Annex E

Report of the Standing Working Group on the Aboriginal Whaling Management Procedure (AWMP)

Members: Donovan (Convenor), Allison, Baird, Bickham, Brandão, Butterworth, Cavalcanti, de Moor, George, Givens, Iñíguez, Kitakado, Lundquist, Okazoe, Prewitt, Punt, Rendell, Roel, Santos, Scordino, Stachowitsch, Stimmelmayr, Suydam, Walløe, Witting.

1. INTRODUCTORY ITEMS

1.1 Convenors opening remarks

Donovan welcomed the participants. He noted that this year the primary topic on the agenda was to continue development of *SLA*s for the Greenland hunts, with emphasis on the bowhead and humpback whales given the intersessional work undertaken.

He also noted that the approach of the work of the SWG (and the RMP) is of broader relevance to the work of the Committee when examining status and the effects of human-related mortality. Irrespective of whether an *SLA* (or the *CLA*) itself is used, the modelling framework and approach to dealing with uncertainty is of wide application, for example when assessing the effects of bycatch in fishing gear or ship strikes. Lessons learned during *SLA* development and *Implementation Reviews* are of value in assessments generally. He noted that this approach is now being used for North Pacific gray whales (see SC/65b/Rep08).

1.2 Election of Chair

Donovan was elected Chair.

1.3 Appointment of rapporteurs

Punt, Allison and Givens acted as rapporteurs with assistance from the Chair.

1.4 Adoption of Agenda

The adopted Agenda is given as Appendix 1.

1.5 Documents available

The SWG had before it SC/65b/AWMP01-05, SC/65/Rep04 and Rep06, and SC/65/AWMP RP01 and RP02.

2. DEVELOPMENT OF *SLA* FOR THE BOWHEAD WHALE HUNT OF GREENLAND

2.1 Report of the intersessional Workshop (SC/65b/Rep06)

The Chair introduced the relevant sections of the intersessional Workshop. The Workshop had focussed on finalising the trial structure for the bowhead and humpback whale hunts of Greenland.

Before focussing on the bowhead-specific aspects of the report, he noted the Workshop considered a generally applicable issue raised last year (IWC, 2014a), i.e. the development of trials to incorporate environmental-driven variability on population dynamics (see SC/65b/Rep06, item 2.1.1). The Workshop developed an approach to this following intersessional work by Punt and Witting. This is reflected in the revised trial structure given in Annex D of SC/65b/Rep06.

With respect to bowhead whales, the Workshop discussed two new abundance estimates for bowhead whales off West Greenland, one based on aerial survey data and the other on genetic mark-recapture. Discussion can be found under item 3.1 of SC/65b/Rep06. In summary, the Workshop agreed that:

(1) the mark-recapture abundance estimate of 1,274 (CV=0.12) constituted the best available estimate of abundance for the number of whales visiting West Greenland;
(2) given the present operating model, it was appropriate for this *Implementation* to continue to use (and project into the future), sighting survey estimates – determining an approach to use mark-recapture estimates should however be undertaken in the future (this is a major task); and
(3) conditioning would be based therefore upon on: (a) the fully-corrected 2012 sighting survey abundance estimate of 744 (CV=0.34, 95% CI: 357-1,461); and (b) a comparable estimate for the 2006 survey (see Annex E of SC/65b/Rep06).

With respect to removals, considerable work was undertaken to compile a complete list and to discuss how Canadian catches should be incorporated into the trial structure (item 3.2 of SC/65b/Rep06).

Greenland indicated that the need envelope that increased strikes to 15 over the 100-year period should be removed.

The final trial structure is given in Annex D of SC/65b/Rep06.

2.2 Intersessional progress

The code for the operating model for the trials was updated based on the specifications agreed at the intersessional meeting. The SWG thanked Punt and Brandão for updating and checking the code. The bycatches and incidental catches were provided by Allison to Brandão and Witting who finalised the input files for conducting all the trials and applied the conditioning algorithm to obtain the sets of parameters for each simulation and trial. Brandão and Witting developed candidate *SLA*s for the bowhead whales off West Greenland.

2.3 Candidate *SLA*s

Brandão and Butterworth

SC/65b/AWMP03 provides results for the West Greenland bowhead whale trials as agreed at the AWMP Intersessional Workshop (SC/65b/Rep06) for four potential *SLA*s. One of the *SLA*s considered is the 'Interim *SLA*' agreed by the Committee in 2008 (IWC, 2009) which is based on the most recent estimate of abundance, another *SLA* is a weighted-average interim *SLA* which uses all abundance estimates, but earlier abundance estimates are downweighted compared to more recent ones. Two further *SLA*s, variants of the weighted-average interim *SLA*, apply an adjustment to the multiplier of the abundance estimate in the interim *SLA* which depends on the trend of the abundance indices. This

Table 1
Summary of factors tested in the trials.

Factors	Levels (reference levels shown bold and underlined)	
	Humpback whales	Bowhead whales
$MSYR_{1+}$	1%, 3%, **5%**, 7%	1%, **2.5%**, 4%
$MSYL_{1+}$	0.6	**0.6**, **0.8**
Time dependence in K*	**Constant**, halve linearly over 100 years	
Time dependence in natural mortality, M*	**Constant**, double linearly over 100 years	
Episodic events*	**None**; 3 events occur between years 1-75 (with at least 2 in years 1-50) in which 20% of the animals die; events occur every 5 years in which 5% of the animals die	
Need envelope	A: 10, 15, 20; 20 thereafter	**A: 2, 3, 5; 5 thereafter**
	B: 10, 15, 20; 20->40 over years 17-100	B: 2, 3, 5; 5 -> 10 over years 17-100
	C: 10, 15, 20; 20->60 over years 17-100	
	D: 20, 25, 30; 30->50 over years 17-100	
Future Canadian catches	N/A	**A: 5 constant over 100 years**
		B: 2-> 8 over 100 years
		D[1]: 2 constant over 100 years
Survey frequency	5 years, **10 years**, 15 years	
Historic survey bias	0.8, **1.0**, 1.2	0.5, **1.0**
First year of projection, τ	**1960**	**1940**
Alternative priors	S_{1+}~U[0.9, 0.99]; f_{max} ~U[0.4, 0.6]; a_m~U[5, 12]	N/A
Strategic surveys	Extra survey if a survey estimate is less than half of the previous survey estimate	
Asymmetric environmental stochasticity	$\tilde{\rho}_f$ **= 0.320**	
Depletion	**Depletion = 0.3**; Depletion = 0.15/0.6	

*Effects of these factors begin in year 2013 (i.e. at start of management). The adult survival rate is adjusted so that if catches were zero, then the average population size during years 250-500 equals the carrying capacity. Note: for some biological parameters and levels of episodic events, it may not be possible to find an adult survival rate which satisfies this requirement. [1]Not renamed 'C' for consistency with previous trial names.

approach allows for additional reduction of the *Strike Limit* if the time series of abundances shows a reasonably precise downward trend in abundance. The difference between these two *SLA*s are the values for the control parameters so that the *SLAs* provide either a 'large' or 'lesser' change in depletion values compared to the weighted-average *SLA* so that the resource is not reduced as much by strikes if MSYR is low. Results are also shown in SC/65b/AWMP03 for a fifth *SLA* which sets the *Strike Limit* equal to need. Although the weighted-average *SLA* performs well in terms of need satisfaction, it performs poorly for some trials for the lowest $MSYR_{1+}$ value in terms of depletion values and relative increase in population size. The variants of this *SLA* considered were developed to try to improve the relative increase in population size. Results show that improvement in terms of relative increase in population size comes at the expense of need satisfaction. This trade-off occurs for trials with a higher as well as a low $MSYR_{1+}$.

Witting

SC/65b/AWMP02 outlined candidate *SLA*s based on adjustments to the 'Interim *SLA*'. These *SLA*s have no internal population dynamics model, but are based on a set of relatively simple calculations. The core calculation is an initial *Strike Limit* that is given as a percentage of a lower percentile of an abundance estimate. The percentage is determined by an r parameter, that is specified as a proportional take (e.g., r=0.03), and the lower percentile by a point estimate of abundance for the most recent year with a survey estimate, a percentile parameter p, and the CV of the estimate (assuming a log normal distribution). The point estimate of abundance is given by a linear regression over the most recent four survey estimates, so that noise from random fluctuations between estimates is reduced, while a possible trend over time is maintained in the calculation. The CV is a time-weighted average of the CV's of the four estimates.

The initial *Strike Limit* is modified for increased need satisfaction and increased protection. Need satisfaction is increased by a 'snap to need' function, which sets the *Strike Limit* equal to need if the initial *Strike Limit* is greater or equal to 80% of need. If the point estimate of abundance is lower than a specified abundance, a protection function forces the *Strike Limit* to be very low. For the case of West Greenland bowhead whales, the yearly *Strike Limit* is set to 2 if the point estimate of abundance is 800, and it is then scaled linearly downwards to zero at a point estimate of 400.

The influence of the variation in the CV on the performance of the *SLA* was examined by changing the values for r and p along a trade-off curve that maintains a constant *Strike Limit* for a CV fixed around the average expected CV. Performance was found to be almost identical along this trade-off curve for values for p ranging from 0 to 3; p=2 was chosen for the candidate *SLA*s, which corresponds to an approximate lower 5th percentile. The value of p in the *SLA* was then tuned p=2 to obtain the highest average need satisfaction given the conservation constraint that the lower 5th percentile of the ratio of the 1+ population size at the end to that at the start of the 100-year simulation period was larger than 1 for the *Evaluation Trials* with $MSYR_{1+}$=0.01. The result was a proposed 'best' candidate (denoted p2r0.9) with r=0.009.

Discussion

In discussion, it was noted that the *SLA*s in SC/65b/AWMP02 are discontinuous at the point at which strikes start to be reduced linearly to zero. This could lead to undesirably high changes in strike limit for only small changes to the estimate of abundance. Witting was encouraged to consider variants of his *SLA* which do not include such discontinuities for cases such as the bowhead where the strike limits are small.

The SWG noted that the number of strikes is relatively small and so the *SLA* should operate such that the strike limits for each future six-year block are integers. Witting noted that his *SLA* already included this feature.

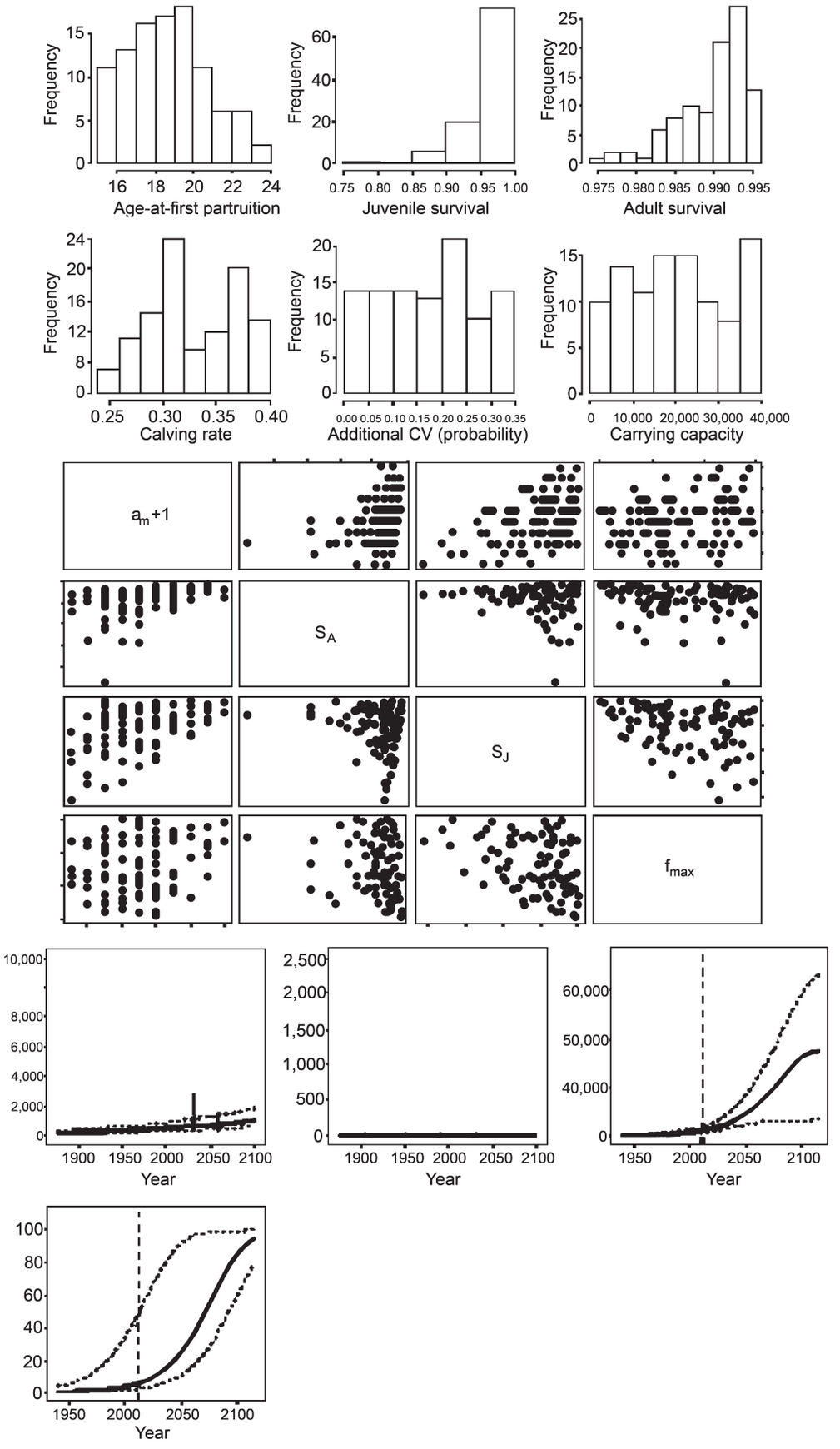

Fig 1. Example of conditioning plots (for Trial B01AA: $MSYR_{1+}$=2.5%; historical survey bias=1.

Table 2

Bowhead whales (each conducted conditioning to the estimate of abundance for West Greenland, treating this as absolute abundance). Values given in bold type show differences from the base trial.

Trial	Description	$MSYR_{1+}$	Need scenario	Survey frequency	Canadian catches	Historical survey bias
1A	$MSYR_{1+}$=2.5%	2.5%	A, B	10	A	1
1B	$MSYR_{1+}$=1%	**1%**	A, B	10	A	1
1C	$MSYR_{1+}$=4% (and $MSYL_{1+}$=0.8)	**4%**	A, B	10	A	1
2A	5 year surveys	2.5%	A, B	**5**	A	1
2B	5 year surveys; $MSYR_{1+}$=1%	**1%**	A, B	**5**	A	1
3A	15 year surveys	2.5%	A, B	**15**	A	1
3B	15 year surveys; $MSYR_{1+}$=1%	**1%**	A, B	**15**	A	1
4A	Survey bias=0.5	2.5%	A, B	10	A	**0.5**
4B	Survey bias=0.5; $MSYR_{1+}$=1%	**1%**	A, B	10	A	**0.5**
5A	3 episodic events	2.5%	A, B	10	A	1
5B	3 episodic events; $MSYR_{1+}$=1%	**1%**	A, B	10	A	1
6A	Stochastic events every 5 years	2.5%	A, B	10	A	1
6B	Stochastic events every 5 years; $MSYR_{1+}$=1%	**1%**	A, B	10	A	1
7A	Alternative future Canadian catches	2.5%	A, B	10	**B**	1
7B	Alternative future Canadian catches; $MSYR_{1+}$=1%	**1%**	A, B	10	**B**	1
9A	Alternative future Canadian catches	2.5%	A, B	10	**D**	1
9B	Alternative future Canadian catches; $MSYR_{1+}$=1%	**1%**	A, B	10	**D**	1
10A	Asymmetric environmental stochasticity (depletion=0.3)	2.5%*	A, B	10	A	1
10B	Asymmetric environ. stochasticity; $MSYR_{1+}$=1% (depletion=0.3)	**1%***	A, B	10	A	1

2.4 Conditioning

The conditioning of the operating models was conducted intersessionally. The SWG reviewed the conditioning based on the following diagnostic plots (for example plots see Fig. 1):

(1) marginal distributions for the parameters estimated during the conditioning process; these are not expected to be particularly smooth given the small number (100) of samples from the posterior;
(2) plots of the samples from the posteriors for the biological parameters (age-at-first parturition, adult survival rate, juvenile survival rate, maximum fecundity) expressed jointly to determine what part of the parameter space is excluded during the conditioning process, primarily due to the constraint that the stock needs to be in balance at carrying capacity; and
(3) plots which show: (a) the posterior medians and 90% intervals for the time-trajectory of 1+ population size, along with the data used to condition the operating model and their assumed 90% confidence intervals; and (b) time-trajectories of 1+ population size based on zero future removals (i.e. no strikes or incidental catches), expressed in absolute terms and relative to carrying capacity.

The SWG **agreed** that conditioning had been achieved successfully. However, trials B01CA and B02CB for which $MSYR_{1+}$=4% led to outcomes which the SWG considered implausible. In particular, while $MSYR_{1+}$=4% may be plausible for bowhead whales, that the stock is at carrying capacity is not - the conditioning algorithm indicated that the stock is currently at carrying capacity so that the population trajectory is in essence flat. This is because the point estimates of abundance decline slightly over time which is not consistent with a high MSYR and a stock depleted below its carrying capacity.

2.5 Trial results

Factors considered within the trials are summarised in Table 1 and the *Evaluation Trials* are given in Table 2; the *Robustness Trials* can be found in SC/65b/Rep06 (Annex D, table 6). The SWG noted the statistics and plots which it had used previously to compare candidate *SLA*s. It **agreed** that it would evaluate the candidate *SLA*s using the following tables and plots.

(1) a table with rows by trial for the 'Interim *SLA*' and each candidate *SLA*, along with scenarios in which: (a) all future catches are set to zero; (b) in which there are only incidental catches into the future (no aboriginal catches), and (c) the strike limit equals need. The tables include the lower 5th percentile and median for the following performance statistics (see Annex D of SC/65b/Rep06 for definitions): D1 (final depletion) for the 1+ component of the population; D1for the mature female component of the population; D8 (rescaled final depletion) based on incidental catches; D8 based on no future catches, D10 (relative increase), and N9 (need satisfaction) for 20 and 100 years.
(2) Time-trajectories of the lower 5th percentiles and medians for 1+ population size in which the area which encompasses the results for zero future catches and future strikes equal to need is shaded, and lines are shown for the scenario in which there are only incidental catches into the future as well as for the 'Interim *SLA*' and the candidate *SLA*s (see example in Fig. 2a).
(3) Zeh plots which show the same results as the table, except that the N12 (mean downstep) statistic is also reported (see example in Fig. 2b).

The SWG explored the performance of four new *SLA*s in detail, as well as the 'Interim *SLA*' for comparison. These were:

(1) *SLA* A: *SLA* p2r0.9 of SC/65b/AWMP02;
(2) *SLA* B: *SLA* p2r1 of SC/65b/AWMP02.
(3) *SLA* C: *SLA* 3 of SC/65b/AWMP03; and
(4) *SLA* D: *SLA* 4 of SC/65b/AWMP03

The SWG noted that the time taken to determine and condition the trials meant that developers had had relatively little time to work on their *SLA*s.

The SWG evaluated these *SLA*s in terms of: (a) the conservation performance of the *SLA*, particularly for trials with $MSYR_{1+}$=1%, high need, and high future Canadian catches; and (b) their performance in relation to the current 'Interim *SLA'*. It was noted that the four *SLA*s are tuned to somewhat different need-conservation trade-offs, which is reflected in the results of the trials.

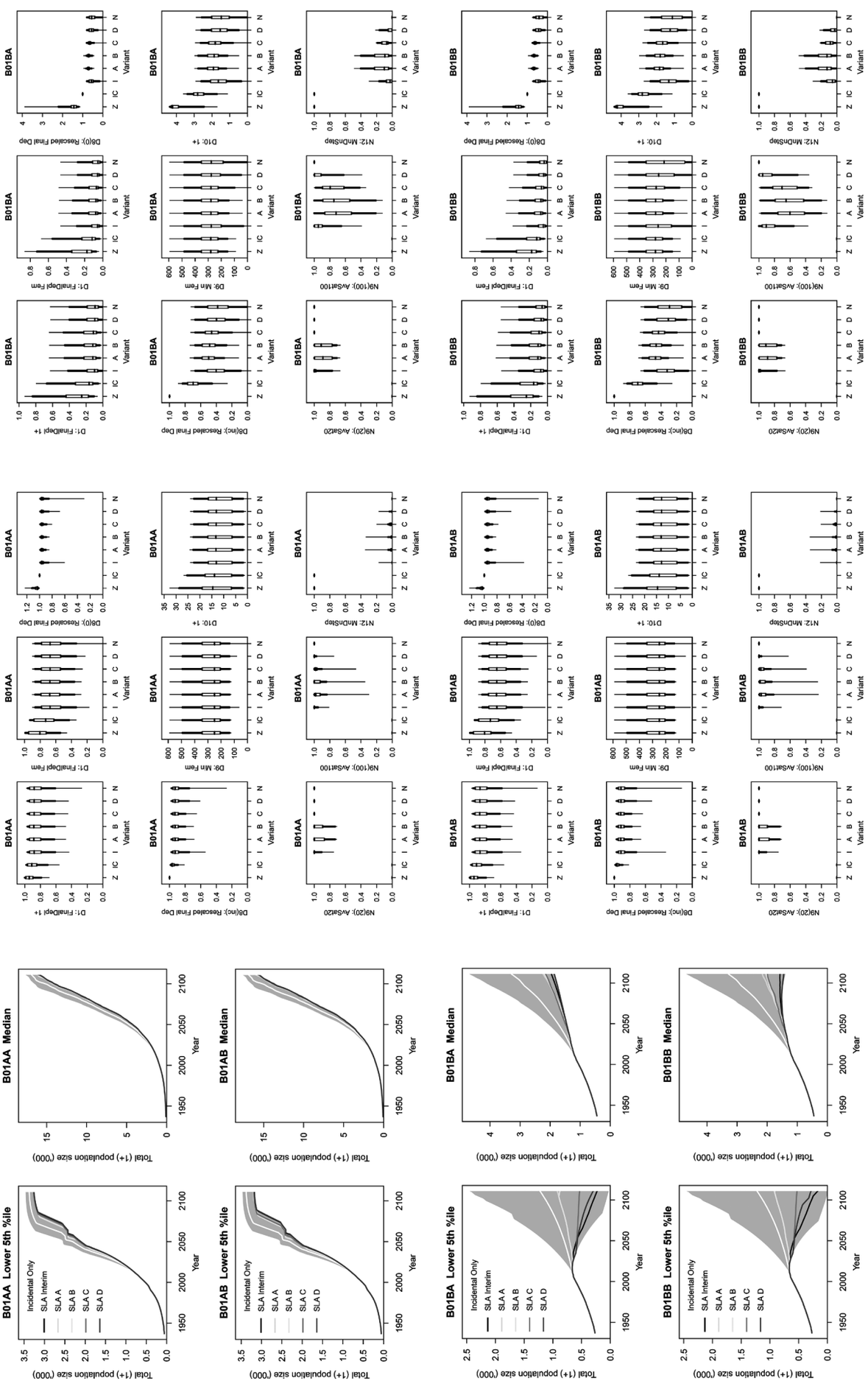

Fig 2. (a) Plot of the lower 5%ile and median projections for the total 1+ population for evaluation trials B01AA, B01AB, B01BA and B01BB.
The shaded region represents the range between the projection for zero catches (zero strikes and zero incidental catches) and the projection setting catch equal to need.
Fig 2 (b) Zeh plots for base case trials B01AA, B01AB, B01BA and B01BB. *Z*=zero future catches; Ic=individualo catch only; I=interim *SLA*; A=*SLA* A etc.; N=Need.

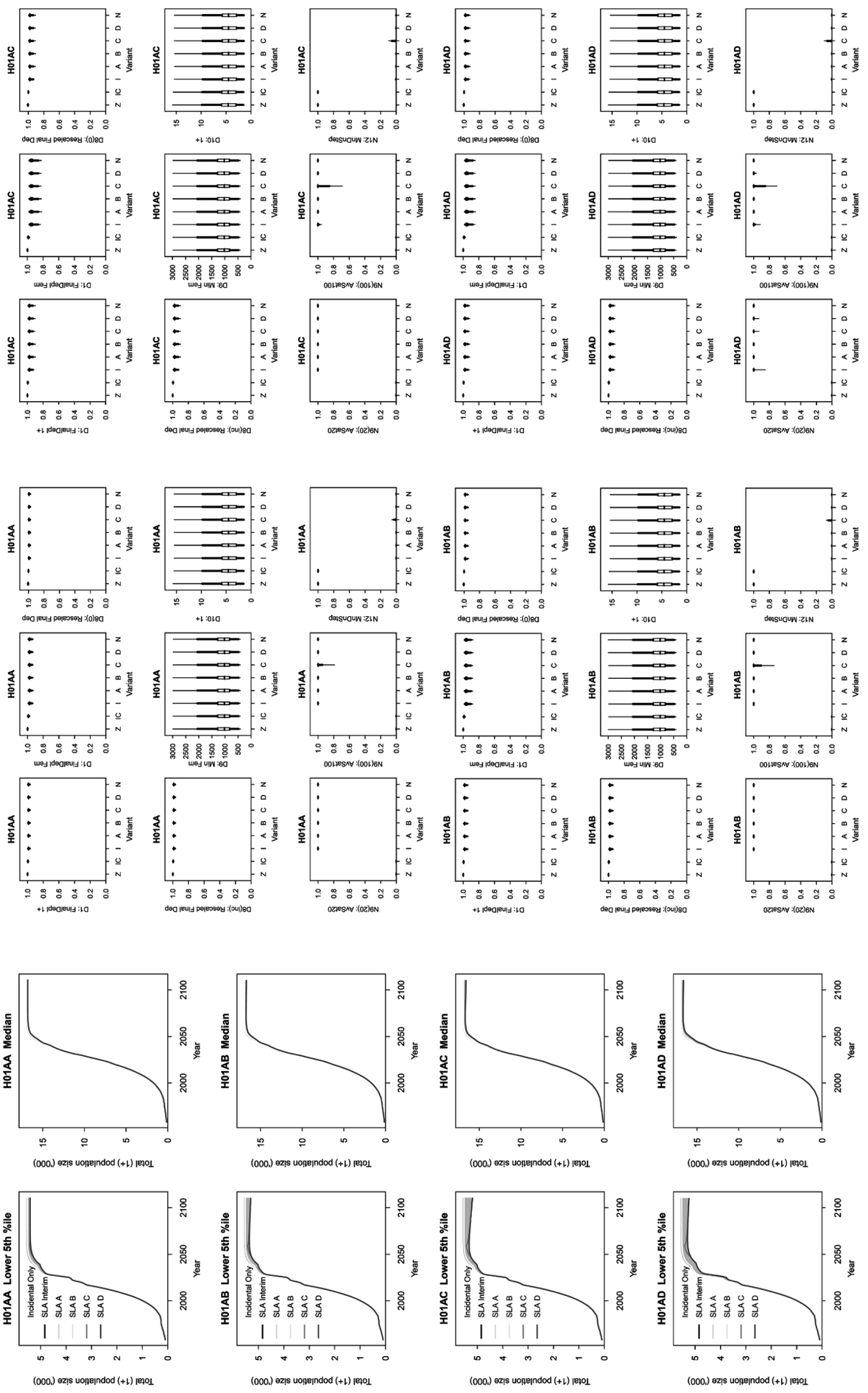

Fig. 3. (a) Plot of the lower 5%ile and median projections for the total 1+ population for evaluation trials H01AA, H01AB, H01AC and H01AD.
The shaded region represents the range between the projection for zero catches (zero strikes and zero incidental catches) and the projection setting catch equal to need.
Fig. 3 (b) Zeh plots for base case trials H01AA, H01AB, H01AC and H01AD. *z*=zero future catches; Ic=individualo catch only; I=interim *SLA*; A=*SLA* A etc.; N=Need.

Table 3

Proportion of times that each *SLA* achieves the conservation performance benchmark for various subsets of the 36 *Evaluation Trials* for bowhead whales off West Greenland, and the mean of the 5th percentile need satisfaction (N9 over 20 and 100 years) values within each such subset of trials. For all table entries, higher numbers indicate better performance.

	Interim	*SLA* A	*SLA* B	*SLA* C	*SLA* D
(a) Results by MSY rate					
$MSYR_{1+}$=2.5% trials (18 trials)					
Conservation performance	1.00	1.00	1.00	1.00	1.00
Need satisfaction 20 years	0.92	0.73	0.74	0.97	0.98
Need satisfaction 100 years	0.96	0.81	0.82	0.88	0.97
$MSYR_{1+}$=1% (18 trials)					
Conservation performance	0.50	1.00	0.89	0.56	0.50
Need satisfaction 20 years	0.81	0.71	0.72	0.97	0.98
Need satisfaction 100 years	0.76	0.38	0.39	0.53	0.76
(b) Results by need envelope					
Need Scenario A (18 trials)					
Conservation performance	0.78	1.00	0.94	0.78	0.78
Need satisfaction 20 years	0.86	0.72	0.73	0.97	0.98
Need satisfaction 100 years	0.88	0.62	0.62	0.73	0.89
Need Scenario B (18 trials)					
Conservation performance	0.72	1.00	0.94	0.78	0.72
Need satisfaction 20 years	0.86	0.72	0.73	0.97	0.98
Need satisfaction 100 years	0.84	0.57	0.59	0.67	0.85
(c) Results by future Canadian catches					
Canadian Scenario A (28 trials)					
Conservation performance	0.75	1.00	0.93	0.79	0.75
Need satisfaction 20 years	0.87	0.72	0.73	0.97	0.97
Need satisfaction 100 years	0.86	0.60	0.61	0.71	0.86
Canadian Scenario B (4 trials)					
Conservation performance	0.50	1.00	1.00	0.50	0.50
Need satisfaction 20 years	0.84	0.72	0.72	1.00	1.00
Need satisfaction 100 years	0.81	0.53	0.53	0.66	0.84
Canadian Scenario D (4 trials)					
Conservation performance	1.00	1.00	1.00	1.00	1.00
Need satisfaction 20 years	0.85	0.72	0.72	1.00	1.00
Need satisfaction 100 years	0.88	0.62	0.61	0.72	0.91

As with the development of previous *SLA*s, initial examination of the full set of results was undertaken by a small 'winnowing' group (Allison, Brandão, Givens, Punt, Roel and Witting); their task was to bring to the attention of the SWG those results that required further comment or examination. In order to investigate inferences from the trials, the SWG focussed its initial attention on the cases where either the lower 5th percentile of the D1 (1+) statistic was less than 0.6 or the 5th percentile of the D10 statistic was below 1 and where the lower 5th percentile of the N9 statistic was below 0.75.

Table 3 summarises various aspects of the trials in terms of conservation and need performance using these criteria. Overall, all of the *SLA*s performed adequately in terms of conservation performance if $MSYR_{1+}$=2.5% but as would be expected, performance was more variable for $MSYR_{1+}$=1% (Table 1a). There was relatively little impact on need satisfaction performance of the *SLA*s (Table 1b). The ability to satisfy conservation goals was roughly equivalent for scenarios A and B for future Canadian catches for which the average annual Canadian catch is 5 and easier for scenario D for which annual Canadian catches are 2.

From an examination of the tabular and graphical results, the SWG identified some general features.

(1) *SLA*s A and B generally had better performance with respect to conservation but poorer performance with respect to need satisfaction.
(2) *SLA*s C and D showed better performance for the $MSYR_{1+}$=2.5% trials, performing well in terms of conservation performance and better in terms of need satisfaction.
(3) *SLA*s A and B exhibited higher levels of variability than *SLA*s C and D.
(4) As expected, performance in terms of need satisfaction was better for the trials in which the Canadian catches were lower than for the basecase trials (e.g. trial B01).

The SWG **agreed** that the performance of the 'Interim *SLA*' in these trials confirmed the earlier recommendation of the Scientific Committee that it was suitable for at least up to two quota blocks. However, the SWG also **agreed** that for the longer 100-year period, the results showed that better performance than the 'Interim *SLA*' could be obtained for bowhead whales off West Greenland.

Performance for the *Robustness Trials* is generally as expected given the results of the *Evaluation Trials*. However, there are some features of the *Robustness Trials* which the SWG wished to highlight. In particular, need satisfaction was notably lower for trials B22AA and B22BA (linear increase in natural mortality), indicating that the *SLA*s had the desired property of reacting to declining abundance. In addition, the performance of *SLA* C was notably improved for trials B25AA and B25BA in which stochasticity is less than that for the *Evaluation Trials*. No *SLA*s prevented declines in abundance in the improbable *Robustness Trials* involving severe declines in carrying capacity or natural survival rates.

In discussion it was noted that the two classes of *SLA*s performed quite differently. It was suggested that one strategy might be to consider a combined approach in which *SLA*s C and D were given greater weight earlier in the 100-year period.

2.6 Conclusions and recommendations

The SWG **agreed** that developing *SLA*s for bowhead whales off West Greenland that fully met both conservation and need objectives was particularly difficult since the *SLA* was

only able to 'control' one source of mortality, i.e. strikes for the Greenland hunt, whereas mortality also occurs from catches by a non-member nation and from bycatches; it is also not possible to assume that future Canadian surveys will occur. An added difficulty is that the remaining uncertainty over stock structure (and therefore abundance) means that the scenarios that must be considered may be overly conservative; the SWG **strongly encourages** scientists from Canada and Greenland to co-operate on issues related to stock structure and abundance that may allow revision of the trial structure at a future *Implementation Review.*

Given the difficulties presented by these circumstances, the SWG noted that although improved performance over the *SLA*s considered this year was possible, it was unlikely that an *SLA* could be developed that fully met the conservation and need objectives under present circumstances. Given this, the SWG **requested** Witting to consult within Greenland as to whether it wished to proceed with the 'high' need envelope.

The SWG **concluded** that further work should be undertaken by the developers during the coming year. It noted that now conditioning had been satisfactorily achieved, progress on *SLA* development could take place at a faster rate, with progress being reported at the proposed intersessional Workshop discussed below. The objective would be for the SWG to be in a position to recommend an *SLA* to the Committee next year (see Item 11).

3. DEVELOPMENT OF *SLA* FOR THE HUMPBACK WHALE HUNT OF GREENLAND

3.1 Report of the intersessional Workshop

The Workshop focussed on developing removals series that took into account the incidental captures of 'Greenland' animals elsewhere in their range based *inter alia* on photographic matches from the College of the Atlantic (Simon and Boye, 2014). It agreed that the photo-identification information did not require any change to the approach previously adopted for taking account of bycatches off eastern Canada, and further that resightings in the Gulf of Maine were so few as to negate any need to take explicit account of them. The Workshop also emphasised the importance of adding dead whales to photographic catalogues.

The final series can be seen in Annex F of SC/65b/Rep06.

3.2 Intersessional progress

See Item 2.2 for a summary of progress related to both bowhead and humpback whales.

3.3 Candidate *SLA*s

SC/65b/AWMP01 outlined candidate *SLA*s for humpback whales off West Greenland, that have the same structure, parameters and 'snap to need' function as those applied to bowhead whales (SC/65b/AWMP02). The protection level for humpback whales is slightly higher than that for bowhead whales, with a yearly *Strike Limit* of 6 for a point estimate of abundance of 1,200 individuals, scaling linearly to zero for a point estimate of 600. This difference may appear counterintuitive because humpback whales have higher growth rates than bowhead whales. However, these choices reflect that the bowhead whale is managed on what is known to be a sub-component of a stock, which allows for a somewhat lower protection level. 'Snap to need' occurs when the *Strike Limit* is 80% of need, and *p* is set to 2.The value of *r* was tuned so that an *SLA* which results in an *SLA* with *r*=0.04 provides full need satisfaction for all of the *Evaluation Trials* and also ensures that the 1+ population size at the end of the 100-year simulation period is higher than that at the start of this period for all of the *Evaluation Trials*.

The *SLA*s developed for humpback whales off West Greenland by Brandão (SC/65b/AWMP04) have the same structure as those developed for the bowhead whales (see Item 2.3). The control parameters of these *SLA*s were not 'tuned' for the humpback case; rather the same values were used as for the bowhead case, due to a lack of time.

3.4 Final trial structure

The factors considered within the trials are summarised in Table 1. The *Evaluation Trials* are given in Table 4 whilst the *Robustness Trials* are given in SC/65b/Rep06 (Annex D, table 6).

3.5 Conditioning

The SWG reviewed the conditioning for the trials developed for humpback whales off West Greenland (see Item 2.4 for a description of the diagnostic plots and Figs. 3a and 3b for an example set of plots). It agreed that the conditioning has been achieved successfully except for the trials with $MSYR_{1+}$=1% which were clearly mis-specified.

3.6 Trial results

The SWG explored the performance of four new *SLA*s in detail as well as the interim *SLA* for comparison. These were the same as for the bowhead whale:

(1) *SLA* A: *SLA* p2r4 of SC/65b/AWMP01.
(2) *SLA* B: *SLA* p2r3 of SC/65b/AWMP01.
(3) *SLA* C: *SLA* 3 of SC/65b/AWMP03.
(4) *SLA* D: *SLA* 4 of SC/65b/AWMP03.

The SWG noted that the time taken to determine and condition the trials meant that developers had had relatively little time to work on their *SLA*s. However, it also noted that the humpback case was relatively data rich compared to the bowhead case and that catches from non-member nations were not an issue.

Consideration of the full set of graphical and tabular results was initially considered by the same 'winnowing' group. Performance in terms of conservation and need satisfaction was evaluated using the same performance evaluation statistics (D1, D10 and N9) as for West Greenland bowhead whales (Table 5) as well as consideration of the graphical output. All of the *SLA*s except *SLA* C achieved satisfactory levels of performance when $MSYR_{1}$=5%. However, only *SLA*s A and B achieved fully satisfactory performance when $MSYR_{1+}$=3%. Generally, *SLA*s C and Dachieved notably better performance than the other *SLA*s, especially with respect to need satisfaction.

The SWG **agreed** that the performance of the 'Interim *SLA*' in these trials confirmed the earlier recommendation of the Scientific Committee that it was indeed a suitable *SLA,* at least for up to two block quotas. However, the SWG also **agreed** that for the longer 100-year period, the results showed that better performance than the 'Interim *SLA*' could be obtained for humpback whales off West Greenland.

In terms of *Robustness Trials*, performance was as expected for all *SLA*s.

3.7 Conclusions and recommendations

Unlike the situation for the bowhead whales, the SWG **agreed** that the performance of two of the candidate *SLA*s

Table 4

The *Evaluation Trials* for humpback whales. Values given in bold type show differences from the base trial.

Trial	Description	$MSYR_{1+}$	Need scenarios	Survey frequency	Historical survey bias
1A	$MSYR_{1+}$ = 5%	5%	A, B, C, D	10	1
1B	$MSYR_{1+}$ = 3%	**3%**	A, B, C, D	10	1
1C	$MSYR_{1+}$ = 7%	**7%**	A, B, C, D	10	1
2A	5 year surveys	5%	B, C, D	**5**	1
2B	5 year surveys; $MSYR_{1+}$ =3%	**3%**	B, C, D	**5**	1
3A	15 year surveys	5%	B, C	**15**	1
3B	15 year surveys; $MSYR_{1+}$ =3%	**3%**	B, C	**15**	1
4A	Survey bias = 0.8	5%	B, C, D	10	**0.8**
4B	Survey bias = 0.8; $MSYR_{1+}$ =3%	**3%**	B, C, D	10	**0.8**
5A	Survey bias = 1.2	5%	B, C, D	10	**1.2**
5B	Survey bias = 1.2; $MSYR_{1+}$ =3%	**3%**	B, C, D	10	**1.2**
6A	3 episodic events	5%	B, C, D	10	1
6B	3 episodic events; $MSYR_{1+}$ =3%	**3%**	B, C, D	10	1
7A	Stochastic events every 5 years	5%	B, C, D	10	1
7B	Stochastic events every 5 years; $MSYR_{1+}$ = 3%	**3%**	B, C, D	10	1
8A	Asymmetric environmental stochasticity (depletion = 0.3)	5%	B, C, D	10	1
8B	Asymmetric environmental stochasticity (depletion = 0.3)	**3%**	B, C, D	10	1

Table 5

Number of times that the each *SLA* does ***not*** achieve the benchmark levels for *SLA* performance for the 18 *Evaluation Trials* for humpback whales off West Greenland. In this table, low numbers represent better performance.

	Interim	*SLA* A	*SLA* B	*SLA* C	*SLA* D
(a) Results by MSY rate					
$MSYR_{1+}$=5% trials (24 trials)					
Conservation performance	0	0	0	0	0
Need satisfaction 20 years	0	0	0	0	0
Need satisfaction 100 years	0	0	0	3	0
$MSYR_{1+}$ = 3% (24 trials)					
Conservation performance	0	0	0	0	0
Need satisfaction 20 years	9	0	0	3	3
Need satisfaction 100 years	0	0	0	7	0
(b) Results by Need level*					
Need Level A (2 trials)					
Conservation performance	0	0	0	0	0
Need satisfaction 20 years	1	0	0	0	0
Need satisfaction 100 years	0	0	0	0	0
Need Level B (16 trials)					
Conservation performance	0	0	0	0	0
Need satisfaction 20 years	1	0	0	0	0
Need satisfaction 100 years	0	0	0	2	0
Need Level C (16 trials)					
Conservation performance	0	0	0	0	0
Need satisfaction 20 years	1	0	0	0	0
Need satisfaction 100 years	0	0	0	3	0
Need Level D (16 trials)					
Conservation performance	0	0	0	0	0
Need satisfaction 20 years	6	0	0	3	3
Need satisfaction 100 years	0	0	0	5	0

(*SLA*s A and B) met the Commission's objectives in terms of conservation and need. However, in terms of need satisfaction, *SLA* A performed slightly better than *SLA* B. For example, the lower 5th percentile of need satisfaction exceeded 0.99 for all except one trial for *SLA* A (H06BD) while *SLA* B achieved lower than 99% need satisfaction with 95% probability for 3 trials (20 year need satisfaction) and 8 trials (100-year need satisfaction). In accordance with its previous agreement (IWC, 2014b) that once an *SLA* had been developed that fully met the Commission's objectives, that time would not be spent trying to improve it even further, the SWG **recommends** that, subject to final validation of the code by the Secretariat and archive running of the full set of statistics and graphical output, *SLA* A (hereafter the *Humpback SLA*) be used to provide long-term management advice to the Commission on the subsistence hunt of humpback whales off West Greenland.

The SWG was pleased to note that this component of its work plan had been completed. In particular, it wished to thank the developer of the *Humpback SLA,* Witting, and the other developers, Brandão and Butterworth, for their hard work in reaching this stage. Special thanks are also due to Brandão, Witting and Punt for their conscientious work in developing and finalising the operating model and conditioning. The SWG **stressed** that this work could not have been accomplished without assistance from the AWMP Developer's Fund established by the Commission, the funded intersessional Workshops and the hard work of the intersessional Steering Group. It **agrees** that this process (i.e. maintenance of the Developer's Fund, holding of intersessional Workshops and an active Steering Group) should be followed with respect to completing the development of the remaining *SLA*s for the Greenland hunts.

4. DEVELOPMENT OF *SLA* FOR THE GREENLANDIC COMMON MINKE WHALE HUNT

4.1 Stock structure

4.1.1 Report of the AWMP/RMP Workshop on stock structure

Donovan introduced SC/65b/Rep04, the report of the AWMP/RMP Joint Workshop on the stock structure of North Atlantic common minke whales held in Copenhagen from 14-17 April 2014. A short Chair's summary of the results of the Workshop is given in Annex D, Appendix 5, Item 2.1.

4.1.2 New information

This item is discussed in Annex D, Appendix 5, Item 2.2.

4.1.3 Conclusions and recommendations

The SWG endorsed both the report of the Workshop and its work plan.

4.2 Other new information

An examination of the catch sex-ratios by month and subarea (Annex D, Appendix 5, Table 5) suggests that the relative proportion of males differs between the primary catching season (i.e. before July) and the time when surveys are conducted (July) and thereafter, at least in some sub-areas (ES and EB). Therefore, the values for the parameters of the sightings mixing matrix should be estimated for each replicate by conditioning the operating model to the abundance estimates by sub-area and the average sex-ratio during July. Further details are given in Annex D, Appendix 5, Item 6.1. Other new information is discussed in Annex D, Appendix 5, Items 3, 4 and 5.

4.3 Discussion and work plan

SC/65b/RMP01 provided a draft set of specifications for a trials structure for evaluating *SLA*s for the West Greenland aboriginal hunt and for evaluating RMP variants for commercial whaling operations by Iceland and Norway. The operating model implements the stock structure scenarios agreed at the joint Workshop (SC/65b/Rep04).

The final trials specifications are given in Annex D, Appendix 5, Adjunct 5. The trials capture uncertainty regarding stock structure and MSYR and include the parameterisation of the selectivity patterns by sex and age and of the sightings mixing matrix. A different selectivity pattern is used for the West Greenland aboriginal catch than for the earlier Norwegian fishery in view of the different operational methods and sex ratios in the aboriginal hunt when compared to the historical commercial operation in the sub-area.

Punt reported that he had implemented the basic operating model for the trials and that initial conditioning had been achieved. The SWG thanked Punt for producing the code so quickly. In consequence, a preliminary version of the program is expected to be available to developers shortly after the end of the Scientific Committee meeting. However, the full version of the control program will not be finalised until after the end of the proposed intersessional Workshop. It was noted that AWMP-lite (Punt, 2013) cannot be used as an interim model, as it does not include the sex-ratio component.

The need envelopes for West Greenland minke whales will be confirmed later but will include a constant level of 200 whales for West Greenland and of 12 whales for East Greenland.

In view of the new approach being used to model the sex-ratio, minor amendments to the operating model may be necessary following consideration of the conditioning results, particularly given the interaction between aboriginal and commercial catch patterns.

Witting, Butterworth and Brandão indicated that they expect to extend their *SLA* development work to include development of an *SLA* for Greenlandic minke whales. It was noted that the code for the *SLA* is now standalone and hence developers may use any executable language for its implementation, although the common control program continues to be written in FORTRAN.

Work plan

An intersessional meeting is necessary in order to try to ensure that an *SLA* for minke whales will be ready by 2017. The SWG endorsed the work plan for the completion of the North Atlantic minke *Implementation Review* given in Annex D, Appendix 5, Item 7. The trials steering group will oversee this work.

5. DEVELOPMENT OF *SLA* FOR THE GREENLANDIC FIN WHALE HUNT

5.1 Stock structure

5.1.1 Report of the RMP Workshop on North Atlantic fin whales

Donovan introduced SC/65b/Rep07, the report of the Intersessional Workshop on the *Implementation Review* for North Atlantic fin whales held in Copenhagen in January 2014. The Workshop was primarily a technical Workshop to finalise trial specifications and make progress towards conditioning the trials. Further details are given in Annex D, Item 3.2.

5.1.2 Conclusions and recommendations

The SWG endorsed the report of the Workshop.

5.2 Discussion and work plan

The SWG confirmed that the trial specifications developed for the *Implementation Review* for North Atlantic fin whales are suitable for testing *SLA*s in the West Greenland area. However, the operating model is complex and is not yet operational. The SWG is concerned that the complexity of the model may not allow development of an *SLA* for fin whales in time for the 2017 Scientific Committee meeting. It **agreed** that priority should be given to development of an *SLA* for minke whales, in view of the greater contribution of minke whales to the overall interspecies need satisfaction for Greenland. It was suggested that an alternative approach for fin whales (not dependent on the full North Atlantic operating model) could be to develop a single-stock model, similar to the operating model used for the humpback*s* off West Greenland. The SWG **agreed** this approach will be conservative (i.e. from a conservation perspective) in that it assumes that the animals found of West Greenland comprise a single stock, and should be investigated. The trials Steering Group (Witting, Givens, Brandão, Butterworth, Punt, Allison, Donovan) will consider this suggestion further and report back to the intersessional Workshop.

6. ANNUAL REVIEW OF MANAGEMENT ADVICE

The SWG noted that the Commission had not reached agreement on strike limits for Greenland at the 2012 Annual Meeting (IWC, 2013). The SWG based its management advice on the same need requests considered last year. In providing this advice, the SWG noted that the Commission had endorsed the interim safe approach (based on the lower 5th percentile for the most recent estimate of abundance)

for providing advice for the Greenland hunts developed by the Committee in 2008 (IWC, 2009, p.16); it was agreed that that this should be considered valid for two blocks, i.e. up to the 2018 Annual Meeting. The SWG **emphasised** that the results of the full simulation exercise being undertaken as part of the development process for *SLA*s for the Greenland humpback and bowhead whales reconfirmed the Committee's original advice with respect to the interim *SLA*.

6.1 Common minke whales off West Greenland

6.1.1 New information (including catch data and agreed abundance estimates)

In the 2013 season, 166 common minke whales were landed in West Greenland and 9 were struck and lost. Of the landed whales, there were 127 females, 37 males and two of unknown sex. Genetic samples were obtained from 106 of these minke whales in 2013. The SWG **welcomed** the additional data and **encouraged** the continued collection of samples. It was also pleased to learn that samples from West Greenland were included in the genetic analyses that formed part of the Joint AWMP/RMP Workshop on stock structure (SC/65b/Rep04).

Over the years, the Committee has re-emphasised the importance of collecting genetic samples from these whales, and the SWG **welcomed** the new genetic analysis on population structure of common minke whale in the North Atlantic (SC/65b/RMP09), where samples from the West Greenland hunt were compared with samples from the Icelandic and Norwegian hunts. Out of 66 samples from West Greenland analysed for kin relationships, one parent offspring relation was found with a whale caught in the Central CIC sub-area. Witting advised that more samples are soon to be included in this analysis.

6.1.2 Management advice

In 2009, the Committee was able to provide management advice for this stock for the first time. This year, using the agreed interim approach and last year's revised estimate of abundance (16,100 CV=0.43), the SWG **advised** that an annual strike limit of 164 will not harm the stock.

6.2 Common minke whales off East Greenland

6.2.1 New information (including catch data and agreed abundance estimates)

Four common minke whales were landed in East Greenland in 2013, and two were struck and lost. Of the landed whales, there were three females and one male. The SWG was **pleased** to note that samples were collected from all four landed whales and that samples from the East Greenland hunt were included in the genetic analysis (SC/65b/RMP09). Out of 16 samples from East Greenland analysed for kin relationships, one parent offspring relation was found with a whale caught in the Central CIC area (Annex D, Appendix 7). The SWG **welcomed** the new information and encouraged the continued collection of samples.

6.2.2 Management advice

Catches of minke whales off East Greenland are believed to come from the large Central stock of minke whales. The most recent strike limit of 12 represents a very small proportion of the Central stock – see Table 6. The SWG **repeats** its advice of last year that the strike limit of 12 will not harm the stock.

6.3 Fin whales off West Greenland

6.3.1 New information (including catch data and agreed abundance estimates)

A total of nine fin whales (five females, three male, and one of unknown sex) were landed, and none were struck and lost, off West Greenland during 2013. The SWG was **pleased** to note that genetic samples were obtained from all landed fin whales, and that the genetic samples of fin whales off West Greenland are now being analysed together with the genetic samples from the hunt in Iceland. It **encouraged** the continued collection of samples.

Table 6

Most recent estimates of abundance for common minke whales in the Central North Atlantic.

Small Area(s)	Year(s)	Abundance and CV
CM	2005	26,739 (CV=0.39)
CIC	2009	9,588 (CV=0.24)
CG	2007	1,048 (CV=0.60)
CIP	2007	1,350 (CV=0.38)

6.3.2 Management advice

Based on the agreed 2007 estimate of abundance for fin whales (4,500 95%CI 1,900-10,100), and using the agreed interim approach, the SWG **repeated** its advice that an annual strike limit of 19 whales will not harm the stock.

6.4 Humpback whales off West Greenland

6.4.1 New information (including catch data and agreed abundance estimates)

A total of seven (four males and three females) humpback whales were landed, and one was struck and lost, in West Greenland during 2013. The SWG was **pleased** to learn that genetic samples were obtained from five of these whales and that Greenland was contributing fluke photographs to the North Atlantic catalogue, both from captured whales and other field studies. The SWG again **emphasised** the importance of collecting genetic samples and photographs of the flukes from these whales.

The SWG **welcomed** a report that 11 biopsy samples had been collected from West Greenland humpback whales in 2013 and encouraged continuation of the work.

6.4.2 Management advice

Based on last year's revised and agreed estimate of abundance for humpback whales (2,704 CV=0.34) and the agreed interim approach, the SWG **agreed** that an annual strike limit of 10 whales will not harm the stock.

The SWG **agreed** that the new *Humpback SLA* agreed above (see Item 3.6) should be used to confirm the strike limit, following completion of the validation/checking process.

6.5 Bowhead whales off West Greenland

6.5.1 New information (including catch data and agreed abundance estimates)

No bowhead whales were taken in West Greenland in 2013 while three bowhead whales were taken in northeast Canada in 2013. Samples were reported to have been collected from the Canadian hunt and the SWG encouraged collaboration with Canada on genetic work (and see Item 2.6).

It was reported that 65 biopsy samples had been collected from West Greenland bowhead whales in 2013. The SWG welcomed this information and encouraged continuation of the work.

The SWG **endorsed** the following two new abundance estimates for 2012 (SC/65b/Rep06): (i) a fully-corrected sighting survey abundance estimate of 744 (CV=0.34, 95% CI: 357-1,461); and (ii) a mark-recapture estimate of 1,274 (CV=0.12). It **agreed** that the mark-recapture estimate provides the best estimate of abundance for the number of whales visiting West Greenland.

6.5.2 Management advice

Based on the agreed best 2012 estimates of abundance for bowhead whales (1,274 CV=0.12), and using the agreed interim approach, the SWG **repeated** its advice that an annual strike limit of two whales will not harm the stock. It noted that the results from trials considered during this meeting (see Item 2.6) indicate that the interim approach is safe provided that the Canadian hunt does not increase markedly.

6.6 Humpback whales off St Vincent and The Grenadines

6.6.1 New information (including catch data)

A total of four humpback whales were landed (three males and one female) in St Vincent and The Grenadines in 2013 and individual data on these whales (including lengths and sexes) have been supplied to the Secretariat. No lost whales were reported. Skin and/or blubber samples were collected from all four whales. Preliminary information is that these data are being analysed in collaboration with the USA. The SWG **welcomed** this information from St Vincent and The Grenadines and **strongly encourages** continued tissue sampling and collection of fluke photographs where possible. Data should be shared with the appropriate databases and catalogues for the North Atlantic.

6.6.2 Management advice

The SWG has agreed that the animals found off St Vincent and The Grenadines are part of the large West Indies breeding population (abundance estimate 11,570 95%CI 10,290-13,390). The Commission adopted a total block catch limit of 24 for the period 2013-18 for Bequians of St Vincent and The Grenadines. The SWG **repeated** its advice that this block catch limit will not harm the stock.

7. ABORIGINAL WHALING MANAGEMENT SCHEME

In 2002, the Committee **strongly recommended** that the Commission adopt the Aboriginal Subsistence Whaling Scheme (IWC, 2003). This covers a number of practical issues such as survey intervals, carryover, and guidelines for surveys. The Committee has stated in the past that the AWS provisions constitute an important and necessary component of safe management under AWMP *SLA*s and it **reaffirms** this view as it has for the previous 12 years.

8. FOLLOW-UP WORK ON CONVERSION FACTORS FOR THE GREENLAND HUNT

This item relates to follow up work on conversion factors (i.e. related to converting edible whale products into numbers of whales by species) that was undertaken by Donovan *et al.* (2010) at the request of the Commission. That report, endorsed by the Scientific Committee, provided a conversion factor for the common minke whale (for which data were abundant) and provisional factors for the other species (often by analogy with other areas as data are sparse for Greenland). They had recommended *inter alia* that data for those species be collected in Greenland such that the factors could be modified if necessary.

SC/65b/AWMP05 reported on conversion factors based on more reliable data from the Greenlandic hunt of bowhead, humpback and fin whales. A new data collection system was introduced in 2010 to facilitate new estimates. Hunters were requested to estimate the weight of the bins in which the different edible products were landed, and to count the number of bins landed per whale. Unfortunately the number of weight reports received was low. Information meetings involving biologists, hunters, wildlife officers and hunting license coordinators were then held in the larger towns in 2012 and 2013 to improve the data collection process, and an information folder was produced and distributed to the hunters. The data collection process was also combined with an existing research project on hunting samples to get a greater involvement of biologists. When researchers participate in hunts they train the hunters in measuring the lengths (curved and standard) and they make sure that the meat is weighed.

Witting noted that it was also realised that a potential reason for the low reporting rate was the almost complete absence of weighing equipment where hunters could weigh the different products. To increase the reporting rate, the Greenland Institute of Natural Resources purchased and distributed weighing equipment to three of the major towns for the hunters to use when landing a catch. Furthermore, it was realised that the 'bin system' was more complicated than first anticipated because of the large variation in the size of the bins used within the same hunt and between hunters. It was therefore recommended that hunters weigh all edible products with the crane weight when they land the meat with the crane in the harbour.

All reliable weights obtained since 2009 are listed in Table 2 of SC/65b/AWMP05 (bowhead whale n=6; humpback whales, n=8; fin whale, n=4). Estimates of average weights are somewhat lower than the provisional estimates from fig. 1 of Donovan *et al.* (2010) but fit reasonably well for humpback whale (within 1SD for both derived and total weight data) and bowhead whale (about 1 SD,). The estimate for fin whales is lower than the interim conversion factor. Owing to the low sample size (n=4), it is unclear whether this is a true reflection of the average yield for fin whales in Greenland, or whether it is a statistical artefact. While both the sampling project and the communication with hunters are steadily improving, the amount of data obtained is still disappointing. Greenlandic biologists will therefore continue their close contact with fin and humpback whale hunters to improve the number of reported weights.

The SWG **thanked** the authors for this work which responded appropriately to its recommendations last year for a full report and **encourages** continuation of the study. It noted that the provisional conversion factors developed in 2009 appear to overestimate the amount of edible products actually obtained (although sample sizes are small), but were generally within the confidence intervals. It also noted the low numbers of lost whales in the Greenlandic hunts.

The SWG recognised the difficulties inherent in obtaining the weight data, including: (i) persuading the hunters to modify their behaviour and obtain accurate weight measures; and (ii) enabling researchers to be present to assist in the data collection. The latter is extremely difficult given the opportunist nature of the hunt and the variety of locations (both in distance and difficulties in access) where flensing is carried out.

Recognising: (1) the difficult field conditions; (2) the relatively low number of catches (and thus slow increase in sample size) of the species for which the conversion factors were deemed provisional; (3) the fact that the new data, albeit few, did not suggest that the provisional factors from the 2010 study required major modification: and (4) that the information was not required for *SLA* development, the SWG **agreed** that annual update reports are unnecessary for the work of the Scientific Committee. It **suggests** that data are periodically submitted directly to the Commission and incorporated as necessary into need statements.

Table 7

Summary of survey abundance estimates by species and area. Relative indices of abundance for use in the trials are given in SC/65b/Rep06 (Annex D).

Area	Year	Corr*	Estimate and approx. 95% CI & CV	IWC reference	Original reference
Common minke whale					
West Greenland	2007	A+P	16,610 (7,170-38,400) (CV:0.43)	IWC, 2010; SC/65a	Heide-Jørgensen *et al.* (2010b)
West Greenland	2005	A+P	10,790 (3,400-34,300) (CV:0.59)	IWC, 2008	Heide-Jørgensen *et al.* (2008)
West Greenland	1993	A	8,370 (3,600-19,440) (CV:0.43)	IWC, 1995	Larsen (1995)
Fin whale					
West Greenland	2007		4,360 (1,810-10,530) (CV:0.45)	IWC, 2009	Heide-Jørgensen *et al.* (2010a)
West Greenland	2005	P	3,230 (1,360-7,650) (CV:0.44)	IWC, 2008	Heide-Jørgensen *et al.* (2008)
West Greenland	1988	A	1,100 (554-2,180) (CV:0.35)	IWC, 1993	IWC (1993)
Humpback whale					
West Greenland	2007	A+P	4,090 (1,690-9,880); (CV:0.45) MRDS	IWC, 2009; SC/65a	Heide-Jørgensen *et al.* (2012); Heide-Jørgensen and Laidre (2013)
West Greenland	2007*	A+P	2,700 (1,390-5,270) (CV:0.34) strip census	IWC, 2009; SC/65a	Heide-Jørgensen *et al.* (2012); Heide-Jørgensen and Laidre (2013)
Bowhead whale					
Prince Regent Inlet	2002	A+P	6,340 (3,119-12,906) (CV:0.36)	IWC, 2009	IWC (2009)
Foxe Basin/Hudson Bay	2003	A+P	1,525 (333-6,990) (CV:0.78)	IWC, 2009	IWC (2009)
West Greenland[1]	2007	A+P	1,229 (489-3,090) (CV: 0.47)	IWC, 2008	Heide-Jørgensen *et al.* (2007)
Isabella Bay	2009	A+P?	1,105 (515-2,370) (CV: 0.39)	SC/65a/Rep02	Hansen *et al.* (2012)
West Greenland	2012	A+P	744 (357-1,461) (CV 0.34)	SC/65b/Rep06	Rekdal *et al.* (2015)

*Indicates whether the estimate has been corrected for availability bias (A) and/or perception bias (P). [1]The mark-recapture abundance estimate of 1,274 (CV=0.12; 95% CI: 967-1,581) constitutes the best available estimate of abundance for the number of bowhead whales visiting West Greenland - Rekdal *et al.* (2015); for a discussion as to why this estimate is not suitable for use within the present trial structure see SC/65b/Rep06, Item 3.1.

Table 8

Two-year work plan (the second year is more tentative than the first and depends on progress).

Topic	Intersessional (2014-15)	SC/66a (May-June 2015)	Intersessional (2015-16)	SC/66b (May-June 2016)
Validate *Humpback SLA*	Complete by July 2014	Receive report formally	No	No
Development of *SLA* for bowhead whales	Workshop (January); developers' work	Expect to finalise *SLA* recommendation	Probable workshop (January); developers' work	Finalise *SLA* recommendation if not completed in 2015
Development of *SLA* for common minke whales	Workshop; developers' work	Review progress; developers' work	Workshop; developers' work	Hope to finalise *SLA*
Development of *SLA* for fin whales	Workshop; developers' work	Review progress	Workshop; developers work	Review progress; developers' work
Annual review of catch limits	No	Complete	No	Complete
Implementation Reviews	No	None scheduled	No	Prepare for gray whale *Implementation Review*

9. CONSERVATION MANAGEMENT PLANS

The SWG had no suggestions for CMPs this year.

10. UPDATED LIST OF ACCEPTED ABUNDANCE ESTIMATES

The SWG noted the request to develop a list of accepted abundance estimates for consideration as part of an overall summary for all species to be developed by the Plenary, as well as for use within the SWG. This was developed and has been forwarded for Plenary compilation. The abundance estimates **agreed** by the SWG are summarised in Table 7.

11. WORK PLAN AND PRIORITISED BUDGET

The SWG noted that this year it was expected to put forward a draft work plan and budget for a two-year period. In doing so it drew attention to the unavoidable mismatch between the Scientific Committee year (May-June year 1 to May-June year 2), the Commission's biennial period (September year 1 to September year 3) and the Commission's financial year (1 January to 31 December). This makes planning rather more difficult, and is particularly difficult when the tasks undertaken are iterative i.e. the work needed in year 2 is heavily dependent on the results of year 1. This timing difference is particularly problematic if funded work is expected to be carried out in the period between the close of the Scientific Committee meeting and the adoption of the budget by the Commission which comes into force on the following 1 January (i.e. some 6 months after the Committee meeting).

The two-year work plan summarised in Table 8 has to include a degree of expectation of progress that may not be realised.

The SWG developed two budget proposals per year that are integrally related, one for an intersessional Workshop to progress the work on *SLA* development (SC/65b/AWMP-RP01), and the other to maintain the existing Developers' Fund (SC/65b/AWMP-RP02). Without funding of these two items, experience has shown that the SWG will not achieve its work plan and that the Committee will not be able to achieve the target of completing long-term *SLA*s for all of the Greenland hunts to the Commission to replace the interim *SLA* in time for the 2018 Commission meeting. This is essential for the Committee to provide advice on the next block of subsistence whaling limits.

The SWG therefore **strongly recommended** that both budget proposals are funded and given equal priority. This will require £7,000 for the Developers' fund in each year and £7,000 for each year for each Workshop (i.e. a total of £14,000 in 2015 and £14,000 in 2016. Without this, the SWG cannot achieve its two-year work plan and the Committee is unlikely to be able to meet the Commission's requirement to have long-term *SLA*s ready for the 2018 meeting at the latest.

12. ADOPTION OF REPORT

The report was adopted at 17.00 on 20 May 2014. The Chair thanked the participants for their hard work and diligence in discussing complex issues. In particular, he was pleased that the first long-term *SLA* for a Greenland hunt had been completed and thanked all those who had worked so hard to achieve this. He also paid tribute to the hard working rapporteurs. The SWG thanked the Chair for leading them through a full agenda with patience and good humour.

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Appendix 1

AGENDA

1. Introductory items
   - 1.1 Convenors opening remarks
   - 1.2 Election of Chair
   - 1.3 Appointment of rapporteurs
   - 1.4 Adoption of Agenda
   - 1.5 Documents available
2. Development of *SLA* for the bowhead whale hunt of Greenland
   - 2.1 Report of the intersessional Workshop
   - 2.2 Intersessional progress
   - 2.3 Candidate *SLA*s
   - 2.4 Final trial structure (*Evaluation Trials* and *Robustness Trials)*
   - 2.5 Conditioning
   - 2.6 Trial results
   - 2.7 Conclusions and recommendations
3. Development of *SLA* for the humpback whale hunt of Greenland
   - 3.1 Report of the intersessional Workshop
   - 3.2 Intersessional progress
   - 3.3 Candidate *SLA*s
   - 3.4 Final trial structure (*Evaluation Trials* and *Robustness Trials)*
   - 3.5 Conditioning
   - 3.6 Trial results
   - 3.7 Conclusions and recommendations
4. Development of *SLA* for the Greenlandic common minke whale hunt
   - 4.1 Stock structure
     - 4.1.1 Report of the AWMP/RMP Workshop on stock structure
     - 4.1.2 New information
     - 4.1.3 Conclusions and recommendations
   - 4.2 Other new information
   - 4.3 Discussion and work plan
5. Development of *SLA* for the Greenlandic fin whale hunt
   - 5.1 Stock structure
     - 5.1.1 Report of the RMP Workshop on North Atlantic fin whales
     - 5.1.2 Conclusions and recommendations
   - 5.2 Discussion and work plan
6. Annual review of management advice
   - 6.1 Common minke whales off West Greenland
     - 6.1.1 New information (including catch data)
     - 6.1.2 Management advice
   - 6.2 Common minke whales off East Greenland
     - 6.2.1 New information (including catch data)
     - 6.2.2 Management advice
   - 6.3 Fin whales off West Greenland
     - 6.3.1 New information (including catch data)
     - 6.3.2 Management advice
   - 6.4 Humpback whales off West Greenland
     - 6.4.1 New information (including catch data)
     - 6.4.2 Management advice
   - 6.5 Humpback whales off St Vincent and The Grenadines
     - 6.5.1 New information (including catch data)
     - 6.5.2 Management advice
7. Aboriginal Subsistence Whaling Scheme
8. Follow-up work on conversion factors for the Greenland hunt
9. Conservation Management Plans
10. Updated list of accepted abundance estimates
11. Work plan and prioritised budget requests