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THE 2002/2003 RESEARCH PLAN FOR THE JAPANESE WHALE RESEARCH PROGRAM UNDER SPECIAL PERMIT IN THE ANTARCTIC (JARPA)

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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, 1995;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.

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 51st IWC/SC meeting (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 meeting (Clarke *et al.*, 2000).

In this document the JARPA plan for the austral season 2002/2003 in Areas V and western part of Area VI, is presented.

II. OBJECTIVES OF JARPA

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

III. NUMBER, SEX, SAMPLING SIZE AND AREA

In Area V, three hundred (300) Antarctic 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. 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 Antarctic 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, 1998/99 and 2000/2001 surveys. 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.

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, 1987; 1989; 1996).

Research needs in the western half of Area VI

The analyses on stock structure under JARPA have suggested that at least two stocks occur in Areas IV and V. The basis for such hypothesis was an extensive mtDNA RFLP analysis in those Areas (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 early in the season in some years, with a 'Core' or C Stock distributed mainly in Area V and eastern part of Area IV.

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 to identify the distribution pattern of these hypothesized stocks.

Three JARPA surveys have been conducted in the western part of Area VI. These surveys were conducted in 1996/97, 1998/99 and 2000/01. The number of samples taken in that Area were 110 (97 and 13 in the early and late periods, respectively), 60 (all in the late period) and 110 (all in the early period), respectively.

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 (Pastene and Goto, 1998). Analyses of the samples taken in 2000/01 are in progress but preliminary results are similar to those found in 1996/97.

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 on the stock structure in Area VIW. 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 and 2000/01 surveys were 97 (of which mtDNA analysis was successful in 91 samples) and 110 (of which mtDNA analysis was successful in 103 samples) whales, respectively. In the 1998/99 survey a fire accident occurred on the *Nisshin Maru* and only 60 individuals were collected in the western part of Area VI and these whales were restricted to the late period and around the ice-edge. It has been suggested previously that samples taken around the ice-edge are not informative on the stock structure. Thus for practical purpose only two JARPA surveys can be considered for the study of stock structure in the western part of Area VI and a total of 194 whales have been examined for mtDNA. Apart from the consideration on sample size, the study by Pastene *et al.* (1996a) and other recent analyses suggested certain degree of yearly variation in the pattern of mtDNA variation in the western part of Area IV. A similar situation could occur in Area VIW.

Additional surveys in Area VIW are necessary to both increase the sample size and to study possible yearly variation in the distribution of stocks in that Area.

Acoustic and other surveys

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. Recently, surveys have been 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. In this way the dynamic of stocks can be studied in the context of the oceanographic conditions and dynamic of the prey species in the research area (e.g. Murase *et al.*, 2002).

Applicability of non-lethal methods

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

V. POSSIBLE EFFECT ON THE STOCK

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

VI. OPPORTUNITY FOR PARTICIPATION BY FOREIGN SCIENTISTS

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

VII. OUTLINE OF 2002/2003 RESEARCH

- (1) Number of research vessels: No change from the previous research plan (see Government of Japan, 1996; 2000).
- (2) Research period: No change from the previous research plan (see Government of Japan, 1996; 2000).
- (3) Research area: No change from the previous research plan (Area V and the western half of Area VI) (see Government of Japan, 1996; 2000).
- (4) Sighting method: No change from the previous research plan (see Government of Japan, 1996; 2000).
- (5) Sampling method: No change from the previous research plan (see Government of Japan,

1996; 2000).

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