Report of the Scientific Committee

Bled, Slovenia, 24 April-6 May 2018

Annex U Revised
Statements Related to Item 19, Special Permits

**This report is presented as it was at SC/67b.
There may be further editorial changes (e.g. updated references, tables, figures)
made before publication.**

International Whaling Commission
Bled, Slovenia, 2018

Annex U

Statements Related to Item 19, Special Permits

Annex U1

SUMMARIES OF REPORTS ON ONGOING RESEARCH UNDER NEWREP-A

SC/67b/SP08. Results of the third biological field survey of NEWREP-A during the 2017/18 austral summer season
SC/67b/SP08 presented the results of the biological sampling of Antarctic minke whales during the third NEWREP-A survey conducted in Area VI (170°W-120°W, south of 60°S) during the 2017/18 austral summer season. Two sighting and sampling vessels (SSVs) and one research base vessel engaged in the survey for 83 days. A total of 392 sightings (involving 925 individuals) of Antarctic minke whale were made during 4,164 n.miles of searching distance. A total of 333 Antarctic minke whales (152 males and 181 females) were sampled, and a number of biological samples and data required for the two main objectives of NEWREP-A were obtained from each whale taken. In Area VI-East, the survey was conducted early in the season (December to January) for the first time since the start of JARPA survey in 1987/88. A total of 44 Antarctic minke whales (26 males and 18 females) were sampled in Area VI-East. The obtained samples will contribute to elucidation of the stock structure of Antarctic minke whales, especially to elucidation of the eastern boundary of P-stock. A total of two blue, four humpback and one killer whales were photo-identified and one biopsy sample was collected from a blue whale in the research area. The samples and data collected in this survey are available for interested national and international scientists under the guidelines for research collaboration posted at the home page of the Institute of Cetacean Research (ICR): *http://www.icrwhale.org/NEWREP-AProtocol.html*.

SC/67b/SP04. Results of the feasibility study on biopsy sampling and satellite tagging of Antarctic minke whales under NEWREP-A
SC/67b/SP04 presented the results of the feasibility study on biopsy sampling and satellite tagging of Antarctic minke whales following the recommendations of the NEWREP-A review workshop. The feasibility study was conducted during the first three NEWREP-A surveys between the 2015/16-2017/18 austral summer seasons. The feasibility study was aimed in comparing the efficiency of biopsy sampling in comparison to lethal sampling. First, the Success Proportions of biopsy and lethal sampling was estimated, next the efficiency between the two approaches was assessed using a Generalized Linear Model (GLM) considering the following response variables: sampling methods (biopsy and lethal sampling), Beaufort scale, visibility and sampling area. The explanatory variable in the best fitted model included only 'sampling method'. This result suggested that environmental variables did not have a significant effect. The estimated Success Proportions for biopsy sampling (0.434±0.050) were much lower than that for lethal sampling (0.967±0.006). Furthermore the time spent on the experiment on biopsy sampling was approximately three times longer than that spent on lethal sampling. This result showed that the efficiency of biopsy sampling for Antarctic minke whales targeted under a random sampling procedure in NEWREP-A is much lower than that of lethal sampling. Given these results, no additional experiments on biopsy sampling will be conducted in future NEWREP-A surveys. However additional biopsy samples could be collected opportunistically to increase the sample size and then consider other variables in the statistical analysis in the future. Given the results on satellite tagging additional tagging trials will be conducted in the future to respond specific research questions. A final evaluation of these techniques will be carried during the mid-term review of the NEWREP-A following an established protocol (Mogoe *et al.*, 2016).

SC/67b/SCSP05. Determining sexual maturity in female Antarctic minke whales during the feeding season based on concentrations of progesterone in blubber
SC/67b/SP05 reported the results of a study on the relationship between concentration of progesterone in blubber and reproductive status in the Antarctic minke whale. The study was based on 230 female Antarctic minke whales sampled during the 2015/16 austral summer survey of the NEWREP-A. The study was conducted in response to a recommendation from the NEWREP-A review workshop to 'Examine use of hormones in blubber to detect sexual maturity'. Progesterone concentrations in blubber of the sampled whales were related to their reproductive status determined by the traditional method of examining reproductive organs (56 immature, 11 resting, 6 ovulating and 157 pregnant females). Significant differences were found in median progesterone concentration between all reproductive categories except in the case between ovulating and pregnant females. However, the ranges of progesterone concentration overlapped between each reproductive status with the exception of the cases immature/ovulating and immature/pregnant. The results of the present study indicate that the progesterone concentration in blubber samples, which potentially can be obtained by biopsy sampling, cannot be used as an absolute diagnostic index to discriminate between mature and immature female Antarctic minke whales. A final evaluation of this technique will be carried during the mid-term review of the NEWREP-A following an established protocol (Mogoe *et al.*, 2016).

Annex U2

STATEMENTS ON THE NEWREP-A REPORTED RESULTS

The feasibility of biopsy sampling: A response to Yasunaga *et al.*

Clapham, P., De La Mare, W., Double, M., Hoelzel, R., Ivashchenko, J., McKinlay, J. and Wade, P.

Yasunaga *et al.* (SC/67b/SCSP04) reported the results of a feasibility study on biopsy sampling of Antarctic minke whales, and concluded that such sampling 'is not a feasible technique that could contribute to the NEWREP-A research objectives'. In support of this, the authors indicated that biopsy sampling took longer than lethal sampling, and also stated that the quantity of tissue obtained in a biopsy was insufficient to permit multiple analyses to be conducted (e.g. genetics, stable isotopes, fatty acids and hormone analysis).

There are several factors which render the paper's overall conclusion invalid. First, the overall premise of the paper is fallacious: that one technique takes longer than another should not lead to the conclusion that the more time- consuming technique is infeasible. However, the contention that biopsying a whale takes longer than lethal sampling is itself derived from a spurious comparison of the two processes. The way in which the time involved in obtaining a sample in the two techniques was not explicitly defined, but apparently employed a misleading comparison that involved only the time involved between inception of a chase and the striking of the whale (with either a biopsy dart or a harpoon). This does not take into account processing time, which is considerably longer and far more labour-intensive for lethal sampling (up to an hour with numerous individuals working on deck, versus a few minutes by a single individual to process a biopsy sample); even ignoring the carcass processing time, a catcher still has to deliver the whale to the factory ship before resuming the hunt for another animal. If one instead adopts a more reasonable definition of experimental time as the period between inception of the chase and the point at which the sample is secured and the sampling vessel is free to move on to target another animal, biopsy sampling would emerge as the faster technique.

Second, the authors' statement that the quantity of tissue yielded by a typical biopsy is insufficient for multiple analyses is demonstrably false; other researchers routinely obtain enough material for a variety of experiments of different types, with results providing acceptable levels of precision. For example, a typical minke whale whole biopsy sample yields approximately 60-100 µg of DNA and sometimes much more; the quantity of tissue required for hundreds of genetic experiments is far less (e.g. 20-200 nanograms for 20 microsatellite loci, and 300 nanograms/sample for 5,000-15,000 loci using RAD sequencing). Therefore, even for a low yield from ½ of the biopsy sample (30µg) and a high-coverage method (RAD sequencing) there would be 100 times more DNA than required. Stable isotopes can be analysed from a small portion of the biopsy (as little as 1mg). After identification of the appropriate markers (typically done by methylome sequencing of animals of known age and identifying highly informative loci), as little as 10-100 ng of DNA (depending on the number of loci) would be sufficient for age determination. Note that following the careful selection of loci, this can show a very close correlation to age (e.g. r2 = 0.84 in Hannum *et al.* 2013; and see also Jarman *et al.* 2015). The age determination technique is continually being improved and will likely result in consistently precise results in the near future.

Third, the decline in the time to obtain a biopsy sample, as shown in the authors' Table 2, suggests continued use of insufficiently experienced shooters; the ability to accurately hit a target is one of the most important factors involved in this process.

The definition of feasible is 'capable of being done, effected, or accomplished'; consequently, it is inaccurate to state that biopsy sampling is not a 'feasible' technique, and one that 'cannot contribute' to NEWREP-A's research objectives. Biopsy sampling has been widely, routinely and extensively used on the great majority of cetacean species for more than three decades. Furthermore, even if one accepts the statement that lethal sampling is faster, it is worth noting that, using SCSP04's stated average time of 26 minutes to obtain a single biopsy, it would require only 144 hours to sample 333 minke whales (and this does not take into account the option of simultaneously employing multiple shooters and/or sampling vessels). Given that NEWREP-A cruises typically last for up to three months, this is certainly not an undue time burden with which to obtain a statistically robust sample size. Given the much shorter processing time of a biopsy relative to a whole whale, it is conceivable that much larger sample sizes could be obtained during the course of a typical NEWREP-A cruise.

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Progesterone can be used to estimate the percent mature in a sample of Antarctic minke whales

Wade, P., McKinlay, J., De La Mare, B., Double, M., Archer, E., Clapham, P.

In paper SC/67b/SCSP05 (Inoue *et al.*, Determining sexual maturity in female Antarctic minke whales during the feeding season based on concentrations of progesterone in blubber), the authors have conducted a study examining progesterone levels for different maturity and reproductive states (as determined by examination of ovaries): immature, pregnant, ovulating, resting. We consider this a useful investigation into the potential for non-lethal methods to accurately determine reproductive status.

However, we disagree with their main conclusion, which was that progesterone value cannot be used to categorize whales as immature or mature. The authors apparently reach this conclusion based on a small amount of overlap in the distribution of progesterone values between the immature and resting categories. However, the great majority of the mature whales are in the pregnant or ovulating categories (162 whales), whereas only 11 whales were categorized as mature but resting (not pregnant or ovulating). Therefore, it is worthwhile to examine how much difference a small amount of misclassification would make to the estimation of the % mature in the sample.

If one examines Fig. 1, it can be seen there is no overlap in the inter-quartile ranges (25-75% percentiles, the 'boxes') between the immature and resting categories; there is only overlap in the extreme values. It is not possible to tell from the figure how much overlap in distribution there is between immature and resting categories. A histogram with different colours representing immature, pregnant, ovulating, and resting would be useful to show how much overlap there is in the categories. We request that the authors of SC/67b/SCSP05 make such a plot for the consideration of the SC at this meeting. From such a histogram it would also be simple to directly test how well progesterone levels would serve to categorize whales into immature or mature classes.

Since we know the sample size in each reproductive class (Table 1 in SC/67b/SCSP05), as well as that each 'whisker' can contain no more than 25% of the data in the distribution of each category, we can approximate what the likely misclassification rate would be. From Figure 1 we can guess (for illustration purposes) the amount of overlap between immature and resting stages. For example, if one proposed using a value of 1.0 ng/g to define immature vs. mature, it looks like (assuming an approximate uniform distribution between the box and whisker) roughly 25% of the 11 resting whales would be misclassified, which would be 2.75 whales (rounding to 3).

Similarly, roughly one-third of the upper 25% quartile, or 8.3% of the 56 immature whales would be misclassified as resting, which would be 4.6 whales (rounding to 5). Therefore, with 3 whales moving from resting to immature, and 5 whales moving from immature to resting, there is a net gain of 2 whales being misclassified, resulting in an estimated 54 immature and 13 resting. Adding in the pregnant and ovulating states, the estimated percent mature whales would be 76.4% ((156+6+13/229) based on progesterone, versus 75.5% ((154+6+11/229) based on examination of ovaries, for a difference of 0.9%, less than 1%.

In reality the values are unlikely to be uniformly distributed between the 75 percentile (for immature) and the extreme high value, or similarly between the 25th percentile (for resting) and the extreme low value. Therefore, the true amount of misclassification would likely be less than what we calculate here, so the difference is likely even less than 0.9%. We conclude that the amount of misclassification in immature vs. mature using progesterone values would be very small, and could be corrected by using the data and results from this study. Therefore, in contrast to the authors of SC/67b/SCSP05, we conclude that progesterone could be used very effectively to classify Antarctic minke whales as to their maturity state.

Clarifications and responses regarding NEWREP-A studies on biopsy sampling (SC/67b/SCSP04) and blubber progesterone (SC/67b/SCSP05) on Antarctic minke whales

Yasunaga, G., Inoue, S., Tamura, T. and Pastene, L.A.

BACKGROUND

First, these two studies were carried out in direct response to recommendations from the NEWREP-A review workshop. Experiments in both studies were designed based on specific suggestions from the NEWREP-A review workshop (IWC, 2016, pp.515-16 for biopsy sampling and pp.519-20 for blubber progesterone).

The suggested deadline for completing these analyses was after the completing the third NEWREP-A survey. Consequently, results of both studies were submitted to the 2018 IWC SC meeting after the 2017/18 NEWREP-A survey had been completed.

While encouraging the studies conducted, some members disagreed with our preliminary conclusions on the biopsy sampling study (see Clapham *et al.,* I) and blubber progesterone study (see Wade *et al.*). Responses to these WPs are provided in the third and fourth sections below.

FINAL EVALUATION OF NON-LETHAL TECHNIQUES IN THE CONTEXT OF NEWREP-A OBJECTIVES, USING A PROTOCOL

As noted above, at this stage preliminary conclusions were provided by the proponents and a final conclusion will be provided by the mid-term review workshop; this will be based on i) some additional field data taken opportunistically; ii) additional analysis and iii) the protocol to evaluate non-lethal techniques presented to the IWC SC at the 2016 annual meeting by Mogoe *et al.* (2016).

The protocol above was developed following a recommendation from the JARPNII review workshop (IWC, 2017, p.86), and it was presented and discussed at the 2016 IWC SC meeting (IWC, 2017, p.82-83). Systematic application of such a protocol to evaluate non-lethal techniques is an efficient and constructive approach because, even though the feasibility and practicability of non-lethal means have been repeatedly discussed, conclusions were often difficult to reach due to a lack of an objective evaluation scheme.

In the protocol above, four questions were established to evaluate the feasibility and practicability of non-lethal methods. The primary questions are whether tissue and other samples can be obtained by a non-lethal method (Question 1); whether enough samples for statistical analysis can be obtained by that non-lethal method (Question 2); whether the sample obtained by the non-lethal method can produce as much scientific information as that produced by a lethal sampling method (Question 3); and whether the cost for obtaining the sample/producing scientific information is reasonable (Question 4). Unless all of these four questions are satisfied together for a particular non-lethal method, such a method is not considered satisfactory to replace lethal methods, and therefore a lethal method is necessary (see details in Mogoe *et al.*, 2016).

While final responses and conclusions on these two studies will be provided at the mid-term review of NEWREP-A following the protocol above, we respond preliminarily below some of the technical questions/criticism in Clapham *et al.,* I, and Wade *et al.*

RESPONSES TO CLAPHAM *ET AL.*, I (BIOPSY SAMPLING)

Clapham *et al.,* I, argued that:

(a) The way in which the time involved in obtaining a sample in the two techniques was not explicitly defined, but apparently employed a misleading comparison that involved only the time involved between inception of a chase and the striking of the whale (with either a biopsy dart or a harpoon).

(b) The contention that quantity of tissue yielded by a typical biopsy is insufficient for multiple analyses is demonstrably false; other researchers routinely obtain enough material for a variety of experiments of different types, with results providing acceptable levels of precision.

(c) The decline in the success proportion of a biopsy sample, as shown in the authors' Table 2 in SC/67b/SCSP04, suggests continued use of insufficiently experienced shooters; the ability to accurately hit a target is one of the most important factors involved in this process.

Our responses to those points are:

Response to (a)

First of all, it should be noted that 'the efficiency' of sampling techniques was defined as 'Success Proportion' rather than 'Time of experiment' in SC/67b/SCSP04 because 'Success Proportion' can represent a better indicator of the efficiency. In light of the purposes of NEWREP-A, random sampling is required in which generally only one animal from a school is sampled. Thus, the most important question is the certainty that a particular method can take a sample from the targeted animal, and time necessary to take the sample is less important. For this reason, 'Success Proportion' was used as the response variable in the GLM analysis in SC/67b/SCSP04.

Therefore, the allegation in Clapham *et al.*, I, that 'the overall premise of the paper is fallacious: that one technique takes longer than another should not lead to the conclusion that the more time-consuming technique is infeasible' ignores the statistical analysis already conducted by the proponents.

Notwithstanding this, we provide details of 'time of experiment' in our study in order to clarify further. First, 'Time of experiment (min.)' in Table 2 in SC/67b/SCSP04 was defined as following:

Biopsy sampling: A time period from the time of the starting a chase of whale to the time of having retrieved a biopsy sample on a deck.

Whale (lethal) sampling: A time period from the time of the starting the chase of a whale to the time of having kept a whale body on a side deck.

The time spent in transporting the whale to the base vessel was not considered in the analysis because the catcher vessel does not necessarily return to the base vessel after catching a whale, but can immediately start the search for a further whale to capture or biopsy.

Further analyses will be carried out and evaluated under the protocol for evaluation of non-lethal techniques indicated above, by the mid-term review.

Response to (b)
We agree that the amount of epidermal tissue collected by biopsy sampling is enough for the requirement of genetic, epigenetic and stable isotope analyses. However, we have pointed out that the amount (median of weight: 0.8g) of an adipose tissue collected by biopsy sampling is not large enough to measure progesterone (Objective I-(II)), lipid content (Objective II-(III)) and fatty acid (Objective II-(III)) of NEWREP-A.

Response to (c)
We disagree that success proportion of biopsy sampling is declining allegedly because the use of insufficiently experienced shooters. One of our reasons, is that median of time of experiment (min) did not change substantially. In order to examine this factor further, the differences in success proportion in biopsy sampling experiment only were assessed by a GLM for the response variables of outcome of sampling (failure; success). Explanatory variables were considered with research seasons as an ordered variable (2015/16; 2016/17; 2017/18). Table 1 shows results of a GLM analysis based on the binomial distribution assumption. The coefficients for each years were not significant, suggesting that the differences of success proportions between of 2015/16 and 2016/17, and 2017/18 are not statistically significant and consequently provide no evidence that shooters' experience has decreased over the three research seasons.

Table 1

Results of generalized linear model analyses in the best fitted model involved only research season as explanatory variables of biopsy sampling for Antarctic minke whales in the NEWREP-A (2015/16 - 2017/18).

	Estimate Std.	Error	z value	Pr (>|z|)
2015/16	0.3567	0.4928	0.724	0.4692
2016/17	-0.1054	0.4595	-0.229	0.8186
2017/18	-0.4855	0.2594	-1.871	0.0613

Null deviance: 137.24 on 99 degrees of freedom; Residual deviance: 133.05 on 96 degrees of freedom

RESPONSES TO WADE *ET AL.* (BLUBBER PROGESTERONE)
Wade *et al.* argued/suggested that:

(a) 'A histogram with different colours representing immature, pregnant, ovulating, and resting would be useful to show how much overlap there is in the categories.'

(b) Based on assumptions which are a 'value of 1.0 ng/g to define immature vs. mature', 'one-third of the upper 25% quartile' and '8.3% of the 56 immature whales would be misclassified as resting', the difference of true amount of misclassification would likely be less than 0.9%.

Our responses to those points are:

Response to (a)
A histogram with different colours representing immature, resting, ovulating and pregnant is shown in Fig.1.

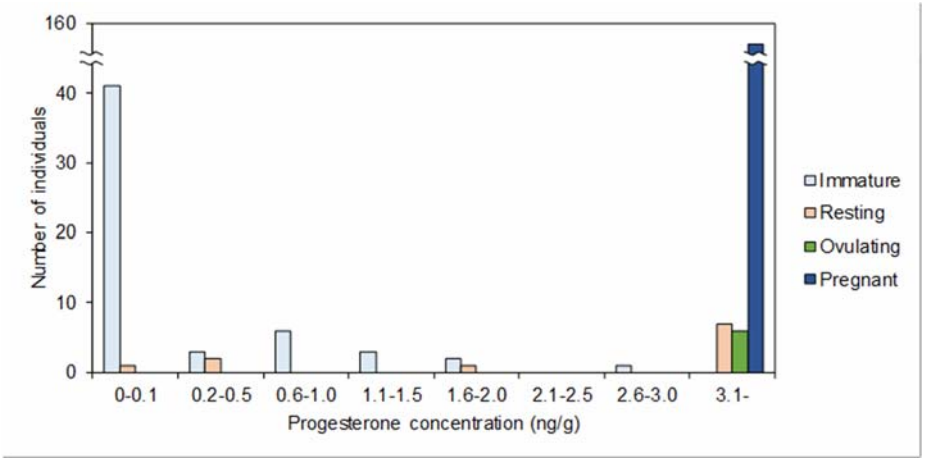

Fig. 1. A histogram with different colours representing immature, resting, ovulating and pregnant of female Antarctic minke whales sampled in 2015/16 NEWREP-A.

Response to (b)
Based on the assumption of cut off values (1.0 ng/g) of progesterone set in Wade *et al.*, six of 56 immature whales and three of 11 resting whales were misclassified. Misclassification ratios are 10.7% and 27.2%, respectively, and they are not negligible.

As mentioned earlier, final evaluation of this technique will be made at the mid-term review workshop based on the protocol developed for evaluating non-lethal techniques.

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Assessing the Efficiency of Biopsy versus Lethal Sampling

Clapham, P., Leaper, R. and Wade, P.

The paper on the feasibility of biopsy sampling by Yasunaga *et al.* (SC/67b/SCSP04) generated considerable discussion, much of which was centered on the comparative speed with which biopsy sampling and lethal sampling are achieved, and the method used to assess this. Here, we propose a standard metric for measuring the efficiency of biopsy sampling, and to compare this to the process of lethal sampling.

METRICS FOR BIOPSY SAMPLING

Obtaining a biopsy sample from a whale involves several stages:

(1) selecting a target whale (or group of whales) and initiating a chase;

(2) attempting to successfully take the biopsy with either a crossbow or gun; and

(3) retrieving and processing the sample.

We suggest that a fair way to measure the time taken to obtain a biopsy is to use the time from initiation of the chase to the time the sample (i.e. the biopsy dart) is retrieved.

One could also add the time taken to process the sample, but this is typically very short and in fact usually does not need to be accomplished on the sampling vessel. A biopsy tip can be removed from the arrow and placed with the intact sample into a plastic bag that is tagged with a unique number of some kind, linked by the data collector to other information on the whale recorded at the time of sampling (e.g. sample number, date and time, group number, whale number et cetera). The sample can be removed from the biopsy tip and processed, with others, later.

If a sample is processed immediately after retrieval - i.e. it is removed from the tip and placed into a pre-labeled vial with preservative - this typically adds a few minutes. In such case, this time should be recorded as the end point of the process, but only if that process prevents the vessel crew from resuming another biopsy attempt[1].

In cases where a biopsy is not obtained, the time between initiation of the chase and suspension of attempts on the whale/group concerned should also be recorded.

In many cases, a sampling vessel encountering an associated group of whales can obtain multiple biopsy samples from the same group. In these cases, the efficiency of subsequent samples should be measured from the time when the previous sample has been secured to the time when the next biopsy is taken, until all members of the group have been sampled or the vessel suspends operations and searches for another whale/group.

METRICS FOR LETHAL SAMPLING

Obtaining a lethal sample from a whale also involves several stages:

(1) selecting a target whale (or group of whales) and initiating a chase;

(2) attempting to kill the whale with a harpoon;

(3) towing the dead whale back to the factory ship;

[1]If multiple clean tips are taken into the field, there is no need to clean tips that have already been used until the end of the day.

(4) winching the carcass onto the flensing deck; and,

(5) taking and processing the sample.

Presumably a catcher is free to resume targeting another whale only after it has delivered the first carcass to the factory ship. Consequently, a reasonable way to measure the time taken to obtain a lethal sample is to use the time from initiation of the chase to the time the carcass is delivered to the factory ship, thus freeing the catcher to attempt further lethal sampling. It is not necessary to include the processing time of the carcass, since that is independent of the chase, which presumably can resume immediately after delivery of the dead whale.

In cases in which the catcher does not succeed in killing the whale, the time between initiation of the chase and suspension of attempts on the whale/group concerned should also be recorded.

OTHER NOTES

For both methods, meteorological variables (notably wind and sea state) should be recorded so that the efficiency of each method can be assessed relative to environmental conditions.

If the sampling design requires whales observed from pre-determined track lines to be sampled, then the time to return to the track line and resume searching after either recovering the biopsy dart or leaving the factory ship, should also be recorded.

Scientists conducting biopsy sampling of any cetacean are encouraged to record the metrics described above so that a robust sample size can be gathered with which to assess the efficiency of biopsy on different species.

Annex U3

SUMMARIES OF REPORTS ON ONGOING RESEARCH UNDER NEWREP-NP

SC/67b/SCSP06. Results of the first cruise of the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) in the 2017 summer season - offshore component

SC/67b/SCSP06 presented the results of the first biological survey of sei and common minke whales under the offshore component of NEWREP-NP. The survey was conducted in part of sub-Areas 7(7WR and 7E), 8 and 9 (-170°E), north of 35°N from June to September 2017. Two sighting sampling vessels (SSVs) and one research base vessel were engaged in the survey for 100 days. A total of 56 sightings (involving 61 individuals) of common minke whale and 320 sightings (involving 407 individuals) of sei whales were made during 5,307 n.miles of searching distance. A total of 43 common minke and 134 sei whales were sampled as originally planned. Biological samples and data required for the two primary objectives of NEWREP-NP were obtained from each whale sampled. In particular earplugs for age determination and reproductive organs for sexual maturity determination were collected for all individuals. SP06 also presented the preliminary results of biological analyses of the whales sampled. Eight blue and one humpback were photo-identified, and biopsy samples were collected from five blue, one humpback and 17 sei whales. Satellite tags were deployed on 15 sei whales and tracking was possible for eight individuals. The samples and data collected in this survey will be available for interested national and international scientists under the guidelines for research collaboration in NEWREP-NP.

SC/67b/SCSP02. Cruise Report of the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) in 2017- Pacific coastal component off Hachinohe and Kushiro

SC/67b/SCSP02 presented the results of the first survey of the coastal component of NEWREP-NP conducted in sub-areas 7CS off Sanriku (Hachinohe) and 7CN off Kushiro, in the Pacific side of Japan. The survey in Hachinohe was conducted from 18 July to 20 August 2017, using two small-type whaling catcher boats as sighting/sampling vessels and six small fisheries boats supporting sighting activities. The survey in Kushiro was conducted from 1 September to 31 October 2017, using four small-type whaling catcher boats as sighting/sampling vessels. Searching for common minke whales and sampling took place in coastal waters about 50n. miles from Hachinohe and Kushiro Ports. All common minke whales sampled were landed at the NEWREP-NP research stations established in Hachinohe and Kushiro, where biological examination was conducted. During the survey in Hachinohe, a total of six primary sightings (six individuals) and two secondary sightings (two individuals) of common minke whale were made during 4,297.1 n.miles of searching distance (456.2 hours). Three common minke whales (one immature and two mature males) were sampled. During the survey in Kushiro, a total of 43 primary sightings (45 individuals) and two secondary sightings (two individuals) of common minke whale were made during 7,038.5 n.miles of searching distance (724.0 hours). A total of 35 common minke whales were sampled (22 males and 13 females). Biological samples and data required for Primary Objective I and Ancillary Objectives I and II of NEWREP-NP were obtained from all animals sampled. The target sample size of 80 common minke whales however could not be attained, because both surveys were greatly affected by bad weather and sea conditions.

SC/67b/SCSP07. Cruise report of the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) in 2017 - coastal component off Abashiri in the southern Okhotsk Sea

SC/67b/SCSP07 presented the results of the first coastal NEWREP-NP survey in the southern Okhotsk Sea (sub-area 11), which was conducted from 11 June to 6 July 2017. The survey was carried out using five small-type whaling catcher boats as sampling vessels, in coastal waters mainly within about 40 n. miles from Abashiri port. Common minke whales collected were landed at the NEWREP-NP research station for biological examination. During the survey, a total of 2,449.9 n. miles (243.4 hours) was searched and 128 schools (132 individuals) of common minke whales were sighted. Sightings of 39 schools (55 animals) of fin, four schools (10 individuals) of humpback, two schools (two animals) of blue, and one of sperm whales were also made. Of the 132 common minke whales encountered, 47 animals were sampled. Earplugs and eye lenses for age determination and reproductive organs for determination of sexual maturity were collected from all the whales. Sex of animals caught was biased towards the female (9 males and 38 females). Average body length was 6.92m (SD=0.55, range=5.62-7.55m) and 7.35m (SD=0.85, Range=4.96-8.18m) for males and females, respectively. Of nine males, eight were sexually mature (88.9%) and 30 of 38 females were mature (78.9%). A total of 25 females were pregnant. Stock assignment was conducted from nuclear microsatellite data. Of 47 animals collected, 28 were assigned to J stock and 17 were identified as O stock. The remaining two animals could not be assigned. Proportion of J stock animals increased from June (53.6%) to July (76.5%). Sex ratio of males was higher in the J stock animals (28.6%) than in the O stock animals (5.9%). In females, the proportion of mature animals was higher in the O stock (93.8%) than in the J stock (65.0%). Conception date was estimated using a growth formula and fetus body length data. Animals migrating into the Okhotsk Sea have two breeding seasons: autumn breeding season and winter breeding season prolonged to spring. Pregnant females with autumn conception date were genetically assigned to the J stock. All females genetically assigned to the O stock conceived in a period from winter to spring. Dominant prey species was krill (89.4%), followed by Copepoda (4.3%) and walleye pollock (2.1%). Animals feeding on copepods were genetically assigned to the O stock. An individual that fed on walleye pollock was genetically assigned to the J stock.

SC/67b/SCSP03. Results of satellite monitored tagging experiments on North Pacific sei whales conducted during the 2017 NEWREP-NP offshore survey

SC/67b/SCSP03 reported the results of the satellite tagging on North Pacific sei whales conducted during the 2017 NEWREP-NP survey. A total of 44 tagging trials were conducted using SPOT6 type tags with LKArts system for attachments from *Yushin-Maru*-type sighting/sampling vessels. A total of 15 tags were deployed on sei whales, and eight whales were tracked. Two sei whales were tracked for more than 35 days, and these two whales showed a longitudinal movement. In general the tagging experiment of penetrate-type tags from sighting/sampling vessels seems to be practical. However some technical improvements are identified, which could increase the tracking period.

[Summary objectives tables from NEWREP-A and NEWREP-NP are on the following pages]

Annex U4

SUMMARY OBJECTIVES TABLES FOR NEWREP-A AND NEWREP-NP

Table 1 NEWREP-A - Summary table of progress with recommendations.

Key for 'Purpose': A: To evaluate contribution of a particular objective or sub-objective of the programme to meet conservation and management needs. B: To evaluate feasibility of particular techniques (whether lethal or non-lethal). C: Relevant to a full evaluation of whether any new lethal sampling is required D: Relevant to issues related to sample size (irrespective of method used to obtain data). E: Relevant to improve existing components of the proposed programme. Note that under 'Suggested timeframe' this was a rough estimate by the Panel and will depend on the amount of time and effort available. A considerable number of the recommendations require analytical work (this includes simulation modelling). Achieving all of these within the timeframe estimated for each individual item will require considerable resources. Those that relate to purposes A, B, C and D are higher priority for completion.

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(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.*	A, C, D	By August 2015	No, analytical	**Completed to a reasonable level** (see details in GOJ, 2016 – SC/66b/SP10). The RMP/IST-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. As stated in previous meetings, the proponents consider that the steps specified by the Advisory Group go beyond the original scope of Recommendation 1. Nevertheless, some new information in the context of the TOR's of the Advisory Group was provided in SC/67b/RMP03. Their intention is to continue contributing to this work subject to logistical constraint and the availability of specialist analysts.	**2015**: The work follows the intent of the Panel recommendation. It addresses the ability to estimate recruitments by the SCAA, though does not yet evaluate the extent to which the precision of estimates of other parameters such as M and MSYR might be improved given further data. From a management perspective there remains the need for quantification of the extent to which the precision achievable for recruitment estimation will improve management performance. Specifically, it remains to be determined whether a reduction in uncertainty in year-class strength has any appreciable effect on performance statistics for *Implementation Simulation Trials*. The current SCAA does not of itself constitute a full specification of the various operating models/*Implementation Simulation Trials* needed for management procedure testing. In any case, the current SCAA is not suitable as an operating model as currently formulated. In particular, SC/66a/SP08 includes no specifications for how the modelled population is to be used to project and the uncertainties that are to be represented in trials, both historically and in projections. Furthermore, the Committee had concluded that the SCAA estimates of MSYR are not robust. **2016**: The proponents have decided to evaluate how the availability of age data can improve management performance rather than assessing the extent to which estimates of management quantities (such as MSYR) can be improved given additional data from NEWREP-A. The RMP/IST-like simulations are conceptually the appropriate way to conduct this evaluation. However, the *MCLA* needs to be tuned to ensure better comparability with the *CLA* to allow appropriate comparisons to be made (see Item 5.1.1) and the scenarios need to link more clearly to information from SCAA (i.e.be conditioned on the data). This could be achieved, for example, by assuming that the past changes in carrying capacity and/or growth could occur in the future. An Advisory Group has been established to provide advice with respect to mathematical specifications (IWC 2017, pp. 441-445). The Committee recognised a range of opinions as to the extent to which this recommendation has been addressed. **2017**: No new information (see IWC/67A/SCSP12). The 2016 evaluation is still valid. See also Recommendation 26 and Item 17.1 (IWC 2018, pp. 71-78) **2018**: Some information presented in the SC/67b/RMP03 (IWC 2019, Item 19.1.2.1).
(2)	Analyses to distinguish between two stocks with mixing versus isolation by distance.	A, D	By May 2015	No, analytical	**Already in progress.** Preliminary analyses have been conducted between the ICR and the Tokyo University of Marine Science and Technology (a document with results was originally planned for the 2018 SC meeting but due to other priorities this work was postponed for the mid-term review 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. Analyses related to this recommendation are still ongoing and will be presented to the mid-term review. As noted above, preliminary results suggest that the scenario of two stocks that mix in the transition area is the most plausible hypothesis.	**2016**: The Committee notes that the work will be presented at the 2017 meeting. **2017**: No new information (see IWC/67A/SCSP12). The 2016 evaluation is still valid. **2018**: **No progress**. Self-declared deadline (i.e. 2018 SC meeting) not met.

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(3)	Simulation study to examine how additional sampling could be expected to improve precision and/or reduce bias in estimates of mixing rates.	A, D	By May 2015	No, analytical	**To be completed by the mid-term review.** The proponents consider that the work associated with this recommendation has lower priority among the remaining recommendations as this topic is not related to the main objectives of NEWREP-A. Analyses related to this recommendation are still ongoing and will be presented to the mid-term review.	**2016**: No progress reported although the Committee notes that the work will be presented at the 2018 meeting. **2017**: No new information (see IWC/67A/SCSP12). The 2016 evaluation is still valid. **2018**: **No progress**.
(4)	Comprehensive biopsy sampling feasibility study.	B, C, D, E	field season 2015-2016 or 2016-2017	Yes, field effort	**Completed.** Explanation of the design of the biopsy sampling feasibility studies were included in the research plans for the dedicated sighting surveys presented annually to, and endorsed by the IWC SC. The design considered all elements in the recommendation. Feasibility studies were conducted in the three first NEWREP-A surveys, and results were presented by Isoda *et al*. (2016), Isoda *et al*. (2017) and Mogoe *et al*. (2018) (SC/67b/ASI07). A Generalized Linear Model (GLM) used to compare the efficiency between biopsy and lethal sampling was conducted using data collected in the three feasibility studies. Results confirmed that the efficiency of biopsy sampling was significantly lower than the lethal sampling (Yasunaga *et al*., 2018; SC/67b/SCSP04). No further biopsy studies on Antarctic minke whales are planned under the NEWREP-A. However additional biopsy samples will be attempted opportunistically.	**2015:** The work follows the intent of the Panel's recommendations, though more details are needed. For example, will there be people on board that have expertise in successful minke whale biopsying? The biopsy sampling design that will be used in the future to achieve representative coverage of the entire study area (not first field year which is just a feasibility study) needs to be specified, perhaps by the 2016 SC meeting. **2016**: SC/66b/IA04 summarised the research plan for the 2016/17 survey, including the biopsy feasibility study. SC/66b/IA05 reported preliminary results on biopsy sampling obtained during the 2015/16 NEWREP-A survey. **2017**: SC/67a/ASI07 reported results on biopsy sampling obtained during the 2016/17 NEWREP-A survey. **2018**: Partially completed, further refined analysis is needed (see this report, Item 19.1.2.2). A WG was formed to review and improve methods.
(5)	Comprehensive telemetry feasibility study.	B, E	field season 2016-2017 or 2017-2018	Yes, field effort	**Completed.** Explanation of the design of the telemetry feasibility studies were included in the research plans for the dedicated sighting surveys presented annually to, and endorsed by the IWC SC. The design considered all elements in the recommendation. Feasibility studies were conducted in the three first NEWREP-A surveys, and results were presented by Isoda *et al*. (2016), Isoda *et al*. (2017) and Mogoe *et al*. (2018) (SC/67b/ASI07). A summary and conclusion of the feasibility studies were made by Yasunaga et al. (2018) (SC/67b/SCSP04). It was concluded that satellite tagging is feasible for Antarctic minke whales to respond specific qualitative question e.g. location of breeding grounds, and will continue on an opportunistic basis.	**2015:** The work follows the intent of the Panel's recommendation, though more details are needed. For example, with which research groups/individuals will there be collaboration to determine which attachment system will be used and which experts will be on board? The future sampling design of when and where telemetry tags will be applied to address the various questions, assuming it is feasible to attach telemetry tags, will need to be specified, perhaps by the 2016 meeting. **2016**: SC/66b/IA04 summarised the research plan for the 2016/17 survey, including the telemetry feasibility study. SC/66b/IA05 reported preliminary results on tagging obtained during the 2015/16 NEWREP-A survey. **2017**: SC/67a/ASI07 presented results on telemetry obtained during the 2016/17 NEWREP-A survey. **2018**: **Completed**. New information was presented (SC/67b/SCSP04). Feasibility study was conducted.
(6)	Estimate $g(0)$for all species.	E	Throughout	Yes, field effort then analytical	**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 (Matsuoka *et al*., 2015), in Area IV in 2015/16 (Isoda *et al*., 2016), in Area V in 2016/17 (Isoda *et al*., 2017) and Areas V and VI in 2017/18 (Mogoe *et al*., 2018; SC/67b/ASI07). The analysis of data collected will allow the estimation of g(0) for large whales.	**2015:** The work follows the intent of the Panel's recommendation, and the survey design allows for pertinent data to be collected. **2016**: **Completed annually**. SC/66b/IA04 summarised the research plan for the 2016/17 survey, which includes the estimation of g(0) for large whale species (using the IWC-SOWER approach). The proposed field plan was approved by the Committee. **2017**: **Completed annually**. SC/67a/ASI4 summarised the research plan for the 2017/18 survey. The Committee endorsed the cetacean abundance estimation component of this proposal and Matsuoka was appointed to provide IWC oversight. **2018**: **Completed annually**. SC/67b/ASI07 summarised the research plan for the 2018/19 survey. The Committee endorsed the cetacean abundance estimation component of this proposal.

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(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) JARPA II review recommendations; (e) the possibility of focussed surveys on specific issues in some years; (f) whales within the ice; and (g) updated power analyses of the effects of survey interval and estimation of trend. (2) Work closely with the IWC Scientific Committee before finalising 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.	E	By August 2015 then throughout	Yes, analytical then field effort then analytical	**Addressed and Ongoing** Research plans including the elements in the recommendations above have been presented annually to the IWC SC: GOJ (2015a) for the survey in 2016/17; Hakamada *et al.* (2016) for the survey in 2016/17; Hakamada *et al*. (2017) for the survey in 2017/18; and Hakamada *et al*. (2018) (SC/67b/ASI11) for the survey in 2018/19. All the plans have been endorsed by the IWC SC.	**2015:** (1) (a) It is not clear if any considerations have been made to modify the data collection methods or track line placement to make future analyses easier. (b) It is not clear which covariates will be considered in the SDM and hence need to be collected during the survey. (c) It is not clear how the CTD and net tows will be used. This type of information would make it possible to evaluate whether the proposed sampling while on the ship is appropriate. See Annex for more detailed comments on this. (d) This item been addressed. (e)-(g) These aspects are not addressed in SC/66a/SP08, but should be addressed within the next year or so. (2) and (3): The work follows the intent of the Panel's recommendation. Papers describing the future survey are being reviewed under IA. **2016**: **Completed annually**. The Committee approved the proposal in SC/66b/04IA04. **2017**: **Completed annually**. See recommendation 6. **2018**: **Completed annually**. See recommendation 6.
(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.	B, C, D	By March 2016	No, laboratory then analytical	**Completed.** After technical consultation with one of the authors of Polanowski *et al*. (2014) 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. The procedure for identification of age-related DNA methylation site (CpG) and measurement of methylation level followed previous study on humpback whale by Polanowski *et al*. (2014). DNA methylation rate of seven CpGs on three different loci (seven sites) were scored successfully. Results of the analyses conducted in response to this recommendation were presented in Goto *et al*. (2018) (SC/67b/SDDNA04). A total of 100 Antarctic minke whale samples, for which earplug readings were considered excellent or good, were selected for the DNA-M feasibility study. Seven CpG sites in three genes (TET2, CDKN2A and GRIA2) were selected for this study because they showed significant correspondence between CpG methylation levels and age in a previous study on humpback whales. In addition, changes in the DNA-M rate among different positions of the whale's body, were investigated. Some positions involved dorsal side (expose to sunlight) and others the ventral side. DNA-M rate of the seven CpG sites were scored successfully and regressions of each CpG methylation against age determined by earplug were conducted. Coefficient of determination (R^2) of all CpG sites were lower than that of the previous humpback whale study. The assay predicts age from skin samples with a standard deviation of 8.865 years. DNA-M rate fluctuated among 8-10 positions of the whale body. It is concluded that age determination of Antarctic minke whale based on the seven DNA-M sites (from three loci) used in this study is not feasible particularly for use in population dynamics models such as SCAA.	**2016**: The Committee was informed that this work has started in collaboration with other research institutions. Results will be presented in 2018. **2017**: See comments in IWC/67a/SCSP12. **2018**: SC/67b/SDDNA04 presents a feasibility study on epigenetic aging. The method can be used, but the SD & DNA Working Group made suggestion as to how to improve resolution (in particular, evaluate more loci and restrict to those with a high age correlation). While resolution can be improved, SD & DNA Working Group has discussed the limit of resolution of the method for individual age estimation in the light of information provided to this group (see this report, items 11.4.4, 19.1.2.3 and Annex I). While further refinement is encouraged, the feasibility study was conducted, thus this recommendation is **partially completed**.

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(9)	Examine use of hormones in blubber to detect sexual maturity	B, C, D	By March 2017	No, laboratory	**Completed.** Results of the analyses conducted in response to this recommendation are presented in Inoue *et al*. (2018) (SC/67b/SCSP05). The relationship between concentration of progesterone in blubber and reproductive status in the Antarctic minke whale was investigated by examining 230 female Antarctic minke whales sampled during the 2015/16 austral summer survey of the NEWREP-A. Progesterone concentrations in blubber of the sampled whales were related to their reproductive status determined by the traditional method of examining reproductive organs (56 immature, 11 resting, 6 ovulating and 157 pregnant females). Significant differences were found in median progesterone concentration between all reproductive categories except in the case between ovulating and pregnant females. However, the ranges of progesterone concentration overlapped between each reproductive status with the exception of the cases immature/ovulating and immature/pregnant. The results of the present study indicate that the progesterone concentration in blubber samples, which potentially can be obtained by biopsy sampling, cannot be used as a diagnostic index to discriminate between mature and immature female Antarctic minke whales. Discrimination between immature and mature females is fundamental information for population dynamics models such as the SCAA. Therefore, at this stage, lethal sampling is required to obtain information on sexual maturity of female Antarctic minke whales for use in population dynamic models.	**2016**: The Committee was informed that this work has started in collaboration with other research institutions. Results will be presented in 2018. **2017**: Some information is available (see IWC/67a/SCSP12). **2018**: **Completed**, but there are disagreements on the interpretation of results and its conclusions. SC/67b/SCSP05 presents results of the study focused on determining sexual maturity in female Antarctic minke whales, during the feeding season, based on concentrations of progesterone in blubber. On accuracy see Item 19.1.2.3 (this report).
(10)	Evaluate the effect on SCAA of assuming 'resting' females are immature females.	A, C, D	By August 2015	No, analytical	**To be completed by the mid-term review.** The proponents will complete this evaluation when conducting additional *IST*- like simulation studies to further validate the improved performance of RMP in the context of Recommendation 1*	**2015:** No methods nor results presented. **No progress**. **2016**: No methods or results presented at this meeting but see discussion under Recommendation 1. **2017**: No new information (see IWC/67A/SCSP12). The 2016 comments remain valid. **2018**: New information presented (SC/67b/SCSP05).
(11)	Update SCAA with respect to density-dependence following Punt *et al.* (2014), and stock mixing based on existing data.	A, C, D	By May 2015	No, analytical	**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 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 *IST*-like simulation studies to further validate the improved performance of RMP in the context of recommendation 1*	**2015: Partially completed.** The SCAA has been updated using the density-dependence function suggested by the Panel – task complete. Results are shown for a different fixed boundary. However, extensions to address the potential utility of genetic data in particular to inform time-dependent mixing and hence improve estimation performance have yet to be addressed. **2016**: **Partially completed**. The SCAA has yet to be updated to include the data on stock mixing and to estimate mixing rates (rather than changing the assumed fixed boundary in the SCAA). Punt advised that this recommendation was not intended by the Panel to be related to RMP/IST testing, but rather to the structure of the SCAA. **2017**: No new information (see IWC/67a\/SCSP12). The 2016 comments remain valid. **2018**: No new information.
(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.	A, C, D	By August 2015	No, analytical	**To be completed by the mid-term review.** The proponents will complete this identification when conducting additional *IST*- like simulation studies to further validate the improved performance of RMP in the context of Recommendation 1. *	**2015**: No methods nor results presented. **No progress**. **2016**: No results nor methods presented but see discussion under Recommendation 1. The Siler model in SC/66b/IA8 is one way to account for time-varying natural mortality. **2017**: No new information (see IWC/67a/SCSP2). The 2016 comments remain valid. **2018**: **No progress**. The 2016 comments remain valid.

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(13)	Develop metrics to evaluate the benefits of including time varying ASM data in the SCAA.	A, C, D	By May 2015	No, analytical	**To be completed by the mid-term review.** 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 ISTs will take place when the proponents conduct additional *IST*- like simulation studies to further validate the improved performance of RMP in the context of Recommendation 1. *	**2015:** The simulation results suggest (as expected given the formulation of the model) that allowing for time-varying age-at-50%-sexual maturityASM50 has little impact on the majority of the results from the SCAA. The calculated values of mature population and recruitment rate are rescaled by changing the definition of the proportion mature over time. In principle, integrating time-varying ASM50 into the Implementation Simulation Trials might suggest that this is an important factor to understand, but this has yet to be demonstrated. **2016**: The approach outlined by the proponents should be able to address the recommendation – it would involve imposing time-trends in ASM and evaluating the impacts on performance measures when catch limits are set using the CLA (after NEWREP-A is completed). The analyses to address this recommendation could be used to select an effect size which could then have formed the basis for a power analysis to determine sample size. **2017**: No new information (see IWC/67a/SCSP12). The 2016 comments remain valid. **2018**: **No progress**. The 2016 comments remain valid.
(14)	Consider the adoption of this multibeam sonar in krill surveys.	E	By August 2015	No, logistical	**Already in progress.** Careful consideration is given before the first dedicated krill survey (CCAMLR-type survey) scheduled for the 2018/19 austral summer season. Survey plan being developed in consultation with CCAMLR.	**2016**: The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists. **2017**: No information was presented (see IWC/67a/SCSP12). **2018**: No information was presented.
(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.	B, E	By 2016 for annual surveys	Yes, logistical, field effort, analytical	**Completed.** Calibration of the echosounder system (EK80) was conducted in Japan before the start of the 2016/17 and 2017/18 NEWREP-A surveys. Details of this work are provided in Wada *et al*. (2017; 2018) (SC/67a/EM09 and SC/67b/EM05).	**2015:** No plan has been presented, but a plan needs to be developed before the survey is conducted. There needs to be documentation on how the EK60 will be calibrated and that someone trained to conduct on such calibration will participate in the surveys. **2016**: **Completed**. This work was completed before the start of the second whale sighting-based krill survey and results were presented in Wada et al. (2017) (SC/67a/EM09). The Ecosystem Modelling working group encouraged further work on the survey in consultation with CCAMLR specialists. **2017**: Results of the krill and oceanographic survey under the NEWREP-A in the Antarctic in 2016/17 were presented in IWC/67a/EM9. **2018**: New information presented (SC/67b/EM05).
(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.	E	Within programme	No, logistical	**Already in progress.** Careful consideration is given before the first dedicated krill survey (CCAMLR-type survey) scheduled for the 2018/19 austral summer season. Survey plan being developed in consultation with CCAMLR.	**2016**: The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists. **2017**: No new information was presented (see IWC/67a/SCSP12). **2018**: No new information was presented.
(17)	Conduct full analysis of statistical power to detect changes in krill abundance from proposed techniques.	A, E	By August 2015	No, analytical	**To be addressed.** This has been deferred until planned discussions with CCAMLR experts have taken place.	**2016**: The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists. **2017**: No new analysis was presented (see IWC/67a/SCSP12). **2018**: No new analysis was presented
(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.	A, B, C	By May 2015	No, logistical	**To be addressed.** This has been deferred until the planned discussions with CCAMLR experts have taken place.	**2016**: The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists. **2017**: No new analysis was presented (see IWC/67a/SCSP12). **2018**: No new information was presented.
(19)	Ensure that sufficient time is allocated for adequate net sampling, based an analysis of previous net sampling data (e.g. BROKE/BROKE West data).	E	Within programme	No, logistical, analytical	**Already in progress.** Careful consideration is given before the first dedicated krill survey (CCAMLR-type survey) scheduled for the 2018/19 austral summer season. Survey plan being developed in consultation with CCAMLR.	**2016**: The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists. **2017**: No new analysis was presented (see IWC/67a/SCSP12). **2018**: No new information was presented.

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(20)	Give careful consideration to scale and design of oceanographic sampling, taking into account BROKE/BROKE West data.	E	Within programme	No, logistical, analytical	**Already in progress.** Careful consideration is given before the first dedicated krill survey (CCAMLR-type survey) scheduled for the 2018/19 austral summer season. Survey plan being developed in consultation with CCAMLR	**2016**: The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists. **2017**: No new analysis was presented (see IWC/67a/SCSP12). **2018**: No new information was presented
(21)	Compare overlap in diet amongst fin and Antarctic minke whales using stable isotopes in skin, with concurrent analyses of krill samples to obtain stable isotope baselines.	E	Throughout programme	Yes, field effort, analytical	**In progress.** The study involves two steps: the first is the stable isotope analyses of the prey species (krill) samples to ensure the correct determination of stable isotope 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 Antarctic krill samples and of 16 Antarctic minke whale skin samples have been conducted. The isotope value of δ13C and δ15N at the base of four krill samples were -26.90±0.45‰ and 3.68+0.36‰, respectively. The isotope value of δ13C and δ15N at the base of 16 skin samples of Antarctic minke whales were -25.04±0.43‰ and 7.26+0.61‰, respectively. Further analyses will be conducted on additional samples to obtain a correct determination of stable isotope baselines. This study is being carry out in collaboration with the Laboratory of Marine Ecosystem Change Analysis, Field Science Center for Northern Biosphere, Hokkaido University. Final results will be presented to the mid-term review meeting.	**2016**: The Committee was informed that this work was started in collaboration with other research institutions. Final results will be presented to the mid- term review. **2017**: Limited new information was presented (see IWC/67a/SCSP12). **2018**: No new information was presented.
(22)	Develop a more powerful approach to estimating energy intake (requirements) using a bio-energetics model; evaluate non-lethal methods for obtaining a time series of tuning data for such models.	A, B, D	By August 2015	No, analytical	**To be addressed.** Need clarification from the IWC SC on the kind of bioenergetics model suggested.	**2016**: The Committee was informed that this work will be completed in 1-2 years. **2017**: No new information was presented (see IWC/67a/SCSP12). **No progress**. **2018**: No new information was presented. **No progress**.
(23)	Investigate stable isotopes along edge of baleen plates to see if this provides insights into duration of time on feeding grounds.	B	By August 2015	No (if existing samples), laboratory	**Completed.** Results of the analyses conducted in response to this recommend-ation are presented in Uchida et al. (2018) (SC/67b/SCSP09). The stable isotope analysis was based on 16 Antarctic minke whales sampled in the NEWREP-A surveys in 2016 and 2017. The stable carbon (δ13C) and nitrogen isotope ratios (δ15N) were determined along the edge of baleen plates of 10 pregnant sampled in the Ross Sea and 6 other immature females. Each baleen plate was examined at an interval of 5mm to investigate if there were records of feeding in the δ15N and δ13C derived from the long-term feeding profile. In the pregnant females, about 4 cycles of nitrogen were seen at each baleen plate and the mean length of cycle was 7.7±2.0cm (mean±SD, range: 6.0-10.0cm), while two individuals had nitrogen cycles more than 12cm. No constant cycle was observed in δ13C. The trophic enrichment factor of the Antarctic minke whale was calculated as 3.48‰, assuming the mean δ15N value at base of baleens derived from feeding on the Antarctic krill. From the analyses in immature animals, the δ15N kept high value before birth to the end of lactation followed by a rapid down, suggesting feeding on krill causes lower δ15N. The cycles of stable isotope values in immature animal were longer than those in pregnant females, suggesting the baleen plates in younger animals have higher growth rate. It is difficult the interpretation of the changes of values of δ13C compared to δ15N. The fluctuation range of δ15N in the pregnant females was 0.97 ±0.21 ‰, suggesting that they highly depend on the Antarctic krill only. The duration of time on feeding grounds of the Antarctic minke whales remains unknown. Analysis of baleen samples obtained at lower latitude during austral winter, which possibly show the change of δ15N during fasting, could facilitate the estimate the timing of leaving Antarctic waters. The growing ratio of baleen plates can facilitate the estimate the seasonal changes of δ15N, and subsequently the duration of time on feeding ground.	**2016**: The Committee was informed that this work has been started in collaboration with other research institutions. Final results will be presented at the 2018 Annual meeting. **2017**: Some new information was presented in IWC/67a/SCSP12. **2018**: **Completed**.

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(24)	Use 'non-lethal' techniques on all animals; develop 'condition indices'; work to develop non-lethal techniques for total consumption.	E	Within programme	To be determined after relevant analyses related to purposes A-D are completed	**To be addressed.** This needs careful consideration. Clarification from the IWC SC is required on the 'condition indices' suggested.	**2016**: No new information was presented. **2017**: No new information was presented (see IWC/67a/SCSP12). **2018**: **No progress**.
(25)	Provide an improved outline of the proposed ecosystem and multispecies model structures and provide a data gap analysis.	E	By May 2015	No, analytical	**To be completed by the mid-term review** An update of the Mori- Butterworth Antarctic ecosystem model, taking JARPA and JARPA II data into account was presented in SC/67a/EM14.	**2016**: The Committee notes that the further work will be presented at the 2017 meeting. **2017**: Some results were presented in SC/67a/EM14. The Proponent will present results in 2018 (see IWC/67a/SCSP12). **2018**: **No Progress**.
(26)	Provide a thorough power analysis of sample sizes required to detect change in ASM and follow the other recommendations in this Item.	D	By May 2015	No, analytical	**Completed to a reasonable level** (see details in GOJ, 2015c; 2016 – SC/66b/SP10). 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. The IWC SC has already concluded that the approach being taken to address the recommendation is appropriate As stated in previous meetings, the proponent's opinion is that the additional refinements specified in 2016 go beyond the original scope of Recommendation 26. Nevertheless the proponents intention is to continue contributing to this work subject to logistical constraint and the availability of specialist analysts.	**2015:** The simulations conducted generally follow the approach suggested by the Panel. However, future recruitment was not stochastic, no allowance was made for cohort-specific deviations in ASM, and overdispersion associated with the annual proportion mature by age was not modelled. As expected, more additional variation leads to lower power as does lower effect size. Consequently, sample sizes are likely to be too small. Ideally, there should be a management-related (or biologically-based) justification for the effect sizes. **2016**: The analyses now reasonably account for three of the six aspects that constitute a realistic model (i.e. ageing-reading error, overdispersion in catch composition, recruitment variation). Overall, the approach being taken to address the recommendation is appropriate but **some further refinements are required**. • **SC/66b/SP10 restricts the data used to fit the models to ages 4- 13 and 1980-87 and 1992-99. All of the data should be used to estimate the amount of extra- age, -cohort and -year variation rather than restricting the analysis to a subset of years and ages. Doing this also avoids the need to simulate the process of excluding some cohorts and ages when analysing future (simulated) age data.** • **The estimates in SC/66b/SP10 of the variance of cohort random effects and extra-binomial variation (i.e. overdispersion) are zero, which makes these asymptotic estimates potentially questionable. Use a method (such as likelihood profile or the R package blme) to better quantify the uncertainty of these variances and develop probability distributions for them. Adjunct X provide an example of a likelihood for the overdispersion parameter, confirming that the asymptotic estimate of variance is too small. The simulations to evaluate power should then sample from these distributions.** • **The current analyses do not attempt to specifically quantify the effects of year-to-year sampling variation, which reflects the impact of, for example, the locations of sampling (for examples, in some years in regions where mature animals predominate) although overdispersion arisng from this sort of heterogeneity was considered to some extent in SC/66b/SP10 in beta-binomial model.** • **Though challenging, simultaneous estimation of random effects of year and cohort can be explored using the type of model used to estimate cohort random variation in SC/66b/SP10.** **2017**: No new analysis was presented (see IWC/67a/SCSP12) and Item 19.2.1. The 2016 comments remain valid. **No progress**. **2018**: **No progress**. The 2016 comments remain valid.
(27)	Provide additional analyses on effect of catches upon the stocks for comparison with those presented.	E	By May 2015	No, analytical	**Completed** The proponents had provided results based on one application of the CLA and by using the program Fitter. The NEWREP-A review workshop agreed that the conclusion that catches of the order of 333 every 2nd year form these analyses will not harm the stocks is very	**2016**: The Committee notes the rationale for the additional work provided in the Panel report and agrees with that position. **2017**: No new information (see IWC/67a/SCSP12). The 2016 comments remain valid. **2018**: **No Progress**.

					likely robust to the analytical method applied (IWC, 2016a). Therefore the proponents see no real need to implement this recommendation.	

N.	Summary	Purpose	Suggested Timeframe	Needs new samples/ data? Effort type	Proponents comments on progress (see SC/67a/SP12)	Committee's comments
(28)	Improve mechanisms for co-operative research.	E	By May 2015	No, logistical	**Already in progress.** The proponents have already posted a formal protocol for outside scientists to submit proposals for both field and analytical work. Expanded information on the mechanisms for co-operative research was presented in the revised research plan proposal for NEWREP-NP (GOJ, 2017), which is also valid for NEWREP-A (see section 6 and Annexes 20 and 22 of the NEWREP-NP revised research proposal).	**2016**: The Committee noted the protocol placed upon the ICR website. **2017**: See comments in IWC/67a/SCSP12. **2018**: **No Progress**.
(29)	Provide information on programme management, personnel and logistic resources.	E	Throughout programme	No, logistical	**Already in progress.** Expanded information and explanation of the logistics and project management was presented in the revised research proposal for NEWREP-NP (GOJ, 2017), which is also valid for NEWREP-A. In particular refer to section 5 and Annex 21 of the research proposal.	**2016**: SC/66b/SP09 Appendix 1 contains a progress report on management, personnel and logistic resources. **2017**: See comments in IWC/67a/SCSP12. **2018**: **No Progress**.

*As described in the sub-section 4.4 of SC/66b/SP10, the proponents believe that the response required for recommendation 1 has been provided. Building upon this, the proponents are aware that, for the purpose of justifying the adoption by the Committee of a modified *CLA* with age data (*MCLA*) for Antarctic minke whales in preference to the existing *CLA*, further work would need to be specified by and then undertaken through the Committee. This would involve both refinement of the *MCLA* developed here and its testing under a more extensive set of trials/OMs, and such further work would desirably be pursued in the future. However, in line with the Committee's customary practice, a pre-requisite for this further work, is for the Committee to provide a pre-specified set of agreed trials (the proponents, if contributing to such further work, should not be expected to invest considerable time in developing and running further trials, only to be informed later by the Committee that they would have wanted different trials run). Accordingly, the proponents look forward to the Committee agreeing on the specifications of an extension to the trials undertaken here (or at least, more immediately, on a process to develop those specifications in the Committee), so that work can continue in the Scientific Committee with the aim of ultimately adopting a *MCLA* making use of age data which would be suitable for implementation for setting catch limits for Antarctic minke whales.

Table 2. Summary of recommendations relevant to NEWREP-NP.

HIGHEST PRIORITY RECOMMENDATIONS			
No.	**Panel recommendations**	**Proponent response/comments**	***Scientific Committee Comment***
1	The Panel **recommends** that a more thorough quantitative review of the relative contribution of those data types that can only be obtained by lethal sampling to the ability of the proponents to meet their primary objectives is warranted for a full evaluation of options in terms of lethal vs non-lethal methods in relation to the objectives;	Completed. Already responded for Antarctic minke whale (GOJ, 2016). See SC/67a/SC SP01. p.6, 10-14; SC/67a/SC SP13 pp. 2-5.	**2017**: Different opinions, need for more discussion (IWC 2018, Annex D Item 2.4, pp. 116-117). **2018**: **No progress**.
12	*Offshore component*: During the workshop, the proponents provided the Panel with the sampling strategy (samples by month, year, and sub-area) and the Panel **recommends** that this information be included in the version of the proposal that is provided to the Scientific Committee. The Panel also **recommends** that tables of past samples in the same format as the new samples should be included in a revised proposal to place the new samples in a spatio-temporal context.	Completed. Not important because it is not relevant to the justification of lethal sampling of NEWREP-NP (this recommendation is related to data archiving and compilation).The additional information on sampling strategy provided to the Panel was included in the final research plan (P.90, P.151).	**2017**: **Completed**: historical samples of minke whale (SC/67a/SCS/10, pp. 86-87) and of sei whale (see SC/67a/SCS/10 p. 111) have been included.
13	The Panel **recommends** conducting analyses in which the historical age-composition data are downweighted by various levels.	Disagree with Panel (see SC/67a/SC SP01, p. 15).	**2017**: No progress as proponents disagree with Panel. **2018**: **No progress**.
15	Given the discussion under Item 3.3.4, the Panel **recommends** that a properly designed experiment to assess the efficiency of biopsy sampling of common minke whales be undertaken (there is already sufficient detail on catch to render additional capture experiments unnecessary). This should incorporate at least: **(a) the use of the expected vessels in the programme (i.e. the small type whaling vessels);** **(b) the use of vessels (that may be different from the expected vessels) considered suitable by scientists already experienced with biopsy sampling this species;** **(c) suitable levels of effort to allow a statistical comparison (effort for biopsy sampling should be measured or converted to the same units used for examining catching efficiency);** **(d) effort should be carried out in various environmental conditions (e.g. sea state, swell, visibility) up to the maximum conditions that would apply to whaling;** **(e) advice and training from invited experienced minke whale biopsy samplers (e.g. Christian Ramp or Lars Kleivane);** **(f) analyses that provide a proper comparison of biopsy sampling and catching (including time to process samples under various variables such as experience of sampler, vessel, equipment, effort under similar conditions).** The Panel **reiterates** its comments that the proponents must (a) ensure that data are promptly analysed to ensure a meaningful mid-term review – it also refers to its comments about providing adequate resources into work on common minke whale biopsy sampling as soon as possible to facilitate the prompt use of non-lethal techniques.	Disagree with Panel (see SC/67a/SC SP01, p. 3). See also Yasunaga *et al*. (2017a; b). Not important because it is not relevant to the justification of lethal sampling of NEWREP-NP (this recommendation is related to the design of the experiments of biopsy sampling).	**2017**: No progress as proponents disagree with Panel. Advisory Group established regarding biopsy sampling. See discussion under Item 19.3.1 (IWC 2018, p. 78). **2018**: **No progress**.
21	*Sample size (potential reduction of lethal sample size)*: An important component of determining appropriateness of techniques is determination of sample size - as non-lethal techniques become appropriate, non-lethal and lethal sample sizes will need to be recalculated to ensure that objectives are met. The Panel noted there was no discussion in the proposal as to what the strategy would be to determine sample sizes or how the current methods that determine sample sizes might be modified to determine the new sample sizes. The Panel **recommends** this issue be considered by the proponents and a strategy to be included in the project proposal before the start of the fieldwork.	To be considered by the mid-term review. Not important because it is not relevant to the justification of initiation of lethal sampling of NEWREP-NP (this recommendation is related to future consideration of sample size). Agree with the Panel in principle but see SC/67a/SC SP01, p. 16. See "Possible modification of lethal sample sizes" section in SC/67a/SC SP10 (p.39) and the final research plan (p.37).	**2017**: The possibility for further work has been considered (SC/67a/SCSP10 p.39). **2018**: **No progress**.
22	*Sample size (in general)*: The Panel **strongly recommends** that the Proponents take full advantage of existing materials and data to assess the suitability of the planned efforts under NEWREP-NP to resolve the current stock structure hypotheses in the targeted species, before collecting more samples. Simulation studies based upon data collected from the current samples are recommended to adjust the experimental design to address the targeted levels of population divergence/heterogeneity. Such simulations may reveal that an increase in data from existing samples may prove beneficial over collecting additional samples.	Not relevant. Not important because it is not relevant to the justification of lethal sampling of NEWREP-NP (this recommendation is related to genetic information, but genetic information is not the basis of sample size and sampling design). Disagree with Panel (see SC/67a/SC SP01, p. 17). Also see SC/67a/SCSP/13 p. 5 for split samples into coastal and offshore.	**2017**: The proponents made available additional microsatellite data (10 loci) for small subset of data. The proponents also presented additional analysis (i.e. kin ship, STRUCTURE) in SC/67a/SD-DNA01 and SC/67a/SD-DNA05. See discussion under Item 19.3.2 and in Annex I (Item 2.2 in IWC 2018). **2018**: **No progress**.

23	In relation to the impact of catches on common minke whales, the Panel **recommends** that the assessment of the effects of catches on stocks be based on a subset of the trials on which the 2013 *Implementation* was based (including two levels for MSYR and all three stock hypotheses) as this will better account for uncertainty regarding current abundance and future bycatch, as well as time-variation in the J-O mixing proportion. The trials will also be able to account for the location (sub-area) and timing (month) of future catches. However, the trials on which the 2013 *Implementation* was based consider $MSYR_{mat}$=1%, whereas the Scientific Committee has agreed that the lower bound for MSYR should be MSYR1+=1% (IWC, 2014).	Disagree with Panel (see SC/67a/SC SP01, p. 18). Notwithstanding the disagreement, analyses were presented to the 2017 SC meeting (SC/67a/SCSP13). Refined analyses were presented this year in SC/67b/RMP/02.	**2017**: Major concerns by the Panel were addressed by the proponents. See Item 19.4.2.2 (IWC 2018). **2018**: **Completed**. Refined analyses were presented. It could be reconsidered in the next *Implementation Review*.
24	Furthermore, the analyses for common minke whales did not use the most recent estimates of abundance. Thus, before a full consideration of the effects of the catches can be concluded, the Panel **recommends** that the proponents update the trials so that trials are conducted for MSYR1+=1% and $MSYR_{mat}$=4% are fit to the most recent estimates of abundance. The Panel **recognises** that modifying trials is a substantial undertaking (and must be accompanied by evidence of satisfactory conditioning) and it may not be possible to update even a subset of the trials prior to the 2017 Annual Meeting. However, the Panel it **stresses** the importance of this being completed before the programme commences.	Disagree with Panel (see SC/67a/SC SP01, p. 18). Notwithstanding the disagreement, analyses were presented to the 2017 SC meeting (SC/67a/SCSP13). Refined analyses were presented this year in SC/67b/RMP/02.	**2017**: Major concerns by the Panel were addressed by the proponents. See Item 19.4.2.2. More information on technical details is recommended (see Annex D, Item 4.1, pp. 10-11; IWC 2018). **2018**: **Completed**. Refined analyses were presented. It could be reconsidered in the next *Implementation Review*.
25	In relation to North Pacific sei whales, the Panel **recommends** that the proponents consider additional analyses in which current abundance is assumed to equal to the lower 95% confidence bound for the current estimate of abundance and present results for MSYR1+=1% and $MSYR_{mat}$=4%, as these are the values selected by the Scientific Committee (IWC, 2014).	Completed. Addressed in SC/67a/SCSP/13 Section 4.	**2017**: **Completed** (see Annex D, Item 4.2, pp. 11-12; IWC 2018).
HIGH PRIORITY RECOMMENDATIONS			
No.	**Panel recommendations**	**Proponent response/comments**	***Scientific Committee Comment/timeline***
3	*Sexual maturity:* The Panel **recommends** that levels of progesterone in blubber and serum should be compared with sexual maturity and reproductive status of examined females. This comparison is valuable for assessing the efficacy of biopsy sampling for assessing reproductive status.	Completed. See "Sexual maturity" section in SC/67a/SC SP10, 3.1.1 (p.25) and the final research plan (p.23). Results of a study for Antarctic minke whales were presented in SC/67b/SCSP/05, demonstrating that the progesterone level in blubber cannot be used as an absolute index for determining sexual maturity.	**2017**: The Proponents demonstrated intention to include analysis of blubber for progesterone, but there are few details of how. **2018**: **Completed for blubber**, but there are disagreements on the interpretation of results and its conclusions. SC/67b/SCSP05 presents results of the study focused on determining sexual maturity in female Antarctic minke whales, during the feeding season, based on concentrations of progesterone in blubber. On accuracy see Item 19.1.2.3 (this report).
4	*Sightings surveys*: The Panel highlighted several issues that must be considered when designing line transect surveys that are expected to provide abundance information to address multiple objectives. The Panel **recommends** that these issues related to survey design, data collection protocols and priorities, data analyses and coordination are included in the plans to be submitted to the Scientific Committee for approval, before the surveys start. The main additional issues that should be covered in the proposals for surveys submitted to the Scientific Committee are: **(a) Evaluation of past surveys' analytical difficulties. These new surveys provide an important opportunity to evaluate and potentially add/modify the variables or values of variables that are collected. Evaluating the shortcomings of previous surveys (for example, sample size issues and the amount of effort expended, problems that arose in analyses of past data) could suggest ways to supplement the future surveys.** **(b) Appropriate temporal stratification of the surveys.** **(c) Appropriate direction of travel for the survey vessel(s) and direction of track lines to account for migrating animals.** **(d) Use of independent observer (IO) mode, especially in the offshore waters where the weather and sea state conditions are poorer.** **(e) Use of passive independent observer mode with abeam closing to get the benefits of estimating g(0) and also improving the precision of the group sizes.** **(f) Development of protocols/priorities for biopsy-related activities.** **(g) Evaluation of additional variance analysis and spatial model methods to determine which is preferred or whether both methods are investigated.** **(h) 'Regime shift'-related aspects require that consideration should be given to whether sampling of prey is possible during the line transect surveys - obtaining simultaneously collected prey and whale data seems ideal, however logistically challenging.**	Ongoing. See SC/67a/ASI06, SC/67b/ASI10	**2017**: **Completed**: new survey plan was presented to the SC by the proponents (SC/67b/ASI6, appendix 1). The plan was endorsed. Matsuoka IWC oversight. **2018**: **Completed**: new survey plan was presented to the SC by the proponents (SC/67b/ASI10). The plan was endorsed.
5	Care is required during sub-sampling of prey in whale stomachs to ensure that the sample is representative when stomach volumes are large and prey diverse; the Panel **recommends** that the proponents specify how this is to be achieved in the field protocols.	Completed. See "Stomach contents/tissue sampling" section in SC/67a/SC SP10, Annex 17 (p.126-127) and the final research plan Annex 17 (p.169-175).	**2017**: **Completed**. This recommendation referred to the former secondary objective that has been transformed into an ancillary objective. The information provided is sufficient.

7	In order to achieve aim of research item (i) the Panel **recommends** that any immune function assays used should be those already established for cetaceans (Schwacke *et al.*, 2012) so that the results are comparable to published studies.	Completed. See "Laboratory and analytical works" section in SC/67a/SC SP10, Annex 18 (p.135) and the final research plan Annex 18 (p.176-178).	**2017**: **Completed**.
8	Following previous expert panel recommendations, the Panel **strongly reiterates** that all lipophilic compounds being measured must be reported on a lipid weight and not a wet weight basis.	Completed. See "Laboratory and analytical works" section in SC/67a/SC SP10, Annex 18 (p.135) and the final research plan Annex 18 (p.176-178).	**2017**: **Completed**.
10	The Panel **recommends** coordination with IWC-POWER with respect to sightings surveys, biopsy sampling and photo-ID for large whales to ensure consistent data collection and processing, as appropriate. The Panel also **recommends** information on these species are included in annual reports to the Scientific Committee to encourage collaboration with scientists involved with research on these two species.	Ongoing. See "Photo-identification and biopsy sampling" in SC/67a/SCSP10, 3.1.1 (p.126) and the final research plan Annex 19 (p.179-180). See SC/67b/ASI/06 Appendix 1 p.11-12.	**2017**: **Completed annually**: presentation of sightings surveys plans and results. **2018**: **Completed annually**: presentation of sightings surveys plans and results (SC/67b/ASI06).
11	*Coastal component*: The Panel **recommends** that analyses be conducted, before the start of the programme, to assess the extent of loss in power and precision due to the sampling strategy for the objectives related to common minke whales and the implications for meeting Secondary Objectives. The experience/data gained from JARPN II should be used by the proponents to investigate issues (a) – (c) below: **1. the design would lead to oversampling of the areas close to ports (the Panel was informed that an additional land-based station may be established in the northern Sanriku to better cover sub-areas 7CS and 7CN);** **2. the boats can search freely once they reach 30 n.miles from port if no whales have been encountered *en route* from port, which means the design is not fully specified in terms of the catches by the port-based boats; and** **3. (c) the *Nisshin Maru* will conduct sampling if the number of common minke whales caught does not reach the target number, but no sampling plan for this contingency is provided.**	Disagree with Panel (see SC/67a/SC SP01, p. 8).	**2017**: No progress as proponents disagree with Panel. **2018**: **No progress**.
17	Rather than set an arbitrary number of telemetry tags for deployment, the Panel **recommends** that the number, location and timing of tag deployments should reflect the questions being addressed.	Ongoing. See SC/67a/SC SP10, (p. 105 for minke whale; p. 120 for sei whale) and the final research plan (p. 108 for minke whale; p. 162 for sei whale). Result of feasibility study for sei whales presented in SC/67b/SCSP/06.	**2017**: **Partially addressed**. **2018**: New information presented (SC/67b/SCSP/06).
27	Although a new graduate analyst has been appointed, the Panel **remains concerned**, that as has been the case for all previous special permit programmes undertaken by Japan, field and laboratory work and laboratory analyses have been allocated much higher priority than analyses and modelling. This has been reflected in the long times taken to complete analyses (some of which remain incomplete). The Panel **strongly recommends** the recruitment of sufficient highly trained and qualified analyst/modellers to improve NEWREP-NP study design, data analysis and review.	Ongoing. See section on "Description of overall project management including personnel and logistic resources" in SC/67a/SC SP10, 5.2 (p.43) and the final research plan (p.47).	**2017**: It is not clear that additional qualified personnel have been hired. **2018**: **No progress**.
28	Additional information on sample and data archiving, relational database(s) as noted by previous expert panels would be welcome.	Ongoing. See section on "Description of overall project management including personnel and logistic resources" in SC/67a/SC SP10, 5.1 (p.43) and the final research plan (p.47-48). See also relational data set presented to the JARPNII review meeting.	**2017**: The proponents **partially addressed** this recommendation for DNA data and associated biological information, as used in SC/67a/SD-DNA01 and SC/67a/SD-DNA05. **2018**: No new information presented.
29	The proponents recognised the need for a backup contingency plan in the event of disruption of the programme. The primary contingency is for the cruise leader to adjust sampling efforts and locations, if necessary, for example due to bad weather preventing the collection of data in a certain location. The Panel **agrees** that contingency plans are needed, but noted that the proponents have not yet developed a more detailed plan/protocol, *a priori*, for how research will be modified in the event of disruption. It **recommends** that this be done.	Ongoing. See section on "Adjustments of research protocols at the scene and in the year of disruption" in SC/67a/SC SP10, 5.3 (p.44) and the final research plan (p.48-49).	**2017**: This recommendation has been **partially addressed**. **2018**: No new information presented.

FUTURE PRIORITIES (OPTIONAL)			
No.	**Panel recommendations**	**Proponent response/comments**	***Scientific Committee Comment/timeline***
2	The Panel **recommends** that any Special Permit programme should include a specific Primary Objective to continually review new techniques as these become available to facilitate discussions of methods and samples sizes at milestones such as the mid-term reviews. *If* present data do not allow for this, a focussed pilot study to enable a full and proper evaluation of lethal vs present non-lethal methods integrated across objectives should be undertaken, prior the full programme starting; where such data already exist then the desktop-study evaluation should be undertaken *before* the permit programme begins. Such evaluations could be undertaken in light of an expanded framework as recommended under Item 3.3.4 and must be properly designed to enable more effective reviews of sample sizes/methods during mid-term reviews.	Not Applicable.	**2017**: Not considered in the new proposal. **2018**: **No progress**.
9	Research item (iii) relates to novel compound exposure and indicates that the levels of polybrominated diphenyl ethers (PBDEs) and other flame retardants would be quantified in blubber, prey and marine debris (presumably micro- and macro-plastics found in whale stomachs). However, there is no indication of how these results would be related to 'adverse effects' as stated in the objective. The Panel therefore **recommends** an integration and combined analysis of the results obtained by all three research items (i.e. relating exposure to polychlorinated biphenyls, flame retardants and novel compounds from plastics to responses) such as immune function and enzyme induction, including controlling for any effects of age (emphasizing the need to use the age estimates obtained from the earplugs rather than body length) and nutritional condition. This would require samples from the same individuals to be included in each of the three research items.	Completed. See section on "Laboratory and analytical work" in SC/67a/SCSP10, Annex 18 (p.133) and the final research plan Annex 18 (p.176-178).	**2017**: This recommendation has been **partially addressed** as partially reflected in SC/67a/SCSP10; additional details are needed. **2018**: **No progress**.
14	The Panel **recommends** the implementation of biopsy sampling to reduce the lethal sample size as soon as it is deemed feasible rather than wait until the mid-term review.	Disagree with Panel. See SC/67a/SCSP10, Fig 2 "Use and evaluation of new non-lethal techniques (field and analytical) on common minke whales in NEWREP-NP" (p.27).	**2017**: No progress. **2018**: **No progress**.
16	The Panel **recommends** the proponents attend the IWC-ONR joint Workshop on Tag Development, Follow-Up Studies and Best Practices to be held in September 2017 in Silver Spring, MD (USA) to become acquainted with the most current tagging technologies and deployment methods.	Completed. See section on "satellite tagging" in SC/67a/SC SP10, Annex 9 (p.105-106).	**2017**: **Completed** (SC/67a/SCSP10). **2018**: A Japanese scientist (Dr. Minamikawa) participated in the 2017 Workshop.
18	Once a suitable tag is developed, the Panel **recommends** tagging North Pacific common minke whales within the study area to address stock structuring within the NEWREP-NP study region. Again, tag deployment location and tag design should be tailored to the question being addressed.	Ongoing. See SC/67a/SCSP10, (p. 105 for minke whale) and the final research plan (p.108).	**2017**: The proponents provided a few details in SC/67a/SCSP10. **2018**: No new information presented.
19	The Panel **recommends** using the extensive amount of data in age-related methylation in mammal model species (e.g. humans) where thousands of CpG sites have been identified in which the level of methylation correlates with age, similar to the approach taken by Polanowski *et al.* (2014) who assessed 37 CpG sites originally identified in humans. Once putative aging CpG sites have been identified among the candidate CpG sites observed in humans, a more targeted approach may be developed by identifying the homologous loci in the minke whale genome, thereby presumably increasing the precision of methylation-based aging in North Pacific minke whales. This work should be undertaken in the context of whether the technique shows a suitable level of precision for meeting conservation and management objectives requiring age data, not whether it achieves a comparable level of precision to ear plug readings.	Ongoing. Agree partially with Panel (see SC/67a/SC SP01, p. 16). Will be considered when the feasibility study on Antarctic minke whale is completed. Results of the feasibility study for Antarctic minke whales was presented in SC/67b/SDDNA04 and authors concluded precision insufficient for use in SCAA.	**2017**: No new information has been presented, but this recommendation is highly relevant in the context of age determination by non-lethal methods. **2018**: **Partially addressed**. SC/67b/SDDNA04 applied the epigenetic aging technique to the Antarctic minke whales, closely related to common minke whales. Issues of general feasibility can be derived from this paper. Further loci need to be evaluated to improve resolution.
20	The Panel **recommends** that the similar data/results from the Icelandic sampling programme are incorporated in the analyses. The Panel **reiterates** that non-lethal techniques should be incorporated into the programme as soon as they are deemed plausible.	Completed. SC/67a/SCSP10, Fig 2 "Use and evaluation of new non-lethal techniques (field and analytical) on common minke and sei whales in NEWREPNP" (p.27) and the final research plan (p. 25).	**2017**: This recommendation has been **partially addressed**. Reflected in SC/67a/SCSP10.
26	The Panel **recommends** that the proponents collaborate with wildlife immunologists and immunotoxicologists to assist them as optimising, validating and interpreting the results from any immune assays requires specialist skill and knowledge; it is **not** a trivial undertaking.	Completed. See section on "Expected outcomes and future plan" in SC/67a/SCSP10, Annex 18 (p.133) and the final research plan Annex 18 (p.176-178).	**2017**: Collaboration with specialists has begun and thus this recommendation has been **partially addressed (ongoing)**, as reflected in SC/67a/SCSP10. **2018**: No new information presented.