

FINAL SUMMARY REPORT OF THE SCIENTIFIC COMMITTEE ON ANTARCTIC
RESEARCH (SCAR) REVIEW COMMITTEE
November 1, 1992

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C.C. Tscherning (R.R. Colwell, Chair)

The Committee was asked to do its work by mail, telephone and Fax, since funds were not available to hold a meeting of the Committee. Thus the following is a summary of correspondence and telephone exchanges to address the issues brought to the Committee. SCAR documents were provided by ICSU headquarters and by the Committee Chair to the Committee members for their review. These included documents from the XXII Meeting of SCAR, held in San Carlos de Bariloche, Argentina, June 5-19, 1992.

The committee, in its deliberations addressed the following questions:

1. What are the stated goals of SCAR? Have they been accomplished (and by what means)? Is the work completed?
2. What is the level of excellence or quality of the work of SCAR?
3. What are the opinions of those now involved in SCAR, of the sponsoring unions, of the concerned scientific community?
4. Should the goals of SCAR be modified and, if so, in what directions?
5. What is the situation with regard to financial support of SCAR? Is it adequate, inadequate? Is the funding in accordance with SCAR's goals?
6. Has SCAR addressed and helped to obtain answers to important questions?
7. Has the work of SCAR contributed to major scientific breakthroughs?
8. Has SCAR contributed to the coordination (formation of networks and activities of networks) needed to attack problems of interdisciplinary international nature?

The Committee determined that the role of SCAR as a lead agency in international Antarctic science is extremely important. Even more, given changes in the Antarctic Treaty System which have taken place in recent years, and the considerable pressures driving research agendas into a direction of relevance, i.e.,

monitoring activities, SCAR should define its mission and develop a strategy for the future.

Whether, and to what extent SCAR is still needed to provide policy advisory services to the Antarctic Treaty System is a question that remains to be answered. This has been a burden for SCAR. It can be considered to have interfered with SCAR's need to take a stronger leadership role in coordinating international scientific research in Antarctica.

From IGY to IGBP:

In the historical perspective, SCAR was established as a continuation of a special committee on Antarctic research whose task was to oversee, coordinate and stimulate research during the International Geophysical Year.

SCAR has operated as a network with a minimum of bureaucracy, meeting once every other year, hosted by participant countries on a rotational basis. SCAR has a small secretariat, located at the Scott Polar Research Institute (SPRI) in Cambridge, UK. SPRI publishes Polar Record, a journal on polar research which incorporates activities reports relating to SCAR. A SCAR Bulletin appears quarterly within Polar Record, and includes documents from SCAR meetings and meetings of the SCAR executive. Since 1986, SCAR Report has been issued as a occasional publication to disseminate more detailed special reports from SCAR and its eight disciplinary working groups, as well as a number of specialists groups created specifically for important missions.

During the latter part of the 1980's, in response to increased relevance and accountability pressures, especially in the domain of environmental concerns, SCAR has restructured a number of working groups and created a number of new specialists groups to deal with matters of research related to new initiatives in this domain. A steering group of the IGBP was also created and it has recently been upgraded in a form of a group of specialists to liaise with international research programs and develop six core programs for SCAR. The working group for logistics has been reorganized under COMNAP. SCALOP, with the organization of managers of Antarctic programs (COMNAP, Council of Managers of National Antarctic Programs, created in 1988) is federated with SCAR. SCALOP replaced the former Working Group on Logistics. Unfortunately, there is a problem determining overlapping responsibilities amongst SCAR, SCALOP and COMNAP. A close working relationship and interactive feedback between SCAR and COMNAP/SCALOP is essential, particularly for supporting large international and interdisciplinary programs. The role of SCAR should be one of scientific policy advice, promoting appropriate research priorities for cooperative adoption within the national programs represented by COMNAP.

Current Strategy:

In its recent strategy discussion SCAR's Executive has noted the need for the organization to "improve its influence and visibility in Antarctic affairs", especially in the light of "the rapid tempo of change in Antarctic affairs with the emergence of important issues alongside science legal and juridical matters, conservation and environmental concerns, commercial interests, and the wider influential political framework evolving through the Antarctic Treaty System." It was also noted that there is "a growing need to reexamine the whole question of scientific data and information exchange in relation to global scientific programmes". Development of an Antarctic data base system is currently being addressed by a combined SCAR/COMNAP group which has replaced the earlier SCAR ad hoc committee. This is particularly important in the geosciences where many countries have accumulated acoustic and geologic data in the course of offshore surveys. These data are being collected and stored in a Seismic Data Library System, which was developed by OCAR. Guidelines are being discussed, to standardize, but also because some of the data collected by different countries is sensitive from a commercial point of view.

The ad hoc Committee on the Coordination of Antarctic Data was created to cover biology, geosciences (including glaciology), atmospheric sciences, geodesy and geographic information systems, BIOMASS (a multicountry program on marine resource data started in 1976), and logistics. A joint SCAR/COMNAP ad hoc working group is completing the work. Development of a proper data management structure for proposed large programs would be useful. Retrospective development of a data base for past research, while it may be valuable, is not driven by clearly identified scientific priorities and could be viewed as a service function.

Smaller and newer SCAR nation members have also been asking for better coordination, particularly of scientific research programs, in order to minimize costs.

Task Differentiation:

Ad hoc groups of specialists have a dual mandate, both scientific and advisory. The Group of Specialists on Southern Ocean Ecology, established jointly with SCOR (the ICSU Scientific Committee on Ocean Research), for example, acts as a forum for review and coordination of ongoing and new activities in Southern Ocean ecology and related fields and responds to requests for advice on the possible impacts on marine ecosystems from fishing.

The disciplinary working groups include the atmospheric physics group (renamed to cover the "physics and chemistry of the atmosphere") reflecting a stronger focus on environmental factors, like radioactive elements and pollutants while a new

group has been created to specialize in the "upper" end, viz., for solar, terrestrial and astrophysical research. The ionosphere and magnetosphere, are now known collectively as geospace, reflecting the turn to systemic thinking. A group on solid-earth geophysics is concerned with the structure and dynamic behaviour of the Earth as a system.

The glaciology group, concerned with the physics and chemistry of the ice sheet, seeks to achieve a better understanding of climate change and is encouraging investigations into past levels of "greenhouse" gases from the "archives" of ice sheets by deep core drilling. The variability in the seasonal growth and the extent of the sea ice is also significant since it affects the total albedo (i.e., reflective property) of the continent and its climate, with repercussions on world climate. Studies of glacial movement and the interaction between the ice, ocean and atmosphere increasingly use remote-sensing techniques, particularly those available in orbiting satellites. Here trans-national collaboration and standardization of databases is important, not least for those analysts who seek to test global computer simulation models of the atmospheric, oceanic and cryospheric systems.

The working group on geology encourages analysis of how the continental system of Antarctica was formed; what are the crustal forces and processes that shaped its past and will continue to shape its future? By studying rocks and fossils the climatic history may be unravelled and thus the evolution of the animals and plants that lived on and around the continent understood. Many of these problems are beyond the logistic and financial capability of any one nation, so SCAR has set up two groups of specialists to promote and coordinate international research in two specific fields: one on the structure and evolution of the Antarctic lithosphere (the rigid shell of the Earth), and the other on the evolution of Cenozoic paleoenvironments (i.e., from about 65 million years ago) of the high southern latitudes.

The SCAR Executive in 1988 created the Group of Specialists on Environmental Affairs and Conservation, a sign of further accommodation to environmental issues. The importance of the logistics function has also been upgraded, with the creation of the Standing Committee on Antarctic Logistics and Operations (SCALOP), which is outside but "federated" with SCAR. Other SCAR Working Groups include, for example, WG Geodesy and Geographic Information, and WG Human Biology and Medicine.

New Initiatives:

SCAR has taken on some new initiatives, such as organizing an Antarctic Science Conference in Bremen in 1991. Unfortunately, the BREMEN conference did not achieve as much visibility for antarctic research amongst political, public

information, and environmental science circles, as had been hoped.

New members have been brought into SCAR and the new members are demanding that efforts be made to assist their participation in Antarctic science more efficiently and in greater coordination. The Third World Nations, of course, are an important component of such coordination.

SCAR scientists are seeking to break the traditional isolation of Antarctic science from international research. The Journal, Antarctic Science has been a useful step in this direction, although publications in the wider literature may be helpful in this regard. There have been efforts made to integrate more closely with global programs in other fields, especially the global climate program and to interact more with other ICSU bodies.

The reorganization of working groups and specialist groups in response to environmental concerns and commitments to international efforts such as the global change program has been carried out and more attention has been paid to the type of research needed in the Antarctic. It is not certain to what extent the formation of COMNAP and SCALOP, as independent organizations will take some of the central coordinating capability and activity from SCAR. If this does take place, it will relieve SCAR of certain burdens in situations where SCAR has been pressed from many sides for advice and demands to act more effectively. It would be useful to define clearly the interrelationships in functional divisions of labor among SCAR, COMNAP and SCALOP in order to define more clearly SCAR's role in this new context.

Redefining SCAR's lead role under new conditions:

There is no question, but that SCAR's role needs to be redefined within the changing agendas of Antarctic science.

The greatest concern amongst Antarctic scientists is maintaining a very high quality of science. A stronger lead role for SCAR in this context would be valuable.

The question of international research stations under SCAR's leadership (see appendix) should be addressed, as this responsibility places demands on SCAR's activities in general. It is recommended that SCAR play a more central role in determining criteria for locating new research stations. This has been essentially left to individual nations with, on occasion, political and logistic expediency overriding concerns of scientific merit for projects. SCAR should take an active role if high priority, clearly defined, and relevant scientific research is facilitated by an international facility.

As stated by Aant Elzinga, "Certain questions are raised about the interplay between internal, peer review and quality control criteria and external relevance criteria in Antarctic science. The increasing pressure for relevance coming from environmentalists' concerns is having an effect on Antarctic science and the working conditions of SCAR. SCAR's strategy is to take more account of strategic research, but at the same time, maintaining a solid disciplinary scientific basis. Should SCAR be responsible for international research programs to a greater extent, and should national programs follow these integrated programs more so than now?"

Professor Elzinga states that it is clear that changing prospectives on Antarctica as a natural resource will affect the perception of this icy continent as an object of research. Thus, the complex interplay of the two dimensions-natural resource and fundamental research- require changing agendas on global policy on the one hand and changing trends in Antarctica research on the other, recognizing that these are a product of both internal and external determinance, i.e., factors internal to scientific interests, as well as factors setting a broader frame of reference.

Professor Elzinga also pointed out that thirty years ago, when the Antarctica Treaty was established, basic research stood supreme. Ten years ago, political pressures associated with perceived prospects of oil and mineral potential, together with the actual needs of marine resource management, had a significant bearing on activities of scientists, including the way research agendas were defined and defended. At the present time, pressure from environmental organizations and the introduction of a comprehensive conservationist regime places science under an intense scrutiny that preoccupies scientists. Good intentions, it is feared, might put an end to good science.

Under the Environmental Protocol, adopted 4 October 1991 and now in the process of ratification, there will be an Environmental Protection Committee. In it scientists will have an important role. One of its tasks will be to assess environmental impacts and advise ATS Consultative Parties on management plans for specially regulated areas to be decided upon at Consultative Meetings. SCAR is invited to provide input, but its role appears to be a secondary one, since advice is supplied via the Environmental Committee. It is mandatory that SCAR clarify its role more precisely in this new context.

Budget and Organization:

In general, SCAR does work of reasonably high quality for relatively little money. Currently, SCAR's budget is about \$200,000-300,000 US per year, about half of what is reportedly needed to satisfy requests of the various groups within SCAR,

calls for workshops on interdisciplinary topics, and other demands. This sum of money, in essence is comparable to what some international organizations in other domains spend for a single meeting, with simultaneous translation and other infrastructural costs. In the case of SCAR, the budget is spread thinly among many highly competing activities. The very small budget is a serious problem, especially when the number of participating countries in Antarctic research is increasing and the number of science advisory tasks and demands for SCAR to carry out peer review, along with new initiatives in the field of science have increased.

In general, SCAR is an organizational structure and a mode of operation suited to conditions thirty years ago when SCAR comprised a group of working Antarctic scientists. It is the view of the Review Committee that SCAR should reexamine its organizational structure, taking into account the current world situation. The nature of SCAR is one of reacting to need, rather than developing a vision of the future and this has become a problem. Many research scientists are asking SCAR to be more proactive and to develop other institutional arrangements which can better deal with current needs and pressures. SCAR's activity in the science policy advisory arena has been somewhat reduced in the last few years, since a number of other bodies serve this function within the Antarctic treaty organization. A recommendation of the Review Committee is for SCAR to consider greater concentration on science and less on science advisory functions.

Increasingly, Antarctic research is becoming an aspect in other international programs or research fronts that are interdisciplinary and task oriented. Clearly there is a globalization at the level of theory, with strong advances in various fields. SCAR has difficulty meeting needs that arise where integration of research results into wider disciplinary and strategic studies must be carried out, especially where initiatives derive mostly from other international agencies and associations. Thus, SCAR finds itself continuously in a reactive mode and it is difficult because of the structure of SCAR, as it is presently constituted, to meet current needs cognitively, institutionally, and at the level of research policy.

Scientific Results and Unique Opportunities:

Nevertheless, the committee believes that many of the initiatives undertaken within SCAR have provided very useful results. The BIOMASS program completed its work and organized a major colloquium in Bremerhaven, Germany, September 18-20, 1991. The BIOMASS program dates back to 1976, but traces its origin to the second SCAR Biology Symposium held in 1968 in Cambridge, UK with the establishment in 1972 of the Subcommittee on Marine Living Resources of the Southern Ocean. The First International

Conference on Living Resources of the Southern Ocean was held in Woods Hole, Massachusetts, US, in 1976 where the first draft of the BIOMASS document was completed.

The problem with much of the work that has been done is the proliferation of data and developing efficient data banks in Antarctic research is a problem SCAR recognizes and has tried to address.

The increased number of member nations has resulted in a change in SCAR meetings and organization. The somewhat "clubby" atmosphere of Antarctic research scientists meeting to share information has been replaced by much larger meetings and Working Group membership. Occasionally, discipline Working Group meetings become unwieldy.

During the past few years, increased public awareness and concern about global environmental issues, particularly those in the remaining "wilderness areas" such as Antarctica, have brought more attention to polar regions. The Madrid Protocol within the ATS arises from the new international attitude. SCAR is in a unique position to provide the scientific background required for proper environmental management, but there is also concern that provision of advice to service ATS protocols will dilute SCAR's ability to promote fundamental scientific research. Environmental awareness is increasing at the same time Antarctic scientific activity and tourism (which has potential for explosive, possibly unregulated growth) are putting greater pressures on environment.

Additional pressure on the conduct of relevant Antarctic science, and on SCAR, results from the complexity and interrelationships in the large national systems that are involved in Antarctic research. Thus, strong coordination and effective international cooperation is required for modern, large scale, and sophisticated programs.

Recommendations:

The committee recommends that the structure of SCAR be examined and that reorganization be considered with stronger infrastructural support, and a set of clear-cut priority tasks, to obtain a more focused thrust and concentration of effort, including quality control (peer review) in relevant scientific fields. The science advisory function could be reduced. Among the many problems that must be addressed are: the complexity of the organization since many new countries have joined; financial requirements for function and the need to seek new sources of funding; the role of Third World scientists, both in participating in research and in training programs for their benefit; the relationship between SCAR and IASC (International Committee on Arctic Science); maintaining the initiative in the

course of collaboration with strong international research programs based in other international or trans-national organizations; and finally, attention to developing a sufficient data base system (e.g. an expanded seismic data library system to embrace all scientific data, the SDLS-Scientific Data Library System).

It has been suggested that an Antarctic Science Foundation be formed so that a new institutional arrangement will thereby, be devised and that SCAR can increase its focus on marine as well as terrestrial science. The purpose of an Antarctic Science Foundation might be to provide an institution, in itself international, to coordinate, stimulate and raise the funding needed for research in the Antarctic. The suggestion of an Antarctic Science Foundation arises from the belief that a more proactive lead agency is needed to stimulate agendas for research based on international cutting edge science, as well as to participate more effectively in other international programs such as global climate change and to reduce the time between formulation of ideas and implementation of projects, using the most advanced technologies. However, how such a foundation would be funded would have to be addressed.

There is clearly a strong driving force from national interests in polar research and this could be capitalized upon, giving new institutional arrangements, especially in capturing the interest of European countries.

The notion of an Antarctic Science Foundation is an interesting one. However, the committee believes there is still a role for SCAR to play, to ensure stronger internationalism in Antarctic research. In any case, the formation of an Antarctic Science Foundation under ICSU and affiliated with SCAR might facilitate meeting some of the needs, as well as facilitate dealing with demands for the institution of international research stations in Antarctica to carry out high priority, clearly defined, and relevant scientific research.

Summary and Conclusions:

In summary, the goals of SCAR include stimulating, coordinating and overseeing research in Antarctica undertaken under the auspices of a large number of national programs, as well as serving the ATS with advice as requested. The former are achieved through working groups and groups of specialists. The latter is dealt with by groups of specialists and individual scientists. The work of SCAR is certainly not completed and will continue. The latter task will undoubtedly become more difficult and conflicts between the research agenda and the advisory agenda will increase in the future.

The quality of research within the fields covered by SCAR

varies from excellent to acceptable. In some cases, there is a drift toward monitoring undertaken for nonscientific purposes and also some areas of research appear to be isolated from the international research front. In general, SCAR is currently in a difficult situation because of insufficient funds for the tasks it is asked to undertake. Funds are lacking for important new initiatives and criticism has been raised from SCAR members that too much time and effort is spent on science advisory functions, as for example, the Antarctic Treaty System (ATS) and more attention should be taken to carrying out excellent science. Finally, it is necessary to find a mechanism for improving access to Antarctica by Third World country scientists.

SCAR's mission and goals should be sharpened so that science coordination, stimulation, and quality enhancing functions are clearly defined and greater attention is placed on science, either down-playing or eliminating science advisory functions.

There is no question but that the funding is much too little for what is needed to operate in accordance with SCAR's goals and the gap is increasing rapidly. The formation of an Antarctic Science Foundation to attract funding and to provide a pool of funds for research in Antarctica, as well as strengthening SCAR's role in Antarctica merits exploration.

Clearly, SCAR's participation in addressing major questions undertaken at the initiative of national research programs, the most obvious example being ozone layer research, requires certain working groups within SCAR, as well as its Executive make every effort to modernize and interact more strongly and effectively within international programs, especially those of global change.

Finally, SCAR has been effective but now must consider current needs for Antarctic research. SCAR should consider an organizational structure more in tune with international science and should provide leadership for cutting edge scientific research in areas such as ozone layer research, deep ice core drilling, systems modeling for climatological purposes, paleobotany, Antarctic-related biotechnology, atmospheric chemistry, plate tectonics, etc.

SCAR clearly has a significant mission in Antarctica, especially in coordination of research. The most reassuring information about SCAR obtained by the Review Committee was that there are new young scientists participating in SCAR activities. Thus, a stronger focus of SCAR on science will serve it well in the future.

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS
SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCHSCAR BULLETIN
No 103, October 1991STATIONS OF SCAR NATIONS
OPERATING IN THE ANTARCTIC, WINTER 1991

*Stations north of 60°S

*Argentina*Belgrano II, 77°52'S, 34°37'W
Orcadas, 60°44'S, 44°44'W
Esperanza, 63°24'S, 57°00'W
Marambio, 64°14'S, 56°37'W
San Martin, 68°08'S, 67°06'W
Jubany, 62°14'S, 58°40'W*Australia**Macquarrie Island, 54°30'S, 158°57'E
Mawson, 67°36'S, 62°52'E
Davis, 68°36'S, 77°58'E
Casey, 66°18'S, 110°32'E*Brazil*

Commandte Ferraz, 62°05'S, 58°24'W

*Chile*Capitan Arturo Prat, 62°30'S, 59°41'W
General Bernardo O'Higgins, 63°19'S, 57°54'W
Teniente Rodolfo Marsh, 62°12'S, 58°55'W*France*Dumont d'Urville, 66°40'S, 140°01'E
*Alfred-Faure, 46°26'S, 51°52'E
*Martin-de-Vivies, 37°50'S, 77°34'E
*Port-aux-Francais, 49°21'S, 70°12'E*Germany*Georg von Neumayer, 70°37'S, 08°22'W
Georg Forster, 70°47'S, 11°51'E*India*

Dakshin Gangotri, 70°05'S, 12°00'E

*Japan*Syowa, 69°00'S, 39°35'E
Asuka, 71°32'S, 24°08'E*New Zealand*Scott Base, 77°51'S, 166°45'E
*Campbell Island, 52°33'S, 169°09'E*People's Republic of China*Great Wall, 62°13'S, 58°58'W
Zhongshan, 69°22'S, 76°23'E*Poland*

Arctowski, 62°09'S, 58°28'W

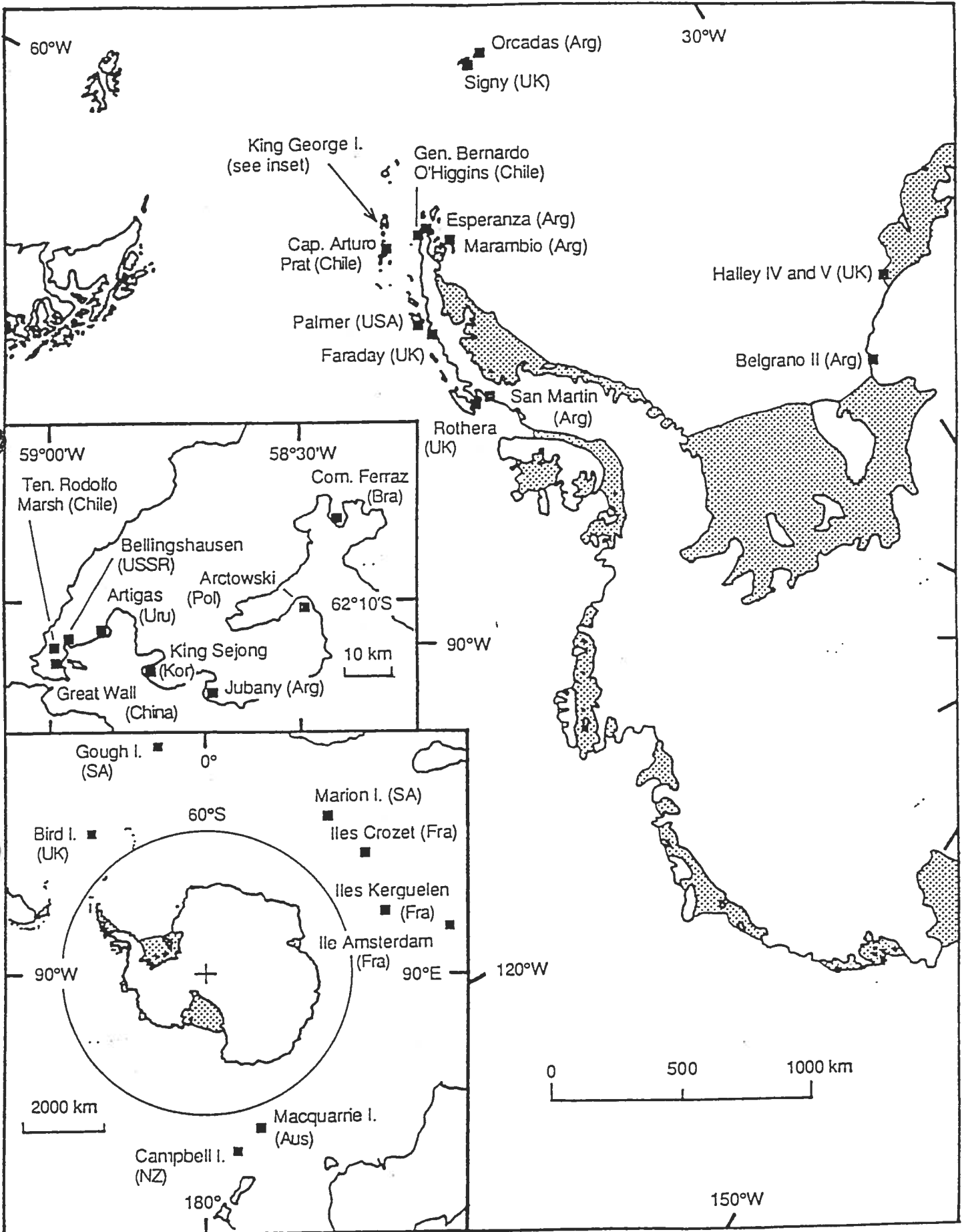
Republic of Korea

King Sejong, 62°13'S, 58°47'W

*South Africa*SANAE, 70°18'S, 02°25'W
*Marion Island, 46°52'S, 37°51'E
*Gough Island, 40°21'S, 09°52'W*United Kingdom**Bird Island, 54°00'S, 38°03'W
Faraday, 65°15'S, 64°16'W
Halley (IV), 75°36'S, 26°46'W
Halley, (V) 75°35'S, 26°15'W
Rothera, 67°34'S, 68°07'W
Signy, 60°43'S, 45°36'W*United States of America*Amundsen-Scott, 90°S
McMurdo, 77°51'S, 166°40'E
Palmer, 64°46'S 64°03'W*Union of Soviet Socialist Republics*Mirny, 66°33'S, 93°01'E
Novolazarevskaya, 70°46'S, 11°50'E
Molodezhnaya, 67°40'S, 45°51'E
Vostok, 78°28'S, 106°49'E
Bellingshausen, 62°12'S, 58°58'W
Leningradskaya, 69°30'S, 159°24'E
Progress, 69°24'S, 76°24'E*Uruguay*

Artigas, 62°11'S, 58°51'W

APPENDIX



APPENDIX

