Annex F

Report of the Sub-Committee on In-depth Assessments

Members: Palka (Convenor), Allison, Baba, Baker, Bell, Brownell, Burkhardt, Butterworth, Cholewiak, Cipriano, Clapham, Cooke, de la Mare, de Moor, Diallo, Donovan, Double, Enmynkau, Filatova, Findlay, Fortuna, Funahashi, Goodman, Goto, Gushcherov, Hakamada, Herr, Hughes, Iñíguez, Isoda, Ivashchenko, Jackson, Kato, Kitakado, Konan, Lang, Lundquist, Maeda, Mallette, Matsuoka, McKinlay, Miyashita, Mizroch, Morishita, Morita, H., Morita, Y., Moronuki, Nelson, Øien, Park, J., Park, K., Pastene, Punt, Redfern, Reeves, Rosenbaum, Scordino, Sirović, Skaug, Slugina, Stimmelmayr, Taguchi, Tamura, Wade, Walløe, Walters, Weinrich, Yasokawa, Yasunaga, Yoshida, Zerbini, Zharikov.

1. INTRODUCTORY ITEMS

1.1 Introductory remarks and election of Chair

Palka welcomed the participants and was elected Chair for SC/67a. Herr was identified as co-Chair for this sub-committee.

1.2 Appointment of rapporteurs

Cooke, Clapham, Herr, and Palka agreed to act as rapporteurs.

1.3 Adoption of Agenda

The adopted Agenda is shown in Appendix 1.

1.4 Documents available

The documents considered by the sub-committee were SC/67a/IA02, SC/67a/SH14 and SC/67a/Rep08.

2. IN-DEPTH ASSESSMENT OF INDO-PACIFIC ANTARCTIC MINKE WHALES

2.1 Progress on summary report of completed in-depth assessment

In 2014, after 13 years, the in-depth assessment of Antarctic minke whales in the Indo-Pacific Antarctic region was completed. At that time it was suggested all of the components and results of the assessment that had been concluded over the years be brought together in one document. The intersessional Correspondence Group initially established at SC/65b was asked to prepare a document synthesising the results of the in-depth assessment of Antarctic minke whales in the Indo-Pacific region which was conducted from 2001-14. The main task of the group was to summarise the obtained results, and not to go too much into details of analyses. No new or recent analyses conducted after SC/65b were to be considered or included in the document. SC/67a/SH14 was presented to this meeting as a draft of that document. The document covered a wide variety of topics discussed over 13 years including systematics, commercial and research catches, abundance estimates, spatial distribution patterns, stock structure, biological information, population dynamics, feeding ecology and energetics, pollutants and marine debris, and species interactions. The intersessional correspondence group plans to complete the task assigned to the group during the upcoming intersessional period by finalising the document, taking into account comments received during this year's meeting, and submitting the manuscript to a peer-reviewed journal.

The sub-committee welcomed the document and acknowledged the great effort that had gone into summarising the information and results collected over a time period of so many years. After a general discussion of which issues should be included in the summary document, it was noted that the text on the discussion of trends in nutritional condition in SC/67a/SH17 was incomplete and so several additional references were identified that reflected the status of the discussion at that time (2014). Other suggestions to improve the document were the paper should include a clear description of what animals are being assessed; it should mention that even after completion of the in-depth assessment, research is continuously ongoing but this document is focusing on research results that occurred at or before the completion of in-depth assessment in 2014; the document could be shorter; and extracts of conclusions from previous Committee reports could be presented for complete and precise representation of final results.

2.2 Work plan

The sub-committee **agreed** that the intersessional correspondence group appointed last year should continue to finalise the document that summarises the in-depth assessment of the Indo-Pacific Antarctic minke whales that was completed in 2014 by integrating points raised in the discussion in preparation for submission to a peer-reviewed journal.

3. IN-DEPTH ASSESSMENT OF NORTH PACIFIC SEI WHALES

3.1 Progress on intersessional work

SC/67a/IA02 documented progress with model development. The model can be run when the input data have been prepared.

Allison reported that the catch series had been completed. The Japanese *Discovery* marking data had also been coded and entered, and (with the assistance of Yoshida) all remaining questions of interpretation had been resolved, as far as is possible.

No new analyses of sightings data were presented, but an analysis of the US west coast sightings data has been published (Barlow, 2016). The specific data items for use in the assessment are discussed below.

3.2 Preparation of data for the assessment

3.2.1 Stock structure hypotheses

Issues of stock structure were discussed extensively at the 2015 and 2016 meetings. Last year, the Committee agreed to proceed on the basis of two alternative hypotheses: (i) a single stock for the entire North Pacific (Kanda *et al.*, 2015; Pastene *et al.*, 2016); and (ii) a 5-stock hypothesis presented in Mizroch *et al.* (2016). After much discussion, the Committee considered that the evidence for the 5-stock hypothesis is weak. The genetic information was consistent with a single stock in the area covered by the samples. However, it noted that all the samples had been taken from the area of just one of the stocks proposed in Mizroch *et al.* (2016), namely the North Pacific pelagic stock.

This year the sub-committee decided to proceed, as agreed last year, with assessment modelling based on two alternative hypotheses: (1) the entire North Pacific contains a single stock; and (2) there are up to 5 stocks as proposed last

year. The sub-committee tentatively **agreed** to use the lines shown in Appendix 2 for compiling catch and abundance data for use in the assessment model, but **agreed** that the intersessional steering group could modify them, if necessary to facilitate the divisions of data into sub-regions. There is no implication that these lines correspond to stock boundaries.

The sub-committee noted the policy used in RMP *Implementations* of assigning relative plausibilities (high, medium, low and disputed) to different hypotheses relating to stock structure and other matters. The sub-committee **agreed** that it would not attempt to assign relative plausibilities to the alternative stock structure hypotheses at this stage. The issue of relative plausibility will be addressed next year when results of assessment modelling are available.

The sub-committee emphasised that this decision to proceed does not imply endorsement of either hypothesis at this stage. The sub-committee acknowledges that some members are of the view that there is no scientific basis for a multi-stock scenario.

3.2.2 Abundance data and trends

Last year the sub-committee classified the sources of abundance data into three groups: (i) surveys which have been analysed and from which usable abundance estimates are already available; (ii) surveys involving significant sei whale sightings for which no analysis was yet available; and (iii) surveys resulting in zero or minimal sei whale sightings, which can be used to bound the area of abundance (IWC, 2017).

No progress was made intersessionally on the analysis of surveys in group (ii). The sub-committee decided that it was no longer in a position to delay the assessment pending further analyses. It, therefore, developed a final list of abundance information that will be used in the assessment (see Appendix 3). This consists of existing estimates that are published or contained in documents to the Committee, plus data from published sources that can be used with minimal analysis.

As noted in the work plan, the sub-committee **recommended** that the intersessional steering group for the assessment be reconvened, and that its first task will be to produce a table of inputs to the assessment model. Most of the remaining work on abundance involves extracting existing estimates from papers and assigning or prorating them to sub-regions. The only dataset that may require some limited additional analysis in order to generate potential model input is the summary data from JSV (Japanese sighting vessels) and Japanese dedicated surveys. The analysis should use the published summaries by 10° square of n (number seen) and L (survey distance) by year, summer only (May-October). A simple regression analysis may be required to account for the shifting distribution of effort over time. Cooke offered to provide such an analysis of the JSV data for consideration by the intersessional group. The sub-committee **agreed** that these data would be used in the assessment model either as a purely relative abundance index or converted to absolute abundance using a plausible range for a scaling factor.

The sub-committee **agreed** that sei whales do not occur to any significant extent in the following areas: Okhotsk Sea (apart from the Kuril Islands); Sea of Japan; waters north of the Bering Strait. As listed in Appendix 3, there are some further areas of near-zero recent abundance but where catches were taken in the past (Gulf of Alaska, eastern Aleutians, and Canadian west coast).

3.2.3 Marking data

The coding of the Japanese *Discovery* marking data is now complete, but a choice needs to be made on how to handle known or presumed multiple marking of individuals, because marks believed to have been fired into different whales may be recovered in the same whale, and single marks may be recovered from whales thought to have been multiply marked. The sub-committee referred the question to the proposed intersessional group, because some (preferably simple) analysis of the data may be required to resolve it.

Mizroch reported that she is coding up some US marking data. Because it is a fairly small dataset, the sub-committee **agreed** that it can be used if it is submitted to the Secretariat in time for the assessment, but that it is not an essential input.

The sub-committee had little information on marking efficiency, mark retention, or recovery efficiency. Marking efficiency and recovery efficiency are mutually confounded in the data and should be considered a single parameter. It was **agreed** to try two alternative assumptions: (i) marking/recovery efficiency is 100%; and (ii) marking/recovery efficiency is a free parameter in the model, with values in the range of 0 to 1. Marking efficiency includes marking-caused mortality, if it is present and acts within the first year. Marks recorded with any other verdict than definite hits should either be excluded from the analysis, or allowed to have as lower marking efficiency than definite hits.

The sub-committee **agreed** to try two alternative assumptions about mark shedding: (i) no mark shedding; and (ii) parameter to be estimated from the data. For the latter case the modeller may wish to refer to published estimates of shedding rate (de la Mare, 1985) to guide the choice of a prior for the shedding rate.

3.2.4 Catch history

Allison reported that nearly all catches have either actual positions or have been assigned approximate positions that are precise enough to assign them to one of the tentative sub-regions for the assessment. The only exception is some USSR catches where a decision needs to be made where to assign them to. A proportion of catches of uncertain species (such as sei whales in the years prior to their distinction from Bryde's whales) have been assigned to sei whales by prorating from known species compositions for the given areas and seasons. Sex is unknown for some of the earlier catches, but for the purpose of implementing the model in SC/67a/IA02 the sex ratio of the catch is pro-rated according to the sex ratio from known-sex catches in the same area and year if there are any, otherwise according to the sex ratio of catches by area averaged over years.

The sub-committee requested Allison to identify any remaining adjustments to the catch series that may be necessary, and to refer them to the intersessional group for endorsement.

3.2.5 Life history parameters

The life history and exploitation-related parameters required by the assessment model are age at recruitment (or selectivity ogive), age at maturity (or maturity ogive), and the natural mortality rate. For initial runs of the assessment model, the same parameter values would be used as at the last assessment of North Pacific sei whales. The intersessional group would extract the values, because the published report of the last assessment (IWC, 1977) does not provide them in a form directly usable as input to the model.

3.3 Assessment model

The sub-committee **endorsed** the model structure described in SC/67/IA02. The model is similar to that used in multi-stock *Implementation Simulation Trials*. The time step is half-yearly, with summer defined as May to October and

winter as November to April. The model can accommodate any definitions of feeding and breeding areas with any degree of mixing between them. The model utilises catches, marks and recoveries, and abundance information, which are used to calculate a likelihood function of the parameters.

Model outputs include time series of abundances by year and sub-region (and by stock where applicable). The goodness-of-fit to each data source and the residuals shall be plotted to help the sub-committee to examine the ability of the model to fit the different inputs, and potentially to draw inferences about their mutual consistency or otherwise. In principle, it may be possible to reject specific hypotheses based on (lack of) fit to the model, but it is difficult to specify explicit criteria for this in advance.

The sub-committee did not consider the mixing matrices in detail, but **agreed** that the model should allow movement between the wintering grounds and the summer feeding areas, as indicated by the mark recaptures. With regard to mixing between summer sub-regions, the sub-committee **agreed** that initial exploration of the model should include runs with: (i) no mixing; (ii) minimal mixing to achieve consistency with the mark-recapture data; and (iii) maximal mixing (no fidelity to feeding grounds). The intersessional steering group should consider alternative mixing assumptions if initial runs of the assessment model indicated that the above scenarios were not consistent with the data.

For scenarios that involve more than one breeding stock, the initial assumption should be that there is no mixing between breeding stocks.

3.4 Work plan

The sub-committee **agreed** that an intersessional steering group was needed to take forward preparation of model inputs, especially the abundance data, and that it should start its work before leaving this meeting. The sub-committee **agreed** that the first version of the group's proposals for input data for the assessment could be appended to this report, although the sub-committee had not reviewed it at this meeting.

The following tasks need to be completed in the intersessional period:

- finalise and review the data inputs for the assessment (intersessional steering group);
- conduct initial runs of the assessment using the assumptions proposed by the sub-committee (Punt);
- review results of initial runs and specify alternative assumptions if required (intersessional steering group); and
- report to next year's meeting on the final model inputs and the results.

There are no new budgetary implications, as the required funds were approved last year.

4. COMPREHENSIVE ASSESSMENT OF NORTH PACIFIC HUMPBACK WHALES

4.1 Progress on intersessional work

Donovan provided a summary of the IWC's first Workshop on the Comprehensive Assessment of North Pacific Humpback Whales. The Workshop was held from 19-21 April 2017 at the kind invitation of the Marine Mammal Laboratory in Seattle. It was convened by Phil Clapham, and Greg Donovan was elected Chair. The Workshop covered an enormous amount of material and since it was just held, it was not possible to finalise a report of the Workshop before the Committee meeting. As a result details of the Workshop's results are summarised below. It is expected the report for this meeting will be combined with the report of the upcoming 2018 intersessional Workshop that will continue the development of the Comprehensive Assessment.

The objective of the Workshop was to undertake the first steps in assessing humpback whales in the North Pacific (the Comprehensive Assessments of North Atlantic and Southern Hemisphere humpback whales were completed in 2002 and 2014, respectively). It is envisioned that this will be a 2-3 year process. The primary task was to identify and review the available information on stock structure, removals (catches, bycatches and ship strikes), abundance and trends (by stock and area), biological parameters and environmental issues. This information will ultimately be integrated using a population dynamics modelling approach. The important steps that were completed at the Workshop were to confirm available data, develop a series of plausible conceptual models for stock structure, and identify major uncertainties or knowledge gaps.

4.2 Preparation of data for assessment

4.2.1 Stock structure hypotheses

The Workshop reviewed information on stock structure from a suite of datasets including photo-identification, genetics, telemetry, acoustics, catches and sightings.

The Workshop was fortunate to be able to review and build upon the extensive SPLASH (Structure of Populations, Levels of Abundance and Status of Humpbacks) project. This major international collaborative project was conducted on all then-known winter breeding regions during three seasons (2004, 2005 and 2006) and all known summer feeding areas during two seasons (2004 and 2005[1]). A total of 7,971 unique individuals were catalogued and a total of 6,178 tissue samples were also collected for genetic studies of population structure, with broadly even representation of wintering and feeding areas.

Updated information, in some cases extensive, was received and reviewed from several regions and research groups including the Russian Pacific, the Bering and Chukchi Seas, Japan and Mexico. Thus, the Workshop had an abundance of data with which to develop stock structure hypotheses.

The Workshop identified the geographic 'building blocks' it would use when describing the various stock structure hypotheses. These are listed in Table 1 and shown in Fig. 1.

The hypotheses considered by the Workshop relating to wintering and feeding grounds (and movements) are summarised in Tables 2 and 3. Note that Hawaii in the central North Pacific is always considered a single wintering area.

During the sub-committee meeting Brownell provided information on work conducted on Saipan in the Marianas. The NOAA Pacific Islands Fisheries Science Center conducted small boat surveys on 6 days during 11-22 February 2017. They encountered 25 humpback whales including two mother-calf pairs. Biopsy samples were collected from 11 humpbacks including both mothers. Fluke images were collected from 19 humpbacks. The Saipan catalogue now contains 35 non-calf individuals with fluke images for 24 of them. This year there were three re-sightings from previous years. The first was a male that was photographed and biopsy sampled in 2015. The second was a female first encountered in 2016 with a calf and biopsy sampled; she did not have a calf in 2017. The third was an

[1]Although coverage in 2005 was much reduced for offshore and Aleutians.

Table 1
Geographic areas used to describe stock structure hypotheses (see Fig.1).

Area	Abbreviation	Area	Abbreviation
Philippines	PHI	Western Gulf of Alaska	wGOA
Ogasawara	OG	Central Gulf of Alaska	cGOA
Okinawa	OK	Northern Gulf of Alaska/Prince William Sound	nGOS-PWS
Hawaii	HI	Southeast Alaska-Northern British Columbia	seAK-nBC
Kuril Islands	KI	Southern British Columbia-Washington State	sBC-WA
Okhotsk Sea	OS	Northern California-Oregon	nCA-OR
Eastern Kamchatka	eKam	Southern and Central California	s&ccA
Western Aleutians	wAI	Mexico Baja	MXBJ
Central Aleutians	cAI	Mexico Mainland	MXMN
Eastern Aleutians	eAI	Mexico Islands (Revillagigedos)	MXIS
Bering Sea	BS	Southern Mexico	sMX
Arctic	Ar	Central America	cAm

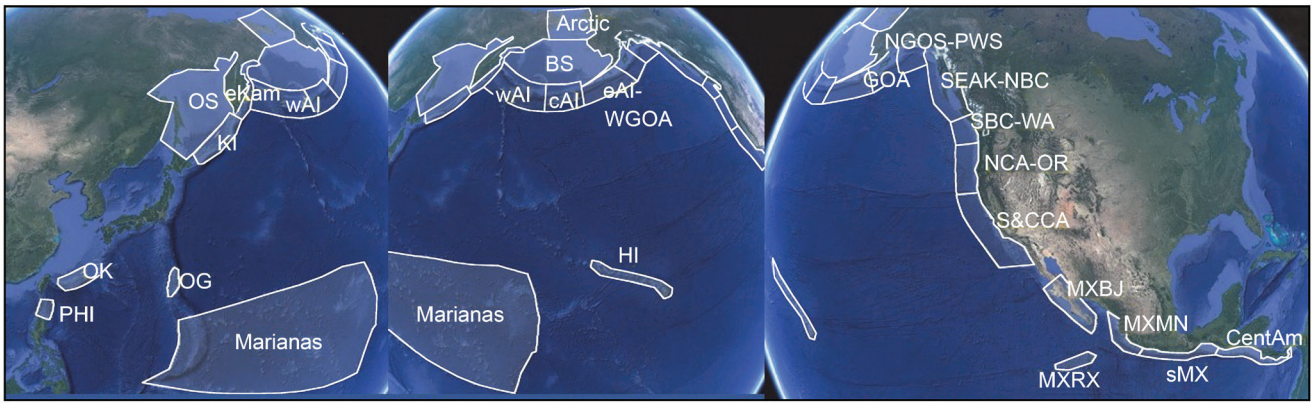

Fig. 1. The geographic 'building blocks' identified by the Workshop to use when describing the various stock structure hypotheses.

Table 2a
Summary of hypotheses under consideration with respect to wintering areas: eastern North Pacific. Y=final destination breeding ground T=Transit i.e. animals found in this area are moving through to their final destination. For areas see Table 1 and Fig.1

MX BJ	Y	Y	T	Y	Y	Y
MX IS	Y		Y			Y
nMLMX	Y		Y			Y
sMLMX	T			Y	Y	Y
cAm	Y	Y	Y			

Table 2b
Summary of hypotheses under consideration with respect to wintering areas: western North Pacific. Legend as Table 2a.

Ogasawara	Y	Y	T	Y
Okinawa	Y		Y	
Philippines	Y			
Mariana+	Y		Y	Y

individual that was encountered in 2007 during the MISTCS cruise; in 2017 it was involved in a competitive group and is assumed to be male. Comparisons of Saipan humpbacks to humpback catalogs from the Philippines, Okinawa, Russia, and Japan are underway. It was noted that genotyping has occurred for all the Saipan samples, and that one individual had been matched between Saipan and Ogasawara; given the small sample size, this suggested a strong connection between the two areas.

Kato reported that a significant number of genetic and photo-identification samples have been collected from Okinawa waters since 1991 by the Okinawa Churashima Research Center. Currently the comparison of these samples with other data sets have begun. In addition, similar data are potentially available from Ogasawara. Formerly during the late 1990's to 2010, the Ogasawara Marine Center conducted photo-identification surveys. Since the 2014/15 season the Ogasawara Whale Watching Association took over the photo-identification surveys. It is expected that the Ogansawara Whale Watching Association data sets from 2014 to 2016 will be available for future analyses. However, access to the older Ogasawara Marine Center data sets will require negotiates with the original data holder.

4.2.2 Abundance data and trends

The Workshop examined a comprehensive mark-recapture analysis (still ongoing) using data for the whole North Pacific derived from the SPLASH dataset. Several difficulties were identified, and suggestions were made to address these. In addition, the completed analysis will take into account the revised (since SPLASH) stock structure hypotheses considered at the Workshop and the need for abundance estimates for the areas relevant to these.

The Workshop compiled a list of abundance estimates (or data that could be used to generate such estimates) for the areas that would be needed for the various stock structure hypotheses. It also addressed the future work needed to complete analyses. The intersessional Steering Group will ensure that progress is made to this end.

During the sub-committee meeting a question was raised regarding whether data collected since the SPLASH project are being used to update abundance estimates. The response was additional data have become available since SPLASH, and the intent was to incorporate these new data to provide a consistent series of estimates for inclusion in the assessment.

4.2.3 Catch history and other removals

The Workshop examined the existing catch data and has agreed the series for incorporating into the assessment. This will require different allocations of catches for each

Table 3
Summary of consideration of links between areas used to describe feeding grounds (Y=separate feeding ground on its own). For areas see Table 1 and Fig.1

Area	Links with			
KI	Y	With eKam	With wAI	
OS	With KI			
eKam	With KI			
wAI	With BS, cAI and eAI	With BS and cAI		
cAI	With BS, wAI and eAI	With BS and wAI	With BS and eAI	
eAI	With BS, cAI and eAI	With BS and eAI		
Ar	With BS			
BS	With A	With wAI, cAI and eAI	With wAI and cAI	With cAI and eAI
wGOA	With aAI and cGOA	With nGOA, eAI, cGOA		
cGOA	With aAI and wGOA	With nGOA, eAI, wGOA		
nGOA-PWS	With nGOA-PWS			
seAK-nBC	T			
sBC-WA	With nCA-OR			
nCA-OR	With s&cCA	With sBC-WA		
c&cCA	Y	T		

stock structure hypothesis. It also reviewed the available information on bycatch and ship strikes. This is a more complex issue than direct catches. The Workshop noted that, as for other assessments (e.g. gray whales) there was rather limited information from some areas and that even where there are data, the numbers will likely be underestimated by an unknown (and possibly large) amount. The Workshop agreed that it will follow the approach adopted elsewhere that it will develop several scenarios reflecting both past and likely future removals; these are intended to capture the uncertainty (both in numbers and allocations for the various stock structure hypotheses) for use in the modelling work. These scenarios will be developed by an intersessional Steering Group that will also investigate whether additional data can be tracked down.

During the sub-committee it was noted in discussion that additional data on mortalities were available from various sources. It was **agreed** to request any data on mortalities be sent to Clapham, who would compile these for future inclusion into the model. Assigning cause of death (e.g. entanglement, ship-strike etc.) to mortality reports is often difficult, but this would be attempted where sufficient information are available. It was proposed that uncertainty in these data would be dealt with using an approach similar to that employed for the gray whale assessment.

4.2.4 Life history parameters

The Workshop compiled and reviewed the available information on biological parameters for humpback whales in all oceans. It was recognised that these can vary amongst populations. This information will be considered as necessary within the context of the modelling framework, particularly with respect to maximum rates of increase.

4.2.5 Environmental issues

The Workshop considered this item in the context of potentially changing carrying capacity in the North Pacific. It was agreed that whilst separating the effects of environmental changes from the traditional view of populations approaching carrying capacity is something to strive for, such data are not available. However, the Workshop noted several interesting studies linking humpback whale occurrence and density with environmental factors in parts of the North Pacific and adjacent Arctic, as well as information suggesting changes in numbers, distribution, health and reproduction of humpback whales (e.g. parts of southeast Alaska and Hawaii). Further investigations into the effects of environmental changes in the habitat of humpback whales were encouraged.

4.3 Assessment model

The Workshop reviewed an initial sex- and age-structured modelling framework that might be used as the basis for the assessments, and this proved valuable in allowing the Workshop to move forward. In the light of discussions of the available data the Workshop agreed that future modelling efforts should employ a simpler modelling framework based upon an age-aggregated model; this will allow easier use of priors for the maximum rate of increase, and allow the model to be fitted using a Bayesian estimation approach, in common with the assessments for Southern Hemisphere humpback whale populations.

4.4 Work plan

The Workshop developed several research recommendations that do not have cost implications for the IWC. These include: additional comparisons amongst catalogues; support for the existing work in Russia and expansion of this research; further information and catalogue comparisons with new Japanese data; further consideration of Korea; further information from the Mariana Islands; additional analytical genetic work including further characterisation of the Mexican regions and central California, as well as investigation of population assignment (feeding grounds to breeding units); additional biopsy sampling in particular in Marianas Islands and central Mexico; and additional work on abundance estimates.

The Workshop made considerable progress with the work to develop conceptual stock structure hypotheses and to review the available information on other factors central to completing the Comprehensive Assessment. It recommended that an intersessional Steering Group be established to:

(a) consolidate and prioritise the stock structure hypotheses developed at this Workshop from a modelling perspective and develop appropriate draft presence/absence and mixing matrices for consideration at the next Workshop;
(b) facilitate the additional work on abundance estimates; and
(c) finalise plans for the second Workshop in 2018.

The sub-committee **endorsed** this work plan and **agreed** to establish the intersessional Steering Group. It also thanked Donovan and the Workshop participants, and recognised the progress that has been made towards an assessment.

Table 4

Summary of the work plan for the In-depth Assessments (IA) sub-committee.

Item	Intersessional 2017/18	2018 Annual Meeting (SC/67b)
Document Indo-Pacific Antarctic minke whale assessment	Finalise document and submit for publication	-
In-depth assessment of North Pacific sei whales	Reconvene intersessional steering group to further data preparation and development of the assessment model	Review progress of intersessional work and continue in-depth assessment
Comprehensive assessment of North Pacific humpback whales	Reconvene intersessional steering group and convene 2nd workshop to further data preparation and development of the assessment model	Review progress of intersessional workshop and continue comprehensive assessment

Table 5

Summary of budget requests for the 2017-18 period. For explanation and details of each project see text.

Title	Relevance to which sub-committee(s)?	2018 (£)
Second Workshop on the Comprehensive Assessment of North Pacific Humpback Whales	IA	11,040
Total request		11,040

5. WORK PLAN AND BUDGET REQUESTS

The sub-committee expects progress on the three assessments intersessionally through the working and steering groups (Table 4 and Annex W). Details on the work plans are found in Items 2.2, 3.4 and 4.4. The sub-committee **recommended** a budget request for an intersessional workshop to progress the comprehensive assessment of the North Pacific humpback whales be funded to insure progress (Table 5). There was discussion as to whether to hold this as a pre-meeting or an inter-sessional workshop. It was **agreed** to decide this after the sub-committee meeting taking in account the budget and needed participants.

6. ADOPTION OF REPORT

The report was adopted at 15:36 on 17 May 2017.

REFERENCES

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International Whaling Commission. 1977. Report of the Special Meeting of the Scientific Committee on sei and Bryde's whales, La Jolla, 3-13 December 1974. *Rep. int. Whal. Commn. (special issue)* 1:1-9.

International Whaling Commission. 2017. Report of the Scientific Committee. Annex G. Report of the Sub-Committee on In-Depth Assessments. *J. Cetacean Res. Manage. (Suppl.)* 18:203-29.

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Mizroch, S.A., Conn, P.B. and Rice, D.W. 2016. REVISE OF SC/66a/IA14: The mysterious sei whale: its distribution, movements and population decline in the North Pacific revealed by whaling data and recoveries of Discovery-type marks. Paper SC/66b/IA20 presented to the IWC Scientific Committee, June 2016, Bled, Slovenia (unpublished). 129pp. [Paper available from the Office of this Journal].

Pastene, L.A., Goto, M. and Taguchi, M. 2016. Additional genetic analyses on stock structure in North Pacific Bryde's and sei whales. Paper SC/66b/SD01 presented to the IWC Scientific Committee, June 2016, Bled, Slovenia (unpublished). 12pp. [Paper available from the Office of this Journal].

Appendix 1

AGENDA

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   - 1.3 Appointment of rapporteurs
   - 1.4 Adoption of Agenda
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   - 2.1 Progress on summary report of completed in-depth assessment
   - 2.2 Work plan
3. In-depth assessment of North Pacific sei whales
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4. In-depth assessment of North Pacific humpback whales
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     - 4.2.4 Life history parameters
     - 4.2.5 Environmental issues
   - 4.3 Assessment model
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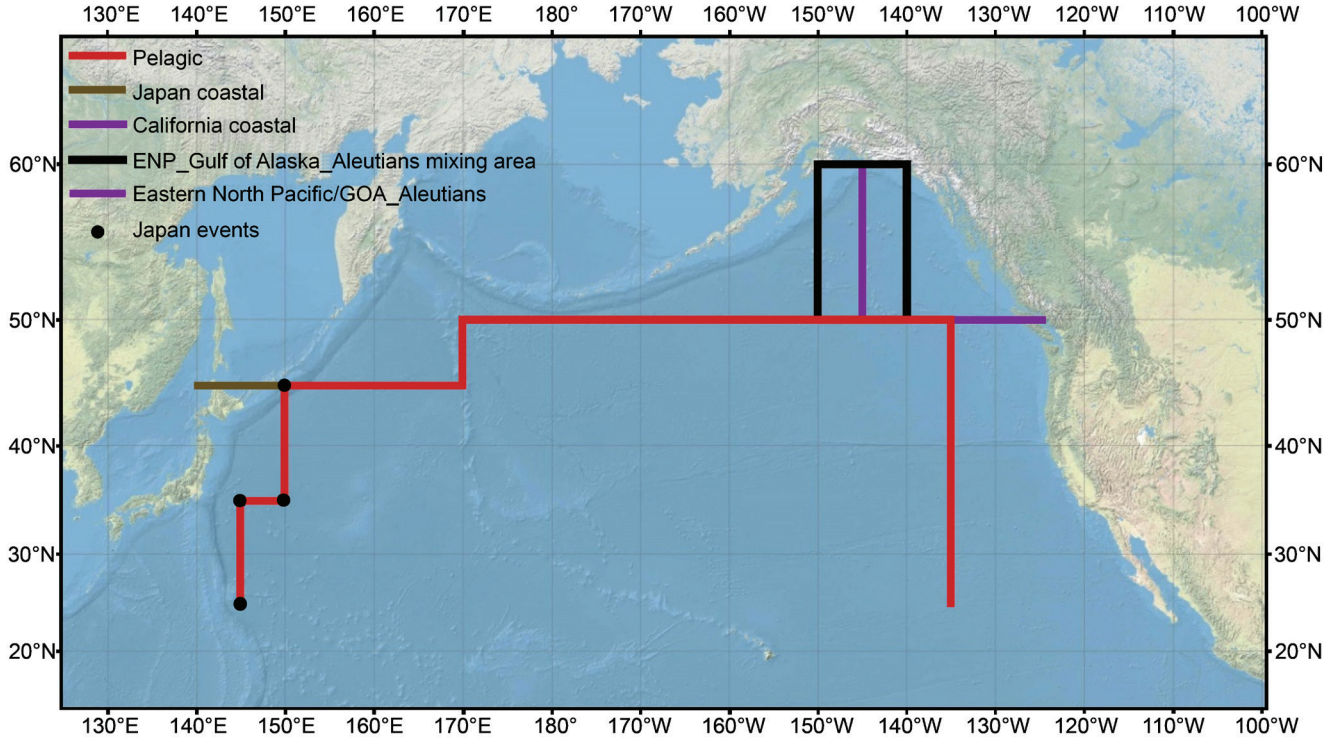
5. Work plan and budget requests
6. Adoption of Report

Appendix 2

SCHEMATIC LINES FOR DIVIDING DATA INTO SUB-REGIONS FOR IN-DEPTH ASSESSMENT OF NORTH PACIFIC SEI WHALES

These lines were tentatively agreed by the sub-committee as schematic representation of how data may be divided. They do not represent putative stock boundaries. The sub-committee agreed that the intersessional group could modify them to facilitate allocation of sightings and other data.



Appendix 3

REPORT OF THE SMALL GROUP TO DETERMINE ABUNDANCE DATA THAT WILL BE USED IN THE NORTH PACIFIC SEI WHALE IN-DEPTH ASSESSMENT

Members: Cooke, Hakamada, Kitakado, Matsuoka, Miyashita, Palka, Yoshida

The group agreed as follows.

(1) The line between the coastal and pelagic regions will be defined in the east and north by the EEZs of USA (west coast), Canada, USA (Alaska), and the Russian Federation. In the west, the data will be split at 150°E. For the 2010 POWER survey, the existing stratum boundary at 47°N can be used.

(2) Of the JARPN II research area, common minke whale sub-area 7 belongs to the sei whale western coastal region, while sub-areas 8 and 9 belong to the pelagic region. For the JARPN II data, separate estimates will be used for the periods 2002-07 and 2008-12. Within each time period and sub-region, the data will be pooled across years and months. Hakamada will provide the estimates, either using the existing estimates or a new analysis.

(3) The JARPN data (1994-1999) are unsuitable for a stratified estimate. They will only be used if a model-base estimate is produced.

(4) Cooke will conduct a multiple regression analysis of the JSV and research survey data by 10° square, to be used as relative or approximate absolute abundance. Currently, only data for 1965-2005 are held on file. Miyashita offered to supply post-2005 data summaries.

(5) The data to be used are listed in Table 1. The intersessional group will supply input data for the assessment to Punt in useable form by Jan 1, 2018. Results of analyses need to be received by the intersessional group by December 1, 2017 if they are to be used in the assessment.

Table 1

Sightings data sets to be used in North Pacific sei whale in-depth assessment.

Survey area	Programme	Years of surveys	Range of months	In IWC database	Years of estimates/ data used	Area n.mile²	Sei sightings *n*	Effort *L*nm	Estimate	CV	Extraction	Reference/paper
North Pacific E of 170°E, Aleutian and Gulf of Alaska (coast out to 47°N or 200 n.miles)	IWC-POWER cruises	2010-12	Jul.-Aug.	Yes	2010-12	574,614	4	1,983	707	0.420	Add across years by stratum	Hakamada and Matsuoka (2015), Table 10
North Pacific pelagic north of 40°N, 170°E-135°W	IWC-POWER cruises	2010-12	Jul.-Aug.	Yes	2010-12	1,463,773	254	6,340	26,490	0.236	Add across years by stratum	Hakamada and Matsuoka (2015), Table 10
North Pacific 20°-40°N, 170°E - 135°W	IWC-POWER cruises	2013-16	Jul.-Aug.	Yes	-	2,800,000	2	12,259	~200	-	Take esw from above	IWC (2017, pp.461-75); SC/67a/ASI9
North Pacific	Japanese scouting vessels (commercial and chartered) and NRIFSF surveys	1964-2015	May-Oct.	No	1965-2005	By 10° square	3,607	1,338,044	-	-	Multiple regression by 10° sq by year	Wada (1973; 1975-81); Anon. (1981-95); Kato (1996-2003); Kato and Iwasaki (1998); Kato and Miyashita (2004; 2005); Miyashita and Kato (2006)
Coast of Japan	JARPN II (coastal)	2002-16	Apr.-Oct.	Yes	2007-16	-	0	57,664	0	-	-	SC/67a/SCSP03
Coast of Japan to 150°E	JARPN	1994-99	May-Sep.	Yes	1994-99	166,306	8	-	Model-based estimate, if available in time			Matsuoka *et al.* (2000)
	JARPN II (offshore)	2002-07	May-Aug.	Yes	2002-07		To be supplied				Pool across years and months (subarea 7)	Hakamada *et al.* (2009)
	JARPN II (offshore)	2008-12	May-Aug.	Yes	2008-12							Hakamada and Matsuoka (2016)
Western North Pacific 150°-170°E, 35-50°N, excl. Russian EEZ	JARPN II (offshore)	2002-07	May-Aug.	Yes	2002-07	662,044	To be supplied				Pool across years and months by subareas (8 and 9)	Hakamada *et al.* (2009)
	JARPN II (offshore)	2008-12	May-Aug.	Yes	2008-12							Hakamada and Matsuoka (2016)
	JARPN	1994-99	May-Sep.	Yes	1994-99	662,044	135	-	Model-based estimate, if available in time			Matsuoka *et al.* (2000)
Canada west coast	-	2004-05	Summer	No	-	7,183	1	1,286	~10	-	Not necessary	Williams and Thomas (2007)
Canada west coast	DFO	2002-14	Mainly spring, summer	No	-	~50 000	0	8,705	~0	-		Ford *et al.* (2010)
SE Bering Sea	MML	1999-2011	Summer	No	-	98,361	9	13,750	<100	-		Friday *et al.* (2012; 2013)
Gulf of Alaska	GOALS	2009-15	Summer	No	-	73,424	1	4,674	~10	-		Rone *et al.* (2017)
Alaskan Peninsula, E, Aleutians	Various	2001-03	Summer	No	-	-	0	4,886	0	-		Zerbini *et al.* (2006)
US west coast EEZ	SWFSC	1991-2014	Summer and fall	No	2008, 2014	332,538	25	38,922	519	0.40	Published estimate	Barlow (2016)

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