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Strictly confidential until after the discussion in the Scientific Committee of the 50th IWC Annual Meeting

The 1998/99 Research Plan for the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA)

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I. INTRODUCTION

OVERVIEW

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 research in 1987/88 and 1988/89, the full-scale research started in the 1989/90 season (Government of Japan, 1989).

Objectives of the JARPA research 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).

The JARPA research plan and results have been annually submitted to the Scientific Committee of the International Whaling Commission (IWC/SC) and the Committee reviewed these reports every year. In addition, the IWC/SC carried out a comprehensive review of the data and results obtained from JARPA in May 1997 (the JARPA review workshop). Several main points were agreed to by workshop participants regarding the contribution of JARPA to minke whale management in the Antarctic (IWC, 1997 a). At the same time several issues were raised at the JARPA review workshop and annual meeting of the Scientific Committee in 1997. Taking into account of these issues, a feasibility study on sampling method and other technical aspects of the JARPA is to be undertaken in its 1998/1999 survey.

Other major elements of the research has been maintained to best achieve a long-term consistency of the survey. Total sample size of minke whales is maintained to be 300 (+-10%) in Area V and 100 (+-10%) in the western half of Area VI.

OUTCOMES OF THE JARPA REVIEW IN 1997

The JARPA review workshop in May 1997 agreed the following main points:

First, under the objective of the estimating biological parameters the information produced by the JARPA has set the stage for answering many questions about long term population changes regarding minke whales in the Antarctic Areas IV and V. Not surprisingly, at the halfway point in the JARPA program there are few definitive answers because of the time scale required to obtain sufficient age distribution and abundance data, and because of unanticipated problems in designing representative sampling regimes and in understanding the

stock structure of minke whales in the Southern Hemisphere. For example, the JARPA has already made a major contribution to understanding of certain biological parameters (e.g., direct measures of age at sexual maturity) pertaining to minke whales in Areas IV and V, yet such analyses have not fully addressed potential problems related to stock structure (IWC, 1997 a).

Second, under the objective of elucidating the role of minke whales in the Antarctic ecosystem, the JARPA has collected data on body condition that, in conjunction with the data on biological parameters as noted above, should result in an improved understanding of the status of minke whales in these Areas. These data are likely to be useful in testing various hypotheses related to aspects of the 'krill surplus' model (IWC, 1997 a).

Third, under the objective of 'Elucidation of the effect of environmental change on cetaceans' more effort is needed to develop meso-scale studies to integrate physical and biological oceanography and prey distribution with minke whale studies (IWC, 1997 a).

Fourth, under the objective of 'Elucidation of the stock structure of minke whales to improve stock management', deciding on the amount of genetic data required to meet this objective is difficult because the Scientific Committee has provided only a vague definition as to what constitutes a stock. Proper delineation of stocks has implications for interpretations of data gathered for all other JARPA objectives (IWC, 1997 a).

OUTCOMES OF THE 49TH ANNUAL MEETING OF THE SCIENTIFIC COMMITTEE
These points were reflected in the report of the 49th Annual Meeting of the IWC/SC in October 1997. In addition, at the Committee further discussion were made related to issues on stock structure and problems associated with obtaining representative samples. The Committee agreed 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, 1997 b). At the same time, the Committee also identified ten main areas to address these unresolved problems as the below (IWC, 1997 b);

1. Development of methods to correct bias of abundance estimate
2. Stock definition
3. Statistical analysis of mtDNA data considering the inclusion of school sizes as a covariate
4. Pilot study on nuclear DNA analysis on JARPA minke samples.
5. Effort to obtain biological materials for genetic analysis from low latitude areas of the Southern Hemisphere
6. External morphology/morphometry analysis for stock structure
7. Examination of possible stock boundaries (geographical and temporal) in Areas IV
8. Segregation study
9. Recalculation of biological parameters by biological stocks
10. Mesoscale survey plan on marine ecosystem and environmental change

JAPANESE RESPONSE
With respect item 1, the study was already started by Dr. Borchers and his colleague. Some details of this work have already been submitted to the 49th IWC/SC meeting as the document SC/49/SH30. On item 2, the lack of a working definition of stocks and substocks is a general

problem, not for the JARPA alone, and therefore, needs to be addressed by the IWC/SC (IWC, 1997 a). On item 4, the pilot study has already started, and progress of this study will be submitted to the next IWC/SC meeting. On item 5, a preliminary paper was already presented at the 48th meeting of the IWC/SC with the results of a survey of biological material among researchers and institutions of the Southern Hemisphere. These efforts have been continuing but without further success as yet. Other items listed are under consideration.

Furthermore, plans to address the problem of sampling biases are;
(i) the quantity of the biases will be evaluated using a re-sampling simulation model;
(ii) post modelling methods will be applied to determine whether it is possible to resolve or reduce biases;
(iii) if this is not effective, modification of the sampling scheme will be considered, and the effectiveness and practicability of such a modification will be evaluated; while;
(iv) simultaneously, the comparability between the current and any new scheme will be carefully evaluated.

With respect to item (iii), Annex U2 of the report of last IWC/SC meeting contains one approach for a possible modification of the current sampling scheme to be considered if post modelling is found not to be effective (IWC, 1997 b).

Item (ii) is the same as item 1 as the above list of future works. Examination on item (i) is already started by Dr. Fujise (ICR). However, considering the progress achieved at this time, it is not expected to be able to submit final result of these studies by the time of the next meeting of IWC/SC. Thus, it is considered to be premature to modify all of the current sampling method at present time, and intend for the time being to maintain the most of present survey scheme for the long-term consistency of JARPA. Nevertheless, it also is intended to conduct a limited scale of feasibility study at the 1998/99 JARPA survey on whether the modified method suggested in Annex U2 is workable or not; further discussion during the 1998 IWC/SC meeting on how best this study might be implemented would be appreciated.

II. OBJECTIVES OF JARPA

No change from the previous research plan (see SC/48/SH3: Government of Japan, 1996).

III. NUMBER, SEX, SAMPLING SIZE AND AREA

In Area V, three hundred (300) ordinary form minke whales with 10% allowances (+-10%) will be sampled. Sampling design within the Area V basically remains 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. All samples will be randomly sampled, using essentially the same methodology as employed in the past (see section I).

In addition to the above, 100 animals (+-10%) of the ordinary form minke whale will be sampled in the western half of Area VI (170W - 145W).

IV. RESEARCH NEEDS AND APPLICABILITY OF NON-LETHAL METHODS

RESEARCH NEEDS IN AREA V
No change from the previous research plan (see SC/47/SH3 and SC/48/SH3).

RESEARCH NEEDS IN WESTERN HALF OF AREA VI
The result of the DNA analysis of the samples collected in the 1996/97 season showed that the group of minke whales genetically similar to Core Stock (distributed from Area IV to Area V) were found in the western part of Area VI in the initial feeding stage. This findings was not in conformity with the initial expectation with respect to a putative Eastern Stock, as a separate stock from the Core Stock (Pastene and Goto, in prep.), which can be assumed from the morphological differences indicated by Doroshenko (1979) and Kato (1982).

However, 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 Eastern Stock and the Core Stock are almost equal with those between the Core Stock and the Western Stock, 150-200 samples will be needed to detect those stocks (Pastene *et al.*, 1996). But the number of samples in the initial feeding period in the western part of Area VI in the 1996/97 JARPA was only 97 animals (of which mtDNA was detected from 91 samples), which is far from statistically sufficient.

Further, in the analysis of the eastern part of Area III, distributions of the Western Stock and Core Stock changed according to year, suggesting that annual changes exist in distribution patterns in the boundary area (Pastene and Goto, 1997). This could suggest the risk of drawing conclusion using a single year survey in the case of the distribution of Southern Hemisphere minke whales in their feeding ground. Thus, research of a similar scale is to be repeated in the western part of Area VI during next research 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. Surveys will be conducted, with quantitative echo sounder newly equipped on the dedicated sighting vessels. 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. This data would also contribute to the study of the Antarctic ecosystem, which is one of the objectives of the research, as well as clarification of the possible impact of environmental changes on whale stocks.

Although samples for DNA analysis can be collected through biopsy, lethal means are necessary in this proposed survey for other reasons. In the JARPA, stock identification has been investigated using a multi-factor analysis approach: an in depth study on stock identity which requires combined results of DNA analysis, allozyme analysis, morphometric analysis, age dependent pollution analysis, and sexual/age segregation analysis. Many of such analyses use internal organs which cannot be collected by any of the existing non-lethal methods.

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.

Also, research can be undertaken more efficiently in many lethal methods than non-lethal methods. Collecting 100 samples from biopsy alone in one season would be almost impossible. Past JARPA cruises attempted to collect biopsy samples, and proved that biopsy attempts in the rough sea condition in the Antarctic have markedly low success rate (Fujise, unpublished data).

Furthermore, age information is critical for analysis of the information from the JARPA to obtain estimates of key population dynamics parameters, but cannot be obtained by non-lethal means.

V. AVAILABILITY OF EXISTING SAMPLES IN AREA VI

Taylor (1997) suggested a potential measure to incorporate commercial samples into the analyses of lethal research data. In general, the suggestion contains interesting elements, and researchers in Japan are now re-establishing a comprehensive inventory of usable commercial samples. However, in Area VI, Japanese scientists completed this task before implementing the initial research in Area VI. Pastene *et al.* (1996) reported the result of analysis of mtDNA of 134 samples collected in Area VI in 1985/86 season, and concluded that further sampling was necessary.

Also, the Western Stock was only detected through comparison between offshore and ice-edge samples collected in JARPA surveys from Area IV (Goto *et al.*, in prep.). This example suggests that commercial samples, usually collected in waters close to ice-edge, are not sufficient for the stock distribution identification.

The accumulation level of pollutants, such as heavy metals and PCBs which are a valuable indicator for stock identification, tends to change year by year. Materials in the same or near-by years are most appropriate to assure reliable comparisons.

In addition, the sex and age data from the commercial samples are biased due to the selective nature of the operation and, therefore, are not suitable for in depth analysis of stock structure such as segregation by sex and age.

It was therefore concluded that these past samples are not sufficient, at least with regard to the western part of the Area VI, to establish stock distribution and its structure due to the limited geographical range of the past commercial sampling sites. None the less, in accordance with the discussion in Annex U1 of the SC report last year, analysis of those samples will have been started for confirmation.

VI. POSSIBLE EFFECT ON THE STOCK

This matter was already described the previous research plan (see SC/48/SH3.)

VII. OPPORTUNITY FOR PARTICIPATION BY FOREIGN SCIENTISTS

No change from the previous research plan (see SC/48/SH3.)

VIII. OUTLINE OF 1998/99 RESEARCH

Number of research vessels, research period, and research area will not be changed from the previous research plan (see SC/47/SH3 and SC/48/SH3.) With regard to sighting and sampling method, minimal modification from previous research plan is under consideration taking into account of the discussions made at the JARPA review workshop and subsequent SC Annual meeting.

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