Report from the group of independent scientists requested to review the proposal from Japanese scientists for catch limits for Japanese commercial whaling

Japan has announced its withdrawal from the International Convention for the regulation of Whaling (ICRW), which comes into effect on 30 June 2019. Japan has also announced the start of commercial whaling from July 2019 within Japan's Exclusive Economic Zone (EEZ). The Japanese government has indicated that the catch limits for this whaling would be in line with the RMP.

Japanese scientists have developed a detailed proposal for such management procedures with a tuning level of 0.60, and with associated current catch limits computations, for the commercial catch of sei whales, Bryde's whales and minke whales in these waters (JRT, 2019).

The following Panel of scientists external to and independent of Japan were asked to comment on this proposal:

Lars Walløe, University of Oslo, Norway (Chair)
Doug Butterworth, University of Cape Town, South Africa
Samba Diallo, Centre National des Sciences Halieutiques de Boussoura, Conakry, Guinea
Bjarki Elvarsson, Marine and Freshwater Research Institute, Reykjavik, Iceland
Thomas Nelson, Department of Fisheries, Castries, Saint Lucia
Ralph Tiedemann, Universität Potsdam, Germany (remote part-time participation)

The Panel's specific mandate was to review:

- the technical aspects of the work conducted by Japanese scientists on the calculation of catch limits for North Pacific sei, Bryde's and common minke whales along the lines of the International Whaling Commission's (IWC's) Revised Management Procedure (RMP);
- the hypotheses on stock structure used to define management areas; and
- the *Implementation Simulation Trials (ISTs)* developed and run to capture uncertainties deemed to be the most important for the stocks involved.

Finally, the Panel was asked to provide technical recommendations on how to improve these catch limit calculations and *ISTs* in the future.

The members of the Panel received the Japanese proposal on 11 June 2019, and met in Tokyo for a three-day meeting 18-20 June 2019. Tiedemann participated in parts of the meeting remotely using Skype. The report was agreed by all participants on Thursday 20 June 2019.

SEI WHALES

Genetic analyses on the stock structure of North Pacific sei whales have been conducted based on the data set of the Institute of Cetacean Research. Genetic samples are from past commercial whaling, IWC-POWER surveys and JARPNII surveys. Different genetic analyses conducted on both the mitochondrial DNA and microsatellite DNA were consistent with genetic homogeneity among temporal and spatial strata, consequently suggesting that the pelagic area of the North Pacific is occupied by a single stock. JARPNII sighting surveys were conducted in many years during the period from 2008 to 2011, and IWC-POWER sighting surveys were conducted in the years 2010 to 2012. The catch history of sei whales is well known. Japanese scientists treated the total area in the North Pacific covered by the sighting surveys as one *Small Area*, and calculated the annual catch limit 174 sei whales (after adjusting for sex ratio in the standard manner).

The Panel had two comments to this calculation. First, the number of genetic samples from the western part of the total area is limited, which makes the conclusion of one genetic stock across the total North Pacific somewhat uncertain. Secondly, the IWC Scientific Committee (SC) has had to consider a similar situation for minke whales in the North Atlantic. During the last *Implementation Review* of minke whales in the North Atlantic (IWC, 2015), no genetic differences amongst the extensively sampled minke whales across the North Atlantic from the Barents Sea in the east to the Davis Strait in the west could be detected. Nevertheless, the IWC SC decided not to regard the total North Atlantic as one management area, but instead kept the division in an eastern, a central and a western management area. The Panel suggests that Japan uses a similar precautionary approach for sei whales in the North Pacific, and at this time calculates catch limits for its commercial whaling only for abundance estimates and catch history west of 170°E. There are also other arguments for the choice of this specific restriction. There are a number of mark-recaptures within this region, showing that the sei whales in this region move around freely, and the boundary corresponds to that between the JARPNII and the POWER surveys. Figure 1 shows the available mark-recapture information, from which this free movement conclusion is readily justified visually; while a case might be made to move this boundary further to the east, the placement of such a revised boundary would not be straightforward, and would require more detailed computations for adequate justification. At the time this report was written, the distribution of historical catches east and west of 170°E was not available. Until those data become available, the Panel suggests that the annual catch limit is calculated pro rata to the survey abundance estimate for the whole North Pacific, viz.: 174 x 5086/34718 = 25 sei whales per year.

According to the plans advised by the Government of Japan, these 25 sei whales will be taken within the EEZ of Japan, which covers only approximately 15 % of the JARPNII survey area for which the abundance estimate 5086 applies. It is not obvious that to take all whales from a small fraction of the total area is without problems, as this could lead to local depletion. However, the movements of sei whales in this area are widespread (Figure 1), so that it is considered safe to concentrate the catches within the EEZ.

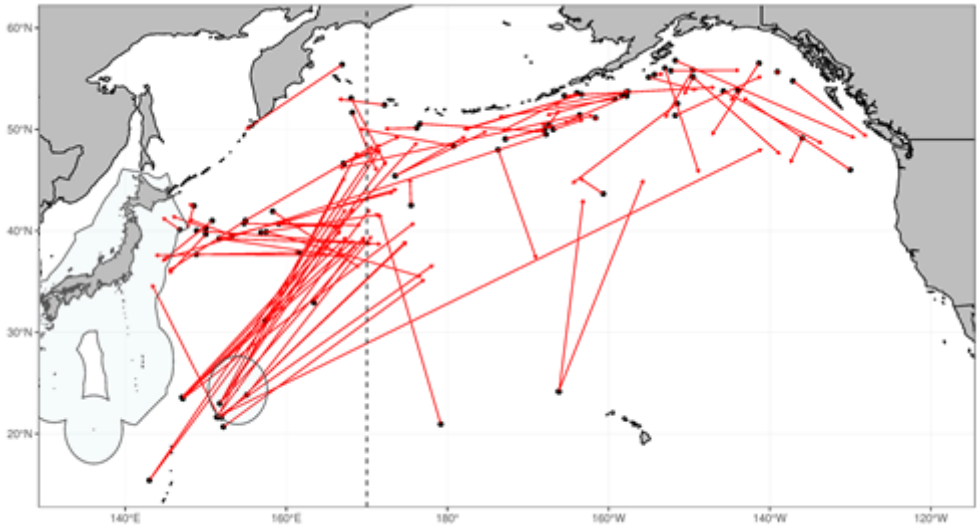

Figure 1: Mark - recaptures for sei whales in the Northern Pacific Ocean. The figure shows the position of marking (black point) and the recapture (red arrow). The dashed vertical line indicates 170°E and the thin black lines around Japan illustrate the Japanese EEZ.

For the future it is suggested that:

1) This catch limit calculation be implemented by application of the CLA to the area east of 170°E.

2) Further movement analysis be conducted including mark-recapture data to the west of 170°E; should these analyses indicate sufficiently rapid mixing of these sei whales with those in the Japanese EEZ, some eastward extension the 170°E boundary used for this catch limit computation should be considered.

The initial calculations by Japanese scientists made clear that there is the potential for a catch limit of 174 sei whales annually if taken throughout the North Pacific area. To increase the annual catch limit of 25 sei whales suggested above towards this level, some combination of the analysis suggested in 2) above and extension of catches substantially beyond Japan's EEZ would be necessary.

BRYDE'S WHALES

Information on the stock structure of Bryde's whales in the Western North Pacific originates mainly from samples gathered during sighting surveys, the JARPNII and IWC-POWER surveys, as well as commercial catches that preceded the moratorium and bycatch. The genetic analysis of these samples conducted by the Japanese scientists suggests that there is significant heterogeneity between subareas 1W and 2. Subarea 1E appears, however, to be intermediate in genetic terms, suggesting that it may be a mixing area for the two stocks. Mark recapture studies, conducted by Japan and the Soviet Union, do not suggest any additional stock structure and are considered compatible with the results of the genetic analysis.

The RMP *Implementation Review* for Bryde's whales in the North Pacific was completed the 2019 IWC SC meeting (IWC 2019, Annex D). The evaluation of the stock management simulations, comparing two management variants, was conducted based on 0.72 tuning, the results of which are shown in (IWC, 2019 Annex D). Before this meeting, the full management projections conducted by the IWC SC were rerun based on a 0.60 tuning level for the CLA and compared with equivalent single stock trials with tuning levels of 0.60 and 0.48. The procedure of assigning acceptability follows a slightly modified procedure to that used by the IWC (as described below in the section on minke whales).

The management variants tested were:

* Variant 1: Area 1 is a *Small Area*, all catch is taken in 1W
* Variant 2: Area 1 is a *Combination Area*, catch is taken only in 1W.

A list of the trials and their weighting can be found in Table 9 of (JRT, 2019).

The results from these trials were consistent with what was previously reported in Annex D of IWC (2019). Both management variants where deemed acceptable, with variant 1 having the best catch related performance.

Based on the simulation trials the proposed catch limit is calculated based on the available catch series and abundance estimates. For Bryde's whales estimates of abundance are available for three years, 1995, 2000 and 2011, and the catch series from 1906. The resultant proposed catch limit is 187 whales in subarea 1W. The Panel considered these computations appropriate and acceptable.

The Panel noted that while management variant tested corresponded to taking catches throughout the 1W subarea, the whaling operations are planned to take place within the Japanese EEZ. While this may not have detrimental effect on the stock, it may lead to issues related to local depletion of Bryde's whales within the EEZ. However, as the data on mark recapture (see Figure 2) suggest, this is probably not a concern in the short to medium term as, while 50 % of markings recaptured originated outside of the EEZ, 75% of all recaptures occurred within the EEZ.

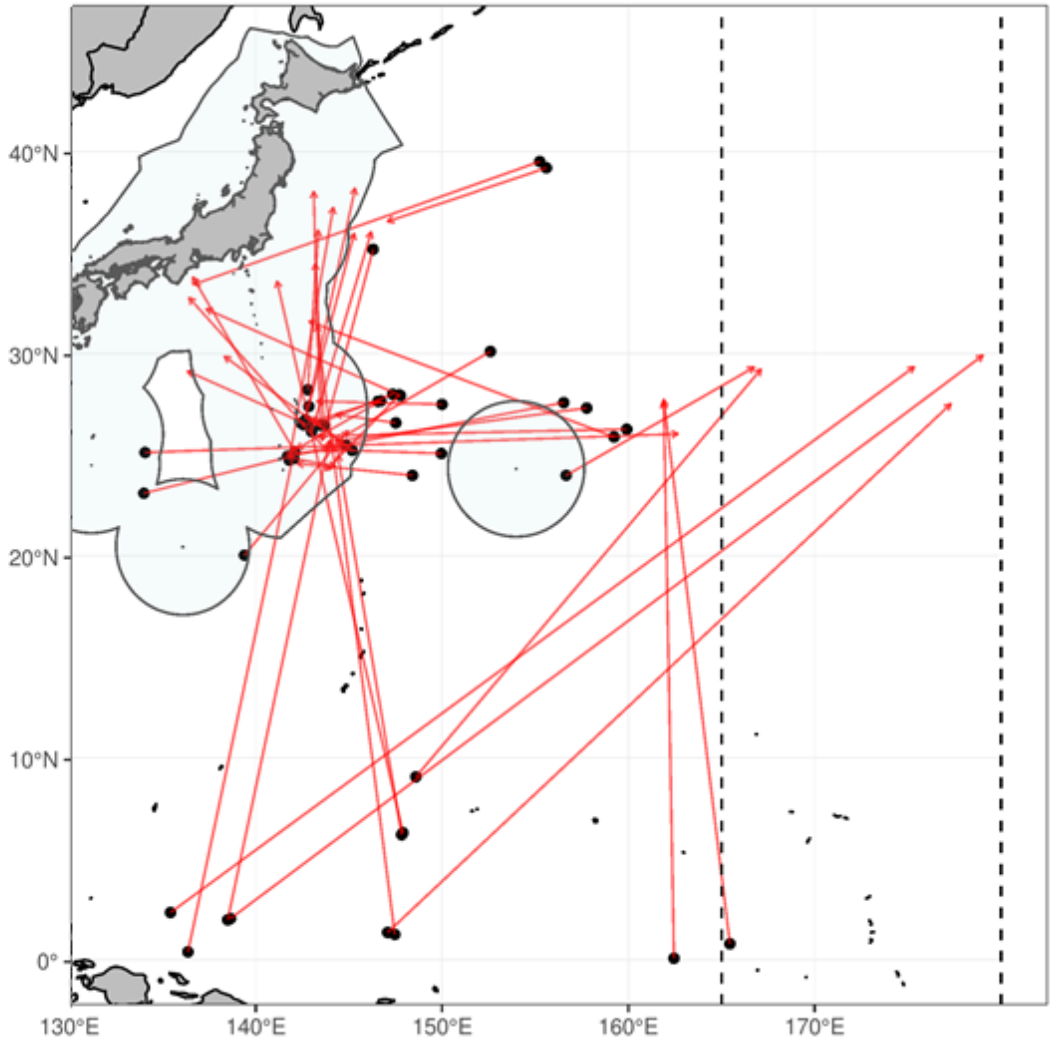

Figure 2 Mark - recaptures for Bryde's whales in the Northern Pacific Ocean. The figure shows the position of marking (black point) and the recapture (red arrow). The dashed vertical line indicate 165°E and 180°E respectively and the thin black lines around Japan illustrate the Japanese EEZ. Note that 165°E is the boundary between subareas 1W and 1E.

A further similar potential concern arises because the catch limit calculation is based on treating subareas 1W and 1E as a single *Small Area*, but the catch is proposed to be taken from 1W , leading to the question of whether there is sufficient mixing between 1W and 1E to avoid the possibility of local depletion. Marks have been placed almost exclusively in 1W only, with only 5 of 48 recoveries being from 1E. However, when account is taken of the fact that about 90% of the catch has been taken from 1W compared to only some 10% in 1E, this is compatible with scenario of whales being roughly as likely to move from the one region to the other as to stay within one. Hence the movement rate between these two regions would seem to be sufficiently high that local depletion would not be a concern in this case.

Future work
Further movement analyses should be conducted, similar to what is suggested above for sei whales.

MINKE WHALES

Abundance estimates
The abundance estimates used for the catch limit computations are appropriate, having been accepted in the IWC SC review process for use for such purposes. A concern, however, is that the value of the NP minke whale catch limit calculated is heavily dependent on abundance estimates for the Okhotsk Sea, with the most recent of these being from a survey carried out in 2003. A new survey is planned for this area in 2020. The catch limit calculation should be updated as soon as the new abundance estimate for this area becomes available, and a revised catch limit should then be set. Should there be delays in the provision of this updated abundance estimate, modification of the catch limit to be set for 2019 and 2020 would need consideration for the years that follow.

Basis to set catch limit
The basis for setting the catch limit differs from that considered previously in the IWC SC in two important respects.

1) A 60% rather than a 72% tuning of the CLA is being used.
2) The whole area to the north and east of Japan, including the Okhotsk Sea, is being treated as a *Small Area*, with catches being restricted to the eastern and northern coastal area of Japan (subareas 7CS, 7CN and 11).

This required the running of further *ISTs* to test variants of management procedures in line with the RMP and its testing procedures (in Table 21 of JRT, 2019) based on 2). It was noted that for the standard IWC process for determining adequate performance amongst such variants, the CLA tuning pertinent to the trials assigned medium plausibility had been taken to be 48% (being 12% below the 60% CLA tuning selected, similar to the process used when 72% is the selected CLA tuning). This process was considered to have been carried out appropriately.

Having considered the results from these trials (in Table 25 of JRT, 2019), the V2011 variant (see Table 24 of JRT, 2019) was both considered acceptable and noted to be preferred by Japan amongst the set of acceptable variants.

The details of V2011 are as follows:
2= Abundance for O stock as defined by option S2 (Table 15 of JRT, 2019)
0= Closure to commercial operations within 10n. miles of the coast (Table 24 of JRT, 2019)
1= No temporal restriction (Table 24 of JRT, 2019)
1= Catch limit allocation Opt. 1 (Table 23 of JRT, 2019).

The Panel recommended adoption of the S2 option (Table 15 of JRT, 2019) for the proportion of O stock animals assumed in the abundance estimates for northern subareas because this yielded the highest catch amongst those option categorised as Acceptable for a MSYR(1+) value of 1%. This yields a catch limit of 171 (after allowance for bycatch) which was split as follows in the *ISTs* (though these also indicate that allowing for some flexibility in this split would not be problematic): 7CS: 69, 7CN: 34, 7WR: 34 and 11: 34 (Table 23 of JRT, 2019).

Implications of stock structure uncertainty

The results above assume the presence of only two stocks close to Japan: the J- and the O-stock. In discussions in the IWC Scientific Committee, the possible presence of a further coastal stock (the putative "Purple" (P) stock) has been raised on the basis of certain genetic analyses.

The Panel noted that the data on conception dates for J and O stocks (Taguchi et al. 2019) are compatible with the possibility of inter-breeding between them (which could lead to animals assigned to a separate population, i.e., the putative P stock, by some analyses). The Panel also noted that, aside from fluctuations to be expected in instances where the number of samples was very low, the haplotype frequency data for the putative P stock whales was compatible with these being the products of such inter-breeding. It had been noted on the last IWC SC meeting that any putative P stock – if it exists – could not be reproductively independent, but would receive migrants (i.e., gene flow) from both the J and the O stock.

The Panel reached the view that the genetic data reconcile well with the scenario of the putative P stock being a manifestation of inter-breeding between J and O stock whales.

The Panel also noted the proposal was to restrict catches of minke whales to outside of 10nm from the coast to reduce potential (though relatively small) catches of J stock whales, so as to take account of the possibility that this population might be appreciably depleted. Calculations based on the genetic assignment information of J and O stocks in 7CS and 7CN (total number of whales assigned = 1,683), indicate that by restricting the catches to outside of 10nm, the take of J stock animals will be reduced by about 25% (Appendix 1 of Annex 7 in GOJ, 2017). Given that, and the interpretation of the putative P stock not constituting a demographically independent population, but presumably being a manifestation of J and O stock interbreeding, the Panel considered that any residual stock structure uncertainties were not sufficient to raise concerns about the catch limit being proposed.

Future work

- Coming work in further IWC SC meetings on the in depth assessment of NP minke whales should be taken into account in future assessments of the implications, if any, of the existence of the hypothesised P stock for these catch limit calculations.
- The distribution of putative P stock animals should be investigated to check what proportion might be within the 10 nm from the coast within which commercial catches will be prohibited.
- More detailed analyses should be carried out to confirm whether the haplotype information is indeed fully compatible with the P stock animals being entirely a manifestation of J and O stock inter-breeding.
- Further work on the time trends in J and O stock animals in bycatches should be pursued to refine bounds on possible values for MSYR.

REFERENCES

Government of Japan. 2017. Proposed Research Plan for New Scientific Whale Research Program in the western North Pacific (NEWREP-NP). Paper SC/J17/JR01 presented to the Expert Panel Workshop on the Proposed Research Plan for New Scientific Research Program in the western North Pacific (NEWREP-NP), January 2017 (unpublished). 162pp.

International Whaling Commission. 2015. Report of the Sub-Committee on the Revised Management Procedure. *J. Cetacean Res. Manage.* 16 (*suppl*.): 100-143.

International Whaling Commission. 2019. Report of the Sub-Committee on Implementation Reviews and Simulations Trials (IST). *J. Cetacean Res. Manage.* 21 (in press).

Japan's RMP Team. 2019. Catch limits for western North Pacific sei, Bryde's and common minke whales calculated in line with the Revised Management Procedure (RMP). Paper presented to the workshop to review the results of the Japan's catch limits calculation for North Pacific baleen whales, June 2019 (unpublished). 55pp.

Taguchi, M., Goto, M. and Pastene, L.A. 2019. Genetic and non-genetic evidences suggest a low plausibility for western North Pacific common minke whale stock structure Hypothesis E. Paper SC/68A/SDDNA/02 presented to the IWC Scientific Committee. May 2019 (unpublished). 22pp.