**SC/65A/Rep04**

# Report of the 'Second' Intersessional Workshop on the *Implementation Review* for Western North Pacific Common Minke Whales[1]

**Contents**



[1] Give the complexities of this particular *Implementation Review*, it has not been possible to keep to the normal 2-year period. This is termed the 'Second' workshop as it is intended to achieve the objectives of the second workshop specified under the requirements and guidelines (IWC, 2012a) even though it is in fact the third workshop.

The Workshop took place at the Southwest Fisheries Science Center, La Jolla, USA, from 19-23 March 2013. The list of participants is given as Annex A.

## 1 INTRODUCTORY ITEMS

### 1.1 Welcoming remarks

Butterworth (Convenor) welcomed participants to the Workshop and thanked the hosts, the National Marine Fisheries Service and particularly Weller for making their facilities available and assisting in the meeting organisation. Weller explained the logistical arrangements for the Workshop.

### 1.2 Election of Chair

Donovan was elected Chair. He reminded the participants that this was primarily a technical workshop whose objectives (IWC, 2005, p.87) were to review the results of work agreed at the 2012 Annual Meeting (IWC, 2013) and consider the results of the final trials using the agreed approach that forms part of the *Implementation* process (IWC, 2012a), and then to develop recommendations for consideration by the full Committee on:

(1) management areas;
(2) RMP variants (e.g. catch-cascading, catch-capping);
(3) suggestions for future research (either within or outside whaling operations) to narrow the range of plausible hypotheses/ eliminate some hypotheses; and
(4) 'less conservative' variants(s) with their associated required research programmes and associated duration.

### 1.3 Appointment of rapporteurs

Allison, Butterworth and Punt served as rapporteurs with the assistance of the Chair.

### 1.4 Adoption of Agenda

The adopted Agenda is given as Annex B.

### 1.5 Review of documents

A list of the documents prepared for the Workshop is given as Annex C.

## 2 PROGRESS SINCE ANNUAL MEETING IN RELATION TO THE WORKPLAN

### 2.1 Updated Trials Specifications

SC/M13/NPM2 was an update of the document specifying the *Implementation Simulation Trials* process as developed at the previous meetings of the Scientific Committee. Since the 2012 meeting, a number of items had required amendment or addition, and these changes required confirmation from the Workshop. The final trial specifications can be found in Annex H.

*Section B: Basic Dynamics*
Given the delay in completing the *ISTs*, the Workshop **agreed** that the first year in which catches would be set by the RMP variants being evaluated would be 2013 rather than 2012, but the actual catches for 2012 will not be used so that there is no need to recondition the trials. The Workshop **agreed** that the scientific permit catches for 2012 would be assumed to equal those for 2011, as this is the assumption on which the conditioning is based.

*Section D: Catches*
The Workshop noted that the existing specification for splitting of incidental catches in sub-area 7CS and 7CN (see Fig. 1) between the J/JE and O/OW stocks led to inconsistencies in projections, with proportions remaining the same despite changes in the abundances of the two stocks over time. The equations in question were modified so that projections would initially reflect the average proportions of the abundances of the two stocks present for the most recent five years, but these would change over time in line with changes in stock abundance. These modifications are given as Annex D, and have been incorporated into Annex H.

The Workshop **agreed** that the bycatch fishing proportions projected into the future would correspond to the average over the last five years for which incidental catch data were available for each of Japan and Korea when the conditioning was conducted. These two countries each provided updates on these and (in the case of Japan) the special permit catches to Allison. These values can be found in Annex H.

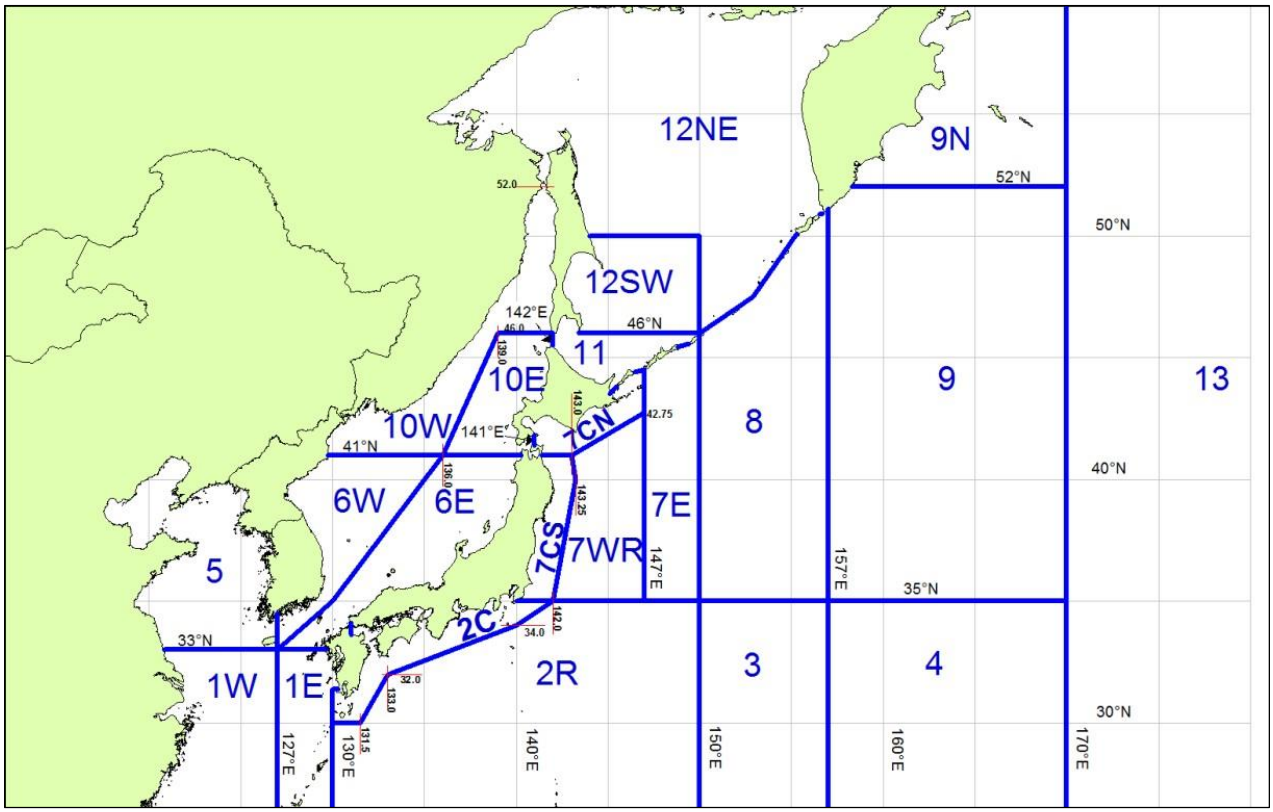


Fig. 1. The 22 sub-areas used for the *Implementation Simulation Trials* for North Pacific minke whales. Note that sub-area 7W is the combination of sub-areas 7CS, 7CN, and 7WR

The Workshop **confirmed** that the RMP specification 3.5, which reduces the catch limit in a *Small Area* to the extent required to ensure that the intended catch of females is not exceeded, was only applicable to the commercial catch for the present trials (IWC, 2012a). The Workshop **recommended** that the generic issue of how to deal with imbalanced sex ratios in incidental catches under the RMP be examined by the Committee.

*Section E: Generation of data*

Amendments to specifications in regard to past and future survey estimates of abundance are detailed under Item 2.2 below.

The extent of observation error associated with future survey estimates of abundance differs among sub-areas. The CV for a future survey in a given sub-area depends on (1) the average survey CV in the sub-area historically and (2) the average 1+ population size during past years for which abundance estimates are available in the sub-area relative to the associated pre-exploitation population size. The initial results presented to the Workshop set the parameter which determines future survey CVs ($\tau$; see Equation E.4 of Annex H and associated text) based on the CVs for the historical (pre-2012) surveys which were used when testing RMP variants. The Workshop **agreed** that the observation error associated with future surveys should not depend on which historical abundance estimates are used when testing these variants. Rather the size of this observation error should depend on sub-area and population size only. The Workshop discussed whether the observation error associated with future surveys in a sub-area should be based on the average CV for all of the surveys in that sub-area, or on the CVs for only those surveys which were conducted during the period of the year when future surveys are planned to occur. Using all surveys will reduce the influence of outlying CVs, but will be inappropriate if CVs differ systematically among months. After reviewing the values of $\tau$ with for both options, the Workshop **agreed** to use all of the past surveys in each sub-area for such computations (see Annex E).

*Section F: Parameter values and conditioning*

The biological parameter values used in the trials are based on North Atlantic common minke whales (as was the case during the initial *Implementation*). Japanese scientists advised that this was an appropriate approach given the well-known practical difficulties in using earplugs for age determination of North Pacific common minke whales. However, they also noted that technical advances meant that it may be possible to obtain age estimates in the future.

*Section G: Trials*

Trials ABC26-1 require a reduction in the number of age 1-4 O/OE whales predicted to occur in sub-areas 9 and 9N in spring and summer, as these seem rather large. However the Workshop noted that the number of whales aged 1-4 in these two sub-areas for the baseline C01-1 trial was already less than for trial B26-1. Accordingly the Workshop **agreed** to delete trials C26-1 and C26-4 (see SC/M13/NPM2). The Workshop **agreed** to add a new trial (C31) to test an alternative time invariant proportion of JE-stock whales in 7CN in Jan-Jun to be used to remove bycatch (see Table 2b of Annex H).The final list of agreed trials is given as Table 1.

Table 1

The list of Trials

(Details of the trials are given in Annex H. Trial 24 is assigned low plausibility and so is crossed through)

| Stock hypothesis | Trial no. | MSYR | Description |
|---|---|---|---|
| A | A01-1 & A01-4 | 1% & 4% | Baseline A: 2 stocks ('J' and 'O'); g(0) = 0.8; including Chinese bycatch |
| B | B01-1 & B01-4 | 1% & 4% | Baseline B: 3 stocks ('J', 'O', and 'Y'); g(0) = 0.8; including Chinese bycatch |
| C | C01-1 & C01-4 | 1% & 4% | Baseline C: 5 stocks ('JW', 'JE', 'OW', 'OE', and 'Y'); g(0) = 0.8; including Chinese bycatch |
| AC | A02-1 etc | 1% / 4% | With a 'C' stock |
| ABC | A03-1 etc | 1% / 4% | Assume g(0) = 1 |
| ABC | A04-1 etc | 1% / 4% | High direct catches + alternative Korean & Japanese bycatch level |
| ABC | A05-1 etc | 1% / 4% | Some 'O' or 'OW' animals in sub-area 10E. The mixing matrices will be modified such that the proportion of O/OW-stock in 10E is ~30% of that in 7CN in all months. |
| ABC | A06-1 etc | 1% / 4% | Mixing proportion in 7CS and 7CN calculated using 2/60 weight for bycatch |
| ABC | A07-1 etc | 1% / 4% | Mixing proportion in 7CS and 7CN calculated using 10/60 weight for bycatch |
| ABC | A08-1 etc | 1% / 4% | More Korean catches in sub-area 5 (and fewer in 6W). |
| ABC | A09-1 etc | 1% / 4% | More Korean catches in sub-area 6W (and fewer in 5) |
| ABC | A10-1 etc | 1% / 4% | 10% J (/ JW) -stock in sub-area 12SW in June (base case value = 25%). |
| ABC | A11-1 etc | 1% / 4% | 30% J (/ JW) -stock in sub-area 12SW in June (base case value = 25%). |
| C | C12-1 & 4 | 1% / 4% | No 'C' animals in sub-area 12NE |
| C | C13-1 & 4 | 1% / 4% | No 'OW' in 11 or 12 SW. (OW & OE whales mix with JW in 11 & 12 SW in the baseline C trials). |
| C | C14-1 & 4 | 1% / 4% | No 'OE' in 11 or 12 SW |
| C | C15-1 & 4 | 1% / 4% | No 'OE' in 7WR. (OE & OW whales mix in 7WR from Apr-Sep, while OW whales are present year round in the baseline C trials) |
| C | C16-1 & 4 | 1% / 4% | Dispersal rate of 0.005 between the OW and OE & the JW and JE stocks |
| C | C17-1 & 4 | 1% / 4% | Dispersal rate of 0.02 between the OW and OE & the JW and JE stocks |
| ABC | A18-1 etc | 1% / 4% | Chinese incidental catch = 0 (the base case value = twice that of Korea in sub-area 5) |
| ABC | A19-1 etc | 1% / 4% | Alternative abundance estimates in 6E (see table 6a of Annex H) |
| ABC | A20-1 etc | 1% / 4% | Additional abundance estimate in 10E in 2007 (see table 6a of Annex H) |
| ABC | A21-1 etc | 1% / 4% | Abundance estimate in 5 = 'minimum' value listed in Table 6b of Annex H, with a CV=0.1. |
| ABC | A22-1 etc | 1% / 4% | Abundance estimate in 5 = 'maximum' value listed in Table 6b of Annex H (= 5 * baseline value), with a CV=0.1 |
| C | C23-1 & 4 | 1% / 4% | Single J-stock (with pure J-stock definition using 6E (all months)) |
| ~~C~~ | ~~C24-1 & 4~~ | ~~1% / 4%~~ | ~~Single O-stock (with pure O-stock definition using 7WR, 7E and 8 (all months))~~ |
| ABC | A25-1 etc | 1% / 4% | The number of bycaught animals is proportional to the square-root of abundance rather than to abundance (in order to examine the impact of possible saturation effects) |
| AB | A26-1 etc | 1% / 4% | A substantially larger fraction of whales ages 1-4 from O-stock are found in sub-areas 2R, 3 and 4 year-round (so the proportion of 1-4 whales in sub-area 9 is closer to expectations given the length-frequencies of catches from sub-area 9).<br>The mixing matrices are adjusted such that the numbers of age 1-4 of O-stock animals in sub-area 9 and 9N are no more than half the base case numbers; juveniles will be allowed into subareas 2R, 3 and 4 in the corresponding months. |
| ABC | A27-1 etc | 1% / 4% | Set the proportion of O/OE animals of ages 1-4 in sub-area 9 and 9N to zero and allow the abundance in sub-areas 7CS and 7CN to exceed the abundance estimates for these sub-areas. Projections for this sub-area will need to account for the implied survey bias |
| ABC | A28-1 etc | 1% / 4% | The number of 1+ whales in 2009 in sub-area 2C in any month < 200 (if large numbers of whales were found in 2C, the historical catch would be expected to be much greater). |
| ABC | A29-1 etc | 1% / 4% | Abundance estimate in 6W = 'minimum' value listed in Table 6b of Annex H, with a CV=0.1. |
| ABC | A30-1 etc | 1% / 4% | Abundance estimate in 6W = 'maximum' value listed in Table 6b of Annex H (= 5 * baseline value), with a CV=0.1 |
| C | C31-1 etc | 1% / 4% | Alternative time invariant proportion of JE-stock whales in 7CN in Jan-Jun used to remove bycatch ( |

*Section H: Management options*

Japan and Korea confirmed that the RMP variants listed in this section correctly reflected the options which they had requested to be examined. However, upon examination of the preliminary results, they requested modifications to those variants as discussed under Item 5.

The Workshop **agreed** that the frequency with which simulated future catch limit calculations are performed would change from every five to every six years in line with the Commission's decision to move to biennial meetings. While the choice

of 2013 as the first year for setting a catch limit may appear to be contradictory (the Commission next meets in 2014), the Workshop **agreed** that the purpose of the trials is to evaluate long-term performance, and the choice of 2013 avoids the need to make assumptions for removals in 2013. Actual calculation of catches using the *CLA* will occur only if the Commission requests it.

### 2.2 Choice of surveys to be used in trials and the months to which these surveys are to be taken to refer

*1. Choice of surveys*

The Workshop reviewed SC/M13/NPM1 which summarised the past sighting surveys of western North Pacific minke whales, and the work of the intersessional group established to examine in detail the decisions made at the 2012 Scientific Committee meeting on the status of estimates for use in the projections of the RMP variants under consideration. The Workshop **confirmed** that any updated survey estimates would not be used in the conditioning, which are consistently based on the set of estimates agreed earlier (as listed in Annex H Table 6).

The Workshop first considered cases where the 2012 Scientific Committee meeting had indicated acceptability for use in the trials, but only after some further work or checks had been requested. The Workshop **confirmed** the following estimates to be acceptable for use in projections

(1) sub-area 10E in 2002 - coverage of the planned trackline was sufficient to retain the estimate;
(2) sub-area 7CS in 2004 - the estimate pertained to the northern part of the survey only (sightings from outside this area had been used in estimating mean school size and effective search half-width to increase estimation precision);
(3) sub-area 7WR in 2003 - the estimate pertained to a northern part of the sub-area only, for which adequate survey coverage had been obtained;
(4) sub-area 11 in 2007 - only survey transect lines were used in calculating the estimate;
(5) sub-area 12NE in 1999 - areas used in the abundance computations corresponded to only those parts of the various strata which had been covered effectively by the survey transects achieved.

In one case, sub-area 7W in 1991 (actually an estimate developed from the combination of results of surveys in 1990, 1991 and 1992), the work conducted, which involved splitting of the estimate proportional to sub-area size amongst 7CN, 7CS and 7WR, was not considered acceptable. This was because the sighting rates in the three sub-areas had been very different. These data were re-analysed in a manner that took account of this difference (see Annex F), and the resultant alternative for splitting the overall abundance estimate between the three sub-areas was **agreed** for use in projections for the *ISTs*. This process led to a zero estimate of abundance for 7CS.

In discussing how to incorporate this zero estimate, the Workshop referred to Annotation (29) of the RMP specification document (IWC, 2012) which details how a Poisson likelihood component is developed in such situations. This is described in Annex F, with a final output of a negative log – likelihood component of $P/98.6$ where $P$ is the true abundance present. This could not, however, be used directly when applying the *RMP* in the *IST*s as the program implementing the RMP does not make allowance for such terms. Accordingly the Workshop **agreed** to replace this form with a negative log-likelihood based on the assumption of a log-normally distributed pseudo estimate, which as with the Poisson form would yield a value of 1 when $P = 98.6$. Since this is not sufficient to define this likelihood term unambiguously, the Workshop decided to fix the mean at 42 (D. Adams, 1995) which resulted in a standard deviation of 0.603. This approach was applied to other cases of zero abundance estimates as shown in Annex F, which also details how zero estimates should be dealt with in the projections.

Other sub-areas with zero abundances, either in the past or in future projections were accorded negative log-likelihoods with the same standard deviation, but a different mean depending on the what the population estimates would have been for recent surveys in those areas had there been only one minke whale sighting made. Specifically, with averages taken over such population estimates calculated separately for each of the surveys listed and then scaled by 42/98.6, the results were:

(1) 6E 27.8 (based on the average of the 2002, 2003 and 2004 surveys)
(2) 10E 29.3 (based on the average of the 2002, 2003 and 2005 surveys)
(3) 10W 29.3 (based on the 2006 survey)
(4) 7CN 44.8 (based on the average of the 1991 and 1992 surveys)
(5) 7WR 86.3 (based on the average of the 1991 and 1992 surveys)
(6) 7E 52.6 (based on the 2006 survey)
(7) 8 63.6 (based on the average of the 2006 and 2007 surveys)
(8) 11 23.0 (based on the average of the 2003 and 2007 surveys)

The Workshop then reviewed those estimates for which there had been 'No agreement' during the 2012 Scientific Committee meeting regarding their acceptability for use in projections for the *ISTs*. The Workshop **agreed** that the following estimates were acceptable for use in the trials:

(1) sub-area 6E in 2002 - only the northern part where there was adequate survey coverage had been used for the estimate;
(2) sub-area 11 in 2003 - the estimate referred only to that part of the sub-area which had been surveyed, and sightings and effort on transit legs had not been included in computations;
(3) sub-area 12SW in 2003 - the estimate referred only to that part of the sub-area over which adequate survey coverage had been obtained;
(4) sub-area 12NE in 2003 - the estimate included only blocks where survey coverage had been adequate, and for the northernmost block that only the area covered by the transects completed had been included in the computation.

In addition, the Workshop **agreed** that the estimates for sub-area 10E in 2004 and sub-area 7CN in 2003 should not to be used for projections under RMP variants because of poor coverage resulting from bad weather, although the formal status of the abundance estimates for these sub-areas could be reviewed in the future if further analyses were presented.

The Workshop received a working paper which after modification to account better for appropriate survey boundaries was upgraded to a full paper (SC/M13/NPM3). This provided minke whale abundance estimates from the most recent (2012) survey in the western North Pacific, following the Scientific Committee's requirements and guidelines for surveys. The Workshop **endorsed** the updated estimates in this paper for use in the *ISTs* in forward projections (but not conditioning as that was effectively already completed), and consequently these estimates are included in Table 3 in Annex H.

The Workshop noted particular difficulties arising in the past in such reviews because of confusion over which parts of areas had been included in the survey abundance computations, inclusion (or not) of transit legs and associated sightings in plots, and survey block boundaries not corresponding to sub-area boundaries (in part because some sub-areas had been defined by the Committee only after surveys had been carried out). Accordingly, in the interests of keeping a clear record, the Workshop **recommended** that Miyashita and An develop a document containing a set of plots covering all the western North Pacific minke whale surveys to present at the 2013 Scientific Committee meeting. These plots are to show survey transects with primary minke whale sighting positions (but excluding transit legs), together with survey block boundaries, sub-area boundaries, and those parts of the area surveyed which has been included when calculating the abundance estimate. Furthermore this document should contain a table summarising: the number of primary sightings made; the distance searched on primary effort; the size of the open-ocean area included in the survey design; the mean school size and the effective search half-width inputs, together with population estimates output on a block-by-block basis for these surveys. The Workshop further **recommended** that the Scientific Committee consider making this a standard requirement for all *Implementations/Implementation Reviews*.

Annex G updates the summary of the status of abundance estimates in the context of the RMP developed at the 2012 Annual Meeting. It specifies "Yes*" next to any survey estimates of abundance considered acceptable for use in projections when testing RMP variants, but which merit further analysis before they might be used for input in using the *CLA* to calculate catch limits. The Workshop **agreed** that this annotation should be extended further to include the following surveys: (1) sub-area 7CS in 2004; (2) sub-areas 10E in 2004 and 7CN in 2003 (see above); (3) sub-area 7W in 1991; (4) sub-area 11 in 2003; and (5) all surveys in sub-areas 12SW and 12NE.

One reason for this is that with different area coverage for successive surveys in the same region, it is possible that GLM methods could be used to 'fill in the holes' for certain surveys to provide time-series of abundance estimates with associated variance-covariance matrices for comparable portions (full extents where possible) of the sub-areas concerned.

*2. Future surveys*

Both Japan and Korea advised some changes to the plans specified in SC/M13/NPM1. These updates are reflected in Table 2.

The Workshop **agreed** that the trials would assume that proportional coverage of sub-areas by future surveys remained fixed and at its most recent level. Over the period of the past surveys, there have been instances where this proportional cover had decreased, but none where it has increased (see Table 2). Such decreases are not seen as a problem for the *ISTs* from a conservation perspective, as the effect will be that the trials (and future surveys) reflect an overall abundance that is too low, and the *CLA* interprets the apparent past decline in abundance as low productivity. It is naturally conceivable (and considered likely in some cases) that proportional coverage might increase in some future surveys. The Workshop **agreed** that such circumstances would trigger an *Implementation Review*, as it would not be acceptable to input such estimates automatically into the RMP because they would give the *CLA* a false impression of resource productivity that was too large.

Table 2

Summary of past and future surveys. 1=Agreed survey (% coverage). Estimates will be generated for surveys from 2011 in subareas 5 and 6W and from 2013 on in other subareas. They are assumed to continue in the future in the same pattern

(a) Surveys to the West of Japan. All Surveys are in April-May except past surveys in 6E, 10W and 10E which were in May-June.

| | 5 | 6W | 6E | 10W | 10E |
|---|---|---|---|---|---|
| 2000 | - | 1 (14.3%) | - | - | - |
| 2001 | 1 (13%) | - | - | - | - |
| 2002 | - | 1 (14.3%) | 1 (79.1%) | - | 1 (100%) |
| 2003 | - | 1 (14.3%) | 1(79.1%) | - | 1 (100%) |
| 2004 | 1 (13%) | - | 1(79.1%) | - | - |
| 2005 | - | 1 (14.3%) | - | - | 1 (64.4%) |
| 2006 | - | 1 (14.3%) | - | 1 (59.9%) | - |
| 2007 | - | 1 (14.3%) | - | - | - |
| 2008 | 1 (13%) | - | - | - | - |
| 2009 | - | 1 (14.3%) | - | - | - |
| 2010 | - | 1 (14.3%) | - | - | - |
| 2011 | 1 | - | - | - | - |
| 2012 | - | 1 | - | - | - |
| 2013 | 1 | - | - | - | - |
| 2014 | 1 | - | - | - | - |
| 2015 | - | 1 | 1(79.1%) | 1(59.9%) | 1(100%) |
| 2016 | - | 1 | - | - | - |
| 2017 | 1 | - | - | - | - |
| 2018 | 1 | - | - | - | - |
| 2019 | - | 1 | 1(79.1%) | 1(59.9%) | 1(100%) |
| 2020 | - | 1 | - | - | - |
| 2021 | 1 | - | - | - | - |
| 2022 | 1 | - | - | - | - |
| 2023 | - | 1 | 1(79.1%) | 1(59.9%) | 1(100%) |

(b) Surveys to North and East of Japan. Surveys are carried out in August-September unless otherwise noted.

| | 7CS | 7CN | 7WR | 7E | 8 | 9 | 11 | 12SW | 12NE |
|---|---|---|---|---|---|---|---|---|---|
| 1990 | - | - | - | - | 1 (61.8%) | 1 (35.0%) | 1 (100%) | 1 (100%) | 1 (100%) |
| 1991 | 1* | 1 | 1 | - | - | - | - | - | - |
| 1992 | - | - | - | - | - | - | - | - | 1 (89.4%) |
| 1999 | - | - | - | - | - | - | 1 (100%) | - | 1 (63.8%) |
| 2000 | - | - | - | - | - | - | - | - | - |
| 2001 | - | - | - | - | - | - | - | - | - |
| 2002 | - | - | - | - | 1 (Jn-Jl 65.0%)* | - | - | - | - |
| 2003 | - | - | 1 (My-Jn 26.7%) | - | - | 1 (Jl-S 33.2%) | 1 (33.9%) | 1 (100%) | 1 (46.0%) |
| 2004 | 1 (My 36.7%) | - | 1 (My-Jn88.8%) | 1 (My-Jn 57.1%) | 1 (Jn 40.5%) | - | - | - | - |
| 2005 | - | - | - | - | 1 (My-Jl 65.0%) | - | - | - | - |
| 2006 | 1 (J-J 100%) | - | - | 1 (My-Jn 57.1%) | 1 (My-Jl 65.0%) | - | - | - | - |
| 2007 | - | - | 1 (Jn-Jl 88.8%) | 1 (Jn-Jl 65.0%)* | 1 (Jn-Jl 65.0%) | - | 1 (20.2%) | - | - |
| 2008 | - | - | - | - | - | - | - | - | - |
| 2009 | - | - | - | - | - | - | - | - | - |
| 2010 | - | - | - | - | - | - | - | - | - |
| 2011 | - | - | - | - | - | - | - | - | - |
| 2012 | 1 (My-Jn) | 1 (My-Jn)<br>1 (Au-Se) | - | - | - | - | - | - | - |
| 2013 | - | - | 1 (88.8%) | 1 (57.1%) | 1 (100%) | 1 (100%) | - | - | - |
| 2014 | - | - | - | - | - | - | 1 (30.1%) | 1 (48.9%) | 1 (46.4%) |
| 2015 | - | - | - | - | - | - | - | - | - |
| 2016 | 1 (100%) | 1 (75.4%) | 0 | 0 | 0 | 0 | - | - | - |
| 2017 | - | - | 1 (88.8%) | 1 (57.1%) | 1 (100%) | 1 (100%) | - | - | - |
| 2018 | - | - | - | - | - | - | 1 (30.1%) | 1 (48.9%) | 1 (46.4%) |
| 2019 | - | - | - | - | - | - | - | - | - |
| 2020 | 1 (100%) | 1 (75.4%) | - | - | - | - | - | - | - |
| 2021 | - | - | 1 (88.8%) | 1 (57.1%) | 1 (100%) | 1 (100%) | - | - | - |
| 2022 | - | - | - | - | - | - | 1 (30.1%) | 1 (48.9%) | 1 (46.4%) |
| 2023 | - | - | - | - | - | - | - | - | - |

Notes: Future coverage in 7CN, 7WR and 7E is expected to be similar to above (because of territorial issues). Coverage in 8 and 9 assumes that future surveys include the Russian EEZ. Future coverage in subareas 11 and 12SW (of 30.1% , and 48.9% respectively) excludes areas in the Russian EEZ which cannot be surveyed until the resolution of territorial issues with Japan. Future coverage in sub-area 12NE (of 46.4) reflects the area which cannot be surveyed in the North and East because of Russian restrictions.

* * Abundance estimate = 0

Further, given that the matter of changing proportions of survey coverage over time is one with potential relevance also to other populations to which the RMP might be applied in addition to western North Pacific minke whales, the Workshop **recommended** that the Scientific Committee should give further attention to this matter.

*3. Acceptability of past surveys in relation to the months in which they took place*

Future survey plans submitted by both Japan and Korea propose that future surveys in any one subarea will be carried out in the same months. However, past surveys have not always kept to this pattern (see Tables 2 and Annex G). The survey timing is taken into account explicitly in the conditioning process, as the underlying population model allows for changing proportions of the different stocks in each sub-area during the course of a year. However, the *CLA* does not include any mechanism to adjust for this, and in principle 'expects' that the series of abundance estimates input for a particular sub-area is comparable over time.

The Workshop considered carefully whether the projections under the RMP variants for the various trials should include or exclude past surveys that had taken place in different months of the year compared to what is planned for the future. The Workshop **decided** to include these surveys in simulated applications of the candidate RMP variants. The rationale was that their inclusion will most probably lead to larger catches, and therefore provide a more stringent test of the conservation performance on the RMP variants considered; if a variant is acceptable with these surveys included, it would be acceptable had they been excluded, and the purpose of the trials is purely to determine whether or not different variants are acceptable. The Workshop **emphasised** that this decision did not imply that such survey results would be acceptable for input in an actual application of the RMP, and **recommended** that the generic aspects of this matter be discussed by the Scientific Committee.

In some instances where RMP variants involving *Combination Areas* are being tested, in the past not every sub-area within that *Combination Area* has been surveyed in a given block of years. The approach adopted in such circumstances is that if the sub-areas without surveys would have made only a relatively small contribution to the estimate for the *Combination Area*, then those sub-areas are treated having contributing zero abundance to the combined estimate which is accepted for input to the computations for the RMP variant concerned. However, if those sub-areas would have made the major contribution to the combined estimate, then computations assume that no abundance estimate is available for that *Combination Area* for the block of years in question (see Table 4 in Annex H).

### 2.3 Plans for trials not yet conditioned

Conditioning for trials 8 and 9 which had not been run before the Workshop and for the new trial C31 will be prioritised and the results will be available by the end of April via Dropbox.

## 3 REVIEW NEW CONDITIONING RESULTS

The Workshop noted that most of the conditioning had been completed and accepted by the Scientific Committee at the 2012 Annual Meeting. Conditioning runs take a considerable time to run and the Workshop **agreed** that the full set of conditioning results for all trials would be made available to the Steering Group as soon as each becomes available; all results will be available by the end of April via Dropbox. Allison and de Moor will review the results and draw the attention of the Steering Group to any issues, should they arise, in a timely fashion.

## 4 GUIDELINES ON THE REVIEW OF ISTS

### 4.1 Overview and procedure to follow at the Workshop

The Workshop **agreed** that the RMP phase-out rule (Item 3.4, IWC, 2012b) would not be implemented for running the *ISTs* for western North Pacific minke whales. The reason is that this rule reduces catches, and consequently may give an inappropriately positive impression of the conservation performance of certain RMP variants. Of course, the phase-out rule will be invoked should the Commission decide to ask the Committee to develop actual catch limits in the future.

The Workshop reviewed past *Implementations*, notable the most recent undertaken (for North Atlantic fin whales) as well as the Requirements and Guidelines for *Implementations* (IWC, 2009; 2012a). It **agreed** that the following approach was appropriate for reviewing the trial results.

The procedure for defining 'acceptable' and 'borderline' performance agreed by the Committee involves conducting the following steps for each stock in an *IST* for which $MSYR_{(mat)}$=1%:

(1) Construct a single stock trial, which is 'equivalent' to the *IST*. For example, if a particular *IST* involved carrying capacity halving over the 100-year projection period, the 'equivalent single stock trial' will also involve carrying capacity halving over the next 100 years.

(2) Conduct two sets of 100 simulations based on this single stock trial in which future catch limits are set by the *CLA*. The two sets of simulations correspond to the 0.60 and 0.72 tunings of the *CLA*. Rather than basing these calculations

on a single initial depletion, the simulations for each stock shall be conducted for the distribution of initial depletions for the stock concerned in the *IST* under consideration.

(3) The cumulative distributions for the final depletion and for the minimum depletion ratio (the minimum over each of the 100-year projections of a trial of the ratio of the population size to that when there are no future catches) shall be constructed for each of these two tunings of the *CLA*.

(4) The lower 5%-ile of these distributions shall form the basis for determining whether the performance of the RMP (i.e. the RMP variant under consideration) for the *IST* is 'acceptable - A', 'borderline - B' or 'unacceptable - U', as follows:

(a) if the 5%-ile of the final depletion or the 5%-ile of the minimum depletion ratio for the *IST* (where the scalar used to compute the depletion ratio is based on projections where there are only incidental catches) is greater than for the equivalent single stock trial with 0.72 tuning of the *CLA* (or the 5%-ile of the minimum depletion ratio for the *IST* is greater than 0.999), the performance of the RMP shall be classified as 'acceptable';

(b) if performance is not 'acceptable', and either the 5%-ile of the final depletion or the 5%-ile of the minimum depletion ratio for the *IST* is greater than for the equivalent single stock trial with 0.60 tuning of the *CLA*, the performance of the RMP shall be classified as 'borderline'; and

(c) if performance is neither 'acceptable' nor 'borderline' then the 5%-ile of the final depletion and the 5%-ile of the minimum depletion ratio for the *IST* are less than those for the equivalent single stock trial with 0.60 tuning of the *CLA*, and the performance of the RMP shall be classified as 'unacceptable'.

If the performance for a small number of medium weight trials is 'borderline' but closer to 'acceptable' then performance of the variant can be considered 'acceptable' without research. A flow chart summarising the decision process to follow is given as Fig. 2.

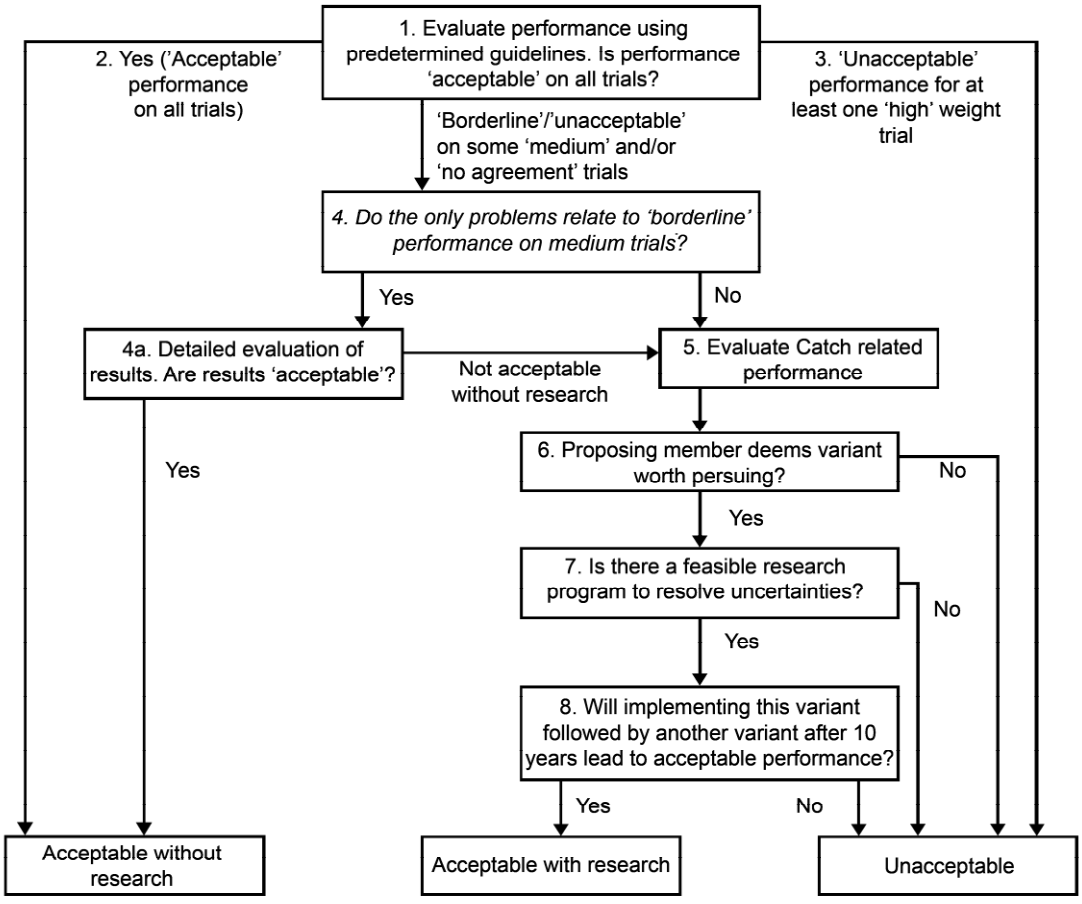


Fig. 2. Schematic of the review process (and see text).

### 4.4 Presentation style for results

The Workshop **agreed** to use the same tabular and graphical summaries as used in the equivalent workshop for the North Atlantic fin whale *Implementation* (IWC, 2009). The purposes of the various plots and tables range from providing a quick graphical summary of conservation performance to listing the full set of performance statistics for each trial and RMP variant. The master set of plots and tables will be archived by the Secretariat, and be made available to members of the Committee on request.

(1) A plot for each of the $MSYR_{(mat)}$=1% trials showing the performance of each RMP variant and scenarios with (i) only the incidental catch and (ii) with no catches of any kind using the procedure for defining 'acceptable', 'borderline' and 'unacceptable' performance. This plot will have panels for the various stocks and the two performance statistics on which the thresholds are based (the lower 5$^{th}$ percentile of the final depletion distribution and the lower 5$^{th}$ percentile of the minimum depletion ratio distribution). The values for the performance statistics for each variant (and the no-catch scenario) are represented as dots, and horizontal lines indicate the thresholds (upper line: 'acceptable'; lower line: 'borderline'). The shaded area in this plot indicates 'unacceptable' performance.

(2) An example plot or plots showing the performance for one of the trials. This plot will consist of the following types of outputs:

   (a) the median population size trajectories by stock for all of the RMP variants and that for the scenario with only the incidental catch;
   (b) the 5%-ile, median and 95%-ile of the population size trajectories by stock under the specific RMP variant (1980 until the end of the projection period);
   (c) the 5%-ile of the population size trajectories by stock (1980 to the end of the projection period) for all of the RMP variants;
   (d) the median population size trajectories by stock (1980 to the end of the projection period) for all of the RMP variants;
   (e) the 5%-ile of the population size trajectories by stock (1980 to the end of the projection period) for all of the RMP variants;
   (f) the median catch trajectories for the RMP variants (since 1935 and since 1980); and
   (g) ten individual population size trajectories for each stock under the specific RMP variant.

(3) A table for each of the trials for which $MSYR_{(mat)}$=1% showing for each RMP variant: the median catch over the entire projection period; the 5%, median and 95%-iles of the annual catch over the first 10 years; and a summary of the application of the procedure for defining 'acceptable - A', 'borderline - B' and 'unacceptable - U' performance. The table shows results for each performance statistic and stock separately, results by stock (i.e. after aggregating the outcomes for two performance statistics), and results in total (i.e. after aggregating outcomes from each performance statistic and stock).

(4) A table showing the detailed results for each trial and RMP variant (and the two no commercial 'catch' scenarios). The following information is included in this table:

   (a) median catch over the entire projection period and over the first 10 years;
   (b) lower 5%-ile and median of the final depletion distribution (by stock);
   (c) lower 5%-ile and median of the minimum depletion distribution (by stock);
   (d) lower 5%-ile and median of the minimum depletion ratio distribution (which is scaled by the no commercial catch trajectory) (by stock); and
   (e) lower 5%-ile and median of the initial depletion distribution (by stock).

This table will also include the values for the thresholds for each performance statistic and stock for the trials for which $MSYR_{(mat)}$=1% and the outcomes of the application of the procedure for defining 'acceptable', 'borderline' and 'unacceptable' performance using the symbols described for (3).

(5) A table showing all of the performance statistics for each trial and RMP variant (and the scenario with only the incidental catch).

## 5 REVIEW TRIAL RESULTS

The Workshop had available to it the preliminary results for a number of trials; however, given the additional work required to develop final specifications that occurred at the Workshop itself, it was clearly not possible to obtain final trials results for any of the trials. Allison and de Moor focussed on ensuring that the new factors were carefully programmed and checked by the end of the Workshop. As shown under Item 7, a process to ensure that the final trial results are available well before the 2013 Annual Meeting was developed.

However, even recognising the limitations of the preliminary trial results, certain features of those allowed the Workshop to refine (and reduce) the total number of management variants to be considered. The final list of variants is summarised below (and included in Annex H).

(1) *Small Areas* equal sub-areas. For this option, the *Small Areas* for which catch limits would be set are 5, 6W, 7CS, 7CN, 7WR, 7E, 8, 9*, and 11.
(2) 5, 6W, 7+8, 9*, and 11 are *Small Areas* and catches are taken from sub-areas 5, 6W, 7CN, 9, and 11.
(3) 5, 6W, 7+8, 9*, and 11 are *Small Areas* and catches are taken from sub-areas 5, 6W, 7CS, 9, and 11.
(4) 5, 6W, 7CS, 7CN, 7WR+7E+8, 9* and 11 are *Small Areas* and catches are taken from sub-areas 5, 6W, 7CS, 7CN, 7WR, 9 and 11.
(5) 5 and 6W are *Small Areas* and catches are taken from sub-areas 5 and 6W. 7+8+9*+11+12 is a combination area and catches are cascaded to the sub-areas within the combination area. The catch limits for sub-areas 12SW and 12NE are not taken.
(6) 5, 6W, 7+8, 9*, and 11 are *Small Areas* except that the catches from the 7+8 *Small Area* are taken from sub-areas 7CS and 7CN using the same method as for catch cascading to allocate the catch across the two sub-areas.
(7) 5+6W+6E+10W+10E, 7+8+9*+11 are *Small Areas*; catches from the 5+6W+6E+10W+10E *Small Area* are taken from subareas 5 and 6W using the same method as for catch cascading to allocate the catch across those five sub-areas, and catches from the Small Area 7+8+9+11 are taken in the sub-area 7CN.
(8) 5, 6W, 7+8+9*+11+12 are *Small Areas* and catches from sub-areas 5, 6W and 7+8+9*+11+12 *Small Area* are taken from sub-areas 8 and 9 using the same method as for catch cascading to allocate the catch across the two sub-areas.
(9) 5, 6W, 7+8+9*+11+12 are *Small Areas* and catches from sub-areas 7+8+9*+11+12 *Small Area* are taken from sub-areas 7CS, 7CN, 7WR, 7E, 8 and 9 using the same method as for catch cascading to allocate the catch across these sub-areas.
(10) 5, 6W, 7+8+9*+11+12 are *Small Areas* and catches from sub-areas 7+8+9*+11+12 *Small Area* are taken from sub-areas 7CS, 7CN, 7WR, 7E, 8, 9 and 11 using the same method as for catch cascading to allocate the catch across these sub-areas. Catches from sub-area 11 occur in May and June only.

## 6 RECOMMENDATIONS FOR THE SCIENTIFIC COMMITTEE

The Chair noted that until the final trial results were available it would not be possible for recommendations to be developed for consideration by the Scientific Committee. The recommendations would normally cover the following:

(1) management areas;
(2) RMP variant(s) and operational constraints;
(3) inputs for *CLA* (estimates of abundance and future removals);
(4) future research to narrow the range of plausible hypotheses;
(5) identification of less conservative RMP variants which may be acceptable with research, together with the nature and duration of that research.

The Workshop **agreed** a mechanism to ensure that most of these recommendations could be developed prior to the 2013 Annual Meeting. The exceptions are for (3) and (4) above which it refers to the Committee itself.

## 7 WORKPLAN UNTIL SCIENTIFIC COMMITTEE MEETING

The Workshop **agreed** to the workplan given in Table 3.

## 8 ADOPTION OF REPORT

The report was adopted at 14.15 on 23 March 2013 subject to final email confirmation. The Chair thanked all of the participants for the co-operative approach to the meeting. He thanked the rapporteurs for their prompt production of the report. He also thanked Allison and de Moor for their extensive work up to and during the Workshop. The complexity of the computing work for this *Implementation Review* cannot be over-emphasised. Although the Workshop was unable to fully meet its objectives, he was confident that the mechanism developed would allow recommendations to be developed in a timely fashion for the 2013 Annual Meeting as scheduled. The Workshop thanked the Chair for his usual efficient and good humoured handling of the meeting.

Table 3

Workplan: NB These dates have had to be modified due to unforeseen problems in sorting out the 'zero estimates' issue (see Annex F)

| Task | Date | Responsible persons |
|---|---|---|
| Finalise the present report and circulate to participants for final comments or additional pieces | **5 April 2013** | Donovan, Butterworth |
| Send final comments/additional pieces to Donovan | **12 April 2013** | All members |
| Complete final report and place on IWC website | **30 April 2013** | Donovan |
| (1) Run all of the baseline trials for the agreed variants, a no incidental catch scenario and a no catch of any kind scenario.<br>(2) Collate the results and present them in the agreed graphical and tabular formats.<br>(3) Place these in the appropriate Dropbox folder | Place online as become available with all results to be available by:<br>**3 May 2013** | Allison and de Moor |
| Complete all of the conditioning runs, with an initial focus on those for which results have not yet been seen and place the results in the agreed format in the appropriate Dropbox folder | Place online as become available with all results to be available by:<br>**10 May 2013** | Allison and de Moor |
| Produce a summary of the key results, highlighting the key trials and suggesting possible conclusions for (1) management areas; (2) acceptable variants; and (3) any candidates for possible 'acceptance with research' in the format of an additional report to the Scientific Committee | Place online within the Dropbox folder by:<br>**10 May 2013** | Allison, Punt, Donovan |
| Provide comments on the draft conclusions via email to the full group | **17 May 2013** | All members |
| Incorporate comments and place final report for the Scientific Committee on the IWC website | **23 May 2013** | Donovan |

# Annex A
# List of Participants

**Japan**

Miyashita, T.

Sakamoto, T,

Shimada,

**Republic of Korea**

An, Y-R

Park, J-Y

**USA**

Wade. P.

**Invited Participants**

Butterworth, D.S.

de Moor, C.L.

Punt, A. E.

**Secretariat**

Allison, C.

Donovan, G.P.

# Annex B

# Agenda

1 Introductory items
- 1.1 Welcoming remarks
- 1.2 Election of Chair
- 1.3 Appointment of rapporteurs
- 1.4 Adoption of Agenda
- 1.5 Review of documents

2 Progress since Annual Meeting in relation to the Workplan
- 2.1 Updated Trials Specification document
- 2.2 Choice of surveys to be used in trials and the months to which they are to be taken to refer
  - 2.2.1 Choice of surveys
  - 2.2.2 Future surveys
  - 2.2.3 Acceptability of past surveys in relation to the months in which they took place
- 2.3 Plans for trials not yet conditioned

3 Review new conditioning results (to come)

4 Guidelines on the review of ISTs

5 Review trial results

6 Recommendations for the Scientific Committee

7 Workplan until Scientific Committee meeting

8 Adoption of report

# Annex C

# List of Documents

SC/M13/NPM1: Allison, C. Proposal for combining surveys. 3pp.

SC/M13/NPM2: Allison, C., de Moor, C. L., Punt, A.E. Trial Specifications, 13 March 1013 (sic). 67pp.

SC/M13/NPM3: Hakamada, T., Matsuoka, K. and Miyashita, T. Abundance estimate of western North Pacific minke whales using JARPNII dedicated sighting survey data obtained in 2012. 7 pp. [Upgraded from working paper during the Workshop]

# Annex D
# Approach for accounting bycatch in sub-areas 7CS and 7CN

ANDRÉ E. PUNT

The future bycatches by sex, month, sub-area and year are generated assuming that the exploitation rate due to bycatch in the future equals that estimated for the most recent five-years for which data are known, i.e.

$$C_{B,t}^{g,k,q} = \bar{\bar{F}}^{k} \tilde{P}_{t}^{k,q} Q_{B}^{g,k,q} \tag{D.7}$$

where $\tilde{P}_{t}^{k,q}$ is the availability-weighted population size in sub-area *k* during month *q*:

$$\tilde{P}_{t}^{k,q} = (P_{t}^{k,q,J/E} + \lambda^{k,q} P_{t}^{k,q,O/OW}) \frac{\bar{P}^{k,q,J/JE} + \bar{P}^{k,q,O/OW}}{\bar{P}^{k,q,J/JE} + \lambda^{k,q} \bar{P}^{k,q,O/OW}} \tag{D.8}$$

where $\bar{P}^{k,q,O/OW}$ is the average population size (including calves) of stock O/OW in sub-area *k* during month *q* over the last five years;

$\bar{P}^{k,q,J/JE}$ is the average population size (including calves) of stock J/JE in sub-area *k* during month *q* over the last five years;

$P_{t}^{k,q,O/OW}$ is population size (including calves) of stock O/OW in sub-area *k* during month *q* of year *t*;

$P_{t}^{k,q,J/JE}$ is population size (including calves) of stock J/JE in sub-area *k* during month *q* of year *t*;

$\lambda^{k,q}$ is a relative availability factor for O/OW whales relative to J/JE whales:

$$\lambda^{k,q} = \frac{(1 - \ddot{\bar{P}}^{k,q})}{\ddot{\bar{P}}^{k,q}} \frac{\bar{P}^{k,q,J/JE}}{\bar{P}^{k,q,O/OW}} \tag{D.9}$$

$\ddot{\bar{P}}^{k,q}$ is the weighted mean proportion of stock J/JE in sub-area *k* during month *q* (Table 2b of Annex H).

This catch is allocated the J / O (JE/OW) stocks as follows:

$$C_{B,t}^{g,k,q,J/JE} = \frac{P_{t}^{g,k,q,J/JE}}{\lambda^{k,q} P_{t}^{g,k,q,O/OW} + P_{t}^{g,k,q,J/JE}} C_{B,t}^{g,k,q} \tag{D.10a}$$

$$C_{B,t}^{g,k,q,O/OW} = \frac{\lambda^{k,q} P_{t}^{g,k,q,O/OW}}{\lambda^{k,q} P_{t}^{g,k,q,O/OW} + P_{t}^{g,k,q,J/JE}} C_{B,t}^{g,k,q} \tag{D.10b}$$

where $P_{t}^{g,k,q,O/OW}$ is population size (including calves) of animals of gender *g* from stock O/OW in sub-area *k* during month *q* of year *t*; and

$P_{t}^{g,k,q,J/JE}$ is average population size (including calves) of animals of gender *g* from stock J/JE in sub-area *k* during month *q* of year *t*.

# Annex E

# Comparison of τ Values for Different Sets of Surveys

CL DE MOOR

An alternative set of surveys to be used in the calculation of τ was tested. The surveys to be removed from the current set were those occurring in months other than those chosen for future surveys, with the exception that if the only historical surveys available in a sub-area were from "wrong" months, then they were still included. This resulted in only 3 surveys in sub-area 8 being removed from the original set of surveys used for conditioning. Comparisons are thus only shown for sub-area 8 as the τ estimates are the same in all other sub-areas.

The estimates of τ are the same for all variants as they are based on historical data. The estimates of τ are the same for alternative combinations of surveys (see section 2.2.1) as they are based on the historical surveys used in conditioning.

The 5%ile, median and 95%ile of the τ values are given below for the original and alternative sets of data for sub-area 8, for trials B01-1 and C01-1.

| | **B01-1** | | | **C01-1** | |
|---|---|---|---|---|---|
| | Original | Alternative | | Original | Alternative |
| 5%ile | 3.95 | 3.30 | 5%ile | 4.03 | 3.36 |
| Median | 3.99 | 3.32 | Median | 4.05 | 3.38 |
| 95%ile | 4.02 | 3.35 | 95%ile | 4.07 | 3.40 |

# Annex F

# Derivation of Revised estimate for subarea 7 in 1991 and Zero abundance estimates

DOUG BUTTERWORTH AND TOMIO MIYASHITA

An estimate of abundance sub-area 7W[2] in 1991 used in the 2003 trials was actually an estimate developed from the combination of results of surveys in 1990, 1991 and 1992. It is not acceptable to derive estimates for the component subareas (7CN, 7CS and 7WR) by splitting the estimate proportional to sub-area size because the sighting rates in the three sub-areas had been very different. These data were re-analysed in a manner that took account of this difference and the resultant alternative for splitting the overall abundance estimate between the three sub-areas was **agreed** for use in projections for the *ISTs*.

Table 1 shows the abundance prorated by *nA*/*L* from total estimate. The two estimates for each subarea were averaged to give the following estimates for use in trials: 7CS 0; 7CN 853 CV=0.23; 7WR 311CV=0.23.

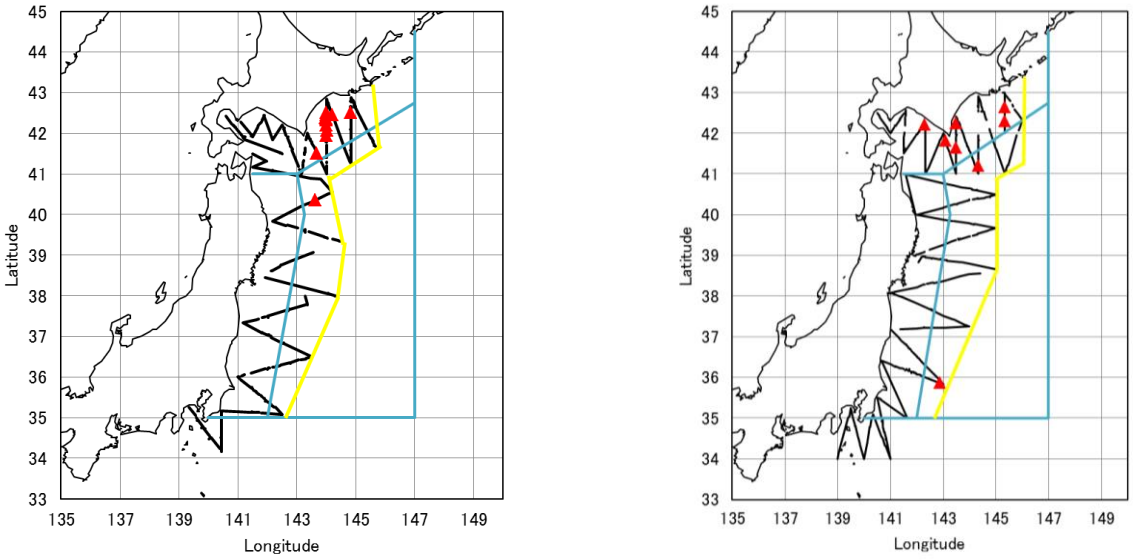


Fig. 1. Track line on effort (black thick line), primary sighting (red triangle), sub-area definition (blue thick line) and area definition for estimate (yellow thick line) for Shunyomaru in 1991 (left) and 1992 (right).

Table 1
Abundance prorated by *nA*/*L* from total estimate (1,164 animals, CV=0.183)

| | 91 Shunyomaru | | | 92 Shunyomaru | | |
|---|---|---|---|---|---|---|
| | 7CN | 7CS | 7WR | 7CN | 7CS | 7WR |
| L: Researh distance (nmi) | 775 | 516 | 597 | 703 | 774 | 816 |
| n: # primary sighting | 11 | 0 | 1 | 6 | 0 | 2 |
| A: Area ($nmi^2$) | 15,948 | 26,828 | 26,088 | 16,545 | 26,826 | 34,232 |
| n/L*A | 226.3483 | 0 | 43.67138 | 141.2217 | 0 | 83.89933 |
| P | 976 | 0 | 188 | 730 | 0 | 434 |
| Coverage (%) | 87.2 | 100 | 40.3 | 90.5 | 100 | 29.2 |

[2] Subarea 7W was used in the 2003 trials and is a combination of the current sub-areas 7CS, 7CN and 7WR.

*Inclusion of zero abundance estimates in the trials*

Table 1 includes one abundance estimate which is zero. Annotation (29) of the RMP specification document (IWC, 2012) specifies how a Poisson likelihood component is developed in cases when a zero abundance estimate occurs. The annotation says:

> (29) An example where the lognormal assumption cannot be used is when the estimate of absolute abundance is zero. Zero estimates of absolute abundance arise when no sightings of the target species are made on primary effort during a survey of an area. This should not be a frequent occurrence, but such estimates should not be ignored when they do occur.
>
> Although several factors contribute to the variance of an estimate of absolute abundance, the variance is dominated by the variance in the number seen when the number of sightings is very low. The variance of the number of sightings will be at least as high as the variance of a random variable with a Poisson distribution with expectation equal to the expectation of the number of sightings. The number of sightings refers to the number of schools or groups, rather than to individual animals.
>
> The expected number of sightings, E(n), is proportional to the true absolute abundance, P: $E(n) = P/\alpha$
>
> The parameter α represents the estimate of absolute abundance that would have been obtained had there been exactly one sighting. This will be a function of the survey effort, the size of the area, and survey parameters that may need to be estimated by adopting values from similar surveys. Ignoring the variance of α, the likelihood of the zero estimate of absolute abundance is the following function of the true absolute abundance:
>
> $L(P) = \exp(-P / \alpha)$
>
> Since the only covariance between the absolute abundance estimate and other absolute abundance estimates is that due to the α parameter, whose variance is being ignored, the joint likelihood function of the zero estimate of absolute abundance and the remaining estimates is taken to be the product of the respective likelihood functions.
>
> The information about the zero estimate of absolute abundance that needs to be supplied to the Catch Limit Algorithm is: (i) the Year of the zero estimate; (ii) the fact that it is a zero estimate; and (iii) the value of the α parameter. The computer program implementing the Catch Limit Algorithm that has been validated by the IWC Secretariat has the facility to handle zero estimates of absolute abundance in this manner. P is identified with the simulated population size generated by the Catch Limit Algorithm's internal calculations.
>
> Since the treatment above ignores some contributions to the variance of a zero estimate of absolute abundance, it assigns more weight to a zero estimate than is strictly warranted.

For the zero abundance estimate obtained above for subarea 7CS in 1991, there is a final output of a negative log – likelihood component of P/98.6 where P is the true abundance present. This could not, however, be used directly in the ISTs as the program implementing the RMP (which is also used for the ISTs) does not make allowance for such terms. Accordingly the Workshop agreed to replace this form with a negative log-likelihood based on the assumption of a log-normally distributed pseudo estimate, which as with the Poisson form would yield a value of 1when P = 98.6. Since this is not sufficient to define this likelihood term unambiguously, the Workshop decided to fix the mean at 42 (D. Adams, 1995) which resulted in a standard deviation of 0.603. This approach is also to be applied to other cases of zero abundance estimates which may occur in the projections as well.

These other sub-areas with zero abundances, either in the past or in future projections are to be accorded negative log-likelihoods with the same standard deviation, but a different mean depending on the what the population estimates would have been for recent surveys in those areas had there been only one minke whale sighting made. Specifically, with averages taken over such population estimates calculated separately for each of the surveys listed and then scaled by 42/98.6, the results are given in Table 2.

Table 2

Population estimates to replace zero estimates in the trials.

| Sub-area | 6E | | | 10E | | | 10W | 7CN | | 7WR | | 7E | 8 | | 11 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Season | 2002 | 2003 | 2004 | 2002 | 2003 | 2005 | 2006 | 1991 | 1992 | 1991 | 1992 | 2006 | 2006 | 2007 | 2003 | 2007 |
| L | 1,676 | 1,226 | 1,037 | 486 | 651 | 466 | 1,157 | | | | | 461 | 1,039 | 914 | 192 | 564 |
| n | 21 | 19 | 7 | 10 | 7 | 9 | 36 | 11 | 6 | 1 | 2 | 2 | 3 | 2 | 10 | 19 |
| A | 71,914 | 71,914 | 71,914 | 27,823 | 27,823 | 17,912 | 63,912 | | | | | 48,208 | 162,789 | 162,789 | 15,243 | 9,064 |
| P | 891 | 935 | 727 | 816 | 405 | 599 | 2,477 | 976 | 730 | 188 | 434 | 247 | 309 | 391 | 882 | 377 |
| Scaled | 18.1 | 21.0 | 44.2 | 34.8 | 24.6 | 28.4 | 29.3 | 37.8 | 51.8 | 80.1 | 92.4 | 52.6 | 43.9 | 83.3 | 37.6 | 8.5 |
| Average | 27.8 | | | 29.3 | | | 29.3 | 44.8 | | 86.3 | | 52.6 | 63.6 | | 23.0 | |

# Annex G

# Updated table of abundance estimates

CHERRY ALLISON, DOUG BUTTERWORTH AND TOMIO MIYASHITA

The Workshop's recommendations on acceptance of the abundance estimates for use in the current *Implementation Simulation Trials* are reflected in the final two columns of the Table below in the form of yes/no agreement/no, followed by a brief rationale for any disagreement. NA = No agreement. It was agreed that the two no agreement estimates would not be used in the current trials – see main text (item 2.2). The notation * indicates that further analysis needs to be considered for an estimate to become acceptable for use in a real application.

| Sub-area | Year | Season | Areal coverage (%) | STD estimate[3] | CV[4] | Current Conditioning | Used in 2003 trials? | Use in current trials | Rationale and Notes |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 2001 | Apr-May | 13.0 | 1,534 | 0.523 | Minimum | - | Yes* | Low area coverage. Only area completed. Needs further analysis |
| | 2004 | Apr-May | 13.0 | 799 | 0.321 | Minimum | - | Yes* | Low area coverage. Only area completed. Needs further analysis |
| | 2008 | Apr-May | 13.0 | 680 | 0.372 | Minimum | - | Yes* | Low area coverage. Only area completed. Needs further analysis |
| | 2011 | Apr-May | | | | | - | Yes* | Only area completed. Needs further analysis |
| 6W | 2000 | Apr-May | 14.3 | 549 | 0.419 | Minimum | - | Yes* | Low area coverage. Use inshore segment only with adjustment for differential extent of inshore coverage. (No extrapolation) |
| | 2002 | Apr-May | 14.3 | 391 | 0.614 | Minimum | - | Yes* | " |
| | 2003 | Apr-May | 14.3 | 485 | 0.343 | Minimum | - | Yes* | " |
| | 2005 | Apr-May | 14.3 | 336 | 0.317 | Minimum | - | Yes* | " |
| | 2006 | Apr-May | 14.3 | 459 | 0.516 | Minimum | - | Yes* | " |
| | 2007 | Apr-May | 14.3 | 574 | 0.437 | Minimum | - | Yes* | " |
| | 2009 | Apr-May | 14.3 | 884 | 0.286 | Minimum | - | Yes* | " |
| | 2010 | Apr-May | 14.3 | 1,014 | 0.397 | No | - | Yes* | " |
| 6E | 2002 | May-Jun | 79.1 | 891 | 0.608 | Yes | - | Yes* | Poor coverage and analysis difficulties. Poor availability. Only use northern part. Original estimate was based only on northern part. |
| | 2003 | May-Jun | 79.1 | 935 | 0.357 | Yes | - | Yes | |
| | 2004 | May-Jun | 79.1 | 727 | 0.372 | Yes | - | Yes | (Incomplete coverage). Only N offshore block used |
| 10W | 2006 | May-Jun | 59.9 | 2,476 | 0.312 | Yes | - | Yes | |
| 10E | 2002 | May-Jun | 100.0 | 816 | 0.658 | Yes | - | Yes | 61% of pre-determined track line was covered on effort and is sufficient to retain the estimate |
| | 2003 | May-Jun | 100.0 | 405 | 0.566 | Yes | - | Yes | |
| | 2004 | May-Jun | 100.0 | 474 | 0.537 | Yes | - | NA* | Design question: (most sightings in concentration near coast) |
| | 2005 | May-Jun | 64.4 | 599 | 0.441 | Yes | - | Yes | In 2005, survey blocks were surveyed twice. In order to avoid double counting the abundance was estimated using 2nd part and only in offshore block. (Number of primary sightings: 1st part : one over 387n.m. , 2nd part: nine over 842 n.m.). The estimate was recalculated using 2nd part and only in offshore block. Area, n and L were recalculated; ESW and $\overline{s}$ were the same as for the whole area |
| 7CS | 1991 | Aug-Sep | | 0 | | 2003 only | Yes | Yes* | See Annex F for details of how the original estimate for subarea 7W was split to subarea (prorated by nA/L from the total estimate) |
| | 2004 | May | 36.7 | 504 | 0.291 | Yes | - | Yes* | Use Northern part only.<br>Res.:n, L and Area were recalculated for the northern part only; the estimates of ESW and s used were from the whole area. |
| | 2006 | Jun-Jul | 100.0 | 3,690 | 1.199 | Yes | - | Yes* | Analysis for non-random start<br>Note different survey timings |
| | 2012 | May-Jun | 100.0 | 890 | 0.393 | No | - | Yes* | See item 2.2 above, and SC/M13/NPM3. |

[3] The Standard (STD) estimate based on "Top and Upper bridge will be used as given in the catch limit calculations (when conditioning the estimates are adjusted for g(0)).

[4] CV does not consider any process errors

| Sub-area | Year | Season | Areal coverage (%) | STD estimate[1] | CV[2] | Current Conditioning | Used in 2003 trials? | Use in current trials | Rationale and Notes |
|---|---|---|---|---|---|---|---|---|---|
| 7CN | 1991 | Aug-Sep | | 853 | 0.23 | 2003 only | Yes | Yes* | See Annex F for details of how the original estimate for subarea 7W was split to subarea (prorated by nA/L from the total estimate) |
| | 2003 | May | 75.4 | 184 | 0.805 | Yes | - | NA* | Inadequate and heterogeneous coverage |
| | 2012 | May-Jun | 66.7 | 302 | 0.454 | No | - | (Yes*)[5] | See item 2.2 above and SC/M13/NPM3. |
| | | Sept | 66.7 | 398 | 0.507 | No | - | Yes* | |
| 7WR | 1991 | Aug-Sep | | 311 | 0.23 | 2003 only | Yes | Yes* | See Annex F for details of how the original estimate for subarea 7W was split to subarea (prorated by nA/L from the total estimate) |
| | 2003 | May–Jun | 26.7 | 267 | 0.700 | Min | - | Yes* | Low area coverage. Estimate recalculated for northern portion only. With analysis for non random starts |
| | 2004 | May–Jun | 88.8 | 863 | 0.648 | Yes | - | Yes | |
| | 2007 | Jun–Jul | 88.8 | 546 | 0.953 | Yes | - | Yes* | With analysis for non-random start. |
| 7E | 1990 | Aug-Sep | | 791 | 1.848 | 2003 only | Yes | No | CV too high to be meaningful |
| | 2004 | May–Jun | 57.1 | 440 | 0.779 | Yes | - | Yes | |
| | 2006 | May–Jun | 57.1 | 247 | 0.892 | Yes | - | Yes | |
| | 2007 | Jun–Jul | 57.1 | 0 | | Yes[6] | - | Yes* | With analysis: non random start; no planned coverage in upper left (Russian EEZ) |
| 8 | 1990 | Aug-Sep | 61.8 | 1,057 | 0.705 | Yes | Yes | Yes | Agreed in 2003. In other years, no whales observed in area not covered |
| | 2002 | Jun–Jul | 65.0 | 0 | | Yes | - | Yes | Note different survey timings |
| | 2004 | Jun | 40.5 | 1,093 | 0.576 | Yes | - | Yes | In other years, no whales observed in area not covered |
| | 2005 | May-Jul | 65.0 | 132 | 1.047 | Yes | - | Yes* | With analysis: non random start; no planned coverage in upper left (Russian EEZ), 2 sets of lines in lower blocks |
| | 2006 | May-Jul | 65.0 | 309 | 0.677 | Yes | - | Yes | |
| | 2007 | Jun-Jul | 65.0 | 391 | 1.013 | Yes[6] | - | Yes* | With analysis: non random start; no planned coverage in upper left (Russian EEZ) |
| 9 | 1990 | Aug-Sep | 35.0 | 8,264 | 0.396 | Yes | Yes | Yes | Agreed in 2003 |
| | 2003 | Jul-Sep | 33.2 | 2,546 | 0.276 | Minimum | - | Yes | Survey not co-incident with density peak in Aug-Sept |
| 9N | 2005 | Aug-Sep | 67.8 | 420 | 0.969 | Yes | - | (Yes) | Agreed estimate. Not used as catch limits are not set for 9N. |
| 11 | 1990 | Aug-Sep | 100.0 | 2,120 | 0.449 | Yes | Yes | Yes | Agreed in 2003 |
| | 1999 | Aug-Sep | 100.0 | 1,456 | 0.565 | Yes | Yes | Yes | Agreed in 2003 * Check map to make sure |
| | 2003 | Aug-Sep | 33.9 | 882 | 0.820 | Yes | - | Yes* | Potentially biased due to weather induced coverage omission to North. Agreed: not acceptable to include coastal transect in analysis. Confirmed: estimate refers only to surveyed part of subarea and excludes transit legs |
| | 2007 | Aug-Sep | 20.2 | 377 | 0.389 | Minimum | - | Yes* | Low area coverage. Estimate was confirmed to have come from transect lines only |
| 12SW | 1990 | Aug-Sep | 100.0 | 5,244 | 0.806 | Yes | Yes | Yes* | Agreed in 2003 |
| | 2003 | Aug-Sep | 100.0 | 3,401 | 0.409 | Yes | - | Yes* | Low area coverage. Confirmed: estimate refers only to part of sub-area with had adequate coverage. |
| 12NE | 1990 | Aug-Sep | 100.0 | 10,397 | 0.364 | Yes | Yes | Yes* | Agreed in 2003 |
| | 1992 | Aug-Sep | 89.4 | 11,544 | 0.380 | 2003 only | Yes | Yes* | Agreed in 2003. Year wrong in SC/53/Rep 3. |
| | 1999 | Aug-Sep | 63.8 | 5,088 | 0.377 | Yes | - | Yes* | Omit E block – inadequate coverage. Limit N block to area surveyed. Estimate recalculated using only those parts of the various strata which had been covered effectively. |
| | 2003 | Aug-Sep | 46.0 | 13,067 | 0.287 | Yes | - | Yes* | Agreed: 2 blocks should be omitted due to inadequate coverage. Question concerning coverage in the other 3 blocks (2 NW and one E). Confirmed: the estimate is based on the 3 blocks with adequate survey coverage and for the Northernmost block includes only the area covered by completed transects. |

[5] This estimate was agreed to be suitable for use in trials but will not be used in the current trials as the September estimate (which has the correct formal time stamp for RMP input) will be used instead.

[6] For conditioning, the estimate of 0 from sub-area 7E was combined with the estimate of 391 from sub-area 8.

# Annex H

# North Pacific Minke Whale *Implementation Simulation Trial* Specifications

**(final version will be distributed as a separate file)**

## REFERENCES

International Whaling Commission. 2005. Report of the Scientific Committee. *J. Cetacean Res. Manage. (Suppl.)* 7:1-62.

International Whaling Commission. 2009. Report of the First Intersessional RMP Workshop on North Atlantic Fin Whales, 31 March to 4 April 2008, Greenland Representation, Copenhagen. *Journal of Cetacean Research and Management (Suppl.)* 11:425-52.

International Whaling Commission. 2012a. Requirements and Guidelines for *Implementations* under the Revised Management Procedure. *J. Cetacean Res. Manage. (Suppl.)* 13:495-506.

International Whaling Commission. 2012b. The Revised Management Procedure (RMP) for Baleen Whales. *J. Cetacean Res. Manage. (Suppl.)* 13:483-94.

International Whaling Commission. 2013. Report of the Scientific Committee. *J. Cetacean Res. Manage. (Suppl.)* 14:1-86.