

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Tokyo, Japan, 1983 February 25

REPORT OF THE SCIENTIFIC SUB-COMMITTEE OF THE AD HOC COMMITTEE ON
MARINE MAMMALS

The Scientific Sub-Committee of the Ad Hoc Committee on Marine Mammals met February 21 to 25, 1983 in Tokyo, Japan. C.R. Forrester convened the meeting. Mr. Tatsuo Saito of Japan welcomed participants and made opening remarks.

1. PARTICIPANTS

Individuals participating in the meeting are listed in Appendix 1.

2. SELECTION OF CHAIRMAN

J. Ito of Japan was selected as chairman.

3. SELECTION OF RAPPORTEUR

The Secretariat kept the record and prepared a draft report for consideration by the sub-committee.

4. AGENDA

The scientific sub-committee adopted the following agenda for its sessions:

- (1) Opening remarks
- (2) Introduction of members and advisers
- (3) Election of chairman
- (4) Appointment of rapporteur
- (5) Adoption of agenda
- (6) Review of terms of reference
- (7) Review of documents

- (8) Review of research program and 1982 research activities
 - (a) Incidental catch by Japanese research vessels and salmon fishery
 - (b) Studies on reduction of incidental catch
 - (i) Modifications to gear or techniques
 - (ii) Acoustic studies
 - (c) Abundance studies
 - (i) Sighting survey
 - (ii) Incidental catch data
 - (d) Biological studies
 - (e) Behavioral studies
 - (f) Others
- (9) Research plan in 1983 season
- (10) Report according to the Memorandum of Understanding
- (11) Future meeting or consultations
- (12) Consideration of report to the ad hoc committee

5. TERMS OF REFERENCE

The sub-committee's terms of reference as assigned by the Commission in 1981 are as follows:

- (1) Coordinate and review studies with respect to marine mammals incidentally caught in the Convention area when fishing for anadromous species, as per Article X of the Convention, paragraph 1(c) of the Annex to the Convention, and the Memorandum of Understanding regarding Dall's porpoises signed by representatives of the Governments of Japan and the United States in Washington, D.C. on June 3, 1981.
- (2) Prepare a report annually for consideration by the Ad Hoc Committee on Marine Mammals on the above matters.

6. REVIEW OF DOCUMENTS

The following documents were reviewed by the sub-committee: Docs. 2585, 2594, 2598, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, and 2619.

7. REVIEW OF RESEARCH PROGRAM AND 1982 RESEARCH ACTIVITIES

- (1) Incidental catch by Japanese research vessels and salmon fishery

A summary of observations on incidental catches of marine mammals (principally Dall's porpoise) was given by United States and Japanese participants and discussion followed. The United States summarized information contained in Docs. 2594 and 2515 as follows:

U.S. biologists boarded three Japanese salmon research vessels in 1982 to conduct marine mammal sightings, observe gillnet operations and marine mammal entanglements and collect biological samples. During 67 gillnet operations observed, a total of 24 Dall's porpoise were entangled. Of these, 12 were dead, 6 were alive and released and 6 were lost during retrieval. The entanglement rate was about 2.6 porpoise per 1,000 tans or about 0.87 porpoise per 330 tans. Other species entangled included 1 Delphinus delphinus (common dolphin) and 8 Callorhinus ursinus (northern fur seal) of which 3 were dead. A computer tape with the 1981 and 1982 incidental take, gillnet set and retrieval data was provided to Japan.

United States and Japanese biologists boarded salmon catcher boats inside the U.S. FCZ to monitor the incidental take of marine mammals. Japanese scientists also monitored incidental take outside the U.S. FCZ. The total number of gillnet sets monitored by observers in the FCZ was 414 out of 6,271 sets (6.6%) and the total sets monitored for the fishing season was 475 or 5.3% of the 8,957 sets. A total of 292 entangled Dall's porpoise was observed during the 1982 fishing season, with up to 8 entangled in a single set. The observed take rates in 1982 were substantially higher than in 1981. The observed rates inside the U.S. FCZ in 1982 varied from 0.29 to 0.96 porpoise per set. The take rates reported for the fleet in 1982 ranged from 0.35 to 0.38 porpoise per set. The estimated take of Dall's porpoise inside the U.S. FCZ in 1982 was 4,187 and the estimated take for all areas was 5,903.

The United States noted that the incidental take of Dall's porpoise in 1982 was significantly higher than in 1981. Some factors which may have accounted for the increased catch were increased numbers of porpoises in the areas fished, changes in areas fished, or differences in environmental conditions. An examination of the observed gillnet operations by area showed differences by fishing areas in 1982 with higher take rates in the northern area of 53° to 55°N (1.29 per set) than in the southern area of 49° to 52°59'N (0.69 per set). No observations were made in the northern area in 1981. The take rate in the southern area in 1982 was higher than in 1981 (0.29 porpoise per set). In some 1°x1° areas there was no difference in take rate between years; in others there was a substantial increase in 1982.

The frequency distribution of the number of porpoise entangled was also compared for the two years. In 1982 there were fewer sets with no porpoise entangled than in 1981, and there were a number of sets in which higher numbers were entangled than in 1981. There was no apparent association between sightings of porpoise and subsequent entanglements during observed setting or retrieving operations.

Japan had previously summarized in Doc. 2585 the incidence of entanglements in 1982 and on the research conducted since 1978. In 1982 a total of 317 salmon research vessel operations were conducted using a total of 40,262 tans. Fifty Dall's porpoise were observed to be entangled (48 dalli type and 2 truei type). This was an entanglement rate of 0.15 per operation or 1.24 per 1,000 tans. Of the porpoise entangled, 15 were alive and released, 11 were dead and lost and 24 were dead and landed aboard vessels for biological sampling.

The incidental take reported for the mothership operation in 1982 was 3,190 Dall's porpoise (Doc. 2609). The incidental take of Dall's porpoise reported in the landbased fishery in 1982 was 1,641 individuals (Doc. 2610).

A discussion took place on the interesting differences in incidental capture between 1981 and 1982 and the high incidence found north of 53°N. The take rates alone provided no answer. It was noted that distribution of porpoise schools was not consistent and that general patterns of distribution may be affected by distribution of prey. It is planned to study factors such as degree of water clarity, Beaufort Sea state, swell direction, etc., in relation to individual daily catcher boat data if such information is available.

(2) Studies on reduction of incidental catch

(a) Modification to gear or techniques

Tests by Japanese commercial fleets in 1982 of fishing gear modified to prevent the incidental take of Dall's porpoise as described in Doc. 2619 were summarized. Gillnet gear was modified by (1) the insertion of air tube threads and (2) by attachment of sound generators designed to emit a frequency normally considered to be used by porpoises. Results of incidental take of porpoises by the modified gears were compared with the take by vessels using standard gear.

Both experimental gears showed reductions in incidental take rate of about 40% from the standard gear in 1982. These results were similar to those observed in 1981. The reductions increased with the number of porpoise entangled. Both the test and standard vessels showed a high proportion of "0" incidental take operations. A comparison of incidental take by test and adjacent standard fishing vessels to the north, south, east and west of the test vessel showed similar reductions in catch by the test vessels as shown for the experiments as a whole.

Entanglements were found to occur most frequently in the upper and middle portion of the net compared to the lower portion (ratio of 5:4:1). No appreciable difference in horizontal distribution of entanglement was observed by Japan, but in 1982 there

appeared to be slightly more entanglements near the ends of the nets. The United States scientists noted that they had observed a higher incidence of entanglements at the end of the nets in both 1981 and 1982. The 1982 rates were 0.77 porpoise per set for 500 m at the start and end of the net sections and 0.35 per set for the remainder of the net. There was some suggestion that this may be associated with locations of buoys or beacons.

Japan reported that most occurrences of entanglement of the porpoise were at the tail fin of the animal or in a complicated form of entanglement. There was no apparent variation in the incidental take at Beaufort Sea state conditions of 5 or less, but there was a tendency for take to decline at sea conditions of 6 or higher.

The data collected to date show no appreciable difference in catches of salmon between the modified fishing gears and the standard gear, but comparative data are only available for the year 1982.

(b) Acoustic studies

Acoustic studies by Japan related to reducing the incidental take of Dall's porpoise by salmon gillnets were described (Doc. 2617). Experiments included recording of echo-locating pulses of Dall's porpoise and modification of sound generation equipment for use in 1983. In July 1982, several Dall's porpoise approached within one or two meters of a hydrophone and recordings were made for a period of ten minutes. The clicks generated by the porpoises were roughly from 130 to 150 kHz frequency with pulse widths of 50 to 200 microseconds and sound pressures of 30 to 40 db. The clear pulses obtained are being studied.

Sound generators used up to now with the salmon gillnets have operated at 9 kHz. Modifications have been made to the generators to produce pulses of 143 kHz which is in the range most frequently used by the Dall's porpoise, and to provide capability of changing sound pressures, pulse widths and periods. It is planned to use the modified and the original sound equipment on nets on the fishing grounds in 1983.

(3) Abundance studies

(a) Sighting survey

Sighting studies to aid in determining the abundance of Dall's porpoise were continued by Japan in 1982 (Doc. 2608). The studies were conducted with a total of 10 vessels including the dedicated marine mammal vessel the Hoyo maru No. 12 over a research area extending from 34°N to 59°N and 144°E to 130°W. The format for recording observations was similar to that used during 1978 to 1981 but recording environmental data was increased from every two hours to every hour in 1982. The distance surveyed in 1982 was 49,830 nautical miles, an increase of 3,598 miles over 1981. The number of days of sighting also increased.

During the 1982 survey 20 species of marine mammals which totalled 6,800 in number were sighted and recorded. Dall's porpoise were the most abundant of those observed (4,594 or 67.5%) and the dalli type constituted 91.4%. The dalli type and northern fur seals were sighted in almost all research areas north of 40°N. Most of the truei type were sighted in areas west of 153°E. The largest school of dalli type sighted in 1982 consisted of 20 individuals and average school size was 3.9. Examination of school size by area showed no substantial differences in 1978 to 1982 data, but larger schools appeared more frequently in the northwestern North Pacific and in the Gulf of Alaska.

Japan considered that the average size of schools of porpoise observed increased with distance up to 400 to 1,000 m from the vessel and thereafter decreased. This suggested a splitting of schools as they neared the vessels and that natural school size was around six individuals or more. Observations on behavior showed that about 50% of schools observed showed no interest in the vessels. It was apparent that estimation of group size would be more accurately determined by other than ship-board observations. Weather condition and visibility also had an effect on sightings. This relationship was discussed at earlier meetings. A study by Japan of the relationship between visibility and sighting distance suggested that the estimation of density from the Japanese research is underestimated.

In estimating abundance Japan has used a form of line transect method (Doi 1974) and in 1982 also used a Fourier series method which appeared more appropriate. The Doi method yielded abundance estimates for 1982 of 1.965 million Dall's porpoise and 169,000 northern fur seals in the research area. Extrapolation of these estimates to the whole North Pacific north of 40°N including the Okhotsk and Bering Seas yielded estimates of total Dall's porpoise of 4.543 million individuals and an estimated 391,000 northern fur seals.

The Fourier method, which excluded the Okhotsk and Japan Seas, yielded a population estimate in the research area of 2.337 million Dall's porpoise in 1982. There were variations in population estimates from year to year calculated by both the Doi and Fourier methods with abundance appearing higher in 1980 and 1982 than in 1981.

The United States reported on abundance estimates derived from 200 and 400 m strip transects. A computer tape containing the sighting data collected by the United States in 1982 was provided to Japan. Population estimates of Dall's porpoise ranged from 760,000 (400 m strip in 1982) to 1,414,000 (1978 to 1982, 200 m strip). Japan noted that the 400 m strip method has a greater possibility of underestimation than the 200 m strip method, due to difficulty of sighting in the range 200 m to 400 m. Japan suggested that the abundance estimates of the United States, both the 200 m and 400 m strips, are not modified by a factor for weather conditions and may have a tendency to underestimate.

It was recognized that in the U.S. estimate for 1982 there was insufficient data for the eastern North Pacific area to make direct estimation of density and abundance. Both the United States and Japan expressed the desire for greater sighting survey effort, particularly in the northeastern Pacific and the Bering Sea and the need for further refinement of methods of estimating abundance of Dall's porpoise.

(b) Incidental catch data

It was recognized that there should be some relationship between abundance of Dall's porpoise and their rate of incidental capture in the salmon fishery. Japan noted the agreement in trends in overall incidental catch rate and estimates of abundance, with both showing lower values in 1981 than in 1980 and 1982. In particular areas, however, this pattern of agreement was not always apparent.

Japan suggested that complete agreement in trends in incidental take rates and abundance estimates should not be expected because of the schooling nature of the animals, changes in patterns of distribution, and variations in the environment encountered during the sighting surveys.

(4) Biological studies

Japan reported on vertebral studies made on a total of 97 Dall's porpoise (Doc. 2611). The specimens were obtained from salmon research vessels (31), the landbased fishery (53), by harpoons off Sanriku (11), and in the Yodo River, Osaka (2). Of these, 85 were dalli type, 11 truei type, and one was a black variant. Ten of the truei type were obtained off Sanriku.

Total vertebral counts for P. dalli were 90 to 98. The vertebral counts for the 34 male dalli were significantly higher than for the 51 females. The difference appeared to occur in the caudal vertebrae and was observed in the specimens collected in the northwestern North Pacific, but not in the 7 specimens collected in the Bering Sea. No significant differences were observed in total vertebral counts between the dalli type and the truei type examined. Japan noted the desirability for additional effort to collect more specimens from the Bering Sea and Sanriku waters, and the need for more research and sampling in the northeastern Pacific Ocean, the Japan Sea, and the Okhotsk Sea.

Japan gave an oral report on other biological information obtained from 27 Dall's porpoise taken by the landbased fishery. This material was still being examined. The United States summarized biological studies conducted on Dall's porpoise collected in 1981 and 1982. A computer tape of the 1981 biological data has been provided to Japan. Food habits are being studied from stomachs collected

aboard the Japanese mothership in the Bering Sea and northwestern North Pacific in 1981 and 1982. Fish prey are being identified through otoliths and attempts are being made to identify the squid remains found in stomachs.

U.S. studies directed toward stock identification are being pursued through morphometric and parasite data. Counts of total vertebrae made on specimens collected from the U.S. FCZ, central and southern California showed no significant differences. Electrophoretic studies on tissues collected in 1981 and 1982 are also planned.

(5) Behavioral studies

Japan reported on behavioral characteristics of Dall's porpoise observed during the 34 day cruise in August and September 1982 of the Hoyo maru No. 12 (Doc. 2618). The cruise covered waters as far east as 174°E and north to 50°N. The southern limit of Dall's porpoise was observed to be at latitudes of 41° to 42°N where water temperature was about 18° to 19°C. The southern part of the range overlapped that of Lissodelphis and Lagenorhynchus.

Of the porpoise observed (710) most were dalli type and the truei type were limited to Japanese coastal waters. The sighting frequency of the dalli type was high in the western and northern parts of the research area and somewhat lower in the southeastern part.

The proportion of Dall's porpoise that rode the ship's wave was greater in the daytime than in the morning and evening, and was higher in areas where the surface water temperature was 11°C or above. In sea areas having surface water temperature of 11°C or below, most of the Dall's porpoise avoided the ship.

Where water temperature was below 11°C there were a large number of cows and calves and there was a decided reduction in the proportion of animals observed which rode the ship's wave. No cow and calf pairs were observed riding the wave.

Pod size was similar in the northern and southern areas of the region surveyed. Those in the south were predominantly males and more cows and calves were observed to the north.

Hand harpoons were used to capture 80 animals. Seventy-two of these were dalli type of which 60 were males. Ages of the animals collected ranged from 2 to 17 years.

Observations taken during the cruise and knowledge gained during the salmon mothership operations suggest that in the season of June through September, (1) females in the state of late pregnancy, lactation, or pregnancy and simultaneous lactation are mainly distributed in the northern area, and (2) the southern area is characterized by many males and some females not accompanied by calves.

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The present study clarified that the Dall's porpoise is geographically segregated by growth stage, sex and reproductive status, and that their reaction to vessels is not uniform. This suggests that the sighting rate of Dall's porpoise from ships may vary by the areas and seasons. Care must be paid to this point when estimating the Dall's porpoise population by sighting.

It is also recognized that further research on biological data such as sexual maturity, skeletal material, is important to improve the knowledge of the life history, particularly reproductive parameters and stock structure of Dall's porpoise.

The United States in behavioral studies in 1982 investigated the response of Dall's porpoise to a survey vessel through the use of helicopter observations (Doc. 2613). The helicopter made flight paths within visual range of the vessel at an altitude of 152 m and hovered over schools to observe the behavior relative to the vessel. Five distinct behavior patterns were observed: slow rolling, rooster tailing, fast swimming, surface splashing, and deep diving. Several of these patterns were linked.

Average pod size was 3.2 animals. Of pods observed, 71.3% made no apparent movement towards or away from the vessel. Of those displaying response to the vessel, 71.8% moved towards the vessel and 28.2% moved away from the vessel. Data collected suggested that porpoise within 0.5 nautical miles of the vessel were more likely to rooster tail towards the vessel than when they were at greater distances. Pod splitting was observed with a portion of the pod approaching the vessel. However, when schools split it was noted that cows and calves did not approach the vessel.

No conclusion could be reached as to whether a significant number of Dall's porpoise either moved to or away from the survey vessel and thus bias any population estimate. Also, it is not known if there is an equal chance of animals being seen whether rooster tailing or slow rolling. If too few animals are seen to be slow rolling than expected on the Japanese salmon mothership fishing grounds, and assuming the behaviors observed in the inshore area of the operation are the same as on the fishing grounds, then an underestimate of the current population may occur. However, if animals move toward the vessel in greater numbers, for example when rooster tailing, then the abundance estimates may be too high.

No attempt was made to estimate abundance of Dall's porpoise with the helicopter or to compare the sighting efficiency between vessel and helicopter observers.

(6) Others

The United States noted that in 1982 Japan had undertaken to provide information on incidental capture of marine mammals in the Japanese flying squid fishery in 1982 and asked about the availability of the data. Japan replied that information collected was now being examined but noted that the unfamiliarity of squid fishermen with marine mammals might cause problems in proper identification. The data for the fishery in 1982 would be summarized and provided after the examination. Japan also expressed its intention to continue the collection of such data and to improve its quality.

8. RESEARCH PLAN IN 1983 SEASON

The United States proposal for cooperative U.S.-Japan research on Dall's porpoise in 1983 as outlined in Doc. 2614 was discussed. The research plan in which U.S. scientists will participate is basically similar to that of 1982 and includes: (1) monitoring and verifying the incidental take of Dall's porpoise by the mothership fleets, (2) collection of sighting data for estimating abundance, and (3) collection of specimen material for biological studies. The United States also plans to continue the helicopter observer experiment in the inshore waters of Prince William Sound and hopes to arrange a similar helicopter program for a cruise in offshore waters from Seattle to Dutch Harbor, Alaska and return. This program will help to determine whether or not there are differences in behavior between Dall's porpoise in inshore and offshore areas. The United States invited Japan to participate in this latter research cruise. Japan expressed pleasure on learning of the continuation of the helicopter program in 1983.

Japanese research in 1983 related to marine mammals will be conducted in a manner similar to that in 1982. Research will include (1) collection of statistics on incidental take of marine mammals, particularly Dall's porpoise, by Japanese mothership fishery, landbased fishery, and research vessels, (2) sighting research using nine research vessels in the North Pacific Ocean and Bering Sea to estimate abundance of Dall's porpoise, (3) collection of biological material in the mothership fishery and on research vessels in cooperation with the United States, (4) sampling the incidental take of Dall's porpoise in the Japanese landbased fishery, (5) research on the vessel dedicated to marine mammal research, including sampling, and (6) continued experiments in the commercial fleet with gear and acoustic studies to reduce or prevent the incidental capture of Dall's porpoise.

An intensification of the Japanese gear experiments is planned for 1983. Three vessels per fleet (12 in total) will use air thread gear similar to that used in 1982. Three additional vessels per fleet (12 in total) will use a net with an increased number of air

threads. One vessel per fleet (4 in total) will use conventional sound generating equipment, and 2 vessels per fleet (8 in total) will use the newly developed sound generating equipment. Thus a total of 36 vessels will use experimental gear in 1983, compared to 24 in 1982.

The United States asked about plans for gear related research other than the research mentioned above. Japan expressed their intention to provide plans to the United States when finalized.

The United States asked if the level of biological sampling in the landbased operations could be increased and if some larger Dall's porpoise could be retained. Japan noted that they would make as much effort as possible to satisfy the U.S. requests even though there are various difficulties due to limited freezing capacity of the landbased vessels.

Japan noted that sighting coverage in the eastern Pacific area should be increased. The United States agreed and outlined planned effort on Platform of Opportunity Program vessels.

The United States expressed an interest in having observers aboard the following research vessels: Hokushin maru--first and second cruises; Oshoro maru; Hokusei maru--cruise 3. With respect to observers on motherships and catcher boats in 1983, the United States planned to have the same number as in 1982, with responsibilities generally similar to those in 1982. It was anticipated that U.S. observers would embark at Adak on June 6 (Japan Standard Time). This date is to be confirmed when the fishing operations scheduled for 1983 were finalized in late April.

The United States noted the high value of the information which was being generated from the research operations which have been conducted since 1978 and expressed great appreciation to Japan for the level of activity and cooperation in the marine mammal studies.

9. REPORT ACCORDING TO THE MEMORANDUM OF UNDERSTANDING

Final reports on research relating to Dall's porpoise are required to be provided by February 1, 1984. The sub-committee agreed that the reports would include results of research for the period 1978 to at least 1982 inclusive. Draft reports prepared by Japan and the United States are to be circulated to sub-committee members by the end of September 1983. To work towards completion of final reports, the sub-committee RECOMMENDS that a working group of the sub-committee meet for 2 or 3 days to consider the draft reports in Anchorage, Alaska during or immediately following the 1983 Annual Meeting of INPFC.

10. FUTURE MEETINGS OR CONSULTATIONS

The sub-committee considered the question of location and timing of its next meeting. The sub-committee recognized the desirability in principle of rotating the location of its meeting and, for the sake of consistency with other sub-committee meetings, of holding the meeting in conjunction with the Annual Meeting of INPFC. However, the logistical arrangements for marine mammal research need to be discussed prior to the fishing season not only with Japanese scientists but also with a substantial cross section of the Japanese commercial fishing industry. In addition, a fall meeting would make meaningful discussion of the current year's research virtually impossible. For these reasons, the sub-committee RECOMMENDS that its next meeting be scheduled for late February or early March in 1984 in Tokyo, Japan. The sub-committee considered that Secretariat representation was indispensable.

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

Tokyo, Japan, 1983 February 25

PARTICIPANTS

The following persons took part in the sub-committee's sessions:

UNITED STATES

Member	L. Jones	National Marine Mammal Laboratory, National Marine Fisheries Service
Adviser	G.C. Bouchet	National Marine Mammal Laboratory, National Marine Fisheries Service

JAPAN

Member	Shigeru Odate	Far Seas Fisheries Research Laboratory, Fisheries Agency of Japan (FAJ)
Advisers	Kenji Takagi	Far Seas Fisheries Research Laboratory, FAJ
	Jun Ito	Same
	Mamoru Kato	Same
	Seiji Ohsumi	Same
	Yoshimi Hatakeyama	National Research Institute of Fisheries Engineering, FAJ
	Toshio Kasuya	Ocean Research Institute, University of Tokyo
	Nobuyuki Miyazaki	National Science Museum
	Moritaka Moritoyo	International Affairs Division, FAJ
	Manzo Tachibana	Same
	Minoru Morimoto	Same
	Masanori Miyahara	Same
	Shigeto Hase	Same
	Daishiro Nagahata	Offshore Fisheries Division, FAJ
	Shuji Ishida	Resources Division, FAJ
	Ryoji Koseki	Same
	Toshitaka Suzuki	Same
	Kenzo Kawakami	Special Adviser, Ministry of Foreign Affairs (<u>Gaimusho</u>)
	Susumu Akiyama	Fishery Division, <u>Gaimusho</u>
	Takashi Shinomiya	Same

Observers	Masayoshi Narita	Japan Salmon Gillnet Fisheries Cooperative Associations
	Sannosuke Sato	Secretary General, Northern Seas Salmon Mothership Council
	Kunio Kasai	Fleet Commander, <u>Nojima maru</u> fleet
	Takahiro Ohtsuki	<u>Nojima maru</u> fleet
	Jun Kumagai	Same
	Kenzo Kato	Same
	Shigeki Takizawa	Same
	Hiromi Ohba	Same
	Toshihiro Yoshimura	Fleet Commander, <u>Kizan maru</u> fleet
	Takayuki Tanaka	<u>Kizan maru</u> fleet
	Akira Takayama	Same
	Toshio Hidaka	Fleet Commander, <u>Meiyo maru</u> fleet
	Kunio Sunoh	<u>Meiyo maru</u> fleet
	Sumio Hirokawa	Same
	Hiroshi Miyauchi	Same
	Kazunori Kataoka	Same
	Kiichi Tomura	Fleet Commander, <u>Jinyo maru</u> fleet
	Hiroshi Ogiwara	<u>Jinyo maru</u> fleet
	Sohroku Gomikawa	Same
	Toshikatsu Maeda	Same

SECRETARIAT C.R. Forrester
 Namie Uno (Inter Group)
 Sachiko Takahashi
 Sawako Nagai

INTERPRETERS Akiko Fukushima
 Chihiro Okazaki
 Chiaki Kominami