. Section I, in Regents of the Univ. of Calif. (editors), Marine mammal and seabird survey of the Southern California Bight Area, p. III - 1-269, Draft final rep. 1975-1976, BLM contract 08550-CT5-28.

Odell, D.K. 1971. Censuses of pinnipeds breeding on the California Channel Islands. J. Mammal. 52:187-190.

_____1972. Studies on the biology of the California sea lion and the northern elephant seal on San Nicolas Island, California, Ph.D. thesis, Univ. Calif., Los Angeles, 168 p.

Orr, R. T., J. Schoenwald, and K. W. Kenyon. 1970. The California sea lion: skull growth and a comparison of two populations. Proc. Calif. Acad. Sci., 4th Ser., 37:380-394.

Peterson, R. S., and G. A. Bartholomew. 1967. The natural history and behavior of the California sea lion. Am. Soc. Mammal., Spec. Publ. No. 1, 79 p.

Peterson, R. S., and B. J. LeBoeuf. 1969. Population studies of seals and sea lions. Trans. 34th N. Am. Wildl. Nat. Res. Conf., pp. 74-79.

Rice, D. W., K. W. Kenyon, and D. Lluch-B. 1965. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California in 1965. Trans. San Diego Soc. Nat. His. 14(7):73-84.

Ripley, W. E., K. W. Cox, and J. L. Baxter. 1962. California sea lion census for 1958, 1960, and 1961. Calif. Fish Game 48:228-231.

NORTHERN (STELLER) SEA LION

(Eumetopias jubatus)

Distribution and Migration: The northern sea lion is found in continental shelf water from the Sea of Japan and northern Honshu, Japan, northward around the North Pacific Ocean rim to the Okhotsk and Bering Seas and southward to the California Channel Islands. Some seasonal movements occur in parts of its range. Examples of such movements are differences in the winter and summer distribution of these animals in the Bering Sea, and the postbreeding movements in central California.

Abundance and Trends: Mate (1976) estimated a world population of 250,000 to 325,000. Alaska has 202 known rookeries and hauling grounds. The Alaska population has increased considerably since the early 1900's and now exceeds 200,000 and may be near maximum levels in many areas (Alaska Department of Fish and Game, 1973). Between 1964 and 1973, the year the Marine Mammal Protection Act became effective, several thousand pups were harvested annually; 6,546 were taken in 1972.

The population of sea lions in British Columbia waters was estimated at 11,000 to 12,000 from an aerial census in 1956-57. The authorities undertook a heavy reduction program in 1959 and 1960, and the population was reduced to about 4,000 animals in 1969 (Banfield, 1974). The breeding population is estimated to be 5,000 by Fisher and Brenton (cited in Mate, 1976).

Kenyon and Scheffer (1962) made six aerial and one surface survey along the Washington coast between 1949 and 1959 and stated that the population did not exceed 500. Mate (1975) revised this estimate to 600. Pearson and Verts (1970) estimated the Oregon population at 1,078. Mate (pers. comm., 1975) estimated the Oregon breeding population at about 2,000 animals. The California Department of Fish and Game makes periodic aerial censuses of sea lions in California. Carlisle and Aplin (1971) have given the following figures for sea lions in California north of Pt. Conception: (1958) 7,053; (1961) 6,675; (1965) 4,998; (1969) 7,156; and (1970) 5,189. They consider these to be northern sea lions, although small numbers of California sea lions were known to occur north of Pt. Conception at the time the census was made. The California breeding season population probably numbers about 2000 (Mate 1977, Fiscus pers. comm.).

The northern sea lion ranges to the Channel Islands group south of Pt. Conception. In the Channel Islands, the population peaked at about 2,000 in the late 1930's and has declined since (Bartholomew, 1967). In 1977, the San Miguel Island Population was estimated by Antonelis (pers. comm.) at less than 20; 3 pups were born in 1977.

General Biology:

Species Statistics. -- The adult males grow to 3.0 m in length and over 900 kg in weight. The adult females reach 2.0 m and almost 300 kg. Newborn pups weigh 16 to 23 kg, are 89 to 102 cm long, and have a dark chocolate-colored pelage.

Reproductive Data. -- Northern sea lions favor isolated locations with some shelter, free access to the sea, and freedom from human harassment. Colonies may become established on rock outcrops and boulder, cobblestone, and coarse sand beaches.

Males may mature sexually by age 5 years, but hold breeding territories first at age 7 or 8. Females can first produce young at age 5 or 6, and breed 10 to 14 days after parturition. The adult male maintains a territory 40 to 60 days and fasts throughout the period. The harems consist of 10 to 30 cows. The female is aggressive toward other females for several days after her pup is born.

Age-Growth Data. -- The pup sheds its dark chocolate birthcoat for the tan pelage in the autumn of birth. Some pups remain with their mothers the first year. They have been known to live 17 years in the wild.

The northern sea lion has only a few predators besides man--the killer whale and one or two species of large sharks.

Feeding Habits. -- The northern sea lion eats a variety of fish and cephalopods. A study of 382 stomachs indicated the following diet: squid, octopus, sand lance, rockfish, clams, crabs, flounder, halibut, greenling, and lumpfish.

Ecological Problems: Northern sea lions in some areas may compete with other pinnipeds for spaces on rookeries and hauling grounds. Some animals have abandoned their rookeries and hauling grounds because of excessive disturbance by humans.

Allocation Problems: Northern sea lions have damaged gear and destroyed fish in the halibut longline, salmon purse seine, gillnet, and troll fisheries. The species has also destroyed herring in herring traps and has been accused of biting and sinking inflated plastic buoys used to mark crab pots. This species has considerable esthetic and recreational value.

Current Research: This species has its center of abundance in Alaska where the Alaska Department of Fish and Game's management and research investigations have been directed primarily at determining abundance and distribution, and the effects of harvesting operations on rookery populations. A marking program began in 1975, and an aerial survey program in 1976. The University of California, Santa Cruz, is conducting research on the species off California. The National Marine Fisheries Service has carried out surveys in the eastern Aleutian Islands since 1975.

References:

Alaska Department of Fish and Game. 1973. Alaska's wildlife and habitat. Van Cleve Printing, Anchorage, 143 p.

Banfield, A. W. F. 1974. The mammals of Canada. University of Toronto Press, 438 p.

Bartholomew, G. A. 1967. Seal and sea lion populations of the California islands, pp. 229-244. In R. N. Philbrick (ed.), Proc. Symp. on the Biology of the California Islands. Santa Barbara Botanic Garden.

Bonnot, P. 1929. Report on the seals and sea lions of California, 1928. Calif. Fish Game, Fish Bull. 14, 62 p.

Carlisle, J. G., and J. A. Aplin. 1971. Sea lion census for 1970, including counts of other California pinnipeds. Calif. Fish Game 57:124-126.

Fiscus, C. H., and G. A. Baines. 1966. Food and feeding behavior of Steller and California sea lions. J. Mammal. 47:195-200.

Gentry, R. L. 1968. Censuses of Steller sea lions Ano Nuevo Island during 1967-1968, pp. 23-25. In R. L. Peterson (ed.), Ano Nuevo Reports 2, Univ. of Calif., Santa Cruz.

Gentry, R. L. 1970. Social behavior of the Steller sea lion. Ph.D. thesis, Univ. Calif., Santa Cruz, 113 p.

Kenyon, K. W., and D. W. Rice. 1961. Abundance and distribution of the Steller sea lion. J. Mammal. 43:223-234.

Kenyon, K. W., and V. B. Scheffer. 1962. Wildlife surveys along the northwest coast of Washington. Murrelet 42:1-9.

Mate, B. R. 1973. Population kinetics and related ecology of pinnipeds along the Oregon coast. Ph.D. thesis, Univ. Oreg., Eugene, 92 p.

_____1975. Annual migrations of the sea lions Eumetopias jubatus and Zalophus californianus along the Oregon coast. Rapp. P.-V. Réun. CIEM 169: 455-461.

_____1976. History and present status of the northern (Steller) sea lion, Eumetopias jubatus. Food Agric.Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/66, 6 p.

_____1977. Aerial censusing of pinnipeds in the eastern Pacific for assessment of population numbers, migratory distributions, rookery stability, breeding effort, and recruitment. Final rep., Mar. Mammal Comm., Contract MM5AC001, 67 p.

Mathisen, O. A., R. T. Baade, and R. J. Lopp. 1962. Breeding habits, growth and stomach contents of the Steller sea lion in Alaska. J. Mammal. 43: 469-477.

Nishiwaki, M., and F. Nagasaki. 1960. Seals of the Japanese coastal waters. Mammalia 24: 459-467.

Orr, R. T., and T. C. Poulter. 1965. The pinniped population of Ano Nuevo Island, California. Proc. Calif. Acad. Sci. 32:377-404.

Pearson, J. P., and B. J. Verts. 1970. Abundance and distribution of harbor seals and northern sea lions in Oregon. Murrelet 51:1-5.

Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish. Res. Bd. Can., Bull. 171, 54 p.

Sandegren, F. E. 1970. Breeding and maternal behavior of the Steller sea lion (Eumetopias jubata) in Alaska. MS thesis, Univ. Alaska, Fairbanks, 138 p.

Smith, I. D. 1972. Sea lions wintering along the outer coast of Vancouver Island. J. Fish. Res. Bd. Can. 29:1,764-1,766.

Spalding, D. J. 1964. Comparative feeding habits of the fur seal, sea lion, and harbour seal on the British Columbia coast. Fish. Res. Bd. Can., Bull. 146, 52 p.

NORTHERN FUR SEAL

(Callorhinus ursinus)

Distribution and Migration: Most of the animals are on their breeding grounds from May through November to bear young and to breed. They otherwise are found at sea along the continental shelf from the Bering Sea south along both sides of the North Pacific Ocean to lat. 32°N. Some intermingling of eastern and western Pacific populations occurs at sea and on land, primarily among males younger than age 6 years.

Abundance and Trends: A program of reducing the population of Pribilof Islands fur seals was begun in 1956 with the expectation that the rate of survival would improve (Roppel, et al., 1963) and result in an increased yield of pelts. By 1968, it had become evident that the herd had been reduced to a level somewhat below that of maximum sustainable yield, and that an increase in the number of pups born was desirable. Thus, female fur seals have not been harvested commercially on the Pribilof Islands since 1968 with the expectation that the population would increase. However, less than average survival of several year classes, the cause of which is not understood, has prevented the expected increase. 1/ In 1975, the number of pups born was estimated to be 361,000; and in the past, the maximum yield of furs was produced when about 400,000 pups were born.

Apparently the Commander Islands fur seals have not become reestablished on a considerable portion of their original rookery area. Consequently, this population should increase to a higher level. It is likely that the Robben Island population is near the maximum. Johnson (1972) estimated the abundance of northern fur seals by breeding islands, as follows:

	Estimated number of northern fur seals
	Thousands
Location of fur seal rookeries:	
Pribilof Islands	1,300
San Miguel Island	2
Commander Islands	265
Robben Island	165
Kuril Islands	33
Total	1,765

General Biology:

Species Statistics. -- The adult male weighs 227 to 318 kg, and the female 36 to 59 kg. Newborn pups average 4.5 (female) and 5.4 kg (male). The male is polygynous and establishes his territory in late May and early June.

1/ An average of 48,000 males were harvested annually in 1956-72, while the average was 65,000 annually from 1939 to 1955.

Age-Growth Data: Pups shed their birthcoat in late summer for the adult pelage. The females reach 23 kg in weight by age 4 years, or 46 percent of their average adult size of 50 kg. They become sexually mature by age 3 to 5 years. The males weigh 25 to 35 kg by age 4 years, then experience major growth adding approximately 200 kg of weight by age 10. Males are sexually mature as young as age 4 to 5 years, but do not become members of the organized breeding structure until age 10. Females have been observed to reach 22 years, whereas few males live longer than 15 years.

Reproductive Data. -- Most of the pregnant females arrive on the rookeries in late June and early July, when they form harems of 1 to 100 females to 1 adult male. Within 3 days of her arrival, the female bears a single pup (twins are rare), breeds 2 to 5 days later, then begins nursing-feeding cycles of 2 days on land and about 8 days at sea within a 200-mile radius. Implantation of the blastocyst is delayed until November. Most of the males first breed at age 10, and few live longer than 15 years.

General Behavior. -- Immature fur seals arrive on the breeding grounds in descending order of age, the males beginning in mid-June and the females in late July. Some 1-year-olds haul out in September and October, but most fur seals return first at age 2. Most of the animals have left the rookeries by December. The adult males winter in northern waters, pregnant females usually migrate as far south as southern California, and young animals of both sexes are found throughout that range.

Diseases and Parasites. -- The main causes of death among pups on the rookeries are, in order of importance: emaciation-malnutrition syndrome, hookworm disease, bacterial infections, leptospirosis (perinatal hemorrhagic syndrome), and injuries. Pathogenic bacteria thus far isolated include: Clostridium perfringens, Proteus mirabilis, Salmonella enteriditis, and Leptospira sp. A psittacosis group chlamydia has been reported, but the clinical syndrome caused by the agent has not been described. A calcivirus, indistinguishable from vesicula exanthema of swine virus, has been found associated with vesicles on the flippers and may be related to emaciation syndrome.

The fur seal has filariid worms, stomach ascarids, intestinal flukes, cestodes, hookworms, and acanthocephalans, and nasal mites, but no heart or lungworms. Hookworms and sucking lice parasitize the newborn.

Feeding Habits: The fur seal is an opportunistic feeder taking squid and a variety of fishes including herring, anchovy, salmon, capelin, saury, walleye pollock, and mackerel.

Ecological Problems: Northern fur seals concentrate within their body tissues contaminants such as pesticides and heavy metals. For example, mercury compounds have been found in fur seal liver. The effect of contaminants on the health of fur seals is unknown. Predators include sea lions, sharks, and killer whales. Some competition may exist between fur seals, other pinnipeds and sea birds (Lander and Kajimura, 1976).

Allocation problems: In the North Pacific Ocean and Bering Sea, fur seals and commercial fisheries may compete for the same species of fish. Harvesting of fur seals on the Pribilof Islands has been criticized in recent years by animal protection organizations that would prefer esthetic and educational rather than economic use of the resource.

Current Research: Long-term research is financed and carried out by the Governments of Japan, Canada, the U.S.S.R., and the United States. Short-term projects are frequently carried out on the Pribilof Islands by university professors or graduate students.

In 1973 St. George Island was designated by the North Pacific Fur Seal Commission as an area of intensive research where no commercial harvest would take place for some years. An expanded research program on St. George Island began in 1973.

References:

Anas, R. 1970. Mercury found in fur seals. Comm. Fish. Rev. 32(12):3.

Anas, R. E., and A. J. Wilson, Jr. 1970. Organochlorine pesticides in nursing fur seal pups. Pest. Monit. J. 4:114-115.

Chapman, D. G. 1964. A critical study of Pribilof fur seal population estimates. U.S. Fish Wildl. Serv., Fish. Bull. 63:657-669.

Johnson, A. M. 1975. The status of northern fur seal populations. In K. Ronald and A. W. Mansfield (eds.) Biology of the seal. Cons. Int. Expl. Mer., Proc. Verb., 169 p. RAPP P.-v. Réun. CIEM 169: 263-66.

Kenyon, K. W., V. B. Scheffer, and D. G. Chapman. 1954. A population study of the Alaska fur seal herd. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Wildl. 12, 77 p.

Keyes, M. C. 1965. Pathology of the northern fur seal. J. Am. Vet. Med. Assoc. 147:1,090-1,095.

Lander, R. H., and H. Kajimura. 1976. Status of northern fur seals. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/34, 50 p.

North Pacific Fur Seal Commission. 1965. North Pacific Fur Seal Commission report on investigations from 1958 to 1961. Kenkyusha Co., Tokyo, 183 p.

_____1969. North Pacific Fur Seal Commission report on investigations from 1964 to 1966. Kenkyusha Co., Tokyo, 161 p.

Roppel, A. Y., A. M. Johnson, R. D. Bauer, D. G. Chapman, and F. Wilke. 1963. Fur seal investigations, Pribilof Islands, Alaska. U.S. Fish Wildl. Serv. Spec. Sci. Rep. Fish. 454, 101 p.

SOUTH AFRICAN (CAPE) FUR SEAL

(Arctocephalus pusillus pusillus)

Distribution and Migration: The South African fur seal breeds on the mainland and coastal islands of southern Africa from Cape Cross (South West Africa) to Algoa Bay (South Africa). This species shows no definite seasonal migration, but disperses widely while feeding. A marked adult was seen in deep-sea trawling grounds 450 miles from its birthplace. Young seals in their first year (November to October) frequent protected bays and areas near their places of birth. (Another race, A. pusillus doriferus, occurs in southeastern Australia and Tasmania.)

Abundance and Trends: Rand (1972b) estimates about 19,500 mature territorial males and about 273,000 mature females on mainland and island rookeries of the Republic of South Africa. Best (1973) estimates that from 250,000 to 300,000 South African fur seal pups are born each year in the Republic of South Africa and South West Africa. Shaughnessy (1975) has reviewed the estimates of Best (1973) and revised them downward to between 211,000 and 213,000 pups. Assuming the number of pups to be 1/4 the population, Shaughnessy estimates the total population to be 850,000 animals. First-year pups (about 9 months) and a small (unknown) number of second-year animals of either sex are harvested in the winter (June-September), although all cow seals are protected (Rand, 1972b). In 1950, the winter harvest totaled 27,289 pups and has increased to 76,694 in 1971 (Laws, 1973). The summer kill of surplus adult males (October-December) has declined from 3,000 in the early 1950's to 812 in 1969 (Rand, 1972b).

General Biology:

Species Statistics. -- The adult males weigh 204.2 to 363 kg and grow to 2.3 m long; females weigh 90.7 to 122.0 kg and are 1.5 to 1.8 m long. At birth the pup is about 0.76 m long and averages 6.4 kg.

Reproductive Data. -- In late October, when most of the older pups are weaned, the first adult males come ashore to establish territories and harems; pregnant females arrive about a week later. In November and early December, the female bears a single pup (twins are rare), mates 5 to 6 days later, then leaves its pup for the first time and feeds for 1 to 2 days at sea. Subsequent nursing-feeding cycles extend to 4 to 5 days on land and 7 to 10 days at sea. Implantation of the blastocyst in the uterus is delayed until April or May. Thus, gestation is 7 to 8 months, but may be longer for some females that mate for the first time in their second year.

Age-Growth Data. -- Adults of both sexes molt on land (14 days' duration) a few weeks after the breeding season, usually during March. The pups also shed their natal hair and milk teeth at this time and acquire the olive-gray coat of the yearling. The copper-colored underfur also becomes obvious.

Weaning is well advanced by September and October, although undisturbed mother-pup relationships may prolong weaning.

Feeding Habits. -- Food consists of fish, cephalopods, and various small crustaceans.

Ecological Problems: Sharks and killer whales are natural predators. On the desert coast, the black-backed jackal is a predator on pups.

Allocation Problems: Local fishermen engage in scattered and illegal killing of seals, contending that the animals interfere with their expanding purse-seine fishery. Seals occasionally feed on fish protruding through the meshes of otter trawl nets or taken by line fisheries.

Current Research: A recently expanded research program is carried out by the South African government to measure herd size, production, annual recruitment, natural and harvest mortality, and movements.

References:

Best, P. B. 1973. Seals and sealing in South Africa and South West Africa. 14 processed pp. plus appendix. Statement at the application of the Fouke Company for exemption from the Marine Mammal Protection Act.

Franca, P. da. 1967. Sur la presence d'Arctocephalus pusillus (Schreber) (Otaridae) et de Mirounga leonina (Linne) (Phocidae) au sud de l'Angola. Mammalia 31:50-54.

King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.

Laws, R. M. 1973. The current status of seals in the Southern Hemisphere. IUCN, New Pub. Ser., Suppl. Pap. No. 39:144-161.

Rand, R. W. 1955. Reproduction in the female cape fur seal, Arctocephalus pusillus (Schreber). Proc. Zool. Soc. London 124:717-740.

_____1956. The Cape fur seal (Arctocephalus pusillus). Its general characteristics and moult. Invest. Rep., Div. Fish. S. Afr. 21:1-52.

_____1959. The Cape fur-seal (Arctocephalus pusillus). Distribution, abundance and feeding habits off the southwestern coast of the Cape Province. Div. Sea Fish., Invest. Rep, 34:75p.

_____1967. The Cape fur-seal (Arctocephalus pusillus). 3. General behaviour on land and at sea. Div. Sea Fish., Invest. Rep. 60, 39 p.

_____1972a. Conservation of Cape fur-seals. Text of a lecture delivered to Wildlife Society, Transvaal Branch, 7 Nov. 1972 at Johannesburg.

_____1972b. The Cape fur-seal (Arctocephalus pusillus). 4. Estimates of population size. Div. Sea Fish., Invest., Rep. 89, 28 p.

Rand, R. W. 1973. Management of the South African fur seals. J. S. Afr. Wildl. Manage. Assoc. 3(2):85-87.

Shaughnessy, P. D. 1976. The status of seals in South Africa and South West Africa. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/52, 30 p.

Visser, J. 1967. Catching South African fur seals. *Zoonooz* 40(2): 15-19.

SOUTH AMERICAN FUR SEAL

(Arctocephalus australis)

Distribution and Migration: Two major populations of the South American fur seal, identifiable only by size, are found, one on the Falkland Islands (Islas Malvinas) and the other on coastal Uruguayan Islands. Minor populations of this species occur in Argentina, Chile, and Peru. The adults are on the Uruguayan breeding grounds in November and December, and offshore up to 200 miles east on the edge of the continental platform during the austral winter. An extreme northern record for the South American fur seal was of one identified at Rio de Janeiro, Brazil.

Abundance and Trends: In 1972, the Uruguayan population was estimated at 252,000. This population grew from an estimated 129,000 in 1960 to an estimated 174,000 in 1965. According to Strange (1973), the 1965-66 population on the Falkland Islands was 15-16,000. From a census taken in 1976, Chile reports a population of 40,000. The data on the Argentine population were collected in 1954 and are given as 2,700. (Advisory Committee on Marine Resource Research, 1976)

General Biology:

Species Statistics. -- Adult males on the Falkland Islands grow to 159 kg, whereas those in Uruguay reach only 136 kg; the females weigh 33 to 48 kg. The males are blackish-gray; the females and immature animals vary but usually have a silvery-gray neck and back and a yellow tint to the belly.

Reproductive Data. -- Males are polygynous and establish territories in early November. Most of the pregnant females arrive on the rookeries in mid-November and form small harems of about six animals. Within 6 to 7 days, each female bears a single pup and breeds 2 to 3 days later. Most males breed at age 7 years and the females at age 3 years. Uterine implantation of the blastocyst probably occurs in March. Gestation, including the period of delayed implantation, lasts nearly 1 year.

Age-Growth Data. -- Most of the animals leave the rookeries during the austral winter. On the rookeries, the fur seals are in close contact with South American sea lions, Otaria flavescens. Main causes of death in order of importance are from sporadic storms, which wash large numbers of pups out to sea; the seven-gilled shark; and probably the killer whale, which is common around the larger rookeries.

Feeding Habits. -- Brownell, cited in Vaz-Ferreira (1976), examined 13 stomachs and found remains of anchovies, mackerel, and sea bass.

Parasites and Diseases. -- The South American fur seal has nasal mites and 10 species of endoparasites, but no heart-or lungworms.

Ecological Problems: Offshore oil wells are planned in the near future and may result in an ecological hazard.

Allocation Problems: The species has esthetic, educational, and economic values. The Government of Uruguay annually harvests about 12,000 male fur seals on the islands.

Current Research: Long-term research on this species is carried out by the Governments of Uruguay and Argentina. In addition, short-term projects are carried out by the Natural History Museum of Montevideo and the Smithsonian Institution.

References:

Advisory Committee on Marine Resource Research 1976. Mammals in the sea: ad hoc group III on seals and marine otters, addendum. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/4 add. 1, 9 p.

Perez-Fontana, H. 1943. Informe sobre la industralia lobera (Ciento diez anos de explotacion de la industria lobera en nuestro pais). Informe sobre la industria pesquera nacional. Publicado por el Servicio Oceanografico y de Pesca. Montevideo, Uruguay. 70 p. +1 cuadro. Monteverde.

Peso Blanco, J. del. 1911. Focos de la Republica o del Uruguay. Granada, Spain, 27 p.

Smith, H. M. 1927. The Uruguayan fur seal islands. Zoologica 9(5):271-294.

Strange, I. 1973. The silent ordeal of a South Atlantic Archipelago. Natur. Hist. 82(2):30-39.

Vaz-Ferreira, R. 1950. Observaciones sobre la Isla de Lobos. Rev. Fac. Human. Cien., Montevideo, Uruguay, 5:145-176.

_____1956. Etologia terrestre de Arctocephalus australis (Zimmerman) ("lobo fino") en las Islas Uruguayas. Servicio Oceanografico de Pesca, Trabajos sobre de Lobos y Lobos Marinos 2:1-22.

Vaz-Ferreira, R., and B. Sierra de Soriano. 1961. Division funcional del habitat terrestre y estructura de las agregaciones sociales de Arctocephalus australis (Zimmerman), estudio grafico. Rev. Fac. Hum. Cien. Montevideo, Uruguay. 19:253-260.

Vaz-Ferreira, R. 1976. Arctocephalus australis (Zimmerman) South American fur seal. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/49, 13 p.

Ximenez, I. 1963. Frecuencia y fluctuaciones estacionales en la poblacion de Arctocephalus australis en algunas zonas de la Isla de Lobos. Rev. Inst. Invest. Pesq. 1(2):141-158.

_____1973. Nota preliminar sobre la repoblacio de Arctocephalus australis en la Isla Rasa. Trab. V Congs. Latinoam. Zool., Montevideo, Uruguay, 1:281-288.

JUAN FERNANDEZ FUR SEAL

(Arctocephalus philippii)

Distribution and Migration: This seal is known to occur only on the Islas Juan Fernandez (360 and 440 miles west of Valparaiso, Chile) and Islas San Felix (500 miles west of Caldera, Chile). The two groups are 500 miles apart. It is not known elsewhere, and migratory movements are unknown.

Abundance and Trends: In the late 18th and early 19th centuries the population on the Islas Juan Fernandez may have numbered 3 to 3-1/2 million, but was reduced to the point of commercial extinction. Although there were occasional reports of its existence, the species had been regarded as probably extinct since the early 20th century. In 1965 its survival was confirmed (Aguayo, 1971). Aguayo (1973) estimates 700 to 800 seals now occur in the Islas Juan Fernandez. The trend in numbers is increasing. Seals were formerly common on the Islas San Felix; despite several searches, only two seals have been seen there in recent years (Hubbs and Norris, 1971).

General Biology: The biology of this species is little known. Few specimens have been taken, and no studies made. It is now known to breed only on the Islas Juan Fernandez. Pupping occurs in December. The habitat of the Juan Fernandez seal is similar to that utilized by the Guadalupe seal.

Species Statistics: In the genus Arctocephalus, this species is second in size to A. pusillus. One male taken in November 1968 was 201 cm long and weighed an estimated 159 kg.

Reproductive Data: No study has been made.

Age-Growth Data: No study has been made.

Ecological Problems: None known.

Allocation Problems; Although the species has been given complete protection by Chilean law since 1965, local fishermen may still kill some seals for lobster bait.

Current Research: None known.

References:

Aguayo, L. A. 1971. The present status of the Juan Fernandez fur seal. K. Norske Vidensk. Selsk. Skr. 1:1-4.

Aguayo, L. A. 1973. The Juan Fernandez fur seal. In Seals, Proceedings of a working meeting of seal specialists on threatened and depleted seals of the world held under the auspices of the Survival Service Commission of IUNCH, pp. 140-143.

Hubbs, C. L., and K. S. Norris. 1971. Original teeming abundance, supposed extinction and survival of the Juan Fernandez fur seal. Antarctic Res. Ser. 18:35-52.

Repenning, C. A., R. S. Peterson, and C. L. Hubbs. 1971. Contribution to the systematics of the southern fur seals, with particular reference to the Juan Fernandez and Guadalupe species. Antarctic Pinnipedia. Antarctic Res. Ser. 18:1-34.

GUADALUPE FUR SEAL

(Arctocephalus townsendi)

Distribution and Migration: The distribution of A. townsendi in the 18th and 19th centuries is unknown. The Guadalupe fur seal was believed extinct during two periods (1895-1926; 1928-49). One adult male was observed on San Nicolas Island in 1949, and breeding animals were rediscovered at Guadalupe Island in 1954. Subsequently, individual animals have been reported at Cedros Island, Baja California, and adult and immature males have been sighted on San Miguel Island each year since 1968.

Abundance and Trends: The last Guadalupe fur seal was commercially harvested from the islands of southern California and Baja California in 1894. The populations of Guadalupe fur seals on the Guadalupe and San Benito Islands apparently once numbered in the thousands. Rice, et al. (1965) counted 285 of these mammals on Guadalupe Island and suggested that the population was growing rapidly and may contain as many as 600 animals, including those in the water. Peterson, et al. (1968) counted 372 animals in April 1966. In June 1968, 314 individuals including pups were observed on Isla de Guadalupe (Brownell, et al., 1974). About 1,000 seals were counted in June and July 1977 by Fleischer (pers. comm.), on Isla de Guadalupe.

General Biology: Biological information on this species is scarce. Specimens have not been collected since their recent rediscovery.

Species Statistics. -- The males are almost 1.8 m long and weigh about 136 kg. Males appear somewhat smaller and females considerably larger than Callorhinus ursinus. A. townsendi can be separated from C. ursinus by its narrow, pointed muzzle and the extension of pelage beyond the wrist onto the dorsum of the foreflipper. It is separated from Zalophus californianus by its distinctive underfur.

Reproductive Data. -- The pups are born in June and July. Although breeding has not been observed, a postpartum estrus probably occurs, which would extend the breeding period into August. The adult males establish territories in isolated caves or recesses that have access to the sea or among large boulders close to the splash zone. Single or small groups of breeding territories are distributed along 20 km of the eastern shoreline of Guadalupe Island. The harems contain 1 to 10 females.

Age-Growth Data. -- The adult males apparently spend considerable time at sea; most sightings of males on other islands have occurred during the nonbreeding season, but since 1973 males have been observed at San Miguel Island during the breeding season. The females may not migrate long distances from Guadalupe Island.

Ecological Problems: Increasing numbers of human visitors to Guadalupe Island are subjecting the animals to more disturbance. Because they breed only on Guadalupe Island, the seals need complete protection from undue disturbance and habitat modification.

Allocation Problems: None known.

Current Research: The University of California makes periodic censuses of this species. In 1976, the University of Washington and NMFS, Marine Mammal Division, began a study of the species.

References:

Brownell, R. L., Jr., R. L. DeLong, and R. W. Schreiber. 1974. Pinniped populations as Islas de Guadalupe, San Benito, Cedros, and Natividad, Baja California, in 1968. J. Mammal. 55:469-472.

Hubbs, C. L. 1956. Back from oblivion; Guadalupe fur seal: still a living species. Pac. Disc. 9(6):14-21.

Peterson, R. S., C. L. Hubbs, R. L. Gentry, and R. L. DeLong. 1968. The Guadalupe fur seal; habitat, behavior, population size, and field identification. J. Mammal. 49:665-675.

Peterson, R. S., and D. H. Ramsey. 1969. Reproductive behavior of the Guadalupe fur seal. Proceedings of Biological Sonar and Diving Mammal Conference, Stanford Res. Inst., pp. 35-42.

Repenning, C. A., R. S. Peterson, and C. L. Hubbs. 1971. Contributions to the systematics of the southern fur seal, with particular reference to the Juan Fernandez and Guadalupe species. Antarctic Pinnipedia. Antarctic Res. Ser. 18:1-34.

Rice, D. W., K. W. Kenyon, and D. Lluch-B. 1965. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California, in 1965. Trans. San Diego Soc. Nat. Hist. 14(7):73-84.

Scheffer, V. B. 1958. Seals, sea lions, and walruses: a review of the Pinnipedia. Stanford Univ. Press, 179 p.

LARGA SEAL

(Phoca largha)

Distribution and Migration: The larga seal is found in the Bering, Chukchi, western Beaufort, Okhotsk, northern Sea of Japan and the Po Hai Seas. This species lives in the seasonal pack ice in winter and spring, bearing and nurturing its pup there, and moves toward the coasts when the ice retreats. A large portion of the eastern Bering Sea population moves northward into the Chukchi and western Beaufort Seas in summer. Breeding populations gather on the sea ice in spring in the eastern Bering Sea, in the Gulf of Anadyr, and near Karaginski Island in the western Bering Sea; in the northeastern and southwestern Okhotsk Sea; in Tatar Strait and Peter the Great Bay, Sea of Japan; and in the northern Po Hai Sea (Shaughnessy and Fay, 1977).

Abundance and Trends: The Bering Sea larga seal population has been estimated to contain from 135,000 to 200,000 animals. The Okhotsk Sea population estimate is 135,000 to 200,000 animals. No data available for populations in the Sea of Japan or in the Po Hai Sea. (Advisory Committee on Marine Resource Research, 1976, Popov 1976).

General Biology:

Species Statistics.--Adult male larga seals range in size from 1.5 to 1.7 m in length; adult females from 1.3 to 1.6 m in length. Adults of both sexes weigh from 90 to 114 kg. Newborn pups are .76 to .90 m long and weigh 7 to 10 kg. Pups are born with a woolly white lanugo hair coat. Color of the adults varies somewhat, but is generally light with a gray saddle and dark spots overall. Larga seals are usually paler than harbor seals.

Reproductive Data.--Larga sea adults form male-female pairs with a single pup along the front zone of the sea ice in the Bering Sea and the pups are born from late March to mid-May. Pupping in the northern Okhotsk Sea occurs from the end of March to mid-April; in Tatar Strait and in the southwestern Okhotsk Sea in March; and in the Po Hai Sea and Peter the Great Bay, it occurs from early February to mid-March. Larga seals are reproductively active about 2 months earlier than harbor seals, and their ranges do not usually overlap during the larga seal breeding season. The pups nurse from 4 to 6 weeks during which time they more than double their weight. Males become sexually mature at 4 to 5 years of age; females at 3 to 4 years. Breeding is annual, and the period of pregnancy (including delayed implantation) is about 10.5 months.

Age-Growth Data.--Adults are gregarious outside the breeding season. The annual molt occurs between August and early November. It proceeds from the posterior to the anterior parts. Predators include the polar bear, walrus, and killer whale.

Feeding Habits.--The diet of the larga seal, which varies according to season and location, includes pelagic, demersal, and anadromous fishes, cephalopods, and other invertebrates.

Parasites and Diseases.--Almost all adult seals have anisakid roundworms and corynosomid acanthocephalans.

Ecological Problems:--None known.

Allocation Problems:--The U.S.S.R. manages the commercial take of Soviet sealers by setting harvest limits in the Okhotsk and Bering Seas.

Current Research:--Ongoing research in Alaska, the U.S.S.R., and Japan is aimed toward describing their distribution and movements, reproductive biology, feeding habits, growth, physiology, and ecology.

References:

Alaska Department of Fish and Game. 1972. Testimony presented to Senate Sub-Committee on Oceans and Atmosphere. Nome, Alaska, May 11, 12, and 13, 1972. Serial No. 92-56, U.S. Gov. Print. Off., Wash., D.C.,pt. 2:839-1, 192.

Advisory Committee on Marine Resources Research. 1976. Mammals in the Seas: ad hoc group III on seals and marine otters. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/4, p. 182.

Burns, J. J. 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. J. Mammal. 51:445-454.

Burns, J. J., and F. H. Fay, 1972. Comparative biology of Bering Sea harbor seal populations. Paper presented at 23d Alaska Sci. Conf., Fairbanks, Alaska, Aug. 1972.

Chapskii, K. K. 1966. Sovremennoe sostoyanie i zadachi vos stanoveleniya resursov morskogo zveroboinogo promysia (Present state and task of the restoration of resources of marine trapping). Tezisy 3-go Vses, Soveshch. po Izuch, Morsk. Mlek., Moskva-Leningrad, "Nauka." (not seen, cited by Bychkov, 1971).

Galster, W., and J. Burns. 1972. Accumulation of pesticides in Alaskan marine mammals. Paper presented at 23d Alaska Sci. Conf., Fairbanks, Alaska, Aug. 1972.

Naito, Y., and M. Nishiwaki. 1972. The growth of two species of the harbor seal in the adjacent waters of Hokkaido. Sci. Rep. Whales Res. Inst. 24:127-145.

Popov, L.A. 1976. The status of main ice forms of seals inhabiting waters of the U.S.S.R. and adjacent to the country marine areas. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/51, 17 p.

Shaughnessy P.D. and F.H. Fay 1977. A review of the taxonomy and nomenclature of North Pacific harbor seals. J. Zool. Lond. 182:385-419.

HARBOR SEAL

(Phoca vitulina)

Distribution and Migration: The harbor seal is found in the North Atlantic Ocean from the ice pack south to France and Georgia and in the North Pacific Ocean from the Bering Sea south to Baja California and southern Japan and Korea. (P.v. richardii and P.v. stejnegeri in the North Pacific; P.v. vitulina and P.v. concolor in the North Atlantic are essentially coastal forms.) The harbor seal is the predominant nearshore seal in ice-free waters north of lat. 35°N.

Abundance and Trends: Overall, the world population of harbor seals appears to be high and stable, and is estimated to be between 380,000 and 399,000 distributed as follows: 48,200 to 51,500 Northeast Atlantic, no data for Baltic sea; 20,000 to 30,000 Northwest Atlantic, no data for eastern USA; 312,500 to 317,500 in the Pacific (Adv. Comm. Mar. Resour. Res, 1976).

General Biology:

Species Statistics. -- Harbor seals of all subspecies are of medium size; large adults of both sexes are from 1.2 to 1.8 m. long and weigh about 45 to 105 kg. Pups weigh from 0.9 to 12 kg, and are about 60 to 90 cm long at birth. Pups of this species normally shed the lanugo hair in utero and are born with an adultlike pelage. Coat color and pattern are variable.

Reproductive Data. -- Adults congregate on islets and bear a single pup, usually in April to July. The pups nurse 4 to 6 weeks, in which time the weight is more than doubled. Males become sexually mature at 4 to 5 years of age; females at 3 or 4 years. Breeding is annual, and the period of pregnancy (including delayed implantation) is about 10.5 months.

Age-Growth Data. -- Adults are gregarious outside the breeding season. The annual molt occurs between August and early November; it proceeds from the posterior to the anterior parts. Predators include the killer whale and sharks. Golden eagles have been known to prey upon newborn pups resting on sandbars.

Feeding Habits. -- The diet of the harbor seal, which varies according to season and location of specific populations, includes primarily pelagic, demersal, and anadromous fishes, cephalopods, and crustaceans. In captivity a single animal eats about 4 kg of fish per day.

This species has been known to dive as deep as 91.5 m for short periods and can remain under water for as long as 23 minutes.

Parasites and Diseases. -- Almost all adult seals have anisakid roundworms and corynosomid acanthocephalans, and occasionally, high infestations of anopluran lice. The latter seem associated with filarial heartworms may be vectors. Toxoplasma has been reported in captive animals, but its presence in wild seals is not verified.

Ecological Problems: In some parts of its range, the harbor seal contributes to high worm infections in fish, notably codfish. This animal is extremely sensitive to disturbance, and may leave an area temporarily or even permanently after continual harassment by people, equipment, or aircraft. Contamination of the environment with pesticides, heavy metals, and other contaminants may be a problem for the land-breeding harbor seal, because it frequently inhabits the relatively closed waters of bays and estuaries where these contaminants are likely to concentrate.

Allocation Problems: These seals damage commercial fishing gear and compete with man for such fish as herring, salmon, smelt, and whitefish.

According to the Alaska Department of Fish and Game, hunting and the harvest of the harbor seal have declined markedly during the past year because of a reduced market for salable products from these species, mainly skins. In southeastern Alaska, the decreased harvest has resulted in additional conflicts between the harbor seal and the fishermen.

Current Research: Ongoing research in California, Washington, British Columbia, Alaska, the U.S.S.R., and Japan is aimed toward the identification of North Pacific populations and describing their distribution and movements, reproductive biology, feeding habits, growth, physiology, and ecology.

References:

Advisory Committee on Marine Resource Research. 1976. Mammals in the Seas: ad hoc group III on seals and marine otters. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/4, p. 182.

Banfield, A. W. F. 1974. The mammals of Canada. Univ. Toronto Press, 438 p.

Bigg, M. A. 1969. The harbor seal in British Columbia. Fish. Res. Bd. Can., Bull. 172, 33 p.

Bishop, R. H. 1967. Reproduction, age determination, and behavior of the harbor seal, Phoca vitulina L., in the Gulf of Alaska. MS thesis, Univ. Alaska, 121 p.

Bonner, W. N. 1972. The grey seal and common seal in European waters. Oceanogr. Mar. Biol. Ann. Rev., 10:461-507.

Bychkov, V. A. 1971. Pinnipeds of the U.S.S.R., pp. 59-74. In L. K. Shaposhnikov (ed.), Review of the status of U.S.S.R. pinnipedia conservation. Min. Sel. Khoz. S.S.S.R., Tsent. Lab. Okhr. Prir. Moscow. (Transl. IPST 650946, 129 p.)

Chapskii, K. K. 1966. Sovremennoe sostoyanie i zadachi vos stanoveleniya resursov morskogo zveroboinogo promysia (Present state and tasks of the restoration of resources of marine trapping). Tezisy 3-go Vses. Soveshch. po Izuch. Morsk. Mlek., Moskva-Leningrad, "Nauka." (Not seen, cited by Bychkov, 1971.)

Galster, W., and J. Burns. 1972. Accumulation of pesticides in Alaskan marine mammals. Paper presented at 23d Alaska Sci. Conf., Fairbanks, Alaska, Aug. 1972.

Mansfield, A. W. 1967. Distribution of the harbor seal, Phoca vitulina Linnaeus, in Canadian arctic waters. J. Mammal. 48:249-257.

Naito, Y., and M. Nishiwaki. 1972. The growth of two species of the harbor seal in the adjacent waters of Hokkaido. Sci. Rep. Whales Res. Inst. 24:127-145.

Shaughnessy, P.D. and F.H. Fay. 1977. A review of the taxonomy and nomenclature of North Pacific harbor seals. J. Zool. Lond. 182: 385-419.

Wilson, S. 1973. Mother-young interactions in the common seal Phoca vitulina vitulina. Behavior 48:23-26.

RINGED SEAL

(Phoca hispida)

Distribution and Migration: The ringed seal is circumarctic in distribution in the ice pack. In the North Pacific Ocean it is found in the Bering, Chukchi, and Okhotsk Seas and in the permanent ice pack of the Polar Basin. In winter, most ringed seals occupy areas of land-fast ice, but nonbreeding adults and juveniles may be found wherever ice occurs. Apparently, animals wintering in the Bering and Chukchi Seas move northward in spring as the ice recedes and southward in autumn as it advances again, whereas those in the Canadian Arctic may reside year-round in the same locality. In western Alaska, the ringed seal is the dominant near-shore seal during months when sea ice is present and is replaced by the harbor seal during ice-free months. A small proportion of the population, mainly juveniles, remains in ice-free areas of the Bering Sea during summer.

Abundance and Trends: Counts of ringed seals on land-fast ice along the northern coast of Alaska made in 1970 (Burns and Harbo, 1972) indicated that the density of resident animals varies from 5.36 per square mile in the Chukchi Sea between Point Lay and Wainwright to 1.06 per square mile in the Beaufort Sea between Oliktok and Flaxman Island. Overall, the population in the Bering and Chukchi Seas appears high and is probably stable. Estimates of population size made by the Soviets are difficult to evaluate, because they recognize three subspecies with overlapping ranges. The Soviets estimate that the total population of P. hispida is 5 to 6 million (Chapskii, 1966); P. h. hispida (North Atlantic and Arctic Oceans) at 2,500,000; P. h. krascheninikovi (western Bering Sea) at 12,000 and P. h. ochotensis (Okhotsk Sea) at 800,000 to 1,000,000 animals (Fedoseev, 1969, from Bychkov, 1971). The Alaska Department of Fish and Game (1973) estimates the Bering-Chukchi Seas population at about 250,000 ringed seals. The U.S. harvest in 1976 was limited to an aboriginal harvest of 4,500 to 5,200 animals. Soviet pelagic sealing is limited to a quota of 18,000 pelagic and 7,000 shore animals in the Okhotsk Sea and the shore harvest in the Bering and Chukchi areas is 2,000 to 3,000 animals annually.

General Biology:

Species Statistics. -- The ringed seal is the smallest of the northern seals. The adults of both sexes grow to about 1.3 m in length and 66 kg in weight. A few individuals, usually females, become much larger. The animals undergo marked seasonal changes in weight, being heaviest in mid- to late winter. Newborn pups are 55 to 65 cm long, weigh about 4.0 kg, and bear white coats. Coloration of the adults is variable. Dorsally they may be brown to blueish-black in background with irregular creamy rings with dark centers. The ventral surface may be silvery white to creamy yellow with scattered black spots.

Reproductive Data. -- Males become sexually mature at 6 to 8 years of age, females at 5 to 7 years. The ringed seal breeds annually, has a 10.5-month period of pregnancy (including delayed implantation) and is probably

monogamous. The males are sexually active between mid-March and mid-May, but they do not collect harems. The females are monestrous, and the oestrous period is postpartum while the females are still lactating. The pups are born from March to about mid-May in a birth lair within an ice pressure ridge or under drifted snow. The females nurse their pups for a full 4 to 6 weeks. A longer nursing period in sheltered northern bays, where snow and ice remain longer, produces larger pups.

Age-Growth Data. -- The weight of the pup triples during the nursing period. The annual molt occurs between mid-May and mid-July, but a few molting individuals have been noted as late as 1 September. Maximum longevity exceeds 35 years, but one individual (a male) was 43 years old according to annuli on the dentine layers of its teeth.

Predators of adults include sharks, killer whales, and polar bears. Polar bears and arctic foxes prey upon newborn "whitecoats" in their natural dens, and even the larger and more powerful gulls attack exposed young pups.

Feeding Habits. -- Ringed seals tend to be solitary, but congregate in areas favorable for feeding, along extensive tide cracks in land-fast ice, and during seasonal migrations. The diet of these seals varies considerably, depending on their location and water depth. Their diving potential appears to be a depth of 91.5 m and for as long as 20 minutes. In western Alaska, this seal feeds mainly on mysids, amphipods, euphasiids, shrimps, saffron cod, polar cod, and sculpin. These seals fast from April to late June or July during their reproductive and molting seasons.

Parasites and Diseases. -- The mammals commonly have internal parasites, including roundworms, acanthocephalans, and anopluran lice.

Ecological Problems: None known.

Allocation Problems: According to the Alaska Department of Fish and Game, hunting and the harvest of the ringed seal have declined markedly during the past year because of a reduced market for salable products from these species, mainly skins.

Current Research: The State of Alaska monitors the Eskimo harvest and conducts some biological research in conjunction with other programs. Canada conducts research on the ringed seal.

References:

Alaska Department of Fish and Game. 1973. Marine mammal status reports. Unpublished report, Juneau, Alaska.

Burns, J. J. 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. J. Mammal. 51:445-454.

Burns, J. J., and S. J. Harbo, Jr. 1972. An aerial census of ringed seals, northern coast of Alaska. Arctic 25:279-290.

Bychkov, V. A. 1971. Pinnipeds of the USSR, pp. 59-74. In L. K. Shaposhnikov (ed.), Review of the status of the USSR Pinnipedia conservation. Min. Sel. Khoz. SSSR, Tsent. Lab. Okhr. Prir. Moscow. (Transl. IPST 650946, 129 p.)

Chapskii, K. K. 1966. (Present state and tasks of the restoration of resources of marine trapping.) Tezisy 3-Go Vsesoyuznogo Soveshchaniya po izucheniyu morskikh mlekop tayushchikh. Moscow, "Nauka." (Not seen, cited by Bychkov, 1971.)

Fay, F. H. 1974. The role of ice in the ecology of marine mammals of the Bering Sea. In D. W. Hood and E. J. Kelly (eds.), Oceanography of the Bering Sea, ch. 19, pp. 383-399. Institute of Arctic Biology, University of Alaska, Fairbanks.

Johnson, M. L., C. H. Fiscus, B. T. Ostenson, and M. L. Barbour. 1966. Marine mammals. In N. J. Wilimovsky and J. N. Wolfe (eds.), Environment of the Cape Thompson Region, Alaska, pp. 877-924. U.S. Atomic Energy Comm., Oak Ridge, Tenn.

McLaren, I. A. 1958. The biology of the ringed seal (Phoca hispida Schreber) in the Eastern Canadian arctic. Fish. Res. Bd. Can., Bull. 118, 97 p.

Popov, L. A. 1976. Status of main ice forms of seals inhabiting waters of the USSR and adjacent to the country marine areas. Food Agric. Organ. U.N. Adv. Comm. Mar. Resour. Res., FAO ACMRR/MM/SC/51, 17 p.

Smith, T. G. 1973. Population dynamics of the ringed seal in the Canadian eastern Arctic. Fish. Res. Bd. Can., Bull. 181, 55 p.

Tikhomirov, E. A. 1966. On the reproduction of the seals belonging to the family Phocidae in the North Pacific. Zool. Zhur. 45:275-281. (Transl. by George Tschuikow-Roux, Auke Bay Biol. Lab., Juneau, Alaska.)

HARP SEAL

(Phoca groenlandica)

Distribution and Migration: The harp seal occurs in pack ice in the North Atlantic and Arctic Oceans from Europe to eastern Canada. In the spring, it migrates south for breeding to the White Sea, to the Greenland Sea north of 73°N, and to southern Labrador, northeastern Newfoundland, and the Gulf of St. Lawrence.

Abundance and Trends: Three breeding stocks of harp seals are known, the eastern (White Sea), central (Norwegian Sea around Jan Mayen Island), and western (Newfoundland). The last is divided into two substocks, one east of Belle Isle on winter pack ice drifting southward--the "Front," and the other in the southern Gulf of St. Lawrence on winter ice formed in situ--the "Gulf." Sergeant (1973) estimates the total eastern Canadian population at 1.3 million. The number of pups born decreased from about 400,000 in 1960 to 300,000 in 1970. The population size in 1970 was less than that giving maximum production, and estimates indicated the 1970 catch was well in excess of the sustainable yield (International Commission for the Northwest Atlantic Fisheries. 1971. Redbook, Part I, Standing Committee on Research and Statistics Proceedings, annual meeting). From an aerial survey, the west Atlantic stocks were determined to be 630,000 tp 790,000 animals (Lavigne et al., 1975). Ronald et al., (1976), give the following estimates: White Sea, 600,000; Greenland Sea, 100,000; N.W. Atlantic, <1,000,000.

The Total Allowable Catch (TAC) for the entire northwest Atlantic for 1978 has been set at 180,000 harp seals (including 10,000 for Greenland, the Canadian Arctic,and Labrador). The total for the Gulf of St. Lawrence and Front will be 170,000 compared with 160,100 in 1977. These quotas will include, for the first time, those seals taken as scientific samples (2,400 in 1978).

General Biology:

Species Statistics. -- The adults grow to about 1.8 m and 135 kg; newborn pups are about 1.0 m long and weigh 11.8 kg.

Reproductive Data. -- The females mature at age 4 to 6 years and bear a single pup annually after a gestation period of about 7.5 months. The pups are born from late January to early April, and are nursed for 10 to 12 days, by which time they have attained a weight of 38 to 40 kg. Apparently the female can delay birth until there is suitable ice.

Age-Growth Data. -- Molting by the pups is completed at 4 weeks. The maximum life span is about 30 years.

Feeding Habits. -- Pups feed in surface waters on small pelagic crustaceans and small fish. The food of adults includes capelin, herring, cod, polar cod, flatfish, redfish, skate, barracudina, and various crustaceans.

Ecological Problems: -- One species of helminth affecting the harp seal is also found in the muscles of groundfish, particularly cod, necessitating expensive removal by hand.

Allocation Problems: The harp seal may eventually conflict with man over capelin stocks as this fishery expands. Several animal protection societies object to the harvest of harp seals.

Current Research: Canadian, Danish, Norwegian, and Soviet Government scientists are studying the population of harp seals. At the University of Guelph, scientists are studying the biology of this mammal.

References:

Bychkov, V. A. 1971. Pinnipeds of the USSR. pp. 59-74. In L. K. Shaposhnikov, (ed.), Review of the status of USSR Pinnipedia conservation. Min. Sel. Khoz. SSR, Tsent. Lab. Okh. Prir., Moscow. (Transl. IPST 650946, 129 p.)

Fisher, H. D. 1952. Harp seals of the Northwest Atlantic. Fish. Res. Bd. Can., Gen. Ser. No. 20, 4 p.

_____1954. Studies on reproduction in the harp seal Phoca groenlandica Erxleben in the northwest Atlantic. McGill University. Ph.D. thesis, 133 p.

Lavigne, D.M., S. Innes, K. Kalpakis, and K. Ronald. 1975. An aerial census of Western Atlantic harp seals (Pagophilus groenlandicus) using ultra violet photography. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/EC/33, 9 p.

Ronald, K., P.J. Healey, and H.D. Fisher. 1976. The harp seal (Pagophilus groenlandicus). Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/36, 29 p.

Sergenant, D.E. 1976. History and present status of populations of harp and hooded seals. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/35,p. 31.

Sivertsen, E. 1941. On the biology of the harp seal. Hvalråd. Skr. 26:10 + 166 p.

RIBBON SEAL

(Phoca fasciata)

Distribution and Migration: Geographically, the ribbon seal is separable into the Okhotsk and Bering-Chukchi Seas populations, and interchanges between these two groups are not known to occur. In the latter group, the center of abundance is in the central Bering Sea. The ribbon seal bears and nurtures its pup on the sea ice. During winter and spring, the entire population is concentrated along the southern edge of the seasonal ice pack. Only a few ribbon seals remain with the ice edge as it retreats northward through Bering Strait. In summer and autumn, ribbon seals are believed to be pelagic, mainly in the ice-free Bering Sea.

Abundance and Trends: The population of ribbon seals is relatively low, having been markedly reduced by commercial sealers of the Soviet Union during the 1960s. In recent years the species has been afforded increased protection by Soviet sealing regulations and its numbers may be increasing again. U.S. citizens harvest very few ribbon seals. The Alaska Department of Fish and Game (1973) estimates that the population probably does not exceed 100,000 animals. Soviet estimates indicate a population of 133,000 in the Okhotsk in 1969 (Popov, 1976). Soviet sealers took less than 3,000 ribbon seals in 1973 from Bering and Okhotsk Seas. In Alaska, the native harvest is usually less than 250 per year.

General Biology:

Species Statistics. -- Adults of both sexes average 1.5 m in length and 80 kg in weight. A very large female was 1.8 m long with a girth of 1 m had a blubber thickness of 6.1 cm, and weighed 148.2 kg. The pups are born with white coats.

Reproductive Data. -- Pups are born from late March to mid-April and average about 10 kg and 80 cm. Males become sexually mature when 3 to 5 years old; females when 2 to 4 years. The species breeds annually, and pregnancy (including delayed implantation) probably lasts 10.5 months. A very large 23-year-old female (see measurements given above) obtained in March was carrying a near-term fetus.

Age-Growth Data. -- The pup nurses for about 4 weeks, during which time its weight triples. Maximum longevity is estimated at 26 years.

Feeding Habits. -- The diet of these seals during late winter and early spring (in the ice edge zone) includes mainly pelagic and demersal fishes, cephalopods, and small crustaceans.

Parasites and Diseases. -- Ribbon seals host anisakid roundworms in the stomach and corynosomid acanthocephalans in the intestine.

Ecological Problems: None known.

Allocation Problems: None known.

References:

Alaska Department of Fish and Game. 1973. Marine mammals status report. Unpublished report, Juneau, Alaska.

Burns, J. J. 1969. Marine mammal report. Fed. Aid Segment Report, vol. X. Unpublished, Alaska Dept. Fish Game, Juneau, Alaska, 25 p.

_____1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. J. Mammal. 51:445-454.

Bychkov, V. A. 1971. Pinnipeds of the USSR, pp. 59-74. In L. K. Shaposhnikov (ed.), Review of the status of USSR Pinnipedia conservation, Min. Sel. Khoz. SSSR, Tsent. Lab. Okhr. Prir. Moscow. (Transl. IPST 650946, 129 p.)

Fay, F. H. 1974. The role of ice in the ecology of marine mammals of the Bering Sea. In D. W. Hood and E. J. Kelly (eds.), Oceanography of the Bering Sea, Institute of Arctic Biology, University of Alaska, Fairbanks. Ch. 19, pp. 383-399.

Popov, L.A. 1976. Status of main ice forms of seals inhabiting waters of the USSR and adjacent to the country marine areas. Food Agri. Organ. U.N. Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/51. 17 p.

Tikhomirov, E. A. 1966. On the reproduction of the seals belonging to the family Phocidae in the North Pacific. Zool. Zhur. 45: 275-281. (Transl. by George Tschuikow-Roux, Auke Bay Biol. Lab., Juneau, Alaska)

GRAY SEAL

(Halichoerus grypus)

Distribution and Migration: The gray seal inhabits the North Atlantic Ocean, with major populations in eastern Canada, Iceland, and northwestern Europe. Dispersion, particularly by pups, from the Canadian breeding colonies in late spring and summer presumably accounts for most of the gray seals seen scattered along the coast of Maine. The tendency for adults to disperse is far less, although they at times make pronounced local movements. One animal tagged in eastern Canada was recently taken off western Norway.

Abundance and Trends: The world population is estimated at 50,000 to 60,000 animals, with about two-thirds of these animals in the British Isles (Bonner, 1972). Because the population estimates for 1956-71 fit a straight-line projection reasonably well, it can be presumed that the population will continue to expand in this manner (Bonner and Hickling, 1974). Platt, Prime, and Witthames (1974) state that the annual increase in the number of births indicates a similar trend in the total population in the Farne Islands. An estimated 5,000 gray seals inhabit Canadian waters. A small colony of 10 to 15 animals was noted in the 1960's on Muskeget Island, Mass.

General Biology:

Species Statistics. -- Adult males range in length from 2.0 to 2.3 m and weigh from 170 to 310 kg; females average smaller in size 1.7 to 2.0 m in length and weight of 249 kg. The average weight and length of the newborn pups are 13.6 kg and 0.9 m, respectively. The adult coat is gray with obscure black blotches on the flanks and back, with lighter underparts. The pups are born in a long white coat which they molt when 2 to 3 weeks old to assume a dark gray, spotted juvenile coat.

Reproductive Data. -- Sexual maturity is reported to be reached between 6 and 7 years of age for members of Canadian populations. In the Farne Islands, bulls do not breed until their 8th year, and most do so between 12 and 18 years of age. Cows do not enter the breeding population until their 10th year. The apparent gestation period is 11.5 months, and single births are the rule. Pups of the Canadian and Baltic populations are born mostly in February, whereas most of those in Britain are born in September and October. The pups are weaned in about 3 weeks, at which time mating occurs.

Age-Growth Data. -- Following birth, the pup gains about 1.4 kg per day and weighs about 41 to 45 kg when weaned at about 3 weeks. It begins to molt after the third week. When the molt is completed, it makes its way to the sea and disperses. When they are yearlings they have changed little in weight (40 kg), but are 115 to 127 cm long. The cows molt annually between late January and April, and males between late February and May. Estimated by dental rings, captive gray seals have reached an age of 41 to 42 years, and wild seals have reached an age of up to 35 years.

Feeding Habits. -- The adult seals feed chiefly on skates, mackerel, flounders, cod, hake, and herring; and occasionally salmon, haddock, sea bass, dogfish, squid, and crustaceans.

Parasites and Diseases. -- In the Baltic Sea, the seals harbor an anisakine nematode, Terranova (Porracaecum) decipines.

Ecological Problems: People occasionally harass the animals and use them for target practice. An oil spill in the Georges Banks area could do irrevocable harm to the only U.S. colony, located on Muskeget Island, Mass.

Allocation Problems: A significant indirect cause of damage by gray seals to fisheries in the waters around the British Isles and off Canada is the harboring by the seals of an anisakine nematode, Terranova (Porracaecum) decipines, the larvae of which infest cod and other gadids, reducing their commercial value.

Current Research: Research on biology, ecology, and populations continues by Canadian and British Governments and private groups. Some work is also being carried out by the University of Massachusetts on Muskeget Island and by the State of Maine.

References:

Advisory Committee on Marine Resource Research. 1976. Mammals in the Seas: ad hoc group II on seals and marine otters. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/4, p. 182.

Backhouse, K. M., and H. R. Hewer. 1957. A note on spring pupping in the gray seal (Halichoerus grypus Fab). Proc. Zool. Soc. Lond

Banfield, A. W. F. 1974. The mammals of Canada. Univ. Toronto Press, 438 p.

Bonner, W. N. 1972. The gray seal and common seal in European waters. Oceanogr. Mar. Biol. Ann. Rev. 10:461-507.

Bonner, W. N. 1973. Grey seals in the Baltic. IUCN, Sur. Serv. Comm., Suppl. Pap. No. 39:164-174.

Bonner, W. N., and G. Hicklin. 1974. Seals of the Farne Islands, 1971-73. Trans. Nat. Hist. Soc. North Umbria 42(2):65-84.

Cameron, A. W. 1967. Breeding behavior in a colony of western Atlantic gray seals. Can. J. Zool. 45:161-173.

Dubrovskii, A. N. 1937. On the biology of the grey seal (Halichoerus grypus Fabr.). Priroda, Leningrad, No. 2, p. 107.

Mansfield, A. W. 1963. Seals of arctic and eastern Canada. Fish. Res. Bd. Can., Bull. No. 137, 30 p.

_____1966. The grey seal in eastern Canada waters. Can. Audubon 28:161-166.

Platt, N. E., J. H. Prime, and S. R. Witthames. 1974. The age of the grey seal at the Farne Islands. Int. Counc. Expl. Sea, C. M. 1974/N:3, Prel. Rep., 7 p.

Smith, E. A. 1966. A review of the world's grey seal population. J. Zool. 150:463-489.

BEARDED SEAL

(Erignathus barbatus)

Distribution and Migration: The bearded seal is found in the North Pacific region in the Bering, Okhotsk, and northern Japan Seas and is circumpolar in the Arctic Ocean. In winter and spring it is found from the southern edge of the seasonal ice pack, north to permanent ice, wherever areas of broken, moving ice exist. During summer and autumn, it occurs along the edge of the permanent polar ice of the Arctic Ocean. Marked seasonal migrations are associated with the advance and retreat of the seasonal ice. The bearded seal is usually solitary, though very loose aggregations are sometimes observed during the breeding season. It does not normally come ashore.

Abundance and Trends: All populations seem to be at high levels and relatively stable. A Soviet estimate places the population at 450,000 animals in the East-Siberian, Chukchi, Bering, Okhotsk, and Japan Seas (Bychkov, 1971). The Alaska Department of Fish and Game (1973) estimates a population of 300,000 animals in the Bering, Chukchi, East-Siberian, and Beaufort Seas. The combined U.S. native and Soviet harvest in the Bering, Okhotsk, and Chukchi Seas is 8,000 to 10,000 seals per year, well within the biological productivity of this species. Hunting loss, however, is high (op. cit.). Soviet pelagic sealing has been prohibited since 1970. Land quotas are 5,000 for Okhotsk Sea and 3,000 for Bering Sea. U.S. subsistence catch has been less than 3,000 animals.

General Biology:

Species Statistics. -- The bearded seal is the largest phocid of the western arctic and subarctic. Large adults attain a winter weight in excess of 340 kg. From June through September the adults weigh from 215 to 240 kg and average 2.4 m in length. Some adult females are slightly larger than adult males. The pelage is a smoky-gray with a darker brown cap and dorsum. Newborn pups weigh about 31 kg and are 1.3 m long, and have a gray-brown natal coat.

Reproductive Data. -- The males become sexually mature at 6 or 7 years. Some females ovulate at age 3 years, but reproductive maturity is not attained until age 5 or 6 years. Female bearded seals are unique among northern seals in that they possess four mammary teats instead of the usual two, and produce one pup every other year instead of annually. A single pup is born, usually during late April or early May. The female does not ovulate until early June when the males are out of breeding condition; therefore, they must wait a year to be mated again. The period of pregnancy is 10.5 months, including 2.5 months of delayed implantation.

Age-Growth Data. -- The weight of the pups triples by the end of the 12- to 18-day nursing period. They then molt their natal coat for one similar to the adult's, although it is sometimes spotted. The adults probably molt

shortly after mating. Yearlings are about 160 cm long. Bearded seals attain full growth at about 10 years of age and average 235 cm long in the eastern Canadian arctic and 225 cm at Svalbard. At Svalbard, age groups are fully recruited at age 9 years and live to about 31 years.

Polar bears are a natural enemy of the bearded seal.

Feeding Habits. -- The bearded seal consumes several species of invertebrates, principally crabs, shrimps, clams, and amphipods, and some demersal fishes, all from less than 200 meters.

Parasites and Diseases. -- Most bearded seals, other than nursing pups, are heavily parasitized by anisakid roundworms in the stomach, acanthocephalans and diphyllobothriid cestodes in the intestine, and lice on the skin.

Ecological Problems: The bearded seal is the final host for anisakid worms that infect fishes, but this problem is unimportant in Alaska at present. About 1 percent of these animals harbor Trichinella spiralis, the cause of trichinosis in man.

Allocation Problems: None known. Bearded seals consume commercially important pandalid and crangonid shrimps and lithode crabs; however, they do not compete directly for commercial fishes, nor do they damage fishing gear.

Current Research: None known.

References:

Alaska Department of Fish and Game. 1973. Marine mammal status reports. Unpublished report, Juneau, Alaska.

Benjaminsen, T. 1973. Age determination and the growth and age distribution from cementum growth layers of bearded seals at Svalbard. Fisk. Dir. Ser. Havunders. 16:159-170.

Burns, J. J. 1967. The Pacific bearded seal. Alaska Dept. Fish Game, Juneau, 66 p.

_____ 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. J. Mammal. 51:445-454.

Bychkov, V. A. 1971. Pinnipeds of the USSR, pp. 59-74. In L. K. Shaposhnikov (ed.), Review of the status of USSR Pinnipedia conservation. Min. Sel. Khoz. SSSR, Tsent. Lab. Okhr. Prir. Moscow. (Transl. IPST 650946, 129 p.)

Fay, F. H. 1974. The role of ice in the ecology of marine mammals of the Bering Sea. In D. W. Hood and E.J. Kelly (eds.), Oceanography of the Bering Sea, Institute of Arctic Biology, University of Alaska, Fairbanks, ch. 19, pp. 383-399.

McLaren, I. A. 1958. Some aspects of growth and reproduction of the bearded seal, Erignathus barbatus (Erxleben). J. Fish. Res. Bd. Can. 15:219-227.

Popov, L. A. 1976. Status of main ice forms of seals inhabiting waters of the USSR and adjacent to the country marine areas. Food Agric. Organ, U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/51, 17 p.

HOODED SEAL

(Cystophora cristata)

Distribution and Migration: The hooded seal occurs mainly in the east Greenland pack ice from Bear Island and Spitzbergen to Jan Mayen, Iceland, and Denmark Strait. It also occurs off southern Greenland, southeastern Labrador, and the Gulf of St. Lawrence. Stragglers appear on the American coast as far south as Cape Kennedy, Fla. along the Canadian Arctic coast as far west as Herschel Island, and on the European coast as far south as the Bay of Biscay, France. Hooded seals prefer deep water and thick, drifting ice floes.

In March 1974, an aerial survey by the Fisheries and Marine Service of Canada rediscovered a whelping population that had been reported by two different sources, one in 1840 and the second in 1873. The seals were located between 63°30' and 64°20'N, 56°00' and 56°30'W. There were adults, pups, and blood patches, indicating that births had taken place recently. Total numbers were estimated to be 50,000 animals. This population is believed to be the source of recruitment that maintains the herd of hooded seals at icefields east of Newfoundland where the species is heavily hunted.

Abundance and Trends: Hooded seals of all ages are harvested commercially when the animals are congregated for molting. According to Scheffer (1958), the herds in the middle of the 20th century were estimated at 300,000 to 500,000. Sergeant (1965) states that the catch rate of hooded seals has been high. The average annual kill from the Jan Mayen Island herd declined from about 53,000 (1949-53) to about 40,000 (1959-63) (Popov, 1967). Since 1972, quotas of 15,000 to 30,000 animals have been imposed. Popov. (1976), estimates the population to be between 500,000 and 600,000.

General Biology:

Species Statistics. -- Adult males grow to 2.7 to 3.0 m and 408 kg; females are slightly smaller. The adult coat is gray, covered with black patches of irregular size. The pups shed their light gray embryonal hair before birth and when born have an exceptionally beautiful silver gray coat dorsally with a creamy white ventral surface.

Reproductive Data. -- The pups are born from late March to early April, are 1.1 m long and weigh 23 kg. Seals of both sexes mature at age 4 to 6 years. The adults mate when the lactation period ends (about 2 weeks).

Age-Growth Data. -- The pups are nursed about 2 weeks. The adults return to sea after mating, leaving the pups on the ice where they remain an additional 2 weeks before following the adults. Hooded seals of all ages are preyed upon by polar bears.

Feeding Habits. -- Hooded seals feed on octopus, squid, rosefish, herring, capelin, cod, shrimp, mussels, and starfish and are capable of deep diving.

Ecological Problems: Oil exploration shows signs of increase on the Labrador shelf, and with it the stress on marine mammals may increase. There may also be competition for food with the human fishing industry.

Allocation Problems: None known.

Current Research: Research on the hooded seal is carried out by the Fisheries Research Board of Canada, Denmark (Grönlands Fiskeriundersögelser), Norway (Fiskeridirektoratets Havforsknings Institutt), and the Soviet Union (VNIRO).

References:

Advisory Committee Marine Resources Research 1976. Mammals in the Seas: ad hoc group III on seals and marine otters. Food Agric. Organ. U.N., Advisory Committee Marine Resources Research. FAO ACMRR/MM/SC/4, p. 182.

King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.

Mansfield, A. W. 1967. Seals of arctic and eastern Canada, 2d ed. (revised). Fish. Res. Bd. Can., Bull. 137, 30 p.

Popov, L. A. 1967. Modern marine animal hunting industry of the North Atlantic Seas. Prob. Severa 11:160-165.

Popov, L. A. 1976. Status of main ice forms of seals inhabiting waters of the U.S.S.R. and adjacent to the country marine areas. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/51, 17 p.

Rasmussen, B. 1960. Om klappmyssbestanden i det nordlige Atlanterhav (On the stock of hood seals in the North Atlantic). Fisken og Havet (Bergen), No. 1, 23 p. (Fish. Res. Bd. Can., Transl. Ser. No. 387.)

_____1962. Klappmyssen aldersfordeling i Danmarkstredet. Fisk. Gang 48:60-62.

Scheffer, V. B. 1958. Seals, sea lions, and walruses; a review of the Pinnipedia. Stanford Univ. Press, 179 p.

Sergeant, D. E. 1965. Exploitation and conservation of harp and hood seals. Polar Rec. 12(80):541-551.

_____1974. A rediscovered whelping population of hooded seals, Cystophora cristata Erxleben, and its possible relationship to other populations. Polarforschung 44:1-7.

_____1976. History and present status of populations of harp and hooded seals. Food Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/35, 31 p.

CARIBBEAN MONK SEAL

(*Monachus tropicalis*)

The Caribbean monk seal is classified as endangered in the Red Book of the International Union for the Conservation of Nature, and was proposed for listing as an endangered species under authority of the Endangered Species Act of 1973 on 8 March 1977. From 17 to 29 March 1973, the Bureau of Sport Fisheries and Wildlife, Department of the Interior, conducted an aerial survey of this species' former habitat in the Gulf of Mexico and Caribbean Sea. The conclusion is that the Caribbean monk seal is now extinct. (Kenyon, 1977).

From the 1973 survey and from other field observations, it formerly inhabited shores and islands of the Greater Antilles, Bahamas, Yucatan Peninsula, and Florida Keys. It was reported at Serannilla Bank as late as 1952. A single pup was born, probably in alternate years. The adults grew to 2.4 m in length. The color was a uniform brownish gray above; the underparts were pale yellow or yellowish white. Monk seals were vulnerable to hunters because they were sluggish, unwary, and not easily alarmed.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the western hemisphere with the marine species of all the oceans. New York, Amer. Comm. Int. Wild Life Prot., Spec. Publ. 11, 620 p.

Elliot, H. W. 1884. The monk seal of the West Indies (*Monachus tropicalis*, Gray). Science 3:752.

Gilmore, R. M. 1959. Is the West Indian seal extinct? Sea Frontiers 5:225-236.

Gunter, G. 1947. Sight records of the West Indian seal, *Monachus tropicalis* (Gray), from the Texas coast. J. Mammal. 28:289-290.

Kenyon, K. W. 1977. Caribbean monk seal extinction. J. Mammal. 58:97-98.

King, J. 1956. The monk seals (genus *Monachus*). Bull. Brit. Mus. (Nat. Hist.), Zool. 3:201-256.

Knudtson, P. M. 1977. The case of the missing Monk Seal. Nat. Hist. 86(8):78-83.

Rice, D. W. 1973. Caribbean monk seal (*Monachus tropicalis*). IUCN, Survival Service Commission, IUCN Publ. New Ser., Suppl. Pap. No. 39:99-112.

Ward, L. 1887. (*Monachus tropicalis*). Notes of its life history. Am. Nat. 21:254-264.

HAWAIIAN MONK SEAL

(Monachus schauinslandi)

Distribution and Migration: The Hawaiian monk seal breeds only on Necker Island, French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, and Midway and Kure Atolls of the Northwestern (Leeward) Hawaiian Islands. The first five of these islands are within the Hawaiian Islands National Wildlife Refuge (HINWR). Rarely do individuals wander southeastward to the main Hawaiian Islands. The species is not known to have a migratory pattern.

Abundance and Trends: The total population was estimated at 1,350 in 1958 (Rice, 1960). It was classified as endangered under the Endangered Species Act of 1973, on November 13, 1976. All monk seals are considered endangered by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, signed 3 March 1973. Counts in the 1960's and 1970's suggest that the population is declining (Kenyon, 1973), due to human disturbance on pupping and nursing areas. Counts made during the 1977 pupping season produced 625 individuals (R.L. DeLong, pers. comm.).

General Biology:

Species Statistics. -- An adult female measures 2.3 m, and her estimated weight is 273 kg. On the average, females outweigh adult males. A typical male is about 2.1 m long and weighs about 173 kg. The newborn pups weigh 16 to 17 kg and are about 100 cm long.

Reproductive Data. -- Observations of 47 tagged individuals on Kure Atoll indicate an annual reproductive rate of 15 living pups per 100 adults. About 19 percent of the adult females breed in successive years, and only 56 percent of the adult females had pups in either of two seasons.

The age at which Hawaiian monk seals of either sex first breed is not known, but they may do so at age 3 years. Pups are born from late December to July, with the peak in April and May. They nurse about 6 weeks.

Age-Growth Data. -- The pup grows from 100 to about 130 cm during its first year. The weights of 6 yearlings averaged 45 kg. Two seals tagged as yearlings doubled their weight in their second year, and one increased in length by 36 percent and the other by 15 percent. They probably do not attain full growth until at least 4 years of age. A technique developed for determining the ages of these seals by examination of the upper canine teeth indicated an age for one female of about 11 years and about 20 years for a male.

Sharks are serious predators.

Feeding Habits. -- Spewings found on haul-out areas included the remains of reef and bottom fishes, eels, and cephalopods.

Ecological Problems: Harassment of the monk seal by humans and dogs on Midway and Kure Atolls may be causing a problem by preventing these animals from using sheltered dry pupping areas.

Allocation Problems: None known.

Current Research: A joint study has been undertaken by NMFS and U. S. Fish and Wildlife Service scientists. During 1976, the first year of the study, all breeding islands were surveyed in March and April. Recommendations were made to conserve and protect the monk seal. In 1977, research teams will intensively study the species on these islands.

References:

Kenyon, K. W. 1972. Man versus the monk seal. J. Mammal. 53:687-696.

_____1973. Hawaiian monk seal (Monachus schauinslandi). IUCN, Survival Service Commission, IUCN Publ. New Ser., Suppl. Pap. No. 39:88-97.

Kenyon, K. W., and C. H. Fiscus. 1963. Age determination in the Hawaiian monk seal. J. Mammal. 44:280-282.

Kenyon, K. W., and D. W. Rice. 1959. Life history of the Hawaiian monk seal. Pac. Sci. 13:215-252.

King, J. E. 1956. The monk seals (genus Monachus). Bull. Brit. Mus. (Nat. Hist.) 3:210-256.

Repenning, C.A.,and C.E. Ray. 1977. The origin of the Hawaiian Monk Seal. Proc. Biol. Soc. Wash. 89:667-688.

Rice, D. W. 1960. Population dynamics of the Hawaiian monk seal. J. Mammal. 41:376-385.

_____1964. The Hawaiian monk seal, rare mammal surveys in Leeward Islands. Nat. Hist. 73:48-55.

Scheffer, V. B. 1958. Seals, sea lions, and walruses; a review of the Pinnipedia. Stanford Univ. Press, 179 p. + 32 pls.

Tomich, P. Q. 1969. Mammals in Hawaii. Bernice P. Bishop Museum Spec. Publ. 57, Bishop Museum Press, Honolulu, Hawaii, 238 p.

Wirtz, W. O., II. 1968. Reproduction, growth and development, and juvenile mortality in the Hawaiian monk seal. J. Mammal. 49:229-238.

CRABEATER SEAL

(Lobodon carcinophagus)

Distribution and Migration: The species is circumpolar and abundant in pack ice of the southern oceans. It is found as a straggler in Uruguay, New Zealand, Australia, Tasmania, and South America. Part of the population moves toward the coasts in summer and away from land in the winter.

Abundance and Trends: The crabeater seal is the most abundant species of seal in the Antarctic, with population estimates ranging from 2 to 5 million (Scheffer, 1958) to 30 million (Erickson, et al., 1971). Laws (1973) believes that the later estimate is unreliable, but that earlier estimates were too conservative. Gilbert (1974) is in general agreement with Laws and provides an estimate of 15 million.

Laws (1972) reports that a total of 1,251 crabeater seals were killed or captured in the Antarctic Treaty area during the period 1964-69, which does not pose a direct threat to these seals.

General Biology:

Species Statistics. -- Adult males range in size from 2.2 to 2.4 m and 200 to 260 kg in weight. Adult females range in size from 2.2 to 2.5 m and 200 to 265 kg in weight. At birth the pups are about 1.3 m long and 20 kg in weight, and the natal color is gray-brown. Color ranges from black to silvery white, depending on the individual, its age, time of year in relation to the molt, and dampness of pelage.

Reproductive Data. -- Little information is available on the breeding habits; mating has not been observed, but sperm are present in the testes of males in October and November. Single pups are born during the Antarctic spring (mid-September to early November). Available data indicate that the adults attain sexual maturity when 3 to 6 years old.

Age-Growth Data. -- By January or February the pups have grown so large that they are difficult to distinguish from adults. The adults molt in January and February while partly fasting. The life span as determined from tooth sections is 29 years or more.

Killer whales and leopard seals are known to prey upon crabeater seals, and may be responsible for the numerous scars on a high proportion of these animals.

Feeding Habits. -- The principal food of the crabeater seal is krill (primarily Euphausia superba).

Parasites and Diseases. -- The species has lice on the skin, roundworms in the stomach, and, rarely, tapeworms in the intestine.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: The University of Minnesota is studying population dynamics of Antarctic seals.

References:

Advisory Committee Marine Resources Research 1976. Mammals in the Seas: ad hoc group III on seals and marine otters. Food Agric. Organ. U.N., Advisory Committee Marine Resources Research FAO ACMRR/MM/SS/4 p. 182.

Bertram, G. C. L. 1940. The biology of the Weddell and crabeater seal. Sci. Rep. Brit. Graham Land Exped. 1934-37, 1:1-39.

Eklund, C., and E. A. Atwood. 1961. A population study of Antarctic seals. J. Mammal. 43:229-238.

Erickson, A. W., and R. J. Hofman. 1974. Antarctic seals. In Antarctic Mammals, Antarctic map folio series, Folio 18, Am. Geogr. Soc., pp. 4-13.

Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman. 1971. Distributional ecology of Antarctic seals, pp. 55-75. In Sir George Deacon (ed.), Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970.

Gilbert, J. R. 1974. Abundance and distribution of seals in Antarctic pack ice. Ph.D. Dissertation, University of Idaho, 126 p.

Laws, R. M. 1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-1969. Polar Rec. 16(101):303-364.

_____1973. The current status of seals in the Southern Hemisphere. IUNC, Survival Service Commission, IUNC Publ. New Ser., Suppl. Pap. No. 39:141-161.

Laws, R. M., and R. J. F. Taylor. 1957. A mass dying of crabeater seals, Lobodon carcinophagus (Gray) Proc. Zool. Soc. London 129:315-324.

Oritsland, T. 1970. Biology and population dynamics of Antarctic seals, pp. 361-366. In M. W. Holdgate (ed.), Antarctic Ecology 1.

_____1970. Sealing and seal research in the southwest Atlantic, September-October 1964, pp. 367-367. In M. W. Holdgate (ed.), Antarctic Ecology 1.

Scheffer, V. B. 1958. Seals, sea lions, and walruses; a review of the Pinnipedia. Stanford Univ. Press, 179 p.

Seals, U. S., A. W. Erickson, D. B. Siniff, and R. J. Hofman. 1971. Biochemical, population genetic, phylogenetic and cytological studies of Antarctic seal species, pp. 77-95. In Sir George Deacon (ed.), Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970.

Siniff, D. B., D. R. Cline, and A. W. Erickson. 1970. Population densities of seals in the Weddell Sea, Antarctic, in 1968, pp. 377-394. In M. W. Holdgate (ed.), Antarctic Ecol. 1.

ROSS SEAL

(Ommatophoca rossii)

Distribution and Migration: The species is circumpolar in heavy pack ice of the Antarctic Ocean.

Abundance and Trends: The Ross seal is usually solitary. Scheffer (1958) lists the population at 20,000 to 50,000, but more recent estimates of population size are greater than 100,000 (Hofman et al., 1973) and 220,000 (Gilbert, 1974).

Laws (1972) states that only 23 Ross seals have been killed or captured in the Antarctic Treaty area from 1964 to 1969, and that clearly there is at present no serious direct threat to these animals.

The Ross seals account for 1.0 to 2.0 percent of the total Antarctic pinniped population (Hofman, et al., 1973).

General Biology:

Species Statistics. -- The adults range in length from 2.0 to 2.4 m and up to 204 kg in weight. The animal is plump, with a short, wide head, a small mouth, and small teeth. The vocalizations of this mammal are striking and account for the common name "singing seal."

Reproductive Data. -- Little is known of its reproduction, and newborn pups have never been seen. The males matures at 3 to 4 years, and the female at 2 to 7 years. Breeding probably takes place in November, and available evidence indicates that the pups are born about 11 months after implantation.

Age-Growth Data. -- Molting probably occurs in January and February. These animals may live up to 12 years.

Feeding Habits. -- Food consists primarily of squids, fish, and other invertebrates.

Parasites and Diseases. -- Roundworms are found in the stomach, tapeworms in the intestine, and lice on the skin.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: The University of Minnesota is studying the population dynamics of Antarctic seals.

References:

Advisory Committee Marine Resources Research 1976. Mammals in the Seas: ad hoc group III on seals and marine otters. Food Agric. Organ. U.N., Advisory Committee Marine Resources.

Eklund, D., and E. A. Atwood. 1962. A population study of Antarctic seals. J. Mammal. 43:229-238.

Erickson, A. W., and R. J. Hofman. 1974. Antarctic seals. In Antarctic mammals, Antarctic map folio series, Folio 18, Amer. Geogr. Soc., pp. 4-13.

Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman. 1971. Distributional ecology of Antarctic seals, pp. 55-75. In Sir George Deacon (ed.), Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970.

Gilbert, J. R. 1974. The biology and distribution of seals in Antarctic pack ice. Ph.D. Dissertation, University of Idaho.

Hofman, R., A. Erickson, and D. Siniff. 1973. The Ross seal (Ommatophoca rossii). IUCN, Survival Service Commission, IUCN Publ. New. Serv., Suppl. Pap. No. 39:129-139.

King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.

Laws, R. M. 1964. Comparative biology of Antarctic seals, pp. 445-457. In R. Carrick, M. Holdgate, and J. Prevost (eds.), Biologie Antarctique-Antarctic Biology, Hermann, Paris.

Laws, R. M. 1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-69. Polar Rec., 16(101):343-364.

Oritsland, T. 1970. Biology and population dynamics of Antarctic seals, pp. 361-366. In M. W. Holdgate (ed.), Antarctic Ecology, 1.

Scheffer, V. B. 1958. Seals, sea lions, and walruses; a review of the Pinnipedia. Stanford Univ. Press, 179 p.

LEOPARD SEAL

(Hydrurga leptonyx)

Distribution and Migration: Leopard seals are circumpolar in Antarctic pack ice and in southern temperature regions and subarctic islands in the winter. They are occasionally seen off the southern tips of New Zealand, Australia, South America, and South Africa.

Abundance and Trends: The leopard seal is a solitary animal. Scheffer (1958) estimated the population at 100,000 to 300,000. More recently, in 1972, Laws (1973) estimated the population at 250,000 to 500,000.

Laws (1972) reports that 140 leopard seals were killed or captured in the Antarctic Treaty area, which does not indicate any threat to the population.

General Biology:

Species Statistics. -- The adult males grow to 3.0 m in length and 450 kg in weight; adult females reach 3.3 m in length and 500 kg in weight. Leopard seals have a long slim body, large head, and wide gape. Newborn pups are 1.6 m long and weigh 29.5 kg. The color of adults is dark gray dorsally and light gray ventrally, and a variable amount of spotting is present.

Reproductive Data. -- Males are sexually mature at 3 to 7 years, and females at 2 to 6 years. Analysis of random specimens indicates that parturition occurs between October and December, but, unlike crabeater and Weddell seals, breeding may not occur until January or March. The gestation period is 240 days. Lactation lasts about 2 months.

Age-Growth Data. -- The life span for both sexes is judged to be more than 25 years, based on studies of tooth sections.

Feeding Habits. -- The leopard seal, largest of the Antarctic seals, is the only seal that regularly feeds on warm-blooded animals. Their food consists of other seals, euphausiids, penguins, whale carcasses, fish, and squid.

Parasites and Diseases. -- Leopard seals suffer from diseased teeth, tumors, bony nodules in nasal passages, and stomach carcinomas.

Ecological Problems: Krill harvest could have deleterious effect upon population size.

Allocation Problems: None known.

Current Research: The University of Minnesota is studying population dynamics of Antarctic seals.

References:

Advisory Committee Marine Resources Research 1976. Mammals in the Seas: ad hoc group III on seals and marine otters. Food Agric. Organ. U.N., Advisory Committee Marine Resources Research FAO ACMRR/MM/SC 4 p. 182.

Bonner, W. N., and R. M. Laws. 1964. Seals and sealing. In Antarctic Research: a review of British scientific achievement in Antarctica; pp. 163-190. R. Priestly, R. S. Adie, and G. de Q. Robin (eds.), Butterworths, London.

Brown, K. G. 1957. The leopard seal at Heard Island, 1951-54. A.N.A.R.E. Interim Rep. No. 16:1-34.

Erickson, A. W., and R. J. Hofman. 1974. Antarctic seals, In Antarctic Mammals, Antarctic map folio series, Folio 18, Am. Geogr. Soc., pp. 4-13.

Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman, 1971. Distributional ecology of Antarctic seals, pp. 55-75. In Sir George Deacon (ed.), Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970.

Laws, R. M. 1964. Comparative biology of Antarctic seals, pp. 445-457. In Carrick, R., M. Holdgate, and J. Prevost (eds.), Biologie Antarctique-Antarctic Biology, Herman, Paris.

_____1972. Seals and birds killed and captured in the Antarctic Treaty Area, 1964-1969. Polar Rec. 16 (101):343-364.

_____1973. The current status of seals in the Southern Hemisphere. IUCN, Survival Service Commission, IUCN Publ. New Ser., Suppl. Pap. No. 39: 144-161.

Oritsland, T. 1970. Biology and population dynamics of Antarctic seals, pp. 361-366. In M. W. Holdgate (ed.), Antarctic Ecology, 1.

Scheffer, V. B. 1958. Seals, sea lions, and walruses; a review of the Pinnipedia. Stanford Univ. Press, 179 p.

Seal, U. S., A. W. Erickson, D. B. Siniff, and R. J. Hofman. 1971. Biochemical, population genetic, phylogenetic and cytological studies of Antarctic seal species, pp. 77-95. In Sir George Deacon (ed.), Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970.

WEDDELL SEAL

(Leptonychotes weddelli)

Distribution and Migration: This species is circumpolar in fast ice around Antarctica, occasionally reaching as far north as Uruguay (lat. 35°S). It is littoral in distribution and nonmigratory. Because of its occurrence near scientific stations, it is the best known of the Antarctic seals.

Abundance and Trends: The population was estimated to be 200,000 to 500,000 by Scheffer (1958) and 250,000 to 500,000 by Laws (1973). Recent investigations (Erickson and Hofman, 1974) suggest a total population in excess of 756,000. Gilbert (1974) estimated 730,000 in pack ice alone (excluding animals in shore-fast ice).

Laws (1972) reports that a total of 893 Weddell seals were killed or captured in the Antarctic Treaty area during the period 1964-69, which poses no threat to the population.

General Biology:

Species Statistics. -- Adults range in size from 2.1 to 2.5 m in length and 318 to 550 kg in weight. Females are slightly larger than males. Newborn pups are 1.2 m long, weigh from 22 to 25 kg, and have permanent dentition. Coloration of adults is dark brown to black, conspicuously mottled with white spots.

Reproductive Data. -- Males reach sexual maturity at 6 to 8 years; females at 3 to 6 years of age. The average age of breeding females is 9 years. Pregnancy last 9 to 10 months. The pups are born from September to early November on fast ice, usually close to the Antarctic continent. The mating period has not been defined, but males with sperm and females that had ovulated have been collected between late November and mid-December. Lactation lasts 5 to 6 weeks, and pups are weaned at 6 weeks. The females protect their pups and are aggressive toward intruders.

Age-Growth Data. -- The pups molt their natal fur and replace it with the adult pelage by the 44th day. Initial weight gains are dramatic: the pups gain an average of 12 kg or more per week for the first 6 weeks and weigh as much as 135 kg by the time the molt is completed. The life span, as determined by the teeth, is not over 20 years.

Tooth wear associated with maintaining breathing holes may be a mortality factor.

Feeding Habits. -- Weddell seals feed on mysids, decapod crustaceans, amphipods, cephalopods, euphausiids, and various species of fish.

Parasites and Diseases. -- Wounds inflicted on this mammal heal slowly, and festering sores are common. Kidney stones and uterine fibroids have been

found. Weddell seals are heavily infested with tapeworms, trematodes, and ro· ıdworms.

Ecological Problems: Local populations are discrete breeding units which could be eliminated by oil slicks.

Allocation Problems: None known.

Current Research: The University of Minnesota is studying population dynamics of Antarctic seals.

References:

Advisory Committee Marine Resources Research 1976. Mammals in the Seas; ad hoc group III on seals and marine otters. Food Agric. Organ. U.N., Advisory Committee Marine Resources Research FAO ACMRR/MM/SC/4 p. 182.

Bertram, G. C. L. 1940. The biology of the Weddell and crabeater seals. Sci. Rep. Brit. Graham Land Exped. 1934-37, 1:1-319.

Dearborn, J. H. 1965. Food and Weddell seals at McMurdo Sound, Antarctica. J. Mammal. 46:37-43.

Eklund, C., and E. A. Atwood. 1962. A population study of Antarctic seals. J. Mammal. 43:229-238.

Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman. 1971. Distributional ecology of Antarctic seals, pp. 55-75. In Sir George Deacon (ed.), Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970.

Erickson, A. W., and R. J. Hofman. 1974. Antarctic seals. In Antarctic Mammals, Antarctic map folio series, Folio 18, Am. Geogr. Soc., pp. 4-13.

Gilbert, J. R. 1974. The biology and distribution of seals in Antarctic pack ice. Ph.D. Dissertation, University of Idaho, 621 p.

Kaufmann, G. D., D. B. Siniff, and R. Reichle. 1972. Colony behavior of Weddell seals, Leptonychotes weddelli, at Hutton Cliffs, Antarctic. In Symposium on the biology of the seal, Guelph, Ontario, Aug. 14-17, 1972, pp. 228-246.

Laws, R. M. 1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-60. Polar Rec. 16(101):343-364.

Laws, R. M. 1973. The current status of seals in the Southern Hemisphere. IUCN/SSC Working Group on Threatened and Depleted Seals of the World. Guelph, Ontario, Aug, 1972, p. 144-161.

Mansfield, A. W. 1958. The breeding behavior and reproductive cycle of the Weddell seal (Leptonychotes weddelli Lesson). Falkland Islands Dep. Surv., Sci. Rep. 18:1-41.

Scheffer, V. B. 1958. Seals, sea lions and walruses; a review of the Pinnipedia. Stanford Univ. Press, 179 p.

Siniff, D. B., D. R. Cline, and A. W. Erickson. 1970. Population densities of seals in the Weddell Sea, Antarctica, in 1968, pp. 377-394. In M. W. Holdgate (ed.), Antarctic Ecol., 1.

Siniff, D. B., J. R. Tester, and V. B. Kuechle. 1971. Some observations on the activity patterns of Weddell seals as recorded by telemetry, pp. 173-180. In W. H. Burt (ed.), Antarctic Pinnipedia, Antarctic Res. Ser. 18.

Stirling, I. 1971. Population dynamics of the Weddell seal (Leptonychotes weddelli) in McMurdo Sound, Antarctica, 1966-68, pp. 141-167. In W. H. Burt (ed.), Antarctic Pinnipedia, Antarctic Res. Ser. 18.

SOUTHERN ELEPHANT SEAL

(Mirounga leonina)

Distribution and Migration: The southern elephant seal is circumpolar on subantarctic islands, south to the ice edge of lat. 78°S. It breeds on the continental coast of Argentina and on subantarctic islands.

Abundance and Trends: The population of the southern elephant seal has been estimated at 600,000±100,000 (Laws, 1960). This species was once sought for its oil. It was nearly extinct by 1900, but since that time regulations have allowed the herds to increase. At South Georgia the average annual kill between 1952 and 1964 was 6,000 animals. There has been no commercial sealing there since 1964, although licenses to harvest these animals have been offered (Laws, 1973).

Laws (1972) reported a total of 25 southern elephant seals killed or captured in the Antarctic Treaty area during the period 1964-69, and states that clearly there is at present no serious direct threat to these seals, although one cannot rule out the possibility of restricted overexploitation of some local populations.

General Biology:

Species Statistics. -- The southern elephant seal is the largest pinniped. Males grow to 5.5 to 6.1 m in length and 3628 kg in weight; females reach 3.1 to 3.7 m and 907 kg. The South Georgia stock averages larger in size (adult males 4.4 m, 3,200 kg, adult females 2.8 m, 680 kg) than the Macquarie Islands stock (adult males 4.1 m, 3,000 kg; adult females 2.5 m, 400 kg). The newborn pups are 1.2 m long and weigh from 37.6 to 49 kg.

Reproductive Data. -- Males are sexually mature at 4 years, and hold harems at 5 to 7 years in commercially utilized populations. The females mature at 2 years and bear single pups at age 3. In unuitilized populations, the females mature at age 3 to 6 years, but the males do not reach harem status until 12 years old. The breeding season varies with locale and occurs from August through November. Most harems contain 20 to 40 females, but up to 100 have been counted. The pups are born in October, about 1 week after the females haul-out, and nurse about 23 days. The females mate about 18 days after their pups are born.

Age-Growth Data. -- The pups weigh 113 to 181 kg at weaning. The molt usually starts in early November, when the pups, then 2 to 3 weeks old, shed their natal fur and older immature seals begin to haulout to molt. Mature females begin their molt in late December or January and mature males in late January or February. The molt requires about 18 days to complete. After the molt, they return to the sea and probably spend the winter feeding near pack ice.

The females live about 12 years and the males up to 20 years.

The leopard seal and killer whale are natural enemies of the southern elephant seal.

Feeding Habits. -- Shortly after weaning the pups feed on amphipods for a time, after which they feed primarily on cephalopods and fish.

Ecological Problems: None known.

Allocation Problems: According to Laws (1973), the southern elephant seal may become threatened because they compete with Soviet fishermen for commercial species of fish in the vicinity of Kerguelen Islands.

Current Research: The University of Minnesota makes incidental observations of this mammal while studying the Antarctic seal species.

References:

Advisory Committee on Marine Resource Research. 1976. Mammal in the Seas: ad hoc group III on seals and marine otters. Food Agric. Organ. U.N. Adv. Comm. Mar. Resour. Res. FAO ACMRR/MM/SC/4 p. 182.

Carrick, R., and S. E. Ingham. 1962. Studies on the southern elephant seal. Pt. 5, Population dynamics and utilization. Commonwealth Sci. Ind. Res. Org. (CSIRO) Wildl. Res. 7:161-197.

Cline, D. R., A. W. Erickson, and R. J. Hofman. 1970. Elephant seal in the Weddell Sea. J. Mammal. 51:204.

Erickson, A. W., and R. J. Hofman. 1974. Antarctic seals. In Antarctic Mammals, Antarctic Map Folio Series, Folio 18, Am. Geogr. Soc., pp. 4-13.

King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.

Laws, R. M. 1953. The elephant seal (Mirounga leonina, Linn.). I. Age and growth. Falkland Islands Dep. Surv. Sci. Rep. 8, 62 p.

_____1956. The elephant seal (Mirounga leonina, Linn.). II. General social, reproductive behavior. Falkland Islands Dep. Surv. Sci. Rep. 13, 88p.

_____1956. The elephant seal (Mirounga leonina, Linn.). III. The physiology of reproduction. Falkland Islands Dep. Surv. Sci. Rep. 15, 66 p.

_____1960. The southern elephant seal (Mirounga leonina, Linn.) at South Georgia. Norsk Hvalfangst-Tid. 49(10; 11):466-476, 520-542.

_____1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-69. Polar Rec. 16(101):343-364.

_____1973. The current status of seals in the Southern Hemisphere. IUCN, Survival Service Commission, IUCN, New Publ. Serv, Suppl. Pap. No. 39:144-161.

NORTHERN ELEPHANT SEAL

(Mirounga angustirostris)

Distribution and Migration: This species originally occupied rookeries and hauling grounds on the mainland and islands from Cabo San Lazaro, Baja California, northward to Pt. Reyes, just north of San Francisco. Non-breeding animals range at least as far north as southeastern Alaska.

This species now breeds on Isla San Benito, Islas Los Coronados, Isla Cedros, San Miguel Island, Santa Barbara Island, San Nicolas Island, Ano Nuevo Island, and Southeast Farallon Island.

Abundance and Trends: By 1890 the population had been reduced to 100 or fewer animals found only on Guadalupe Island, but this number increased to an estimated 15,000 animals by 1960 (Bartholomew and Hubbs, 1960). A total of 10,581 were counted in April 1968 on the six Mexican islands off Baja California (Brownell, et al., 1974). DeLong (1977) estimated a population of about 50,000 in 1976. This species has reoccupied most or all of its historic rookeries and hauling grounds.

Odell (1974) believes that the San Nicolas Island population is increasing. The largest California population of Mirounga is found on San Miguel Island, where DeLong and Johnson (in Press) estimate the total island population to be 16,000.

General Biology:

Species Statistics. -- Maximum body lengths are about 5 m for adult males and 3.3 m for adult females. Newborn pups are about 1.2 m long and have black natal pelage.

Reproductive Data. -- The adult males usually arrive first on the rookeries in November, followed by the pregnant females in December. Dominant adult males occupy choice locations within the breeding colonies and do most of the mating. The female usually bears a single pup about 7 days after her arrival and weans it about a month later. The female is bred during her last few days ashore. Most pups are born January 1 to February 10.

Age-Growth Data. -- On San Nicolas Island most pups have molted their black natal pelage for the gray pelage of older animals by 1 March. The age at which the pups go to sea is not firmly established, but they spend at least 2 to 3 months ashore. Older animals return to shore to molt beginning with the females about 1 April, followed by immatures of both sexes the males are the last to return.

Feeding Habits. -- Little information on the feeding habits of Mirounga is available. The stomach of one elephant seal contained seven ratfish, one 66.0 cm California dogfish shark, one swell or puffer shark, three skates, and four squids. The species apparently can feed at considerable depths, as indicated by prey species and the fact that three young Mirounga were taken on hooks set at about 100 fathoms. The stomach of a subadult male found dead in California contained the remains of cusk eels, toadfishes, scorpionfishes, flounder, cat sharks, and segments of undetermined teleosts and elasmobranchs.

Ecological Problems: Oil from the Santa Barbara spill of 28 January 1969 coated about 100 elephant seal pups ashore on one area of San Miguel Island. The pups had been weaned and apparently suffered no ill effects.

Allocation Problems: None known.

Current Research: Scientists from the University of California at Santa Crus, and from the Point Reyes Bird Observatory, Stinson Beach, Calif. are studying this species.

References:

Anthony, A. W. 1925. Expedition to Guadalupe Island, Mexico in 1922. Proc. Calif. Acad. Sci., 4th Ser., 4:277-320.

Bartholomew, G. A. 1952. Reproductive and social behavior of the northern elephant seal. Univ. Calif. Publ. Zool. 47:369-471.

_____1967. Seal and sea lion populations of the California Islands, pp. 229-244. In R. N. Philbrick (ed.) Proceedings of the Symposium on the Biology of the California Islands, Santa Barbara Botanic Garden.

Bartholomew, G. A., and C. L. Hubbs. 1960. Population growth and seasonal movements of the northern elephant seal, Mirounga angustirostris. Mammalia 24:313-324.

Brownell, R. L., Jr., R. L. DeLong, and R. W. Schreiber. 1974. Pinniped populations at Islas de Guadalupe, San Benito, Cedros, and Natividad, Baja California, in 1968. J. Mammal. 55:469-472.

Carlisle, J. G., Jr. 1973. The census of northern elephant seals on San Miguel Island, 1965-73. Calif. Fish Game 50:311-313.

Carlisle, J. G., and J. A. Aplin. 1971. Sea lion census for 1970, including counts of other California pinnipeds. Calif. Fish Game 57:124-126.

Daugherty, A. E. 1965. Marine mammals of California. Calif. Dept. Fish Game, Sacramento, Calif., 86 p.

DeLong, R. L., and A. M. Johnson. In preparation. Increase in the northern sea elephant population on San Miguel Island, California.

Huey, L. M. 1930. Capture of an elephant seal off San Diego, Calif., with notes on stomach contents. J. Mammal. 11:229-230.

King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.

LeBoeuf, B. J. 1972. Sexual behavior in the northern elephant seal, Mirounga angustirostris. Behavior 41:1-26.

Morejohn, G. V., and D. M. Baltz. 1970. Contents of the stomach of an elephant seal. J. Mammal. 51:173-174.

Odell, D. K. 1974. Seasonal occurrence of the northern elephant seal, Mirounga angustirostris, on San Nicolas Island, California. J. Mammal. 55(1):81-95.

_____1972. Studies on the biology of the California sea lion and the northern elephant seal on San Nicolas Island, Calif. Ph.D. thesis, Univ. Calif., Los Angeles, 168 p.

Peterson, R. S., and B. J. LeBoeuf, 1969. Population study of seals and sea lions. Trans. 34th N. Am. Wildl. Nat. Res. Conf., pp. 74-79.

Radford, K. W., R. T. Orr, and C. L. Hubbs. 1965. Reestablishment of the northern elephant seal (Mirounga angustirostris) off central California. Proc. Calif. Acad. Sci. 4th ser., 31:601-612.

Rice, D. W., K. W. Kenyon, and D. Lluch-B. 1965. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California, in 1965. Trans. San Diego Soc. Nat. Hist. 14(7):73-84.

Scammon, C. M. 1874. The marine mammals of the northwestern coast of North America. John H. Carmany and Co., San Francisco, Calif., 319 p.

Scheffer, V. B. 1964. Deep diving of elephant seals, Murrelet 45:9.

Townsend, C. H. 1912. The northern elephant seal. Zoologica 1:159-173.

GRAY WHALE

(Eschrichtius robustus)

Distribution and Migration: The gray whale is now restricted to the North Pacific Ocean, although it once occurred in the North Atlantic Ocean.

Two geographically isolated populations are recognized: (1) the eastern Pacific ("California") stock, which spends the summer in the Chukchi, western Beaufort, and northern Bering Seas (and rarely along the coast as far south as central California), and migrates to the west coast of Baja California and the southern Gulf of California for the winter; and (2) the western Pacific Ocean ("Korean") stock, which spends the summer in the northern Sea of Okhotsk and migrates to the southern coast of Korea for the winter.

Abundance and Trends: Eastern North Pacific Ocean--contrary to earlier published estimates, the original population was almost certainly less than 15,000 (Henderson, 1972). During the late 18th and earlier 19th centuries the population was greatly reduced. Since complete protection was given the stock in 1947, the population has increased to about 11,000 and has remained stable since 1967 (Rice and Wolman, 1971). An average of about 160 gray whales are killed each year in a subsistence fishery on the Chukotski Peninsula of Siberia. In Alaska, no more than five per year have been taken by Eskimos in recent years.

Western North Pacific Ocean--in 1910, the population probably numbered between 1,000 and 1,500. The status of this population is uncertain at the present time, but it appears to be nearly extinct.

General Biology: The gray whale is identified by its mottled gray color and low hump in place of a dorsal fin. It feeds on benthic amphipods and other benthic invertebrates on the summering grounds, and fasts during migrations and on wintering grounds. Sexual maturity is attained at an age of 5 to 11 years, at a mean body length of 11.0 m for males and 11.6 m for females. The mating season is in late November and early December while the animals are on their southward migration. The calf is born following a 13-month gestation period after the pregnant females have arrived in certain shallow lagoons on the west coast of Baja California. The female bears a calf only once every 2 or more years. The calves average about 5.0 m long at birth and are weaned 7 months later when they are about 8.0 m long.

Ecological Problems: The gray whale is now valuable as a tourist attraction, and it supports a rapidly increasing cruise-boat industry, including 1/2-day cruises off San Diego and Los Angeles, and week-long cruises from these ports to Scammons Lagoon.

These activities have generated a problem of increasing harassment of the whales. In 1972, the Mexican Government declared Scammons Lagoon a whale refuge, so the cruise boats are now partly regulated.

Allocation Problems: None known.

Current Research: Studies on gray whales are being made by the National Marine Fisheries Service and the Soviet Union's Far Eastern Institute of Marine Fisheries and Oceanography.

References:

Evans, W. E. (ed.). 1974. The California gray whale. Mar. Fish Rev. 36(4):1-64.

Henderson, D. A. 1972. Men and whales at Scammons Lagoon. Dawson's Book Shop, Los Angeles, 313 p.

Rice, D. W., and A. A. Wolman. 1971. Life history and ecology of the gray whale (Eschrichtius robustus). Am. Soc. Mammal. Spec. Publ. 3:1-142.

Wolman, A. A., and A. J. Wilson, Jr. 1970. Occurrence of pesticides in whales. Pest. Monit. J. 4:8-10.

MINKE WHALE

(Balaenoptera acutorostrata)

Distribution and Migration: The minke whale inhabits all oceans of the world, except equatorial regions, and ranges into the polar pack ice zones in the Northern and Southern Hemispheres. It makes extensive seasonal migrations between high-latitude summering grounds and low-latitude wintering grounds.

At least three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. The affinities of the minke whale stocks in the northern Indian Ocean are unknown.

In the eastern North Pacific Ocean, the minke whale ranges from the Chukchi Sea south to northern Baja California during the summer, and from central California south to within 2 degrees of the Equator during the winter.

In the western North Atlantic Ocean, it ranges from Baffin Bay south to Chesapeake Bay during the summer, and from the eastern Gulf of Mexico and northeastern Florida south to Puerto Rico and the Virgin Islands during the winter.

Abundance and Trends: The exploitable population in the Southern Hemisphere originally numbered about 183,000 and currently numbers about 157,000. For the North Atlantic there is no estimate of the original population, but the present population is about 80,000. No estimates are available for the North Pacific.

The minke whale has long been an important species in the "small whale" fisheries of the world. In 1975 (including the 1975/76 Antarctic season), catches were over 9,522, distributed as follows:

North Atlantic	1,969
Japan	370
Korea	no data (566 in 1974)
Brazil	1,039
South Africa	110
Antarctic	6,034

General Biology: The minke whale is the smallest member of the genus Balaenoptera, not exceeding 10 m in length in the Northern Hemisphere. The northern animals are distinguished by a white band on the flipper; individuals from the Southern Hemisphere average about a meter longer, and usually lack the white flipper band. The minke whale feeds mainly on euphausiids, but also takes some small fishes. In the Northern Hemisphere, it attains sexual maturity at an age of 7 to 8 years and an average body length of 7.0 m in males and 7.9 m in females. The female bears a calf only once every 2 years (rather than annually, as once believed). During the summer, pregnant females migrate to much higher latitudes than do the lactating and immature females.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: Research on minke whales is being conducted by the Japanese Far Seas Fisheries Research Laboratory, the South African Division of Sea Fisheries, and the Norwegian State Institute for Whale Research.

References:

Jonsgård, Å. 1951. Studies on the little piked whale or minke whale (Balaenoptera acutorostrata, Lacepede). Norsk Hvalfangst-Tid. 40(5): 209-232.

_____1962. Population studies on the minke whale, Balaenoptera acutorostrata Lacepede, pp. 158-167. In E. D. LeCren, and M. W. Holdgate (eds.), The exploitation of natural animal populations. Blackwell Sci. Publ., Oxford.

Mitchell, E., and V. M. Koziki. 1975. Supplementary information on minke whale (Balaenoptera acutorostrata) from Newfoundland fishery. J. Fish. Res. Bd. Can. 32:985-994.

Ohsumi, S., and Y. Masaki. 1975. Biological parameters of the Antarctic minke whale at the virginal population level. J. Fish. Res. Bd. Can. 32:995-1,004.

Ohsumi, S., Y. Masaki, and A. Kawamura. 1970. Stocks of the Antarctic minke whale. Sci. Rep. Whales Res. Inst. 22:75-126.

Omura, H., and H. Sakiura. 1956. Studies on the little piked whale from the coast of Japan. Sci. Rep. Whales Res. Inst. 11:1-39.

Sergeant, D. 1963. Minke whales, Balaenoptera acutorostrata Lacepede, of the western North Atlantic. J. Fish. Res. Bd. Can. 20:1,489-1,504.

Williamson, G. R. 1975. Minke whales off Brazil. Sci. Rep. Whales Res. Inst. 27:37-59.

BRYDE'S WHALE

(*Balaenoptera edeni*)

Distribution and Migration: Bryde's whale is found in tropical and warm temperate waters around the world. In the western Atlantic Ocean, it ranges from Maryland south to Cabo Frio, Brazil, and in the eastern Atlantic Ocean from Morocco south to the Cape of Good Hope. In the Indian Ocean, it ranges from the Cape of Good Hope north to the Persian Gulf, east to the Gulf of Martaban, Burma, and thence south to Shark Bay, Western Australia. In the western Pacific Ocean, it is distributed from northern Hokkaido, Japan, south to Victoria, Australia, and North Island, New Zealand; in the eastern Pacific Ocean, it ranges from central Baja California, Mexico, south to Iquique, Chile.

At least some of the temperate zone populations (Japan, South Africa) make limited seasonal migrations. The tropical populations may be sedentary.

Abundance and Trends: The population in the western North Pacific, north of lat. 20°, originally numbered about 20,000, and has now been reduced to about 16,000. No estimates are available of population sizes elsewhere in the world.

Until recently, Bryde's whales have been of minor importance in the modern whaling industry, and only a few were taken by shore stations in Japan, South Africa, and rarely elsewhere. Since 1970, however, increasing numbers have been harvested by pelagic expeditions in the western North Pacific Ocean, as these expeditions have shifted operations more to the south. In 1975, 1,433 were killed there--1,317 by Japanese and Soviet pelagic expeditions, and 116 by Japanese shore stations. The only ones reported taken in the Southern Hemisphere were three taken by the shore station at Durban, South Africa. However, it is believed that most of the 151 "sei" whales taken by the combination catcher-boat/factory-ship *Sierra* (registered in Somalia) off Angola were actually Bryde's whales.

General Biology: Bryde's whale is very similar in appearance to the sei whale, and the two species were formerly confused. The Bryde's whale is slightly smaller--usually less than 13.5 m long; its throat grooves extend posteriorly beyond the umbilicus, and it has a pair of lateral ridges on top of its snout, one on each side of the median ridge. The fringe on its baleen plates is much coarser than that of the sei whale. It feeds mainly on small schooling fishes, and also takes some euphausiids and other crustaceans. Males attain sexual maturity at an average length of 12.2 m and females at 12.5 m. The mating and calving season is usually during the winter, but in some areas--South Africa, for example, they breed year-round. The gestation period is about 1 year. The female does not bear a calf 2 years in succession.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: Research on Bryde's whale is being conducted by the South African Division of Sea Fisheries and the Japanese Far Seas Fisheries Research Laboratory.

Mead, J. G. 1974. Record of sei and Bryde's whale from the Atlantic coast of the United States, the Gulf of Mexico, and the Caribbean. Unpublished report submitted to Scientific Committee, International Whaling Commission.

Ohsumi, S., Y. Shimadzu, and T. Doi. 1971. The seventh memorandum on the results of Japanese stock assessment of whales in the North Pacific. Rep. Int. Comm. Whaling 21:76-89.

Omura, H. 1959. Bryde's whale from the coast of Japan. Sci. Rep. Whales Res. Inst. 14:1-33.

_____1962. Further information on Bryde's whale from the coast of Japan. Sci. Rep. Whales Res. Inst. 16:7-18.

_____1966. Bryde's whale in the northwest Pacific, pp. 70-78. In K. S. Norris [ed.], Whales, dolphins, and porpoises. Univ. of California Press, Berkeley and Los Angeles.

SEI WHALE

(Balaenoptera borealis)

Distribution and Migration: The sei whale is nearly worldwide in distribution. In the eastern North Pacific, it summers from California to the Gulf of Alaska and Aleutian Islands; in the North Atlantic, from New England and the British Isles to the Arctic Ocean. It winters at low latitudes. In the Southern Hemisphere this species summers in all oceans from lat. 30°S southward, and in winter it is generally found north of lat. 40°S.

Abundance and Trends: Information in this section is from the annual reports of the International Whaling Commission and from recent reports of the Bureau of International Whaling Statistics. The number of sexually mature animals originally numbered about 200,000 (excluding the North Atlantic, for which no estimates are available), and has now been reduced to about 57,000, distributed by major ocean areas as follows:

Ocean	Original population	Current population
North Atlantic	no data	no data
North Pacific	42,000	9,000
Southern Ocean	160,000	48,000

Inclusion of sexually immature whales would increase these estimates by roughly 50 percent.

Catches of sei whales in recent seasons have been:

Season	North Pacific	North Atlantic	Southern oceans (south of 40°S) 1/ 2/	Southern land stations
1969	5,158	222	5,857	917
1970	4,504	139	6,153	465
1971	2,993	476	5,452	446
1972	2,327	315	3,864	346 2/
1973	1,856	139	4,392	30 2/
1974	1,280	9	3,859	354 2/
1975	504	138	1,820	549 2/
1976	0 3/	3 4/	1,858	4 5/

1/ Southern ocean catches are for the seasons 1969-70 through 1976-76.

2/ No data from Chile.

3/ Protected

4/ No data from Greenland

5/ No data from Peru

General Biology: The species resembles the fin whale but is slightly smaller, with less white underneath, and a large dorsal fin. In the far north of the Northern Hemisphere it feeds mostly on copepods. The diet is much more varied in lower latitudes--including euphausiids, copepods, sauries, anchovies, herring, sardines, and jack mackerel. Sei whales usually travel in small pods of 2 to 5. They attain sexual maturity at 6 to 12 years of age, at a body length of about 13.1 m (males) and 13.7 m (females). Females bear calves every 2 or 3 years. The mating and calving season occurs in winter in the respective hemispheres. Gestation lasts 1 year, and the calf is weaned when about 7 months old.

Seven percent of the sei whales taken off California have been infected with a unique disease that causes progressive shedding of the baleen plates and their replacement by an abnormal papillomalike growth.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: The National Marine Fisheries Service is conducting population and biological studies of this species. Other organizations carrying out research on this species are the Japanese Whale Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), Norwegian State Institute for Whale Research (Antarctic), South African Division of Sea Fisheries (South Africa), and Soviet All-Union Research Institute of Marine Fisheries and Oceanography.

References:

Bannister, J. L., and R. Gambell. 1965. The succession and abundance of fin, sei, and other whales off Durban. Norsk Hvalfangst Tid. 54(3):45-60.

Gambell, R. 1968. Seasonal cycles and reproduction in sei whales of the Southern Hemisphere. Disc. Rep. 35:31-134.

International Commission on Whaling. 1972. Twenty-second report of the Commission, 151 p.

_____1973. Twenty-third report of the Commission, 264 p.

Matthews, L. H. 1938. The sei whale, Balaenoptera borealis. Disc. Rep. 17:183-290.

Omura, H., and T. Nemoto. 1955. Sei whales in the adjacent waters of Japan. Sci. Rep. Whales Res. Inst. 10:79-87.

FIN WHALE

(Balaenoptera physalus)

Distribution and Migration: The fin whale is worldwide in distribution. In the eastern North Pacific it summers from California into the Chukchi Sea, and in the North Atlantic from Cape Cod and Spain into the Arctic Ocean. The fin whale migrates to more southern latitudes in winter. In the Southern Hemisphere it is generally found at lat. 47° to 60° S. in summer and from 20° to 40° S. in winter.

Abundance and Trends: Information in this section is from the annual reports of the International Whaling Commission and from the report of the Bureau of International Whaling Statistics, Sandefjord. The stocks available for commercial harvest originally numbered about 470,000, but have now been reduced to about 107,000. These are distributed by major ocean areas as follows:

Ocean	Original population	Current population
North Atlantic	25,000	10,000
North Pacific	44,000	17,000
Southern Ocean	400,000	80,000

Inclusion of immature whales shorter than the legal length limit would increase these estimates by roughly 50 percent. Recent catches from the stocks have been:

Season	North Pacific	North Atlantic	Southern oceans [1]	Southern land stations
1969	1,276	[3] 800	3,002	224
1970	1,012	1,063	2,890	135
1971	802	751	2,683	104
1972	758	689	1,761	[3] 61
1973	460	342	1,288	[3] 52
1974	413	346	979	[3] 26
1975	[5] 508	[4] 245	[5] 206	[3] 26
1976	[5] 0	[4] 275	[5] 0	[5] 0

[1] Southern ocean catches are for the seasons 1969-70 through 1975-76.

[2] An additional 122 "baleen whales" taken off Spain were probably fin whales.

[3] No information from Chile.

[4] No data from Spain.

[5] Protected

The fin whale is commercially the most valuable baleen whale. Stocks in the North Pacific and southern oceans are below maximum sustainable yield levels.

General Biology: This species is second in size only to the blue whale; in the Northern Hemisphere it grows to at least 23.2 m and is distinguished by a gray back, white belly, and well-developed dorsal fin. Fin whales feed mostly on euphausiids, but often eat fish--especially anchovies in the North Pacific and capelin in the North Atlantic.

They usually travel in small pods of 2 to 5 animals. Fin whales are sexually mature at 6 to 12 years, with a body length of about 17.7 m (males) and 18.3 m (females). Females bear calves every 2 to 3 years. The mating and calving season occurs in winter in respective hemispheres. Gestation lasts 1 year, and the calf is weaned at about age 7 months.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: The National Marine Fisheries Service is conducting population and biological studies of this species. Other organizations carrying out research on this species are the Japanese Whales Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), British National Institute of Oceanography (South Africa and Antarctic), South African Division of Sea Fisheries (South Africa), and Soviet All-Union Research Institute of Marine Fisheries and Oceanography (North Pacific and Antarctic).

References:

International Commission on Whaling. 1972. Twenty-second report of the Commission, 151 p.

_____1973. Twenty-third report of the Commission, 264 p.

Jonsgård, Å. 1966. Biology of the North Atlantic fin whale Balaenoptera physalus (L.): taxonomy, distribution, migration and food. Hvalrådets Skr. 49, 62 p.

Laws, R. M. 1961. Reproduction, growth, and age of southern fin whales. Disc. Rep. 31:327-486.

Mackintosh, N. A., and J. F. G. Wheeler. 1929. Southern blue and fin whales. Disc. Rep. 1:257-540.

Mitchell, E. 1975. Present status of Northwest Atlantic fin and other whale stocks, pp. 108-169. In W. E. Schevill (ed.) The whale problem. Harvard Univ. Press, Cambridge, Mass.

Ohsumi, S., M. Nishiwaki, and T. Hibiya. 1958. Growth of fin whale in the northern Pacific. Sci. Rep. Whales Res. Inst. 13:97-133.

BLUE WHALE

(Balaenoptera musculus)

Distribution and Migration: The blue whale is found throughout all oceans from the Equator to the polar pack ice zones in the Northern and Southern Hemispheres. It makes seasonal migrations between rather restricted high-latitude summering grounds and low-latitude wintering grounds.

At least three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. Each population is probably comprised of several more or less discrete stocks. The "pygmy blue whale" of the southern Indian Ocean is morphologically distinct from the stocks which spend the summer in Antarctic waters. The affinities of the blue whale populations in the Arabian Sea and Bay of Bengal are unknown.

In the eastern North Pacific Ocean, blue whales range from the Aleutian Islands and Gulf of Alaska south to central California during the summer, and from central Baja California south to within 8 degrees of the Equator during the winter.

In the western North Atlantic Ocean, they range from Davis Strait south to the Gulf of St. Lawrence during the summer and spend the winter in the waters east of the West Indies.

Abundance and Trends: During the first half of the 20th century, the blue whale was one of the most important cetaceans to the whaling industry, but it is now so rare that it will require probably half a century of complete protection to restore the stocks to a significant level. In the North Pacific Ocean, the population, which once numbered about 5,000, now contains about 1,700 individuals (Wada, 1975). This species apparently has been slowly increasing since 1966, the year it was first given complete protection.

The population in the western North Atlantic (off eastern Canada), which originally numbered about 1,100 (Allen, 1970), now numbers only a few hundred. Estimates of the eastern North Atlantic population have not been made.

The Southern Hemisphere population originally numbered about 200,000 (Chapman, Allen, and Holt, 1964), but was severely depleted before complete protection was given the stock in 1965. The present population is estimated at about 9,000, half of which are pygmy blue whales (Masaki, 1975).

General Biology: The blue whale is the largest mammal that ever lived on Earth, reaching a known length of 29 m and a weight of 117.5 metric tonnes. is distinguished from the fin whale by its mottled blue-gray color dorsally and ventrally, its smaller dorsal fin, its broad flat snout, and its

black baleen plates. Blue whales feed exclusively on euphausiids during the summer and fast during the winter. They become sexually mature at an average age of about 10 years, when males of the Antarctic stocks average 22.5 m and females 24.0 m; whereas the "pygmy blue whales" of the southern Indian Ocean average about 2 m less in length. Every 2 or 3 years during the winter the female gives birth to a calf after a 12-month gestation period. At birth the calf is about 7 m long; when weaned 8 months later it is about 15 m long.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: Observers aboard whaling and research vessels record sightings of blue whales and routinely report them to the International Whaling Commission.

References:

Allen, K. R. 1970. A note on baleen whale stocks of the northwest Atlantic. Rep. Int. Comm. Whaling 20:112-113.

Chapman, D. G., K. R. Allen, and S. J. Holt. 1964. Reports of the Committee of Three Scientists on the special scientific investigation of the Antarctic whale stocks. Rep. Int. Comm. Whaling 14:32-106.

Gulland, J. 1972. Future of the blue whale. New Sci. 54(793): 198-199.

Jonsgard, A. 1955. The stocks of blue whales (Balaenoptera musculus) in the North Atlantic Ocean and adjacent Arctic waters. Norsk Hval-fangst-Tid. 44:505-519.

Mackintosh, N. A., and J. F. G. Wheeler. 1929. Southern blue and fin whales. Disc. Rep. 1:257-540.

Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/75. Unpublished report submitted to Scientific Committee, International Whaling Commission.

Ohsumi, S., and S. Wada. 1972. Stock assessment of blue whales in the North Pacific. Unpublished report submitted to Scientific Committee, International Whaling Commission.

Wada, S. 1975. Indices of abundance of large-sized whales in the North Pacific in 1974 whaling season. Unpublished report submitted to Scientific Committee, International Whaling Commission.

HUMPBACK WHALE

(Megaptera novaeangliae)

Distribution and Migration: The humpback whale is found in almost all oceans from tropical waters to the edge of, but not into, the polar pack ice zones in the Northern and Southern Hemispheres. It makes extensive seasonal migrations between high latitude summering grounds and low latitude wintering grounds--the latter along continental coasts or around islands.

Three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. Each population is comprised of several almost entirely discrete stocks.

In the eastern North Pacific Ocean, the humpback whale ranges from the Chukchi Sea south to southern California during the summer, and from southern California south to the Islas Revillagigedo and Jalisco, Mexico, and also around the Hawaiian Islands, during the winter.

In the western North Atlantic Ocean it ranges from Disko Bay in western Greenland south to Massachusetts during the summer, and from Hispaniola and Puerto Rico south to Trinidad during the winter.

Abundance and Trends: The humpback whale was important, especially to shore stations, during the first half of the 20th century. Now, however, this mammal is so scarce that it will require a half century of complete protection for it to increase to a significant level. A few are killed in subsistence fisheries in Greenland, the Lesser Antilles, and the Tonga Islands. It has a minor value as a tourist attraction in Hawaii and southeastern Alaska.

The original population size of the North Pacific Ocean was about 15,000, but is now severely depleted to about 850 individuals. A summer resident population of about 60 animals occupies the inside waters of southeastern Alaska. About 500 spend the winter around the main Hawaiian Islands.

The original population size of the North Atlantic Ocean is unknown, and the western North Atlantic Ocean stock is now reduced to about 1,000 animals (Winn, Edel, and Taruski, 1975). A small increase may have occurred in recent years. Estimates of the eastern North Atlantic Ocean population have not been made.

The original population of the Southern Hemisphere, which probably numbered about 100,000, now contains about 2,500 individuals (Masaki, 1975). The stock has apparently not increased since complete protection was given the species in 1964.

General Biology: The humpback whale is much more heavy bodied than members of the genus Balaenoptera, and is characterized by its extremely long flippers. It feeds mainly on euphausiids, but also eats anchovies and sardines when available. The species attains sexual maturity at an age of 6 to 12 years, when males average 11.6 m long and females 11.9 m. The mating and calving season is from October to March in the Northern Hemisphere, and April to September in the Southern Hemisphere. The gestation period is 12 to 13 months, and the calf nurses for about 11 months. The female rarely bears a calf 2 years in succession.

The humpback whale is heavily infested with three species of ectocommensal barnacles and with whale lice.

Ecological Problems: None known.

Allocation Problems: None at present.

Current Research: Observers aboard research vessels and foreign whaling ships record sightings of humpback whales and routinely report them to the International Whaling Commission. The National Marine Fisheries Service is conducting research on the summer grounds in southeastern Alaska and the winter grounds around the Hawaiian Islands.

References:

Allen, K. R. 1970. A note on baleen whale stocks of the Northwest Atlantic. Rep. Int. Comm. Whaling 20:112-113.

Chapman, D. G. In press. Status of research and baleen whale stocks in the Antarctic. Presented at IBP Conference on the Biology of Whales, Luray, Va., June 1971.

Chittleborough, R. G. 1965. Dynamics of two populations of the humpback whale, Megaptera novaeangliae (Borowski). Austr. J. Mar. Freshw. Res. 16:33-128.

Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/75. Unpublished report submitted to Scientific Committee, International Whaling Commission.

Nishiwaki, M. 1959. Humpback whales in Ryukyuan waters. Sci. Rep. Whales Res. Inst. 14:49-87.

Winn, H.E., R.K. Edel, and A. G. Taruski. 1975. Population estimate of the humpback whale (Megaptera novaeangliae) in the West Indies by visual and acoustic means. J. Fish. Res. Bd. Can. 32:499-506.

BLACK RIGHT WHALE

(*Balaena glacialis*)

Distribution and Migration: This right whale inhabits all temperate waters of the world. It migrates between summering grounds in cool temperate waters and wintering grounds in warm temperate waters; the wintering grounds are mostly along continental coasts or around islands.

Three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere.

In the eastern North Pacific Ocean, the right whale ranges from Bristol Bay and the Gulf of Alaska south to lat. 50°N during the summer, and from Oregon south to central Baja California during the winter.

In the western North Atlantic Ocean, it ranges from Labrador south to the Bay of Fundy during the summer, and Massachusetts south to Florida and Bermuda during the winter.

Abundance and Trends: The right whale was originally very abundant, but heavy exploitation, mostly during the 19th century, reduced all populations nearly to extinction by the turn of the century. At least some local stocks have increased in recent years. Present numbers are: North Pacific Ocean--about 220 (Wada, 1975); North Atlantic Ocean--no estimate; Southern Hemisphere--about 3,200 (Masaki, 1975).

General Biology: The black right whale is a heavy-bodied animal up to 18.0 m long and is characterized by lack of a dorsal fin and by a large head with a narrow arched rostrum. It feeds mainly on copepods. The reproductive biology is poorly known. Body length at sexual maturity is about 15.2 m in males and 15.8 m in females. Mating and calving occur in the winter, so the gestation period is probably about 1 year. The female probably bears a calf only once every 2 (or more) years.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: Research on the black right whale is being carried out by the South African Divison of Sea Fisheries and off Argentina by a joint project of the National Geographic Society and the New York Zoological Society. Observers aboard whaling and research vessels record sightings of right whales and routinely report them to the International Whaling Commission.

References:

Best, P. B. 1970. Exploitation and recovery of right whales Eubalaena australis off the Cape Province. S. Afr. Div. Sea Fish., Invest. Rep. 80:1-20.

Cummings, W. C., J. F. Fish, and P. O. Thompson, 1972. Sound production and other behavior of southern right whales, Eubalaena glacialis. Trans. San Diego Soc. Nat. Hist. 17(1):1-13.

Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/74. Unpublished report submitted to Scientific Committee, International Whaling Commission.

Omura, H. S. Ohsumi, T. Nemoto, K. Nasu, and T. Kasuya. 1969. Black right whales in the North Pacific. Sci. Rep. Whales Res. Inst. 21:1-78.

Wada, S. 1975. Indices of abundance of large-sized whales in the North Pacific in 1974 whaling season. Unpublished report submitted to Scientific Committee, International Whaling Commission.

BOWHEAD WHALE

(Balaena mysticetus)

Distribution and Migration: The bowhead whale inhabits arctic and subarctic waters in four principal areas: (1) from Spitzbergen west to east Greenland; (2) in Davis Strait, Baffin Bay, Hudson Bay, and adjacent waters; (3) in the Bering, Chukchi, Beaufort, and East Siberian Seas; and (4) in the Okhotsk Sea. These whales travel singly, in pairs or threes during the spring. In autumn they are generally scattered, but may occur in groups of up to 50. Bowheads migrate in association with the seasonal movement of arctic pack ice.

Abundance and Trends: All bowhead whale populations were decimated by the end of the 19th century because of the great value of this species for oil and baleen (Tomilin, 1957). No commercial whaling for bowheads has taken place since about 1915. Bowhead whales have been completely protected from commercial whaling by the Convention for the Regulation of Whaling since 1947, and, subsequently, by the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. These acts allow for a subsistence harvest of these whales by the Indians, Aleuts, and Eskimos. In the last two decades the take of bowhead whales by Eskimos in Alaska has been (Maher and Wilimovsky, 1963; Marquett, unpublished data):

Year	Whales taken	Year	Whales taken	Year	Whales taken
1952	2	1965	6	1972	38
1959	1	1966	13	1973	37
1960	19	1967	4	1974	20
1961	10	1968	16	1975	15
1962	12	1969	18	1976	48
1963	10	1970	24	1977	29
1964	16	1971	24		

The differences in take between years is primarily because of variation in hunting conditions, although in recent years an increase in hunting intensity has taken place. Bowhead whales are taken only occasionally by the USSR for their natives.

The size of the bowhead whale population in the Bering Sea and western Arctic Ocean is unknown. Based upon counts of whales migrating past ice stations near Barrow, Alaska, it is estimated that about 800 whales passed in the near-shore lead during the survey period. This is not a complete estimate because some whales migrated before and after the survey while an unknown number migrated in offshore leads and along the Siberian coast.

In the Spitzbergen area and the Okhotsk Sea, only a few sightings have been made in recent years.

General Biology:

Species Statistics.-- The bowhead whale grows to 18 m in length. The color is generally black or dark gray, marked by some white, generally on the chin but sometimes also on the belly.

Reproductive Data.-- Sexual maturity is reached at 11.6 m and 12.2 m in males and females, respectively. Mating probably occurs in early April or earlier. Gestation lasts 12 to 13 months, with a single calf (3 - 4.5 m long) born in April-May. The reproductive cycle is apparently 2 years long.

Age-Growth Data.-- The calf is weaned at 6 months. Yearlings are from 6.7 to 7.9 m long. These whales travel singly, in pairs or threes during the spring. In autumn they are generally scattered, but may occur in groups of up to 50.

Feeding Habits.-- The species feeds mainly on euphausiids and other krill, but occasionally on bottom-dwelling invertebrates.

Parasites and Diseases.-- Bowhead whales appear to be remarkably free of external and internal parasites.

Ecological Problems: The north-slope oil project might alter the inshore southward migration should fall steamer and barge traffic increase to force the whales farther offshore.

Allocation Problems: Some conflict of interest may exist between people who would like complete protection for bowhead whales and Eskimos who hunt these whales.

Current Research: The National Marine Fisheries Service contracted with the University of Southern California to gather biological data on bowhead whales in 1973. In the spring of 1973 a group of scientists from United States and Canadian universities attempted to record underwater sounds of the bowhead whale. The Fisheries Research Board of Canada makes annual surveys from planes of bowhead whales in Canadian waters. In the spring of 1974 the National Marine Fisheries Service re-instituted a research program on bowhead whales.

References:

Bruemmer, F. 1971. Whalers of the North. Beaver 302(3):44-55.

Davidson, A. No date. Eskimo hunting of howhead whales. Rural Alaska Comm. Action Program, Anchorage, Alaska. 37 p.

Fiscus, C. H., and W. M. Marquette. 1975. National Marine Fisheries Service field studies relating to the bowhead whale harvest in Alaska, 1974. National Marine Fisheries Service, Northwest Fisheries Center, Seattle, WA, 98112, 23 p. (Processed.)

Maher, W. J., and N. J. Wilimovsky. 1963. Annual catch of bowhead whales by Eskimos at Pt. Barrow, Alaska, 1928-1960. J. Mammal. 44:16-20.

Mansfield, A. W. 1971. Occurrence of the bowhead or Greenland right whale (Balaena mysticetus) in Canadian arctic waters. J. Fish. Res. Bd. Can. 28:1,873-1,875.

Marquette, W. M. 1976. Bowhead whale field studies in Alaska, 1975. Mar. Fish. Rev. 38(8):9-17.

Ross, W. G. 1974. Distribution, migration, and depletion of bowhead whales in Hudson Bay, 1860-1915. Arct. Alp. Res. 6(1):85-98.

Scammon, C. M. 1874. Marine mammals of the northwestern coast of North America: together with an account of the American whale fishery. J. H. Carmany and Co., San Francisco, 319 p.

Sonnenfeld, J. 1960. Changes in an Eskimo hunting technology, an introduction to implement geography. Assoc. Amer. Geogr. Ann. 50:172.

Tomilin, A. G. 1957. Zverli SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries. Vol. IX,Cetacea.) Moscow, Akad. Nauk. USSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

GANGES SUSU
(GANGES RIVER DOLPHIN)

(Platanista gangetica)

Distribution and Migration: This species (with which the Indus dolphin, P. minor, was formerly thought to be identical) is confined to the Ganges-Brahmaputra river system of India and Bangladesh, from tidal limits to the foothills, and the Karnaphuli River, a small river that empties into the Bay of Bengal east of the mouth of the Ganges. During the summer monsoon season, these dolphins extend their distribution up stream into the smaller tributaries; during the winter dry season they retreat into the larger main streams.

Abundance and Trends: No data are available on population size, but the species is still fairly numerous, and there is no indication that it is currently endangered. A few are captured incidentally in seines by fishermen, who attempt to release the dolphins alive.

General Biology: Sexual maturity is attained at an average age (estimated from growth layers in the teeth) of 10 years, when females have attained a body length of 1.70 to 2.00 m, and males a length of 1.70 m. Physical maturity is attained at an age of about 20 years, and a body length of 2.5 m, for females and 2.0 to 2.1 m for males. Mating is said to occur from July to September, and the single calf, .70 to .75 m long, is born between April and July after an apparent gestation period of 8 to 9 months. Such a short gestation period is highly questionable, and Pilleri (1971) suggests evidence for mating in April. The calves are weaned by the beginning of the next winter. The mean interval between successive calves is at least 2 years. These dolphins, which are blind, feed on shrimps and mud-frequenting fishes which they apparently catch by probing about in the bottom of the rivers.

Ecological Problems: None known.

Allocation Problems: None at present.

Current Research: Several field studies have recently been made by biologists from the University of Tokyo, the Bangladesh Agricultural University, and the University of Berne.

References:

Anderson, J. 1878. A monograph of the two cetacean genera Platanista and Orcella, pp. 355-550. In Anatomical and Zoological Researches 1. Bernard Quaritch, London.

Harrison, R. J. 1972. Reproduction and reproductive organs in Platanista indi and Platanista gangetica. Cetacea 4: 71-82.

Kasuya, T. 1972. Some informations on the growth of the Ganges dolphins with a comment on the Indus dolphin. Sci. Rep. Whales Res. Inst. 24: 87-108.

Kasuya, T., and A.K.M.A. Haque. 1972. Some informations on distribution and seasonal movement of the Ganges dolphin, Sci. Rep. Whales Res. Inst. 24: 109-115.

Pilleri, G. 1970. Observations on the behavior of Platanista gangetica in the Indus and Brahmaputra Rivers. Invest. Cetacea 2:27-60.

——— 1971. Observation on the copulatory behavior of the Gangetic dolphin. Platanista gangetica. Invest. Cetacea 3: 31-33.

INDUS SUSU
(INDUS RIVER DOLPHIN)

(Platanista minor)

Distribution and Migration: This species (which until recently was thought to be the same as the Ganges dolphin, P. gangetica) is confined to the Indus River system of Pakistan and India. It originally occurred throughout the system from tidal limits to the foothills, but is now absent from many sectors. Its movements have been restricted by the construction of many dams ("barrages"), which have split it into several separate populations.

Abundance and Trends: In 1974 the total population was estimated to be between 450 and 500 animals; most (350-400) inhabited the 100-mile (160-km) sector of the lower Indus between the Sukkur Barrage and Gaddu Barrage. The population appears to be decreasing at a rate of about 10 percent per year (Kasuya and Nishiwaki, 1975). These dolphins are captured with hoop nets by the local people who eat the meat and use the oil for its alleged medicinal properties.

General Biology: Almost nothing is known of the life history and ecology of this species, but it is presumably similar to the Ganges dolphin. The gestation period is said to be 1 year, with mating and calving in March and April. The annual reproductive rate has been roughly estimated at 0.05, and the annual mortality rate at 0.16.

Ecological Problems: The habitat has been greatly altered by the construction of weir as part of the extensive irrigation systems in Pakistan.

Allocation Problems: The marked lowering of the water during the dry season greatly limits the area available to the dolphins. The dolphins would be benefited by more economical use of the water for irrigation to maintain water levels above a certain minimum in the reserviors and main river channels.

Current Research: Several field studies have recently been made by biologists from the University of Tokyo, the University of Berne, the California Academy of Sciences, and the International Union for the Conservation of Nature and Natural Resources.

References:

Harrison, R. J. 1972. Reproduction and reproductive organs in Platanista indi and Platanista gangetica. Invest. Cetacea 4:71-82.

Herald, E. S., R. L. Brownell, Jr., F. L. Frye, E. J. Morris, W. E. Evans, and A. B. Scott. 1969. Blind river dolphins: first side-swimming cetacean. Science 166(3911):1,408-1,410.

Kasuya, T. 1972. Some informations on the growth of the Ganges dolphin with a comment on the Indus dolphin. Sci. Rep. Whales Res. Inst. 24:87-108.

Kasuya, T., and M. Nishiwaki. 1975. Recent status of the population of Indus dolphin. Sci. Rep. Whales Res. Inst. 27:81-94.

Pilleri, G. 1970. Observations on the behavior of Platanista gangetica in the Indus and Bramuputra Rivers. Invest. Cetacea 2:27-60.

_____1972. Observations carried out on the Indus dolphin Plantanista indi in the winter of 1972. Invest. Cetacea 4:23-29.

ROUGH-TOOTHED DOLPHIN

(Steno bredanensis)

Distribution and Migration: The rough-toothed dolphin inhabits tropical and warm temperate seas. It ranges in the western Atlantic Ocean from Virginia south. In the North Pacific Ocean it ranges north to southern Japan (35°N) where it is rare, and to the Hawaiian Islands where it is fairly common. It is known in the eastern Pacific from strandings near San Francisco and in the Galapagos Islands, and from several records in the tropical tuna fishery where it occasionally is captured together with bottlenosed, spotted, and spinner dolphins.

Abundance and Trends: The rough-toothed dolphin is uncommon, but not rare throughout most of its range. It is caught infrequently in the Japanese dolphin fishery (Ohsumi, 1972).

General Biology:

Age-Growth Data. -- This dolphin grows to about 2.4 m.

Feeding Habits. -- Very little is known about feeding habits of this species. The stomachs of specimens captured in the tuna fishery contained remains of fish and squid.

Ecological Problems: None known.

Allocation Problems: Rough-toothed dolphins are occasionally trapped accidentally in commercial fishing gear. In this way, a small number are lost in the eastern Pacific international tuna seine fishery.

Current Research: The Oceanic Institute in Hawaii is studying this species in the wild and had a Steno-Tursiops hybrid in captivity. Specimens retrieved from the incidental kill in the eastern Pacific international tuna fishery are examined at the Southwest Fisheries Center, La Jolla, California.

References:

Dohl, T. P., K. S. Norris, and I. King. 1974. A porpoise hybrid: Tursiops x Steno. J. Mammal. 55:217-221.

NOAA. 1972. Observation on the status of stocks and a recommended program to reduce the incidental kill of porpoise taken in the eastern tropical Pacific tuna seine fishery. Report of the NOAA Tuna-Porpoise Review Committee, 63 p.

Norris, K. S., and J. H. Prescott. 1961. Observations on Pacific cetaceans of California and Mexican waters. Univ. Calif. Publ. Zool. 63:291-402.

Ohsumi, S. 1972. Catch of marine mammals, mainly of small cetaceans by local fisheries along the coast of Japan. Bull. Far Seas Fish. Res. Lab. No. 7:137-166.

Perrin, W. F., and W. A. Walker. 1975. The rough-toothed porpoise, Steno bredanensis, in the eastern tropical Pacific. J. Mammal. 56:905-907.

Pryor, K. W., R. Haag, and J. O'Reilly. 1969. The creative porpoise: training for novel behavior. J. Exp. Anal. Behav. 12:653-661.

BOTTLENOSED DOLPHIN

(Tursiops truncatus)

Distribution and Migration: The bottlenosed dolphin is widely distributed in temperate and tropical waters, but strays into much colder latitudes. In the western North Atlantic, it ranges at least as far north as Nova Scotia and southern Greenland, but is best known from New England southward to Florida, westward throughout the Gulf of Mexico, and thence throughout the West Indies and Caribbean to Venezuela. From about North Carolina northward this species begins to distribute offshore, and southward its members are nearshore, riverine, and estuarine with far fewer distributed to the edge of the continental shelf. In the eastern Atlantic, it is found from the northeast Scandinavian coast to South Africa. In the eastern north Pacific it infrequently occurs in offshore currents, perhaps as far north as southern Oregon, but is far more common south of Point Conception, where individuals may be encountered primarily within the coastal zone but also less frequently on the continental slope and beyond. The species is probably continuous to central Chile. In the western Pacific, it is found north to Japan and south to Australia and New Zealand. Its Pacific range includes the Hawaiian Islands, where it is said to be common. Nominal species have been named from the tropical IndoPacific (T. aduncus), and the northern Gulf of California and waters along the west coast of Baja California and southern California (T. gilli). The geographical ranges and characters delimiting these named forms are still poorly defined. The Small Cetaceans Subcommittee of the International Whaling Commission commented on the taxonomy of Tursiops, as follows: "The necessary taxonomic work has not yet been done, it seems likely that there is only one species of Tursiops, with sharply-defined geographical races varying in body size and tooth size and distributed differentially relative to sea temperature and depth. There is great need to gather materials that will allow definitive examination of the nominal species T. aduncus, T. gilli, and T. nunanu, and materials from as many other populations as possible. These names are currently used by some workers." Subjective impressions and limited data from regional surveys and radio and static tagging programs suggest that populations are localized within about a 100-mile radius and that this species does not make long migrations. Bottlenosed dolphins are often seen in large loose schools of several hundred animals, which appear to consist of aggregations of small groups of no more than a dozen individuals. Humpback and right whales traveling along the Atlantic coast of Florida and pilot whales off the southern California coast are almost always accompanied by bottlenosed dolphins. Gray whales along southern and Baja California are also frequently accompanied by one or more Tursiops.

Abundance and Trends: In 1974-75, populations from Mobile Bay to western Louisiana alone were estimated from aerial surveys to number 3,500 to 10,000 animals (Leatherwood and Evans, 1976). Population estimates currently are not available for other areas.

In North Carolina, from 500 to 1,500 animals were killed annually during the early 20th century (Townsend, 1914). A few bottlenosed dolphins are now taken for food in small open-boat pilot whale fisheries in the Lesser Antilles (St. Vincent, St. Lucia, Dominica), and some are harvested by Venezuelan fishermen. In the past, several hundred bottlenosed dolphins have been taken each year off Florida, Mississippi, and Texas for display in marine aquariums and for research. Based on subjective data it is believed that local populations of the southwestern United States are not now being significantly affected by these activities (D. K. Caldwell, pers. comm.).

Small numbers are taken for food off Baja California and mainland Mexico, in the nets of tuna fishermen in the eastern tropical Pacific, and for aquarium display in southern California and Hawaii.

General Biology:

Reproductive Data. -- Gestation lasts about 1 year, and calves may nurse for 1.5 to 2 years, although they begin to take solid food at age 6 months. Breeding apparently occurs throughout the year, but the fact that most of the young are born during a certain time of year suggests that breeding, as well as calving, takes place in the spring and summer.

Age-Growth Data. -- Bottlenosed dolphins are 1.0 m long at birth and grow to 3.6 m in length and 650 kg in weight. Captive animals have become sexually mature at 6 years, but recent evidence suggests that this species normally breeds at about 12 years. The estimated life span for this species is about 25 years, but it may be longer indicating that natural mortality is low.

Feeding Habits. -- Bottlenosed dolphins feed on several species of fish, squid, and a few crustaceans. In many areas they are catholic in their food selection, seasonally capitalizing on the most abundant or accessible food species.

Ecological Problems: None known.

Allocation Problems: Some fishermen state that bottlenosed dolphins harass fishing efforts by biting fish and shrimp nets, and some attempt to drive them away. Bottlenosed dolphins are occasionally trapped accidentally in commercial fishing gear. In this way, a small number are lost in the eastern Pacific international tuna seine fishery. As indicated in the Tursiops truncatus Assessment Workshop (Odell, et al., 1975), the effect on the population of taking these animals for display and research off the southeast United States requires further study.

Current Research: Several agencies and institutions conduct or support research on the bottlenosed dolphin. Included are the Office of Naval Research, National Institutes of Health, and the National Science Foundation. The University of Florida concentrates its research on general life history, intraspecies communication, and ecological studies. The U. S. Fish and

Wildlife Service is conducting similar detailed studies of the life history of the animals near Tampa Bay, Fla. The Florida State Museum is studying systematics. Research on physiology, echolocation, anatomy, life history, and the behavior of captive and wild individuals has been done at the Naval Undersea Centers in San Diego and Hawaii. These laboratories are also assessing numbers and viability of regional stocks. Texas A&M University is conducting a detailed population study of Aransas Bay, Texas. Studies on vision are being carried out by scientists from the University of Miami. The Dolfinarium at Hardewijk, Netherlands, has recently conducted studies of the physiology and handling of these animals. Specimens retrieved from the incidental kill in the eastern Pacific international tuna fishery are examined at the Southwest Fisheries Center, where studies are underway on their systematics, distribution, life history, and feeding habits.

References:

Anderson, H. T. (ed.). 1969. The biology of marine mammals. Academic Press, New York, 511 p.

Caldwell, D. K., and M. C. Caldwell. 1972. The world of the bottlenosed dolphin. J. B. Lippincott Co., Philadelphia, 157 p.

Leatherwood, S. 1975. Aerial assessment of bottlenosed dolphins off Mississippi and western Louisiana, pp. 49-86. In D. K. Odell, D. B. Siniff, and G. H. Waring (eds.), Final report Tursiops truncatus assessment Workshop. Univ. Miami Contract Rep. UM-RSMAS-75042.

Leatherwood, S. 1975. Some observations of feeding behavior of bottlenosed dolphins (Tursiops truncatus) in the northern Gulf of Mexico and (Tursiops of T. gilli) off southern California, Baja California, and Nayarit, Mexico. Mar. Fish. Rev. 37(9):10-16.

Leatherwood, S., and W. E. Evans. In press. The bottlenosed dolphin, Tursiops truncatus: a synoptic account of the species. In S. H. Ridgeway and R. J. Harrison (eds.), A handbook of marine mammals of the world. Academic Press, New York.

Leatherwood, S., D. K. Caldwell, and H. E. Winn. 1976. Whales, dolphins, and porpoises of the western North Atlantic: a guide to their identification. NOAA Tech. Rep. NMFS Circ. 396, 176 p.

Norris, K. S. (ed.). 1966. Whales, dolphins, and porpoises. Univ. California Press, Berkeley, 789 p.

Odell, D. K., D. B. Siniff, and G. H. Waring (eds.). 1975. Final report Tursiops truncatus assessment workshop. Univ. Miami Contract Rep. UM-RSMAS-75041, 141 p.

Ridgeway, S. H. (ed.). 1972. Mammals of the sea: biology and medicine. Charles C. Thomas, Springfield, Ill., 812 p.

Sergeant, D. E., D. K. Caldwell, and M. C. Caldwell. 1973. Age, growth, and maturity of bottlenosed dolphin (Tursiops truncatus) from northeast Florida. J. Fish. Res. Bd. Can. 30:1,009-1,011.

SPINNER DOLPHIN
(Stenella longirostris)

Distribution and Migration.--The spinner dolphin inhabits tropical inshore and offshore waters around the world. In the United States, it has been recorded on the Gulf of Mexico but not on the U.S. Pacific Coast. In the eastern tropical Pacific, this species commonly associates with the spotted dolphin in mixed aggregations of up to several thousand animals. It is involved in the international tuna fishery in the eastern tropical Pacific, from Cabo San Lucas to Peru and west to about long. 145°W. Little is known of its migrations.

There are at least three races of spinner dolphin in the eastern Pacific and one in Hawaiian waters, differing modally in several characters. One form that occurs very near the coast of Central America, referred to below as the "Costa Rican" form, is relatively long, slender, and gray.

A second race, called "eastern spinner" occurs along the coast of Mexico and seaward about 800 km and is relatively short, slender, and gray. A third, called "whitebelly spinner," occurs in far offshore waters west to about long. 145°W and is relatively short, robust, and white below. A fourth form, relatively long, robust, and white below, occurs in Hawaiian waters and possibly to the south and west. The ranges of the eastern and whitebelly forms overlap. In the area of overlap, the two forms are occasionally captured together. A few apparent intergrades have also been collected. The eastern and whitebelly forms are involved in the international tuna fishery.

The maximum recorded straight-line movement of a single animal is 280 miles (448 km) in 396 days.

Abundance and Trends.--The size of the population of eastern spinner was estimated to be 1.2 million as of January 1, 1974. Projecting ahead to the beginning of 1977 on the basis of net reproductive rate and annual kills of 22,000, 26,000, and 8,700 in 1974, 1975, and 1976, the population size was 1.289 million, indicating a recent annual increase of 3 percent. This population size was determined to be 55 percent of the pre-exploitation size in 1977 and, therefore, very near the lower limit of optimum sustainable population (SWFC, 1976).

The population size of whitebelly spinner dolphin was estimated to be 690,000 or 80 percent of its initial size as of January 1, 1977. This estimate was determined using the ratio of sightings of whitebelly spinner dolphin and offshore spotted dolphin in 1976 and the estimate of spotted dolphin population size in 1976. The annual kills in 1974, 1975, and 1976 were 18,000, 39,000, and 40,200, respectively. Thus, it was determined that the population size of whitebelly spinners is decreasing at a rate of about 2 percent per year. Exploitation of whitebelly spinners has not been subjected to incidental mortality as long as the other forms of Stenella; therefore, the expected increase in reproduction due to a decreasing population size probably has not fully occurred yet.

General Biology.--Average length at birth is .77 m. Gestation is 10.6 months. Average length of males at attainment of sexual maturity is 1.7 m. Average length of adult males is 1.75 m (range 1.6 to 1.9 m). Average length of females at attainment of sexual maturity is 1.6 m. Average length of adult females is 1.7 m (range 1.5 to 1.8 m). Approximately 1 percent of adult females are postreproductive. Estimates of annual pregnancy rate range from 0.450 (based on 1973 data) to 0.474 (based on 1974 data). The pooled estimate for all years' data is 0.461. The corresponding estimates of calving interval (reciprocal of pregnancy rate) are 2.22 years, 2.11 years, and 2.17 years. Estimates of gross annual reproductive rate based on the 1973, 1974, and 1975 data are 0.099, 0.103, and 0.105, respectively. The estimate based on pooled data for the 3 years is 0.102.

Feeding Habits.--The spinner dolphin feeds on small pelagic fishes and squids.

Ecological Problems.--None known.

Allocation Problems.--Because of its association with yellowfin tuna, this species is taken incidentally by fishermen from the United States, Canada, France, Japan, Mexico, Panama, and other countries in coastal and international waters of the eastern tropical Pacific.

The foreign share of the tuna catch has been increasing in recent years resulting in an increasing proportion of the total incidental kill being caused by foreign fishermen. The increase is expected to continue.

Current Research.--The National Marine Fisheries Service and the tuna fishing industry are assessing the effects of porpoise mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. No other nation involved in the Pacific tuna fishery is conducting research aimed at improving rescue methods and gear to eliminate porpoise losses associated with the tuna harvest.

Other research includes systematics and ecological studies by P.J.H. van Bree at the Zoological Museum in Amsterdam, W. Dawbin at Sydney University, and E.D. Mitchell at the Arctic Biological Station of the Fisheries Board of Canada in Ste. Anne de Bellevue, Quebec; and ethological studies by K.S. Norris at the University of California at Santa Cruz.

REFERENCES

Bree, P.J.H. van. 1971. On skulls of Stenella longirostris (Gray 1828) from the eastern Atlantic. (Notes on Cetacea, Delphinoidea IV.) Beaufortia 19: 99-105.

Fitch, J.E., and R.L. Brownell, Jr. 1968. Fish otoliths in cetacean stomachs and their importance in interpreting feeding habits. J. Fish. Res. Bd. Can. 25: 2,561-2,574.

Green, R.E., W.F. Perrin, and B. Petrich. 1971. The American tuna purse seine fishery. In Hilman Hristjonsson (ed.) Modern fishing gear of the world, Vol. 3. United Nations FAO, Fishing Books, Ltd, London.

Hester, F.J., J.R. Hunter, and R.R. Whitney. 1963. Jumping and spinning behavior in the spinner porpoise, J. Mammal. 44: 586-588.

Mizue, K., K. Yoshida, and S. Sonoda. 1964. Studies on the little-toothed whales in the West Sea area of Kyusyu. X. About Prodelphinus sp., so-called "Hashinaga Iruka" in Japan caught in the sea area around Goto Is., Nagasaki Pref. Bull. Fac. Fish. Nagasaki Univ. 17: 10-24.

Morris, R.A., and L.S. Mowbray. 1966. An unusual barnacle attachment on the teeth of the Hawaiian spinning dolphin. Norsk Hvalfangst-Tid. 55(1): 15-16.

National Oceanic and Atmospheric Administration. 1972. Report of the NOAA Tuna-Porpoise Review Committee. Processed report, 63 p.

_____. 1975. Progress of research on porpoise mortality incidental to tuna purse-seine fishing for fiscal year 1975. Southwest Fisheries Center Administrative Report No. LJ-75-68, 98 p.

Perrin, W.F. 1969. Using porpoise to catch tuna. World Fish. 18(6): 42-45.

_____. 1972. Color patterns of spinner porpoise (Stenella cf. S. longirostris) of the eastern Pacific and Hawaii, with comments on delphinid pigmentation. Fish. Bull. (U.S.) 70: 983-1,003.

_____. 1972. Variation and taxonomy of spotted and spinner porpoises of the eastern tropical Pacific and Hawaii. Ph.D. dissertation, Univ. Calif., Los Angeles, xxvi + 590 p.

Perrin, W.F., and E.L. Roberts. 1972. Organ weights of noncaptive porpoise (Stenella spp.). Southern Calif. Acad. Sci. Bull. 71: 19-32.

Southwest Fisheries Center(SWFC). 1976. Report of the workshop on stock assessment of porpoises involved in the eastern tropical Pacific yellowfin tuna fishery. Southwest Fisheries Center Administrative Report No. LJ-76-29, 105 p.

SPOTTED DOLPHIN
(*Stenella attenuata*, *S. frontalis*, *S. graffmani*, *S. dubia*)

Distribution and Migration.--Knowledge of the spotted dolphins is scanty, and their taxonomy is confused, but two species probably exist. The taxonomy used here is provisional. One form is confined to warm waters of the Atlantic and probably is *Stenella plagiodon*, which is discussed in a separate status report. The other apparent species occurs in all tropical waters of the world, including the Atlantic Ocean, and has been identified as belonging to the four above-listed nominal species. Taxonomists do not agree on the taxonomy. The two apparent species differ in basic color pattern, but both have spots.

The spotted dolphin occurs in the Gulf Stream adjacent to the U.S. east coast. Nothing is known of its migrations. It has not been recorded from the U.S. Pacific coast, but it is the primary cetacean species involved offshore in the international yellowfin tuna fishery in the eastern tropical Pacific, from Cabo San Lucas to Peru and west to about long. 145°W. In the eastern tropical Pacific, this species commonly associates with the spinner dolphin in mixed aggregations of up to several thousand animals.

Skull measurements and other features indicate that there are at least two races of spotted dolphin in the eastern Pacific and another in Hawaiian waters. They differ in several features. A coastal form is relatively large and robust, has heavy jaws and teeth, and is restricted to onshore waters from Guaymas, Sonora, Mexico, to northern Peru. An offshore race is relatively small and slender, has lightly built jaws and teeth, is spotted to varying degrees, and occurs in offshore waters west to about long. 145°W. The races of the two forms may overlap, or the boundary between them may move seasonally or from year to year. They have not been observed or captured together, but in the central latitudes of the range the coastal form has been collected as far offshore as 50 km and the offshore form as far inshore as 20 km from the coast. The offshore form predominates in the eastern tropical Pacific yellowfin tuna fishery. Another race inhabits the waters around Hawaii and may extend into the South Pacific and to the west. This form also is small and slender, but relatively lightly spotted.

Abundance and Trends.--The size of the offshore spotted dolphin was estimated by a stock assessment workshop (SWFC, 1976) to be 3.5 million animals at the start of 1974. Projecting forward on the basis of net reproductive rate and annual mortalities of 72,000, 93,500 and 85,400 in 1974, 1975, and 1976, respectively, the population size as of January 1, 1977, was estimated to be 3.655 million (65%) of initial size with a range of 2.379 to 5.069 million based upon two standard errors. Using the above midpoint estimates, a recent annual increase in population size of 1.6 percent as indicated. Additionally, the population was determined to be within the lower end of the range of optimum sustainable population (SWFC, 1976).

Results of the 1977 aerial/shipboard survey will provide new population estimates. The estimates coupled with mortality data and a critical analysis of assumptions about stock boundaries, school sizes, and non-U.S. kill rates will allow a complete reassessment of the abundance and trends.

General Biology.--Average length at birth is 82.5 cm. Gestation is 11.5 months. Average length at 1 year is 1.3 m. Age is estimated from dentinal layers in thin sections of teeth. A two-phase Laird-Gompertz growth model has been fitted to layer-length data. Direct calibration of the dentinal layers beyond the first year (two layers) is not possible, and three alternative hypotheses are considered: (1) two layers per year, until pulp cavity occluded, (2) two layers per year in first year, and then one per year thereafter, and (3) two layers per year until puberty, and one per year thereafter. The second alternative is most probably the correct one, but reproductive parameters below are estimated in terms of dentinal layers. Breeding is diffusely seasonal, with prolonged calving seasons in spring and fall and a pronounced low in winter. A third calving season may exist in the summer. Average age at attainment of sexual maturity of males is approximately 12 dentinal layers (average length about 1.9 m and average weight about 75 kg); females attain sexual maturity on the average at about 9 dentinal layers and 1.8 m. Apparently post reproductive females are encountered in the samples. Corpora albicantia of ovulation and pregnancy persist indefinitely in the ovaries. It is not possible to distinguish between the two types of corpora. Ovulation rate changes with age, from about four per dentinal layers in very young adult females to about one per dentinal layer in older females. The average reproductive cycle lasts 26 months and consists of 11.5 months of pregnancy, 11.2 months of lactation, and 3.3 months of "resting" (not pregnant or lactating). About 4 percent of lactating females are pregnant. Pregnancy rate decreases with age, from about 0.6 per year at 8 to 10 dentinal layers, to about 0.3 at 16 layers. The sex ratio in the population overall is 44 percent males and 55.1 percent females. Sex ratio changes with age, from near parity at birth, indicating higher mortality rates for males. Average gross annual production of calves, 1973-75, based on age and sex structures of the sample and the estimated pregnancy rate, is 13.1 percent of the population per year. No evidence has been found of age or sex segregation in schooling. The estimated parameters differ in a consistent way from those estimated for a population of Stenella attenuata in the western Pacific, possibly reflecting the exploitation in the eastern Pacific.

Feeding Habits.--Spotted dolphins feed on small mesopelagic and epipelagic fishes and squids.

Ecological Problems.--None known.

Allocation Problems.--Because of their association with yellowfin tuna, many of these mammals are taken incidentally during tuna harvesting operations by fishermen from the United States, Canada, France, Japan, Mexico, Panama, and other countries in coastal and international waters in the eastern tropical Pacific.

The foreign share of the tuna catch has increased in recent years, resulting in an increasing proportion of the total incidental kill being caused by foreign fishermen.

Current Research.--The National Marine Fisheries Service and the tuna industry are assessing the effects of porpoise mortality and are improving rescue methods and gear to eliminate losses associated with the tuna harvest. No other nation involved in the Pacific tuna fishery is conducting research aimed at improving rescue methods and gear to eliminate porpoise losses associated with the tuna harvest.

Other research includes systematic and ecological studies by P.J.H. van Bree at the Zoological Museum in Amsterdam, W. Dawbin at Sydney University, and E.D. Mitchell at the Arctic Biological Station of the Fisheries Research Board of Canada in Ste. Anne de Bellevue, Quebec.

REFERENCES

Best, P.B. 1969. A dolphin (Stenella attenuata) from Durban, South Africa. Ann. S. Afr. Mus. 52(5): 121-135.

Caldwell, D.K., M.C. Caldwell, W.F. Rathjen, and J.R. Sullivan. 1971. Cetaceans from the Lesser Antillean Island of St. Vincent. Fish. Bull. (U.S.) 69:303-312.

Fraser, F.C. 1950. Description of a dolphin Stenella frontalis (Cuvier) from the coast of French Equatorial Africa. Atlantide-Report No. 1 Scientific Results of the Danish Expedition to the coasts of tropical West Africa 1945-1946. Danish Press, Copenhagen, 83 p.

Green, R.E., W.F. Perrin, and B. Petrich. 1971. The American tuna purse seine fishery. In Hilman Kristjonsson (ed.), Modern fishing gear of the world, Vol. 3. United Nations FAO, Fishing Boats, Ltd.

Kasuya, T., N. Miyazaki, and W.H. Dawbin. 1974. Growth and reproduction of Stenella attenuata in the Pacific coast of Japan. Sci. Rep. Whales Res. Inst. (Tokyo) 26: 157-226.

Mizue, K., and K. Yoshida. 1962. Studies on the little-toothed whales in the West Sea area of Kyusyu. IX. About Prodelphinus sp., so-called "Madara Iruka" in Japan caught at Ariko Wa in Goto Is., Nagasaki Pref. Bull. Fac. Nagasaki Univ. 13: 1-8.

National Oceanic and Atmospheric Administration. 1972. Report of the NOAA Tuna-Porpoise Review Committee. Processed report, 63 p.

National Oceanic and Atmospheric Administration. 1975. Progress of research on porpoise mortality incidental to tuna purse-seine fishing for fiscal year 1975. Southwest Fisheries Center Administrative Report No. LJ-75-68, 98 p.

Nishiwaki, M. 1966. A discussion of rarities among the smaller cetaceans caught in Japanese waters, pp. 192-202. In Norris, K.S., (ed.). Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

Perrin, W.F. 1969. Using porpoise to catch tuna. World Fish. 18(6): 42-45.

_____. 1970. Color pattern of the eastern Pacific spotted porpoise, Stenella graffmani Lonnberg (Cetacea, Delphinidae). Zoologica 54(4): 134-152.

_____. 1975. Distribution and differentiation of population of dolphins of the genus Stenella in the eastern tropical Pacific. J. Fish. Res. Bd. Can. 32:1,059-1,067.

Perrin, W.F., J.M. Coe, and J.R. Zweifel. 1976. Growth and reproduction of the spotted porpoise, Stenella attenuata, in the offshore eastern tropical Pacific. Fish. Bull. (U.S.) 74: 22-269.

Perrin, W.F., T.D. Smith, and G.T. Sakagawa. 1974. Status of populations of spotted dolphin, Stenella attenuata, and spinner dolphin, Stenella longirostris, in the eastern tropical Pacific. Working document presented at meeting of Ad Hoc Consultants Group on Small Cetaceans and Sirenians (Ad Hoc Group 2), Working Party on Marine Mammals, ACMRR, FAO, La Jolla, Calif., 16-19 Dec. 1974, 22 p. (proc.).

Perrin, W.F., R.R. Warner, C.H. Fiscus, and D.B. Holts. 1973. Stomach contents of porpoise Stenella spp., and yellowfin tuna, Thunnus albacares, in mixed-species aggregations. Fish. Bull. (U.S.) 71: 1,077-1,092.

Southwest Fisheries Center (SWFC). 1976. Report of the workshop on stock assessment of porpoises involved in the eastern tropical Pacific yellowfin tuna fishery. Southwest Fisheries Center Administrative Report No. LJ-76-29, 105 p.

ATLANTIC SPOTTED DOLPHIN

(Stenella plagiodon)

Distribution and Migration: The Atlantic spotted dolphin (exact taxonomic position not yet known) is probably confined to tropical and subtropical waters of the Atlantic Ocean. It occurs on the U.S. Gulf coast and off the east coast in Gulf Stream waters, and may be restricted to continental waters, being replaced in the West Indies by some other species in this genus (probably Stenella frontalis). Seasonal inshore-offshore migrations occur in Florida waters, and perhaps elsewhere in the Gulf of Mexico, with animals moving close to shore in late spring.

Abundance and Trends: Population estimates have not been made for this species. The only known fishery for the species has taken 12 or fewer animals per year for display; however, these animals do not easily withstand handling and captivity. Thus, an increased fishery for display animals is not likely.

General Biology: The newborn are about 0.8 m long, and the adults reach 2.0 to 2.2 m in length. Little is known of the life history of this species. Except for the annual spring migrations to near shore, this species is considered a mammal of the outer continental shelf or adjacent high seas. Spotted dolphins appear to feed primarily on squid in the wild, but they readily adopt to a fish diet in captivity. Newborn and young animals are not spotted, but progress through a series of color changes until the adults become spotted all over except for the ventral surface near the belly. This species is subject to infestations externally by barnacles and whale lice, internally by trematodes in the stomach, liver, and pancreas, and nematodes in the lungs and stomach. In captivity and in cold weather, these animals easily contract pneumonia.

Ecological Problems: Little is known about the ecology of this dolphin, but because it normally lives well offshore, it seems likely that it is little affected by man.

Allocation Problems: None known.

Current Research: Some information on this species has been gathered incidental to studies by the Office of Naval Research on the bottlenosed dolphin. Most of the recent research has been on various aspects of sound production by this species. However, David K. and Melba C. Caldwell have long been gathering general biological information at the Marine Mammal Center of the Communication Sciences Laboratory of the University of Florida located at Marineland, Florida (near St. Augustine).

References:

Cadenat, J. 1959. Rapport sur les petits Cetaces ouest-africains. Resultats des recherches entreprises sur ces animaux jusqu'au mois des mars 1959. Bull. I.F.A.N., Ser. A 21:1,367-1,409.

Caldwell, D. K., and M. C. Caldwell. 1966. Observations on the distribution, coloration, behavior and audible sound production of the spotted dolphin, Stenella plagiodon (Cope). Los Angeles County Mus., Contr. Sci. 104, 28 p.

_____1971. Underwater pulsed sounds produced by captive spotted dolphins, Stenella plagiodon. Cetology 1:1-7.

Caldwell, M. C., D. K. Caldwell, and J. F. Miller. 1973. Statistical evidence for individual signature whistles in the spotted dolphin, Stenella plagiodon. Cetology 16:1-21.

Caldwell, M. C., N. R. Hall, and D. K. Caldwell. 1971. Ability of an Atlantic bottlenosed dolphin to discriminate between, and potentially identify to individual, the whistles of another species, the spotted dolphin. Cetology 6:1-6.

Perrin, W. F. 1972. Variation and taxonomy of spotted and spinner porpoises of the eastern tropical Pacific and Hawaii. Ph.D. dissertation, Univ. Calif., Los Angeles, xxvi + 590 p.

Zam, S. G., D. K. Caldwell, and M. C. Caldwell. 1971. Some endoparasites from small odontocete cetaceans collected in Florida and Georgia. Cetology 2:1-11.

STRIPED DOLPHIN
(Stenella coeruleoalba)

Distribution and migration.--The striped dolphin inhabits temperate and tropical waters around the world and has been recorded from both U.S. coasts. Nothing is known about the movements of striped dolphins in waters contiguous to the United States.

Abundance and Trends.--Population estimates were made for the striped dolphin involved in the eastern tropical Pacific yellowfin tuna fishery (SWFC, 1976). The estimate was 248,000. The annual kill averages about 700 in this area, indicating no major impact.

General Biology.--Biological data are based on studies carried out on the population off Japan.

Reproductive Data.--The gestation period is 12 months long. Lactation lasts about 18 months, and the mean length of the reproductive cycle is about 3 years. Schools of striped dolphins segregate somewhat by age and sex.

Age-Growth Data.--The mean length of the newborn is 1 m. The mean age at sexual maturity in males and females is 9 years at 2.2 and 2.1 m, respectively.

Feeding Habits.--The stomachs of 27 specimens taken off Japan contained remains of mesopelagic fishes, squids, and crustaceans; myctophid fishes dominated.

Ecological Problems.--None known.

Allocation Problems.--The striped dolphin is involved in the eastern Pacific international tuna fishery to a minor extent.

Current Research.--A Federal program of research recently begun by Japan is expected to yield an estimate of population size in the northwestern Pacific Ocean. Studies of striped dolphins incidentally killed in the international tropical tuna fishery are underway at the Southwest Fisheries Center.

REFERENCES

Fraser, F.C., and B.A. Noble. 1970. Variation of pigmentation pattern in Meyen's dolphin, Stenella coeruleoalba (Meyen), p. 147-164. In Pilleri, G. (ed.) Investigations on Cetacea, Vol. II, Bentelli, Berne.

Girh, M., and G. Pilleri. 1969. On the anatomy and biometry of Stenella styx Gray and Delphinus delphis L. (Cetacea, Delphinidae) of the western Mediterranean, pp. 15-65. In Pilleri, G. (ed.), Investigations of Cetacea, Vol. I. Bentelli, Berne.

Hubbs, C.L., W.F. Perrin, and K.C. Balcomb. 1973. Stenella coeruleoalba in the eastern and central tropical Pacific. J. Mammal. 54: 549-552.

Kasuya, T. 1972. Growth and reproduction of Stenella coeruleoalba (sic) based on the age determination by means of dentinal growth layers. Sci. Rep. Whales Res. Inst. 24: 57-79.

Miyazaki, N., T. Kasaka, and M. Nishiwaki. 1973. Food of Stenella coeruleoalba. Sci. Rep. Whales Res. Inst. 25: 265-275.

Miyazaki, N., T. Kasuya, and M. Nishiwaki. 1974. Distribution and migration of two species of Stenella in the Pacific coast of Japan. Sci. Rep. Whales Res. Inst. 26: 227-243.

Southwest Fisheries Center (SWFC).1976. Report of the workshop on stock assessment of porpoises involved in the eastern tropical Pacific yellowfin tuna fishery. Southwest Fisheries Center Administrative Report No. LJ-76-29, 105 p.

COMMON DOLPHIN (WHITEBELLY PORPOISE)
(Delphinus delphis)

Distribution and Migration.--This species is worldwide in distribution in temperate to tropical waters of from 12° to 28°C. There may be more than one species; pronounced variation in size, shape, and coloration has been demonstrated for three distinct populations in the eastern Pacific (W.E. Evans, pers. comm.). In the northwestern Atlantic Ocean, where this animal is also known as the saddleback dolphin, this mammal ranges from Newfoundland to the Caribbean Sea. In the northeastern Pacific Ocean, the primary distribution of this species is from the California-Oregon border to Costa Rica, but one stranded animal was found in British Columbia. Large populations occur off southern California (Santa Barbara to San Diego), the west coast of Baja California, Mexico (Cedros Island to Cape San Lucas), and Costa Rica. A relatively large population also occurs in, and may be a resident of, the Gulf of California. In southern California waters Delphinus is present throughout the year, but is most abundant from August to January. An observed decrease in herd size during the spring and summer may be due primarily to the animals breaking up into small subgroups of 50 to 200 animals, and a general movement offshore and northward.

Abundance and Trends.--Population estimates were made for the common dolphin involved in the eastern tropical Pacific yellowfin tuna fishery (SWFC, 1976). The estimate was 1.4 million. The average annual kill of common dolphin in this area is about 9600 animals. This indicates that there is probably no major impact.

General Biology:

Reproductive Data.--Males and females may segregate between mating seasons, especially when the latter are nursing calves or are about to bear their young. The gestation period lasts 10 to 11 months with a post-parturition estrus. The young dolphin is weaned at about age 5 to 6 months (110-120 cm overall length), but may stay with the female up to 1 year. In the northeastern Pacific Ocean, this species appears to have two mating seasons (January-April and August-November) and two calving seasons (March-May and August-October).

Age-Growth Data.--The young are .75 to .85 m at birth. The males grow to 2.6 m and are an average of .14 m longer than females. The average individual of the northeastern Pacific Ocean is larger than that of the Black and Mediterranean Seas. The largest known specimen from the Black Sea was 2.1 m; however, in the northeastern Pacific Ocean a male 2.5 m long was taken.

Parasites and Disease.--Parasitism has been implicated in natural mortality. The brains of 12 stranded specimens contained flukes and their eggs, which in most cases had caused abscesses and lesions.

Feeding Habits.--This species is seldom found inside the 100-fathom line, but it frequents seamounts, escarpments, and other prominent offshore features. The animal makes most of its dives in excess of 10 fathoms after sunset. The deepest dive recorded is 140 fathoms, but the average dive is to 30 fathoms. During feeding the animal stays under water for 2 to 3 minutes, but dives of 5 minutes have been recorded. It feeds mainly on anchovy, sprat, pelagic pipefish, and cephalopods in the Black Sea: whiting, horse mackerel, sardine, and hake in the Atlantic Ocean; and anchovy, cephalopods, myctophids, and hake in the northeastern Pacific Ocean.

Ecological Problems.--None known.

Allocation Problems.--Because the northern anchovy and squid constitute the bulk of this mammal's diet in the northeastern Pacific Ocean, a substantial increase in the fishery for these resources might have a noticeable effect on the porpoise populations. Delphinus is the third most important species of porpoise taken incidentally in the eastern tropical Pacific international tuna purse-seine fishery.

The final estimated incidental kill in the international tuna fishery during 1974 was 4,000 animals. Estimates of incidental kills in previous years are 4,000 animals in 1971, 9,000 animals in 1972, and 22,000 animals in 1973.

Current Research.--The National Marine Fisheries Service and the tuna fishing industry are assessing the effects of porpoise mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. Studies of behavior, distribution, and abundance have been made by the Naval Undersea Center, San Diego, California since 1968. This research terminated at the end of FY '73 at NUC, but will continue at the Southwest Fisheries Center.

REFERENCES

Evans, W.E. 1971. Orientation behavior of Delphinus: radio telemetric studies. Ann. N.Y. Acad. Sci. 188: 142-162.

_____. 1975. Distribution, differentiation of populations, and other aspects of the natural history of Delphinus delphis Linnaeus in the northeastern Pacific. Ph.D. dissertation, University of Calif., Los Angeles, 145 p.

Gihr, M., and G. Pilleri. 1969. On the anatomy and biometry of Stenella styx Gray and Delphinus delphis L. (Cetacea, Delphinidae) of the western Mediterranean, pp. 15-65 In Pilleri, G. (ed.). Investigations on Cetacea, Vol. I. Bentelli, Berne.

National Oceanic and Atmospheric Administration. 1972. Report of the NOAA Tuna-Porpoise Review Committee. Processed report, 63 p.

Norris, K.S., and J.H. Prescott. 1961. Observations on Pacific cetaceans of California and Mexican waters. Univ. Cal. Publ. Zool. 63(4): 291-402.

Sleptsov. M.M. 1940. Determination of the age of Delphinus delphis L. Bull. Soc. Moscow, S. Biologique. 49(2): 43-61. (Fish. Res. Bd. Can. Transl. No. 46, 1957.)

Tomilin, A.G. 1948. On the biology and physiology of the Black Sea dolphin. Zool. Zhur. 27: 53-64.

Southwest Fisheries Center (SWFC). 1976. Report of the workshop on stock assessment of porpoises involved in the eastern tropical Pacific yellowfin tuna fishery. Southwest Fisheries Center Administrative Report No. LJ-76-29, 105 p.

FRASER'S (SARAWAK) DOLPHIN

(Lagenodelphis hosei)

Distribution and Migration: Only a single specimen of Fraser's dolphin, from Borneo, was known to science until 25 of the mammals were taken in a tuna purse seine in the eastern tropical Pacific. Since then, it has been recorded from several widely separated localities in the Pacific and Indian Oceans: Durban, South Africa; near Sydney, Australia; Tokyo, Japan; and the Central Pacific south of Hawaii.

Abundance and Trends: The animal is rare in collections and presumably not common in its habitat (Perrin, et al., 1973).

General Biology:

Age-Growth Data. -- Length at birth is about 1 m, and the adults are about 2.5 m long.

Feeding Habits. -- This dolphin feeds on deep-living fishes and squids.

Ecological Problems: None known.

Allocation Problems: Loss of Fraser's dolphins in the eastern Pacific international tuna fishery is minor in terms of absolute numbers, but may be significant considering the apparent extreme rarity of the animal. Of 34 identified specimens worldwide, 29 have been taken incidentally by tuna seiners.

Current Research: None.

References:

Fraser, F. C. 1956. A new Sarawak dolphin. Sarawak Mus. J. 7:478-503.

Perrin, W. F., P. B. Best, W. H. Dawbin, K. C. Balcomb. R. Gambel, and G. J. B. Ross. 1973. Rediscovery of Fraser's dolphin, Lagenodelphis hosei. Sarawak Mus. J. Nature. 241(5388):345-350.

WHITE-BEAKED DOLPHIN

(Lagenorhynchus albirostris)

Distribution and Migration: The white-beaked dolphin inhabits the coastal waters of the North Atlantic Ocean from the Barents Sea and Davis Strait to France and Massachusetts. It is most common in the North Sea from the east coast of the United Kingdom to the Faroe Islands, and may winter in the southerly parts of the North Atlantic Ocean. It appears in Davis Strait in the spring and summer after the belukha and narwhal migrate north and leaves in autumn sometimes as late as November. It apparently ranges farther north into Arctic waters than its relative, the white-sided dolphin.

Abundance and Trends: This species is one of the more abundant of North Atlantic toothed whales. Schools of as many as 1,500 have been reported from the coast of Norway where it is attracted by herring (Fraser, 1949).

Tomilin (1957) reports schools of several hundred and states that this species is taken commercially in Norway, but gives no statistics on the catch. He also mentions that it was once taken commercially in Davis Strait. Mitchell (1975) summarized a small-scale harvesting in Newfoundland.

General Biology: This gregarious species grows to 3.0 m and matures at 2.0 m or larger; the calves are as long as 1.2 m when born. The mating period is long, but limited to the warmer half of the year. Most of the calves are born during midsummer. Food is mainly fish such as herring, cod, whiting, and capelin, but also crustaceans and mollusks such as hermit crabs, whelks, and squids.

Ecological Problems: Strandings of schools of up to 30 animals have been reported.

Allocation Problems: None known.

Current Research: None.

References:

Fraser, F. C. 1949. Whales and dolphins. Part II. In J. R. Norman and F. C. Fraser, Field book of giant fishes, pp. 201-349. G. Putnam's Sons, New York.

Mitchell, E. 1975. Porpoise, dolphin and small whale fisheries of the world, status and problems. Int. Union Conserv. Nat. Resour., Morges, Switzerland, Monogr. 3:1-129.

Morzer Bruyns, Capt. W. F. J. 1971. Field guide of whales and dolphins. Amsterdam, Uitgeverij to/N. V. Uitgeverij v.h.c.a. mees, 258 p.

Nishiwaki, M. 1972. General biology, Chap. 1., pp. 1-204. In S. H. Ridgeway (ed.), Mammals of the sea, biology and medicine. Charles C. Thomas, Springfield, Ill.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries, Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii + 717 pp.)

Van Bree, P. J. H. 1970. Uber Weisschnauzdelphine (Lagenorhynchus albirostris) von den deutschen Nordseekusten. Natur. Mus. 100:264-268.

ATLANTIC WHITE-SIDED DOLPHIN

(Lagenorhynchus acutus)

Distribution and Migration: The Atlantic white-sided dolphin ranges the coastal waters of the North Atlantic Ocean from the Barents Sea and Davis Strait south to France and Cape Cod.

Abundance and Trends: The status of this species is unknown. According to Tomilin (1957), "this dolphin is taken only in summer in the waters of Norway: the animals are trapped in the fjords, which they enter in vast schools pursuing herring. The take may reach 1,500 individuals at a time." It is sometimes taken in association with pilot whales in Newfoundland drive fisheries (Sergeant and Fisher, 1957).

General Biology: This species grows to 3.0 m. Gestation is 10 months. The young are born mostly in midsummer and are about 1.0 m long. The age of a 1.5-m animal was estimated at 3 years (Sergeant and Fisher, 1957). It feeds mostly on squid, pelagic and benthopelagic fish such as mackerel, salmonids, and herring, and some crustaceans and mollusks such as Pagurus and Buccinum. Schools in excess of 1,000 animals have been reported while they were feeding; groups of 10 to 50 are normally seen.

Ecological Problems: Stranded schools of up to 30 have been reported.

Allocation Problems: None known.

Current Research: None.

References:

Sergeant, D. E., and H. D. Fisher. 1957. The smaller cetacea of eastern Canadian waters. J. Fish. Res. Bd. Can. 14:83-115.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii + 717 p.)

Utrecht, W. L. van, and A. M. Husson. 1968. Strandingen van Cetacea in het Voorjaar van 1967 op de Nederlandse Kusten. Lutra 10:7-17.

PACIFIC WHITE-SIDED DOLPHIN

(Lagenorhynchus obliquidens)

Distribution and Migration: The Pacific white-sided dolphin ranges the northern North Pacific from the coast of Japan and Baja California northward. It is found year-round off California and Washington and in Alaska and Kurile Islands waters during the summer, but has not been reported from the Bering Sea. It frequents the waters of the continental shelf and slope, but on occasion has been sighted in large schools in offshore waters. Small numbers, which are "resident" from Point Conception south to Cedros Island, appear to be morphologically different from northern forms (being larger and more robust). These resident stocks are supplemented in southern California and Baja California by migrants coming south and inshore. Inshore migrations into Monterey Bay and the central California continental shelf also apparently occur during midwinter.

Abundance and Trends: Norris and Prescott (1961) report the species as common off southern California in inshore waters in winter and spring and offshore in summer and fall. According to sighting reports in the files of the National Marine Fisheries Service, Seattle, the University of California, Santa Cruz, and the Naval Undersea Center, San Diego, as reported by Pike and MacAskie (1969), this species may be the most abundant dolphin north of southern California. No estimate of the size of the population along the west coast of North America has been made.

Nishiwaki (1972) estimates the population in Japanese waters to be between 30,000 and 50,000. Klumov (1959) reports that the Pacific white-sided dolphin is one of the two most numerous dolphins found in the late summer and fall in the Kurile Islands area, and forms schools of up to several thousand animals.

A few of these animals are taken for display in ocean aquaria.

General Biology: This species grows to 2.3 m, and weighs up to 181 kg. A male 1.2 m long with milk in its stomach was taken off Washington. It probably breeds in late spring to autumn, with a gestation period of 10 to 12 months. Schools of thousands are seen, often together with common and right-whale dolphins and less frequently with Grampus. It is active day and night, frolics, follows ships, dashes across ships' bows, and occasionally jumps clear of the surface. It adapts well to captivity. This dolphin feeds primarily on cephalopods and small fish such as herring, sardine, anchovy, and saury.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: A study of the natural history and behavior has been funded by the Marine Mammal Commission.

References:

Klumov, S. K. 1959. Commercial dolphins of the far east. Pac. Sci. Res. Inst. Fish. Econ. Oceanogr. (TINRO) Izv. 47:154-160. (Transl. by L. V. Sagen, 1962.)

Nishiwaki, N. 1972. General biology. Chap. I, pp. 1-204. In S. H. Ridgeway (ed.), Mammals of the sea, biology and medicine. Charles C. Thomas, Springfield, Ill.

Norris, K. S., and J. H. Prescott. 1961. Observations of Pacific cetaceans of California and Mexican waters. Univ. Calif. Publ. Zool. 63:291-402.

Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish. Res. Bd. Can., Bull. 171, 54 p.

Scheffer, V. B. 1950. The striped dolphin, Lagenorhynchus obliquidens Gill, 1865, on the coast of North America. Am. Midl. Nat. 44:750-758.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

NORTHERN RIGHT WHALE DOLPHIN

(Lissodelphis borealis)

Distribution and Migration: Little is known about the distribution of the northern right whale dolphin other than that it inhabits temperate waters of the North Pacific Ocean.

In the western North Pacific Ocean, the northern right whale dolphin is found from Cape Inubo, Japan, north as far as Etorofu and Paramushir Islands, from which it apparently migrates southward in autumn or winter to near the southern Kurils and is common, at least seasonally, in the northern Sea of Japan.

In the eastern North Pacific, this species has been reported from lat. 29° to 50°N, though mostly from California. It occurs in the southern California continental borderland only from October or November to about April.

Though it is also oceanic, the right whale dolphin has been observed most frequently along the continental slope and near such features as seamounts and banks. It has been seen close to the California Channel Islands and the mainland coast near San Diego and Palos Verdes. Two sightings and one specimen from the central Pacific suggest that the species may be continuously distributed across the temperate North Pacific.

Abundance and Trends: Groups of 200 are most common, but herds of an estimated size of from 300 to 1,000 off Japan and up to 2,000 off southern California have been seen. Although the species was once thought to be uncommon, aerial surveys have revealed that it is abundant off the Pacific Coast of North America (Leatherwood, pers. comm.). This species is reportedly common in the northern Sea of Japan (Okada and Hanaoka, 1940), where it is harvested.

General Biology: Newborn animals are about 0.6 m long and generally lighter in color than adults. They grow to 3.1 m. The species is gregarious and is frequently reported in close association with the white-sided dolphin, with which it shares an extensive common range.

Right whale dolphins may reach speeds in excess of 25 knots in bursts. One entire herd averaged more than 15 knots for 30 minutes while attempting escape from a helicopter. When approached, the animals may move away quietly or in a series of low angle leaps, each covering as much as 7 m. Individuals that are widely scattered when approached bunch together tightly while fleeing from the cause of their disturbance.

Food is primarily squid, but also miscellaneous fishes, including myctophids and engraulids. Parasites include trematodes and cestodes.

Ecological Problems: If migrations are food dependent, as they appear to be, decimation or contamination of food supplies in the southern end of its range could adversely affect the species.

Allocation Problems: None known.

Current Research: The only research known is an unfunded examination of all museum materials, collection of beached specimens, and survey of literature being conducted by J. S. Leatherwood, NUC, San Diego, R. F. Green, Ventura College, California, and W. A. Walker, Palos Verdes, California.

References:

Brownell, R. L. 1964. Observations of odontocetes in central California waters. Norsk Hvalfangst-Tid. 3:60-66.

Fiscus, C. H., and K. Niggol. 1965. Observations of cetaceans off California, Oregon, and Washington. *U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish.* 408, 27 p.

Leatherwood, S., and R. F. Green. In press. The right whale dolphins, Lissodelphis spp.: a synoptic account of the genus. In S. H. Ridgeway and R. J. Harrison (eds.), A handbook of marine mammals of the world. Academic Press, New York.

Nishiwaki, M. 1972. General biology: Cetacea, pp.3-204. In Sam H. Ridgeway (ed.), Mammals of the sea, biology and medicine, Charles C. Thomas, Springfield.

Norris, K. S., and J. H. Prescott. 1963. Observations of Pacific cetaceans in California and Mexican waters. Univ. Calif. Publ. Zool. 63:291-402.

Okada, Y., and T. Hanaoka. 1940. A study of Japanese Delphinidae. Sci. *Rep. Tokyo Bunrika* Daijaku 4(77):285-306.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

RISSO'S DOLPHIN

(Grampus griseus)

Distribution and Migration: Risso's dolphin ranges through all temperate and tropical seas. In western North America, its northern limit is British Columbia. It is sighted during the winter in central California. In the eastern United States it ranges from Massachusetts south. Strandings in Britain are most common during the summer. The species probably migrates to higher latitudes in the warmer months.

Abundance and Trends: Risso's dolphin was described in 1894 as "abundant" near Monterey Bay, Calif. (Daugherty, 1972). The species is uncommon but not rare throughout most of its range. Over 200 of these animals were sighted in one group during 1972 off the Washington coast (Fiscus, unpublished field notes, 1972).

General Biology: Risso's dolphin grows to 3.6 to 4.0 m. Its skin commonly has long, narrow, white marks believed to be scars caused by others of the same species. Solitary animals or schools of 12 or less are generally observed. This species is frolicsome, and sometimes leaps clear of the water. Known foods are almost exclusively cephalopods.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: Studies of distribution and abundance in the eastern Pacific are currently underway by K. S. Norris and a group of co-workers at University of California, Santa Cruz, and by J. S. Leatherwood of the Naval Undersea Center, C. S. Hubbs of Scripps Institution of Oceanography, and the Southwest Fisheries Center.

References:

Daugherty, A. E. 1972. Marine mammals of California. State Calif. Res. Agency, Dept. Fish Game, 91 p.

Orr, R. T. 1966. Risso's dolphin on the Pacific coast of North America. J. Mammal. 47:341-343.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Adak. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

MELON-HEADED WHALE

(Peponocephala electra)

Distribution and Migration: Peponocephala inhabits the tropical Atlantic, Indian, and Pacific Oceans.

Abundance and Trends: The status of this species is unknown, except that it is apparently rare (Nishiwaki and Norris, 1966).

General Biology: Unknown.

Ecological Problems: None known.

Allocation Problems: A few are taken annually in the eastern Pacific international purse seine fishery for tuna. This small take is probably insignificant.

Current Research: None.

References:

Nishiwaki, M., and K. S. Norris. 1966. A new genus Peponocephala for the odontocete cetacean species Electra electra. Sci. Rep. Whales Res. Inst. 20:95-100.

Perrin, W. F. 1976. First record of the melon-headed whale, Peponocephala electra, in the eastern Pacific, with a summary of world distribution. Fish. Bull. (U.S.) 74:457-458.

PYGMY KILLER WHALE

(Feresa attenuata)

Distribution and Migration: The pygmy killer whale probably inhabits most tropical waters.

Abundance and Trends: The status of this species is unknown except that it is apparently rare (Caldwell and Caldwell, 1971). The species has been captured for exhibit in the oceanaria of Hawaii and Japan. In the continental United States it has been recorded only three times, twice in Florida, once in Texas.

General Biology: The adults reach about 2.4 m. In appearance they resemble a small false killer whale. They are aggressive in captivity, with captives of other species showing fright reactions to them.

Ecological Problems: None known.

Allocation Problems: This species has been reported as captured to a very minor extent in the yellowfin tuna fishery in the eastern tropical Pacific.

Current Research: None.

References:

Best, P. B. 1970. Records of pygmy killer whale, Feresa attenuata, from southern Africa, with notes on behavior in captivity. Ann. S. Afr. Mus. 57(1):1-14.

Caldwell, D. K., and M. C. Caldwell. 1971. The pygmy killer whale, Feresa attenuata, in the western Atlantic, with a summary of world records. J. Mammal. 52:206-209.

_____1975. Pygmy killer whales and short-snouted spinner dolphins in Florida. Cetology, No. 18, 5 p.

James, P., F. W. Judd, and J. C. Moore. 1970. First western Atlantic occurrence of the pygmy killer whale. Fieldiana, Zoology 58:1-3.

Nishiwaki, M., T. Kasuya, T. Kamiya, T. Tobayama, and M. Nakajima. 1965. Feresa attenuata captured at the Pacific Coast of Japan in 1963. Sci. Rep. Whales Res. Inst. 19:65-90.

Perrin, W. F., and C. L. Hubbs. 1969. Observations on a young pygmy killer whale (Feresa attenuata Gray) from the eastern tropical Pacific Ocean. Trans. San Diego Soc. Nat. Hist. 15(18):297-308.

FALSE KILLER WHALE

(Pseudorca crassidens)

Distribution and Migration: The false killer whale ranges through all temperate and tropical seas. It is an oceanic form, found on the Atlantic side of the United States from North Carolina south, and on the Pacific side from the Aleutian Islands south.

Abundance and Trends: This species is uncommon throughout most of its range. It is seldom caught in the Japanese small-whale fishery, but is common on the Pacific side of Honshu (Ohsumi, 1972).

General Biology: The males grow to 6.1 m and the females to 4.9 m; adult animals weigh up to 1,360 kg. Mating appears to be over a protracted period, with young born at about 1.8 m. False killer whales are found in schools of both sexes and all ages. They have been seen eating dolphinfish (mahi-mahi) off Hawaii.

Ecological Problems: Schools of up to 835 of these animals have stranded.

Allocation Problems: The Japanese state that a toothed whale (shachi), which may or may not be the false killer whale, does much damage to their longline tuna industry by feeding on hooked fish.

Current Research: None.

References:

Bullis, H. H., and H. C. Moore. 1956. Two occurrences of false killer whales, and a summary of American records. Am. Mus. Nov. 1756; 5 p.

Mizue, K., A. Takemura, and K. Nakasai. 1969. Studies on the little-toothed whales in the West Sea area of Kyushu. XVI. Underwater sound of the false killer whale. Bull. Fac. Fish., Nagasaki Univ. 28:19-29.

Ohsumi, S. 1972. Catch of marine mammals, mainly of small cetaceans, by local fisheries along the coast of Japan. Bull. Far Seas Fish. Res. Lab. No. 7: 137-166.

Yamaguchi, Y. 1964. On the predation of tuna longline catches by the smaller toothed whales (Sachi). Maguro Gyogyo (Tuna Fishing) 27:59-73. (Transl. by T. Otsu, NMFS, Hawaii, June 1972).

LONG-FINNED PILOT WHALE

(Globicephala melaena)

Distribution and Migration: This pilot whale ranges from Greenland, Iceland, and the Barents Sea south to Virginia and the Mediterranean. It is a schooling mammal and appears regularly off the Canadian and United States coasts. It also inhabits temperate waters of the Southern Ocean. It generally favors pelagic regions, but often moves close to shore in search of food.

Abundance and Trends: Mercer (1975) estimates the original Newfoundland stock prior to 1947 at fewer than 60,000. There are no estimates for other parts of its range. About 40,000 were killed from 1951 to 1959 in local Newfoundland fisheries (Sergeant, 1962), but only 6,902 have been taken between 1962 and 1973. About 177,000 were taken in the Faeroe Islands from 1584 to 1883 (Tomilin, 1957), and 16,564 were taken by Norway and Denmark between 1962 and 1973 (Christensen, 1975). A total of 468 were driven ashore in Ireland in 1840, 1844, 1851, 1853, and 1957; one school of undetermined number was taken in 1965 (O'Riordan, 1975).

General Biology: The adults grow to about 6.5 m; females are usually mature at 6 to 7 years and males at about age 12. Calves are about 1.8 m long at birth, in July to August, although full-term fetuses have been found year-round. Cows probably bear calves every 3 years, gestation period is about 16 months, and lactation lasts about 2 years. Pilot whales are gregarious and occur in schools of hundreds and thousands. They have a distinct social organization; however, the sex ratio is not always equal in stranded groups. They are believed polygynous, with bachelor males sometimes forming separate schools. They travel in tight schools when not feeding, and disperse into scattered groups when on feeding grounds. Captive pilot whales feed at night and sleep days. They have a top swimming speed of more than 25 mph, and a longevity of about 50 years. They feed almost exclusively on squids · but also eat small fish such as clupeids and gadids. Sergeant (1962) estimates food intake per year at about 11.5 times the weight of the animal.

Ecological Problems: Whole schools sometimes strand.

Allocation Problems: None known.

Current Research: None.

References:

Christensen, I. 1975. Preliminary report on the Norwegian fishery for small whales: expansion of Norwegian whaling to Arctic and northwest Atlantic waters, and Norwegian investigations of the biology of small whales. J. Fish. Res. Bd. Can. 32:1,083-1,094.

Sergeant, D. E. 1962. The biology of the pilot or pothead whale Globicephala melaena (Traill) in Newfoundland waters. Fish. Res. Bd. Can., Bull. 132, vii+84p.

Mercer, M. C. 1975. Modified Leslie-DeLury population models of the long-finned pilot whale (Globicephala melaena) and annual production of the short-finned squid (Illex illecebrosus) based upon their interaction at Newfoundland. J. Fish. Res. Bd. Can. 32:1,145-1,154.

O'Riordan, C. G. 1975. Long-finned pilot whales, Globicephala melaena, driven ashore in Ireland, 1800-1973. J. Fish. Res. Bd. Can. 32:1,101-1,103.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

SHORT-FINNED PILOT WHALE

(Globicephala macrorhynchus)

Distribution and Migration: In the North Atlantic Ocean, this pilot whale has been reported from New Jersey (though it is far more common south of Cape Hatteras) and Madiera and ranges south to at least northern Brazil nd Dakar, Senegal. In the North Pacific Ocean it is found from Japan and the Aleutian Islands to probably Peru. It is an oceanic species with a very wide range. Schools of pilot whales appear regularly off U. S. coasts. It generally favors offshore waters, but often moves closer to land in search of food. Greatest numbers are seen in the eastern North Pacific in winter, fewer in summer.

Abundance and Trends: The status of this species is unknown except that it is fairly abundant around the California Channel Islands (Norris and Prescott, 1961). The population of pilot whales around the Channel Islands has been fished for live specimens to supply U. S. oceanaria since about 1955. Many pilot whales are taken in the Japanese small-whale fishery. This species is also taken in the lesser Antilles.

General Biology: The adults grow 4.6 to 6.7 m. Little work has been done on this species, but indications are that the general biology is similar to G. melaena.

Ecological Problems: Schools of this species often strand.

Allocation Problems: None known.

Current Research: The taxonomy of Pacific Globicephala is being studied by R. L. Brownell and D. K. Caldwell in the United States, and T. Kasuya and M. Nishiwaki in Japan. The U. S. Naval Undersea Center is studying the behavior and distribution of the pilot whale in southern and Baja California.

References:

Bree, P. J. H. van. 1971. On Globicephala seiboldi Gray, 1846, and other species of pilot whale (Notes on Cetacea, Delphinoidea III). Beaufortia 19(249):79-87.

Norris, K. S., and J. H. Prescott. 1961. Observations of Pacific cetaceans of Californian and Mexican waters. Univ. Calif. Publ. Zool. 63:291-402.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

KILLER WHALE

(Orcinus orca)

Distribution and Migration: The killer whale is worldwide and ranges north and south to polar ice. It is more common in cooler waters, and in more productive coastal areas. The Strait of Georgia in British Columbia, Prince William Sound in Alaska, and Puget Sound in Washington State are areas of concentration. Migratory habits probably depend on food supply, and killer whales are most numerous in Puget Sound in November and late summer. In Japan, most of these mammals are taken from April to November, with the greatest number from August to November. In the Norway fishery, killer whales seem dependent on distribution and migration of herring, capelin, and cod.

Abundance and Trends: Authoritative estimates of the world population are not available. A limited cooperative effort of the Fisheries Research Board of Canada and the Washington State Department of Game primarily in the inside waters of Washington and British Columbia gave counts of 459 killer whales in 1971, 255 in 1972, and 249 in 1973. About 65 individuals have been removed from inside waters of British Columbia and northern Washington State since 1962 for display by marine aquariums in 25 captive operations. Eleven of these whales were killed during U. S. capture operations, mostly during the early years. Two killer whales were killed in Canadian capture operations. The Japanese fishery took 1,439 killer whales from the Okhotsk Sea to south of Japan from 1948 to 1974. Norwegians took 2,096 in the northeastern North Atlantic between 1938 and 1974. The USSR took 444 animals in the Antarctic and North Pacific between 1958 and 1974. South Africa took 27 whales from 1972 to 1974.

General Biology:

Species Statistics. -- Females grow to 7.0 m and males to 8.2 m. Males weigh up to about 8,000 kg, with about 4,000 kg the apparent limit for females. An adult male dorsal fin may be 1.8 m high, considerably higher than that of the female. The body has conspicuous white markings on a black background.

Reproductive Data. -- Breeding appears to occur year-round although it may peak in May to July; gestation lasts 13 to 16 months. In the Northern Hemisphere births occur mostly in autumn.

Age-Growth Data. -- Newborn calves are about 2.4 m long and weigh about 180 kg.

Feeding Habits. -- Killer whales usually are found in groups of 10 to 100 or even more. The males are probably polygynous. Killer whales hunt successfully in packs, but there are no records of attacks on people.

The stomach contents of 364 killer whales taken off Japan from 1948 to 1957 included (in order of occurrence): fish (mostly cod, flatfish, and sardines), squid, octopus, dolphins, whales, and seals. Salmon constituted 1.6 percent of all stomach contents. Soviets in the Kurils recorded "fish and squid", but no

marine mammal remains in 10 animals. Of eight killer whales examined by the National Marine Fisheries Service, Seattle, six adult males had only marine mammal remains except for one squid; one adult female and one immature male had only fish remains. Food consumption has been estimated at 4 percent of the body weight per day.

Parasites and Diseases. -- The most common diseases are those caused by wearing of tooth crowns and denudation of the pulp cavity, which results in abscesses. Other diseases include bony outgrowths and bone tumors. Parasites include nematodes, cestodes, and trematodes. One Puget Sound killer whale stomach contained 5,000 nematodes.

Ecological Problems: This species has no natural enemies except man. Stranding probably is the greatest nonhuman hazard.

Allocation Problems: Public interest in killer whales was stimulated by the first live capture in 1964 in British Columbia. Growing public interest is increasing in killer whales as a recreational resource, especially in Puget Sound (Haley, 1970). The animals are commercially valuable in the United States for display in oceanariums. United States, Japanese, and Canadian fishermen contend that the whales cause gear damage and interfere with salmon and tuna longline fisheries. Many consider killer whales an important predator of salmon and herring; others defend them as the natural enemy of other fish eaters, including harbor seals and sea lions. Some sports salmon fishermen claim their presence spoils fishing.

Current Research: The National Marine Fisheries Service and the Fisheries Research Board of Canada are studying killer whale distribution in western United States and Canadian waters.

References:

Bigg, M. A., and A. A. Wolman. 1975. Live-capture killer whale fishery, British Columbia and Washington, 1962-73. J. Fish. Res. Bd. Can. 32: 1,213-1,221.

Haley, D. 1970. Views on the killer whale dispute. Pac. Search 5(1):1-3.

Jonsgård, Å., and P. B. Lyshoel. 1970. A contribution to the knowledge of the biology of the killer whale Orcinus orca (L). Nytt Mag. Zool. 18:41-48.

Nishiwaki, M., and C. Handa. 1958. Killer whales caught in the coastal waters off Japan for recent 10 years. Sci. Rep. Whales Res. Inst. 13:85-96.

Rice, D. W. 1968. Stomach contents and feeding behavior of killer whales in the eastern North Pacific. Norsk Hvalfangst-Tid. 57:35-38.

HARBOR PORPOISE

(Phocoena phocoena)

Distribution and Migration: The harbor porpoise is circumpolar in distribution in ice-free seas, ranging south in the Atlantic Ocean to the Delaware River and the Mediterranean Sea. In the Pacific Ocean it is found south to Japan and southern California, although it is not abundant south of San Francisco.

The harbor porpoise is an inshore species, frequenting coastal waters, the mouths of large rivers, harbors, and bays, and sometimes ascending freshwater streams.

Abundance and Trends: The harbor porpoise is especially abundant in the waters of Washington (Scheffer and Slipp, 1948) and western Canada (Pike and MacAskie, 1969). It is common at certain sites off the coast of Maine during the summer (Gaskin, Arnold, and Blair, 1974). Tomilin (1957) reports single catches of 2,000 to 2,500 harbor porpoises at the time they migrate between the Sea of Azov and the Black Sea.

Mohl-Hansen (1954) reporting on biological investigations of the harbor porpoise in Danish waters examined 188 harbor porpoises in 1941-42, 230 in 1942-43, and 212 in 1943-44, so at least those numbers were commercially harvested in Denmark during those years. He also states that these harbor porpoises were from the Baltic Sea populations.

Catches of P. phocoena in west Greenland recently have averaged over 2,500 annually. During 1972, an estimated 1,500 animals were taken in the non-Greenlandic salmon driftnet fishery. No estimates are available for Greenlandic driftnetters. In addition, about 1,000 are taken annually in direct catches (Kapel, 1975). In the Black Sea, where a moratorium has existed since 1967, an estimate of the present population is 25,000 to 30,000. Incidental catches of P. sinus have ranged from tens to the low hundreds annually.

General Biology: This species grow to 1.8 m, and weighs up to 72 kg. The females are sexually mature at about age 3 to 4 years. Newborn calves are half the length of the mother. They breed annually during late spring and summer. The gestation period is 10 to 11 months, and the calves nurse up to 8 months. Harbor porpoises travel in pairs and schools of up to 200 or more, especially on the feeding grounds. This species is less playful than most dolphins or porpoises; they seldom jump out of the water, and usually ignore passing boats. Schools containing all "bachelors" are common; the females stay in groups of mixed sex. Usually they swim just below the surface, rising about four times per minute to breathe when not feeding. They feed mainly on bottomfishes such as cod, herring fry, flounder, and occasionally on invertebrates such as squids, clams, and crustaceans. Parasites of the alimentary canal and respiratory system are common (Gaskin, Arnold, and Blair, 1974).

Ecological Problems: These animals occasionally strand for unknown reasons, and because of their feeding habits, a few tend to get trapped in fishermen's nets. (See Abundance and Trends.) They are preyed upon to an unknown degree by Greenland sharks, great white sharks, and killer whales. Significant residues of chlorinated hydrocarbon insecticides and PCB's have been recorded from the Baltic, United Kingdom, and Bay of Fundy.

Allocation Problems: None known.

Current Research: None.

References:

Fisher, H. D., and R. J. Harrison. 1970. Reproduction in the common porpoise (Phocoena phocoena) of the North Atlantic. J. Zool. 161:471-486.

Gaskin, D. E., P. W. Arnold, and B. A. Blair. 1974. Phocoena phocoena. Mammalian Species, (Am. Soc. Mamm.) No. 42, 8 p.

Kapel, F. O. 1975. Preliminary notes on the occurrence and exploration of smaller cetacea in Greenland. J. Fish. Res. Bd. Can. 32:1,079-1,082.

Lear, W. H., and O. Christensen. 1975. By-catches of harbour porpoise (Phocoena phocoena) in salmon driftnets at West Greenland in 1972. J. Fish. Res. Bd. Can. 32:1,223-1,228.

Mohl-Hansen, U. 1954. Investigations on reproduction and growth of the porpoise (Phocaena phocaena L) from the Baltic. Vidensk. Medd. Dan. Naturhist., Foren. 116:369-396.

Norris, K. S., and W. N. McFarland. 1958. A new harbor porpoise of the genus Phocoena from the Gulf of California. J. Mammal. 39:22-39.

Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish. Res. Bd. Can., Bull. 171, 54 p.

Scheffer, V. B., and J. W. Slipp. 1948. The whales and dolphins of Washington State with a key to the cetaceans of the west coast of North America. Am. Midl. Natur. 39:257-337.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobrazyne. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk, SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

DALL PORPOISE

(Phocoenoides dallii)

Distribution and Migration: The Dall porpoise inhabits the North Pacific Ocean from Japan and central Baja California north into the Bering and Okhotsk Seas. In both areas the southern limits of distribution appear to expand with the cooling of waters to at least 56°F, and individuals are seen in areas having surface temperatures of up to 62°F. It has been observed in the Bering Sea in locations and at periods when surface waters were 36°F. In the northeastern Pacific, Dall porpoises are year-round residents as far south as the northern Channel Islands, but are found further south and further inshore, as far as Cedros and Guadalupe Islands, from about October to late May. They are observed off Monterey Bay throughout the year, though there appears to be a separation of smaller juveniles inshore from more heterogenous groups offshore, and apparent inshore migrations tend to increase numbers of all animals there during winter and early spring. Dall porpoises are reported off San Francisco Bay from at least March through November. The southern and inshore movements appear closely related to movements of squid, a primary food item. The species is found offshore of the eastern Pacific coast to at least 1,047 km. The Marine Mammal Division has many records of Dall porpoise ranging from the Bering Sea and the eastern Aleutian Islands south to lat. 34° in California waters (MMD files, Marine Mammal Observations, 1958-72). The NMFS Southwest Fisheries Center and the Naval Undersea Center, San Diego, have similar detailed records of occurrences south to Cedros and Guadalupe Islands.

Abundance and Trends: The Dall porpoise is one of the most abundant small cetaceans found in Alaska inside waters (U. S. Forest Service) and in British Columbia waters (Pike and MacAskie, 1969). It is commonly seen off northern California (W. J. Houck, pers. comm.). The species appears to be abundant throughout its range. Kasuya (1974) also stated that between 4,500 and 7,500 are caught annually in coastal eastern Japan waters, but there has been a decrease in catch per unit effort in recent years.

General Biology: There may be two forms of Dall porpoise (P. dallii and P. truei). They grow to lengths of about 2.2 m and weights of about 218 kg. They and the killer whale have the most conspicuous color patterns among cetaceans. Calves are born in the spring and summer, and young are observed in August. These animals are usually found in groups of 2 to 20, but occasionally 200 or more are seen on favorable feeding grounds. It plays in the bow waves of ships, and is among the swiftest of all marine mammals. This mammal consumes squid and such fish as saury, hake, herring, jack mackerel, and bathypelagic and deepwater benthic fish.

Ecological Problems: None known.

Allocation Problems: Kasuya (1974) reports on annual accidental catch of more than 20,000 Dall porpoises in the Japanese high-seas salmon gillnet fishery in the northern North Pacific and Bering Sea west of long. 175°W.

Mizue and Yoshida (1965) state the Dall porpoise is abundant east of long. 175°W,but that the Japanese fishing fleet does not operate east of the boundary.

Current Research: W. J. Houck is studying P. dallii and P. truei at Humboldt State College in California, and M. Nishiwaki is studying these species in Japan. G. V. Morejohn is studying feeding habits, migration, behavior, and morphology of the species at the Moss Landing Marine Station, California. S. Leatherwood is monitoring seasonal movements of the species into waters of southern and Baja California.

References:

Kasuya, T. 1974. Biology, catch, and populations of Phocoenoides in the western North Pacific. FAO/ACMRR Report, Doc. 2, 20 p.

Leatherwood, S., and M. R. Fielding. 1974. Distribution and movements of the Dall porpoise Phocoenoides dallii in the temperate eastern Pacific. Working paper submitted by FAO/ACMRR Group, Dec. 1974, La Jolla, Calif.

Mizue, K., and K. Yoshida. 1965. On the porpoises caught by the salmon fishing gillnet in Bering Sea and the North Pacific Ocean. Bull. Fac. Fish. Nagasaki Univ. 19:1-36.

Mizue, K., K. Yoshida, and A. Takemura. 1966. On the ecology of the Dall's porpoise in Bering Sea and the North Pacific Ocean. Bull. Fac. Fish. Nagasaki Univ. 21:1-21.

Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish. Res. Bd. Can., Bull. 171, 54 p.

U. S. Forest Service. 1972. Marine mammal observations in southeastern Alaska and Prince William Sound. Unpublished field records.

WHITE WHALE
(BELUGA, BELUKHA)

(Delphinapterus leucas)

Distribution and Migration: The beluga inhabits the Arctic Ocean and adjacent seas, including the Okhotsk and Bering Seas, Cook Inlet, Hudson Bay, and Gulf of St. Lawrence. Belugas ascend several hundred miles up the large rivers of Siberia and Alaska. Populations of white whales from different areas show marked size differences through the Arctic. Three races are recognized by some authorities: dorofeevi from the Okhotsk Sea, marisalbi in the Barents and White Seas, and leucas in the rest of the range. In the Pacific, belugas are common along Alaska as far south as Bristol Bay; the population found in Cook Inlet is apparently separate.

Abundance and Trends: The population in the Soviet Arctic and Far East is estimated at between 32,000 and 58,000 (Yablokov, 1974). The population in the Canadian Arctic numbers at least 30,000 animals (Sergeant and Brodie, 1975). The Cook Inlet, Alaska, population is estimated at 300 to 500; in Bristol Bay the population is estimated at 1,000 to 1,500 and is considered stable; the size of the beluga population in Alaska north of Bristol Bay is unknown, but is much greater than that residing in Bristol Bay (Alaska Department of Fish and Game, 1973). In Alaska belugas have been used as a source of muktuk, meat, and oil for both people and dogs by residents of villages on the Bering Sea and Arctic Ocean coasts and along rivers that belugas periodically ascend. Belugas also provide a significant amount of fresh and preserved food for native peoples in the Mackenzie River delta region and Baffin Island, where beluga hunting is culturally and economically important (Brodie, pers. comm.). In recent years the demand for beluga products has been reduced in the Arctic. In Bristol Bay only a few belugas are now taken, and the estimated annual harvest of the Bering Sea and Arctic Ocean coasts of Alaska is 150 to 300 (Alaska Department of Fish and Game, 1973). Sergeant (1962) states that from 1948 to 1960 the catch of belugas in the Canadian Arctic averaged 1,200 annually. The present catch in Arctic Canada averages 500 animals per year (Sergeant and Brodie, 1975). A few animals are occasionally taken from the St. Lawrence River estuary population, which numbers 500 to 1,000 animals. In the late 1950's the annual catch of belugas averaged 3,000 to 4,000 in the U.S.S.R., 500 to 800 in Greenland, and 100 to 200 from Spitsbergen (Kleinenberg, et al., 1964). Present catches in the Asian Arctic range from 530 to 825 annually.

General Biology: Males grow to 4.6 m and the females to 4.0 m in the Beaufort Sea, and to 5.2 m and 4.6 m, respectively, in the Soviet Arctic. The beluga is polygamous, breeds in the spring, and has a gestation period of 15 months; newborn are about 1.5 m long. Lactation lasts about 20 months, with a 3-year reproductive cycle. They are gregarious and travel in groups of two or three to hundreds. Belugas feed from midwater to the bottom, with a diet including fish such as salmon, capelin, cisco, pike, char, cod, squid, crustaceans, and nereid worms.

They frequently occur in shallow areas with a bottom of mud, sand, and stones. The beluga produces high-pitched whistles and squeals, ticking and clucking sounds, and have been given the name "sea-canary." Animals break the ice with their backs to reach air for breathing.

Parasites include nematodes in the respiratory organs, ears, circulatory system, intestine, and urogenital system; trematodes are found in the intestine, as well as cestodes and acanthocephalans. Helminths are apparently one cause of mortality.

Ecological Problems: Known natural enemies include the killer whale and polar bear.

Allocation Problems: These mammals take salmon at the mouths of large Alaska rivers, and are important predators of salmon smolt in Bristol Bay, Alaska. Recorded killer whale sounds have been used experimentally to prevent beluga predation in the Kvichak River.

Current Research: Research on the beluga is being conducted by the Fisheries Research Board of Canada.

References:

Alaska Department of Fish and Game. 1973. Marine mammal status reports. Unpublished, Juneau, Alaska.

Brodie, P. F. 1971. A reconsideration of aspects of growth, reproduction, and behavior of the white whale (Delphinapterus leucas), with reference to the Cumberland Sound, Baffin Island, population. J. Fish. Res. Bd. Can. 28:1,309-1,318.

Fish, J. F., and J. S. Vania. 1971. Killer whale, Orcinus orca, sounds repel white whales, Delphinapterus leucas. Fish. Bull. (U.S.) 69:531-536.

Kleinenberg, S. E., A. V. Yablokov, B. M. Bel'kovich, and M. N. Tarasevich. 1964. Beluga (Delphinapterus leucas) investigation of the species. Akad. Nauk USSR. (Transl. by IPST, Jerusalem, 1969, 376 p.)

Klinkhart, E. G. 1966. The beluga whale in Alaska. Unpublished report, Alaska Department of Fish and Game, Juneau, Alaska.

Sergeant, D. E. 1962. The biology and hunting of beluga or white whales in the Canadian Arctic. Fish. Res. Bd. Can., Circ. 8, 13 p.

_____1973. Biology of white whales (Delphinapterus leucas) in western Hudson Bay. J. Fish. Res. Bd. Can. 30:1,065-1,090.

Sergeant, D. E., and P. F. Brodie. 1969. Body size in white whales, Delphinapterus leucas. J. Fish. Res. Bd. Can. 26:2,561-2,580.

_____1975. Identity, abundance and present status of populations of white whales, Delphinapterus leucas, in North America. J. Fish. Res. Bd. Can. 32:1,047-1,054.

Yablokov, A. V. 1974. Present status of beluga and narwhal in USSR Arctic and Pacific waters. FAO/ACMRR Report, Doc. 39.

NARWHAL

(Monodon monoceros)

Distribution and Migration: The narwhal is the most northern cetacean and occurs in north polar seas, mainly in the North Atlantic sector. It is most common in northwestern Greenland and the eastern Canadian Arctic, particularly Jones and Lancaster Sounds, the north and east coasts of Baffin Island, Repulse Bay, and occasionally in northern Foxe Basin and Hudson Strait. Narwhals also occur near Franz Josef Land and Novaya Zemlya. They are rare in the Laptev, East Siberian, Chukchi, and Beaufort Seas.

Abundance and Trends: The Canadian and northwest Greenland population is at least 10,000 (Mansfield, 1975). Numbers elsewhere are unknown. Rare occurrences in Great Britain (4) and Holland (1) are documented. Narwhals are hunted in Greenland and the eastern Canadian Arctic for dog food, muktuk, sinew, and ivory.

General Biology: Females attain a length of 4.0 m and a weight of 900 kg. Each female bears a single calf about once every 3 years. Mating takes place in April, and the 1.5-m-long young are born in July after a 14.5-month gestation period. Lactation probably lasts about 20 months. Narwhals are gregarious, forming schools of up to 1,000 to 2,000, and made up of small groups of up to about 20 (Mansfield, pers. comm.). Food of the narwhal consists mainly of cephalopods, Arctic cod, Greenland halibut, and shrimps.

Ectoparasitic whale lice occur in cuts, skinfolds, and around the base of the tusk. Endoparasitic nematodes occur occasionally in the stomach, and frequently in basicranial sinuses.

Ecological Problems: Narwhals are occasionally trapped in large numbers by rapid freeze-up. In such situations, Greenlanders may kill entire groups of these mammals. Although it is not adapted to drift ice areas, the killer whale probably occurs there and may be a natural enemy of the narwhal.

Allocation Problems: None known.

Current Research: The narwhal is being studied by the Fisheries Research Board of Canada.

References:

Best, R. C., and H. D. Fisher. 1974. Seasonal breeding of the narwhal (Monodon monoceros L.). Can. J. Zool. 53:429-431.

Degerbol, M., and P. Freuchen. 1935. Mammals: Report of the Fifth Thule Expedition, 1921-24. Vol. 2, Nos. 4 & 5. Nordisk Forlag, Copenhagen, 278 p.

Mansfield, A. W., T. G. Smith, and B. Beck. 1975. The narwhal, Monodon monoceros, in eastern Canadian waters. J. Fish. Res. Bd. Can. 32:1,041-1,046.

Peterson, R. L. 1966. The mammals of eastern Canada. Oxford Univ. Press, Toronto, 465 p.

Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitoobraznye. (Mammals of the U. S. S. R. and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.).

Vibe, C. 1950. The narwhal, pp. 77-84. In The marine mammals and marine fauna in the Thule District (Northwest Greenland) with observations on ice conditions in 1939-41. Medd. Gronl. 150(6).

SPERM WHALE

(Physeter macrocephalus)

Distribution and Migration: The sperm whale is nearly worldwide in distribution except for the pack ice of the polar regions. Females and immature animals are generally found between lat. 40°S and 50°N. Sperm whales appear to migrate north during the northern summer and south during the northern winter. In the North Pacific, male sperm whales are found as far north as the Bering and Okhotsk Seas; in the North Atlantic they move into Davis Strait and near Spitsbergen.

Abundance and Trends: In 1946, the world stock of exploitable males (i.e., males over the legal length limit of 9.2 m) and sexually mature females was over 1 million, of which almost half were males. The present stock is about 700,000, of which only about one third are males. These are distributed by major ocean areas as follows (Mitchell, 1974; Chapman, 1976; International Whaling Commission,1977):

Ocean	1946 population	Current population
North Atlantic	(22?)[a/]	22[a/]
North Pacific	400	300
South Atlantic	120	90
Indian	220	140
South Pacific	360	180

a/ Estimate of total population, including immature animals. All figures in thousands.

The total populations of each sex, including undersized males and immature females, are approximately 2.5 times the number of exploitable males and 1.67 times the number of mature females (Gambell, 1976).

The sperm whale is currently the most important species of the world whaling industry. Stocks in most areas are at or above maximum sustainable yield levels. Catches of sperm whales in recent seasons have been:

Season	North Pacific	North Atlantic	Southern oceans, pelagic[a/]	Southern land stations
1970	14,815	649	5,891	4,135
1971	10,890	831	7,335	4,498
1972	6,323	691	8,172	2,695
1973	8,567	613[b/]	9,394	2,652[d/]
1974	8,127	238[c/]	8,930	2,891[e/]
1976	5,854	111	4,075	70

a/ Southern ocean catches are for the seasons 1970-71 through 1975-76.

b/ No data from Azores or Madeira.

c/ No data from Azores, Madeira, or Spain.

d/ No data from Chile.

e/ No data from Peru.

In most areas, males dominate the catches, and in the Antarctic (south of lat. 40°S) the catch is almost exclusively males.

General Biology:

Species Statistics. -- The sperm whale's large squarish head is distinctive because it bears a tanklike "case" containing spermaceti. The lower jaw is long and narrow, and has about 25 pairs of teeth. Females reach 11.6 m in body length, males 16.8 m.

Reproductive Data. -- The females mature sexually about age 8 to 11 years when body length is about 8.5 to 9.1 m, physically at 25 to 30 years and body length of 11.0 m. Males are not sexually mature until about 10 years and 11.9 m, and are not "socially" mature until about age 25 years. Females and juveniles of both sexes form schools of 10 to 50 animals, averaging about 25. Younger, sexually mature males (ca. 11.0 - 13.4 m, age 15 - 25 years) form "bachelor" schools usually containing not more than 10 animals. Older males (13.7 m, 22 - 27 years) are usually solitary except when with schools of females for breeding for about 5 months in the spring and early summer. The female bears a calf (about 4.0 m) once every 3 to 5 years. Gestation lasts 14 to 15 months, and the calf nurses 1 to 2 years and is weaned at about 6.7 m long.

Age-Growth Data. -- Newborn calves are about 3.5 to 5 m, and weigh about 1,000 kg. Growth of males continues until they are 45 to 60 years old, and about 15.5 m long.

Feeding Habits. -- This species dives to at least 1,000 m, can remain submerged for about an hour, and feeds mainly on large squid. It also consumes significant quantities of octopuses and demersal and mesopelagic fishes.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: The National Marine Fisheries Service is studying the life history of the sperm whale. Other organizations carrying out research on this species are the Japanese Whales Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), British National Institute of Oceanography (South Africa and western South America), South African Division of Sea Fisheries (South Africa), Australian Commonwealth Scientific and Industrial Research Organization (Australia), the University of Chile (Chile), the Marine Institute of Peru (Peru), and the Marine Department of New Zealand (New Zealand).

References:

Berzin, A. A. 1971. Kashalot. Izdatel'stvo. Pishchevaya Promyshelennost, Moscow, 368 p.

Chapman, D. G. 1976. Summary of North Pacific sperm whale assessments. Unpublished report submitted to Scientific Committee, International Whaling Commission.

Gambell, R. 1976. World whale stocks. Mammal Rev. 6(1):41-53.

International Whaling Commission. (In press) Report of the Sperm Whale Meeting, La Jolla, Calif., 16-25 March 1976. Rep. Int. Comm. Whaling 27.

Mitchell, E. 1974. Canada, progress report on whale research, May 1972 to May 1973. Rep. Int. Comm. Whaling 24:196-213.

Ohsumi, S., and Y. Fukuda. 1974. Revised sperm whale population model and its application to the North Pacific sperm whale. Rep. Int. Comm. Whaling 24:91-101.

PYGMY SPERM WHALE

(Kogia breviceps)

Distribution and Migration: The pygmy sperm whale occurs in all the warmer seas of the world. In the Pacific Ocean it ranges north to Washington and Japan; in the Atlantic Ocean it ranges north to Nova Scotia and the Netherlands. Its southern range limit is not well known.

Abundance and Trends: The status of this species is unknown other than the fact that it is apparently rather rare. There are many more records of stranding than there are for Kogia simus, the dwarf sperm whale (C. O. Handley, Jr., pers. comm.). This species is occasionally taken in the Japanese small-whale fishery (Yamada, 1954).

General Biology: Adult pygmy sperm whales are 2.7 to 3.4 m long. Their dorsal fin is low and posterior to the center of the back. This species was long confused with the dwarf sperm whale, and the following composite statement is based on both species. They are usually solitary or in small pods. They feed mostly on squid, but also take pelagic crustaceans such as shrimps and giant mysids. Females simultaneously pregnant and lactating have been found, suggesting that they may bear a calf 2 years in succession.

Parasites include tapeworm cysts in the blubber, roundworms in the stomach, and giant kidney worms.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: D. K. Caldwell and M. C. Caldwell have been gathering data on the life history in Florida (D. K. Caldwell, pers. comm., 1974). D. K. Caldwell, M. C. Caldwell, and C. O. Handley, Jr., have been working on the distribution (seasonal as well as geographical) in southeastern United States (Caldwell, pers. comm., 1974).

References:

Allen, G. M. 1941. Pygmy sperm whale in the Atlantic. Zool. Ser., Field Mus. Nat. Hist. 27:17-36.

Handley, C. O., Jr. 1966. A synopsis of the genus Kogia (pygmy sperm whales), pp. 62-69. In K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press. Berkeley and Los Angeles.

Yamada, M. 1954. Some remarks on the pygmy sperm whale, Kogia. Sci. Rep. Whales Res. Inst. 9:37-58.

DWARF SPERM WHALE

(*Kogia simus*)

Distribution and Migration: The dwarf sperm whale apparently has a discontinuous distribution around the world. It has been found in the seas adjacent to South Africa, India, Ceylon, Japan, Hawaii, South Australia, and the west and east coasts of the United States. On the west coast it has been recorded only from Cabo San Lazaro, Baja California, and San Luis Obispo County, California. On the east coast it ranges from Cape Henry, Virginia, south and west to Texas.

Abundance and Trends: The status of this species is unknown other than the fact that it is apparently rather rare over much of its range. However, it strands rather frequently on the southeast coast of the United States and is taken in the Japanese small-whale fishery (Yamada, 1954).

General Biology: Adult dwarf sperm whales are 2.1 to 2.7 m long. Their dorsal fin is high and near the center of the back. This species was long confused with the pygmy sperm whale, and the following is a composite statement based on both species. They are usually solitary or in small pods. They feed mostly on squid, but also take pelagic crustaceans such as shrimps and giant mysids. Females simultaneously pregnant and lactating have been found, suggesting that they may bear a calf 2 years in succession.

Parasites include tapeworm cysts in the blubber, roundworms in the stomach, and giant kidney worms.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: D. K. Caldwell and M. C. Caldwell have been gathering data on the life history in Florida (D. K. Caldwell, pers. comm., 1974). D. K. Caldwell, M. C. Caldwell, and C. O. Handley, Jr., have been working on the distribution (seasonal as well as geographical) in southeastern United States (Caldwell, pers. comm., 1974).

References:

Handley, C. O., Jr. 1966. A synopsis of the genus *Kogia* (Pygmy sperm whales), pp. 62-69. *In* K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

Yamada, M. 1954. Some remarks on the pygmy sperm whale, *Kogia*. Sci. Rep. Whales Res. Inst. 9:37-58.

BAIRD'S BEAKED WHALE
GIANT BOTTLENOSE WHALE

(Berardius bairdii)

Distribution and Migration: The giant bottlenose whale is endemic to the North Pacific Ocean, where it ranges from St. Matthew Island in the Bering Sea south to central Honshu on the western side and southern California on the eastern side. Its migrations are poorly known.

Abundance and Trends: The status of this species is unknown except that it is uncommon, but not rare. According to information taken from the Bureau of International Whaling Statistics, between 100 and 400 giant bottlenose whales have been taken annually in the Japanese small-whale fishery during the past 20 years.

General Biology: This species is the largest of the beaked whales. Males attain a maximum length of 11.9 m and females 12.8 m. Their long narrow beak, bulging forehead, and size distinguish them from other species of beaked whales in the North Pacific Ocean. They usually travel in tight schools of up to 30 individuals. Their main foods are deepwater fishes and squids. Males attain sexual maturity at a length of about 10.0 m, and females at about 10.3 m. Sexual maturity is not attained earlier than age 3 years, and probably much later. Mating takes place mostly in February, and calves are born in December.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: Research on this species has been conducted incidentally to other studies in Japan by the Whales Research Institute and the Ocean Research Institute; in California by the National Marine Fisheries Service; and in British Columbia by the Fisheries Research Board of Canada.

References:

Betesheva, E. I. 1960. Pitanie kashalota (Physeter catodon L.) i berardiusa (Berardius bairdii Stejneger) v raione Kuril'skoi gryady. Trudy Vses. Gidrobiol. Obshch. 10:227-234.

Bureau of International Whaling Statistics 1952-1972. International Whaling Statistics.

Nishiwaki, M., and N. Oguro. 1971. Baird's beaked whales caught on the coast of Japan in recent 10 years. Sci. Rep. Whales Res. Inst. 23:111-122.

Omura, H., K. Fujino, and S. Kimura. 1955. Beaked whales Berardius bairdii of Japan, with notes on Ziphius cavirostris. Sci. Rep. Whales Res. Inst. 10:89-132.

CUVIER'S BEAKED WHALE

(Ziphius cavirostris)

Distribution and Migration: The goose-beaked whale is found in all oceans except Arctic and Antarctic waters. In the North Pacific Ocean it ranges north to Hokkaido, the Commander and Aleutian Islands, and the Queen Charlotte Islands. In the North Atlantic Ocean it ranges north to Cape Cod, Mass., on the western side and the Shetland and Orkney Islands on the eastern side. Its migrations are not understood.

Abundance and Trends: The status of this species is unknown. The goose-beaked whale is the most frequently observed ziphiid, at least in the eastern North Pacific Ocean, and throughout its range has been found stranded far more often than any other species of the family (Mitchell, 1968). Between 13 and 16 goose-beaked whales have been taken annually in the Japanese small-whale fishery during a recent 5-year period (Nishiwaki and Oguro, 1972).

General Biology: The goose-beaked whale is distinguishable from other ziphiids by its relatively short beak, the dorsal profile of which forms an almost straight line with the steeply sloping forehead, and by its brown coloration; older males have snow-white heads. The maximum body length in both sexes is about 7.0 m. These whales usually travel in tight schools of up to about 10 individuals, but old males are often solitary. Their main foods are squids and deepwater fishes. Sexual maturity is attained at a length of about 5.5 m in both sexes.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: Research on this species has been conducted incidentally to other studies in Japan by the Whales Research Institute and the Ocean Research Institute.

References:

Mitchell, E. 1968. Northeast Pacific stranding distribution and seasonality of Cuvier's beaked whale Ziphius cavirostris. Can. J. Zool. 46:265-279.

Nishiwaki, M., and N. Oguro. 1972. Catch of Cuvier's beaked whales off Japan in recent years. Sci. Rep. Whales Res. Inst. 24:35-41.

NORTH ATLANTIC BOTTLENOSE WHALE

(Hyperoodon ampullatus)

Distribution and Migration: This species of bottlenose whale is endemic to the colder waters of the North Atlantic Ocean. On the western side it ranges from Davis Strait south to Rhode Island; on the eastern side it ranges from Novaya Zemlya south to the Azores and English Channel. It migrates south in the autumn and north in the spring.

Abundance and Trends: The initial population in all waters east of Greenland is estimated to have been between 40,000 and 100,000; by 1915 it was reduced to about half its initial size (Christensen, 1974). It is not known whether it has since increased. Norwegian catches in the North Atlantic ranged from 2,000 to 3,000 annually between 1890 and 1900. Catches ranged from 20 to 100 per year from 1920 to 1954. From 1955 to 1971, a few hundred have been caught annually, peaking at about 700 in 1965. Catches have been near zero since then. A few individuals are sometimes taken by whalers operating from Nova Scotia and the Faeroe Islands.

General Biology: The bottlenose whale is easily recognized by a conspicuous beak that is sharply demarked from the high bulging forehead which, in old males, becomes almost vertical and flattened in front and slightly overhangs the base of the beak. Bottlenose whales are black when young, turn brown when adult and almost yellow with a white head when very old. Males attain a maximum length of 10.7 m, and females 9.7 m. Females attain sexual maturity at about 9 years, males at 9 to 11 years. Mating occurs in April, and the 3.0-m calf is born about 12 months later. Bottlenose whales usually travel in small herds of 4 to 10, but the adult males are often by themselves. Their food appears to be mainly squids. Females attain sexual maturity when about 6.5 m long. The calves are born from early spring to early summer.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: This species is being studied by the Statens Institutet for Hvalforskning, Oslo, Norway.

References:

Bureau of International Whaling Statistics. 1936-1972. International Whaling Statistics.

Benjaminsen, T. 1972. On the biology of the bottlenose whale, Hyperoodon ampullatus (Forster). Norw. J. Zool. 20:233-241.

Christensen, I. 1973. Age determination, age distribution and growth of bottlenose whales, Hyperoodon ampullatus (Forster), in the Labrador Sea. Norw. J. Zool. 21:331-340.

_____1974. The history of exploitation and the initial status of the northeast Atlantic bottlenose whale (Hyperoodon ampullatus). FAO/ACMRR Report, Doc. 21, 23 p.

Gray, D. 1882. Notes on the characters and habits of the bottlenose whale (Hyperoodon rostratus). Proc. Zool. Soc., London, 1882:725-731.

Jonsgård, Å. 1952. Om bottlenosen (Hyperoodon rostrata) og spekkoggern (Orcinus orca). Fauna (1):1-18.

Murray, J., and J. Hjort. 1912. The depths of the ocean. MacMillan and Co., London, 821 p.

TRUE'S BEAKED WHALE

(Mesoplodon mirus)

Distribution and Migration: The True's beaked whale has been found in the western North Atlantic Ocean from Nova Scotia south to Northern Florida, and in the eastern North Atlantic Ocean from the Outer Hebrides south along the west coast of Ireland. There is another population off the coast of South Africa. Its migrations are unknown.

Abundance and Trends: The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General Biology: These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: None.

References:

Moore, J. C. 1966. Diagnoses and distributions of beaked whales of the genus Mesoplodon known from North American waters, pp. 32-61. In K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkely and Los Angeles.

_____1968. Relationships among the living genera of beaked whales with classifications, diagnoses and keys. Fieldiana: Zool. 53(4):209-298.

ANTILLEAN BEAKED WHALE

(Mesoplodon europaeus)

Distribution and Migration: The Antillean beaked whale ranges from Trinidad, Jamaica, and the Gulf of Mexico, north to Long Island, New York. One record for the English Channel has been obtained. Its migrations are unknown.

Abundance and Trends: The status of this species is unknown, except that it is apparently rare (Moore, 1966).

General Biology: These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems: None known.

Allocation Problems: None known.

Current Problems: None.

References:

Moore, J. C. 1966. Diagnoses and distributions of beaked whales of the genus Mesoplodon known from North American waters, pp. 32-61. In K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

GINKGO-TOOTHED WHALE

(*Mesoplodon ginkgodens*)

Distribution and Migration: The ginkgo-toothed whale has been recorded from Ceylon, in the western North Pacific Ocean from Taiwan to the Sanriku coast of Hokkaido, and in the eastern North Pacific Ocean at Del Mar in southern California. Its migrations are unknown.

Abundance and Trends: The status of this species is unknown, except that it may not be so rare in the western part of the North Pacific as once thought (Nishiwaki, et al., 1972).

General Biology: These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: None. Present knowledge is based on opportunistic examination of specimens.

References:

Moore, J. C., and R. M. Gilmore. 1965. A beaked whale new to the western hemisphere. Nature 205(4977):1,239-1,240.

Nishiwaki, M., and T. Kamiya. 1958. A beaked whale stranded at Oiso Beach, Japan. Sci. Rep. Whales Res. Inst. 13:53-83.

Nishiwaki, M., T. Kasuya, K. Kureha, and N. Ogara. 1972. Further comments on *Mesoplodon ginkgodens*. Sci. Rep. Whales Res. Inst. 24:43-56.

ARCH-BEAKED WHALE

(Mesoplodon carlhubbsi)

Distribution and Migration: The arch-beaked whale has been recorded only in the North Pacific Ocean, from the Sanriku coast of Hokkaido on the western side and from British Columbia south to southern California on the eastern side. Its migrations are unknown.

Abundance and Trends: The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General Biology: These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: None.

References:

Moore, J. C. 1963. Recognizing certain species of beaked whales of the Pacific Ocean. Am. Midl. Natur. 70:396-428.

_____1966. Diagnoses and distribution of beaked whales of the genus Mesoplodon known from North American waters, pp. 32-61. In K. S. Norris (ed.), Whales, dolphins and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

_____1968. Relationships among living genera of beaked whales with classifications, diagnoses and keys. Fieldiana: Zool. 53:209-298.

Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish.Res. Bd. Can., Bull. 171, 54 p.

BERING SEA BEAKED WHALE

(Mesoplodon stejnegeri)

Distribution and Migration: The Bering Sea beaked whale is endemic to the North Pacific Ocean. It ranges from the Commander and Pribilof Islands, Bristol Bay, and the northern Gulf of Alaska south to the Sea of Japan on the western side and Oregon on the eastern side. Its migrations are unknown.

Abundance and Trends: The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General Biology: These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: None.

References:

Moore, J. C. 1963. Recognizing certain species of beaked whales of the Pacific Ocean. Am. Midl. Natur. 70(2):396-428.

_____1966. Diagnoses and distributions of beaked whales of the genus Mesoplodon known from North American waters, pp. 32-61. In K. S. Norris (ed.), Whales dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

_____1968. Relationships among living genera of beaked whales with classifications, diagnoses and keys. Fieldiana: Zool. 53(4): 209-298.

Nishimura, S., and M. Nishiwaki. 1964. Records of the beaked whale Mesoplodon from the Japan Sea. Publ. Seto Mar. Biol. Lab. 12(4):323-334.

NORTH SEA BEAKED WHALE

(Mesoplodon bidens)

Distribution and Migration: The North Sea beaked whale ranges mostly from the western Baltic Sea and central Norway south to the Bay of Biscay. It has been recorded in the western North Atlantic Ocean from Newfoundland and Massachusetts. Its migrations are unknown.

Abundance and Trends: The status of this species is unknown, except that it is apparently rare (Moore, 1966).

General Biology: This species is the only one of its genus for which even rudimentary life history data are available. The beaked whales attain a maximum length of 5.5 m for males and 4.9 m for females. Mating and birth usually take place in late winter and spring. The gestation period is about 1 year. At birth the calf is between 1.8 and 2.1 m long, nurses for about 1 year, and at weaning is probably about 3.0 m long.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: None.

References:

Jonsgård, Å., and P. Hoidal. 1957. Strandings of Sowerby's whale Mesoplodon bidens on the west coast of Norway. Norsk Hvalfangst-Tid. 46:507-512.

Kukenthal, W. 1914. Zur Kentniss des Mesoplodon bidens (Sowerby). Jenaische Z. Naturwiss. 51:93-122.

Moore, J. C. 1966. Diagnoses and distribution of beaked whales of the genus Mesoplodon known from North American waters, pp. 32-61. In K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

Nishiwaki, M., and N. Oguro. 1972. Catch of the Cuvier's beaked whales off Japan in recent years. Sci. Rep. Whales Res. Inst. 24:35-41.

Omura, H., K. Fujino, and S. Kimura. 1955. Beaked whale Berardius bairdi of Japan, with notes on Ziphius cavirostris. Sci. Rep. Whales Res. Inst. 10:89-132.

DENSE-BEAKED WHALE

(Mesoplodon densirostris)

Distribution and Migration: The dense-beaked whale is widely, but perhaps discontinuously, distributed in tropical and warm temperate waters around the world. In the North Pacific Ocean it has been recorded from Taiwan, Japan, and Midway Island. In the North Atlantic Ocean it has been recorded from Nova Scotia south to the Bahamas on the western side, and from Madeira on the eastern side.

Abundance and Trends: The status of this species is unknown, except that it is apparently rare (Besharse, 1971; Moore, 1966).

General Biology: These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems: None known.

Allocation Problems: None known.

Current Research: None.

References:

Besharse, J. C. 1971. Maturity and sexual dimorphism in the skull, mandible, and teeth of the beaked whale, Mesoplodon densirostris. J. Mammal. 52:297-315.

Moore, J. C. 1966. Diagnoses and distributions of beaked whales of the genus Mesoplodon known from North American waters, pp. 32-61. In K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

Contributors outside Department of Commerce

(to the status of stocks report)

Brodie, Paul F., Fisheries Research Board of Canada, Marine Ecology Laboratory, Bedford Institute, Dartmouth, Nova Scotia, Canada.

Brooks, James W., Alaska Department of Fish and Game, Subport Building, Juneau, AK 99801.

Brownell, Robert L., Jr., Division of Mammals, National Museum Natural History, Smithsonian Institution, Washington, DC. 20560

Burns, John J., Alaska Department of Fish and Game. 1300 College Road, Fairbanks, AK 99701.

Caldwell, David K., Communication Sciences Laboratory, Route 1, Box 122, St. Augustine, FL 32804.

Caldwell, Melba C., Communication Sciences Laboratory, Route 1, Box 122, St. Augustine, FL 32804.

Carlisle, John G., California State Fisheries Laboratory, Marine Resources Region, 350 Golden Shore, Long Beach, CA 90802.

Chapman, Douglas G., College of Fisheries, University of Washington, Seattle, WA 98195.

Drury, William H., Massachusetts Audubon Society, Lincoln, MA 01773.

Durham, Floyd, Department of Biology, University of Southern California, Los Angeles, CA 90007.

Evans, William E., Naval Undersea Research and Development Center, San Diego, CA 92132.

Fay, Francis H., University of Alaska, College, AK 99701.

Gates, Doyle, California Department of Fish and Game, Marine Resources Region, 350 Golden Shore, Long Beach, CA 90802.

Handley, Charles O., Jr., Department of Vertebrate Zoology, Smithsonian Institution, Washington, DC 20560.

Houck, Warren J., Division of Biological Sciences, Humboldt State University, Arcata, CA 95521.

Kenyon, Karl W., 11964 Lakeside Place NE., Seattle, WA 98125.

Leatherwood, J. Stephen, Marine Life Sciences Laboratory, Naval Undersea Research and Development Center, San Diego, CA 92132.

Mansfield, Arthur W., Arctic Biological Station, Fisheries Research Board of Canada, P. O. Box 400, Ste. Anne de Bellevue, P. Q., Canada.

Mead, James G., Smithsonian Institution, National Museum of Natural History, Washington, DC 20560.

Norris, Kenneth S., University of California at Santa Cruz, Santa Cruz, CA 95060.

Ray, G. Carleton, Department of Pathobiology, Johns Hopkins University, 615 North Wolfe Street, Baltimore, MD 21205.

Scheffer, Victor B., 14806 SE. 54th Street, Bellevue, WA 98006.

Siniff, Don B., Department of Ecology and Behavior, JFB Museum of Natural History, University of Minnesota, Minneapolis, MN 55455

Vania, John S., Marine Mammal Studies, Alaska Department of Fish and Game, 1018 International Airport Road, Anchorage, AK 99502.

Ximenez, Isaias, SOYP Depto Cientifico y Tecnico del Servicio, Oceanografico y de Pesca, Juan Lindolfo Cuestas 1409, Montevideo, Uruguay.

PART IV. APPENDIXES

Appendix A - Tables

Tables 1-3 - Incidental Take of Marine Mammals in the Course of Commercial Fishing Operations

Tables 4-10 - Scientific Research and Public Display Permits

Table I

INCIDENTAL TAKE OF MARINE MAMMALS IN THE COURSE OF COMMERCIAL FISHING OPERATIONS

General Permits - 1977

(Except Category 2; Encircling Gear, Yellowfin Tuna)

		Applications		Permit	
Category 1		Date	Number Requested	Date	Number Granted
Fishermen's Marketing Association of Washington		12/22/76	535	3/14/77	220
National Federation of Medium Trawlers (Japan)		2/08/77	806	3/17/77	806
Japan Deep Sea Trawlers Association		2/08/77	1,515	3/17/77	1,515
North Pacific Fisheries Development Association (Korea)		2/18/77	728	3/28/77	728
Sovrybflot (U.S.S.R.)		3/24/77	1,515	6/17/77	1,515
S.E.E. Okeansky Ribolov (Bulgaria)		5/26/77	42	10/20/77	42
V.E.B. Fischkombinat Rostock (East Germany)		5/23/77	45	10/20/77	45
	SUBTOTAL		5,186		4,871
Category 3					
United Fishermen of Alaska		1/25/77	1,690	3/14/77	845
	SUBTOTAL		1,690		845
Category 4					
United Fishermen of Alaska		1/25/77	160	3/14/77	80
North Pacific Fisheries Development Association (Korea) 2/		2/18/77	0	3/28/77	0
	SUBTOTAL		160		80
Category 5					
United Fishermen of Alaska		1/25/77	3,230	3/14/77	1,600
Hokyuo Longline-Gilbert Association (Japan) 2/		2/08/77	0	3/17/77	0
North Pacific Fisheries Development Association (Korea) 2/		2/18/77	0	3/28/77	0
Japan Federation of Salmon Fisheires Cooperative Associations 3/		4/06/77	2,510	7/27/77	560
	SUBTOTAL		5,740		2,160
	TOTAL		12,776		7,956

1/ Applications for domestic general permits requested total animals to be taken. Applications for foreign general permits requested number of animals be killed. All permits granted were given limits on numbers which could be killed only.

2/ Requested harassment only; no mortality intended.

3/ Request for 2,050 Dall porpoise denied.

NOTE: These permits apply to marine mammals taken within the 200-mile zone.

Table 2

INCIDENTAL TAKE OF MARINE MAMMALS IN THE COURSE OF COMMERCIAL FISHING OPERATIONS

Annual Quotas According to Species

Species/stock-management units	Take	Encirclement	Mortality
Calendar Year 1978			
1. Spotted dolphin (coastal)	0	0	0
2. Spotted dolphin (off-shore)[1/]	14,006,000	5,400,000	35,500
3. Spinner dolphin (Costa Rican)	0	0	0
4. Spinner dolphin (eastern)	0	0	0
5. Spinner dolphin (whitebelly)[2/]	4,365,000	1,400,000	13,500
6. Common dolphin (northern)	192,000	32,000	120
7. Common dolphin (central)	900,000	600,000	500
8. Common dolphin (southern)[3/]	2,688,000	450,000	1,700
9. Striped dolphin (northern)	48,000	3,216	50
10. Striped dolphin (north-equatorial)[4/]	480,000	32,000	470
11. Bottlenosed dolphin	72,000	4,824	70
12. Rough-toothed dolphin	6,000	402	5
13. Fraser's dolphin	6,000	402	5
14. Risso's dolphin	6,000	402	5
15. Pacific white-sided dolphin	2,649	190	15
16. Short-finned pilot whale	6,000	402	5
17. Melon-headed whale	0	0	0
18. Pygmy killer whale	0	0	0
Total			51,945
Calendar Year 1979			
1. Spotted dolphin (coastal)	0	0	0
2. Spotted dolphin (off-shore)[1/]	14,006,000	5,400,000	24,400
3. Spinner dolphin (Costa Rican)	0	0	0
4. Spinner dolphin (eastern)	0	0	0
5. Spinner dolphin (whitebelly)[2/]	4,365,000	1,400,000	10,800
6. Common dolphin (northern)	192,000	32,000	100
7. Common dolphin (central)	900,000	600,000	400
8. Common dolphin (southern)[3/]	2,688,000	450,000	1,400
9. Striped dolphin (northern)	48,000	3,216	40
10. Striped dolphin (north-equatorial)[4/]	480,000	32,000	380
11. Bottlenosed dolphin	72,000	4,824	60
12. Rough-toothed dolphin	6,000	402	5
13. Fraser's dolphin	6,000	402	5
14. Risso's dolphin	6,000	402	5
15. Pacific white-sided dolphin	2,649	190	10
16. Short-finned pilot whale	6,000	402	5
17. Melon-headed whale	0	0	0
18. Pygmy killer whale	0	0	0
Total			41,610
Calendar Year 1980			
1. Spotted dolphin (coastal)	0	0	0
2. Spotted dolphin (off-shore)[1/]	14,006,000	5,400,000	21,300
3. Spinner dolphin (Costa Rican)	0	0	0
4. Spinner dolphin (eastern)	0	0	0
5. Spinner dolphin (whitebelly)[2/]	4,365,000	1,400,000	8,100
6. Common dolphin (northern)	192,000	32,000	70
7. Common dolphin (central)	900,000	600,000	300
8. Common dolphin (southern)[3/]	2,688,000	450,000	1,000
9. Striped dolphin (northern)	48,000	3,216	30
10. Striped dolphin (north-equatorial)[4/]	480,000	32,000	280
11. Bottlenosed dolphin	72,000	4,824	40
12. Rough-toothed dolphin	6,000	402	5
13. Fraser's dolphin	6,000	402	5
14. Risso's dolphin	6,000	402	5
15. Pacific white-sided dolphin	2,649	190	10
16. Short-finned pilot whale	6,000	402	5
17. Melon-headed whale	0	0	0
18. Pygmy killer whale	0	0	0
Total			31,150

1/ *Including the tentatively identified Southwestern stock.*
2/ Including the tentatively identified Southwestern stock.
3/ Including the tentatively identified Equatorial-Oceanic stock.
4/ Including the tentatively identified South-Equatorial stock.

Table 3

INCIDENTAL TAKE OF MARINE MAMMALS IN THE COURSE OF COMMERCIAL FISHING OPERATIONS

Yellowfin Tuna and Tuna Products Importation Prohibition

Status of Nations Determined To Be Operating Tuna Purse Seiners in the Eastern Tropical Pacific (ETP).

Nation	IATTC Member	VSLS. Removed From ETP.	Importation Prohibition Removed (Finding)	Importation Prohibition Effective Jan. 1, 1978
Bermuda				X
Canada	X		X	
Costa Rica	X			X
Ecuador	X		X	
France	X	X		
Ghana		X[1/]		
Japan	X	X		
Mexico	X		X	
Netherlands Ant.			X	
New Zealand[2/]				
Nicaragua	X		X	
Panama	X		X	
Peru				X
Senegal				X
Spain				X
Venezuala				X

1/ Vessel identification error. No purse seiners under Ghanian flag.

2/ Notified of requirement for a finding in November 1977. Importation prohibition effective July 1, 1978.

Table 4

COMMON AND SCIENTIFIC NAMES OF MARINE MAMMALS INVOLVED IN SCIENTIFIC RESEARCH/PUBLIC DISPLAY PERMIT APPLICATIONS

CETACEANS

COMMON NAME	SCIENTIFIC NAME
Atlantic White-Sided Dolphin	Lagenorhynchus acutus
Baird's Beaked Whale	Berardius bairdii
Black Right Whale	Balaena glacialis
Blainville's Beaked Whale	Mesoplodon densirostris
Blue Whale	Balaenoptera musculus
Bottlenose Dolphins	Tursiops sp.
Bottlenose Whales	Hyperoodon sp.
Bowhead Whale	Balaena mysticetus
Bryde's Whale	Balaenoptera edeni
Common Dolphin	Delphinus delphis
Cuvier's Beaked Whale	Ziphius cavirostris
Dall Porpoise	Phocoenoides dallii
Dusky Dolphin	Lagenorhynchus obscurus
Dwarf Sperm Whale	Kogia simus
False Killer Whale	Pseudorca crassidens
Fin Whale, Finback	Balaenoptera physalus
Finless Porpoise	Neophocaena phocaenoides
Fraser's (Sarawak) Dolphin	Lagenodelphis hosei
Gray Whale	Eschrichtius robustus
Harbor Porpoise	Phocoena phocoena
Hubb's Beaked Whale	Mesoplodon carlhubbsi
Humpback Whale	Megaptera novaeangliae
Killer Whale	Orcinus orca
Lagenorhynchine Dolphins	Lagenorhynchus sp.
Long-Finned Pilot Whale	Globicephala melaena
Melon-Headed Whale, Electra	Peponocephala electra
Minke Whale	Balaenoptera acutorostrata
Northern Right Whale Dolphin	Lissodelphis borealis
Pacific White-Sided Dolphin	Lagenorhynchus obliquidens
Pilot Whales	Globicephala sp.
Pygmy Killer Whale	Feresa attenuata
Pygmy Sperm Whale	Kogia breviceps
Right Whales	Balaena sp.
Risso's Dolphin, Grampus	Grampus griseus
Rough-Toothed Dolphin	Steno bredanensis
Sei Whale	Balaenoptera borealis
Short-Finned Pilot Whale	Globicephala macrorhynchus
Southern Right Whale	Balaena australis
Sperm Whale	Physeter catodon
Spinner Dolphin	Stenella longirostris

Table 4 (con.)

CETACEANS

COMMON NAME	SCIENTIFIC NAME
Spotted Dolphin	*Stenella attenuata*
Stenelline Dolphins	*Stenella* sp.
Striped Dolphin, Streaker	*Stenella coeruleoalba*
Unspecified Cetacea	Cetacea
Unspecified Toothed Whales	Odontoceti
Vaquita, Cochito	*Phocoena sinus*
White Whale	*Delphinapterus leucas*
White-Beaked Dolphin	*Lagenorhynchus albirostris*

PINNIPEDS

Amsterdam Island Fur Seal	*Arctocephalus tropicalis*
Arctocephaline Fur Seals	*Arctocephalus* sp.
Baikal Seal	*Phoca sibirica*
Bearded Seal	*Erignathus barbatus*
California Sea Lion	*Zalophus californianus*
Caspian Seal	*Phoca caspica*
Crabeater Seal	*Lobodon carcinophagus*
Gray Seal	*Halichoerus grypus*
Guadalupe Fur Seal	*Arctocephalus townsendi*
Harbor Seals	*Phoca vitulina*
Harp Seal, Greenland Seal	*Phoca groenlandica*
Hawaiian Monk Seal	*Monachus schauinslandi*
Kerguelen Fur Seal	*Arctocephalus gazella*
Largha Seal, Spotted Seal	*Phoca largha*
Leopard Seal	*Hydrurga leptonyx*
Northern Elephant Seal	*Mirounga angustirostris*
Northern Fur Seal	*Callorhinus ursinus*
Northern Sea Lion	*Eumetopias jubatus*
Ribbon Seal	*Phoca fasciata*
Ringed Seal	*Phoca hispida*
Ross Seal	*Ommatophoca rossii*
South African Fur Seal	*Arctocephalus pusillus*
South American Sea Lion	*Otaria flavescens*
Southern Elephant Seal	*Mirounga leonina*
Unspecified Marine Mammals	Unspecified Marine Mammals
Unspecified Pinnipedia	Pinnipedia
Weddell Seal	*Leptonychotes weddelli*

Table 5

SYNOPSIS OF PERMIT APPLICATIONS

	Scientific Research	Public Display	Scientific and Public Display	Scientific Research	Public Display	Scientific and Public Display	Cumulative Total
	(as of March 31, 1977)			(April 1, 1977, to March 31, 1978)			
Applications Submitted	115	144	5	16	26	0	306[a]
Animals Requested (Total)	67,930	813	469	449,608	125	0	518,945
Of These:							
Taken by Killing	11,910	0	0	4,491	0	0	16,401
Taken and Kept Alive	241	752	32	9	102	0	1,136
Kept in Captivity	49	0	0	0	0	0	49
Taken and Released	53,278	0	335	445,055	0	0	498,668
Found Dead	824	0	0	0	0	0	824
Beached/Stranded	0	28	2	5	13	0	48
Imported	928	33	100	48	10	0	1,119
Harassed	700	0	0	0	0	0	700
Action Taken							
Applications Forwarded to Marine Mammal Commission	86	123	4	14	15	0	242
Applications Reviewed by Marine Mammal Commission	88	121	4	14	11	0	238
Applications Withdrawn	3	13	1	0	1	0	18
Applications Referred to Fish and Wildlife	0	0	0	0	0	0	0
Applications Referred to States	12	1	0	0	0	0	13
Applications Referred to Region	1	0	0	1	6	0	8
Applications Resolved Through Interagency Agreement	1	0	0	0	0	0	1
Applications Returned Due to Insufficient Submittal	2	10	0	0	1	0	13
Applications Denied	2	6	0	0	0	0	8
Applications Approved	93	109	4	13	8	0	227
Applications Pending	0	1	0	2	10	0	13
Animals Approved (Total)	67,050	526	462	449,622	40	0	517,700
Of These:							
Taken by Killing	11,865	0	0	4,491	0	0	16,356
Taken and Kept Alive	218	468	27	4	36	0	753
Killed in Captivity	49	0	0	0	0	0	49
Taken and Released	52,553	0	335	445,080	0	0	497,968
Found Dead	722	0	0	0	0	0	722
Beached/Stranded	25	26	0	5	0	0	56
Imported	900	32	100	42	4	0	1,078
Harassed	718	0	0	0	0	0	718

[a] In five instances before April 1, 1977, institutions submitted applications separately that were later combined by NMFS and processed as a single application. This accounts for the difference between 306 applications submitted and 301 acted upon.

Table 6

CETACEANS REQUESTED IN SCIENTIFIC RESEARCH/PUBLIC DISPLAY PERMIT APPLICATIONS

Common Name[a]	Requested (as of March 31, 1977) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Requested (April 1, 1977, thru March 31, 1978) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Cumulative Total Requested
Baird's Beaked Whale	----	----	----	25	----	----	----	----	----	----	25
Black Right Whale	----	----	----	10	----	----	----	----	----	----	10
Blue Whale	----	----	----	95	----	----	----	----	----	----	95
Bottlenose Dolphins	70	337	----	779	3	----	53	----	50,100	----	51,342
Bowhead Whale	----	----	----	50	40	----	----	----	----	----	90
Bryde's Whale	----	----	----	420	----	----	----	----	----	----	420
Common Dolphin	170	16	----	717	3	----	----	----	75,050	----	75,956
Cuvier's Beaked Whale	----	2	----	----	----	----	----	----	----	----	2
Dall Porpoise	----	----	----	610	3	----	----	----	----	----	613
Dusky Dolphin	----	----	----	61	----	----	----	----	----	----	61
False Killer Whale	----	14	----	6	----	----	----	----	----	----	20
Fin Whale, Finback	----	----	----	395	----	----	----	----	----	----	395
Finless Porpoise	----	6	----	----	----	----	----	----	----	----	6
Fraser's (Sarawak) Dolphin	70	----	----	50	----	----	----	----	1,000	----	1,120
Gray Whale	----	----	----	419	11	----	----	----	----	----	430
Harbor Porpoise	----	----	----	100	3	----	----	----	----	----	103
Hubb's Beaked Whale	----	----	----	----	3	----	----	----	----	----	3
Humpback Whale	----	----	----	140	----	----	----	----	----	----	140
Killer Whale	----	9	----	85	23	----	----	----	----	----	117
Long-Finned Pilot Whale	----	----	----	30	30	----	----	----	----	----	60
Melon-Headed Whale, Electra	45	4	----	50	----	----	----	----	250	----	349
Minke Whale	----	----	----	810	3	----	----	----	----	----	813
Northern Right Whale Dolphin	----	2	----	130	3	----	----	----	----	----	135
Pacific White-Sided Dolphin	----	25	----	521	3	----	----	----	----	----	549
Pilot Whales	----	4	----	----	----	----	----	----	----	----	4
Pygmy Killer Whale	45	8	----	50	----	----	----	----	250	----	353
Pygmy Sperm Whale	----	----	----	----	3	----	----	----	----	----	3
Risso's Dolphin, Grampus	70	8	----	100	----	----	----	----	1,000	----	1,178
Rough-Toothed Dolphin	70	9	----	50	----	----	----	----	5,000	----	5,129
Sei Whale	----	----	----	480	----	----	----	----	----	----	480
Short-Finned Pilot Whale	70	19	----	130	3	----	----	----	----	----	222
Sperm Whale	----	----	----	1,035	----	----	----	----	----	----	1,035
Spinner Dolphin	2,929	17	----	3,780	----	----	----	----	100,165	----	106,891
Spotted Dolphin	4,925	----	----	7,780	----	----	----	----	150,050	----	162,755
Stenelline Dolphins	----	----	----	100	3	----	----	----	----	----	103
Striped Dolphin, Streaker	100	----	----	50	----	----	----	----	50,000	----	50,150
Unspecified Cetecea	340	6	----	1,239	----	----	----	----	----	----	1,585
Vaquita, Cochito	----	----	----	----	2	----	----	----	----	----	2
White Whale	----	14	----	----	50	----	----	----	----	----	64
White-Beaked Dolphin	----	2	----	----	----	----	----	----	----	----	2
TOTALS:[b]	8,904	502	0	20,297	189	0	53	0	432,865[c]	0	462,810

[a] Please refer to Table 4 of this appendix for the appropriate scientific names.

[b] Where permit applicants requested a total number of animals to be taken without specifying the number to be taken from a particular species, the number requested was listed under Unspecified Cetacea.

[c] A single application requested 432,850 cetaceans and accounts for nearly the total number of cetaceans requested in the Taken and Released category during this reporting period.

Table 7

PINNIPEDS REQUESTED IN SCIENTIFIC RESEARCH/PUBLIC DISPLAY PERMIT APPLICATIONS

Common Name[a]	Requested (as of March 31, 1977) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Requested (April 1, 1977, thru March 31, 1978) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Cumulative Total Requested
Arctocephaline Fur Seals	-----	-----	-----	60	-----	2	-----	-----	20	-----	82
Baikal Seal	-----	-----	-----	-----	-----	-----	4	-----	-----	-----	4
Bearded Seal	140	-----	-----	750	10	90	-----	-----	-----	-----	990
California Sea Lion	680	398	-----	1,035	243	-----	39	-----	-----	-----	2,395
Caspian Seal	-----	-----	-----	-----	-----	-----	2	-----	-----	-----	2
Crabeater Seal	18	-----	-----	1,425	-----	2,610	-----	-----	5,500	-----	9,553
Gray Seal	-----	30	-----	-----	-----	-----	-----	-----	-----	-----	30
Harbor Seals	1,056	92	-----	3,485	23	90	9	-----	475	-----	5,230
Harp Seal, Greenland Seal	-----	-----	-----	-----	-----	-----	40	-----	-----	-----	40
Hawaiian Monk Seal	-----	2	-----	980	-----	-----	-----	-----	-----	-----	982
Kerguelen Fur Seal	6	-----	-----	-----	-----	125	-----	-----	750	-----	881
Largha Seal, Spotted Seal	100	-----	-----	-----	-----	-----	-----	-----	-----	-----	100
Leopard Seal	18	2	-----	150	-----	510	6	-----	1,050	-----	1,736
Northern Elephant Seal	-----	13	-----	9,046	278	-----	-----	-----	-----	-----	9,337
Northern Fur Seal	-----	22	-----	-----	3	-----	10	-----	-----	-----	35
Northern Sea Lion	630	-----	-----	12,500	3	-----	-----	-----	-----	-----	13,133
Ribbon Seal	140	-----	-----	-----	-----	90	-----	-----	100	-----	330
Ringed Seal	170	8	-----	1,054	25	90	-----	-----	200	-----	1,547
Ross Seal	6	6	-----	75	-----	252	-----	-----	510	-----	849
South African Fur Seal	-----	-----	-----	10	-----	-----	6	-----	-----	-----	16
South American Sea Lion	-----	9	-----	-----	-----	-----	-----	-----	-----	-----	9
Southern Elephant Seal	6	-----	-----	-----	-----	127	-----	-----	260	-----	393
Unspecified Marine Mammals	-----	-----	-----	-----	50	-----	-----	-----	-----	-----	50
Unspecified Pinnipedia	-----	-----	12	-----	-----	-----	-----	-----	-----	-----	12
Weddell Seal	36	25	37	2,746	-----	505	-----	-----	3,325	-----	6,674
TOTALS:[b]	3,006	607	49	33,316	635	4,491	116	0	12,190	0	54,410

[a] Please refer to Table 4 of this appendix for the appropriate scientific names.

[b] Where permit applicants requested a total number of animals to be taken without specifying the number to be taken from a particular species, the number requested was listed under Unspecified Pinnipeds or Unspecified Marine Mammals, if cetaceans also were involved.

Table 8

CETACEANS AUTHORIZED IN SCIENTIFIC RESEARCH/PUBLIC DISPLAY PERMIT APPLICATIONS

Common Name[a]	Authorized (as of March 31, 1977) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Authorized (April 1, 1977, thru March 31, 1978) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Cumulative Total Requested
Atlantic White-Sided Dolphin	-----	-----	-----	-----	----	-----	----	-------	5	-----	5
Black Right Whale	-----	-----	-----	10	----	-----	-----	-------	------	-----	10
Blue Whale	-----	-----	-----	70	----	-----	-----	-------	------	-----	70
Bottlenose Dolphins	70	228	-----	779	-----	-----	16	-------	50,105	-------	51,198
Bowhead Whale	-----	-----	-----	50	40	-----	-----	-------	------	-------	90
Bryde's Whale	-----	-----	-----	410	-----	-----	------	-------	------	-------	410
Common Dolphin	170	8	------	717	-----	-----	------	-------	75,050	-------	75,945
Dall Porpoise	-----	-----	------	610	------	------	------	-------	------	-------	610
Dusky Dolphin	-----	-----	------	61	------	------	------	-------	------	-------	61
False Killer Whale	-----	12	------	6	------	------	------	-------	------	-------	18
Fin Whale, Finback	-----	-----	------	370	------	------	------	-------	------	-------	370
Fraser's (Sarawak) Dolphin	70	-----	------	50	------	------	------	-------	1,000	-------	1,120
Gray Whale	-----	-----	------	419	10	------	------	-------	------	-------	429
Harbor Porpoise	-----	-----	------	100	------	------	------	-------	5	-------	105
Humpback Whale	-----	-----	------	100	------	------	------	-------	------	-------	100
Killer Whale	-----	4	------	85	20	------	------	-------	------	-------	109
Long-Finned Pilot Whale	-----	-----	------	30	30	------	------	-------	------	-------	60
Melon-Headed Whale, Electra	45	4	------	50	------	------	------	-------	250	-------	349
Minke Whale	-----	-----	------	800	------	------	------	-------	------	-------	800
Northern Right Whale Dolphin	-----	-----	------	130	------	------	------	-------	------	-------	130
Pacific White-Sided Dolphin	-----	17	------	521	------	------	------	-------	------	-------	538
Pygmy Killer Whale	45	4	------	50	------	------	------	-------	250	-------	349
Risso's Dolphin, Grampus	70	6	------	100	------	------	------	-------	1,000	-------	1,176
Rough-Toothed Dolphin	70	9	------	50	------	------	------	-------	5,000	-------	5,129
Sei Whale	-----	-----	------	470	------	------	------	-------	------	-------	470
Short-Finned Pilot Whale	70	16	------	130	------	------	------	-------	------	-------	216
Sperm Whale	-----	-----	------	860	------	------	------	-------	------	-------	860
Spinner Dolphin	2,929	11	------	3,780	------	------	------	-------	100,165	-------	106,885
Spotted Dolphin	4,925	-----	------	7,780	------	------	------	-------	150,050	-------	162,755
Stenelline Dolphins	-----	-----	------	100	------	------	------	-------	------	-------	100
Striped Dolphin, Streaker	100	-----	------	50	------	------	------	-------	50,000	-------	50,150
Unspecified Cetecea	340	6	------	914	------	------	------	-------	------	-------	1,260
Vaquita, Cochito	-----	-----	------	-----	2	------	------	-------	------	-------	2
White Whale	-----	14	------	-----	50	------	------	-------	------	-------	64
White-Beaked Dolphin	-----	2	------	-----	------	------	------	-------	------	-------	2
TOTALS:[b]	8,904	341	0	19,652	152	0	16	0	432,880[c]	0	461,945

a Please refer to Table 4 of this appendix for the appropriate scientific names.

b Where a permit specified the total number of animals to be taken without specifying the number to be taken from a particular species, the number authorized was listed under Unspecified Cetacea.

c A single permit authorized 432,850 cetaceans and accounts for nearly the total number authorized in the Taken and Released category.

Table 9

PINNIPEDS AUTHORIZED IN SCIENTIFIC RESEARCH/PUBLIC DISPLAY PERMIT APPLICATIONS

Common Name[a]	Requested (as of March 31, 1977) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Requested (April 1, 1977, thru March 31, 1978) Taken by Killing	Taken and Kept Alive	Killed in Captivity	Taken and Released	Found Dead	Cumulative Total Requested
Arctocephaline Fur Seals	-----	-----	-----	60	----	2	-----	-----	20	-----	82
Baikal Seal	-----	-----	-----	-----	----	-----	4	-----	-----	-----	4
Bearded Seal	140	-----	-----	750	10	90	-----	-----	-----	-----	990
California Sea Lion	680	294	-----	1,035	240	-----	12	-----	-----	-----	2,261
Caspian Seal	-----	-----	-----	-----	----	-----	2	-----	-----	-----	2
Crabeater Seal	18	-----	-----	1,425	----	2,610	-----	-----	5,500	-----	9,553
Gray Seal	----	24	-----	-----	----	-----	-----	-----	5	-----	29
Harbor Seals	996	65	-----	3,405	20	90	2	-----	480	-----	5,058
Harp Seal, Greenland Seal	-----	-----	-----	-----	----	-----	40	-----	-----	-----	40
Hawaiian Monk Seal	-----	-----	-----	980	-----	-----	-----	-----	-----	-----	980
Kerguelen Fur Seal	6	-----	-----	-----	-----	125	-----	-----	750	-----	881
Largha Seal, Spotted Seal	100	-----	-----	-----	-----	-----	-----	-----	-----	-----	100
Leopard Seal	18	2	-----	150	-----	510	-----	-----	1,050	-----	1,730
Northern Elephant Seal	-----	6	-----	9,046	275	-----	-----	-----	-----	-----	9,327
Northern Fur Seal	-----	10	-----	-----	-----	-----	10	-----	-----	-----	20
Northern Sea Lion	630	-----	-----	12,500	-----	-----	-----	-----	-----	-----	13,130
Ribbon Seal	140	-----	-----	-----	-----	90	-----	-----	100	-----	330
Ringed Seal	170	8	-----	1,054	25	90	-----	-----	200	-----	1,547
Ross Seal	6	6	-----	75	-----	252	-----	-----	510	-----	849
South African Fur Seal	-----	-----	-----	10	-----	-----	-----	-----	-----	-----	10
South American Sea Lion	-----	9	-----	-----	-----	-----	-----	-----	-----	-----	9
Southern Elephant Seal	6	-----	-----	-----	-----	127	-----	-----	260	-----	393
Unspecified Marine Mammals	15	-----	-----	-----	-----	-----	-----	-----	-----	-----	15
Unspecified Pinnipedia	-----	-----	12	-----	-----	-----	-----	-----	-----	-----	12
Weddell Seal	36	25	37	2,746	-----	505	-----	-----	3,325	-----	6,674
TOTALS:[b]	2,961	449	49	33,236	570	4,491	70	0	12,200	0	54,026

[a]Please refer to Table 4 of this appendix for the appropriate scientific names.

[b]Where a permit specified the total number of animals to be taken without specifying the number to be taken from a particular species, the number authorized was listed under Unspecified Pinnipeds or Unspecified Marine Mammals if cetaceans were also involved.

Table 10

SUMMARY OF PERMITS FOR PERMANENT REMOVAL FROM THE WILD - CETACEANS

	Permits			*Number of Animals*					
Species[a]	Issued	Expired	Current	Requested	Authorized	Replacements	Authorization Expired	Taken	Take Remaining
Bottlenose Dolphins	42	15	27	328	314	5	6	140	173
Common Dolphin	5	0	5	186	178	0	0	18	160
False Killer Whale	4	0	4	12	12	0	0	1	11
Fraser's (Sarawak) Dolphin	2	0	2	70	70	0	0	0	70
Melon-Headed Whale, Electra	3	0	3	49	49	0	0	0	49
Pacific White-Sided Dolphin	4	1	3	17	17	0	2	1	14
Pygmy Killer Whale	3	0	3	49	49	0	0	0	49
Risso's Dolphin, Grampus	3	0	3	76	76	0	0	0	76
Rough-toothed Dolphin	5	0	5	79	79	2	0	4	77
Short-Finned Pilot Whale	9	5	4	87	86	3	9	6	74
Spinner Dolphin	3	0	3	2,946	2,940	3	0	66	2,877
Spotted Dolphin	2	0	2	4,925	4,925	0	0	109	4,816
Striped Dolphin, Streaker	1	0	1	100	100	0	0	0	100
Unspecified Cetecea	2	0	2	346	346	0	0	19	327
TOTALS:[b]	88	21	67	9,270	9,241	13	17	364	8,873

[a] Please refer to Table 4 of this appendix for the appropriate scientific names.

[b] Several permits were issued for the permanent removal of more than one species. Therefore, the number of permits issued for each species is accurate, but the total number issued, expired, and current includes these duplications.

Table 11

SUMMARY OF PERMITS FOR PERMANENT REMOVAL FROM THE WILD - PINNIPEDS

Species[a]	Permits			Number of Animals					
	Issued	Expired	Current	Requested	Authorized	Replacements	Authorization Expired	Taken	Take Remaining
Arctocephaline Fur Seals	1	0	1	2	2	0	0	0	2
Bearded Seal	4	0	4	230	230	0	0	26	204
California Seal Lion	68	32	36	999	986	7	21	161	811
Crabeater Seal	3	0	3	2,628	2,628	0	0	1	2,627
Harbor Seals	24	11	13	1,162	1,139	0	28	571	540
Kerguelen Fur Seal	2	0	2	131	131	0	0	0	131
Largha Seal, Spotted Seal	1	0	1	100	100	0	0	0	100
Leopard Seal	3	0	3	528	528	0	0	0	528
Northern Elephant Seal	1	1	0	6	6	0	4	2	0
Northern Fur Seal	2	0	2	20	20	0	0	10	10
Northern Sea Lion	5	0	5	630	630	0	0	216	414
Ribbon Seal	4	0	4	230	230	0	0	19	211
Ringed Seal	4	0	4	260	260	0	0	73	187
Ross Seal	4	0	4	264	264	0	0	0	264
Southern Elephant Seal	3	0	3	133	133	0	0	0	133
Unspecified Marine Mammals	1	0	1	0	15	0	0	4	11
Unspecified Pinnipedia	1	1	0	12	12	3	10	5	0
Weddell Seal	5	0	5	603	603	0	0	8	595
TOTALS:[b]	136	45	91	7,938	7,917	10	63	1,096	6,768

[a] Please refer to Table 4 of this appendix for the appropriate scientific names.

[b] Several permits were issued for the permanent removal of more than one species. Therefore, the number of permits issued for each species is accurate, but the total number issued, expired, and current includes these duplications.

Appendix B - Notices and Regulations

The following rules and regulations initially published in the FEDERAL REGISTER are reprinted each year in the Code of Federal Regulations (CFR). Also, copies of rules, regulations, and notices are available from the Marine Mammal Division, National Marine Fisheries Service, Washington, DC 20235.

B-1. Notices and regulations relating to the bowhead whale.

Notice of proposed designation, June 10, 1977, FEDERAL REGISTER reference 42 F.R. 29946.

Notice of public hearings and availability of Draft Environmental Impact Statement, August 18, 1977 FEDERAL REGISTER reference 42 F.R. 41655.

Final rule, November 25, 1977, FEDERAL REGISTER reference 42 F.R. 60149.

Proposed rules, November 25, 1977, FEDERAL REGISTER reference 42 F.R. 60185.

Withdrawal of proposed rules, January 30, 1978, FEDERAL REGISTER reference 42 F.R. 3921.

Proposed rules, March 3, 1978, FEDERAL REGISTER reference 43 F.R. 9172.

Final rules, March 8, 1978, FEDERAL REGISTER reference 43 F.R. 9481.

B-2. Notices and regulations relating to the incidental taking of marine mammals in the course of commerical fishing operations.

Final notice of methodology for monitoring porpoise mortality quotas, May 4, 1977, FEDERAL REGISTER reference 42 F.R. 22573.

Final notice of enforcement policy, May 4, 1977, FEDERAL REGISTER reference 42 F.R. 22575.

Interim final rule, May 16, 1977, FEDERAL REGISTER reference 42 F.R. 24742.

Notice of modification of permit, June 3, 1977, FEDERAL REGISTER reference 42 F.R. 28566.

Proposed amendments, June 6, 1977, FEDERAL REGISTER reference 42 F.R. 28904 and 29533.

Notice of proposed designation, June 10, 1977, FEDERAL REGISTER reference 42 F.R. 29946.

Expedited procedures for consideration of amended Regulation July 13, 1977, FEDERAL REGISTER reference 42 F.R. 35967.

Final rule, July 18, 1977, FEDERAL REGISTER reference 42 F.R. 36835.

Notice of Application for General Permit, July 27, 1977, FEDERAL REGISTER reference 42 F.R. 38201.

Interim final rule, August 4, 1977, FEDERAL REGISTER reference 42 F.R. 39394.

Notice of modification of permit, August 9, 1977, FEDERAL REGISTER reference 42 F.R. 40230.

Final rulemaking, August 15, 1977, FEDERAL REGISTER reference 42 F.R. 41128.

Notice of public hearing, August 19, 1977, FEDERAL REGISTER reference 42 F.R. 41879.

Notice of prohibition of take of rough-toothed dolphin, August 23, 1977, FEDERAL REGISTER reference 42 F.R. 42370.

DEIS correction notice, August 24, 1977, FEDERAL REGISTER 42 F.R. 42707.

Final rule, October 5, 1977, FEDERAL REGISTER reference 42 F.R. 54294.

Notice of increase of incidental catch rate, October 17, 1977, FEDERAL REGISTER reference 42 F.R. 55488.

Final rule, October 27, 1977, FEDERAL REGISTER reference 42 F.R. 56617.

Notice of prohibition on take of Fraser's dolphin, November 8, 1977, FEDERAL REGISTER reference 42 F.R. 58195.

Recommended decision, November 9, 1977, FEDERAL REGISTER reference 42 F.R. 58419.

Final rule, December 22, 1977, FEDERAL REGISTER reference 42 F.R. 64121.

Final decision, December 23, 1977, FEDERAL REGISTER reference 42 F.R. 64548.

Notice of issuance of a general permit, December 30, 1977, FEDERAL REGISTER reference 42 F.R. 65237.

Final rule--Panama, January 6, 1978, FEDERAL REGISTER reference 43 F.R. 1093.

Notice of applications for general permits, January 24, 1978, FEDERAL REGISTER reference 43 F.R. 3301.

Final rule--Bermuda, January 26, 1978, FEDERAL REGISTER reference 43 F.R. 3566.

Final rule--Costa Rico, February 9, 1978, FEDERAL REGISTER reference 43 F.R. 5521.

Notice of receipt of application, February 23, 1978, FEDERAL REGISTER reference 43 F.R. 7472.

Notice of receipt of application, March 9, 1978, FEDERAL REGISTER reference 43 F.R. 9632.

Notice of prohibition on take of rough-toothed dolphin, March 9, 1978, FEDERAL REGISTER reference 43 F.R. 9632.

B-3. Notices and regulations relating to state management of marine mammals.

Proposed rules, July 20, 1977, FEDERAL REGISTER reference 42 F.R. 37215.

Appendix C

The following table details the status of authorization and funding for fiscal year 1978-79.

Appendix C - Funding

MARINE MAMMAL CONSERVATION
($ in thousands)

Authorization Legislation	FY 1977 Positions	FY 1977 Base Funding	FY 1978 Positions	FY 1978 Base Funding	FY 1979 Positions	FY 1979 Base Funding	Authorization 4/
Marine Mammal Protection Act							
Section 110	0	1,667.0				200.0	200.0
Section 114	77	2,778.0	84	5,166.0	90	6,842.0	11,500.0
MMPA Subtotal	77	4,445.0	84	5,166.0	90	7,042.0	
Endangered Species Act	6	294.0 1/					5,000.0
Fur Seal Act	14	595.0	14	595.0	14	595.0	open
Saltonstall-Kennedy Funding		600.0 2/					open
Other Authorization Subtotal	20	1,489.0	14	595.0	14	595.0	
Marine Mammal Conservation Total	97	5,934.0	98	5,761.0	104	7,637.0 3/	

1/ Reflected in Section 114 in FY 1978

2/ One-time funds from OMB unapportioned $K reserve

3/ Includes increase of 6 pos. & $1,490K

4/ Sections 110 and 114 MMPA authorizations and the Endangered Species Section 14 authorization expire on 9/30/78

NOTE: "K" equals $1,000

*U.S. GOVERNMENT PRINTING OFFICE : 1978 O-261-238/190