ATCM XXIII
Lima Peru

Working Paper Submitted by SCAR and COMNAP on the Monitoring of Environmental Impacts of Scientific Activities and Operations in Antarctica

BACKGROUND

1. Antarctic Treaty Consultative Parties have recognized for some time the need to monitor the impacts of human activities on the Antarctic environment. The science programs conducted by several Parties have for many years monitored changes in the global environment linked to human activities outside the Antarctic e.g. ozone destruction, increasing carbon dioxide etc. More recently ATCPs have become concerned about measuring the direct impacts on the Antarctic of activities on and around the continent within the Antarctic Treaty area, south of 60º South latitude.

2. ATCM XV (1989) adopted Recommendation XV-5 which set out a series of activities that should be monitored (namely; waste disposal, contamination by hydrocarbons or toxic chemicals, construction and operation of logistic facilities, conduct of scientific programs, recreational activities). In addition, it was recommended that a Group of Experts be convened to offer more specific advice on how monitoring should be implemented.

3. The Protocol on Environmental Protection to the Antarctic Treaty was signed in October 1991 and came into force on 14 January 1998. It provides an organized framework for all environmental recommendations and specifically calls for regular and effective monitoring to allow assessment of the impacts of on-going activities in the Antarctic environment and associated ecosystems. The Protocol does not specify how such monitoring should be targeted or implemented.

4. In 1991 XVI ATCM developed the discussion on monitoring using a working paper provided by SCAR and COMNAP, and provided the Terms of Reference for the First Meeting of Experts (Para 66 of the XVI ATCM Report). This Meeting was convened in June 1992 in Buenos Aires and provided a report containing nine recommendations to XVII ATCM in November 1992. One of these recommendations was for a meeting of technical experts and at XVIII ATCM in April 1994 SCAR and COMNAP offered to convene such a meeting. The consolidated report from the two workshops, entitled “Monitoring of Environmental Impacts from Science and Operations in Antarctica”, was sent to all Antarctic Treaty Parties in November 1996.

5. In XXI ATCM/WP20, SCAR and COMNAP presented the key conclusions from the workshops and outlined recommendations for future actions. ATCM XXI welcomed the paper and endorsed the proposals as subjects for future action.

6. The first meeting of the Committee for Environmental Protection (CEP) held in Tromsø during May 1998, invited COMNAP to submit an updated paper on monitoring at the next CEP meeting. This update is intended to create a foundation for further discussions on environmental monitoring at the second meeting of the CEP.

STATUS OF WORK : JANUARY 1999

7. The two SCAR/COMNAP monitoring workshops provided considerable clarification of how to structure monitoring programs, which key activities to monitor, some of the potential ways to make the monitoring measurements, how to handle the data and how to assess whether or not a monitoring project has been successful.

8. In WP20 to ATCM XXI, SCAR and COMNAP proposed four recommendations for future action with respect to monitoring of impacts from science and operational activities in Antarctica. The four recommendations were endorsed by the Meeting as subjects to future action. In the following is provided an update of the status for the four recommendations. This status report on the SCAR/COMNAP Recommendations should provide a platform for further discussion regarding monitoring impacts of activity in Antarctica.

Recommendation 1: ***A technical handbook of standardised monitoring techniques to be prepared by COMNAP, with advice from SCAR, based on the parameters and key indicators identified in the workshop report.***

9. The COMNAP Executive Committee (EXCOM) and Environmental Coordinating Group (ECG) identified the development of the handbook as a monitoring priority. Terms of reference for the work were agreed upon in May 1998. The main objective of the work is to prepare a technical handbook of standardized monitoring methodologies for a common set of indicators. These will be available for use by national Antarctic programs and other Antarctic operators for monitoring the impact of science and operations activities in Antarctica in order to comply with the Protocol's requirements for monitoring. The priority of the first edition of the handbook will be methodologies for monitoring the impacts of stations in Antarctica.

10. A Project Team with representatives from COMNAP and SCAR has been established and is responsible for coordinating the work. The Project Team developed a list of key priority indicators for inclusion in the Handbook (see Attachment), and in November 1998 the Project Team invited organizations to send in proposals for the preparation of a draft Handbook based on the given Terms of Reference. A contractor is to be selected at the beginning of February 1999.

11. A Workshop on Environmental Monitoring is planned to be held in conjunction with the COMNAP XI Meeting at Goa, India in September 1999. The Workshop will discuss the first draft of the Environmental Monitoring Handbook and provide an opportunity for presentation of techniques presented in the Handbook. National operators will have the opportunity of providing input to the discussions.

Recommendation 2: A review of existing data and of key research issues to be undertaken through SCAR

12. The topic of existing research data and activity and research requirements with respect to monitoring was on the agenda of SCAR's Group of Specialists on Environmental Affairs and Conservation (GOSEAC) at their meeting in Switzerland in September 1998. GOSEAC welcomed the document containing the summary of monitoring projects in Antarctica developed by COMNAP (tabled as Information Paper 54 at ATCM XXII). GOSEAC identified this as a major step forward in identifying both existing monitoring projects and published sources of data. GOSEAC emphasized that the initiative should be further developed and made generally available. Several other SCAR groups had important contributions to make in this field. It was suggested, *inter alia*, that an updated version of this information should be available on the Web providing access to the necessary metadata entries where these existed. Many important data sets did not yet have metadata entries on the Antarctic Master Data Directory.

13. Regarding further research, GOSEAC reached the following conclusions:

- *With respect to physiological and biochemical monitoring*:
  Future research should be directed towards the establishment of baselines and the detection of early biological changes at low levels of pollutants. Methodologies developed for temperate regions had yet to be tested on Antarctic species.

- *With respect to biological monitoring methods*:
  Several SCAR groups (EASIZ, the Group of Specialists on Seals and the Subcommittee on Bird Biology) have been requested to give an up-date of biological monitoring methodologies (cf. matrix in table 9.1 of the report from the two monitoring workshops) so as to incorporate new methodologies that have been developed since the conclusion of the workshops.

- *With respect to monitoring responses of birds and seals to disturbance*:
  The literature is limited and contradictory on the effects of human disturbance in penguin colonies. Questions of the timing of disturbance, the interaction with species specific behavior patterns and the significance of threshold effects on colonies possibly stressed by food limitations have yet to be examined. There was some anecdotal evidence of habituation effects in rookeries close to scientific stations, but there was little hard data available. Even less information is available about the effects of human disturbance on the six species of seals that occur in Antarctica. Questions were also raised about the significance of helicopter over-flights on bird colonies in the light of conflicting recommendations on minimum heights over penguin rookeries. Discussions on some recent information from Australia suggested that the whole field of noise effects on birds and seals needs investigation. It was concluded that at present state of knowledge that birds and seals are not adequate indicators for monitoring purposes as variability in the reactions to human presence is high. More data is also necessary on the natural fluctuation in the populations of birds and seals to ensure that human disturbance effects can be adequately distinguished from natural background variation. This would necessitate more long-term monitoring on a range of species.

- *With respect to monitoring of organic and inorganic pollutants*:
  Firstly, there was agreement that there is a need to develop simple cost-effective techniques of initial screening which would enable managers/scientists to decide whether further high cost analyses are actually warranted. Secondly, it was agreed that there is a need to continue the development of methods for continuous or near-continuous measurements. Thirdly, the group agreed that there is a need to develop a better understanding of the linkages between levels of contaminants and the consequent biological effects. This was especially the case for heavy metals where there was data which showed that some species are tolerant of high naturally occurring concentrations.

Recommendation 3: ***The process of data management to be developed through the SCAR/COMNAP Data Management Group to allow synthesis of data for comparative purposes.***

14. In May 1997 SCAR and COMNAP established the Antarctic Data Directory System (ADDS) based on an the recommendation of its *ad hoc* Planning Group on Antarctic Data Management. The ADDS consists of a network of National Antarctic Data Centres (NADC) responsible for collecting descriptions of Antarctic data sets and then submitting these to a central Antarctic Master Directory (AMD). The AMD provides a single point of contact for information on Antarctic data sets and is itself a part of the International Directory Network. In 1997 the Joint SCAR-COMNAP Committee on Antarctic Data Management (JCADM) was established, replacing the *ad hoc* group. Members of JCADM are primarily NADC managers. There is also a joint SCAR/COMNAP steering committee on Antarctic Data Management that is responsible for overseeing the continued development of the AMD.

15. JCADM continues to emphasize the importance of data from monitoring programs being available and comparable. This is reflected in the terms of reference of the Joint Committee, which states that it should interact with the COMNAP-ECG toward the goal of allowing synthesis of data for comparative purposes (a similar provision is found in the Terms of Reference for the ECG). To this end JCADM needs to ensure that metadata on monitoring can readily be included in the AMD, and furthermore continue to motivate scientists/managers to create metadata records of monitoring data to be submitted to AMD as soon as is practicable after the monitoring data has been collected.

16. Further effort is also necessary to ensure that the data sets themselves are comparative in form, so that comparison of monitoring data from various locations for management purposes may be simplified. The issue of comparability of the data sets is an issue that is also relevant in relation to the "technical handbook of standardized monitoring techniques" under development, and a section covering the issue of comparability of data could possibly be included in the handbook.

Recommendation 4: ***Methods of coordination of environmental monitoring activities to be developed through COMNAP to avoid wasteful duplication and ensure effective use of resources.***

17. At ATCM XXII, COMNAP tabled the document "Summary of Environmental Monitoring Activities in Antarctica" as Information Paper 54. The document summarizes environmental monitoring activity recently carried out in Antarctica. By doing this, it aims to demonstrate the existing level of Antarctic monitoring, to increase awareness of monitoring activities and to avoid duplication of information particularly at multiple-operator sites. The document provides an accessible reference (including contacts) for those planning monitoring programs in Antarctica. The aim is to provide a version of the report on the COMNAP WWW site and to develop a mechanism by which it can be updated regularly.

18. The Antarctic Environmental Officers Network (AEON) is planning to arrange a workshop during the COMNAP meeting in Goa, India in September 1999. Environmental monitoring, in particular the ways in which operators might develop programs for multiple-operator sites will be discussed at this workshop.

19. CEP I asked Argentina to coordinate the work of an inter-sessional contact group to establish a set of guidelines for Environmental Impact Assessment (EIAs). The COMNAP EIA Guidelines (1991/92) were to form the basis of this work. Monitoring is a key part of the EIA process and is expected to be addressed in the context of EIA within the guidelines. COMNAP, including members of AEON, have been taking an active part in this work.

RECOMMENDATIONS

20. COMNAP and SCAR jointly recommend that the ATCM:

- endorse the work being carried out by COMNAP and SCAR following the workshops and previous recommendations reported to the ATCM;

- encourage COMNAP and SCAR to focus on ensuring comparability of environmental monitoring data so that evaluation of the data for management purposes may be simplified and thus useful for management decision making:

- request COMNAP and SCAR provide CEP3/ATCMXXIV with an Information Paper on the status of their work on environmental monitoring.

ATTACHMENT

INDICATORS
Environmental Impacts from Human Activities at Antarctic Stations

Indicator		Measured in					
		Waste water (sewage/ grey water)	**Fresh or sea water**	**Soil**	**Marine sediments**	**Snow**	**Other**
1.	*Suspended solids (total and volatile)*	x	x				
2.	*BOD*	x	x				
3.	*COD*	x	x				
4.	*DO*	x	x				
5.	*pH*	x	x				
6.	*Conductivity*	x	x				
7.	*Nutrients (N, P)*	x	x				
8.	*Temperature*	x	x				
9.	*Coliform bacteria*	x	x				
10.	*Grain size*			x	x		
11.	*TOC*			x	x		
12.	*TIC*			x	x		
13.	*Trace Metals (Cu, Pb, Zn, Cd, Hg)*			x	x	x	
14.	Total Petroleum Hydrocarbons (TPH)			x	x	x	
15.	*PAH*			x	x		
16.	*Particulates*					x	
17.	*Phytoplankton*		x				
18.	*Waste water production/emission (quantity/time)*	x					
19.	*Fuel consumption (quantity/type/time)*						x
20.	*Waste incineration (quantity/type/time)*						x
21.	*Hydrocarbon spills (record of spills, amount/type/location and monitoring of spill area)*						x
22.	*Station area (monitoring of coverage/use - e.g. photomonitoring)*						x

Abbrevations

BOD: Biological Oxygen Demand
COD: Chemical Oxygen Demand
DO: Dissolved Oxygen
N: Nitrate
P: Phosphate
PAH: Poly-Aromatic Hydrocarbons
pH: Hydrogen potential (acidity)
TIC: Total Inorganic Carbon
TOC: Total Organic Carbon