Japan's voluntary considerations and response to the ICJ judgement in relation to the adjustment of JARPNII program during the period from 2014 to 2016

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ABSTRACT

Following the March 31, 2014 Judgment of the International Court of Justice (ICJ) in the case Whaling in the Antarctic (Australia v. Japan: New Zealand intervening), the Government of Japan voluntarily reviewed the JARPN II program in response to the Judgment. This paper describes adjustments made in JARPNII program in 2014-2016. The overall research objectives, area and methodology remains the same as those specified in the original JARPNII program. The voluntary review resulted in the reprioritization of research objectives as well as recalculation of sample sizes. The survey concentrated on the study of interactions between whales and fisheries in the coastal area and interactions among whale species in the offshore area, as well as a contribution to the management of whales. Sampling of sperm and common minke whales in the offshore component was suspended. Comparative studies for verifying the feasibility and practicability of non-lethal methods, including biopsy sampling and faeces collection, are being carried out from 2014 to 2016. 10 out of the total sample size of sei whales (100) were allocated to the non-lethal study. 25 out of the total sample size of Bryde's whales (50) were allocated to the non-lethal study.

BACKGROUND

The Judgment of the International Court of Justice (ICJ) in the case Whaling in the Antarctic (Australia v. Japan: New Zealand intervening) was issued on March 31, 2014. While JARPNII was not the direct subject of the ICJ case, the Government of Japan voluntarily reviewed the JARPNII program in response to the Judgment. This decision was made because, as below, the Court expressed its expectation as to research permits under Article VIII of ICRW in general.

"[it is] expected that Japan will take account of the reasoning and conclusions contained in this judgment as it evaluates the possibility of granting any future permits under Article VIII, paragraph 1, of the Convention" (paragraph 246).

Following this expectation, the Government of Japan made a decision that it would initiate a new research program in the Northwestern Pacific Ocean in 2017 after the planned 2nd review of results derived from JARPNII in 2016. The new research program duly takes account of the reasoning and conclusions contained in the judgment with regards to JARPA II as well as advices and recommendations by the 2nd review.

ICJ also indicated the necessity to conduct analysis of the feasibility of non-lethal methods that might contribute to reducing the scale of lethal sampling for future research. For that point to be addressed, the Government of Japan decided to carry out comparative studies on lethal and non-lethal methods in JARPNII during the remaining three years from 2014 to 2016 before designing the new research program. The comparative studies are to verify whether information derived from non-lethal methods could substitute those derived from samples and data collected by lethal methods. The new research program will reflect the results of the comparative studies.

As the comparative studies on lethal and non-lethal methods are on-going, their results to be compiled from three years of the studies will be presented and reviewed after the research in 2016 is completed, possibly at the review workshop of the new research plan in 2017. However, preliminary results of the 2014 research is presented this time in the JARPNII review workshop.

ADJUSTMENT IN THE RESEARCH DESIGN DURING THE PERIOD FROM 2014 TO 2016

Research objectives and purposes

The main purpose of the adjustments is to conduct comparative studies on lethal and non-lethal research methods. In addition, the Government of Japan provides a more detailed and updated basis for setting sample sizes for lethal methods in response to the ICJ Judgment. Recalculation of sample sizes was necessary also for designing the comparative studies as explained below.

In order to achieve the purpose of adjustment above, a priority was placed on one of the original research objectives of JARPNII, prey consumption and preference of cetaceans during 2014-2016. This was because scientific data from lethal

research methods is most important for contributing to this objective and the original sample sizes were calculated mainly from expected data for this objective (Fisheries agency of Japan, 2015).

Accordingly sample sizes were re-calculated based on the latest data on stomach contents of whales as explained in detail in the following sections of this document. Re-calculation is also responding to one of the points raised by the ICJ Judgment that not enough details were provided in calculating the sample sizes for JARPAII.

Target species
Taking account of the decision on the above mentioned adjustment, target species for lethal sampling were reviewed.

- Minke whales in the costal component remained as a target species because competition for prey species between coastal fisheries and this species has been strongly indicated from the past research (IWC 2010a)

- Sei whales and Bryde's whales remained as targets because the past studies revealed that these species are dominant in the offshore research area and play an important role in the pelagic marine ecosystem of the western North Pacific (Konishi *et al*, 2009).

- Sampling of minke whales in the offshore component were suspended because the distribution of this species in the offshore research area appears to be shifting (Matsuoka *et al.*, 2012, 2013; Kanaji *et al*., 2012) and, as a result, new scientific uncertainties are created in its sampling design. Based on the analysis of the recent data indicating the shift, a new sampling design could be presented in the new research plan to be compiled after the 2016 JARPNII review process.

- Sperm whales were excluded from the target species because its consumption of neon flying squid which is a fishery targeted species has been rarely observed in the past research since 2008 (Tamura *et al*., 2009a, 2009b, 2012; Bando *et al*., 2010, 2013, 2014; Yasunaga *et al*., 2011).

Sample sizes
Sample size of each target species was re-calculated using accumulated data set indicated below (up to and including 2010 for the coastal components: up to and including 2012 for the off-shore component) for the estimation of food consumption by cetaceans with the method employed under the Norwegian research (Government of Norway, 1992):

i) Composition of prey species (%)

ii) Average weight of each prey species in the stomach contents (kg)

iii) S.D. and C.V. of the compositions and weights

Sample sizes were calculated as detailed in the following section with a condition that the quantity of stomach contents of a target prey species be estimated with C.V. =0.2, for each year. This C.V. level is the same as the target level employed by other researches including the Norwegian research (Winship and Trites, 2003).

Comparative evaluation of lethal and non-lethal research methods
The following four aspects are to be evaluated in comparing lethal and non-lethal research methods;

(i) whether a tissue and other samples can be obtained by a non-lethal method (*e.g*. biopsy sampling, faeces collection);

(ii) whether enough number of samples for statistical analysis can be obtained by the non-lethal method;

(iii) whether the sample obtained by the non-lethal method can produce scientific information compatible to that produced by a lethal sampling method; and

(iv) whether the cost for obtaining the sample/producing scientific information is reasonable.

The third aspect, in particular, requires an evaluation regarding whether prey consumption can be estimated at a certain high accuracy level in species composition and its quantity.

DETAILED EXPLANATION OF SELECTION OF RESEARCH TARGET SPECIES AND RE-ESTIMATION OF SAMPLE SIZES

Sampling of sperm whale
When the feasibility research for JARPN was planned in 2000, it was assumed that sperm whales have a large biomass in the research area and consume fishery resources such as neon flying squids and bottom fish such as rock fishes and cod, as well as deep-sea squids (Kawakami, 1980). Moreover, considering the objective of the research program it was

important to monitor several cetacean species with different feeding ecologies (Government of Japan, 2000). For these reasons, it was considered necessary to conduct research on sperm whales for developing ecosystem models, and this species was added to the research targets in 2002 and 2003. Based on the outcome of the feasibility research, appropriate research targets were assessed for JARPNII using Ecopath with Ecosim in 2004. Test-run results showed that the consumption by sperm whales exerted an impact on its prey species, which was a similar outcome as minke whales (Okamura *et al.*, 2002). Moreover, little information was available about the niche of deep-sea squids in the marine ecosystem which compose of sperm whales' main prey species and about a role of sperm whales in the pelagic ecosystem. Also, as high as 5 % of neon flying squids targeted in fishery is assumed to be consumed by sperm whales. For these reasons, sperm whales remained as a research target in JARPNII after its feasibility research (Government of Japan, 2004a, 2004b). At the expert review panel workshop in 2009, Japan presented a preliminary assessment that neon flying squids accounted for 30,000 tons of the sperm whales' total food consumption of 1.2 million tons in the research area. They suggested that this result, taking into consideration a large biomass of sperm whales in the research area, indicates sperm whales have a huge impact on pelagic ecosystem. They also presented the results of pollution studies on this species such as mercury and PCB and suggested that sperm whales serve an important role as an indicator species for monitoring pollutants. Although the review panels expressed a concern about an insufficient number of samples and their representativeness of the whole population (IWC, 2010a), Japan kept sperm whales as a research target because a continuous collection of samples was critical for monitoring the trend (IWC, 2010b).

However, little knowledge has been added about the consumption of neon flying squid and other fishery targeted species by sperm whales since 2009. Also, analysis shows that sperm whales have a strong predator-prey interaction with deep-sea squids which are not targeted by fisheries, rather than with fishery species harvested in the pelagic ecosystem (Tamura *et al*., 2009a, 2009b, 2012; Bando *et al.*, 2010, 2013, 2014; Yasunaga *et al*., 2011). For these reasons, sperm whales has come to be regarded as a lower priority species and therefore excluded from the sampling for the 2014 to 2016 research period.

Sampling of minke whale（Offshore component）

Common minke whales in the offshore component have been a target of sampling since JARPN and the species is still important for studies on ecosystem modelling and stock structure. However, the number of sightings of this species has been decreasing recently, indicating a possibility that its spacial and temporal distribution in the western North Pacific is changing over time (Matsuoka *et al.*, 2012, 2013; Kanaji *et al*., 2012). Past research revealed that this species mainly consumes anchovy earlier in the research period (May-June) and Pacific saury later in the period (July-September) in the offshore waters (Konishi *et al*., 2009), but both of the prey species are recognized to recently be decreased in the research area. For example, while the stock of anchovy was estimated 1-2 million tons in 2003, its stock was estimated 630 thousand tons in 2013. Distribution of anchovy is also becoming limited, which could have been reflected in the drastic decrease in the stock estimates (http://www.jfa.maff.go.jp/j/press/sigen/pdf/141222-03.pdf: in Japanese). Similarly, while the stock of Pacific saury was estimated to be 5 million tons in 2003, its stock was estimated at only 1.8 million tons in 2013. In particular, a decrease was reported to be serious in the area west of 170E (http://www.jfa.maff.go.jp/j/press/sigen/pdf/140731-01.pdf: in Japanese). Thus the decrease in number of sightings and the limited distribution of prey species could have caused the change in the distribution of minke whales offshore in the western North Pacific. A possible explanation is that a large-scale change in the marine environment and ecosystem such as a regime shift drives these changes. However, because the main reasons have not yet been clarified, creating new scientific uncertainties in the sampling design, sampling of this species was suspended. Based on the analysis of the recent data indicating the shift, a new sampling design could be presented in the new research plan to be compiled after the 2016 JARPNII review process.

Sampling of minke whale（Coastal component- Sanriku and Kushiro）

Common minke whales in the costal component remained as the target for sampling because a competition for prey species between coastal fisheries and this species has been strongly indicated from the past research (IWC 2010a). Sample size for Sanriku component was recalculated focusing on the main prey species (juvenile sand lance), using a preliminary data set (up to and including 2010). Sample sizes necessary were calculated to detect stomach content with an accuracy of CV=0.2. The result of re-calculation varied from 29 to 78 samples depending on the year the data was obtained. We employed an average of those numbers and set 57 samples as a targeted sample size (Fisheries agency of Japan, 2015). Sample size for Kushiro component was recalculated focusing on the main prey species (Japanese anchovy and walleye pollock), using a preliminary data set (up to and including 2010). Sample sizes necessary were calculated to detect stomach content with an accuracy of CV=0.2. The result of re-calculation varied from 27 to 109 samples depending on the year the data was obtained. We employed an average of those numbers and set 57 samples as a targeted sample size (Fisheries agency of Japan, 2015).

Sampling of sei whale（Offshore component）

Sei whales remained as the target for sampling in the offshore component because the past studies revealed that this species is dominant in the research area and plays an important role in the pelagic marine ecosystem of the western

North Pacific. Sample size for this species was recalculated, using a preliminary data set (up to and including 2012) with a focus on prey species in the stomach content. Prey species in the stomach were diverse, such as copepods, krill, Japanese anchovy, and mackerel. The result of re-calculation varied from 69 to 215 samples depending on the year the data was obtained. We calculated an average of those numbers to be 135 samples (Fisheries agency of Japan, 2015). The sample size was, however, maintained at 100 since recalculation for those species showed the need for substantial increases of sample size. Such increases could be regarded as revisions of the JARPNII program and therefore should be examined after the due process including review of results that is planned in 2016 for the 2nd period of JARPNII (2008-2013).

Sampling of Bryde's whale（Offshore component）

Bryde's whales remained also as the target for sampling in the offshore component for the same reason as sei whales. Sample size for this species was recalculated, using a preliminary data set (up to and including 2012) with a focus on main prey species (krill and Japanese anchovy) in the stomach content. The result of re-calculation varied from 36 to 148 samples depending on the year the data was obtained. We calculated an average of those numbers to be 75 samples (Fisheries agency of Japan, 2015). However, the original sample size was maintained (*i.e.* 50 samples) for Bryde's whales for the same reason as sei whales.

ALLOCATION OF SAMPLE SIZES TO THE FEASIBILITY STUDIES OF NON-LETHAL METHODS

If non-lethal methods can produce the same levels of scientific information as lethal methods in terms of accuracy, quality, and quantity, allocation of a part of lethal sample sizes to the feasibility studies of non-lethal methods should not affect the achievements of the research. However, there are differences of views as to the utility of non-lethal methods. The allocation is an attempt to provide some quantitative scientific information for the comparison of the effectiveness of lethal and non-lethal research methods. Risk is recognized that this approach fails to provide new information that will narrow the differences. Selection of indicators and criteria for the comparison is important and depending on the results of the three year studies an analysis will be conducted.

In cases of minke and sei whales, 10% of the recalculated sample sizes for lethal studies were allocated to the feasibility studies of non-lethal methods. Ten percent was selected by the government as a practical target, considering the importance of data from lethal methods and the risk of failure in the non-lethal studies.

Specifically, for minke whales in the coastal components, six samples (10% of the original sample size) out of the 57 samples were allocated to the feasibility evaluation of non-lethal methods. For sei whales, 10 samples (10% of the original sample size) of the 100 samples, were allocated to non-lethal methods.

In the case of Bryde's whales, 25 samples (50% of the original sample size) of the 50 samples were allocated to non-lethal methods. This higher level of allocation to the feasibility of non-lethal studies than the cases of minke and sei whales was because of the importance of the ecosystem and stock structure studies in the JARPNII research objectives. Minke and sei whales play more informative role in these studies and information from lethal methods is essential, partly because of their interactions with fisheries. On the other hand the comprehensive assessment for Bryde's whales was completed and their interactions with fisheries are more limited judging from the JARPNII results.

COMPARATIVE STUDIES BETWEEN LETHAL AND NON-LETHAL RESEARCH METHODS TO ADDRESS THE RESEARCH OBJECTIVES OF JARPNII

A series of non-lethal methods are to be tested for their feasibility during the 2014 to 2016 period in accordance with the four criteria described in section 2 above.

(i) whether a tissue and other samples can be obtained by a non-lethal method (e.g. biopsy sampling, faeces collection)

While biopsy sampling have been conducted in the past Japanese Special Permit surveys, conditions and resultant success rate differ substantially depending on areas, seasons, and target species. Therefore, biopsy sampling will be tested in a systematic manner during the three years. Faeces collection will also be tried and information such as encounter rate with faeces and actual practicability of sampling faeces excreted from swimming whale species will be collected and analyzed. Some preliminary result from the 2014 season was reported to the Scientific Committee (Mogoe *et al*., 2015). For example, biopsy samples were obtained from sei (16 samples) and Bryde's whales (25 samples) offshore, and minke whales off Kushiro (5 samples), but no samples were obtained from minke whales offshore and off Sanriku. Three faecal samples were obtained from sei whales offshore, but no samples were obtained from Bryde's and minke whales. These results show that biopsy and faecal samples are obtainable in some cases, but not always. More

data needs to be collected and examined to evaluate under what circumstances biopsy and faecal samples can be obtained.

(ii) whether enough number of samples for statistical analysis can be obtained by the non-lethal method

Effort data for the collection of non-lethal samples will be collected and analyzed in comparison with the effort required for obtaining lethal samples. If unrealistic effort is required for collecting non-lethal data, the method will be judged as unfeasible. Some preliminary result from the 2014 season show that intended number of biopsy samples were obtained from sei whales (16 samples) and Bryde's whales (25 samples) within the time allocated to non-lethal methods, but it was not the case for minke whales. In fact, five biopsy samples were obtained from minke whales off Kushiro, which is slightly less than six samples originally allocated, while no samples were obtained from minke whales off Sanriku. When sampling effort (time) is considered, biopsy sampling was more time-consuming than lethal sampling. The average sampling time of sei whales was 80 minutes for biopsy sampling, while it was 27 minutes for lethal sampling; for Bryde's whales, the average sampling time was 32 minutes for biopsy sampling, while it was 13 minutes for lethal sampling; for mike whales off Kushiro, the average sampling time was 92 minutes, while it was 60 minutes for the lethal sampling. Biopsy and faecal sampling data from 2015 to 2016 will be added to further examine if enough number of samples can be obtained, including from a standpoint of sampling efficiency.

(iii) whether the sample obtained by the non-lethal method can produce scientific information compatible to that produced by a lethal sampling method

The comparison will be conducted in respect of quality and accuracy. For example, in the case of age information, whether age information can be produced by the samples obtained by non-lethal method will be tested with potential analytical technologies. If they can produce some age information, its accuracy will be compared with those from the age-reading on ear plug. Regarding feeding information from non-lethal method, stable isotope and fatty acid analyses using biopsy samples and genetic analysis using faeces samples will be tested. Results of preliminary analysis was reported, where prey species was identified from faeces using genetic method (Mogoe *et al*., 2015). The analyses of contents from whale large intestine using next-generation sequencing (NGS) technologies clearly indicated that the genetic prey ID is insufficient to understand feeding habits of the whales, because of low identification rate of prey species from the contents. Furthermore, the prey species compositions identified in the large intestine were quite different from those in the stomach contents. Therefore, it seems impossible to obtain accurate prey information only from faeces. Further examination will be conducted in 2015 and 2016 to investigate what causes these problems.

(iv) whether the cost for obtaining the sample/producing scientific information is reasonable

The cost information of non-lethal methods combined with the effort data from ii) above will be collected and compared with the comparative information regarding lethal methods. How to estimate the sampling cost is to be studied while obtaining data from the comparative experiments.

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