Report of the Scientific Committee

Bled, Slovenia, 7-19 June 2016

Annex D: Report of the Sub-Committee on the Revised Management Procedure

**This report is presented as it was at SC/66b.
There may be further editorial changes (e.g. updated references, tables, figures) made before publication.**

International Whaling Commission

Bled, Slovenia, 2016

Annex D

Report of the Sub-Committee on the Revised Management Procedure

Members: Bannister (Convenor), Allison, Baba, Baker, Bell, Bjørge, Brandão, Brownell, Butterworth, Cipriano, Cooke, Currey, de la Mare, de Moor, Diallo, Donovan, Elvarsson, Fortuna, Fujise, Gonzalez-Delgadillo, Gunnlaugsson, Haug, Hirayama, Hoelzel, Hrabkovsky, Jaramillo-Legorreta, Jimenez, Johnson, Joon Park, Kitakado, Lang, Leaper, Lundquist, McKinlay, Miyashita, Morishita, Morita, Moronuki, Øien, Okazoe, Palka, Pampoulie, Panigada, Pastene, Punt, Reeves, Rodriguez-Fonseca, Simmonds, Skaug, Sohn, Solvang, Tamura, Tiedemann, Tsuji, Víkingsson, Wade, Walløe, Williams, Witting, Yasokawa, Yasunaga, Yoshida, Youn Park, Zerbini, Zharikov, Zimmermann

1. INTRODUCTORY ITEMS

1.1 Convenor's opening remarks

As Convenor, Bannister welcomed the participants.

1.2 Election of Chair and appointment of rapporteurs

Bannister was elected Chair. Butterworth, Johnson, McKinlay and Punt acted as rapporteurs.

1.3 Adoption of Agenda

The adopted Agenda is shown in Appendix 1.

1.4 Available documents

The documents considered by the sub-committee were SC/66b/RMP01-06, SC/66b/IA18, SC/F16/JR11, SC/F16/JR12, SC/66b/Rep04, SC/66b/Rep05, and relevant extracts from past reports of the Committee.

2. GENERAL ASSESSMENT ISSUES WITH A FOCUS ON THOSE RELATED TO THE REVISED MANAGEMENT PROCEDURE

2.1 Relationship between $MSYR_{mat}$ and $MSYR_{1+}$: evaluate energetics-based model

SC/66b/RMP04 reports progress on using an individual based energetics model to examine the relationship between the MSY (maximum sustainable yield) rates applicable to the population aged one year and above (1+) compared with that from the mature component of the population. The results presented are for a 'like minke' energetics model. Comparing the results from the individual based model (IBM) with those from Baleen II show that the ratio between $MSYR_{mat}$ and $MSYR_{1+}$ is higher for the energetics model than for Baleen II. However, the proportion of the 1+ population that is mature is substantially lower from the IBM than for Baleen II, with the consequence that using Baleen II to calculate MSY_{mat} from $MSYR_{1+}$ leads to a numeric MSY that is larger than would be obtained from the energetics model for the same 1+ population size. Averaged over the cases, the numerical MSY from applying the Baleen II model is too large by about 42%. The results for the 'like minke' dynamics are qualitatively different from previous results based on humpbacks. In the latter, the ratios of $MSYR_{1+}$ to $MSYR_{mat}$ are less than those from the Baleen II model, and they are also more dependent on $MSYR_{1+}$.

In discussion, it was noted that the relationship between $MSYR_{1+}$ and $MSYR_{mat}$ is consequential to the work of the Committee. MSYR is defined in terms of the 1+ component of the population when specifying trials because the MSYR review, which was completed in 2013, was based on rates of increase from survey estimates of abundance, which tend to be estimates of 1+ abundance. In contrast, selectivity during actual whaling operations usually pertains to older animals and hence MSYR as it applies to the selected population will determine the performance of RMP variants. The relationship between $MSYR_{1+}$ and $MSYR_{mat}$ will depend on the age-specificity of natural mortality as well as whether density-dependence pertains to the calving/calf survival rate or to natural mortality.

The sub-committee noted that limited progress had been made in relation to the workplan for this item developed last year. This is partially due to the computational demands associated with modifying the individual based energetics model to capture the dynamics of minke whales and conducting projections using this based model. It updated its workplan for the 2017 Annual Meeting to include reviewing how the individual based model was parameterised for 'like minke' whales, as well as how well a population model can capture the behaviour of the individual-based model. The sub-committee **agreed** that the results in SC/66b/RMP04 would not impact the *Implementation Reviews* currently being undertaken for the North Atlantic fin and minke whales, but that future *Implementations* and *Implementation Reviews* should take the results into account during sensitivity tests which explore density-dependence on natural mortality as well as fecundity. The upcoming *Implementation Review* for the North Pacific Bryde's whales should be the first to include these sensitivity tests.

2.2 Requirements and guidelines for conducting surveys: model based abundance estimates

The Committee's existing Requirement and Guidelines were written for design-based surveys only. Recently, the Committee recognised a need to consider what circumstances might require approval when the survey and analysis are

conducted based on spatial modelling or quasi design-based approaches. The Committee agreed in 2012 (IWC, 2013) that a review of this issue should take place intersessionally.

The sub-committee obtained an update on progress by Bravington and colleagues towards developing guidelines and software for developing model-based abundance estimates. A planned meeting prior to SC/66b to develop software for model-based estimation did not occur, and will be unlikely to be conducted until 2017. The sub-committee **agreed** that a demonstration of the software implementing the analysis method should occur, preferably during a workshop held as a pre-meeting to SC/67a. This workshop would test the guidelines against several test cases of model-based abundance estimation.

The sub-committee re-established a Steering Group under Butterworth (Chair) with members Bravington, Cooke, Kitakado and Miller, to co-ordinate intersessional work, develop an agenda for the workshop and facilitate preparations for the workshop.

2.3 Implications of *IST*s for consideration of 'status'

The *Implementation Simulation Trials* used by the Committee can provide information on the current status of populations using metrics such as current population size, current population size relative to carrying capacity, recent past trends, and expected short-term future trends. The sub-committee highlights that there are usually many *Implementation Simulation Trials* for any given *Implementation*, which means that metrics of status may need to be given as ranges based on plausible trials rather than as point estimates. It was also noted that the number of stocks in a region often differs among *Implementation Simulation Trials*. Thus, it may be necessary to provide metrics of status for a region or perhaps some smaller areas such as 'Medium Area'.

The sub-committee **agreed** that this issue would be best addressed intersessionally and established a Steering Group consisting of Donovan (Chair) and members Butterworth, Cooke, Punt, and Walløe to provide advice on how to develop and present metrics of status at the 2017 meeting.

2.4 Work plan

Before the 2017 Annual Meeting	During the 2017 Annual Meeting
(1) Conduct work to evaluate the energetics-based model and hence the relationship between $MSYR_{1+}$ and $MSYR_{mat}$ (Item 2.1): a) Write a paper documenting how the individual-based model was parametersised for 'like minke' whales (de la Mare); b) develop emulator models (de la Mare, Butterworth, Punt, Cooke)[1]; c) conduct simulations of the *CLA* for the energetics-based model (de la Mare); d) conduct simulations of the *CLA* for the emulator models (de la Mare, Butterworth, Punt, Cooke)[1].	(1) Review intersessional progress on evaluating the energetics-based model (Item 2.1).
(2) Develop simple-to-use diagnostic software that uses model-based analysis to assist in evaluating design based estimates (Bravington and Miller, Item 2.2).	(2) Hold a pre-meeting Workshop with Terms of Reference: (i) to test proposed new Guidelines against several test cases of model-based abundance estimates developed specifically for and during the Workshop; and (ii) to demonstrate and discuss the proposed diagnostic software. There will be costs involved for travel and subsistence (Item 2.2).
(3) Further develop ways to integrate results from *Implementation Simulation Trials* to assess status (Item 2.3).	(3) Review the proposed approaches for determining status and apply them to some example species and regions.

[1]This is a multi-year process – completion of these tasks depends on progress relative to issue a).

Before the 2018 Annual Meeting	During the 2018 Annual Meeting
(1) Continue to work to evaluate the energetics-based model and hence the relationship between $MSYR_{1+}$ and $MSYR_{mat}$ (Item 2.1):	(1) Review intersessional progress on evaluating the energetics-based model (Item 2.1).

3. RMP – IMPLEMENTATION-RELATED MATTERS

3.1 North Atlantic fin whales (*Implementation Review*)

3.1.1 Report of intersessional workshop

Donovan reported on the intersessional workshop on the *Implementation Review* of North Atlantic fin whales, held in Copenhagen from 19-23 March 2016. The *Implementation Review* process began during a pre-meeting at the 2013 Annual Meeting of the Scientific Committee (IWC, 2014, pp.97-109) and continued with a first intersessional workshop in 2014 (IWC, 2015, pp.461-486) and a second workshop in 2015 (IWC, 2016, pp.487-94). The original *Implementation* was completed in 2009 (IWC, 2010).

The main tasks of the Workshop were to: (1) review the results of the conditioning and finalise the trial specifications; (2) provide recommendations to the Scientific Committee related to plausibility weighting of trials; and (3) take forward work to enable the Scientific Committee to complete the *Implementation Review* at SC66b.

The Workshop was a technical workshop and a considerable part of the time was spent reviewing conditioning results. This is a substantial task given the complexity of the trials structure (eight stock structure hypotheses – see Fig. 1). Satisfactory conditioning was based upon the consideration of three data sources: abundance estimates; Discovery mark (tag) data; and age data. Initial focus of the workshop was to examine these data sources in light of whether all or subsets were suitable for use in conditioning.

With respect to abundance estimates, discussion focussed on the '1988' surveys for sub-areas EG, WI and EI/F, and the 1995 estimate for sub-area EG. The Workshop concluded that despite some difficulties, the available information was not sufficient to exclude use of those '1988' and 1995 estimates from the conditioning. However, the Workshop agreed that the information provided above was valuable for interpreting whether the fit to the abundance data was acceptable when examining the conditioning results (i.e. how close a fit to the 'trend' was acceptable).

Following on from discussions at SC/66a (IWC, 2016), the Workshop considered the appropriate weighting to be given to the tagging data and the role of those data in conditioning. It agreed that the 43 recoveries from sub-area WI allowed for meaningful comparisons across different hypotheses and assumptions – in particular, predicted recapture values of less than 24[1] did not provide an adequate fit to the data.

In summary, after careful consideration the Workshop recommended:

(a) to discontinue consideration of stock structure Hypotheses IV, VII and VIII, and those involving tag loss, because of incompatibility with the tag-recapture data for sub-area WI (in effect, this is equivalent to giving trials with these hypotheses a 'low' plausibility weighting – see Item 4 of SC/66b/Rep5);
(b) to maintain a downweighting (by a multiplicative 0.1 factor) of the age data in the objective function only for those $MSYR_{1+} = 1\%$ scenarios that had at best marginal acceptability under full weighting of the age data (full weighting of the age data should be used for all other trials).

After work to address issues identified at SC66a (IWC, 2016), the workshop agreed that the fits to the age data whilst not good, were adequate for conditioning purposes. Nevertheless, noting the lack of fit to the post-2000 age data that reflects larger/older whales being caught than in the past (and see discussion in IWC, 2016), the Workshop agreed to omit these data from the conditioning of the baseline trials but also agreed that the sensitivity tests should include a scenario allowing for a change in selectivity post-2000 that included the post-2000 age data in the conditioning (trial NF-S3). The Workshop noted that work is in progress to check the recent age readings and recommended that the results from this work are considered during the next *Implementation Review* (scheduled for around 2021).

The final list of agreed trials is provided as Table 1.

The Workshop then reviewed the conditioning results. The full set of results for the baseline trials were available and were agreed to be acceptable. This was also true for those sensitivity trials for which results were available but it was agreed that review of the remaining trials would be undertaken intersessionally.

The final important task of the workshop was to assign plausibility to the trials following the Requirements and Guidelines. The resultant weightings are indicated in Table 1. A workplan was developed to facilitate completion of the *Implementation Review* at SC/66b.

In concluding his report, Donovan thanked Elvarsson, Allison, Punt and de Moor for their tireless computing work and the Greenland Representation for its excellent facilities.

The sub-committee thanked Donovan for chairing the Intersessional Workshop and the participants for their work during the Workshop and subsequently, in particular Elvarsson, Allison and de Moor. It **endorsed** the Workshop recommendations, including the weights assigned provisionally to the trials.

Elvarsson reported that an error had been discovered in the way the trials were conditioned (the 2003 abundance estimate for sub-area EC was assumed to pertain to 2007), which has led to the need for all of the trials to be re-conditioned. A small group (Allison, de Moor, Elvarsson, Gunnlaugsson, Johnson, Punt, Walløe) was established to review the revised conditioning results (see Appendix 2 for the full set of conditioning diagnostics and Appendix 3 for the final trial specifications). The small group recommended that trials NFU-1 and NFE-4 be assigned 'low' plausibility because of their poor fits to the tagging data (and for NFU-1 for its poor fit to the aging data) and hence dropped from further consideration. The sub-committee **agreed** with this recommendation. Table 1 lists the final set of trials and their associated weights.

3.1.2 Completion of Implementation Review

3.1.2.1 OVERVIEW AND PROCEDURE TO FOLLOW

The procedure for defining 'acceptable', 'borderline' and 'unacceptable' performance agreed by the Committee (IWC, 2007) involves conducting the following steps for each stock (or sub-stock) in an *Implementation Simulation Trial*.

[1]Approximately the lower 95% confidence interval about the observed number of recaptures under the assumption of a Poisson-like recapture process.

(1) Construct a single stock trial, which is 'equivalent' to the stock. For example, if a particular stock in the *Implementation Simulation Trial* 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 *Implementation Simulation Trial* 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 only incidental 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 *Implementation Simulation Trial* 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 *Implementation Simulation Trial* is greater than for the equivalent single stock trial with the 0.72 tuning of the *CLA* (or the 5%-ile of the minimum depletion ratio for the *Implementation Simulation Trial* is greater than 0.999), the performance of the RMP variant 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 *Implementation Simulation Trial* is greater than for the equivalent single stock trial with 0.60 tuning of the *CLA*, the performance of the RMP variant shall be classified as 'borderline'; and

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

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

The sub-committee reviewed the results of the *Implementation Simulation Trials* based on the experience gained during recent *Implementations* and *Implementation Reviews*. The purposes of the following tables range from providing a quick summary of conservation performance to listing many of the performance statistics for each trial and RMP variant. The master set of plots and tables is archived by the Secretariat and available to members of the Scientific Committee on request.

(1) A table showing for each RMP variant: the average over the trials of the lower 5%-ile, median and upper 95%-ile of catch in sub-areas WI and E/IF for the first 10 and final 10 years of the projection period and a summary of the application of the procedure for defining 'acceptable' - A, 'borderline' - B and 'unacceptable' - U performance. Results are shown separately for the 'high' and 'medium' plausibility trials.

(2) A table showing the detailed results for each trial and RMP variant. The following information is included in this table:

   (a) median catch over the entire projection period and median, lower 5%-ile and upper 5%-ile 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 ratio distribution (by stock); and

   (d) lower 5%-ile and median of the initial depletion distribution (by stock).

This table also includes the values for the thresholds for each performance statistic and stock for the trials and the outcomes of the application of the procedure for defining 'acceptable', 'borderline' and 'unacceptable' performance.

3.1.2.2 REVIEW TRIALS RESULTS

The seven management variants to be considered were as follows:

(1) Sub-area WI is a *Small Area*;

(2) Sub-area (WI+EG) is a *Small Area*. All of the Catch is taken in sub-area WI;

(3) Sub-area (WI+EG+EI/F) is a *Small Area*. All of the catch is taken in sub-area WI;

(4) Sub-area WI is a *Small Area*. Catch limits will be set based on survey estimates for sub-area WI north of 60°N (both historical and future surveys).

(5) Sub-areas WI and EG are taken to be *Small Areas* and sub-area WI+EG is taken to be a *Combination Area*. The Catch limits set for the EG *Small Area* are not taken;

(6) Sub-areas WI, EI/F and EG are taken to be *Small Areas* and sub-area WI+EI/F+EG is taken to be a *Combination Area*. The Catch limits set for the EG and EI/F *Small Areas* are not taken.

(7) Sub-areas WI+EG and EI/F are taken to be *Small Areas* and sub-area WI+EI/F+EG is taken to be a *Combination Area*. The Catch limits set for the WI+EG *Small Area* are taken in sub-area WI. The Catch limit for sub-area EI/F is taken there.

The simulated application of the RMP is always based on using the 'best' catch series.

There are a number of possible scenarios to consider when evaluating the trials, and it is at this stage that a degree of judgement is required, including consideration of the overall balance of the trials and the characteristics of the specific trials for which performance is questionable. Tables 2 and 3 summarise the application of the rules for evaluating conservation performance.

In relation to conservation performance:

(1) Variants 1, 4, 5 and 6. These variants did not have 'unacceptable' or 'borderline' conservation performance for any trials and are hence 'acceptable without research'.

(2) Variant 2. This variant had 'borderline' conservation performance for 16 of the 'medium' plausibility trials. Given the large number of trials in which conservation performance was not 'acceptable', there was no justification to consider the conservation performance of this variant to be 'acceptable'.

(3) Variant 3. This variant had 'unacceptable' conservation performance for four of the 'medium' plausibility trials, 'borderline' performance for six of the 'high' plausibility trials and 'borderline' conservation performance for 19 of the 'medium' plausibility trials. Given the large number of trials in which conservation performance was not 'acceptable', there was no justification to consider the conservation performance of this variant to be 'acceptable'.

(4) Variant 7. This variant had 'borderline' conservation performance for three of the 'medium' plausibility trials (A2-1, E2- and E3-1). The performance statistics for this variant for trial A2-1 are marginally below the thresholds for 'acceptable' performance (Fig. 3). The performance statistics for stocks C1 and C2 are halfway between 'acceptable' and 'unacceptable' thresholds for trials E2-1 and E3-1 (trials that involve ignoring the 1987/9 abundance estimates in sub-areas WI, EG & EI/F). However, overall performance was considered sufficiently close to 'acceptable' that the sub-committee considered this variant 'acceptable without research'.

Variant 7 outperforms variants 1, 4, 5 and 6 in terms of catch performance (Table 3).

3.1.3 New information

SC/66b/IA18 presented the sixth North Atlantic Sightings Survey (NASS) conducted in June-July 2015. Three vessels surveyed 7,027 nautical miles in a large area of the northern North Atlantic during 102 vessel days. The effort was similar to the earlier NASSs, but for the first time a fully independent double platform observer mode was applied. A contiguous area north and east of Iceland around Jan-Mayen Island was covered simultaneously by a Norwegian vessel as a part of an annual cyclic mosaic survey and is not presented here. One of the Icelandic survey vessels was conducting coincident fisheries surveys and collecting accompanying environmental data. Transects for the other two vessels, fully dedicated to cetacean surveying, were designed using the program Distance. A plot of the designed and initially planned tracks is given in SC/66b/RMP2. A plot of realised effort in BSS<=5 is given in SC/66b/RMP01. Observers included foreign scientists and students. Surveys were generally successful, and sightings per mile appear similar to earlier surveys, while there were more sightings in the Faroese survey area south of Iceland and around the Faroes than anticipated. Fin, common minke and long-finned pilot whales were the primary target species, but emphasis was made to identify as many sightings as possible to the species level. Consequently, 15 cetacean species were identified. During an 18 day capelin survey north of Iceland to East Greenland in September-October 2015, the same set-up was again used for cetacean surveying and resulted in only 423 nautical miles covered. A point estimate for this area was 4,923 fin whales and 7,083 humpback whales. A few minke whales were seen near the coast of Iceland while sightings of other species were few.

The sub-committee discussed the usefulness of collecting still images of sightings over video recordings, and the potential for this technology to be incorporated into observer binoculars. The sub-committee expressed interest in learning more about this technology and **recommended** that the authors of SC/66b/IA18 provide advice about the technology and its potential for use in surveys at the next meeting.

SC/66b/RMP01 provided abundance estimates for fin whales from the Icelandic and Faroese survey blocks from the NASS 2015 survey. The survey areas were further stratified to match the IWC *RMP Implementation* areas. Estimates were obtained using stratified mark-recapture distance sampling techniques in the DISTANCE 6.2 software package. Covariates were retained only if the resultant Akaike Information Criterion value was lowered. The estimate of perception bias (g(0) = 0.86) for the combined platforms for fin whales at perpendicular distance 0 was used. The perception bias provides a correction for missed sightings, but not for whales missed where one platform sees a smaller group than the other platform. In strata covered by the coincident cetacean/fisheries research vessel, some cetacean survey effort was

maintained while ferrying between transects, resulting in some transects running parallel to the Greenland or Iceland coast. These transects were aligned with expected high fin whale density gradients observed in previous surveys. Rejecting this compromised effort and using effort conducted in Beaufort sea state of less than five, the total corrected estimate for the survey area using all fin whale sightings is 40,788 (CV 0.17; 95% CI 28,476 to 58,423). Estimates are also provided including the compromised effort or excluding low confidence sightings. The estimated densities were higher than estimates from earlier surveys in the area between West Iceland and East Greenland and in the Faroese survey area south of Iceland.

The sub-committee **endorsed** the estimate of abundance for use in the *CLA*.

3.1.4 Conclusions

Based on the results of the *Implementation Simulation Trials*, variants 1,4,5,6, and 7 are acceptable in terms of conservation performance. Of these variants, variant 7 achieves the best performance in terms of catch. This completes the *Implementation Review*.

3.2 North Atlantic common minke whale (*Implementation Review*)

3.2.1 Report of intersessional workshop

Donovan reported on the intersessional workshop on the *Implementation Review* of North Atlantic common minke whales, held in Copenhagen from 19-23 March 2016. The *Implementation Review* process began with a joint AWMP/RMP workshop in 2014 (*Supp. 15, pp.545-57)* followed by a pre-meeting in 2014 (*Supp. 15, pp. 112-36)* and continued with a first intersessional workshop in 2015 (*Supp. 16. Pp. 495-506*) and discussions at the 2015 Annual Meeting. In addition, aspects of the work identified at the 2015 Annual Meeting were considered during the AWMP workshop held in (SC/66b/Rep03).

The main tasks of the Workshop were to: (1) review the results of the conditioning and finalise the trial specifications; (2) provide recommendations to the Scientific Committee related to plausibility weighting of trials; and (3) take forward work to enable the Scientific Committee to complete the *Implementation Review* at SC66b.

The Workshop was a technical workshop and much of the time was spent on improving the conditioning results. This is a substantial task given the complexity of the trials structure and considerable time was spent on improving the mixing matrices. Satisfactory conditioning was based primarily upon the consideration of factors associated with abundance estimates and sex ratio data.

The final list of agreed trials is provided as Table 4.

The Workshop then reviewed the conditioning results. After considerable work the workshop agreed that conditioning had been satisfactorily achieved for providing advice on catches by Norway and Iceland, but that aspects of the conditioning for West Greenland would need to be taken into account when developing a *Strike Limit Algorithm* for the West Greenland hunt.

The final important task of the workshop was to assign plausibility to the trials following the Requirements and Guidelines. The resultant weightings are indicated in Table 4. A workplan was developed to facilitate completion of the *Implementation Review* at SC/66b.

In concluding his report, Donovan thanked Allison, Punt and de Moor for their tireless computing work and the Greenland Representation for its excellent facilities.

The sub-committee thanked Donovan for chairing the Intersessional Workshop and the participants for their work during the Workshop and subsequently, in particular Allison and de Moor. It **endorsed** the Workshop recommendations, including the weights assigned to the trials (Table 4). Appendix 4 lists the final trial specifications for the North Atlantic minke whales.

Allison reported that, as recommended by the Workshop, she and de Moor has developed a method for setting the variation in spatial distribution to mimic the observed variation (see Section E of Appendix 4). She reported the conditioning of the trials has been completed. A small group (Allison, de Moor, Elvarsson, Gunnlaugsson, Johnson, Punt, Walløe) was established to review the revised conditioning results (see Annex D of SC/66b/Rep04 for the full set of conditioning diagnostics). The small group agreed that conditioning had been successfully achieved and this conclusion was **endorsed** by the sub-committee

3.2.2 Completion of Implementation Review

The sub-committee followed the same process for evaluating the results of the *Implementation Simulation Trials* it applied when interpreting the results of the *Implementation Simulations Trials* for the North Atlantic minke whales (see Items 3.1.2.1 and 3.1.2.2).

The five management variants to be considered were as follows:

(1) Sub-areas CIC, CM, CG, CIP, EN, EB, ESW+ESE and EW are *Small Areas*, with the catch limits for these *Small Areas* based on catch cascading from the C and E *Combination Areas*. The catch from the ESW+ESE *Small Area* is

all taken in sub-area ESE. The catch limits set for the CM, CG and CIP *Small Areas* are not taken (except that the Aboriginal catch is taken from CG);

(2) Sub-areas CIC, CM, CG, CIP, EN and EB+ESW+ESE+EW are *Small Areas*, with the catch limits for these *Small Areas* based on catch cascading from the C and E *Combination Areas*. The catch from the EB+ ESW+ESE +EW *Small Area* is all taken in sub-area EW. The catch limits set for the CM, CG and CIP *Small Areas* are not taken (except that the Aboriginal catch is taken from CG);

(3) Sub-areas CIC, CM, CG, CIP, EN, ESW+ESE, and EB+EW are *Small Areas*, with the catch limits for these *Small Areas* based on catch cascading from the C and E *Combination Areas*. The catch from the EB+ EW *Small Area* is all taken in sub-area EW and the catch from the ESW+ESE *Small Area* is taken in the ESE sub-area. The catch limits set for the CM, CG and CIP *Small Areas* are not taken (except that the Aboriginal catch is taken from CG);

(4) As for variant 1, except that sub-areas CIC+CIP+CM are a single *Small Area* and all of the catches from this *Small Area* are taken in sub-area CIC. The catch limits set for the CG *Small Area* are not taken (except that the Aboriginal catch is taken); and

(5) Sub-areas CIP+CIC+CG+CM, EN, EB, ESW+ESE and EW are *Small Areas*, with the catch limits for the E *Small Areas* based on catch cascading from the E *Combination Area*. All the catches from CIP+CIC+CG+CM *Small* Area are taken in sub-area CIC (after taking the Aboriginal catch from CG) and those for the ESW+ESE *Small Area* are taken in sub-area ESE.

3.2.2.1 REVIEW TRIAL RESULTS

The trials were conducted. However, there was insufficient time to finalise interpretation of the results before the end of the sub-committee. The sub-committee **agreed** that work to finalise the analyses should continue and the results reported to the Plenary. In the event that it is not possible to complete the *Implementation Review* during the Plenary, the work can be continued during a two-day pre-meeting before the planned AWMP workshop (see Annex E, Item 3).

3.2.3 New information

SC/66b/RMP02 provided abundance estimates for common minke whales from the NASS 2015 Iceland – Faroese survey blocks that were further stratified according to the IWC *RMP Implementation* areas. Covariates were retained only if the resultant Akaike Information Criterion value was lowered. The estimate of perception bias ($g(0) = 0.51$) for the combined platforms for minke whales at perpendicular distance 0 was used for the first time to produce abundance estimates from NASS shipboard surveys. In strata covered by the coincident cetacean/fisheries research vessel some cetacean survey effort was maintained while ferrying between transects, resulting in some transects running parallel to the Greenland or Iceland coast. These transects were aligned with expected high whale density gradients observed in previous surveys. Rejecting this compromised effort and using only effort in conducted in a Beaufort sea state of less than four, the total corrected estimate for the survey area using all minke whale sightings is 36,185 (cv 0.31; 95% CI 19,942 to 65,658). The highest densities were, as in earlier surveys, observed in Icelandic coastal waters, close to the east coast of Greenland, and around the Faroes. Notably, in 2015 no minke whales were seen to the north of Iceland, an area of high density in previous years. However, realised effort in this area was very low in 2015 due to unfavorable weather, which impacted the estimate for the coastal Iceland area of 12,710 (cv 0.53; 95% CI 4,498 to 35,912). The estimate is in the low range of recent corrected aerial survey estimates for this area. An aerial survey in this area was unsuccessful in 2015 due to the poor weather conditions. The uncorrected estimate is similar to earlier vessel survey estimates generated for this area, and estimated densities are also similar in most other areas, while the estimated minke whale density around the Faroes has varied considerably.

The sub-committee **endorsed** the abundance estimates for use in the *CLA*.

The sub-committee discussed the distinction between availability and perception bias for ship and aerial surveys. The sub-committee **agreed** that the distinction between availability and detection bias for ship-board surveys was somewhat arbitrary and dependent on the exact analysis method employed. It **recommended** that a footnote be added to the table in Section 4 to define how g(0) should be interpreted for different estimates.

SC/66b/RMP03 presented preliminary abundance estimates of common minke whales in Northeast Atlantic areas covered by Norwegian surveys over the two years 2014-15. These areas comprise the RMP *Small Management Areas* ES (2014), EW (2015) and part of CM (2015). Cetaceans were searched for by naked eye from two independent platforms, each manned with two observers following the protocols established for these surveys and used in previous survey cycles. The analyses have followed the same lines as in previous analyses. However, the estimated abundance of 48,232 minke whales is given as point estimates only because the final variance estimation calculations remain uncalculated. The 40% drop in abundance in the Jan Mayen area, which was observed in the survey cycle 2008-2013, as compared to the abundances estimated for the two foregoing survey cycles, seems to have been reversed in 2015. The abundance in 2015 was three times that of 2011 in one major survey block (CM3) in the Jan Mayen area. The minke whale abundance attributed to the Norwegian Sea is apparently stable. The minke whale abundance in the Svalbard area (ES) in 2014 decreased to 45% of the abundance from 2008, indicating a distributional shift. The authors of SC/66b/RMP03 suggest that understanding the scale of the shifts is important for estimating population abundance.

The sub-committee discussed issues related to the likely effect of systematic variation of multi-year surveys on estimated variances, which are currently combined using random effects modelling, the effect of differential yearly patterns of re-sighting, and the effect of changing strip half-widths among years. The sub-committee **recommended** that results from analyses regarding effect strip half-width be presented in 2017, that the abundance estimates not be accepted and the abundance estimates be re-submitted after further work.

SC/64/RMP06 summarised a sighting survey conducted in the eastern Norwegian Sea in the Small Management Area (EW) and at Jan Mayen within the Small Management Area (CM) during the summer 2015. This was the second year of the ongoing six-year survey program (2014-19) for minke whales in the northeast Atlantic with EW as the target area. In addition, an extension was made to the Jan Mayen area as part of the NASS-2015 survey effort. One vessel covered these areas over the period 22 June to 30 August 2016. Three designed survey blocks within EW and two survey blocks within CM were covered during the period. In total, 4,343 nautical miles were conducted in primary search mode. During the primary search, the established sightings procedures, including double platform and tracking of minke whales, were followed as in previous surveys in which minke whales have been the primary target species. The most common species sighted were minke whales, fin whales and sperm whales. In addition, sightings were made of white-beaked dolphins, killer whales, humpback whales, blue whales, harbour porpoises, white-sided dolphins and Northern bottlenose whales.

Øien advised the sub-committee that next year the plan is to survey the Barents Sea which will require access to Russian EEZ. Without such access the final abundance estimates will be compromised and not complete. The sub-committee **recommends** that the Commission request the relevant authorities in Russia to grant permission to a Norwegian vessel to survey the planned areas in Russian EEZ of the Barents Sea. The sub-committee appointed Øien to provide oversight on its behalf.

3.2.4 Conclusions and recommendations

Conclusions and recommendations may be drawn during the Plenary should final results be available, but see Item 3.2.2.1.

3.3 North Pacific common minke whales

3.3.1 Review new information

The sub-committee considered SC/66b/JR11 and SC/66b/JR12, which were submitted to the Final Review of JARPN II Expert Panel in 2016. SC/66b/JR11 presented estimates of common minke whales distributed in JARPN II coastal survey areas.

The sub-committee noted that the abundance estimates were not for the whole of the stock(s), but rather for small coastal sub-areas that were surveyed. The *Small Area* abundance estimates presented in Table 1 of that paper were not corrected for $g(0)$. The authors noted that an estimate of $g(0)$ for Japanese research boats in the North Pacific was developed by Okamura *et al.* (2010) of 0.798 with a CV of 0.134. This estimate was used in most of the *Implementation Simulation Trials* (e.g. IWC, 2012b, p.113). The sub-committee **recommends** continued development of appropriate confidence intervals for $g(0)$ be developed (e.g. using resampling approaches). This information will be of value in the expected 2018 *Implementation Review* of western North Pacific common minke whales, particularly in the context of also estimating additional variance.

SC/66b/RMP05 described a survey plan for a 2017 survey in Korean waters. The sub-committee noted that ideally surveys should be conducted taking the migration patterns of the surveyed animals into account (if these are known). It noted that one block will be surveyed north to south and another south to north. Park was appointed to provide oversight on behalf of the Committee.

Japanese scientists advised that they had decided not to proceed with a 'variant with research' plan. In their view research results reported from the JARPN II research programme indicated that some of the stock structure hypotheses for the previous *Implementation Simulation Trials* were no longer compatible with the data. Accordingly they considered those *Implementation Simulation Trials* flawed and in need of revision, so that development of the research plan linked to those *Implementation Simulation Trials* should be put on hold until an *Implementation Review* is conducted, and perhaps leads to different RMP variants requiring such attention.

Therefore there is no plan by Japan to submit a 'variant with research' plan in 2017.

The sub-committee noted discussion of stock structure for western North Pacific minke whales by the SD working group (see Item 3.2.2.1 of Annex I). It thanked the SD working group and **agreed** that the information provided did not change its plan for the next *Implementation Review* to start in 2018 as anticipated.

3.4 Western North Pacific Bryde's whales

Regular *Implementation Reviews* are required under the RMP. The Committee is initiating the first *Implementation Review* for North Pacific Bryde's whales since the original *Implementation* was completed in 2007. This *Implementation Review* was originally scheduled for 2013. However, in 2012, the Committee postponed the *Implementation Review* until 2016 to allow additional sightings and genetics data to be available and analysed (IWC, 2013). The Committee has agreed that this will be a full *Implementation Review* given there is considerable new information on stock structure and abundance.

The sub-committee established a Steering Group: Donovan (Chair), Allison, Butterworth, Kitakado, Miyashita, Pastene and Punt to guide the *Implementation Review* and to plan for an Intersessional Workshop for next year.

3.5 Work plan

Before the 2017 Annual Meeting	During the 2017 Annual Meeting
	(1) North Atlantic fin whales: Review new abundance estimates (Item 3.1).
	(2) North Atlantic minke whales: Review new abundance estimates (Item 3.2).
	(3) Western North Pacific minke whales: (a) review stock structure hypotheses in light of the new information submitted (b) agree the estimates of abundance for use in actual applications of the RMP (Item 3.3).
(5) Western North Pacific Bryde's whales (a) Conduct the First Intersessional Workshop[2] (Item 3.4) (b) Code the resulting trials and condition the trials (Item 3.4)	(4) Western North Pacific Bryde's whales Conduct the work required for the First Annual Meeting (Item 3.4)

Before the 2018 Annual Meeting	During the 2018 Annual Meeting
	(1) North Atlantic fin whales: Review new abundance estimates (Item 3.1).
	(2) North Atlantic minke whales: Review new abundance estimates (Item 3.2).
	(3) Western North Pacific minke whales: (a) Review new abundance estimates (Item 3.2). (b) Plan for the *Implementation Review*
(6) Western North Pacific Bryde's whales (c) Conduct the Second Intersessional Workshop (Item 3.4)	(4) Western North Pacific Bryde's whales Conduct the work required for the Second Annual Meeting (Item 3.4)

4. ABUNDANCE ESTIMATES

The sub-committee provided an updated list of abundance estimates (Table 5).

5. BUDGET ISSUES

Three intersessional Workshops are proposed:

(1) a Workshop held as a pre-meeting before SC/67a to test the proposed new Guidelines against several test cases of model-based abundance estimates made specifically for and during the Workshop and to demonstrate and discuss the proposed diagnostic software with a wider Committee audience involved in basic line-transect abundance estimation (Convenor: Butterworth) (already funded; Item 2.2); and

(2) two intersessional Workshops (one in early 2017 and another in early 2018) to conduct the *Implementation Review* for North Pacific Bryde's whales (Convenor: Donovan) (£20,000 over two years; Item 3.5).

The sub-committee supported the proposal for computing support, without which it will be impossible to conduct all the computing tasks required to complete the upcoming *Implementation Reviews*.

6. ADOPTION OF REPORT

The Report was adopted at 17:34 on 15 June 2016. The sub-committee thanked Bannister for his excellent Chairmanship, and Punt for his indefatigable rapporteuring.

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Table 1

The agreed final *Implementation Simulation Trials* for North Atlantic fin whales. All trials assume the following unless otherwise stated: the 'Best' catch series; future surveys will occur in sub-areas EG, WI and EI/F; and *g*(0) is taken to be equal to 1. Trial weightings are also shown (H=high and M=medium). Trials assigned 'low' plausibility during the current meeting and not included in the final evaluation are indicated as strike-through font.

Trial No.	Stock Hypothesis	*MSYR*[3]	No. of Stocks	Trial description	Weight 1%	Weight 4%
Baseline						
NF-B1	I	1, 4%	4	4 stocks, separate feeding areas	M	H
NF-B2	II	1, 4%	4	4 stocks; 'W' & 'E' feed in central sub-areas	M	H
NF-B3	III	1, 4%	4	4 stocks; 'C1' & 'C3' feed in adjacent sub-areas	M	H
NF-B5	V	1, 4%	4	4 stocks as in Hypothesis I but stock 'S' in adjacent sub-areas	M	H
NF-B6	VI	4%	3	3 stocks (no 'E' stock)	n/a	H
Sensitivity						
NF-H2	II	1, 4%	4	High historical catch series	M	M
NF-H3	III	1, 4%	4	High historical catch series	M	M
NF-Q3	III	1, 4%	4	Future WI & EI/F surveys exc. strata S 60ºN	M	M
NF-A2	II	1, 4%	4	Pro-rate abundance data for conditioning	M	M
NF-A3	III	1, 4%	4	Pro-rate abundance data for conditioning	M	M
NF-U3	III	~~1~~,4%	4	Selectivity decreases by 4%/yr for age 8+; *M*=0.04	~~M~~	M
NF-G2	II	1, 4%	4	C2 sub-stock enters EG beginning yr 1985 (opt. a)	M	M
NF-G3	III	1, 4%	4	C2 sub-stock enters EG beginning yr 1985 (opt. a)	M	M
NF-F2	II	1, 4%	4	C2 sub-stock enters EG 1985-2025 (opt. b)	M	M
NF-F3	III	1, 4%	4	C2 sub-stock enters EG 1985-2025 (opt. b)	M	M
NF-S3	III	1, 4%	4	Selectivity estimated for pre and post 2000 & use all age data	M	M
NF-Y1	I	1, 4%	4	8 year future survey interval	M	H
NF-Y1	II	1, 4%	4	8 year future survey interval	M	H
NF-Y3	III	1, 4%	4	8 year future survey interval	M	H
NF-Y5	V	1, 4%	4	8 year future survey interval	M	H
NF-Y6	VI	1, 4%	3	8 year future survey interval	n/a	H
NF-E2	II	1, 4%	4	Exclude 1987/9 abundance in WI, EG & EI/F	M	M
NF-E3	III	1,~~4~~%	4	Exclude 1987/9 abundance in WI, EG & EI/F	M	~~M~~
NF-D1	I	1%	4	Dispersal: max bound of 20%	M	
NF-D3	III	1%	4	Dispersal: max bound of 20%	M	
NF-J1	II	1, 4%	4	Assume *g*(0) = 0.8 (all estimates)	M	H
NF-J2	III	1, 4%	4	Assume *g*(0) = 0.8 (all estimates)	M	H

Table 2

Summary of the 'high' and 'medium' plausibility trials on which each of the variants failed to achieve 'acceptable' performance. None of the variants were 'unacceptable' on 'high' plausibility trials.

Variant	High plausibility Borderline	Medium plausibility Unacceptable	Medium plausibility Borderline	Recommendation
1	None	None	None	Acceptable
2	None	None	A2-1, A3-1, B1-1, B2-1, B3-1, B5-1, D1-1, D3-1, 2-1, E2-4, E3-1, H2-1, H3-1, S3-1, Y2-1, Y3-1	Unacceptable
3	B1-4, B2-4, B3-4, Y1-4, Y2-4, Y3-4,	E2-1, E2-4, H2-4, H3-4	A2-1, A3-1, A3-4, B2-1, B3-1, D1-4, D3-1, D3-4, E3-1, E3-4, F2-4, H2-1, H3-1, J2-1, Q3-1, S3-1, S3-4, U3-4, Y3-1	Unacceptable
4	None	None	None	Acceptable
5	None	None	None	Acceptable
6	None	None	None	Acceptable
7	None	None	A2-1, E2-1, E3-1	Acceptable

[3]MSYR in terms of 1^+ on 1% and mature on 4%.

Table 3

Summary of the conservation and catch performance of the seven RMP variants.

Variant	Trial weight	Acceptable	Borderline	Unacceptable	-- Catch first 10 years --			-- Catch last 10 years --		
					Mean 5%	Mean med	Mean 95%	Mean 5%	Mean med	Mean 95%
1	H	12	0	0	15	18	22	0	6	34
2	H	12	0	0	83	86	89	42	90	121
3	H	6	6	0	120	127	135	64	103	144
4	H	12	0	0	4	7	11	0	1	16
5	H	12	0	0	31	33	36	10	25	45
6	H	12	0	0	34	36	40	11	20	34
7	H	12	0	0	121	128	135	64	104	145
1	M	40	0	0	15	18	23	7	30	54
2	M	24	16	0	84	87	90	80	115	144
3	M	17	19	4	118	127	135	64	115	161
4	M	36	0	0	4	8	12	2	16	39
5	M	40	0	0	31	33	37	24	42	60
6	M	40	0	0	33	36	41	18	31	46
7	M	37	3	0	118	127	136	63	114	161

Table 4

The *Implementation Simulation Trials* for North Atlantic minke whales.

Trial No.	Stock Hypothesis	*MSYR*	No. of Stocks	Boundaries	Catch sex-ratio for selectivity	Trial Weight	Notes
NM01-1	I	1%[1]	3	Baseline	2008-13	M	3 stocks, E and W with sub-stocks
NM01-4	I	4%[2]	3	Baseline	2008-13	H	3 stocks, E and W with sub-stocks
NM02-1	II	1%[1]	2	Baseline	2008-13	M	2 stocks, E with sub-stocks
NM02-4	II	4%[2]	2	Baseline	2008-13	H	2 stocks, E with sub-stocks
NM03-1	III	1%[1]	1	Baseline	2008-13	M	1 stock
NM03-4	III	4%[2]	1	Baseline	2008-13	M	1 stock
NM04-1	IV	1%[1]	2	Baseline	2008-13	M	2 cryptic stocks
NM04-4	IV	4%[2]	2	Baseline	2008-13	M	2 cryptic stocks
NM05-1	I	1%[1]	3	Stock C not in ESW	2008-13	M	3 stocks, E and W with sub-stocks
NM05-4	I	4%[2]	3	Stock C not in ESW	2008-13	M	3 stocks, E and W with sub-stocks
NM06-1	II	1%[1]	2	Stock C not in ESW	2008-13	M	2 stocks, E with sub-stocks
NM06-4	II	4%[2]	2	Stock C not in ESW	2008-13	M	2 stocks, E with sub-stocks
NM07-1	I	1%[1]	3	Baseline	2002-07	M	Alternative years to adjust selectivity-at-age
NM07-4	I	4%[2]	3	Baseline	2002-07	M	Alternative years to adjust selectivity-at-age
NM09-1	I	1%	3	Baseline	2008-13	M	E-2 stock in EN 10%
NM09-4	I	4%	3	Baseline	2008-13	M	E-2 stock in EN 10%
NM10-1	I	1%	3	Baseline	2008-13	M	E-2 stock in EN 90%
NM10-4	I	4%	3	Baseline	2008-13	M	E-2 stock in EN 90%
NM12-1	I	1%[1]	3	Stock E1 not in ESW	2008-13	M	3 stocks, E and W with sub-stocks
NM12-4	I	4%[2]	3	Stock E1 not in ESW	2008-13	M	3 stocks, E and W with sub-stocks
NM13-1	II	1%[1]	2	Stock E1 not in ESW	2008-13	M	2 stocks, E with sub-stocks
NM13-4	II	4%[2]	2	Stock E1 not in ESW	2008-13	M	2 stocks, E with sub-stocks
NM01-1v	I	1%[1]	3	Baseline	2008-13	M	CV of future abundance = ½ basecase value
NM01-4v	I	4%[2]	3	Baseline	2008-13	H	Ditto
NM02-1v	II	1%[1]	2	Baseline	2008-13	M	Ditto
NM02-4v	II	4%[2]	2	Baseline	2008-13	H	Ditto
NM03-1v	III	1%[1]	1	Baseline	2008-13	M	Ditto
NM03-4v	III	4%[2]	1	Baseline	2008-13	M	Ditto
NM04-1v	IV	1%[1]	2	Baseline	2008-13	M	Ditto
NM04-4v	IV	4%[2]	2	Baseline	2008-13	M	Ditto

[1] – 1+; [2] –mature

Table 5
New and revised abundance estimates accepted by the sub-committee (see Annex S for an explanation of the column headings).

i) North Atlantic

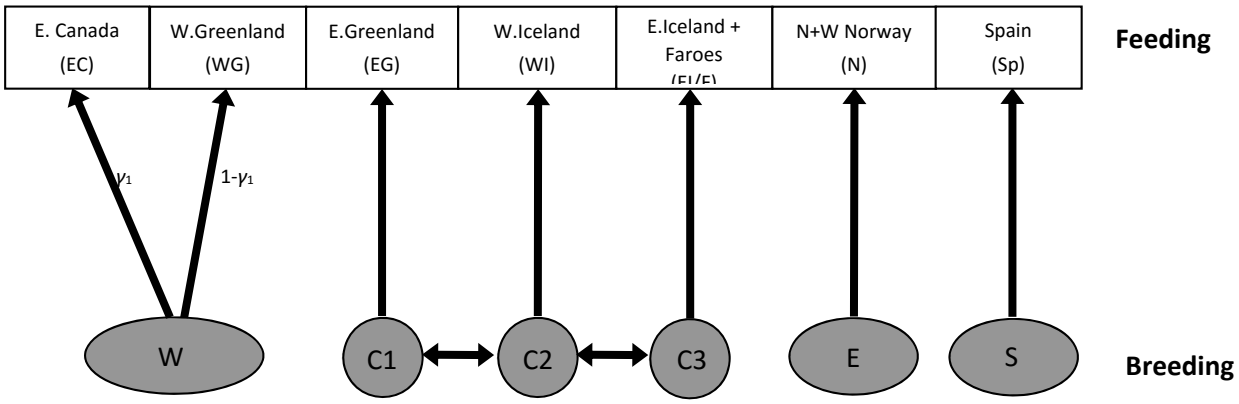
Note. Care should be taken regarding the interpretation of g(0) because the distinction between availability and detection bias for ship-board surveys is somewhat arbitrary and dependent on the exact analysis method employed.

Species	Sub-area	Cat.	RMP status	Year	Method	Cor.	Estimate	CV	Approx. 95% CI	Reference	Notes
Fin	Icelandic & Faroese survey blocks (Subareas EG, WI & EI/F)	1	I	2015	LT	A+P	40,788	0.17	28,476-58,423	SC/66b/RMP01	g(0) = 0.86
C. minke	Coastal Iceland (CIC subarea)	1	I	2015	LT	A+P	12,710	0.53	4,498-35,912	SC/66b/RMP02	g(0) = 0.51
C. minke	Icelandic and Faroese survey blocks (inc. CIC)	1	I	2015	LT	A+P	36185	0.31	19,942-65,658	SC/66b/RMP02	g(0) = 0.51

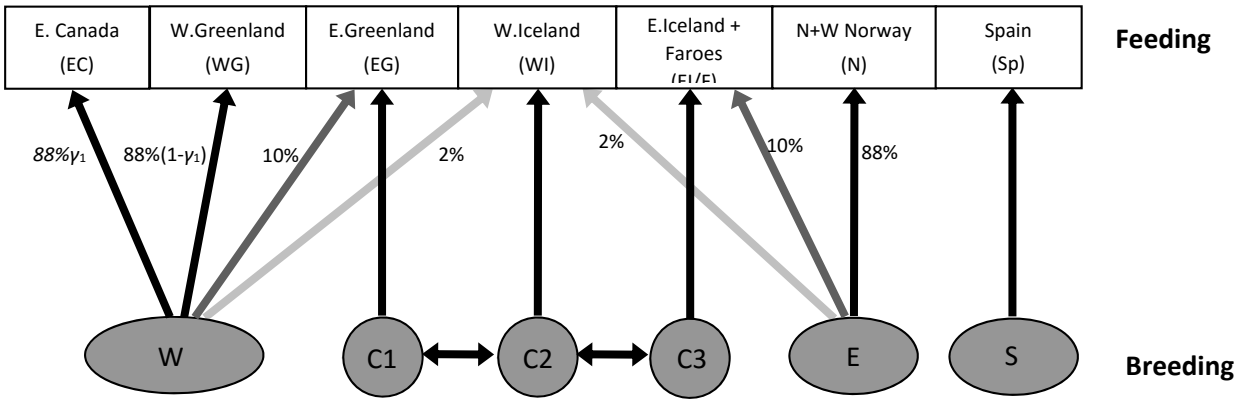
ii) North Pacific

Species	Sub-area	Cat.	Eval. Ext.	Year	Method	Cor.	Estimate	CV	Approx. 95% CI	Reference	Notes
C. minke	7CS	2	1	2012	LT	P	537	0.346	269-1,070	SC/66b/Rep06	May-Jun. Replaces estimate of 890 cv 0.393 (Hakamada et al 2013, IWC 2014)
C. minke	7CN	2	1	2012	LT	P	542	0.601	164-1,790	SC/66b/Rep06 SC/F16/JR11	May-Jun. Replaces estimate of 302 cv 0.454 (Hakamada et al 2013, IWC 2014)
C. minke	7CN	2	1	2012	LT	P	599	0.525	205-1,757	SC/66b/Rep06 SC/F16/JR11	Jul-Aug. Replaces estimate of 389 cv 0.507 (Hakamada et al 2013, IWC 2014)
C. minke	N of 35N, 140E-170E			2008	LT		3,080	0.677	800-11,600	SC/66b/Rep06 SC/F16/JR12	

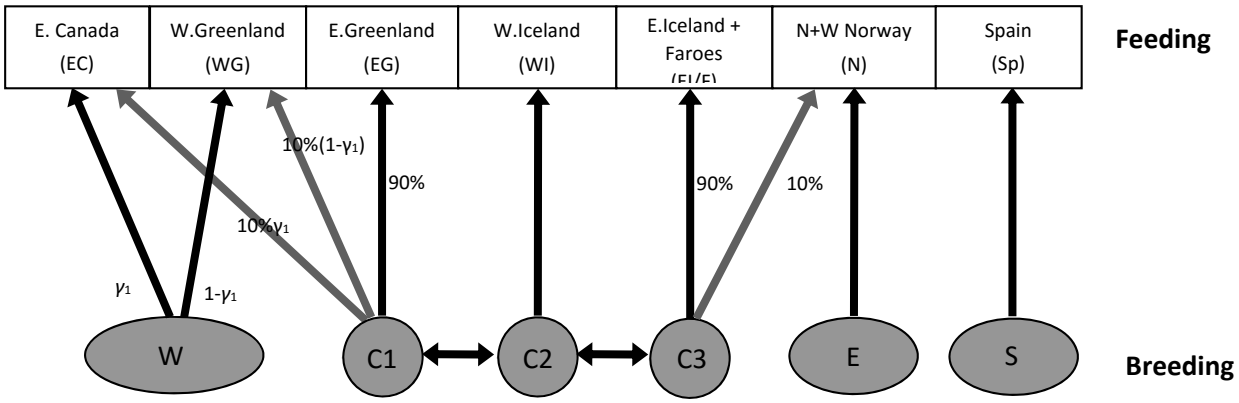
Hypothesis (I). Base case: 4 breeding stocks with separate feeding sub-areas.



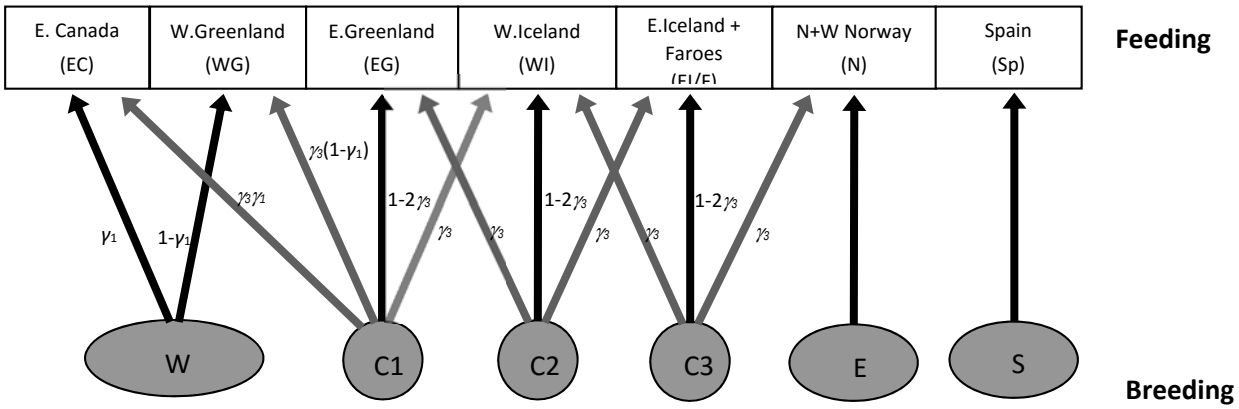
Hypothesis (II). 4 breeding stocks with the W and E stocks also feeding in the central sub-areas.



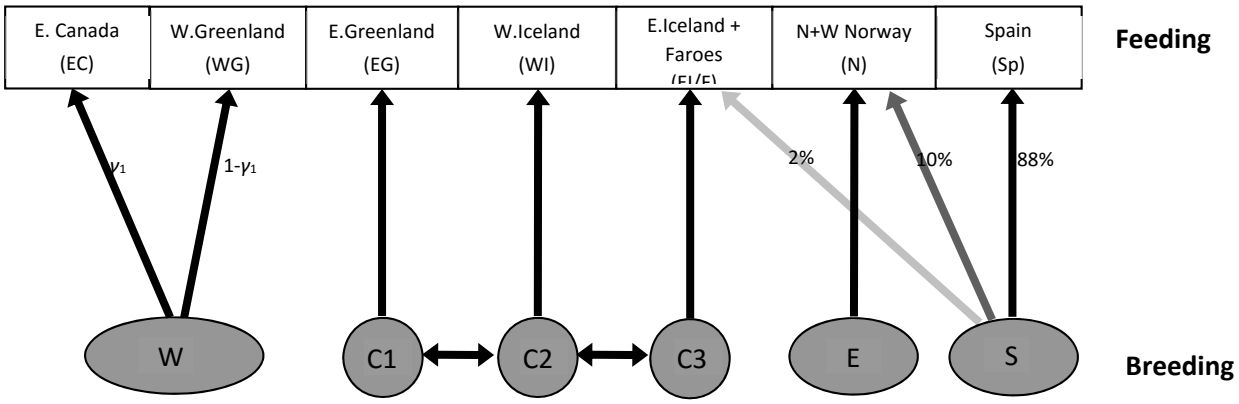
Hypothesis (III). 4 breeding stocks with the 3 C sub-stocks feeding in the adjacent sub-areas.



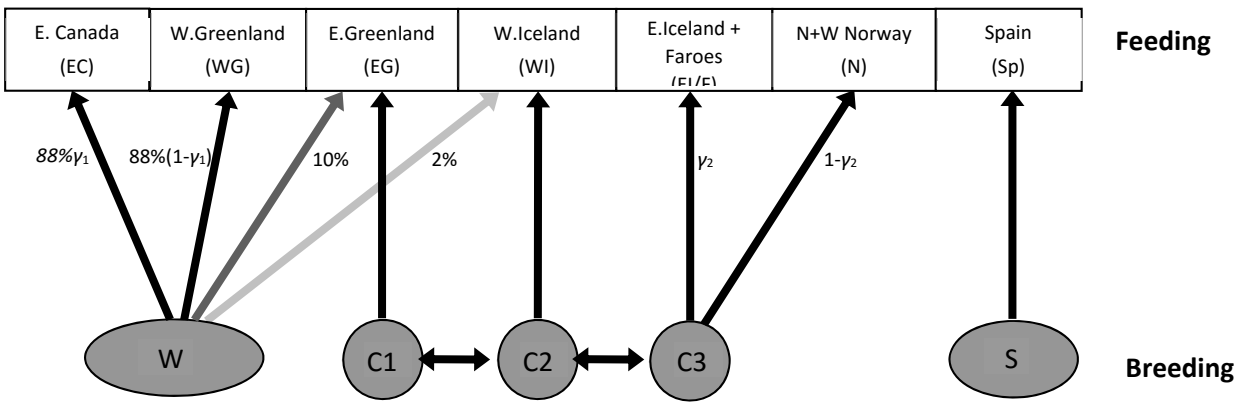
Hypothesis (IV). 4 breeding stocks but without dispersion between the C sub-stocks.



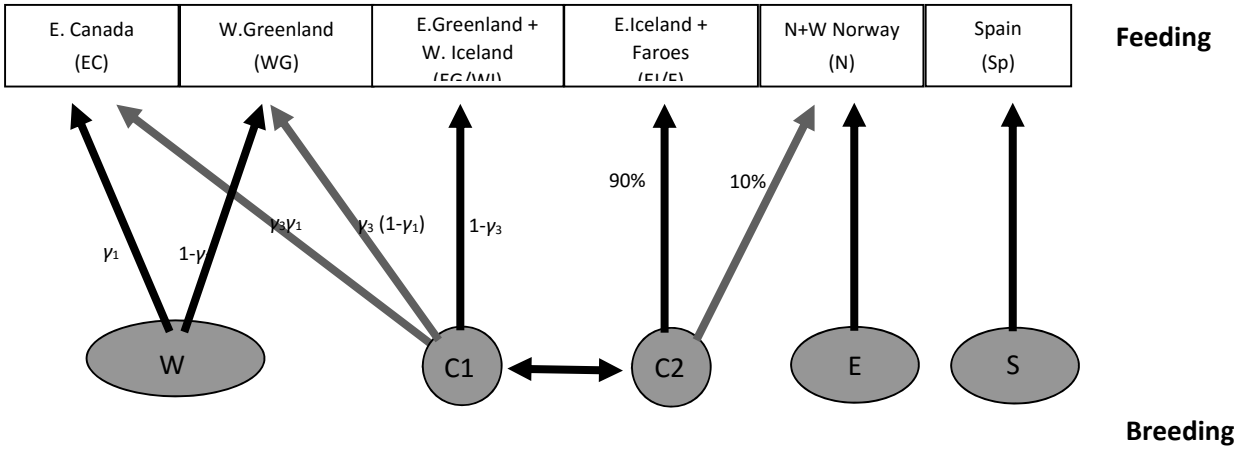
Hypothesis (V). 4 breeding stocks with the S stock feeding in the two adjacent sub-areas.



Hypothesis (VI). 3 breeding stocks.



Hypothesis (VII). 4 breeding stocks with the 2 C sub-stocks feeding in the adjacent sub-areas. Sub-areas EG and WI are combined.



Hypothesis (VIII). 4 breeding stocks with the 2 C sub-stocks feeding in the adjacent sub-areas. Sub-areas EG and WI are combined.

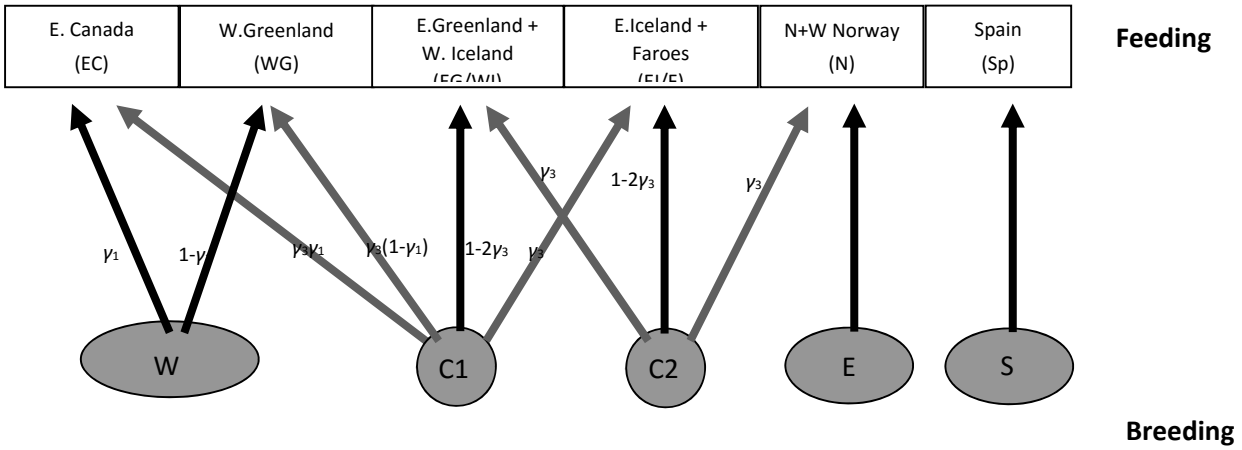


Fig. 1. Stock structure hypotheses for North Atlantic fin whales.

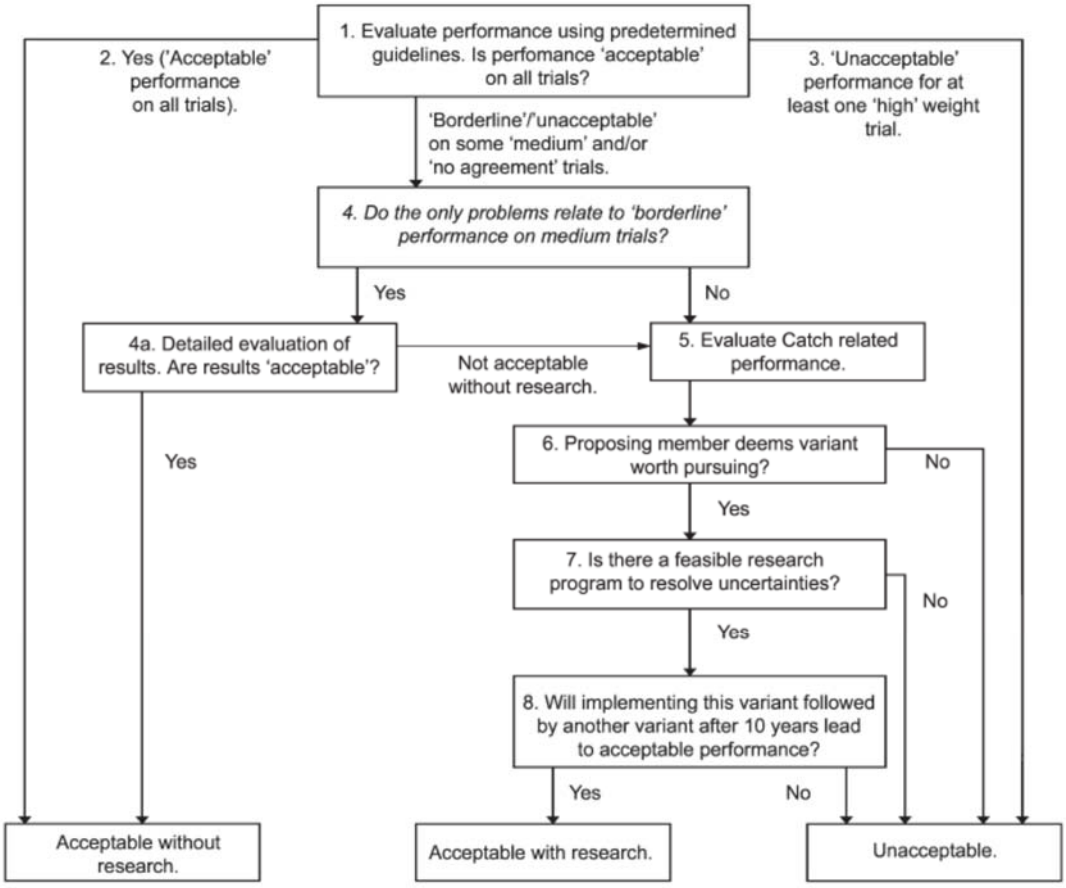


Fig. 2. Flowchart summarising the procedure for review of *IST*s (from IWC, 2005).

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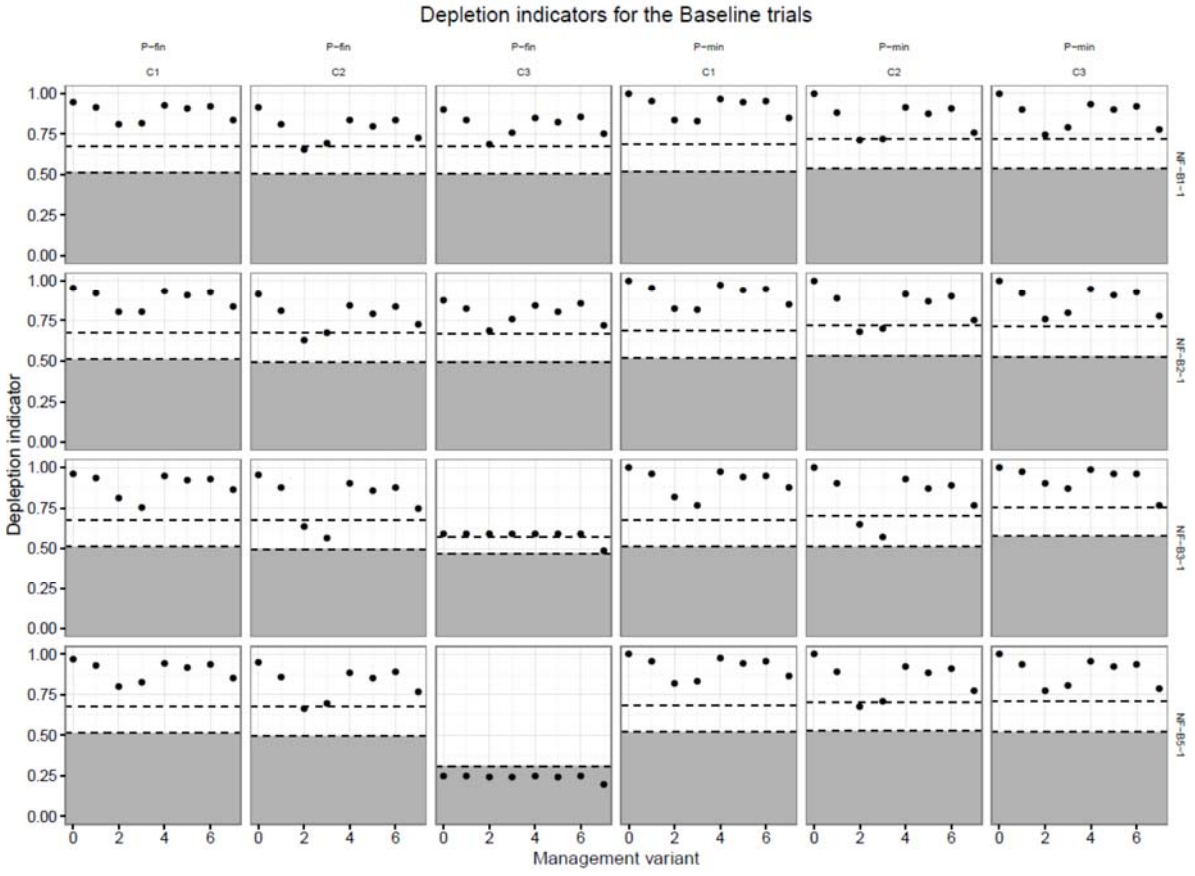
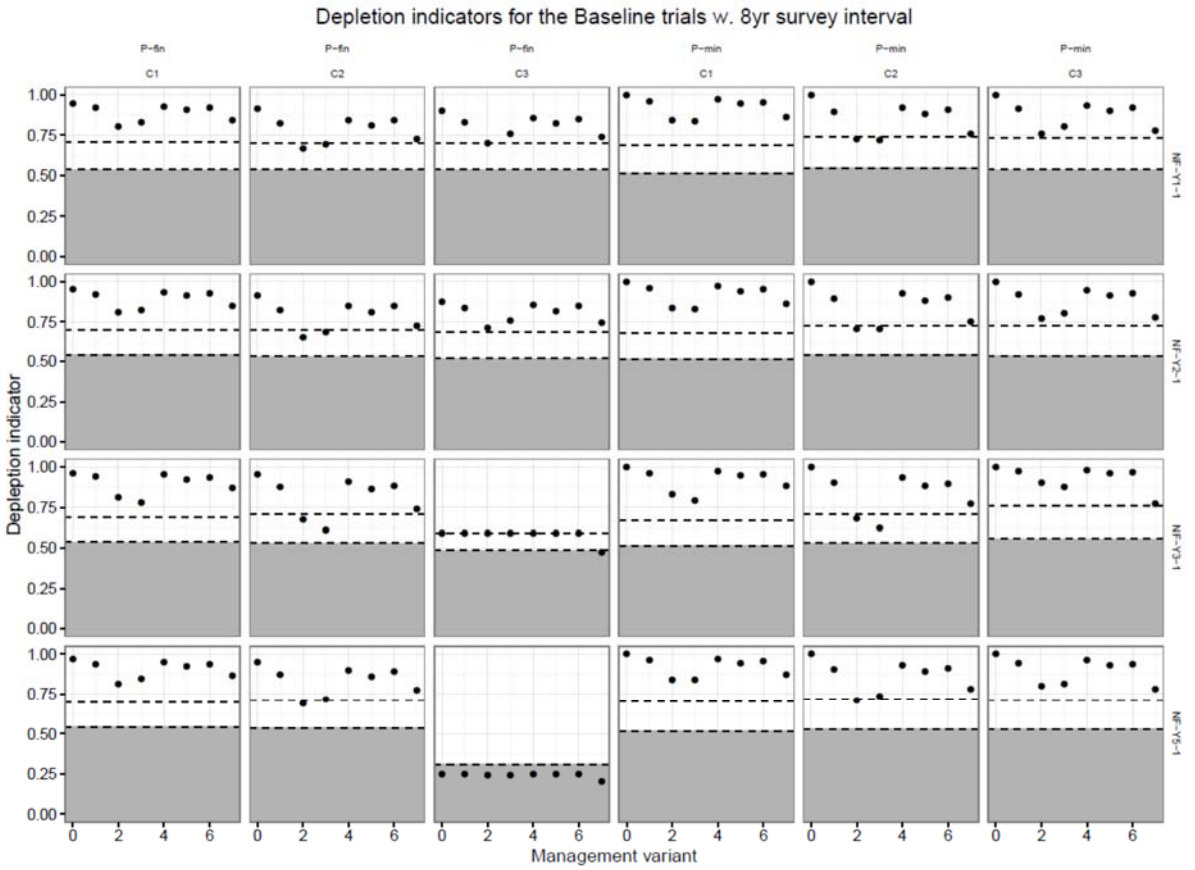
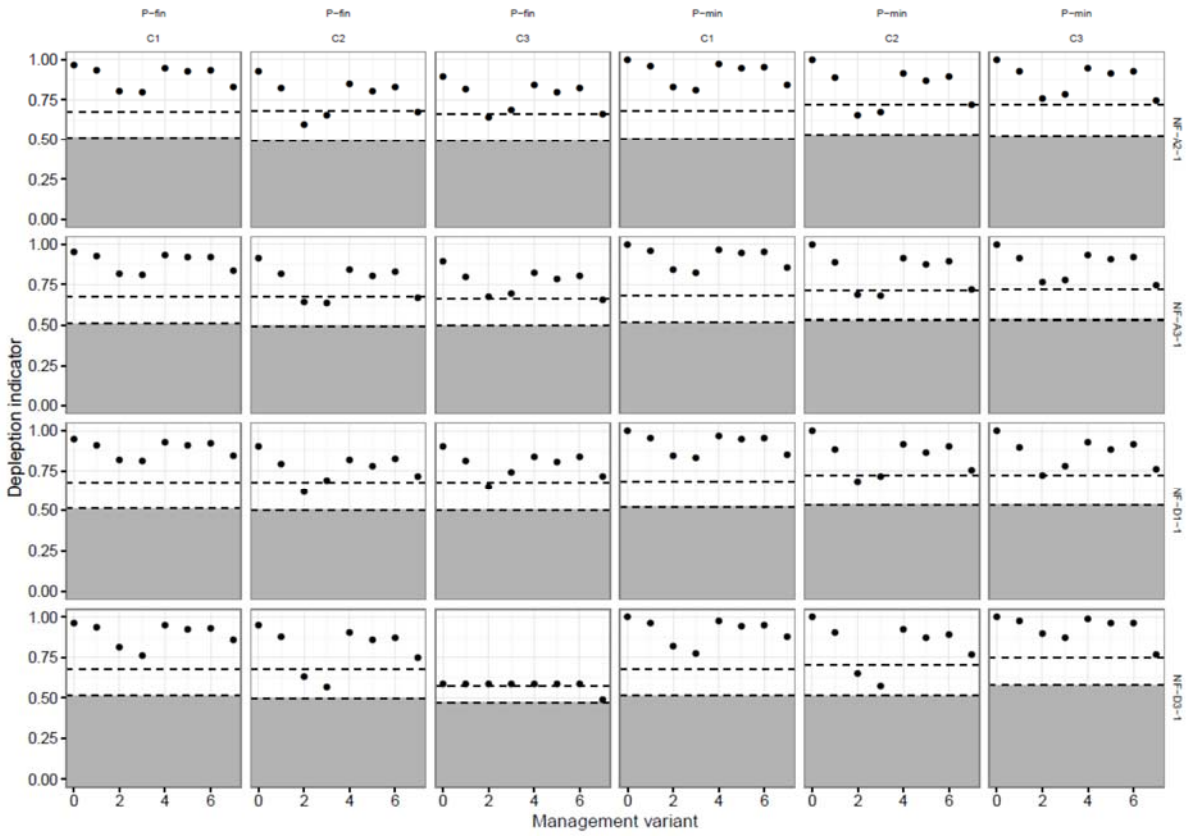
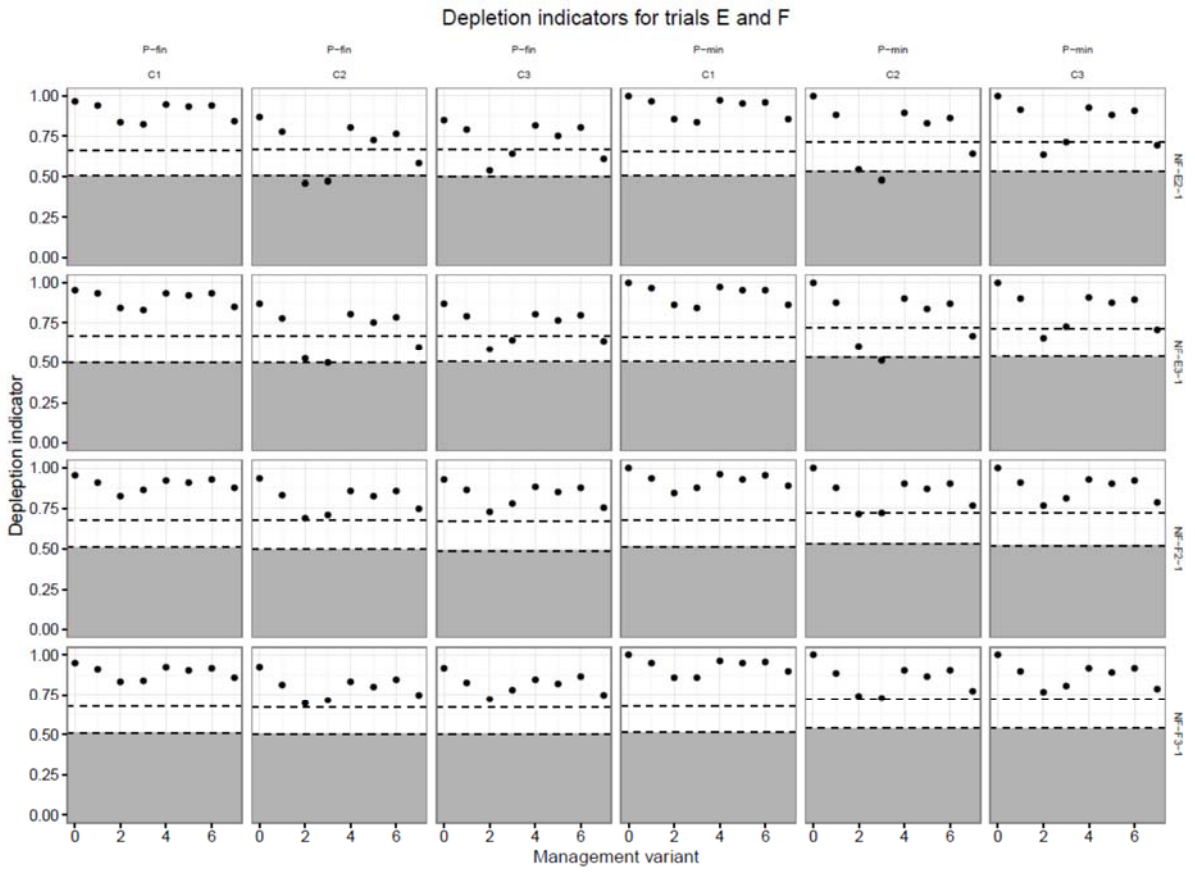
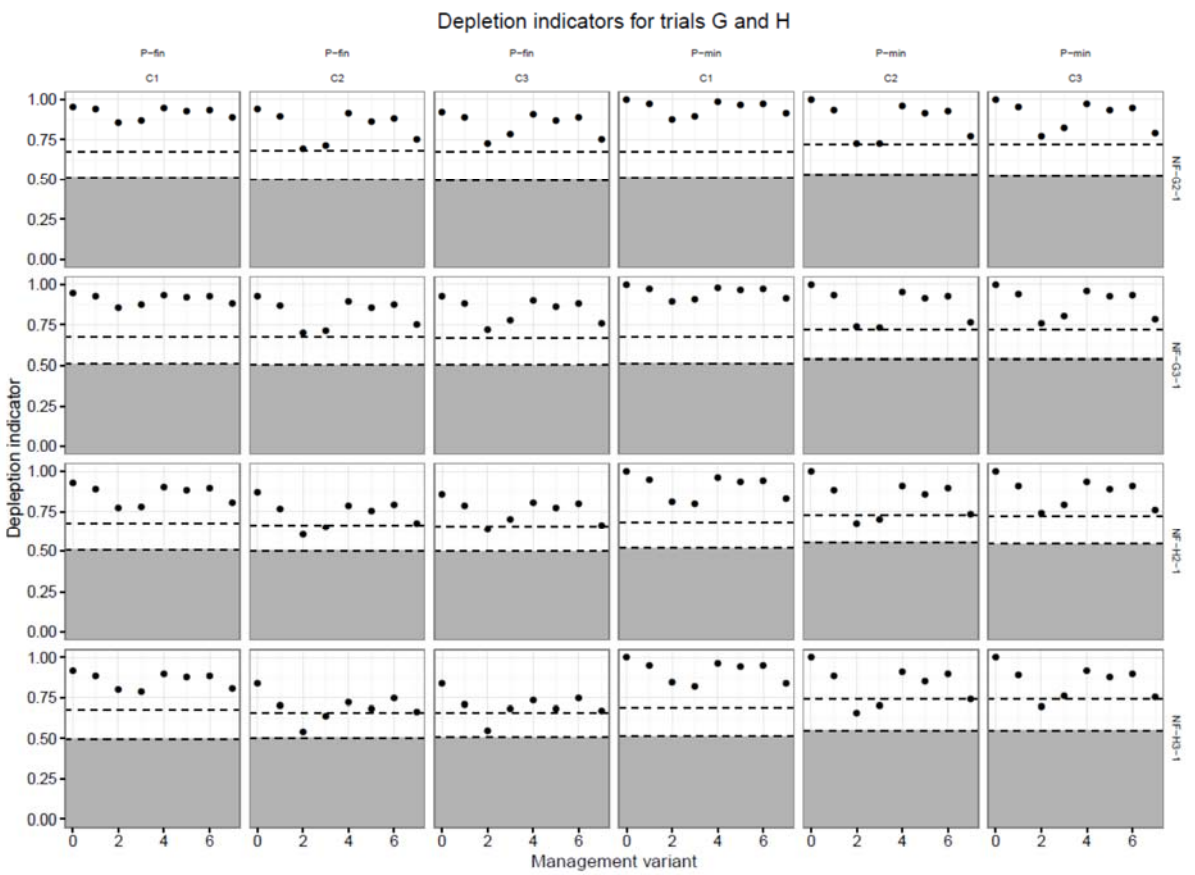



Depletion indicators for the Baseline trials w. 8yr survey interval
P~fin
P~min
C1
C2
C3
NF~Y1~1
NF~Y2~1
NF~Y3~1
NF~Y4~1
Depletion indicator
Management variant


Depletion indicators for trials A and D
P~fin
P~min
C1
C2
C3
NF~A2~1
NF~A3~1
NF~D1~1
NF~D3~1
Depletion indicator
Management variant


Depletion indicators for trials E and F
P~fin
P~min
C1
C2
C3
NF~E2~1
NF~E3~1
NF~F2~1
NF~F3~1
Depletion indicator
Management variant


Depletion indicators for trials G and H
P~fin
P~min
C1
C2
C3
NF~G2~1
NF~G3~1
NF~H2~1
NF~H3~1
Depletion indicator
Management variant

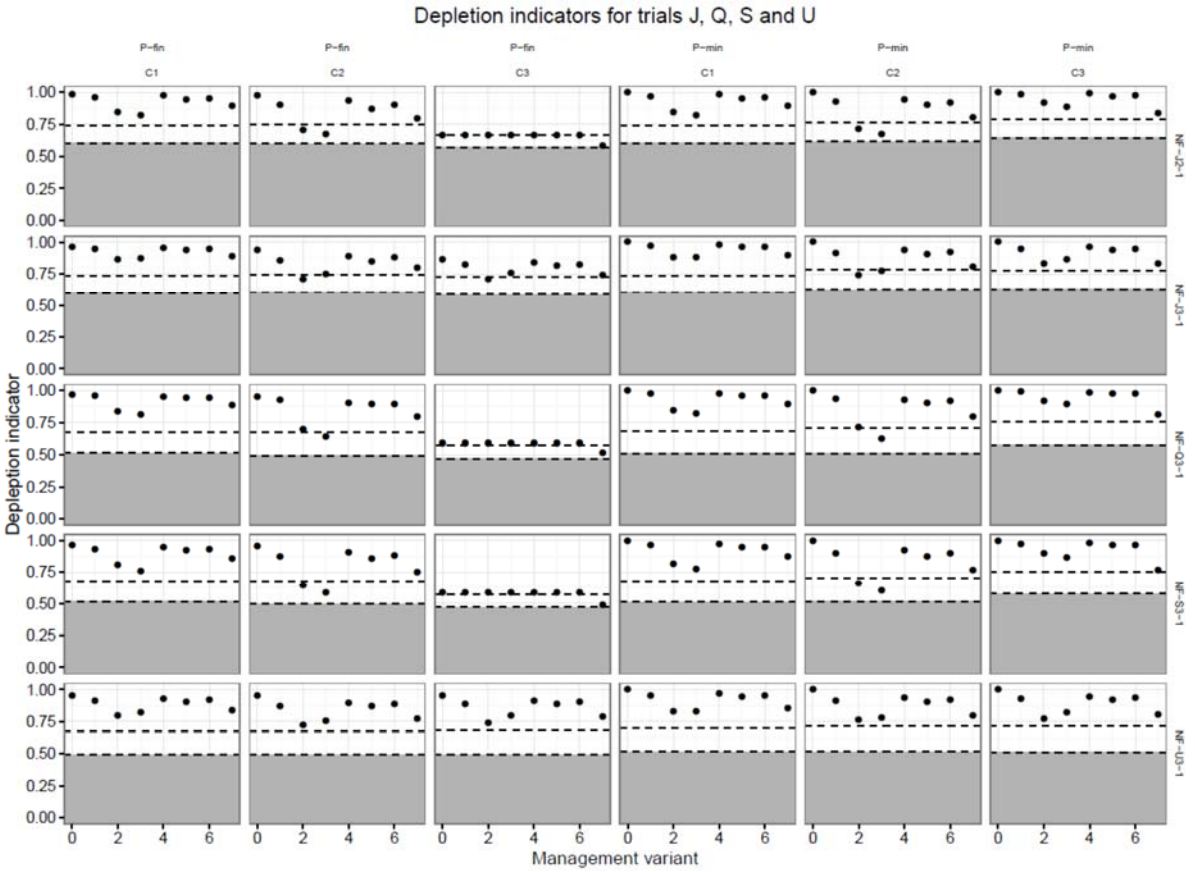


Fig. 3. A plot showing the performance of each RMP variant for each of the $MSYR_{1+}$=1% trials. Results are presented for the C1, C2 and C3 sub-stocks and the two performance statistics on which the thresholds are based (P-fin: the lower 5th percentile of the final depletion distribution and P-min: the lower 5th 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.

Appendix 1

AGENDA

1. INTRODUCTORY ITEMS
    1.1. Convenor's opening remarks
    1.2. Election of Chair and appointment of rapporteurs
    1.3. Adoption of Agenda
    1.4. Available documents
2. GENERAL ASSESSMENT ISSUES WITH A FOCUS ON THOSE RELATED TO THE REVISED MANAGEMENT PROCEDURE
    2.1. Relationship between $MSYR_{mat}$ and $MSYR_{1+}$: evaluate energetics-based model
    2.2. Requirements and guidelines for conducting surveys: model based abundance estimates
    2.3. Implications of IST_s for consideration of 'status'
    2.4. Work plan
3. RMP – *IMPLEMENTATION*-RELATED MATTERS
    3.1. North Atlantic fin whales (*Implementation Review*)
        3.1.1. Report of the intersessional workshop
        3.1.2. Completion of *Implementation Review*
            3.1.2.1 Overview and procedure to follow
        3.1.3. New information
        3.1.4. Conclusions and recommendations
    3.2. North Atlantic common minke whales (*Implementation Review*)
        3.2.1. Report of the intersessional workshop
        3.2.2. Completion of *Implementation Review*
        3.2.3. New information
        3.2.4. Conclusions and recommendations
    3.3. North Pacific common minke whales
        3.3.1. Review of new information
        3.3.2. Conclusions and recommendations
    3.4. Western North Pacific Bryde's whales
    3.5. Work plan
4. ABUNDANCE ESTIMATES
5. BUDGET ISSUES
6. ADOPTION OF REPORT