MANAGEMENT UNDER CONDITIONS OF UNCERTAINTY
ABOUT STOCK SIZE AND SUSTAINABLE YIELD

6.1 WG-FSA reviewed a report of a FAO/Government of Sweden technical consultation on the precautionary approach to fisheries management held at Lysekil in Sweden. The consultation highlighted the nature of precaution in fisheries management, clarified the concept of 'reversal of the burden of proof' in relation to fisheries management and provided specific guidelines for management, research, technology development and transfer, and species introduction. A summary of the report is set out in Annex 5, paragraphs 10.2 to 10.8.

6.2 The Scientific Committee noted that CCAMLR had acted as a pioneer for many of the approaches outlined in the Lysekil meeting. CCAMLR has already implemented, or was in the process of developing, many of the recommendations of the Lysekil meeting. These recommendations represent the latest thinking on what a precautionary approach entails. It considered, however, that some progress could still be made within CCAMLR in the prospective evaluation of management procedures and their likely outcomes under conditions of uncertainty. There was much still to be done and the Scientific Committee considered it important that CCAMLR continue to work at the forefront of world development of precautionary approaches to fisheries management. Working Groups were encouraged to take account of the recommendations of the Lysekil report in their work.

6.3 The Scientific Committee noted the significant advance made in this year's assessment of *D. eleginoides* in Subarea 48.3 through the use of a stochastic stock projection method (Annex 5, paragraphs 5.56 to 5.72). This has allowed uncertainty in the estimates of recruitment, intrinsic variability in recruitment and uncertainty in other demographic parameters to be taken into account in the calculation of total allowable removals. If uncertainty were ignored, the traditional $F_{0.1}$ criterion gives a yield of 12 400 tonnes, which entails a high risk of over-exploitation. Taking uncertainty and recruitment variability into account, however, reduces the yield estimate to 4 000 tonnes and controls the risk of over-exploitation. The use of the stochastic projection method should mean that reductions in uncertainty would be expected to lead to increases in allowable catch (see Annex 5, paragraph 5.70). The Scientific Committee noted that additional sources of uncertainty with the *D. eleginoides* fishery are those related to straddling stock issues and the need to ensure that there are adequate means for the exchange of information between CCAMLR and agencies managing adjacent areas (Annex 5, paragraphs 10.10 to 10.14).

6.4 The Scientific Committee reiterated that a long-term management plan for the *C. gunnari* fishery in Subarea 48.3 is required that takes into account uncertainty arising from sporadic mortality

(see also paragraph 4.66). The Scientific Committee noted, however, that WG-FSA has as yet been unable to devote sufficient time to this work.

6.5 WG-EMM has also made progress in management under uncertainty. The approach, begun this year, of strategic modelling for the development and evaluation of ecosystem assessments provides one of the necessary foundations for the quantification of the effects of uncertainty on management advice. The strategic modelling approach will eventually allow for the integration of harvesting and predator-prey-environment models (Annex 4, paragraphs 7.35 to 7.106).

6.6 The Scientific Committee reiterated the need to consider the interaction between science and management, noting that policy decisions must give rise to the formulation of management objectives. Given management objectives, the Scientific Committee can advise the Commission on the likelihood of achieving them.

6.7 The Scientific Committee noted that CCAMLR has well developed policies and conservation measures for new and exploratory fisheries. However, there are no clear policies or measures to deal with cases where fisheries have been closed but are under consideration for re-opening. Although conservation measures have specified the requirement for a survey before resuming fishing in some fisheries, other steps are not well defined. Such steps could include, for example, the presence of scientific observers during the resumption of the fishery, the subsequent re-assessment of the fishery by WG-FSA and the criteria it would apply in advising on whether the stocks are sufficiently recovered. The Scientific Committee also recognised that a key element once a fishery is re-opened is the need for a plan for obtaining adequate information for further monitoring and assessment. The Scientific Committee agreed that this topic should be the subject of future discussions, and invited Members to submit papers on it.