requiring additional regulations. However, option II(c) would require more work to develop an appropriate index of relative abundance for sub-areas.

With respect to the management variants considered at this meeting as potential implementation candidates based on the trial results (Item 6.1.5.1), variant 6 could be realised by using option II(b) of Appendix 3. The other variants involve designating the sub-areas already defined in the trials, or combinations of them, as *Small Areas* and *Combination Areas*.

The sub-committee had little time to discuss the options listed in Appendix 3, but **agreed** that in the event that the Commission approved variant 6 for the RMP *Implementation* for North Pacific minke whales, *Small Areas* should be delineated using option II(b) of Appendix 3. This would require further discussion at next year's meeting.

5.5 Data required: value of collecting *tympanic bullae*

The Commission had asked the Scientific Committee to consider the utility of including a requirement in the *Schedule* to collect *tympanic bullae* from each whale caught for the purpose of age determination. The sub-committee recalled the Committee's earlier conclusion (IWC, 2002b, p.105) that reliable age determination beyond the first few years was not possible using *tympanic bullae*, and therefore **recommends** that such a requirement not be included in the *Schedule*.

5.6 Comparison of RMP and AWMP

The sub-committee recalled the discussion last year (IWC, 2003a, p.23) that:

> A strict comparison of the *Bowhead SLA* with the *CLA* is not possible for a number of reasons, particularly with respect to: (1) the different objectives for each, notably the difference between management aimed at producing the highest possible continuing yield and management aimed at satisfying a limited need requirement in perpetuity; and (2) the case-specific nature of the *Bowhead SLA* that was tailored to manage a data rich population as opposed to the generic *CLA*, that has to be able to cope with a variety of situations.

SC/55/RMP9 presented a brief review of the discussions on stock structure in the BCB stock of bowhead and western North Pacific minke whales, conducted by the Committee. The author identified what he believed are different criteria by the Committee to define stocks in these two cases. The findings of this paper are summarised in Annex G, item 4.1 in the context of the Committee's discussions on BCB bowhead whales. Responses to the paper, highlighting the differences between the BCB bowhead and North Pacific minke cases, are also contained in Annex G.

Hakamada noted further differences in the Committee's approach to bowhead whales and North Pacific minke whales. The bulk of the trials were conducted for *MSYR* = 1%(mature) for minke whales, vs. 2.5%(1+) for bowhead whales. The RMP tends to allow no catches from stocks depleted to less than 0.54*K*, whereas the AWMP for bowhead whales allows some catch even if the population size is less than 0.2*K*. Applied to BCB bowhead whales, the RMP would not allow any catch before 2030.

Gunnlaugsson commented that if a reasonable MSY rate were used in the *IST*s for North Pacific minke whales, the different stock scenarios for the trials would have had little influence on restricting the range of acceptable RMP variants.

The Chair ruled that the sub-committee would not attempt to undertake a general comparison of the RMP and AWMP under this item, but that the specific points raised in the papers and by members should be considered under the specific topics to which they relate in the sub-committee deliberations on the RMP *Implementations* for North Pacific minke whales and other cases.

5.7 Work plan

Discussion was deferred until Item 6.5.

6. RMP – PREPARATIONS FOR *IMPLEMENTATION*

6.1 Complete North Pacific minke whale *Implementation*

6.1.1 Report of the Implementation Simulation Trials Workshop (SC/55/Rep2)

Following a recommendation by the Workshop itself, which had been held from 15-18 January 2003 in Seattle, Donovan, gave a PowerPoint presentation rather than presenting its report in a traditional manner. This provided a general overview of the trials process and a summary of the work in recent years leading to the finalisation of the *Implementation Trials* agreed in Seattle in January 2003[1].

The presentation summarised the development of the generic *CLA* in terms of simulation trials and the role of *Implementation Simulation Trials (ISTs)* in the transition from the single stock generic to multi-stock case-specific situations. The aim of such trials is to encompass the range of plausible scenarios involving *inter alia* stock structure, MSY rates (MSYR), removals and surveys. These trials are used to investigate the implications of various choices of RMP variants such as *Catch-cascading* from a risk- and catch-related perspective, with a view to recommending an appropriate variant for implementation of the RMP for a specific species/area.

Donovan then summarised the final trials agreed at the Workshop. In particular he concentrated on stock structure hypotheses and management variants. He noted that one reason for the complexity of the situation for western North Pacific minke whales was the need to reflect the spatio-temporal factors involved in scenarios with whaling occurring on migration; the RMP was initially designed for the simpler situation of whaling on the feeding grounds.

In terms of stock structure, the procedure is to identify sub-areas that can be used when specifying possible hypotheses. For the western North Pacific, 18 such areas have been identified during the development process (see fig. 2 of Scientific Committee report). Although certainly not the only possible approach, the Committee had agreed that provided there was some support that a stock structure hypothesis was plausible, it would be considered in the trials; full discussion of plausibility was expected to occur after the trials had been agreed and run but before the results were known.

Four such stock structure scenarios were developed ('Baselines' A-D) and these were outlined in the presentation. Summaries of the background to these are given in Appendices 8a-8c and thus only a simple outline is given here. All scenarios involved a separate 'J-stock', found mainly to the west of Japan (in sub-areas 1, 5, 6, 10) and found mixed with other whales ('O', 'O_w' and 'O_e' (sub-areas 7W, 7E, 11, 12SW) in some months. This stock is not the focus of the *Implementation* in terms of applying the *CLA*, but is included in the simulations and there are implications of the results that will need to be considered.

[1] This is available upon request.

(1) *Baseline A*: this is based on the results of hypothesis testing and involves 3 stocks (J, O and W). It presents possible feeding migration routes for the O-stock. Temporal mixing of O- and J-stock occurs in some sub-areas and the W-stock occurs sporadically in sub-area 9. A simple illustration of this hypothesis is given in Fig. 1a.
(2) *Baseline B*: this is essentially the same as Scenario A but with no W-stock (i.e. a limiting case of Scenario A).
(3) *Baseline C*: this is based on the results of the 'Boundary Rank' method (e.g. see Plenary Item 7.2.2). It involves 4 stocks (J, O_w, O_e and W). The preferred hypothesis is for boundaries at 147°E and 158°E with no mixing. This hypothesis is illustrated in Fig. 1b.
(4) *Baseline D*: this is based on a synthesis of available genetic and other biological information. It involves three stocks (J, O, W) with the O- and W-stocks mixing across the 147°-162°E region. The O stock dominates in the west and the W stock in the east. This is illustrated in Fig. 1c.

In effect, these scenarios are modelled via a catch-mixing matrix that specifies the fraction of each stock that occurs in each sub-area each month by age and sex (juveniles, males age 10+ and females 10+).

The Workshop (and previous meetings) had spent considerable time discussing the conditioning of the trials. Conditioning involves selecting values for the operating models such that they adequately mimic (1) the data, and (2) the dynamics of the particular scenario in the context of evaluating performance to enable an RMP variant to be selected. It was **agreed** that conditioning had been adequately addressed at the Workshop.

As noted above, the aim of the *IST* process is to arrive at a recommended variant for the *Implementation* of the RMP in a specific case. To this end the Workshop confirmed that the trials would examine the six variants previously identified. These are illustrated in Fig. 2 (a-f).

Thus the RMP variants to be considered in the trials and the sub-areas from which catches are taken when a *Small Area* consists of more than one sub-area were:

(1) *Small Areas* equal sub-areas. For this option, the *Small Areas* for which catch limits would be set are 7W, 7E, 8W, 8E, 9W, 9E, 11, 12SW and 12NE.
(2) 7+8, 9, 11 and 12 are *Small Areas* and catches are taken from sub-areas 7W, 9W, 11 and 12SW.
(3) 7+8+11+12 and 9 are *Small Areas* and catches are taken from sub-areas 11 and 9W.
(4) 7W, 7E+8+12, 9 and 11 are *Small Areas* and catches are taken from sub-areas 7W, 9W, 11 and 12SW.
(5) 7+8+11+12 and 9 are combination areas and catches are cascaded to the sub-areas within each combination area.
(6) as (3) except that the catches from the 7+8+11+12 *Small Area* are taken from sub-areas 7W and 11 using catch cascading across those two sub-areas.

The fraction of 'J' stock animals was not insubstantial in sub-area 12SW in June and in sub-area 11 in all months. Therefore, two additional variants based on variants (1) and (5) were also specified. These variants were based on the assumption that catches are zero in sub-area 11 in all months and in sub-area 12SW in June.

The full list of trials **agreed** at the Workshop is given in Table 1[2]. These comprised the four baseline cases (for each scenario, MSYR of 1% and 4% and J-stock at 30%K in year 2000) and a large number of sensitivity trials investigating *inter alia* J-stock depletion ranging from 15-70%K, various levels of mixing and intrusion, differing assumptions about bycatches from Japan and Korea, and survey bias. The Workshop also spent some time developing a recommended format for presentation of results. Other issues discussed but not resolved at the Workshop (and hence passed on to the sub-committee) included how to address questions of plausibility, including whether or not it was acceptable to introduce new data in such discussions.

Following some questions of clarification on SC/55/Rep2, Punt presented SC/55/IST1. This reported some further tests to those detailed in item 5.3 of SC/55/Rep2 to check the consequences of the possibility that the *Implementation Simulation Trials* (*ISTs*) designed might have under-represented the extent of migration in the actual population. It was **agreed** that the results in SC/55/IST1 confirmed the earlier absence of indication that this aspect of the modelling had any appreciable effect on the results of the *ISTs* examined.

Taylor presented SC/55/IST8, which detailed work done since the Workshop to evaluate dispersal rates for certain trials (see Table 1). It was **agreed** that the *ISTs* agreed at the Workshop constituted a sufficient set upon which to base a recommendation for *Implementation* of an RMP variant.

6.1.2 Report of the intersessional Steering Group

Butterworth, who had chaired this group, reported on activities since the intersessional Workshop referenced in Item 6.1.1. These had essentially comprised facilitation of the process of completing conditioning and running of the *ISTs* as finalised in SC/55/Rep2. These activities had included:

(1) Dispersal rates for trials: use of Taylor's 'best' estimate of 0.00725 for trial C19 and 0.01 for trial C17.
(2) Incorporation of an additional requirement in the conditioning process that the J:O_e ratio in 7E = 'J':'O_w' ratio in 7W. This condition was necessary as without it the fitting program could sometimes lead to larger numbers of J whales in the 7E sub-area than in the 7W sub-area. (The alternative was to require the ratio in 7W be lower than that in 7E, but had the disadvantage that the solution was not unique.)
(3) Confirmation of the final version of the mixing matrices for the Baseline D trial. These were as specified by the intersessional Workshop (SC/55/Rep2), but the matrices had not been calculated at the Workshop.

6.1.3 Relative plausibility of trials

6.1.3.1 GENERAL CONSIDERATIONS

Process to be used to formulate recommendation

Attention was drawn to item 9.1 of SC/55/Rep2, which had requested written suggestions for this process. Five papers (SC/55/IST5,12,13,14,15) submitted in response were presented and discussed at length. Two points of consensus that emerged were:

(1) the large number of trials (140) needed to be reduced to render the volume of results to be considered more manageable;
(2) sub-committee members should not see the results of the trials for the six RMP variants under consideration until the debate on the relative plausibility of the different trials had been completed, so that judgements of plausibility were not influenced by trial results.

[2] This Table includes changes made intersessionally and the additional six trials added during the meeting.

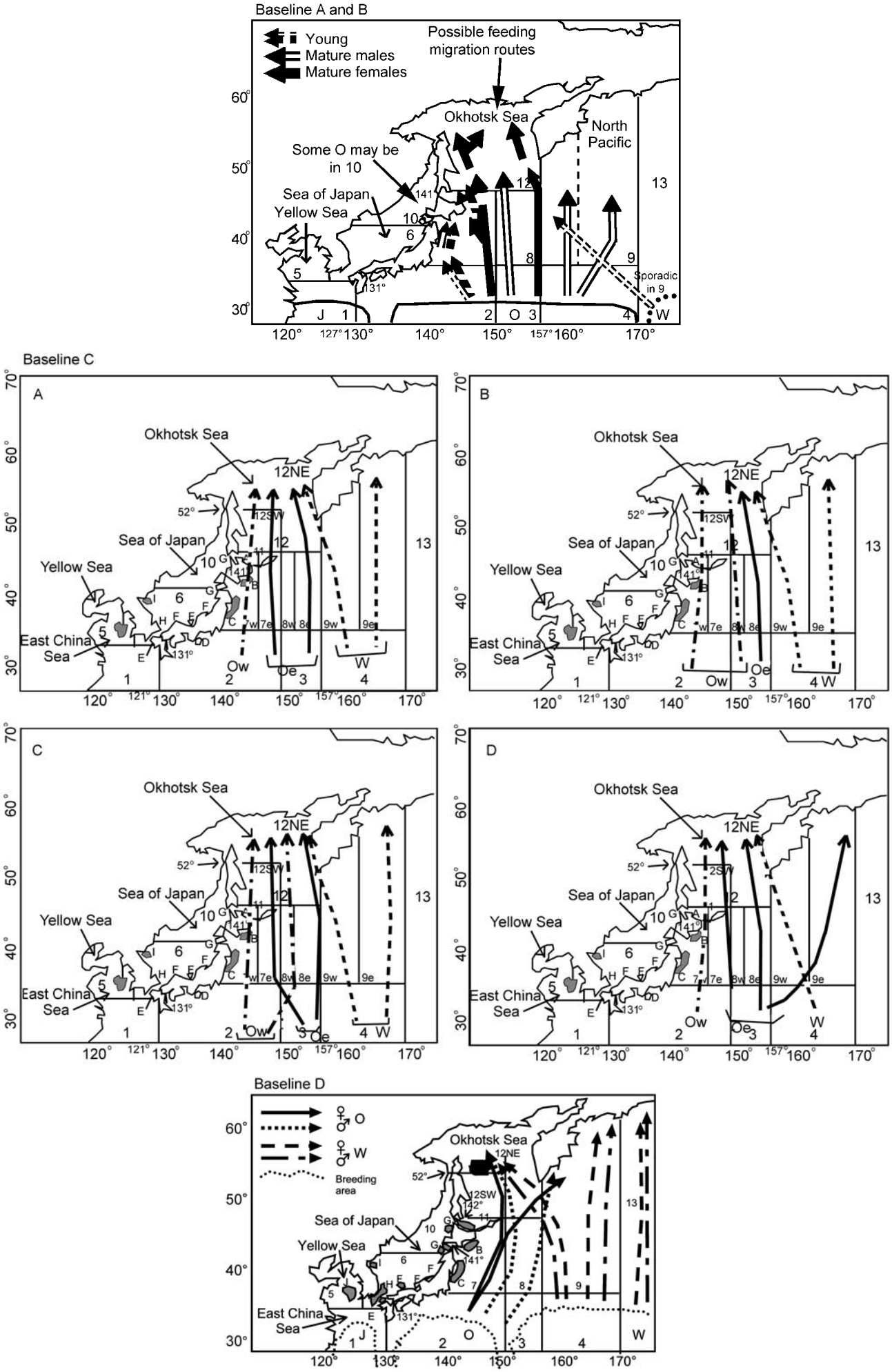

Fig. 1. Schematic diagram of the four baseline stock scenarios: (a) A and B; (b) C; and (c) D. For details see text.

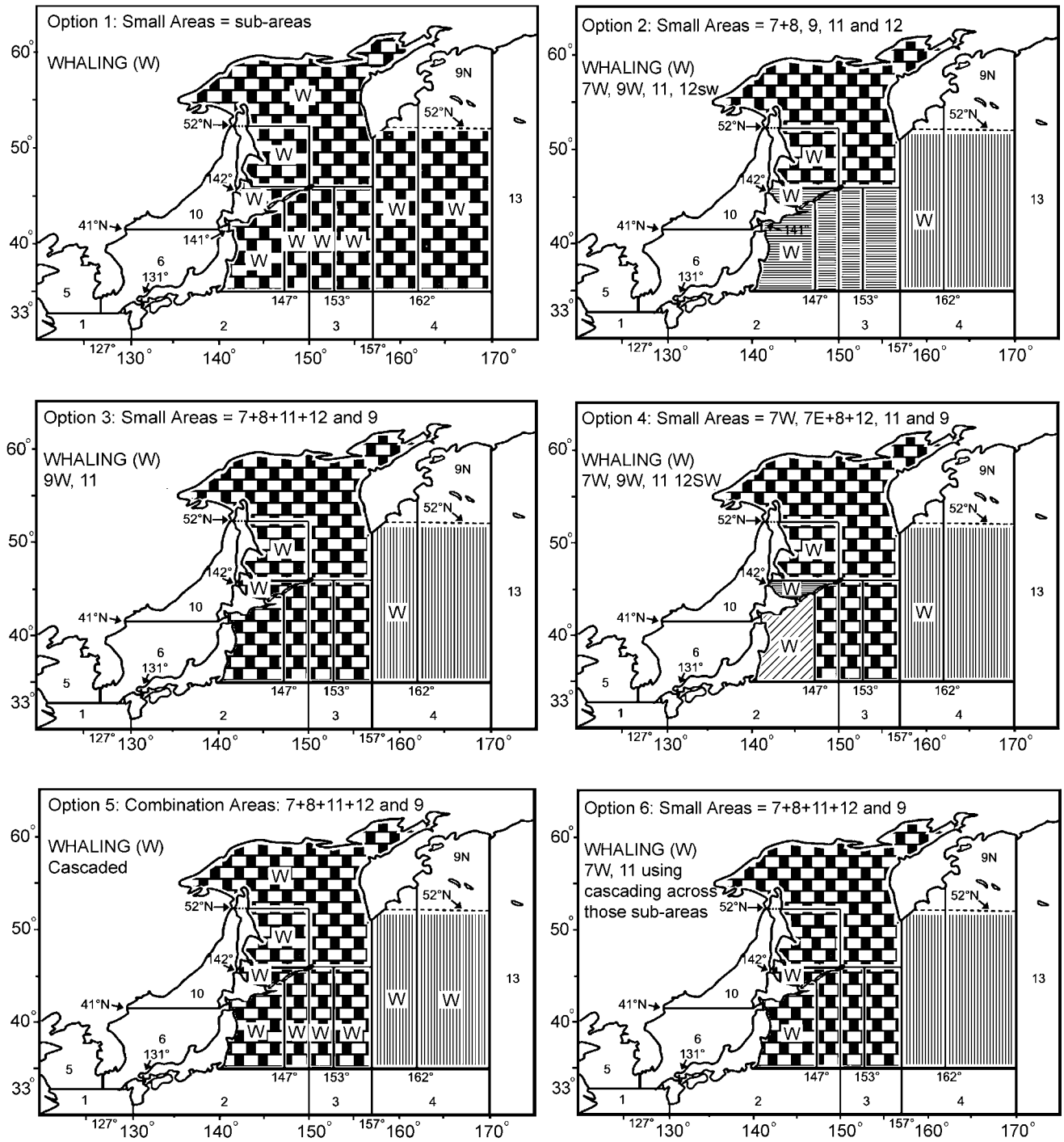

Fig. 2. Schematic diagram of the six variants considered for *Implementation*: (a) 1; (b) 2; (c) 3; (d) 4; (e) 5; and (f) 6. For details, see text. Different shading is used to show *Small Areas* and combination areas.

To achieve this, a sub-group (Allison, Dereksdottir and Punt; the 'Winnowing Sub-group') was appointed to independently assess trial results so as to identify trials which were uninformative as far as differentiating performance amongst the six RMP variants under consideration. The general approach used by this sub-group was as follows:

> Each trial was examined to determine whether it is uninformative by: (1) determining the 'reference' trial for which it was a variant; (2) computing the differences between the lower 5th and median final depletions for each stock for the trial under consideration, and those for the corresponding 'reference' trial, for each RMP variant; and (3) checking whether one or more of these differences exceeded 0.05. The group then categorised the trials into three categories: (i) uninformative; (ii) primarily impacts performance statistics for the 'J' stock; and (iii) primarily impacts the performance statistics for the 'O' stock.

Discussion then moved to specification of the process to be used in formulating a recommendation, and how this process would factor in the plausibility of different trials (or of factors common amongst the trials). Eventually the procedure set out in Appendix 4 was **agreed**. This involves the allocation of one of four possible plausibility rankings to each factor in the trials: high, medium, low or 'in dispute'. Much debate revolved around the 'in dispute' categorisation, which was to be treated as equivalent to 'medium' in terms