

REPORT OF MARINE MAMMAL RESEARCH BY U.S. SCIENTISTS
ABOARD JAPANESE SALMON MOTHERSHIPS AND RESEARCH VESSELS
DURING 1979

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INTRODUCTION

Under the mandate of the International North Pacific Fishery Convention, as amended in 1978, a cooperative Japan-U.S. research program was established to study the incidental take of marine mammals in the Japanese high seas salmon driftnet fishery. The objectives of the program are to determine the effect of the Japanese salmon fishery on marine mammal populations and to work to reduce or eliminate the incidental catch of marine mammals in the fishery. The following information must be obtained to accomplish these objectives:

1. accurate incidental take data;
2. indices of abundance;
3. biological data on migrations, distribution, and identity and discreteness of stocks, and for determination of recruitment and natural mortality rates;
4. data on the acoustic characteristics of gillnets and Dall's porpoise.

The National Marine Mammal Laboratory (NMML) has lead responsibility for undertaking the U.S. portion of this INPFC mandated research.

Aboard the Japanese salmon motherships biological data and samples are collected from all incidentally taken Dall's porpoise for determination of the life history parameters and stock differences. Aboard Japanese salmon research vessels data are collected for estimation of the abundance of Dall's porpoise, biological samples of incidentally taken marine mammals are collected, and observations are made of porpoise behavior in proximity to salmon gillnets and ships. In addition, in 1979, a dedicated vessel was made available for study of the entanglement of marine mammals, the acoustic characteristics of the Dall's porpoise and the salmon gillnet, the behavior of the fishing gear under different environmental conditions, and the behavior of marine mammals near the gillnets and the ship.

STUDIES ABOARD JAPANESE HIGH SEAS SALMON MOTHERSHIPS

During the interval June 9-11, marine mammal scientists were placed aboard the four Japanese high seas salmon motherships. They were aboard for a total of 31 to 38 days, compared to 8 to 13 days in the previous season. Scientists aboard two motherships disembarked for approximately one week (3-12 July) while these vessels worked outside the U.S. Fisheries Conservation Zone (FCZ). They returned to the ships for the period 12-20 July. All scientists and biological specimens were then transported by Japanese patrol vessel to Adak, Alaska.

The marine mammal scientists, their ship assignments and dates aboard were:

Stephen Treacy (NMML)	<u>Jinyo Maru</u>	11 June-4 July; 13-19 July (31 days)
Terrell Newby (NMML)	<u>Meiyo Maru</u>	11 June-2 July; 12-20 July (38 days)
Thomas Crawford (NMML)	<u>Nojima Maru</u>	9 June-11 July (32 days)
Gerald Conlogue (Yale University)	<u>Shinano Maru</u>	11 June-12 July (31 days)

A total of 659 porpoise were reported incidentally taken by catcher boats and scout boats of the high seas salmon driftnet fishery during the 1979 fishing season. Biological samples were collected from 611 Dall's porpoise (including two true's type), and four harbor porpoise (Phocoena phocoena). Of the Dall's porpoise taken, 63% (390) were female, 39% (152) were pregnant and 27% were lactating. A total of 17 porpoise were not returned to the motherships during the season. This includes animals taken by the scout boats which do not have freezer facilities aboard for preservation of the porpoise.

The proportion of porpoise returned to the motherships was substantially increased this year. In 1978, the catcher boats were unable to return 145 out of 499 (29%) incidentally taken Dall's porpoise. This year, only seventeen out of 469 (data for 3 motherships), or approximately 4%, were not returned. This improvement in the return of animals results in a less biased sampling of the incidental take. A further improvement in the incidental catch data would be more complete explanations from the catcher boat captains as to why porpoise are lost.

As requested by the U.S. scientists during the March meeting in Tokyo, prior to the embarkation of the U.S. marine mammal scientists, 10 to 11 Dall's porpoise incidentally taken were frozen aboard each mothership. Biological samples were collected from these animals after the U.S. scientists boarded.

A major concern regarding sampling aboard the motherships this year was difficulty in training the Japanese nationals in proper biological collection procedures. As a result, a minimum of 24 animals (taken in the Bering Sea) were not sampled. Only on one mothership (Jinyo Maru) were samples collected while the vessel was outside the U.S. Fisheries Conservation Zone. The sampling on this vessel was incomplete since no porpoise stomachs were collected. Samples must be collected from these animals in the future to prevent biasing of the data, and to obtain data on stock differences.

Samples collected aboard the motherships were transported to the NMML. Data collected on shipboard have been entered into the computer data base for analysis.

Mr. Thomas Crawford (NMML), aboard the Nojima Maru, was able to board catcher boat #37 (Seishuh Maru) for one fishing operation to observe the fishing operations and collect marine mammal samples. Unfortunately, no Dall's porpoise entangled while he was aboard the catcher boat. Nonetheless,

his observations provided necessary information on fishery operations.

STUDIES CONDUCTED ABOARD JAPANESE SALMON RESEARCH VESSELS

Marine mammal scientists conducted studies aboard the Japanese research vessels Hokusei Maru (16 July-13 August) and Oshoro Maru (5 June-9 August). The objectives of these studies were to obtain biological data and samples of marine mammals and other organisms incidentally taken in the salmon gillnets, and to conduct marine mammal sighting surveys for population estimation, and for determination of marine mammal distributions. In addition, studies of seabird entanglement were conducted in cooperation with U.S. Fish and Wildlife Service personnel.

Marine mammal entanglements during these cruises are listed below:

Oshoro Maru Leg 1 (5 June-3 July)

Anthony Degange (USFWLS)	7 fur seals: 3 released
Lewis Consiglieri (NMML)	alive after measurement

Oshoro Maru Leg 2 (7 July-12 August)

Anthony Degange (USFWLS)	2 Dall's porpoise (1 lost)
Elizabeth Hacker (NMML)	2 fur seals: released alive after measurement

Hokusei Maru

Thomas McIntyre (NMFS)	3 fur seals: released alive after measurement
Lawrence Tsunoda (NMML)	1 Pacific white-sided dolphin

During the first leg of the Oshoro Maru cruise, there were no Dall's porpoise entanglements in the gillnets. However, seven Northern fur seals (Callorhinus ursinus) entangled in the largest mesh sizes (206 and 179 mm). Four were drowned in the gillnets. These animals were weighed, measured and inspected for parasites. Reproductive organs, jaws and stomachs were collected. This was the first opportunity to collect specimens from fur seal taken by this fishery since the Memorandum of Understanding does not specify collection of fur seal samples.

On all research cruises, Dall's porpoise were observed in close proximity to the salmon gillnets during haul and set operations. The porpoise were seen to swim rapidly towards the net, as close as 1 m, and at the last moment veer off sharply, avoiding contact with the net. This behavior was often repeated by the individuals and was described as "play" behavior by observers. At least during daylight hours the porpoise seem aware of the presence of the net and able to avoid it. Of the approximately 110 Dall's porpoise observed near the net (including those observed aboard the dedicated research vessel (Hoyo Maru), none became entangled in the gillnet. It could not be determined whether avoidance was a function of visual or acoustic cues, or whether such behavior occurred during hours of darkness.

STUDIES ABOARD THE JAPANESE VESSEL
DEDICATED TO SALMON AND MARINE MAMMAL STUDIES

The Japan Fisheries Agency chartered a vessel for studies of marine mammals and for evaluation of new areas for fisheries development. Two cruises were made aboard the dedicated vessel. The first cruise (16 May to 23 June), primarily for marine mammal studies, was in the North Pacific Ocean, with an unscheduled cruise tract to allow the work to be conducted in areas of high Dall's porpoise abundance. Cruise two (28 June to 9 August), primarily for salmon research, was in the Bering Sea and had a predetermined cruise track. Marine mammal studies initiated during the first cruise were continued during the second.

The objectives of the marine mammal research conducted aboard the Japanese dedicated vessel (Hoyo Maru No. 67), using commercial gear and techniques, were to (1) determine the factors associated with marine mammal entanglements in commercial operations (including catch characteristics); (2) record Dall's porpoise vocalizations and salmon gillnet noises during

various sea states; (3) obtain information on marine mammal distribution and abundance; (4) determine behaviors of the animals and conditions which influence marine mammal sightings; and (5) observe fishery operations and gear characteristics. A cooperative study of sea bird mortality and food habits was conducted with U.S. Fish and Wildlife Service scientists. Comparisons of food habits of sea birds, marine mammals, and other organisms taken in the nets will be made.

Participants on cruise one were Mr. G. Christopher Boucher (NMML), Mr. James Coe (SWFC), Dr. Linda Jones (NMML), Mr. William Walker (University of Texas Medical School), Mr. Jun Ito (Far Seas Fisheries Research Laboratory, Japan), Dr. Akira Takemura (Nagasaki University, Japan) and Mr. Junichero Okamoto (Japan Fishery Agency). On the second cruise were Dr. David Ainley (Point Reyes Bird Observatory), Mr. Richard Beach (NMML), Mr. Masayoshi Narita (Japan Fishery Agency), Dr. Nobuyoshi Miyazaki (National Science Museum, Tokyo) and Dr. Haruo Ogi (Hokkaido University, Japan).

The total number of gillnet sets on cruise one was seventeen (using 2130 tans, or 106.5 km of gillnet) and on cruise two, twenty (2600 tans or 130 km). Two Dall's porpoise entangled on cruise one. One was alive and released. The other was dead and was brought onboard to be systematically disentangled from the gear. A complete necropsy was performed and biological samples collected. On cruise two, one Dall's porpoise and one fur seal were entangled. The fur seal was alive and released. Samples were collected from the Dall's porpoise.

The gillnets used aboard the dedicated vessel differed from those used by the commercial fishery, which we had requested to be used, in three respects: (1) the mesh size was 114 mm compared to 120-130 mm; (2) the length (except in one set) was 130 tans rather than 330 tans; and (3) thirty tans of research

mesh sizes were present in the center of the net. A total of 300 tons of the commercial net (114 mm mesh) was provided for our use aboard the Hoyo Maru, but unfavorable weather conditions, crew inexperience and large catch levels prevented utilizing the full-sized commercial net more than once.

During the two cruises, more than 60 Dall's porpoise were observed near the gillnets during set or haul operations. These behavioral observations will provide a basis for design of future studies of porpoise-gillnet interactions.

The Hoyo Maru No. 67 fished with the catcher boat fleet of the mothership Nojima Maru on July 15-19 (cruise two) in the central Bering Sea. No marine mammal entanglements occurred in the fleet during this interval. The marine mammal biologists were able to observe the fishery operations of the fleet, including the mimeographed fishery coordinates for adjacent catcher boats and the overall configuration of the fleet. The mimeograph configurations were provided daily to the captain of each catcher boat. Study of these configurations may help explain how porpoise become entangled since the gillnets may form a confusing maze for the porpoise.

It was the consensus of the marine mammal scientists and the Japanese scientists aboard the Hoyo Maru that, although the dedicated vessel was useful for accomplishing some of the research objectives, entanglement of marine mammals would be best studied during the fishing season on the commercial fishing grounds where a large number of entanglements occur. Information on catcher boat deployment strategies is also critically needed since the pattern of the nets in the area must affect the probability of entanglement.

ACOUSTIC STUDIES

Acoustic studies were undertaken in 1978, (1) to characterize the acoustic capabilities of Dall's porpoise and salmon; (2) to characterize the acoustic environment of the salmon gillnets; and (3) to design gear modifications and experiments.

Preliminary work on salmon and Dall's porpoise acoustic responses indicated that the frequency response of the species are dissimilar. Therefore acoustic warning devices could probably be developed to which porpoise would, and salmon would not, respond.

Investigators at the Hubbs Sea World Research Institute (HSWRI) are studying Dall's porpoise phonation and responses, and the morphology of porpoise auditory structures. These investigators have obtained the first recordings of high frequency sound production by Dall's porpoise. They are optimistic that this information can aid design of an acoustic warning device for Dall's porpoise. Comparisons of auditory structures and sound production of several marine mammal species indicate that Dall's and harbor porpoise are similar, but both differ from bottlenose and common dolphin.

The final report on the acoustic studies of HSWRI will be submitted at the end of September. It is to include a bioacoustical model of the Dall's porpoise-salmon gillnet interaction and an evaluation, based on this model, of potential acoustic means for reduction of the incidental take by this fishery.

RESEARCH PLANS 1980

Aboard Japanese motherships

1. Continue collection of biological data and samples from all Dall's porpoise incidentally taken in the high seas salmon drift nets.
2. Obtain data on catcher boat deployment configurations and the factors utilized in deciding the daily configuration.
3. Place observers aboard catcher boats throughout the fishery grounds and season to observe entanglements, the size of individuals lost out of the nets, and the environmental conditions associated with each entanglement, and to conduct sighting surveys for estimation of the abundance of Dall's porpoise on the fishing grounds during the fishery season. If possible, observers would systematically disentangle each marine mammal in order to develop an understanding of how porpoise entangle, and how they behave when contact is made with the net. If possible, the configuration of the gillnet prior to hauling should be detailed.
4. Collect biological samples and data from North Pacific fur seals entangled with in gillnets.

Aboard Japanese research vessels

1. Conduct sighting surveys to estimate abundance of marine mammals and their distribution.
2. Collect biological samples and data from entangled marine mammals.
3. Observe marine mammal behavior near gillnets and vessels.
4. Collect information on other organisms that are present during fishery operations and which may have a role in attracting Dall's porpoise to the gillnet area.
5. Collect specimens for identification of the prey of Dall's porpoise.
6. Collect sea birds entangled in gillnets for cooperative study with U.S. Fish and Wildlife Service.

Aboard Japanese dedicated vessels

1. Deploy the dedicated vessel as a catcher boat in a mothership fleet to study Dall's porpoise entanglement, and the environmental conditions and gear characteristics associated with entanglements. Each marine mammal caught in the gillnet will be systematically untangled to determine how animals behave upon contact with the gillnet, in order to develop gear modifications to reduce incidental take.

2. Conduct marine mammal sightings on the fishing grounds during the fishing season.

3. Study the behavior of animals near gillnets and vessels.

4. Obtain samples of the biological community associated with the gillnets to determine factors that may be involved in attractions of Dall's porpoise to the gillnets and vessels.

5. Tag Dall's porpoise on the fishing grounds prior to commencement of the fishing season to determine movement patterns, and as an indication of catch rate.

Aboard Japanese landbased salmon vessels

1. Obtain biological data and samples from Dall's porpoise and northern fur seals incidentally taken in the drift gillnets of the landbased salmon fishery for estimation of life history parameters and determination of stock differences between animals taken in this fishery and in the high seas fishery.

2. Obtain data on the incidental take of marine mammals in this fishery.