ECOSYSTEM MONITORING AND MANAGEMENT

Advice from WG-FSA

6.1 The Scientific Committee noted the discussion on this item by WG-FSA (Annex 5, paragraphs 5.1 to 5.13).

6.2 The Scientific Committee agreed that this item no longer needs to be considered as a specific item on the agenda of WG-FSA and that the considerations on this issue be taken up under respective items on its agenda, understanding that an ecosystem approach to the consideration of each harvested species will be taken.

6.3 Noting paragraphs 5.6 to 5.8 in Annex 5, the Scientific Committee requested that WG-EMM consider *C. gunnari* and *Pleuragramma antarcticum* as possible indicator species in CEMP.

Advice from WG-EMM

6.4 The seventh meeting of WG-EMM was held at the Kristineberg Marine Research Station, Fiskebäckskil, Sweden, from 2 to 11 July 2001. The Scientific Committee sincerely thanked the host of the meeting, Dr B. Bergström, for a well organised and enjoyable meeting, and the Convener, Dr Hewitt, for chairing the meeting.

6.5 The Scientific Committee congratulated WG-EMM and Dr Hewitt on implementing the changes to the meeting format as discussed last year (SC-CAMLR-XIX, paragraphs 6.18, 13.4 to 13.6; Annex 4, paragraphs 1.4 to 1.9), and on the success of the first workshop in planning the future work of the Working Group, the electronic submission of papers and their distribution via the CCAMLR website (Annex 4, paragraphs 1.10 to 1.25), and the revised agenda considering the krill fishery, status of the krill-centric ecosystem and management advice. It endorsed the deadline for papers to be considered at WG-EMM meetings of two weeks prior to the start of the meeting and that papers received after that date, or papers submitted as abstracts only prior to that date, would not be considered at that meeting. It encouraged the continued use of the website as a means of circulating papers prior to the meeting.

Krill-centred Interactions

6.6 The Scientific Committee noted progress in a number of areas (Annex 4, paragraphs 3.34 to 3.47), including several studies on delineating the foraging ranges of krill predators, understanding the geographic variation in the influence on biological processes of environmental factors, such as wintertime sea-ice, and the identification of important habitats for adult land-based predators both during the period of rearing offspring and during the post-fledging, post-weaning winter periods. It encouraged further studies on critical factors that might influence krill predators outside the breeding season.

6.7 The Scientific Committee noted the recognition by WG-EMM that an increasing body of evidence suggests that a substantial change had occurred in aspects of the dynamics of the

krill-based system, perhaps most noticeably in relation to processes operating in Subareas 48.1 and 48.3 (e.g. Annex 4, paragraphs 3.72 to 3.75). While the ultimate origin of these changes probably reflects changes in physical environmental conditions in the Southern Ocean system, the proximate effects of these changes are almost certainly mediated through changes in food-web processes leading to consequent changes in abundance of krill and krill-dependent species, and to changes in the dynamics of these predator–prey interactions. The Scientific Committee agreed that appropriate fishery-management frameworks need to be developed that can account for long-term changes in the relationships between krill and its predators (Annex 4, paragraphs 3.80 to 3.83).

6.8 The Scientific Committee encouraged further work in this area, agreeing with WG-EMM that the following general points need to be considered in this future work (e.g. Annex 4, paragraph 3.74):

(i) methods underpinning analyses of long-term changes need to be reviewed by WG-EMM; and

(ii) consideration be given to alternative hypotheses that may explain changes in abundance of krill predators, such as changes in krill demography, transport or availability.

Viral Antibodies in Antarctic Seals

6.9 The Scientific Committee noted the review of WG-EMM of several reports of viral antibodies present in Antarctic fur seals and Weddell seals (Annex 4, paragraphs 3.48, 3.49 and 3.114). Also, Prof. Torres presented SC-CAMLR-XX/BG/18 Rev. 1 to the Scientific Committee reporting on further work in this area. The Scientific Committee agreed that disease may play an important role in the dynamics of populations but acknowledged the conclusions of WG-EMM that there is as yet no evidence that animals are infected or that such pathogens may influence reproductive performance and population trends of marine mammals in the Antarctic. WG-EMM had noted that until such evidence became available, the potential influence of pathogens could not be incorporated into management models. The Scientific Committee noted that such evidence could include assessments of the probability that disease will affect populations in a substantial way. The Scientific Committee agreed that in the meantime future submissions on this topic could be directed to CEP.

Future Work of WG-EMM

6.10 The Scientific Committee noted the success of the first workshop of WG-EMM on its future agenda (Annex 4, paragraphs 5.1 to 5.36). Three presentations were given to initiate discussion. Dr Miller reviewed how the concepts embodied in the Convention were translated into operational definitions, the work of WG-CEMP to establish an environmental monitoring program, and the work of WG-Krill to establish a yield model for krill that incorporates a precautionary approach. Dr Everson reviewed progress toward the definition of an ecosystem approach to management of the krill fishery since WG-Krill and WG-CEMP were combined into WG-EMM. Dr Constable outlined the issues that remain to be addressed before a complete management procedure for krill can be elaborated. The Scientific Committee

thanked these speakers for their contributions to the successful discussions of the workshop and endorsed the recommendation of WG-EMM to encourage the authors to submit manuscripts of their presentations to *CCAMLR Science*.

6.11 A list of twelve topics related to developing management procedures was developed and split into two broad categories: those that required theoretical development and those that required consideration of more practical issues (Annex 4, paragraph 5.5). The Scientific Committee endorsed the approach of WG-EMM to work on three topics of highest priority:

(i) definition of small-scale management units, such as 'predator units', to be accomplished at a workshop in conjunction with the meeting of WG-EMM in 2002. This work will be guided by a steering committee convened by Dr W. Trivelpiece (USA) (Annex 4, paragraphs 5.9 to 5.13);

(ii) a review of the utility of CEMP, to be coordinated by a steering committee convened by Prof. Croxall, with a planning session to be convened in conjunction with the 2002 meeting of WG-EMM, and a workshop to be held in conjunction with the 2003 meeting of WG-EMM (Annex 4, paragraphs 5.14 to 5.29); and

(iii) further development of prey–predator–fishery–environment models for use in an ecosystem approach to management of the krill fishery, to be coordinated through a correspondence group convened by Dr Constable (Annex 4, paragraph 5.8).

6.12 The Scientific Committee endorsed the plans for these priority areas. The Scientific Committee thanked the subgroup conveners for taking on these tasks and wished their groups well in their deliberations.

6.13 The Scientific Committee noted that a management approach using data arising from CEMP and modelling work is described in Annex 4 (paragraphs 3.58 to 3.71), but that this approach would require further work before its utility could be determined. This approach illustrates the linking of objectives, reference points and triggers for management action based on a relationship between a combined measure of predator performance and krill density.

6.14 The Scientific Committee noted the work of WG-EMM in response to its request from last year (SC-CAMLR-XIX, paragraph 6.26) to investigate the feasibility of a synoptic survey of krill predators (Annex 4, paragraphs 5.30 and 5.31). A task group, convened by Dr C. Southwall (Australia), was formed to advise as to what extent surveys of land-based krill predators are possible and which techniques should be accorded the highest priority. The Scientific Committee noted that a short workshop would be held in conjunction with the meeting of WG-EMM in 2002 if it was agreed to be necessary by the task group.

Small-scale Management Units

6.15 In response to requests from the Scientific Committee (SC-CAMLR-XIX, paragraphs 5.14 and 5.15) and the Commission (CCAMLR-XIX, paragraph 10.11), WG-EMM considered various alternatives for subdividing the precautionary yield of krill in Area 48 so as to avoid the concentration of fishing effort in, and hence excessive catch from,

small but critical areas. The existing statistical subareas are too large for this purpose and a method was sought to divide these areas into smaller-scale management units. As described above, the concept of defining 'predator units' as an approach to establishing smaller-scale management units will be investigated.

6.16 Definition of predator units will require information on: (i) local predator foraging ranges and consumption; (ii) krill abundance, dispersion and movement; and (iii) fishing fleet behaviour and patterns of fishing. Available data will be considered at the workshop to be convened during the 2002 meeting of WG-EMM.

6.17 In so doing, the Scientific Committee noted that the development of small-scale management units might benefit from the following intersessional work:

(i) Approach the IWC Secretariat for documents relating to the IWC Scientific Committee discussions on small-scale management units. The Scientific Committee agreed that the Secretariat should undertake this on its behalf.

(ii) Develop analyses appropriate for fisheries data prior to the workshop in order to determine what fisheries data are required for the workshop and whether the data provided in the CCAMLR database are sufficient. Correspondence between Dr Kawaguchi and the convener of the workshop, Dr Trivelpiece, the convener of WG-EMM, Dr Hewitt, the CCAMLR Data Manager, Dr Ramm, the convener of the correspondence modelling group, Dr Constable, and other interested scientists was requested to help facilitate this work.

6.18 The Scientific Committee also noted that the workshop on the definition of predator units would primarily be working to provide advice on appropriate boundaries for such units and that the manner in which the overall catch limit for Area 48 is to be subdivided between these units would be determined at a future meeting.

6.19 Dr Naganobu questioned the need for small-scale management units and indicated that the workshop should not consider the management implications of the predator units being investigated.

Timeline for Work of WG-EMM

6.20 In addition, the Scientific Committee endorsed the timeline of WG-EMM for the development of a management procedure for krill (Annex 4, paragraphs 6.3 to 6.5) as set out below:

Issues	Year			
	2002	2003	2004	2005
Harvested species–environment models	D	D	W4	
Predator–prey–environment models	S		W4	
Fishery–prey–environment models	S		W4	
Objectives, decision rules	D	D	D	W5
Performance measures	D	D	D	W5
Assessment methods		*W2		
Utility of CEMP	*IW2	*W2		
Small-scale management units, such as predator units	*W1			
Predator demand	D	W3		
Ecological division of precautionary catch limit		W3		
Field test CEMP, precautionary catch limit	D	W3		
Evaluation of candidate management procedures	D	D	D	W5

D – Developments received by WG-EMM; S – Scoping paper; IW – Interim planning for workshop; W – Workshop; * – Workshops agreed to be held (numbers refer to workshop numbers).

6.21 The Scientific Committee noted that the development of management procedures requires work on all these issues which Members could develop in preparation for the workshops. It noted that more than one workshop may be required to satisfactorily investigate some of these issues and that the timeline may require revision over the next one or two years as work proceeds on the first two workshops. It also accepted that the planned workshops may result in larger annual reports of WG-EMM over the next four years. In so doing, the Scientific Committee encouraged WG-EMM to continue its work in developing management procedures within this timeframe.