

ECOSYSTEM MONITORING AND MANAGEMENT

Report of the Working Group for the CCAMLR Ecosystem Monitoring Program

7.1 Dr K. Kerry (Australia), Convener, introduced the report of the second meeting of the Working Group for the CCAMLR Ecosystem Monitoring Program (CEMP) held at Dammarie-les-Lys, France, 10–15 June, 1987 (Annex 4). He thanked the 23 members of the Group for their participation, the three invited experts for their specialist advice, Dr J.-C. Hureau and his staff for organising the meeting and the rapporteurs (Dr D. Ainley, Dr J. Bengtson, Dr I. Everson and Mr D. Miller) and the Secretariat for preparing the report.

7.2 The main aims of this meeting were to develop practical methods for conducting monitoring operations on selected predator and prey species in specific areas. To this end all species, parameters and potential study sites and areas recommended at the previous meeting were reviewed, in particular in order to establish for which parameters:

- (i) it was possible to recommend monitoring programs to start now,
- (ii) it was necessary to conduct further directed research,
- (iii) the development of appropriate technology was an essential requirement.

7.3 The three experts, invited at CCAMLR expense, gave invaluable advice concerning applications of remote sensing and new technology to both specific and general monitoring objectives.

Predator Monitoring

7.4 For predators within each of the three integrated study areas (Antarctic Peninsula region, South Georgia region, Prydz Bay region), sites at which monitoring of specified species should be started now were listed (Annex 4, Table 1). This was accompanied by recommendations for other sites at which complementary monitoring studies should be undertaken (Annex 4, Table 2).

7.5 The predator parameters which were recommended for monitoring starting now (Annex 4, Table 3) were those which were believed to meet the criteria that:

- (i) available data on intra- and inter-annual variation are adequate to demonstrate that the parameter has appropriate sensitivity for detecting significant changes, at least in the medium-term (i.e. 5–10 years) and to allow specification of appropriate sample sizes,
- (ii) appropriate methods already exist for implementing monitoring at recommended field sites, using the specified sample sizes.

Instruction sheets giving the recommended methods were prepared for each parameter (Annex 4, Appendix 4), to ensure that data collected at different sites and in different seasons are fully comparable.

7.6 Other predator parameters, previously identified as candidates for immediate use in monitoring programs failed to meet the criteria noted in paragraph 7.5. This was because:

- (i) existing data were inadequate for critical evaluation, or
- (ii) adequate data exist but they have not been evaluated, or
- (iii) vital technological and/or methodological developments are required.

Further evaluation and/or directed research on these and other parameters (listed in Annex 4, Tables 4 and 8) was recommended as an equally high priority as starting routine monitoring activities. Such directed research included the development of appropriate equipment to help automate data collection and to facilitate remote-recording of information on predators during their pelagic phase.

Prey Monitoring

7.7 The Meeting focused principally on Antarctic krill, *Euphausia superba*; the utility of monitoring *Pleuragramma antarcticum*, *Eudyptes chrysolophus* and early life stages of fish still requires further research and detailed evaluation.

7.8 There was broad agreement on the type of data required and the general methods that might be used to obtain these (Annex 4, Table 5). It was agreed, however, that until detailed definition and standardisation of methods had been prepared, it was premature to recommend implementation of any prey monitoring studies.

7.9 It was regarded as crucial to develop appropriate methods for assessing krill abundance and availability to predators, especially within the integrated study areas.

7.10 As a first step towards this, it was agreed that:

- (i) Dr K. Sherman (USA) would co-ordinate net-sampling efficiency studies and would summarise current plans for review and comment at the next meeting of the Working Group.
- (ii) Dr I. Everson (UK) would co-ordinate the preparation of suitable survey designs for assessing krill distribution and abundance in integrated study areas, and report to the 1987 meeting of the Scientific Committee.

Environmental Background Data

7.11 It was recognised as essential for monitoring studies to have simultaneous information on predators, prey and the marine environment and that these should all be organised on appropriate temporal and spatial scales.

7.12 Environmental data that are needed in order to interpret predator-prey interactions were listed in detail (Annex 4, Table 6). Methods for acquiring such data were indicated only in outline but many involved techniques standard in oceanography and meteorology, and it would be feasible to use these now. For other methods, further research and evaluation is required and in some cases new techniques would need developing.

7.13 It was clear that remote sensing using satellites (e.g. via the coastal zone colour scanner (CSCZ)) will play an increasingly important role in the acquisition of key environmental data. Dr Feldman (USA) was asked to investigate the availability of environmental data of types deemed relevant by the Working Group and how these might be made available to CCAMLR in the most appropriate form for interfacing with the predator and prey studies in the integrated study areas.

Implementation

7.14 The Working Group recommended that monitoring of certain parameters of predators (Annex 4, Table 3) should start now at as many sites as possible in the integrated study areas and associated network sites.

7.15 These monitoring studies should be conducted as specified on the standard method sheets, particularly with respect to sample sizes. It was stressed that programs which did not meet these criteria could not be recognised as part of routine monitoring activities of the CEMP.

7.16 Because other parameters of predators may prove equally, or more, suitable than those already recommended, directed research on such parameters (Annex 4, Tables 4 and 8) should be given high priority.

7.17 It is now important to expedite progress on monitoring of prey. This should be given priority attention at the next meeting of the Working Group (see paragraph 7.39) and in preparation for this, methodologies for standardisation of net, hydroacoustic and hydrographic techniques, and sampling strategies should be developed. Progress towards a standardised system for monitoring krill abundance and distribution is also required.

7.18 Implementation of long-term, shore-based monitoring of predator parameters would be greatly helped if approved sites were accorded some form of protection from human interference. The attention of the Scientific Committee was drawn to the possible suitability for this of:

- (i) provisions under Article IX, paragraph 2, sub-paragraph (g) of the Convention and
- (ii) the existing systems of site protection under the Antarctic Treaty.

Theoretical Aspects

7.19 A main aim of the CCAMLR Ecosystem Monitoring Program is to distinguish between changes due to harvesting of commercial species and changes due to environmental variability, both physical and biological.

7.20 To start to address this, it will be necessary to devise and conduct appropriate sensitivity analyses on estimates of predator parameters derived from existing data and to plan to undertake case-history studies, particularly of small, defined regions. Members were urged to consider appropriate procedures with a view to making specific recommendations at the next meeting of the Working Group.

Reporting of Monitoring Operations

7.21 In respect of the predator parameters recommended for monitoring and the desired directed research on potentially suitable parameters, all Members were asked to submit reports on current and planned activities before the 1987 Meeting of the Scientific Committee.

7.22 No recommendations were made for the nature of the data to be reported to CCAMLR as a result of monitoring activities. It was recognised that suitable standardised formats would need developing once the type of data to be reported had been defined.

Review of the Report of the Working Group for the CEMP

7.23 The Chairman thanked the Members of the Working Group for their report and noted the considerable progress made towards practical implementation of a monitoring program.

7.24 The Chairman reported that his review of prey monitoring surveys (SC-CAMLR-VI/BG/8) was based only on UK experience, because the two replies to his request for information had arrived too late for incorporation. He urged Members to provide additional information so that a revised review of survey design could be prepared.

7.25 Dr Sherman (USA) reported that the list of experiments on net performance and abundance estimation of krill scheduled for 1987/88 (Annex 4, Table 7) was only preliminary. He asked Members to revise this as appropriate and also to provide new information on experiments planned for 1988/89.

Implementation and Co-ordination of the CEMP

7.26 The Scientific Committee recommended that monitoring of predator parameters as listed in Annex 4, Table 3, using the standard methods detailed in Annex 4, Appendix 4, should proceed immediately.

7.27 It also recommended that the standard method sheets should be circulated as soon as possible, ideally in the form of a booklet which would be easily amended as necessary.

7.28 The Working Group for the CEMP was asked to keep these methodological instructions under regular review and to provide updated versions as required. To help in this, Members conducting monitoring programs were urged to inform the Working Group of any difficulties encountered in using the instructions and to suggest improvements on the basis of their field experience.

7.29 The Scientific Committee recommended that detailed research to evaluate the potential utility of additional monitoring parameters should be given high priority. The results of such research should be reported to the Working Group together with draft methodological protocols where appropriate.

7.30 The Scientific Committee asked all Members, as a matter of urgency, to provide the Secretariat with details of existing and planned monitoring and directed research operations, by completing the appropriate sections of Annex 4, Tables 3, 4 and 8.

7.31 On the basis of the notification of existing and planned monitoring of approved parameters at approved land-based sites, the Convener of the Working Group for the CEMP, in conjunction with the Secretariat, was asked to consider appropriate action in respect of registration and protection of land-based sites, including needs for development of management plans.

7.32 To assist in this, the Scientific Committee requested the Commission to consider how formal protection for these sites might best be achieved, taking account of provisions available within the Convention and the Antarctic Treaty system.

7.33 Now that CCAMLR-approved monitoring studies of predators are recommended to start, it is essential to consider what data should be reported to CCAMLR and the manner in which this should be done. The archiving of existing data, on approved parameters from approved sites, where these have been collected following the standard methods, should also be considered.

7.34 The Scientific Committee asked the Convener of the Working Group for the CEMP to devise, in conjunction with the CCAMLR Data Manager and taking advice from appropriate specialists on seabirds and seals, appropriate instructions and formats for the submission to CCAMLR of predator monitoring data.

7.35 The Scientific Committee noted that the Working Group for the CEMP had deferred proposals for implementation of prey monitoring until further standardisation of methods had

been achieved. The Scientific Committee re-emphasised the importance of acquiring data on prey abundance and availability to predators (and also basic environmental background data) on the same spatial and temporal scales as the predator monitoring program. It recognised, however, the problems inherent in standardisation of survey design and sampling methodology. Consequently the Scientific Committee recommended that initially prey monitoring operations should concentrate on the integrated study areas and focus on sea areas within the foraging range of the predator species being monitored, ideally at the times of year when these foraging ranges are most restricted.

7.36 The development and refinement of standard methods for prey monitoring would be helped by the analysis of existing major data sets on krill. Dr T. Lubimova (USSR) had made available extensive data on the quantitative distribution of krill for 1980/81, 1981/82 and 1983/84 seasons from research vessels operating in all three sectors of the Antarctic and particularly in the areas of the Scotia Sea, Larzarev Sea, Ruser-Larsen and Cosmonaut Seas, Prydz Bay region and the seas between Mawson and Dumont d'Urville stations. Dr K. Sherman (USA) indicated that his group possessed relevant data on krill acoustic and net haul surveys from research in the Elephant Island, South Shetland Islands area during the 1982/83, 1984/85 and 1986/87 seasons (SC-CAMLR-VI/BG/46). Spanish data on krill catches, length distribution and fishing effort for research in 1986/87 in Subareas 48.1 and 48.2 have also been made available. Members possessing relevant data or results were asked to make these available to the CCAMLR Data Manager. Because these data also have considerable relevance to the CPUE studies, Dr J. Beddington (UK) was asked to advise the Secretariat on appropriate analyses taking into account the requirements of both the CPUE studies and those relating to prey monitoring. It was noted that the analysis of the acoustic data on krill abundance collected during the BIOMASS SIBEX program would also be most valuable in terms of designing CCAMLR prey monitoring programs. The Scientific Committee agreed that SCAR should be asked to request the BIOMASS Executive to give high priority to arranging the analysis and publication of these data, with particular attention to aspects relevant to maximising the efficiency of prey monitoring surveys.

7.37 Meanwhile, the Scientific Committee felt it was imperative to make progress towards standardisation of sampling methods and survey design for prey monitoring. Members who had not already done so were asked to provide Dr Everson with information relevant to the design of surveys to estimate krill abundance and to provide net haul samples of krill on spatial and temporal scales consistent with the predator monitoring operations in the integrated study areas.

7.38 Dr Everson, in conjunction with Dr Sherman, was asked to prepare and circulate a new summary of current survey methodology and if possible to recommend to the next meeting of the Working Group for the CEMP appropriate methods for use in each of the integrated study areas.

7.39 The Scientific Committee decided that it would not be necessary for the Working Group for the CEMP to meet during 1988. The Convener of the Working Group for the CEMP was asked to provide the 1988 meeting of the Scientific Committee with a report on the progress of all activities where actions had been requested. Specifically these would include:

- (i) summary of Member's CEMP activities in 1987/88 and those planned for 1988/89 (Members are already requested to provide this as a separate section in their report to the Commission on Member's Activities).
- (ii) proposals for data reporting formats for existing approved predator monitoring operations.
- (iii) proposals for registration and protection of approved land-based monitoring sites.
- (iv) progress towards sensitivity analyses on estimates of predator parameters derived from existing data.
- (v) progress towards acquisition of appropriate environmental background data for predator-prey monitoring.
- (iv) progress towards standardisation of sampling and survey design for prey monitoring.

International Whaling Commission (IWC) Activities and the CEMP

7.40 As part of the development of the CEMP the Scientific Committee has been corresponding with the IWC Scientific Committee in order to:

- (a) determine how the Comprehensive Assessment might contribute to evaluating the nature of and possible means for detecting the effects of krill harvest on Antarctic whale stocks;
- (b) explore means for analysing available data and information assembled during the Comprehensive Assessment on physiological condition, stomach contents, and feeding behaviour of minke whales in terms of their utility for indicating changes in the krill/whale system, and
- (c) identify what further steps might be taken to co-operatively plan and convene a Workshop on the Feeding Ecology of Southern Baleen Whales. (See SC-CAMLR-V, paragraphs 6.8–6.11).

7.41 Dr W. de la Mare, the CCAMLR Observer at the 1987 meeting of the IWC Scientific Committee, reported on matters of relevance to CCAMLR dealt with at this meeting (SC-CAMLR-VI/BG/29).

7.42 He reported that the Comprehensive Assessment does not have strong relevance to question (a) above. Two aspects of the Comprehensive Assessment - estimation of current abundance and of recent trends in abundance - have obvious relevance to detecting effects of krill harvesting on whale stocks. However, data currently available from shipboard sighting surveys and CPUE indicate that reliable detection of trends is only possible over an extended period.

7.43 With respect to question (b) above, data currently being assembled specifically for the Comprehensive Assessment do not include items relating to the body condition of the animal.

7.44 Concerning question (c) above (the CCAMLR/IWC Workshop on the Feeding Ecology of Southern Baleen Whales), the IWC had requested its members to indicate the availability of data suitable for such an undertaking. Although only one reply had been received, it was known that there are extensive sets of Japanese data on stomach contents and blubber thickness, some stomach content and oil yield data with the Bureau of International Whaling Statistics, and some stomach content data in Discovery Investigation files at the Sea Mammal Research Unit, Cambridge.

7.45 The IWC drew up a list of proposed topics for inclusion in the Workshop, which they suggested could be held in late 1988. They approved a budget of £13 500; a further contribution of US\$ 15 000 was offered by the US Marine Mammal Laboratory. It was also

suggested that a small group (consisting of one or two experts on krill distribution and ecology, and one or two whale specialists) should formulate more detailed questions for the Workshop.

7.46 Concern was expressed at the rather broad nature of the topics proposed for the Feeding Ecology Workshop. It was agreed that, to obtain maximum value from the workshop, it was important to refine further the objectives of the Workshop. It was recognised that the identification of suitable data on krill distribution and abundance to complement the existing whale data was required. Accordingly it was agreed that a small joint steering committee of experts from both the IWC and CCAMLR Scientific Committees should be formed to undertake the organisation of the Workshop. It was anticipated that it would be difficult to hold the Workshop before 1989.

7.47 It was agreed that Mr D. Miller (South Africa) and Dr Y. Shimadzu (Japan) should be asked to be the CCAMLR representatives on this steering committee. In the event that one of these were not available, Dr J. Beddington (UK) should be asked to participate. Although it was recognised that the Workshop would deal with all baleen whales, it was hoped that there would be sufficient focus on the minke whale to provide an evaluation of the utility of this species for the CEMP.

7.48 The IWC Scientific Committee had been unable to reach a consensus regarding a submission by Japan, which included reference to questions of interest to CCAMLR, for a Special Permit to take minke and sperm whales for research purposes. It was agreed that it would be inappropriate for the CCAMLR Scientific Committee to comment further on this topic at present.

Advice to the Commission

7.49 The Scientific Committee recommends (SC-CAMLR-VI, paragraph 7.26) that Members should start new programs monitoring approved predator parameters (SC-CAMLR-VI, Annex 4, Table 3) using approved standard methods (SC-CAMLR-VI, Annex 4, Appendix 4) in the integrated study areas and associated network sites (SC-CAMLR-VI, Annex 4, Tables 1 and 2).

7.50 The Scientific Committee further recommends that detailed research be directed towards evaluating the potential utility of the additional monitoring parameters specified in Annex 4, Tables 4 and 8 as of equally high priority (paragraphs 7.6, 7.29).

7.51 The Scientific Committee noted the advice of the Working Group for the CEMP that land-based sites at which approved predator monitoring programs are ongoing or starting should be offered some degree of protection from human interference (SC-CAMLR-VI, Annex 4, paragraph 68). The Commission is requested to advise the Scientific Committee on the appropriate procedure for providing this protection (see paragraph 7.18).

7.52 The Scientific Committee advises that it is unnecessary to hold a meeting of the Working Group for the CEMP during 1988. Progress on six major items of business identified in the report (SC-CAMLR-VI, paragraph 7.39) will be conducted by correspondence and a report presented to the next meeting of the Scientific Committee.