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Progress report of the work conducted by
the proponents in response to IWC
Scientific Committees recommendations
on NEWREP-A

Government of Japan



INTERNATIONAL
WHALING COMMISSION

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ABSTRACT

This paper presents the overall progresses of the work and analyses implemented by the proponents since the International Whaling Commission Scientific Committee (IWC SC) meeting in 2015 in response to the recommendations made by the Expert Panel review workshop of NEWREP-A. The Expert Panel made a total of 29 recommendations, and the proponents considered that they could be divided into two groups: (i) those recommendations relevant to a 'full evaluation of whether any new lethal sampling is required' and 'issues related to sample size' (13 recommendations); and (ii) those recommendations not relevant to such issues (16 recommendations). They considered that it was not necessary to address all the recommendations 'before there is a final conclusion on lethal techniques and samples sizes', as more than half of the recommendations were not related to issues regarding the necessity of lethal sampling and the reasonableness of the sample size. After the discussions at the 2015 IWC SC meeting on the analyses conducted by the proponents in response to the recommendations, it became clear that two recommendations were the most relevant to consider before the start of the NEWREP-A program: (1) 'evaluate the level of improvement that might be expected either in the SCAA or in RMP performance by improved precision in biological parameters using simulation studies including updated *Implementation Simulation Trials*'; and (26) 'provide a thorough power analysis of sample sizes required to detect change in ASM and follow the other recommendations in this item'; several suggestions to improve the analyses addressing these recommendations were offered by the IWC SC. After the IWC SC meeting in 2015, the proponents completed, to a reasonable level, the key elements of further analyses concerning the items agreed at the 2015 IWC SC on these two recommendations, and a brief summary of those analyses is presented here (for details on this work and analyses, see GOJ, 2016). Other recommendations are and will be implemented during the NEWREP-A research period, and progress on the work related to these other recommendations is also summarised here.

INTRODUCTION

The Proposed Research Plan for the New Scientific Whale Research Program in the Antarctic Ocean (NEWREP-A) (GOJ, 2014) was submitted to the International Whaling Commission (IWC) in conformity with Paragraph 30 of the Schedule to the International Convention for the Regulation of Whaling (ICRW) and Annex P (IWC, 2013) as a possible basis for issuing special permits in accordance with Article VIII, paragraph 1, of the ICRW on 18 November, 2014. The IWC Scientific Committee (IWC SC) carried out a review of the NEWREP-A research plan through a workshop of specialists held in Tokyo in February 2015. The review followed the procedure specified in the Revised Annex P (IWC, 2013) and the review criteria suggested in the first operative paragraph of Resolution 2014-5, adopted at the IWC 65th Meeting in 2014.

On 13 April, 2015, the report of the Expert Panel was released; this offered 29 recommendations to improve the research plan (IWC, 2015). On the same date, the proponents provided a preliminary response to the 29 recommendations provided by the Expert Panel, including a timeframe for the work and analyses to be conducted in response to the recommendations, while noting that additional analyses and information would be submitted to the IWC SC (GOJ, 2015a).

The proponents considered that the 29 recommendations made by the Expert Panel were useful and that the recommendations could be divided into two groups: (i) those relevant to a 'full evaluation of whether any new lethal sampling is required' and 'issues related to sample size' (13 recommendations); and (ii)

those recommendations not relevant to such issues (16 recommendations)¹. The proponents considered that it was not necessary to address all the recommendations ‘before there is a final conclusion on lethal techniques and samples sizes’ as more than half of the recommendations made by the Expert Panel (indicated in (ii) above) were not relevant to the determination of the necessity of lethal sampling and the reasonableness of the sample size (GOJ, 2015a). Among the recommendations that are classified in the former category above, the proponents considered that investigations in response to five recommendations (recommendations 1, 11, 12, 13 and 26 in Table 1 below) were of higher priority.

The proponents subsequently presented, in the form of an “additional response to the report of the Expert Panel”, some details of the progress of the analytical work addressing those five recommendations, together with some other recommendations, to the 2015 IWC SC Annual Meeting (GOJ, 2015b). Further, the outcome of the proponents’ additional work and analyses was discussed in detail by the small group of specialists during that meeting (IWC, 2015c). After the discussions at the small group, it became clear that two recommendations were the most relevant to consider before the start of the NEWREP-A program: (1) ‘evaluate the level of improvement that might be expected either in the SCAA or in RMP performance by improved precision in biological parameters using simulation studies including updated *Implementation Simulation Trials*’; and (26) ‘provide a thorough power analysis of sample sizes required to detect change in ASM and follow the other recommendations in this item’. Several suggestions to improve the analyses associated to these recommendations were offered by the small group and endorsed by the IWC SC.

After the IWC SC meeting in 2015, the proponents have conducted further analyses in relation to these two recommendations, and completed, to a reasonable level, the key elements of work and analyses concerning those items. A summary statement regarding the outcome of those analyses was circulated to the IWC Contracting Governments and members, together with the final version of NEWREP-A on 27 November, 2015 (GOJ, 2015c). Other recommendations are being and will be implemented during the NEWREP-A research period. This paper presents the overall progress of the work and analyses implemented by the proponents since the IWC SC meeting in 2015 in response to the recommendations made by the Expert Panel (see details in GOJ, 2016 – SC/66b/SP).

RESULTS

Table 1 below lists the progress of work and analyses conducted by the proponents so far in response to the 29 recommendations made by the Expert Panel, and the timeline for further work and analyses to address the outstanding recommendations. As explained above, recommendations 1 and 26 were considered to be the most relevant among the 29 recommendations to be addressed and completed before the start of the NEWREP-A program.

¹ (i) Recommendations 1, 2, 3, 4, 8, 9, 10, 11, 12, 13, 18, 22 and 26; ii) Recommendations 5, 6, 7, 14, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28 and 29.

Table 1. Summary of the work conducted by the proponents on recommendations on NEWREP-A provided by the IWC SC.

#	Recommendation	Progress	NEWREP-A timeline
1	Evaluate the level of improvement that might be expected either in the SCAA or in RMP performance by improved precision in biological parameters using simulation studies including updated <i>Implementation Simulation Trials</i>	Completed to a reasonable level (see details in GOJ, 2016 – SC/66b/SP). The RMP/ <i>IST</i> -like simulations conducted show that in nearly all cases, the modifications of the RMP's CLA to include information from catch-at-age data lead to either or both of catch being increased and low levels of lowest depletion being improved (where necessary) compared to the CLA. This also applies given periods of especially low or especially high recruitment to the minke whale populations under consideration.	Before start of first survey
2	Analyses to distinguish between 2-stocks with mixing versus isolation by distance	Already in progress. Preliminary analyses have been conducted between the ICR and the Tokyo University of Marine Science and Technology (a document with results will be prepared for the 2017 SC meeting). As expected by the proponents, preliminary results showed that the effect size of the stocks in the Antarctic is too low to allow for the methods proposed by the review workshop to distinguish between the two hypotheses. The proponents consider that the hypothesis of at least two stocks with mixing in the research area is the hypothesis better supported by the genetic and non-genetic data.	Final results at 2017 IWC SC
3	Simulation study to examine how additional sampling could be expected to improve precision and/or reduce bias in estimates of mixing rates	To be completed in the next 1-2 years. The original timeframe for this recommendation was for report at the 2016 IWC SC. However, the proponents consider that the work associated with this recommendations has lower priority among the remaining recommendations as this topic is not related to the main objectives of NEWREP-A. The proponents plan to conduct the relevant analyses to be reported to the 2018 IWC SC meeting.	To be completed in the next 1-2 years
4	Comprehensive biopsy sampling feasibility study on Antarctic minke whale	Already in progress. The original recommendation involved several elements as follows: i) involve people with expertise in successfully biopsy sampling of common minke whales in the North Atlantic; ii) mimic the sampling strategy developed for lethal sampling (e.g. when dealing with schools >2); iii) record information on time taken, sea state, swell, etc. to enable a plausible measure of the effort required to be developed; and iv) consider the amount of tissue required (for each analysis and in total). Feasibility biopsy sampling started in the 2015/16 austral summer season following the presentation and discussion of the dedicated sighting survey research plan in IWC SC 2015 (GOJ, 2015b – SC/66a/SP8). Before starting the feasibility study, consultation with experienced Japanese and Norwegian (e.g. Lars Kleivane) colleagues took place. A total of nine biopsy trials (of a total of 10 planned) was conducted on single schools. The relevant information suggested by the review workshop was obtained for each biopsy trial. Details of the feasibility trials and preliminary evaluation are presented in Isoda <i>et al.</i> (2016) – SC/66b/IA).	Report of survey results will be provided at the 2016, 2017 and 2018 IWC SC
5	Comprehensive telemetry feasibility study on Antarctic minke whale	Already in progress. The review workshop recommended that the proponents undertake this work in collaboration with research groups with experience in such work, rather than try to develop techniques on their own, and that this applies to field methods as well as tag types. Feasibility studies on telemetry started during the 2015/16 austral summer season following the presentation and discussion of the dedicated sighting survey research plan in IWC SC 2015 (GOJ, 2015b – SC/66a/SP8). Before starting the feasibility study consultation took place with experienced Japanese and Norwegian (e.g. Lars Kleivane) colleagues. The focus in the first feasibility study was on the attachment system. A total of 16 trials for satellite tagging was conducted. Seven satellite tags and three dummy tags were attached to whales. The satellite tags successfully transmitted the locations of the whales for different period of time, with a maximum of about three weeks. Effort, Beaufort sea state data as well information on the schools were collected in each trial.	Report of survey results will be provided at the 2016, 2017 and 2018 IWC SC

		Details of the feasibility study and a preliminary evaluation are presented in Isoda <i>et al.</i> (2016) – SC/66b/1A).	
6	Estimate $g(0)$ for all species	Already in progress. Survey design and protocols with both the IO and closing modes were implemented during the dedicated sighting surveys in Area IV in 2014/15 and 2015/16 austral summer seasons (see details in Matsuoka <i>et al.</i> , 2015, and Isoda <i>et al.</i> , 2016 – SC/66b/1A). Data collected are under analysis. This will allow the estimation of $g(0)$ for large whales.	2018 IWC SC for preliminary results
7	(1) Review survey design and methods taking into account: (a) analysis of IWC IDCR/SOWER cruises; (b) spatial modelling developments; (c) experience of previous multi-disciplinary surveys; (d) JARPAII review recommendations; (e) the possibility of focused surveys on specific issues in some years; (f) whales within the ice; (g) updated power analyses of the effects of survey interval and estimation of trend (2) work closely with the IWC Scientific Committee before finalizing survey approaches; (3) ensure that future survey plans submitted to the Scientific Committee follow fully the guidelines for such survey plans, including incorporating proposed track lines	Already in progress. The research plan for the dedicated sighting survey in the austral summer season 2015/16 was presented and endorsed by the 2015 IWC SC (GOJ, 2015b). The research plan for the dedicated sighting survey in the austral summer season 2016/17 is presented to the 2016 IWC SC in Hakamada <i>et al.</i> (2016) – SC/66b/1A. The research plan for the multidisciplinary survey takes the results and experience obtained on the 2015/16 survey into consideration.	Throughout the program (Survey plans will be presented to the IWC SC at every annual meeting)
8	Examine feasibility of using DNA methylation ageing technique with Antarctic minke whales using good quality earplugs, testing against geographical areas and different time periods and using several laboratories	Already in progress. After technical consultation with one of the authors of Polanowski <i>et al.</i> (2014) ¹ it was confirmed that genes and position of age-related DNA methylation sites in the Antarctic minke whale were almost homologous to those in the humpback whales. Feasibility studies based on two approaches, <i>direct sequencing method</i> and <i>pyrosequencing methods</i> , are being conducted in collaboration with the Laboratory of Biology of the Azabu University School of Veterinary Medicine and Graduate School of Veterinary Medicine (former method) ² and Riken Genesis Co. (latter methods) ³ . Work based on the two approaches started with the analyses of the same 14 DNA samples of Antarctic minke whales for which earplug readings were considered excellent. This will allow the comparison of results between two different approaches and laboratories.	Preliminary results at the 2017 IWC SC; final results at the 2018 IWC SC
9	Examine use of hormones in blubber to detect sexual maturity	Already in progress. The idea here is to estimate reproductive status in female Antarctic minke whales, using the concentrations of progesterone in blubber, with appropriate accuracy. To this end, 100 immature, 20 non-pregnant mature (10 with corpus luteum and 10 without corpus luteum) and 100 pregnant female whales sampled by JARPAII 2010/11-2013/14 will be analyzed by ELISA assay, using Crocodile miniworkstation (Titertek-Berthold). The study will be conducted in consultation with specialists of the Obihiro University of Agriculture and Veterinary Medicine, and foreign colleagues who have conducted similar studies in the past.	Preliminary results at the 2017 IWC SC; final results at the 2018 IWC SC
10	Evaluate the effect on SCAA of assuming 'resting' females are immature females	To be completed in the next 1-2 years. The proponents will complete this evaluation when conducting additional <i>IST</i> -like simulation studies to further validate the improved performance of RMP in the context of recommendation 1.	To be completed in the next 1-2 years
11	Update SCAA with respect to density-dependence following Punt <i>et al.</i> (2014), and stock mixing based on existing data	Completed (see GOJ, 2015b – SC/66a/SP8). The density-dependence had already been incorporated (the panel comment reflected a misunderstanding). Sensitivity to an extreme alternative boundary was tested and found to make	Already reported at the 2015 IWC SC meeting;

		little difference to combined abundance trends. Hence this recommendation is considered to have been addressed, though mixing issues may be considered further when the proponents conduct additional <i>IST</i> -like simulation studies to further validate the improved performance of RMP in the context of recommendation 1.	
12	Identify more fully the data to be used to inform the time-varying natural mortality in the SCAA and analyse existing data to determine the feasibility and accuracy of obtaining such estimates.	To be completed in the next 1-2 years. The proponents will complete this identification when conducting additional <i>IST</i> -like simulation studies to further validate the improved performance of RMP in the context of recommendation 1.	To be completed in the next 1-2 years
13	Develop metrics to evaluate the benefits of including time varying ASM data in the SCAA	Already in progress. The proponents have shown the impact of time varying ASM on the results of the SCAA (IWC 2015c). The integration of time varying ASM into <i>IST</i> s will take place when the proponents conduct additional <i>IST</i> -like simulation studies to further validate the improved performance of RMP in the context of recommendation 1.	To be completed in the next 1-2 years
14	Consider the adoption of multibeam sonar in krill surveys.	To be addressed. Careful consideration will be given before the first dedicated krill survey (CCAMLR-type survey) tentatively scheduled for the 2018/19 austral summer season.	Before the start of the first dedicated krill survey (CCAMLR-type survey) likely in 2018/19
15	Trial the ship and echosounder system(s) in Japan well before going to the Antarctic to determine the likely effective acoustic sampling range and potential for detecting krill for multiple frequencies over the required survey depth. Conduct for both annual and broad-scale survey vessels.	Completed. Calibration of the echosounder system (EK80) was conducted in Japan before the start of 2015/16 NEWREP-A. Details of this work are provided in Wada <i>et al.</i> (2016) – SC/66b/IA.	Throughout program (Results to be presented to the IWC SC at each annual meeting)
16	In the years (two out of 12) when both NEWREP-A and CCAMLR-type surveys are conducted, try to survey the same transects by both vessels in near synchrony	To be addressed. Tentatively the first dedicated krill survey (CCAMLR-type survey) will be conducted in the 2018/19 austral summer season. Research plans will be presented to CCAMLR's EMM workshops in 2017 and 2018, and to the IWC SC annual meetings in 2017 and 2018. This recommendation will be considered in the research plan. The research plan will be adjusted in the light of these recommendations from these meetings.	Before the start of the first dedicated krill survey (CCAMLR-type survey) likely in 2018/19
17	Conduct full analysis of statistical power to detect changes in krill abundance from proposed techniques	To be addressed. This has been deferred until planned discussions with CCAMLR experts have taken place.	Before the start of the first dedicated krill survey (CCAMLR-type survey) likely in 2018/19
18	Develop more detailed plans to consider whether comparisons between stomach contents and proposed krill survey data are feasible and if so, how they can be done	To be addressed. This has been deferred until the planned discussions with CCAMLR experts have taken place.	Before the start of the first dedicated krill survey (CCAMLR-type survey) likely in 2018/19
19	Ensure that sufficient time is allocated for adequate net sampling, based on analysis of previous net sampling data (e.g. BROKE/BROKE West data).	To be addressed. Tentatively the first dedicated krill survey (CCAMLR-type survey) will be conducted in the 2018/19 austral summer season. Research plans will be presented to CCAMLR's EMM workshops in 2017 and 2018, and to the IWC SC annual meetings in 2017 and 2018. This recommendation will be considered in the research plan. The research plan will be adjusted in the light of the recommendations from these meetings.	Before the start of the first dedicated krill survey (CCAMLR-type survey) likely in 2018/19
20	Give careful consideration to scale and design of oceanographic sampling, taking into account BROKE/BROKE West data	To be addressed. Tentatively the first dedicated krill survey (CCAMLR-type survey) will be conducted in the 2018/19 austral summer season. Research plans will be presented to CCAMLR's EMM workshops in 2017 and 2018, and to the IWC SC annual meetings in 2017 and 2018. This recommendation will be considered in the research plan. The research plan will be adjusted in the light of the recommendations from these meetings.	Before the start of the first dedicated krill survey (CCAMLR-type survey) likely in 2018/19
21	Compare overlap in diet amongst fin and Antarctic minke whales using stable	Already in progress. This study involves two steps: the first is stable isotope analyses of the prey species (krill) samples to ensure the correct determination of stable isotope	First six years as a first step

	isotopes in skin, with concurrent analyses of krill samples to obtain stable isotope baselines	baselines; and the second is stable isotope analyses of skin samples of Antarctic minke whales and of biopsy samples of fin and humpback whales. At this juncture, the stable isotope analyses of four krill samples have already been conducted, and 16 skin samples of Antarctic minke whale were used in a feasibility study ⁴ . This study will be carried out in collaboration with the Laboratory of Marine Ecosystem Change Analysis, Field Science Center for Northern Biosphere, Hokkaido University ⁵	
22	Develop a more powerful approach to estimating energy intake (requirements) using a bioenergetics model; evaluate non-lethal methods for obtaining a time series of tuning data for such models	To be completed in the next 1-2 years. Biopsy samples which might be used for the tuning of bioenergetics model have already been collected. The next step (i.e. estimation of energy intake) is a huge task and thus needs careful consideration	To be completed in the next 1-2 years
23	Investigate stable isotopes along edge of baleen plates to see if this provides insights into duration of time on feeding grounds.	Already in progress. Study to be conducted initially using baleen plates of Antarctic minke whale collected during the JARPAII. As a first step, stable carbon and nitrogen isotope ratios will be determined along edge of the baleen plates of 10-20 Antarctic minke whales. Each baleen plate will be examined at around 20 places following Mitani <i>et al.</i> (2006). The full study will include analyses of stable isotope of other species such as humpback and fin whales, and is being carried out in collaboration with the Laboratory of Marine Ecosystem Change Analysis, Field Science Center for Northern Biosphere, Hokkaido University ⁵	2018 IWC SC
24	Use 'non-lethal' techniques on all animals; develop 'condition indices'; work to develop non-lethal techniques for total consumption	To be addressed. This needs careful consideration. More time is required for the discussions to plan the details of such an exercise to take place.	Throughout the program
25	Provide an improved outline of the proposed ecosystem and multispecies model structures and provide a data gap analysis	To be completed by 2017. An update of the Mori-Butterworth Antarctic ecosystem model, taking JARPA and JARPA II data into account, is well advanced by a University student for a post-graduate thesis. The decision has been made to await the results from this work to provide further basis upon which to improve the outline provided previously.	Final results at 2017 IWC SC
26	Provide a thorough power analysis of sample sizes required to detect change in ASM and follow the other recommendations in this Item	Completed to a reasonable level (see details in GOJ, 2015c; 2016 – SC/66b/SP). The proponents conducted re-analyses and the results indicate that the point estimate of the cohort random effect is zero. The results therefore do not lead to any strong reason to change the sample size. Consequently the proponents have concluded that the reasonableness of the proposed sample size (333) has now been adequately demonstrated.	Before start of first survey
27	Provide additional analyses on effect of catches upon the stocks for comparison with those presented	The proponents see no real need to implement this recommendation, and request the IWC SC to provide convincing reasons as to why addressing this recommendation is necessary for NEWREP-A. The proponents make this comment in the light of the Expert Panel agreement that the conclusion that catches of the order of 333 every 2 nd year will not harm the stocks is very likely robust to the analytical method applied.	Suspended until clarification by the IWC SC on the necessity of this recommendation
28	Improve mechanisms for co-operative research	Already in progress. The proponents have already posted a formal protocol for outside scientists to express interest, on the website of the ICR (in English): http://www.icrwhale.org/NEWREP-AProtocol.html .	Throughout the program
29	Provide information on program management, personnel and logistic resources	Already in progress. Relevant information is provided to the IWC SC in an annual progress reports in response to the SC's comments and suggestions (see Appendix 1).	Throughout the program

¹e-mail communication with Dr. S. Jarman, Australia, dated 15 December 2015.

²This method is being used in a master thesis study titled: 'Feasibility study of Antarctic minke whale aging based on DNA methylation by direct sequencing method' by Risa Shimizu (Azabu University, Kanagawa Prefecture).

³ICR-Riken Genesis Co. research collaboration under ICR Contract No. ICR-78-4, May 2016.

⁴ICR-Japan Chemical Analysis Center. Research contract No. 27P10, March 2016.

⁵ICR-Hokkaido University research collaboration under ICR Contract No. ICR-76-47, April 2016.

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Appendix 1

Progress on program management, personnel and logistic resources

Background

In the NEWREP-A plan it was stated that the proponents will provide relevant information concerning program management including funding, personnel and other logistic resources to the IWC SC every year in an annual progress report for the IWC SC's comments and suggestions, to facilitate steady progress of the program in an open and transparent manner.

Financial resources

The Fisheries Agency of Japan (FAJ) allocated budget for the first year of NEWREP-A in 2015/16 season for the following purposes:

- To conduct experiments to evaluate the feasibility and practicability of non-lethal methods, including instruments for field (biopsy system, satellite tags) and laboratory works.
- To ensure that the number of samples of Antarctic minke whales taken reaches the planned sample size – including budget to ensure safety for the sighting and sampling vessels.
- To enhance international/domestic collaboration with other research institutes - e.g. travel budgets to have meetings with national and international colleagues and/or to promote distribution of the research outcomes and contributions.

For the second year of NEWREP-A in 2016/17, in addition to the above budget, FAJ allocated funding for a second sighting survey vessel.

Human resources

Since 2015, agreement for research collaborations between ICR and other research organizations in Japan has increased, especially in the research areas of the development of new non-lethal techniques. From 2016 two new scientists will be added to the ICR research staff, one in the area of population genetics and the other in the area of statistics.

Logistic resources

Information on the progress on the tasks related to NEWREP-A is provided in Table 1 of the main report. Associated with those tasks several instruments have been acquired by ICR, some of which are listed below:

1. ELISA Assay applications (Crocodile miniworkstation, Titertek Berthold; Germany).
2. Seven satellite tags (SPOT6, Wildlife computers, WA, USA).
3. Three Larsen gun systems.
4. Quantitative Echosounder (EK80; Simrad, Norway).
5. Pneumatic tool (whale tag launcher: Aerial Rocket Tag System (ARTS), Lars Kleivane and Restech Norway A/S, Norway)
6. Small ring net (1m in mouth diameter and 3m length; Nihon-Kaiyo Co., Ltd., Japan).
7. Calorie meter (Calorie answer CA-NH, Joy World Pacific Company Ltd, Japan).