Annual Report on
Dall Porpoise - Salmon
Research

Conducted Under
International North Pacific Fisheries Convention
Japan - United States Memo of Understanding
April 25, 1978, North Pacific Fisheries
Act of 1954 as Amended April 1, 1978, to
March 31, 1979

A Report to Congress
July 1979

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
Dear Sirs:

It is my honor to submit the Annual Report of the Department of Commerce, prepared in consultation with the Department of State, pursuant to Section 14(d) of the United States North Pacific Fisheries Act of 1954 as amended, for the period April 1, 1978 through March 31, 1979. The Report describes research studies on salmon stocks and the problems of incidental take of marine mammals in the Japanese High Seas salmon fishery.

Sincerely,

[Signature]

Secretary of Commerce

Enclosure

President of the Senate
Speaker of the House
The International Convention for the High Seas Fisheries of the North Pacific Ocean (INPFC) was signed by Canada, Japan, and the United States in 1952 and entered into force in 1953. This Convention provided substantial protection to salmon of North American origin by the inclusion of an abstention principle governing the harvest of salmon on the high seas. Under this principle, each Contracting Party agreed to abstain from fishing for stocks already fully utilized by one or more of the Contracting Parties. Because Pacific salmon met the criteria for abstention, Japan agreed to abstain from fishing for salmon east of a longitude 175° W line in the Northeast Pacific Ocean and Bering Sea (fig. 1).

The Fishery Conservation and Management Act of 1976 (FCMA) directs the Secretary of State, in cooperation with the Secretary of Commerce to initiate promptly the renegotiation of any treaty pertaining to fishing within the U.S. fishery conservation zone (FCZ) or for anadromous species or Continental Shelf fishery resources beyond that zone, which is inconsistent with the purposes, policy, or provisions of the Act. Because the INPFC was inconsistent with the Act in several respects, it was necessary to renegotiate or terminate the treaty.

On February 10, 1977, the United States gave notice of intention to terminate the INPFC in 1 year unless it was renegotiated within that period. Negotiations began in October 1977, and agreement on a Protocol to the INPFC was reached on April 5, 1978. Canada, Japan, and the United States signed the Protocol on April 25, 1978.

Article 10 of the Protocol provides,

The Contracting Parties agree that a scientific program is necessary to carry out the provisions of this Convention. The Contracting Parties, therefore, agree to establish a program to coordinate their scientific research activities with respect to anadromous species in the Convention area, as well as species of marine mammals caught in fishing for anadromous species. The Contracting Parties agree to exchange scientists in order to carry out scientific observations with respect to the catches and methods of operation. The Contracting Parties shall establish procedures to facilitate observations.
Figure 1.--The area of the Japanese driftnet fishery in which marine mammals have been taken incidental to the salmon fishery. The abstention line was moved to 175°E, effective during the 1978 landbased fishery season.
The Annex to the Protocol provides in Paragraph 1(c):

The requirement of the Government of the United States that Japanese fishing vessels, engaged in the salmon fishery within the United States fishery conservation zone, have on board a Certificate of Inclusion relating to the incidental taking of marine mammals shall be suspended for the period ending June 9, 1981, during which period the Governments of Japan and the United States shall conduct joint research, shall cooperate to determine the effect of the Japanese salmon fishery on marine mammal populations, and shall work to reduce or eliminate the incidental catch of marine mammals in the fishery.

Japan and the United States also signed a Memorandum of Understanding (MOU) in connection with Article 10 of, and Paragraph 1(c) of the Annex to the Protocol. This MOU (Appendix 1) details the specific elements of a Japan-United States joint marine mammal research program to be carried out according to the Protocol.

The legal authority which requires that a Certificate of Inclusion be aboard any vessel which takes marine mammals incidentally in the course of commercial fishing operations, within the FCZ, is found in Section 104(h) of the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361-1407) and the Regulations Governing the Taking and Importing of Marine Mammals (50 CFR Part 216). Prior to the issuance of any general permits, the Secretary of Commerce, on the basis of the best scientific evidence available, must make a determination of the optimal sustainable population for the affected species, and demonstrate that the stocks of the species will not be disadvantaged by the proposed taking. Such scientific evidence must include an analysis of the estimates of populations, ascertain the level of incidental take and establish the reproductive rates and net productivity of the species in the marine ecosystem.

It is necessary that a background knowledge of the biology of the species involved in the fisheries be developed to answer the above questions. The research program was designed to determine the distribution, abundance and status of the population, in addition to gathering information on the basic biology and ecology of the species including reproduction, food habits, age structure, and mortality. Appendix I discusses the research plan in greater detail.

Section 14 of the North Pacific Fisheries Act of 1954, as amended to reflect the 1978 Protocol (16 U.S.C. 1021 et seq.; 68 Stat. 698), requires that on May 1, 1979, 1980, and 1981, the Secretary of Commerce submit to Congress a report, prepared in consultation with the Secretary of State, which describes the activities undertaken by Japan and the United States to implement the Protocol objectives, which are (1) carrying out a marine mammal research program; (2) determining the effect of the salmon fishery on marine mammal populations; and (3) working to reduce or eliminate the
taking of marine mammals incidental to fishing operations during the research period ending June 9, 1981. This document reports U.S. research progress made on marine mammals and salmon under INPFC for the period of April 1, 1978 to March 31, 1979.
Several species of marine mammals in the North Pacific are caught incidentally by the Japanese high-seas salmon fishery. Animals entangle and drown in gillnets used by independent land-based driftnet vessels and by catcher boats associated with the motherships. The extent of the taking is not known accurately, but estimates of as many as 20,000 Dall porpoises, Phocoenoides dalli, per year have been made. Available data are inadequate to determine current population size, total incidental take, or the rates of reproduction and natural mortality for the affected porpoise populations. North Pacific fur seals, Callorhinus ursinus, are also taken incidentally in the salmon fishery. The level of that take has decreased in recent years. Effective means to reduce the incidental take of marine mammals in the salmon fisheries are also unknown. The cooperative research program was established by the Memorandum of Understanding to study and resolve that problem.

The Dall porpoise, is a compact, thickly muscled, short-snouted porpoise common to the cold waters of the North Pacific. Mature individuals weigh up to 218 kg and reach a length of 2 m. The body is black with contrasting white ventral and lateral markings; the dorsal fin and tail flukes may be edged with white. Three color variations exist and seem to be associated with different geographical regions: the first, common along the Pacific coast of Japan, has black upper parts, a white area extending laterally to the flippers, and a white throat patch; the second, which is more cosmopolitan, also has a black upper body, but the white area does not extend far beyond the anterior margin of the dorsal fin. The third form, occurring along the Sanriku coast of Japan, is solid black.

The porpoises occur from central Baja California around the North Pacific Coast to the southern region of Honshu, Japan (fig. 2). They also are found in the southern half of the Bering Sea, southern Sea of Okhotsk, and the eastern sea of Japan. The Dall porpoise is a fast swimmer capable of overtaking boats traveling at 17 knots. The porpoises travel in small groups, often less than five individuals per group.

Studies on Incidental Take by Japanese Salmon Gillnet Fishery Motherships

Scientific teams, each composed of one marine mammal biologist and one salmon observer, were assigned to four Japanese motherships in the 1978 salmon fishing season to gather information on incidental take, and to obtain biological specimens for estimating life history characteristics and for determining identity and discreteness of stocks. Although the observers were scheduled to be aboard the motherships from June 9 to 25
Figure 2.--Suggested distribution of the Dall porpoise.
while fishing was conducted inside the U.S. FCZ, the actual time on board was shortened, because of the time required for transit to the ships.

U.S. scientists were aboard the following Japanese motherships:

<table>
<thead>
<tr>
<th>Mothership</th>
<th>Dates</th>
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<tbody>
<tr>
<td>Jinyo Maru</td>
<td>June 11-22</td>
</tr>
<tr>
<td>Meiyo Maru</td>
<td>June 11-24</td>
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<tr>
<td>Nojima Maru</td>
<td>June 12-24</td>
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<tr>
<td>Shinano Maru</td>
<td>June 13-21</td>
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Biological data were obtained on 354 of the total 499 Dall porpoises taken by the mothership fishery. The Japanese catcher boats were unable to return the remaining 145 incidentally taken porpoises to the mothership for sampling. During mothership cruises with U.S. observers aboard, the catcher boats returned a total of 196 Dall porpoises. After United States scientists disembarked, Japanese personnel collected specimens from an additional 158 Dall porpoises, on the motherships.

United States scientists recently received incidental catch data collected by the Government of Japan (GOJ). The data were not received in time to be analyzed for this report. The data include:

1) Distribution of the incidental catch of 499 Dall porpoises caught between May and September 1978 by salmon gillnet motherships, by 1° by 1° areas;

2) Distribution of the incidental catch of 27 Dall porpoises caught between May and September 1978 by salmon research vessels, by 2° by 5° areas; and

3) Distribution of the incidental catch of 303 Dall porpoises caught in June and July 1978 by the land-based salmon driftnet fishery, by 2° by 5° areas.

In addition, six fur seals were captured in the nets and were released alive. Japanese domestic law prohibits the possession of fur seals aboard Japanese vessels so that any found dead were not examined.

The highest incidental take of Dall porpoises in the mothership fleet was in mid and late June. Effort data have not been provided at this time, therefore, it cannot be determined whether the monthly differences in incidental take are caused by greater fishing effort or other factors. It is not known why the incidental take was generally higher inside the U.S. FCZ than outside the FCZ. Highest incidental take in the land-based fishery occurred in May and June.
The 1978 level of incidental take is considerably less than that estimated previously by scientists (20,000 Dall porpoises per year). However, the Japanese delegation at the recent meetings of the Scientific Subcommittee of the INPFC Ad Hoc Committee on Marine Mammals reported a substantial decrease in the number of boats involved in the high-seas salmon gillnet fishery. The relationship between fishing effort and incidental take must be evaluated before conclusions can be made on the impact of the Japanese salmon fishery on marine mammal populations.

**Biological Studies.**

A major program component was the participation of United States scientists in surveys made aboard Japanese research vessels and United States flag vessels to determine the abundance, distribution, and migration of Dall porpoise based upon marine mammal sightings.

Two United States marine mammal biologists were placed aboard each of the three Japanese salmon research vessels that were making oceanographic and fishery studies in the salmon fishing areas during the 1978 season. These scientists were at sea for cruises of 20 to 60 days from June 5 to August 24. Cruise tracks covered the area from Hakodate, Japan, across the North Pacific Ocean, along the southern Bering Sea, and back (fig. 3).

During these cruises, 5,687 marine mammals were sighted, representing 16 species. Of these, 1,266 were Dall porpoise sightings, which recorded 1,924 animals of this species. The Dall porpoise data are being processed and analyzed in the overall work of the research program to estimate population abundance.

In addition, scientists aboard U.S. flag vessels made marine mammal sightings during 10 Platform of Opportunity cruises. Most of these cruises were in the Gulf of Alaska. The first cruise began on May 22; the last ended November 28. A total of 1,733 Dall porpoises were reported in the course of 235 sightings.

Dall porpoise sightings have been recorded since 1958 on sighting surveys conducted by the North Pacific Pelagic Fur Seal Program. These data will be included in a computer analysis and contribute to the estimate of abundance.

Dall porpoises were sighted by the Pelagic Fur Seal Investigations as far north as 66°21'N and as far south as 32°20'N. Coordinates of Dall porpoise sightings made during 1958-78 are being plotted monthly to determine seasonal changes in distribution of Dall porpoises.

Surface water temperature data at the time of the sighting were collected. Sightings occurred in waters of 2° to 21°C, but were most frequent between 8° and 11°C.
Figure 3.--The North Pacific Ocean showing major geographic points.
Finally, studies are being made on the reproductive biology, age structure, and food habits of animals taken in gillnets to determine the impact of incidental taking on Dall porpoise populations.

**Acoustical Studies.**

Studies are being made to characterize the acoustic response of Dall porpoise and evaluate the acoustic environment of the salmon gillnets. The purpose is to develop gear or fishing techniques that could reduce or eliminate incidental take of Dall porpoises in the salmon gillnets. Contracts for these studies were made with investigators of the Naval Ocean Systems Center (NOSC) and with Hubbs-Sea World Research Institute (HSWRI).

The project by NOSC scientists included a literature review, an analysis of field recordings of Dall porpoise sounds, hatchery observation of salmon auditory responses, and development of an acoustic system to reduce incidental take of Dall porpoises in salmon gillnets.

Preliminary assessment of the acoustic characteristics of Dall porpoises indicates that they produce sounds up to 12 kHz, and respond to auditory signals up to 105 kHz. These ranges appear to be well above the auditory response range recorded for salmon. It may be possible, therefore, to place acoustic devices near or on the gillnets to warn porpoises away without affecting the salmon.

Investigators at HSWRI are describing the morphology of the auditory structures of Dall porpoises to predict the auditory response patterns of the species. This study is in the preliminary stages, but is expected to provide a bioacoustical model of the interaction between Dall porpoises and salmon gillnets. The model will be used to evaluate the feasibility of acoustic warning devices for reducing the entanglement of Dall porpoises in salmon gillnets. If proved successful in concept, acoustic devices will be designed for field testing.

**Salmon Research**

The Agreed Minutes to INPFC signed April 25, 1978, provided for no more than three observers from the United States and/or Canada to board Japanese research vessels and collect biological data during salmon research efforts in the Bering Sea. The National Marine Fisheries Service (NMFS) sponsored two observers aboard the cruise of the research vessel Riasu Maru No.2 from June 18 to July 31, 1978, in the Bering Sea (latitude 56° N to 61° N, longitude 175° E to 175° W). The NMFS observers had the following duties (in order of priority):

a. Collect scale samples from chinook salmon (Oncorhynchus tshawytscha) and chum salmon (O. keta) from motherships operating in the study area and determine body length, body weight, gonad weight, and sex.
b. Tag pink salmon (O. gorbuscha) on board commercial catcher boats to determine randomness of samples used by the Japanese to obtain average weight of pink salmon.

c. Collect tissue samples from chinook and chum salmon on board the research vessel to determine the continent of origin by studying the biochemical enzyme systems.

Collection of Biological Data and Samples

A total of 15,283 salmon were gillnetted aboard the Riasu Maru No.2 from June 26 to July 24, 1978, including 9,455 chum, 3,451 pink, 1,893 sockeye (O. nerka), 467 chinook, and 17 coho salmon (O. kisutch). Daily totals ranged from 85 to 1,819 salmon. The highest daily catch was 1,367 for chum salmon and 112 for chinook salmon. More chum, sockeye, chinook, and coho salmon were caught later in the cruise; more pinks were caught earlier in the cruise.

Tagging

Because of a misunderstanding between Japanese officials and United States scientists on objectives of the proposed catcher-boat tagging program and the lack of working space on catcher boats, the tagging study was not started.

Canadian and United States Participation on Japanese Research Vessels

Canadian scientists did not participate in 1978 in cooperative salmon research in the North Pacific Ocean aboard Japanese research vessels. Nine U.S. scientists were on board four of nine salmon research vessels to study salmon, marine birds, and marine mammals caught by gillnets and longlines. All vessels had nonselective monofilament salmon gillnets with 10 mesh sizes ranging from 48 mm to 157 mm and ordinary gillnets with mesh sizes used in Japanese commercial fisheries on the high seas. Three vessels also had longlines. From mid-June through late July 1978, two vessels fished at predetermined stations in the Bering Sea with gillnets or longlines. From May to July 1978, five vessels fished with gillnets along eight north-south lines in the area from 38° N to 52° N and from 146° E to 177° W to determine the abundance, distribution, and migration of salmon. In addition, each vessel fished gillnets at stations south of 45° N to collect biological information on salmon. From late July to early August, another vessel fished gillnets in the North Pacific Ocean west of 175° E. From May to August, two vessels equipped with longlines and gillnets performed tagging experiments in the area from 43° N to 52° N and from 161° E to 172° W, as part of a research program coordinated by scientists from Canada, Japan, and the United States.
**Continent of Origin Studies**

In 1978, United States scientists began a study to determine the continent of origin of maturing coho and sockeye salmon in the Japanese land-based driftnet fishery area. Scale pattern data were subjected to discriminant function analysis (a statistical test that allows analysis of several variables) to determine the continent of origin of sockeye salmon sampled in 1975 by Japanese research vessels and motherships in and near the land-based fishery area. Also, the availability of scale samples for a similar analysis of coho salmon was explored.

Research continued in 1978 on another study to determine the river of origin of Bristol Bay sockeye salmon by discriminant function analysis of scale data. Immature Bristol Bay sockeye salmon were sampled by purse seine south of Adak Island. The results of this analysis were used to forecast the 1978 sockeye salmon runs into river systems of Bristol Bay. To continue studies on separation of stocks by discriminant function analysis of scale patterns, scientists also collected sockeye salmon scales from the Bristol Bay escapement and catch in 1978.

The Salmon Subcommittee of INPFC reviewed progress on the two methods considered for determining continent of origin, scale pattern analysis, and tagging. It was agreed that the United States scientists would develop an analytical method and use scale samples collected in 1975 from the Japanese land-based driftnet fishery, and that the United States would give Canada and Japan a written description of the criteria and methods used and provide them with the basic data on computer tapes. After reviewing tag releases by time and area of tagging, and species tagged, the subcommittee concluded that more detailed catch-effort data in the Japanese land-based fishery would be needed to determine when and where tagging would be most productive. Japan's plans for research vessel sampling and tagging in 1978 were reviewed, and suggestions for focusing tagging effort were discussed. The subcommittee recognized limitations on the number of tags that could be released by two research vessels. At this level of tagging, many years would be required before any substantial information would be available on the country of origin of salmon.

The Salmon Subcommittee concluded that the data bases for continuing continent of origin studies could be improved by 1) gathering more detailed time-area catch and effort information from the Japanese land-based and mothership fisheries, 2) increasing scale collections and amount of associated data, 3) using multicharacter studies to determine stock origins, 4) obtaining U.S.S.R. scale samples, and 5) increasing the tagging effort.
1978 Japanese Salmon Mothership Observer Program

The placement of observer teams on motherships is described on page 2.

Salmon fishing operations of the mothership fleets followed the pattern observed by U.S. scientists in the early 1960’s. Each fleet of 37 catcher boats and 6 scout boats set gillnets in late afternoon and began pulling them early the next morning. Catches were transferred daily in mesh bags to each of the four motherships from the catcher boats moored at fore and aft weighing stations. Each bag contained salmon of a single species. Three men supervised its weighing: a representative of the catcher-vessel owner’s association representing the seller, an official of the mothership company representing the buyer, and a Japan Fisheries Agency (JFA) inspector who certified the accuracy of the catch weight and arbitrated buyer-seller disagreements. The U.S. salmon observer could not monitor all catch weights because the catcher boats were off-loading at two places with about 1-minute intervals between weighings. The observer randomly checked weights at both stations, recording about one-fourth the catch weights of the 37 catcher boats. Observers later compared their catch records with those furnished by the JFA chief inspector. Little or no discrepancy was found between records. One observer obtained daily scout boat landings; similar data of the catches of six scout boats were not available to observers aboard the other three motherships. When the fleets fished seaward of the FCZ, the ship captains directed the observers to suspend recording of weights and limit their observations to Dall porpoises.

Research Plans in 1979

Although the general research program for 1979 is similar to that conducted in 1978, there are some additions. These are as follows:

a. Abundance studies. Japan will provide the research vessel salmon catch record in numbers rather than tons to facilitate comparison with incidental catch of Dall porpoises. Japan and the United States agreed to develop a standardized format for recording sightings and life history data. Japan emphasized the need for sighting studies in areas not covered by the cooperative research programs, and the United States confirmed that its Platform of Opportunity program would continue. Canada, on request, will explore possibilities for Platform of Opportunity sightings by Canadian observers.

It was agreed that all marine mammals taken by the mothership fishery would be recorded, including animals released alive.

It was agreed that the United States would place, and Japan accept, two United States marine mammal scientists aboard the OSHORO MARU and the HOKUSEI MARU. One U.S. marine mammal scientist would also be placed aboard each mothership vessel.
b. **Biological studies.** The United States noted that U.S. scientists would obtain records of the reasons for non-delivery to the mothership of porpoises taken by the catcher vessels. Japan agreed to provide space for the same number of containers for biological specimens as in 1978. Japan also agreed to collect and freeze up to 10 Dall porpoises per mothership prior to the boarding of United States scientists.

c. **Dedicated Vessel Studies.**

The Japanese Fisheries Agency is making available a dedicated vessel during the 1979 fishing season for U.S. and Japanese scientists to study Japanese fishery operations and how entanglement of marine mammals in the gear occurs. The information obtained will be extremely valuable for designing new experiments and equipment to reduce mortality. Japan advised the United States participants that the vessel to be provided specifically for marine mammal research would be a craft of about 300 tons and 33-40 meters long.

Acoustical studies will be made to provide a mathematical model of the porpoise-gillnet interaction. These studies will be useful in designing or modifying gear to reduce incidental take.

The question of embarkation and disembarkation of U.S. observers was discussed. No final conclusion was reached on the period during which observers would be aboard the mothership while they were outside the U.S. FCZ. Further intergovernmental communication will resolve this question. However, it was agreed that observers should arrive in Adak by June 6 for embarkation on Japanese patrol vessels.

**Future Meetings:** The Japan-United States subcommittee of the Ad Hoc Marine Mammal Scientific Committee of INPFC recommended that its next formal meeting be held in Tokyo, Japan, during February or March in 1980.