STRICTLY CONFIDENTIAL UNTIL THE OPENING PLENARY AT IWC/56

THE 2004/2005 PLAN OF THE JAPANESE WHALE RESEARCH PROGRAM UNDER SPECIAL PERMIT IN THE ANTARCTIC (JARPA)

GOVERNMENT OF JAPAN

INTRODUCTION

The Japanese Whale Research Program under Special Permit in the Antarctic (JARPA) has been conducted every year since the 1987/88 season in compliance with Article VIII of the International Convention for the Regulation of Whaling. After two seasons of feasibility study in 1987/88 and 1988/89, the full-scale research started in the 1989/90 season (Government of Japan, 1989). The full-scale program is planned to continue for a period of 16 years and to end following the 2004/05 season. The Scientific Committee of the International Whaling Commission (IWC/SC) agreed to start planning for the review of the final JARPA results and established a small working group to undertake the planning process (IWC, 2004).

The objectives of the JARPA are: (i) estimation of biological parameters of minke whale stock, (ii) elucidation of the role of whales in the Antarctic ecosystem, (iii) elucidation of the effect of environmental changes on cetaceans, and (iv) elucidation of the stock structure of the Southern Hemisphere minke whales to improve stock management (Government of Japan, 1987; 1995; 1996).

In the surveys in Areas IV and V, a sample size of 300 (+10%) has been maintained to achieve a long-term consistency of surveys in these areas. From the 1995/96 season, the survey area was expanded longitudinally to cover the eastern part of Area III (35°E-70°E) and western part of Area VI (145°W-170°W). The objective of this expansion was to investigate the distribution of stock (s) occurring in Areas IV and V and an additional sample of 100 (+10%) minke whales have been taken every year in the extended Areas (Government of Japan, 1995). A total of eight surveys have been conducted covering the whole of Area IV and seven covering the whole of Area V. Five surveys have been conducted in Area IIIE and four in Area VIW.

Annual research plans and scientific papers derived from JARPA have been submitted to the IWC/SC each year for their review. In addition, in May, 1997, the IWC/SC carried out a comprehensive review of the data and results obtained by the JARPA at its half-way point (IWC, 1998a). The report of this review notes the high value of the data accumulated to that point and that the JARPA had already made important contributions toward the objectives of the program. Reviewers also agreed that the JARPA has the potential to improve the management of minke whales in the Southern Hemisphere. Specifically it was agreed that:

Results from JARPA will be useful in reducing the current set of plausible scenarios for the RMP, and will contribute to increase the allowed catch without increasing the depletion risk. JARPA has the potential to provide answers to various questions concerning the trend of stock fluctuation of minke whales in Areas IV and V and already has made large contribution to elucidating the biological parameters for Areas IV and V. JARPA is useful for elucidating the role of whales in the Antarctic ecosystem and the collected data should be useful to verify hypotheses such as the 'krill surplus model'.

At its meeting in 1997, the IWC/SC agreed that none of the sampling and stock identity problems that had been identified in the JARPA review, would in principle prevent JARPA from achieving its objectives in terms of estimation of biological parameters (IWC, 1998b). The Committee also identified ten main areas of research to address these unresolved problems. Studies addressing these ten areas as well as other JARPA-related studies, have been conducted and reported to past IWC/SC meetings (Abe *et al.*, 1999; Clarke *et al.*, 1999; Fujise *et al.*, 1999; Fujise and Ohsumi, 1999; ICR, 1999; Matsuoka *et al.*, 1999; Pastene and Goto, 1999; Polacheck *et al.*, 1999: Butterworth *et al.*, 1999). Other studies related to the JARPA tasks e.g. GAM based abundance estimation, were presented to the 52nd IWC/SC meting (Clarke *et al.*, 2000).

The main text of this document outlines the JARPA plan for the austral seasons 2004/2005 in Areas V and VIW. The attached appendix describes the survey plan of the R/V *Kaiyo Maru*, which will be conducted in co-operation with the regular JARPA survey. The major aim of the *Kaiyo Maru* survey is to simultaneously collect data on both whales and krill to relate their distribution and abundance to the physical and biological environment in a meso scale. It should be noted here that this survey follows the suggestions offered by the IWC/Working Group to review data and results from JARPA (IWC, 1998a). The Working Group noted that elucidating the role of whales in the marine ecosystem also requires concurrent studies on the distribution and abundance of prey species and suggested that process oriented studies would be useful which integrated information from physical and biological oceanography with zooplankton and predator studies. Such studies should be conducted on a smaller scale. The research activities of this vessel are non-lethal and they are related to objectives ii) and iii) of JARPA (see appendix for details of the *Kaiyo Maru* survey).

OBJECTIVES OF JARPA

No change from the previous research plan (see Government of Japan, 1987; 1995; 1996).

NUMBER, SEX, SAMPLING SIZE AND AREA

In 2004/05 three hundred (300) Antarctic minke whales with 10% allowances (+10%) will be sampled in Area V. In addition to this, 100 Antarctic minke whales (+10%) will be sampled in the western half of Area VI (145°W - 170°W). The continuation of the survey in Area VI is necessary for the study on stock structure as explained in the previous plans and reiterated below.

Area V sampling design remains unchanged to obtain data compatible with the past JARPA surveys. The same sample size is also retained to ensure maintenance of present levels of precision for data analysis. All samples will be randomly taken, using the same methodology as employed in the past.

RESEARCH NEEDS AND APPLICABILITY OF NON-LETHAL METHODS

Research needs in Areas V

No change from the previous research plan (see Government of Japan, 1987; 1989; 1995; 1996).

Research needs in the western part of Area VI

Estimation of biological parameters, which is the main objective of the JARPA, should ideally be carried out on the basis of genetically identified stock units. It is therefore very important to corroborate the hypotheses on stock identity derived from genetic and non-genetic analyses under JARPA (e.g. Pastene et al. 1996; Fujise, 1995). As explained in previous plan, the analyses of genetic data suggested a lot of movement of Antarctic minke whales across the IWC-boundary between Areas IV and V. This result has been corroborated recently by analyses of several independent biological and ecological markers. These analyses provide no biological support for a stock boundary at 130°E. Rather these results are consistent with a main (core) stock occupying Area IV and a part of Area V. Different stocks could occur at the lateral sectors of the JARPA research area as suggested by some degree of heterogeneity in Area IIIE (at least detected by some of the approaches being used) and Area VIW (see below). The additional surveys in Areas IIIE and VIW are therefore important to investigate distribution and boundaries (geographical and temporal) of stocks.

The Committee has noted that only preliminary conclusions about stock structure can be drawn and that more concrete conclusions will be able to be made following the completion of different analyses (e.g. microsatellites). It further supported the suggestion that additional analyses using alternative groupings and analytical methods should be conducted (IWC, 2004).

In response to those suggestions the study on stock structure under the JARPA has been extended by the use of several biological markers, both genetic and non-genetic (e.g. mtDNA, microsatellites, body proportion, ecological markers (relative occurrence of parasites), conception date and average body length of animals aged over 15 years old) and alternative groupings of samples (temporal and geographical). These approaches are being used for examining the total samples of the JARPA from 1987/88 to 2001/02.

An evaluation of preliminary results suggests that whales from Area VIW are differentiated from Areas III, IV and VW (the relationships between these whales and Area VE is still being investigated). Therefore these results provide support to an earlier suggestion based on morphological analysis that whales in Area VIW

belong to a different stock (Doroshenko, 1979; Kato, 1982). These results also confirm that the additional sampling in the extended research Areas of JARPA is producing useful information on stock structure.

Four JARPA surveys have been conducted in the western part of Area VI, in 1996/97, 1998/99, 2000/01 and 2002/03. Samples size for the 1998/99 survey is small (the survey in that year was conducted in a shorter period due to a fire accident on the research base vessel). There is the need of further sampling in Area VIW because previous results suggest additional stock structure in that sector. Additional sampling is also necessary to investigate yearly variation in that sector. Analyses of samples of 2002/03 using different approaches are still under way. Comprehensive results will be reported during the JARPA review meeting.

Acoustic and other surveys

The extent of the temporal variation (within and between years) of stock distribution patterns will also be examined using other available data such as ice edge conditions, prey species availability, and nutritional condition of sampled whales. Recently, surveys have been conducted with echo sounding equipment on the dedicated sighting vessel. The distribution and abundance of the food species including Antarctic krill, a major food species for the Antarctic minke whale, will be identified throughout the entire research area. Furthermore, the *Yushin Maru*, one of the sighting and sampling vessels, and the *Kyoshin Maru No.2*, the dedicated sighting vessel, are equipped with the Electric Particle Counting and Sizing System (EPCS). This system allows for quantification of chlorophyll in surface water. Also, useful information can be expected with regard to the survey of the Antarctic ecosystem, which is one of the important objectives of the research, as well as clarification of the possible impact of environmental changes on whale stocks. In this way the dynamics of stocks can be studied in the context of the oceanographic conditions and dynamics of the prey species in the research area (e.g. Murase *et al.*, 2002). Research activities by the R/V *Kaiyo Maru* will be particularly useful on this regard (see Appendix).

Applicability of non-lethal methods

No change from the previous research plan (see Government of Japan, 1995; 1996).

POSSIBLE EFFECT ON THE STOCK

This matter was already described in the previous research plan (see Government of Japan, 1995; 1996).

OPPORTUNITY FOR PARTICIPATION BY FOREIGN SCIENTISTS

No change from the previous research plan (see Government of Japan, 1987; 1994).

OUTLINE OF 2004/2005 RESEARCH IN AREAS V AND VIW

Number of research vessels: No change from the previous research plan (see Government of Japan, 1996; 2002). *R/V Kaiyo Maru* will cooperate with the JARPA fleet.

Research period: No change from the previous research plan (see Government of Japan, 1996; 2002).

Research area: No change from the previous research plan (Area Ⅴ and the western half of Area VI) (see Government of Japan, 1996; 2002).

Sighting method: No change from the previous research plan (see Government of Japan, 1996; 2002).

Sampling method: No change from the previous research plan (see Government of Japan, 1996; 2002).

Cooperative work with *R/V Kaiyo Maru* will be added.

REFERENCES

Abe, H., Goto M., Katsumata, Y., Mizutani, M. and Pastene L.A. 1999. Preliminary microsatellite DNA analysis to investigate stock structure in the Antarctic minke whales (*Balaenoptera acutorostrata*). Paper SC/51/CAWS9 presented to the IWC Scientific Committee, May 1999 (unpublished). 12pp.

Butterworth, D.S., Punt, A.E., Fujise, Y. and Kato, H. 1999. Do the JARPA age-structure data for Southern Hemisphere minke whales provide indication that commercial selectivity could have been age-specific for higher ages? Paper SC/51/CAWS21 presented to the IWC Scientific Committee, May 1999 (unpublished). 10pp.

Clarke, E.D., Burt, M.L. and Borchers, D.L. 1999. Simulations of JARPA surveys to test abundance estimation methods. Paper SC/51/RMP16 presented to the IWC Scientific Committee, May 1999 (unpublished). 17pp+appendices.

Clarke, E.D., Burt, M.L. and Borchers, D.L. 2000. Investigation of bias in GAM-based abundance estimation methods and their suitability for JARPA survey data. Paper SC/52/IA19 presented to the IWC Scientific Committee, June 2000 (unpublished). 15pp.

Doroshenko, N.V. 1979. Populations of minke whales in the Southern Hemisphere. *Rep. int. Whal. Commn* 29: 361-4.

Fujise, Y. 1995. A preliminary morphometric study in minke whales from Antarctic Area IV using data from the 1989/90 JARPA survey. Paper SC/47/SH7 presented to the IWC Scientific Committee, May 1995 (unpublished). 15pp.

Fujise, Y. and Ohsumi, S. 1999. Progress of the outstanding tasks identified at the JARPA review meeting. Paper SC/51/CAWS13 presented to the IWC Scientific Committee, May 1999 (unpublished). 5pp.

Fujise, Y., Tamura, T., Ichihashi, H. and Kishino, H. 1999. Further examinations of the segregation pattern of minke whales in the Antarctic Area IV using a logistic regression model, with considerations on the pack ice distribution. Paper SC/51/CAWS18 presented to the IWC Scientific Committee, May 1999 (unpublished). 18pp.

Government of Japan. 1987. The programme for research on the Southern Hemisphere minke whale and for preliminary research on the marine ecosystem in the Antarctic. Paper SC/39/O4 presented to the IWC Scientific Committee, June 1987 (unpublished). 60pp.

Government of Japan. 1989. The research plan in 1989/90 in conjunction with note for "The programme for research on the Southern Hemisphere minke whale and for preliminary research on the marine ecosystem in the Antarctic (SC/39/O4)". Paper SC/41/SHMi13 presented to the IWC Scientific Committee, May 1989 (unpublished). 21pp.

Government of Japan. 1994. The 1994/95 Research Plan of Japanese Whale Research Programme under Special Permit in the Antarctic. Paper SC/46/SH16 presented to the IWC Scientific Committee, May 1994 (unpublished). 7pp.

Government of Japan. 1995. The 1995/96 Research Plan for the Japanese Whale Research Program under Special Permit in the Antarctic. Paper SC/47/SH3 presented to the IWC Scientific Committee, May 1995 (unpublished). 9pp.

Government of Japan. 1996. The 1996/97 Research Plan for the Japanese Whale Research Program under Special Permit in the Antarctic. Paper SC/48/SH3 presented to the IWC Scientific Committee, April 1996 (unpublished). 10pp.

Government of Japan. 2002. The 2002/2003 Research Plan for the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA). Paper SC/54/O1 presented to the IWC Scientific Committee, May 2002 (unpublished). 7pp.

Institute of Cetacean Research. 1999. Research activities of the Institute of Cetacean Research (RAICR) May 1998-April 1999. Paper SC/51/O6 presented to the IWC Scientific Committee, May 1999 (unpublished). 29pp.

International Whaling Commission. 1998a. Report of the Intersessional Working Group to review data and results from special permit research on minke whales in the Antarctic, Tokyo, 12-16 May 1997. *Rep. int. Whal. Commn* 48: 377-412.

International Whaling Commission. 1998b. Report of the Scientific Committee. *Rep. int. Whal. Commn* 48:55-302.

International Whaling Commision. 2004. Report of the Scientific Committee. *J. Cetacean. Res. Manage.* (in press).

Kato, H. 1982. Some biological parameters for the Antarctic minke whales. *Rep. int. Whal. Commn* 32: 935-45.

Matsuoka, K., Watanabe, A., Ichii, T., Shimada, H. and Nishiwaki, S. 1999. Application of the XCTD oceanographic survey in the Antarctic Areas IIIE and IV (35ºE-130ºE) during 1997/98 JARPA cruise. Paper SC/51/E5. presented to the IWC Scientific Committee, May 1999 (unpublished). 11pp.

Murase, H., Matsuoka, K., Ichii, T. and Nishiwaki, S. 2002. Relationship between the distribution of euphausiids and baleen whales in the Antarctic (35°E-145°W). *Polar Biol*. 25:135-145.

Pastene, L.A, Goto, M., Itoh, S. and Numachi, K. 1996. Spatial and temporal patterns of mitochondrial DNA variation in minke whales from Antarctic Area IV and V. *Rep. int. Whal. Commn* 46:305-314.

Pastene, L.A. and Goto M. 1999. Further spatial and temporal analysis of mitochondrial DNA variation in minke whales from Areas III and IV with considerations on the pack-ice distribution. Paper SC/51/CAWS11 presented to the IWC Scientific Committee, May 1999 (unpublished). 11pp.

Polacheck, T., Dobbie, M., Fujise, Y. and Kato, H. 1999. Spatial and temporal distribution of ages of Southern Hemisphere minke whales in commercial and JARPA catches in areas IV and V. Paper SC/51/CAWS31 presented to the IWC Scientific Committee, May 1999 (unpublished). 32pp.

Appendix

Survey Plan of *R/V Kaiyo Maru* in 2004/05

MIKIO NAGANOBU AND KENJI TAKI

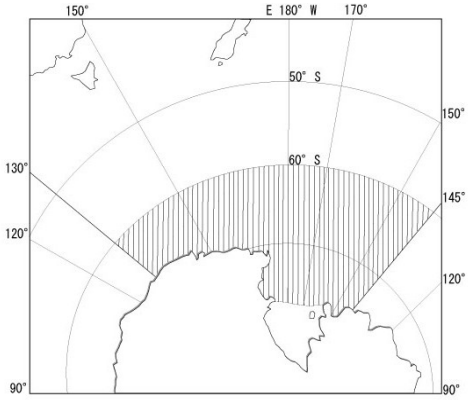
National Research Institute of Far Seas Fisheries, 5-7-1 Shimizu-Orido, Shizuoka 424-8633, Japan.

OBJECTIVES

The major aim of this survey is to simultaneously collect data on whales using non-lethal methods and krill in order to relate their distribution and abundance to the physical and biological environment in a meso scale. The survey will be conducted in cooperation with the JARPA survey. The collected data will be also used to analyze the influences of long-term change in the environment on the whales and krill.

SURVEY AREA

Ross Sea and adjacent waters (Area Ⅴ and the west side of Area Ⅵ; see below.). Actual target areas (approx. 300km x 300-500km) and transect lines will be set to cover hot spots of whales (ex. Balleny Is.).



SCHEDULE

November 2004 – March 2005.

Two meso scale survey cruises (approx. 300km x 300-500km, one month) will be conducted during the period.

RESEARCH VESSEL

R/V *Kaiyo Maru* (2,630GT, Fisheries Agency of Japan) is a 93m long flush-decked stern trawler, which has excellent capability of mid-water trawling and acoustic survey.

SURVEY ITEMS

(1) Mid-Water Trawl Sampling

Zooplankton, krill, micronekton and fishes, which are important prey items for whales, will be collected using the multiple rectangular mid-water trawl (RMT(1+8)M) and the standard mid-water trawl to investigate their horizontal/vertical distribution and abundance.

(2) Acoustic Survey

The multiple-frequency echo-sounder (Simrad EK-500 or EK-60) will be used to investigate the distribution and abundance of krill and other prey species.

(3) Cetacean Sighting Survey

The sighting surveys will be conducted to investigate the distribution, abundance and ice-habitat use of the whales.

(4) Oceanographic Observation

CTD, XCTD and LADCP will be used to investigate the structure of water mass characteristics and circulation features. Stratified samples of water will be collected to investigate the spatial distribution of nutrient, chlorophyll a, phytoplankton and micro-zooplankton.

EXPECTED OUTCOMES

The horizontal/vertical distribution and abundance of prey species will be clarified and these could be compared with the results of whales sighting by R/V *Kaiyo Maru* and JARPA, as well as stomach contents and fitness of whales investigated by JARPA in the same temporal/special scales. This will respond to the request from IWC/SC at the JARPA Review in 1997.

The differences observed in distribution, migration pattern, nutrition condition of minke whales by sex and maturation, which is one of the most crucial topics to have recently arisen through the surveys of JARPA, will be analyzed by comparing the stomach contents of whales and their food environment.

The competition between whales, especially minke and hampback whales, will be investigated by joint whale sighting surveys of JARPA and R/V *Kaiyo Maru*.

By comparing present survey data with past surveys by research vessels and the commercial fisheries data, the influences of the long-term changes in environment, such as global warming, reduction of ice shelves and increase of ultra-violet, on the whales and krill in these areas will be addressed.