

Strictly confidential until after the discussion in the Scientific Committee of the 52<sup>nd</sup> IWC Annual Meeting

## THE 2000/2001 RESEARCH PLAN FOR THE JAPANESE WHALE RESEARCH PROGRAM UNDER SPECIAL PERMIT IN THE ANTARCTIC (JARPA)

Government of Japan  
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### I. 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 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; Government of Japan, 1996).

In the surveys in Areas IV and V, a sample size of 300 ( $\pm 10\%$ ) has been maintained to achieve a long-term consistency of survey in these areas. From the 1995/96 season, the survey area was expanded to understand better on the stock structure of the minke whales in these areas and an additional sample of 100 ( $\pm 10\%$ ) minke whales have been taken every year since then (Government of Japan, 1995).

Annual research plan and scientific papers derived from JARPA have been annually submitted to the Scientific Committee of the International Whaling Commission (IWC/SC) and the Committee has reviewed these reports.

In addition, the IWC/SC carried out a comprehensive review of the data and results obtained by the JARPA in May, 1997 (IWC, 1998a). Agreement was reached by the participants in this Working Group on several points as follows: with respect to estimation of biological parameters, no conclusive results have been obtained, because only half of the planned research period has been covered to date. However, it has been ascertained that JARPA has already made major contributions to the understanding of certain biological parameters (e.g., direct measures of age at sexual maturity) of the minke whale in Areas IV and V of the Antarctic Ocean.

With respect to the Antarctic ecosystem, it has also been ascertained that this research is useful in testing various hypotheses related to the "krill surplus" model. Furthermore, the results of JARPA would be useful in the reduction of the current set of plausible scenarios considered in implementation simulation trials and the identification of new hypotheses. With respect to other biological parameters, on the other hand, more time is needed to obtain sufficient age composition and trend of population abundance. Further, some issues, such as representative nature of the sampling method and the stock structure of the minke whale, still remain unresolved. Also, some future tasks to be tackled have been identified, including the issue of survey on environmental change through meso-scale approach.

After further discussion at the 49th Annual Meeting of the IWC/SC, the Committee agreed finally that none of the sampling and stock identity problems that had been identified in the JARPA review or subsequently, would in principle prevent JARPA from achieving its objectives in terms of estimation of biological parameters (IWC, 1998b). At that Meeting, 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, were reported to the 51<sup>st</sup> IWC/SC meeting (Abe *et al.*, 1999; Clark *et al.*, 1999; Fujise *et al.*, 1999; Fujise and Ohsumi, 1999; ICR, 1999; Matsuoka *et al.*, 1999; Pastene *et al.*, 1999; Polacheck *et al.*, 1999; Butterworth *et al.*, 1999). Other studies related to the JARPA tasks e.g. GAM based abundance estimation, will be presented to the 2000 IWC/SC meeting.

Regarding the sampling scheme, a feasibility study was conducted in the 1999/2000 survey to investigate whether or not the modified method suggested in Annex U2 of the Report of 49<sup>th</sup> Scientific Committee (IWC, 1998b) is workable or not. Preliminary result of this study will be presented to the 2000 IWC/SC meeting. This feasibility study is also planned for the next survey with some modifications, if necessary.

It should be noted that during the 1998/99 JARPA survey in Area V and western part of Area VI a fire accident occurred on board of the research mother ship, *Nisshin Maru*. Due to this accident, the research activities began about two months later and some modification had to be adopted (Government of Japan, 1999). As a result, no sample was collected in the early period (December-mid January) in the western part of Area VI, and only a few samples were taken in the late period (mid January-March). Details of the 1998/99 JARPA survey were presented to the 1999 IWC/SC meeting (Nishiwaki *et al.*, 1999). Sampling of minke whales during the early period in the western part of Area VI had been identified as important for the study of stock structure. It was pointed out that, if possible, these samples should be taken in both near the ice-edge and in offshore areas (Government of Japan, 1998). Therefore, another survey in the western part of Area VI that consider those areas and periods not covered during the 1998/99 survey, is necessary.

## II. OBJECTIVES OF JARPA

No change from the previous research plan (see Government of Japan, 1995;1996;1997).

## III. NUMBER, SEX, SAMPLING SIZE AND AREA

In Area V, three hundred (300) ordinary form minke whales with 10% allowances ( $\pm 10\%$ ) will be sampled. Sampling design within the Area V remain unchanged to obtain data compatible to the past JARPA surveys, and the sample size is also retained to ensure maintenance of present levels of precision. This reason was not only for the stock structure study, but also for the analysis of catch-at-age data. All samples will be randomly sampled, using the same methodology as employed in the past.

In addition to this, 100 animals ( $\pm 10\%$ ) of the ordinary form minke whale will be sampled in the western half of Area VI (170°W - 145°W) as specified in the previous research plans for the 1996/97 and 1998/99 surveys. The continuation of the survey in Area VI is necessary for the study on stock structure as explained in the previous plan for the 1998/99 JARPA survey and reiterated below.

## IV. RESEARCH NEEDS AND APPLICABILITY OF NON-LETHAL METHODS

### Research needs in Area V

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

### Research needs in the western half of Area VI

The analyses on stock structure under JARPA had suggested that at least two stocks occur in Areas IV and V. The basis for such hypothesis was an extensive mtDNA analysis in Areas IV and V (Pastene *et al.* 1996a) and a preliminary morphometric analysis in Area IV (Fujise, 1995). These studies suggested that a different stock ('Western' or W Stock) could occur in the western part of Area IV in the early period, with a 'Core' or C Stock distributed in Area V, the eastern part of Area IV and the western part of Area IV in the late period.

Estimation of biological parameters should ideally be carried out on the basis of genetically-identified stock units. Then for this objective of the JARPA, it is very important to corroborate the new hypothesis on stock identity and to identify the geographical and temporal boundaries for the W and C Stocks in Areas IV and V and adjacent Areas.

The original objective of the expansion to the eastern part of Area III and western part of Area VI was a feasibility study on stock identity to examine the hypothesis of the occurrence of more than one stock in Areas IV and V (Government of Japan, 1995; 1996) and to attempt to determine the distribution pattern of hypothesized C Stock.

The result of the mtDNA RFLP analysis of the samples collected in Area V and western part of Area VI in the 1996/97 survey showed no genetic heterogeneity among minke whales sampled in that survey. Minke whales sampled in the 1996/97 survey in Area V and western part of Area VI were similar to the C Stock and different from the W Stock of the western part of Area IV sampled in the early period in the surveys of 1989/90 and 1991/92 (Pastene and Goto, 1998). A similar result was found after the analysis of the samples taken in Area V and western part of Area VI in the 1998/99 survey, although it should be emphasized that only 'late' samples were taken in that survey. Furthermore the sample size in Area VI was smaller than planned.

This findings was not in conformity with the initial expectation that a putative 'Eastern Stock' or E Stock could be distributed in the western part of Area VI as it has been suggested by morphological analysis (Doroshenko, 1979; Kato, 1982). However, at this stage it is premature to reach any conclusion. There still remain problems of sample size and annual changes in distribution. With respect to the sample size, supposing that the genetic differences between the putative E Stock and the C Stock are similar to that between the C Stock and the W Stock, 150-200 samples will be needed to detect any stock in the western part of Area VI (Pastene *et al.*, 1996b). The number of samples in the early period in the western part of Area VI in the 1996/97 JARPA was only 97 animals (of which mtDNA was extracted from 91 samples). In the case of the 1998/99 survey only 59 individuals were collected in the western part of Area VI and these whales were sampled only in the late period. On the other hand, the study by Pastene *et al.* (1996a) and other recent analyses suggested certain degree of yearly variation in the pattern of mtDNA variation in some longitudinal/temporal groups e.g. western part of Area IV in the late season.

The extent of the yearly variation of stock distribution patterns will be examined using other available sources. Analyses will be made on the ice edge conditions, prey species availability, and nutritional condition of sampled whales. Since the previous season, surveys were conducted with echo sounding system equipped on the dedicated sighting vessel. The distribution and abundance of the food species including Antarctic krill, a major food species for the 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, were 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.

#### **Applicability of non-lethal methods**

There are many previous discussions on the applicability of non-lethal methods for the studies of stock structure. A summary of the views on this matter was made during the JARPA review meeting (IWC, 1998a). The reasons for using lethal methods for the research on the stock structure have been already given in previous research plans. The some of rationales are reiterated below.

Although samples for DNA analysis may be collected through biopsy, this approach is not practical for achieving the objective of the research. An in-depth study on stock identity requires combined results of DNA analysis, allozyme analysis, morphometric analysis, age dependent pollution analysis and sexual/age segregation analysis. Then in the JARPA, stock identification is investigated using multi-approach analyses. Most of such analyses use internal organs, which can not be collected by any of the existing non-lethal methods.

The reasons why other than purely genetic information is of value in determining stock structure have been given in many previous proposals. For example, in the case of North Atlantic long-finned pilot whales, in the absence of morphometric information, it could have been incorrectly concluded from genetic studies alone that the animals from the western and eastern sides of the North Atlantic were from the same stock. The analyses of samples from this expanded research area also include comparison with existing JARPA samples from Areas IV and V. In-depth comparison can be achieved when the same level of information is collected in the expanded research area. Furthermore, age data is fundamental for the estimation of several biological parameters, which are also useful to interpret results on stock structure. These biological data can not be obtained by non-lethal methods.

Also the lethal method is more practical and efficient for covering the objectives of the research. For example, the collection of 100 biopsy samples in one single season would be almost impossible in the case of the minke whale. Past JARPA cruises attempted to collect biopsy samples in the Antarctic but the attempt resulted in a low success rate, especially in offshore areas (Nishiwaki *et al.*, *in prep.*).

## V. POSSIBLE EFFECT ON THE STOCK

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

## VI. OPPORTUNITY FOR PARTICIPATION BY FOREIGN SCIENTISTS

No change from the previous research plan (see Government of Japan, 1995; 1997).

## VII. OUTLINE OF 2000/2001 RESEARCH

- (1) Number of research vessels: No change from the previous research plan (see Government of Japan 1995; 1997).
- (2) Research period: No change from the previous research plan (see Government of Japan, 1995; 1997).
- (3) Research area: No change from the previous research plan (Area V and the western half of Area VI) (see Government of Japan, 1995; 1997).
- (4) Sighting method: No change from the previous research plan (see Government of Japan, 1995; 1997).
- (5) Sampling method: No change from the previous research plan (see Government of Japan, 1995; 1997).

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