REPORT OF A PANEL APPOINTED TO REVIEW A PROPOSED REVISION OF THE CATCH LIMIT FOR WESTERN NORTH PACIFIC COMMON MINKE WHALES

EXECUTIVE SUMMARY

The Panel reviewed the document tabled on the proposed revision of the annual catch limit for western north Pacific common minke whales. It found that the proposed catch limit of 167 minke whales, together with two spatial restrictions on the catches, were in line with the provisions of the RMP and hence acceptable on that basis. Recommendations are made for some issues to be kept under review as more data and analyses become available in the future.

Introduction

The Panel was appointed to review a proposed revision of this catch limit as set out in a document entitled: "Revision of the catch limit for western North Pacific common minke whales calculated in line with the Revised Management Procedure (RMP)" which was authored by Japan's RMP Team (JRT, 2021). The Panel met on 6-8 December, 2021, to hear and discuss presentations by the JRT related to this document, and then in wrap up sessions on 10 and 16 December.

The following scientists were members of the Panel:
Lars Walloe, University of Oslo, Norway (Chair)
Doug Butterworth, University of Cape Town, South Africa
Samba Diallo, Centre National des Science Halieutiques de Boussoura, Conakry, Guinea
Bjarki Elvarsson, Marine and Freshwater Research Institute, Reykjavik, Iceland
Thomas Nelson, Department of Fisheries, Castries, Saint Lucia
Ralph Tiedemann, University of Potsdam, Germany

According to JRT (2021), the catch limit update was carried out in response to the following recommendation from the Panel in 2019: "the value of the NP minke whale catch limit calculated is heavily dependent on abundance for the Okhotsk Sea, with the most recent of these being from a survey carried out in 2003" and that "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" (Review Panel, 2019).

The agenda for the review meeting is found in Annex 1. Agenda item 3.5 was discussed by the Panel only in closed sessions.

The document JRT (2021) puts forward an annual catch limit of 167 to be taken from sub-areas 7CS, 7CN, 7WR and 11, with 80% of this catch to be taken in any part of subareas 7CS, 7CN, and 7WR and 20% to be taken from sub-area 11. There is to be a spatial closure to a distance of 10 n. miles from the coast on the east side of Japan. The average number of minke whales by-caught in set nets over the most recent five years is to be deducted from this catch limit. This revised catch limit is proposed to commence in 2022, and a review is tentatively scheduled for 2028.

RMP-based calculations of catch limits require inputs of past catches and by-catches, as well as abundance estimates from sighting surveys. These were set out in the document and its Annexes. Furthermore, a variant of the RMP (for which a tuning level of 0.6 was used) had to be selected based on performance in simulation trials. The variants considered and the trials conducted were set out in the document, together with the results of their application.

Review

The Panel reviewed the inputs being used for the application of the RMP – past catches and by-catches, and as well as abundance estimates (with their CVs) from surveys, which for RMP calculation purposes are restricted to those held in the months of August and September (to avoid possible double-counting of whales on migration routes) – and found these to be in line with RMP requirements.

The Panel then reviewed the simulation trials developed to test the variants of the RMP considered. These were necessary to examine, in particular, the potential impact of catches on the J stock (predominantly in the Sea of Japan, but extending to other regions close to Japan), which is more depleted than the O stock (predominantly to the north and east of Japan) which is well above its MSYL level. This impact on the J stock can arise for two reasons: abundance estimates from surveys to the north and east of Japan which include some J stock whales, and from catches close to the north and east coasts of Japan where the proportion of J relative to O stock whales is appreciably higher than further offshore. This testing process allows for checking the impacts of alternative spatial allocation of catches.

The Panel found that the trials developed were sufficient for the purpose which they intended, and further that their results had been correctly interpreted under the RMP provisions for establishing the acceptability or otherwise of different RMP variants. Important outcomes from this process were that:

- Despite some J stock animals being amongst those included in the survey estimates of abundance input to the RMP, other safeguards of the process were such that the resultant catch limit of 167 was acceptable.
- The restriction of catches to more than 10 n. miles from the east coast of Japan was essential to avoid unacceptable performance in the trials in respect of conservation of the J stock.
- The restriction of no more than 20% of the catch to be taken from sub-area 11 was similarly essential to avoid unacceptable performance in the trials in respect of conservation of the J stock.

Accordingly, the Panel found that the proposed annual catch limit of 167 minke whales, together with these two spatial restrictions on the catches, were in line with the provisions of the RMP and hence acceptable on that basis.

Related comments

The simulation trials conducted assumed the presence of only two stocks of minke whales in the seas around Japan: the O and the J stocks. At present there is no strong evidence for more than two stocks in this region. However, this aspect should be kept under review as further data and analyses may become available, so that earlier review of the catch limit (than in 2028) could take place if necessary. Furthermore, the stock composition of the whales taken should continue to be monitored to check that the proportion of J whales in the catch remains within the low range intended.

A potential concern is that in the regions close to Japan where catches have taken place over about the last decade, the series of three abundance estimates for each from the August-September period which are input to the catch limit computations of the RMP's CLA indicate a decline over time. This was examined closely by the Panel, which did not find it a matter of any immediate concern for two reasons:

- Trends in the greater number of estimates of abundance from surveys available for earlier periods of the year did not show declines which were statistically significant at the 5% level.
- There was evidence of a recent offshore shift of fishing operations for fish species eaten by minke whales, which is suggestive of a similar distributional shift of the whales.

The Panel does, however, recommend that these two aspects be kept under review as time progresses and further data become available. In that context the Panel notes that some of the surveys constitute only limited coverage of the sub-area concerned. This results in negatively biased inputs to the CLA computations, and also confounds inferences about trends over time. Under the RMP, the use of GLM approaches, for example, to "fill holes" in the spatial coverage of surveys by assuming unchanged spatial distribution patterns within a sub-area is acceptable. The Panel suggests that the use of such approaches should be investigated further.

Details of the presentations and discussions on relevant agenda items are presented in Annex 2.

References

Japan RMP Team. 2021. Revision of the catch limit for western North Pacific common minke whales calculated in line with the Revised Management Procedure (RMP). Document presented to the Review Panel workshop, 6-8 December, unpublished (64p).

Review Panel. 2019. Report of the group of independent scientists requested to review the proposal from Japanese scientists for catch limits for Japanese commercial whaling. https://www.jfa.maff.go.jp.

Annex 1

Agenda

1 Introductory items
1.1 Proponent's welcome and opening remarks
1.2 Appointment of chair and rapporteurs
1.3 Objectives of the review workshop
1.4 Workshop procedures and time schedule
1.5 Logistic arrangements
2 Review of available documents and reports
3 Update of catch limit calculation for North Pacific common minke whale
3.1 Overview
3.2 Review of the information on new abundance estimate
3.3 Calculation of catch limit by the CLA
3.4 Results of trials
3.5 Discussion, conclusions and recommendations (closed sessions)
4 Others

Annex 2
Summary of presentations and resultant discussions

Monday 6 December

Agenda Item 3.1 Overview

An overview of the process followed by Japan for updating the catch limit for sustainable commercial whaling of western North Pacific common minke whales was presented. The overview included the background, objectives, methodology and the main results, which are described in detail in the document 'Revision of the catch limit for western North Pacific common minke whales calculated in line with the Revised Management Procedure (RMP)' prepared by the Japan's RMP Team and presented for the consideration of the Review Panel. In response to the Review Panel's recommendation at the previous review meeting in 2019, the update of the calculations of the catch limit was based on the new abundance estimates obtained from sighting surveys in the Okhotsk Sea (sub-area 12NE), coastal waters around Japan and the western North Pacific up to 2020. Relevant data on removals and previous abundance estimates were updated following communications with the IWC Secretariat. Hence, these data are the same as those used by the IWC Scientific Committee in its *in-depth assessment* of western North Pacific common minke whales. The definitions of management areas were based on stock structure hypothesis A (two stocks, J and O), the same as for the 2019 process. Furthermore, the CLA code, management variants and scenarios for evaluating uncertainties had not been changed from the previous process in 2019. After the evaluations of different sources of uncertainties through the *Implementation Simulation Trials*, the conclusion reached was that a revised annual catch limit of 167 whales under specified spatial constraints represented no threat to the stocks involved. Sighting surveys for abundance estimates and biological analyses of samples obtained during commercial whaling operations have been and will be continued, and results will be presented at the full assessment for updating the catch limit for western North Pacific common minke whales planned tentatively for six years hence.

Discussion

Questions were raised of what had led to the Japan team choosing the S(0) option over the others for the input of abundance estimates to the catch limit calculations, and were there any reasons for non-selection of one of the other options? This S(0) option includes J stock whales in the abundance estimates. In response, the Japan team explained that this option provided acceptable performance under the *ISTs* while giving the largest catch. The Japan team also clarified how the S(1) and S(2) options operated.

The Japan team explained that the most recent version of their document included changes to some abundance estimates, so that these corresponded to recent updates developed by the IWC Secretariat. Consequently, there had also been some minor changes to the results of the catch limit calculations.

Summary Agenda Item 3.2 Annex 1 of JRT (2021)

The abundance of common minke whales in sub-area 12NE was estimated from the sighting data collected by the Russia-Japan cooperative sighting surveys which took place from 2015 to 2020. The sighting survey and analytical procedures followed the guidelines of the IWC Scientific Committee (SC), and the surveys were conducted under the oversight of the SC. The

smearing method was applied to reduce the effect of rounding error in angle estimation in some years on the fit of the detection model. The perpendicular distance was truncated at 0.8 n. miles and the covariates considered in the fit were wind force and visibility. The hazard rate model including visibility provided the best fitted model as selected by AIC, and the resultant abundance estimate was 15,621 (CV: 0.419, 95% CI: 7,106 – 34,340). The survey coverage was 89% in sub-area 12NE. The year 2018 can be considered as the time stamp for this estimate, based on the mean weighted by survey searching distance. The abundance estimate from this study was used in the revision of the minke whale catch limit calculation.

Discussion

Comments made included that the difficulties experienced in sighting minke whales at large distances are similar to those found for minke whales in Northeast Atlantic surveys.

On the Russian vessel, the sighting effort from the upper bridge is less than from Japanese vessels. For this and other reasons, these abundance estimates are likely to be more uncertain, and with a downward bias, compared to those derived from sighting data from Japanese vessels.

A suggestion made was that the provision of a Table listing all the minke whale abundance estimates and CVs from the surveys in August-September which are to be used as input to the CLA would be helpful; this should include the percentage coverage of the sub-area concerned and the value for g(0) used for each abundance calculation. This table is included at the end of this Annex (Table 1).

In answer to a question, explanation was provided that smearing is important to avoid sightings recorded as at 0 degrees from the track-line resulting in a spurious peak at the origin in the distribution of perpendicular distances, and hence biasing abundance estimates upward. However, the contribution of smearing to the variance of the final abundance estimate is likely to be small compared to contributions from other factors such as the inter-transect sighting rate variability.

Summary for Agenda item 3.2 Annex 2 of JRT (2021)

New abundance estimates for western North Pacific common minke whales in sub-areas around Japan were made based on the data obtained from dedicated sighting surveys conducted in spring (May-June) 2018 and 2019 and summer (July-September) 2020. These were calculated by the standard distance sampling methodology and followed the guidelines adopted by the IWC SC; the estimates were made under the assumption of g(0)=1. In the Sea of Japan, the abundance estimates in sub-areas 10E and 6E were 805 (CV=0.502) for spring 2018 and 2,389 (CV=0.392) for spring 2019. In the southern part of the Okhotsk Sea (sub-area 11), the abundance estimate was 306 (CV=0.505) for spring 2018. On the Pacific side of Japan, the abundance estimates in sub-areas 7CN and 7CS were 103 (CV=0.739) and 159 (CV=0.766), respectively, for spring 2018. The abundance estimate in sub-area 7WR was 77 (CV=1.017) for spring 2019. The abundance estimates in sub-areas 7CN and 9 were 219 (CV=0.671) and 642 (CV=0.703), respectively, for summer 2020. Only the abundance estimates for different sub-areas in summer 2020 (with that for sub-area 12NE making the main contribution) were used for the RMP catch limit calculation. All the estimates from this study were used to condition the population models used for the *Implementation Simulation Trials*.

Discussion
These most recent estimates were noted to be low compared to previous estimates. There was a need to consider this further by checking the abundance estimates from other months of the year.

Zero abundance estimates for sub-area 7CS (due to lack of sightings) are not a problem for the CLA computations, as these are implemented at a larger spatial scale for which zero estimates do not occur following combinations across sub-areas.
The input to the CLA includes both the point estimate and the CV from a survey, so that the "quality" of the survey is taken into account.

Summary of presentation for Agenda items 3.3 and 3.4 - Results of CLA and IST and Annex 3 of JRT (2021)
Revised catch limits for western North Pacific minke whales were calculated in line with the provisions for the IWC's RMP, based on the Norwegian Catch Limit Algorithm (CLA) computer code and for a tuning level of 0.6. As in the 2019 implementation, a single management area was defined on the Pacific side of Japan together with the Okhotsk Sea, and consisting of four sub-area aggregations (A: 7CS and 7CN, B: 7WR, 7E, 8 and 9, C: 11, D 12SW and 12NE). The calculations made were based on new abundance estimates for sub-area 12NE and the sub-areas around Japan. Other relevant data used in the calculation were updated removal data, e.g., catch history and by-catches, and revised historical abundance data. Both removal data and previous abundance data were updated and revised in consultation with the IWC Secretariat. Five levels of abundance of the O stock in these sub-area aggregations were considered. Option S0 treated all whales in each sub-area aggregation to be from the O stock. Options S1-4 were more conservative, assuming lower proportions of the O stock in these aggregations. The catch limits were calculated as 167, 150, 154, 135 and 110 for options S0, S1, S2, S3 and S4, respectively.

Implementation Simulation Trials (*ISTs*) were conducted to assess the acceptability of the following variants: combinations of five options for O stock proportions in each sub-area aggregation; spatial closure within 10 n. miles of the coast in sub-areas 7CS and 7CN; and temporal restriction and catch allocation options in sub-areas 7CS, 7CN, 7WR and 11. In addition, uncertainty to the following factors was evaluated: historical catch, the g(0) value used and the mixing proportion of the J stock in sub-areas 12SW and 12NE. The following steps of the RMP process were followed in in developing and interpreting the results from the *ISTs*: conditioning the trials, evaluation of equivalent single stock trials (ESST) and decisions regarding acceptability. The results of the *ISTs* indicated that the following scenario is acceptable from the conservation point of view: Option S0, closure within 10 n. miles of the coast on the east side of Japan, and 20% of the catch limit allocated to sub-area 11 with 80% allocated to sub-areas 7CS, 7CN and 7WR. From this it followed that a catch limit of 167 whales should be considered acceptable.

Discussion
It was noted that there are large abundance estimates for sub-area aggregation D, and these dominate the total abundance estimates. However, most catches have been taken in aggregations A and C. Abundance estimates for these regions decrease over the years, which could indicate problems. Inspection of similar summaries of abundance estimates for surveys during earlier months of the year was therefore suggested.

An explanation was given that the sequence from S0 to S4 considers successively more J-stock whales in the sub-areas. The reason why S0 (with no J stock whales) can nevertheless be used for catch limit calculations is that the RMP variant proposed contains other conservative measures which prevent the take of too many J-stock whales.

Panel members commented that the *IST*-calculations and conclusions are very complicated and consequently difficult to follow. These might be made more easily understandable if one or two cases (one with acceptable as a conclusion and one with unacceptable) were explained in detail step by step.

Tuesday 7 December
Survey results from earlier months in the year
Additional abundance estimates that had not been used for CLA calculations were presented for the aggregated sub-areas A (sub-areas 7CN and 7CS) and C (sub-area 11). Clarification was provided that the basic abundance estimates reported applied only to the areas covered by the surveys concerned, so need adjustment if to be taken (as below) to apply to a full sub-area for trend estimation. For sub-area aggregation A, data obtained in May-July were available for five years (2003, 2006, 2012, 2017 and 2018). The annual trend from log-linear regressions does not differ significantly from zero at the 5% level; 95% CIs are: -27% to +8%. For sub-area aggregation C, data obtained in May-June were available for 2018 only. Data obtained in August were available for five years (1990, 1999, 2003, 2007 and 2014). The annual trend from a log-linear regression does not differ significantly from zero at the 5% level; 95% CIs are: -10% to +4%.

CPUE trends
The yearly trend of the CPUE (catch per vessel day) in sub-area 7CN (one of the sub-areas constituting sub-area aggregation A) from 2002 to 2018 was examined tentatively. The annual trend from log-linear regression did not differ significantly from zero at the 5% level; the 95% CI is: -7% to +4 %.

Discussion
The Panel considered that this trend estimate should not be over-interpreted quantitatively; however, it might be valuable in a qualitative sense by indicating compatibility or otherwise with trends from survey estimates of abundance.

Ecology – sub-area 7CS
The density index of common minke whales (the number of animals found per 100 miles of survey) off Sanriku (Ayukawa) shows indications of some decrease since 2003. It is however considered that this decrease is a result of a change in feeding grounds rather than any reduction of overall abundance. This suppposition is supported by various other observations,

including the recent rise of sea-surface temperature in the region and a change in prey species since 2015 from sand lance to Japanese sardine. The latter is related to the recent appreciable decrease in the fisheries catch in the region. For those reasons, the Sanriku region is no longer a good feeding ground for western North Pacific common minke whales, so that they are likely to have moved to alternative areas for feeding.

Wednesday 8 December

Response to additional queries tabled on Tuesday 7

Distribution of J stock animals taken in sub-areas 7CN and 7CS

The proportions of J stock animals are less in offshore waters, i.e., more than 10 n. miles away from the coastline, than in coastal areas. This is a reason for implementing spatial closures within *10* n. miles of the coast for management.

Treatment of stock mixing in the ISTs

Mixing proportions of J stock in future catches by month in sub-areas 7CS and 7CN are taken to be different between the cases with and without the spatial closure. As expected, the mixing proportions of the J stock are smaller when the spatial closures are introduced in the simulations. In terms of the assumptions in the *ISTs*, spatial closures result on the proportion direct catches in 7CS and 7CN taken from the J stock instead of the O stock dropping by 5%.

Trajectory of the J stock (i.e., how the spatial closure affects the acceptability of an RMP variant)

The trajectory for the J stock can be shown for combinations of trials and management variants. These population trajectories show that the spatial closures do not contribute to an improvement of acceptability for the *Pfinal* criterion. However, they do improve the performance for the *Pmin* criterion substantially. Because acceptability in relation to the J stock requires that only one of these two criteria meet the requisite threshold, these closures do result acceptability of performance for the J stock given the application of spatial closures.

Table 1. List of the abundance estimates assuming g(0)=1 for use in the process for catch limit calculation. Unless otherwise indicated, all abundance estimates shown are divided by the estimate of g(0) =0.798 with SE=0.134 (for top barrel and upper bridge surveys: Okamura et al., 2010) before being input to the CLA.

		Time stamp 1991:						**Time stamp 2003:**						**Time stamp 2018:**					
						sum						sum						sum	
		Year	Est.	CV	Covg.	**Est.**	**CV**	Year	Est.	CV	Covg.	**Est.**	**CV**	Year	Est.	CV	Covg.	**Est.**	**CV**
A	**7CS**	1991	0	-	100	0	0	2004	504	0.291	36.7	504	0.291	2020	0	-	100	0	0
	7CN	1991	853	0.23	75	853	0.23	2003	184	0.805	75.4	184	0.805	2020*	219	0.671	75.4	219	0.671
					Total:	853	0.23				Total:	688	0.303				Total:	219	0.671
B	**7WR**	1991	311	0.23	45.6	311	0.23	2003 2004	267 863	0.7 0.648	26.7 88.8	326.9	0.542	2020	0	-	88.8	0	0
	7E	1990	791	1.848	49.2	791	1.848	2004	440	0.779	57.1	440	0.779	2020	0	-	57.1	0	0
	8	1990	1057	0.706	62.2	1057	0.706	2004	1093	0.576	40.5	0	0.703	2020	0	-	65	0	0
	9	1990	3287	0.819	35.1	3287	0.819	2003	2546	0.276	33.2	2546	0.276	2020*	642	0.703	86.9	642	0.703
					Total:	5446	0.579				Total:	4406	0.231				Total:	642	0.703
C	**11**	1990	2120	0.449	100	2120	0.449	1999 2003	1456 882	0.565 0.82	100 33.9	1132	0.48	2014	306	0.679	35	306	0.679
					Total:	2120	0.449				Total:	1132	0.48				Total:	306	0.679
D	**12SW**	1990	4774	0.508	100	4774	0.508	2003	3401	0.409	100	3401	0.409	-	-	-	-	-	-
	12NE	1990 1992	11805 11051	0.377 0.705	100 89.4	11619	0.333	1999 2003	5088 13067	0.377 0.287	63.8 46	6743	0.253	2018	15621	0.419	89	15621	0.419
					Total:	16393	0.278				Total:	10144	0.217				Total:	15621	0.419

*: The abundance estimates were to be adjusted with g(0)=0.859 with SE = 0.103 (for top barrel, IO platform and upper bridge surveys: Okamura *et al*., 2010).

Reference

Japan RMP Team. 2021. Revision of the catch limit for western North Pacific common minke whales calculated in line with the Revised Management Procedure (RMP). Document presented to the Review Panel workshop, 6-8 December, unpublished (64p).