(5) examine potential model simplification (e.g. reduced parameterisation);
(6) consider alternative density dependent relationships and ensure that the implicit or explicit estimated reproductive outputs from the models are plausible;
(7) examine the sensitivity to time changes in maturity at age and data for supporting such changes;
(8) for the ADAPT VPA approach develop sex-specific model structure; and
(9) for the ADAPT VPA approach, include the estimation of the stock recruitment relationship within the model.

The Working Group helped to facilitate this work through e-mail discussion. The extent to which additional work with respect to these is required will need to be evaluated by the Scientific Committee.

A set of minimum common output statistics to be used when reporting results from catch at age models for Southern Hemisphere minke whales was developed by Butterworth, Mori, Punt and Polacheck and then reviewed by this group (Table 1).

Of the high priority tasks for modelling work identified at last year's meeting, no progress was made on the following:

(1) implement the error models to be developed for the catch-at-age data within the population models and assess their impact on the estimates derived from these models.

The lack of progress on the first of this stems from the lack of any progress on the development of an error model for the catch-at-age data (see above).

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Appendix 6

SUGGESTIONS FOR A WAY FORWARD TO FURTHER EVALUATE AGEING ERROR FOR SOUTHERN HEMISPHERE MINKE WHALES

G.P. Donovan, D.S. Butterworth, L.A. Pastene, A.E. Punt and J. Morishita.

Paper SC/59/O8 provides a very helpful perspective and suggestions to help clarify the use of Antarctic minke whale age data in the commercial and research permit periods. On the basis of the paper, some areas for further work suggest themselves and these are outlined below. We recognise that these involve, in some cases, quite substantial additional work but believe that this will assist considerably in addressing the issues raised *inter alia* at the JARPA review meeting as well as during past IA sub-committee meetings and allow the valuable analyses involving both commercial and scientific permit data to be undertaken.

The second experiment is designed to confirm the proposal in SC/59/O8 to limit analyses to using only data for animals aged six years and over.

EXPERIMENT 1. QUANTIFYING AGE READING ERROR

(1) Left/right earplugs (same animals) two Japanese readers

Experimental procedure

Randomly select 250 animals from the total JARPA catch (not pre-screened for readability) for which both the left and right earplugs have been collected. Each earplug needs to be read by readers 1 and 2 in a random order and without reference to biological information. After all of the earplugs have been read, this should be repeated twice. The three readings are recorded as well as what would be recorded as the best reading following the present reading protocol. All information normally recorded about the earplug (e.g. broken, irregular layers, neonatal core missing, etc.) should be recorded for each blind reading.

Data analysis

The aim is to estimate the distribution of estimated age (mean and variance) as a function of true age, reader and examine other possible covariates (e.g. length of animal, sex etc.). Software already exists that has been used to analyse similar data for fish otoliths. Kitakado is familiar with such analyses and would be an excellent person to do the work.

(2) Left earplug, readers from two schools (Japan, plus we propose Christina Lockyer or Peter Best)

Experimental procedure (essentially as above)

The same animals as in the above experiment are used and the readings from the above experiment for the Japanese readers can be used. Thus the only new reading that needs to be done is by Lockyer or Best. He/she should read the left

plugs in a random order and without reference to biological information. After all of the earplugs have been read once, this should be repeated twice. Note: if he/she deems the left earplug is unreadable for any animal, he/she should read the right earplug following the usual protocol. All readings or attempted readings will be recorded. The three readings are recorded as well as what would be recorded as the best reading following the present reading protocol. All information normally recorded about the earplug (e.g. broken, irregular layers, neonatal core missing, etc.) should be recorded for each blind reading.

Data analysis

The aim is to estimate the distribution of estimated age (mean and variance) as a function of true age and reading school and examine other possible covariates (e.g. length of animal, sex, etc.). As above, software already exists that has been used to analyse similar data for fish otoliths and Kitakado is familiar with such analyses and would be an excellent person to do the work. The results of this experiment can be integrated with a similar analysis of the readings from the 1983 Ageing Workshop.

EXPERIMENT 2. CONFIRMING THE PROPOSAL TO EXCLUDE ANIMALS 5 AND YOUNGER FROM VPA ANALYSES

Experimental procedure

This requires no new age readings. For all animals if the comments are already coded electronically (or a suitable subset[1] if the information is only recorded on paper) construct an *Excel* spreadsheet of the comments recorded when the plug was read (e.g. broken, irregular layers, neonatal core missing etc.) under headings e.g. Indentifier/Date/Age/Sex/Length/Reader/Testes weight/ Comments on state of earplug.

Data analysis

The objective is to determine if there is anything inherent in the state of the earplug that allows one to predict whether a particular age estimate is biologically unreasonable using for example a GLM. The results of the GLM could also be used to predict/identify animals for which the age estimate is in error when this would not be evident from the length of the animal.

[1] Including those for which the age-estimates are 'acceptable' and 'biologically unlike', but with a focus on the latter.

Appendix 7

WORK PLAN FOR THE SEA ICE INTERSESSIONAL WORKING GROUP

Members: Shimada (Convenor), Branch, Bravington, Burt, Hedley, Kitakado, Murase, Nishiwaki, Okamura, Palka.

This small group discussed future abundance estimates which could be compared with changes in sea ice extent. The group agreed that it was a lower priority to produce further refinements of estimates using the standard method, since this method had been shown to be negatively biased by the simulations. Instead, highest priority would be accorded to developing abundance estimates using the newer methods (by Okamura and Kitakado, by Bravington and by Cooke) by 10° longitudinal slice, or by 30° if the 10°-slice estimates would be computationally difficult to obtain.

The group agreed that using the actual survey northern boundaries in CPII and in CPIII for abundance estimates was inappropriate since most CPII surveys left an unsurveyed region between 60°S and the northern boundary. Instead, two alternative methods were advanced (Figs 1-2).

1. The Common Northern Boundary method

In this method, the northernmost boundary of the CPII surveys would also be used for the CPIII surveys. Any sightings or effort recorded in CPIII north of this Common Northern Boundary would be excluded from the analyses.

2. The Fixed Distance from the Ice Edge method

A fixed distance (or set of distances) would be chosen from the ice edge (suggestions included 60 n.miles and 120 n.miles), and the analysis would be based only on the sightings and effort recorded within this distance of the southern ice survey boundary. This would be relatively easy to do since the standard dataset developed for analysis included the distance from the ice edge to each sighting, to the start of each survey leg, and to the end of each survey leg.

The group also suggested that results should be presented as ratios of CPIII:CPII abundance estimates (or as densities) since the purpose was to compare these particular estimates with the changes in the ice extent, not to produce new abundance estimates. All analysts were encouraged to present results in this manner at the next SC meeting.

[*Figures on following page*]