Strictly confidential until after the discussion in the Scientific Committee of the 53rd IWC Annual Meeting

The 2001/2002 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 the feasibility study in 1987/88 and 1988/89 seasons, 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).

In the survey in Areas IV and V, a sample size of 300 (+-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 with the purpose to investigate the stock structure and an additional sample of 100 (+-10%) minke whales has been taken (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 reviewed these papers every year.

In addition, the IWC/SC carried out a comprehensive review of the data and results obtained from JARPA, in May 1997 (Anon., 1997). 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.

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 population abundance estimates. 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, 1998). 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 51st 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; 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 meeting (Clarke *et al.*, 2000).

II. OBJECTIVES OF JARPA

No change from the previous research plan (see Government of Japan, 1987;1996;1999).

III. NUMBER, SEX, SAMPLING SIZE AND AREA

In Area IV, three hundred (300) ordinary form minke whales with 10% allowances (+-10%) will be sampled. Sampling design within the Area IV 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. 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 (+-10%) of the ordinary form minke whale will be sampled in the eastern half of Area III (35° - 70°E) as in the previous survey in the 1999/00 season, except that efforts will be made to take these whales further to the north than in the previous season. It is clear that the continuation of this study is necessary for the study on stock structure, for reasons indicated below.

IV. RESEARCH NEEDS AND APPLICABILITY OF NON-LETHAL METHODS

Research needs

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.*, 1996) and a preliminary morphometric analysis in the Area IV (Fujise, 1995). These studies were consistent with the hypothesis that a different stock ('Western' or W Stock) could occur in the western part of Area IV early in the season, with a 'Core' or C Stock distributed in Area V, Area IV Eastern and Area IV Western Late.

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 on that basis identify a stock unit on which biological parameters can be estimated. That was the original rationale for the expansion to Area III Eastern (Government of Japan, 1995).

Three JARPA surveys have been conducted in the eastern part of Area III and these surveys have been focused mainly in the early period. These surveys were conducted in 1995/96, 1997/98 and 1999/00. For the early period the number of samples examined in the genetic analysis was 67, 86 and 107, respectively. Genetic analysis involving all the available samples in Areas III Eastern and IV from 1987/88 to 1999/00 is under way and the results will be presented to the 53rd IWC/SC meeting. Preliminary results showed that in general samples taken in Area III Eastern Early were more similar to the C stock than to the W stock at least in these three seasons.

Several reasons for such situation have been discussed but the most probable are the following:

1) Yearly variation in the distribution of stocks

The distribution of stocks can vary extremely among surveys. For example the W stock could have been distributed in Area IV Western Early in 1989/90 but that area and period (and adjacent Area III Eastern) could have been occupied by a different stock in more recent surveys. It should be noted that the temporal component in the distribution of stocks in the Antarctic needs to be taken into account when RMP implementation trials for the Antarctic minke whales are next reviewed. The inter-year variability in this component will also need to be incorporated in these revised trials, so that more samples from the Area III Eastern and Area IV regions are needed to better determine the nature of this variability;

2) Different geographical covering between surveys

The latitudinal (and distance from the ice-edge) covering of the survey in 1989/90 in Area IV Western Early (season in which the W stock was detected) could be different from those in Area IV Western Early and III Eastern Early in more

recent surveys. Goto *et al.* (1998) examined samples from Area IV in two seasons, 1989/90 and 1991/92 and they showed that samples taken in offshore areas are more 'informative' on stock structure than samples taken around the ice-edge. Despite effort have been spent to get offshore samples in recent surveys from Areas III Eastern Early and IV Western Early, only a few have been obtained in the recent surveys. Then a possibility is that the W stock was not detected because the off-shore component in the sample was absent or was minimal in these surveys. Genetic analysis of available and future samples from Areas III and IV will consider this additional factor to examine heterogeneity in these areas: the latitudinal factor and the distance from the ice-edge. Results of this new analysis could help to elucidate the nature of the variability observed in these areas.

In addition to the continuation of the expanded research, it is planned to examine the extent of the yearly variation of stock distribution patterns using other available sources. Hence analyses will be made on the ice edge conditions, prey species availability, and nutritional condition of sampled whales.

Further, as far as biological parameters are concerned, it is necessary to stratify the area, season, sex and body size. In this respect, the existing number of samples from the eastern part of Area III is not sufficient to achieve this goal.

I addition to the mtDNA analysis, a preliminary analysis based on nuclear DNA (nDNA) (microsatellite) was conducted using some JARPA samples (Abe *et al.*, 1999). Preliminary results showed that the pattern of variation was different from that observed in the mtDNA analysis. An interesting result of the microsatellite analysis was that genetic heterogeneity was detected in Area III Eastern Early (1995/96, 1997/98). Analysis of the samples obtained in Area III Eastern Early in 1999/00 is still in progress and the results will be presented in the future. Both, analyses based on mtDNA as well on nDNA should be conducted to have a more comprehensive view of the stock structure in these Areas.

Applicability of non-lethal methods
No change from the previous research plan (see Government of Japan, 1998).

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;1999).

VII. OUTLINE OF 2001/2002 RESEARCH

(1) Number of research vessels: No change from the previous research plan (see Government of Japan 1995;1997; 1999).

(2) Research period: No change from the previous research plan (see Government of Japan, 1995;1997;1999).

(3) Research area: No change from the previous research plan (see Government of Japan, 1995;1997;1999).

(4) Sighting method: No change from the previous research plan (see Government of Japan, 1995;1997;1999).

(5) Sampling method: No change from the previous research plan (see Government of Japan, 1995;1997;1999).

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