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QUESTION OF ANTARCTICA

Study requested under General Assembly resolution 38/77

Report of the Secretary-General

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PREFACE

1. In its resolution 38/77 of 15 December 1983, the General Assembly requested the Secretary-General to prepare a comprehensive, factual and objective study on all aspects of Antarctica, taking fully into account the Antarctic Treaty system and other relevant factors. The Assembly also requested the Secretary-General to seek the views of all Member States in the preparation of the study and requested those States conducting scientific research in Antarctica, other interested States, the relevant specialized agencies, organs, organizations and bodies of the United Nations system and relevant international organizations having scientific or technical information on Antarctica to lend the Secretary-General whatever assistance he might request for the purpose of carrying out the study.
2. In accordance with resolution 38/77, the Secretary-General, on 8 February 1984, addressed a note verbale to Member States and requested them to submit, not later than 1 June 1984, their views and the information they were prepared to provide pursuant to the relevant provisions of the resolution.
3. Letters were also sent to the relevant specialized agencies, organs, organizations and bodies of the United Nations system and to relevant international organizations having scientific or technical information on Antarctica. They were invited to submit information on Antarctica, in particular on matters of their main concern.
4. As at 29 October 1984, replies from 54 Member States had been received. To the extent possible those replies, as well as relevant information provided by the specialized agencies, organs, organizations and bodies of the United Nations system and international organizations having scientific or technical information on Antarctica, have been used in preparing part one of the study, in which the physical, legal, political, economic and scientific aspects are discussed. The views of Member States are included in part two of the present document (A/39/583 (Part II)) and should be considered an integral part of the study. The information relevant to the preparation of such a study is vast.
5. Most of the replies from Member States were received as the drafting of part one was being completed. Some Member States indicated that their replies were of an introductory or general nature and that more detailed information would be provided to the Secretary-General later. Some important international organizations that conduct research relevant to the subject indicated that they needed more time to co-ordinate, prepare and transmit substantive information to the Secretary-General. Consequently, such information may be used in future undertakings regarding the question of Antarctica.

ABBREVIATIONS

BIOMASS	Biological Investigation of Marine Antarctic Systems and Stocks
CCAMIR	Commission for the Conservation of Antarctic Marine Living Resources
COSPAR	Committee on Space Research
CSAGI	Comité Spécial de l'Année Géophysique Internationale
FAO	Food and Agriculture Organization of the United Nations
EEC	European Economic Community
ICSU	International Council of Scientific Unions
IGY	International Geophysical Year
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
ITU	International Telecommunications Union
IUCN	International Union for the Conservation of Nature and Natural Resources
IWC	International Whaling Commission
NSF	United States National Science Foundation
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
WMO	World Meteorological Organization



PART ONE

Physical, legal, political, economic and scientific aspects

## CHAPTER I

### PHYSICAL CHARACTERISTICS

1. It was the ancient Greeks who first postulated that there might be a vast continent in the southern hemisphere - "Antarctica" (from anti arktos "opposite the bear" or Arctic), counterbalancing the continents in the north. Although Terra Australis Incognita had been shown on some of the maps drawn in the Middle Ages, it was not until the beginning of the nineteenth century that the existence of the southern continent was proved by the discoveries of explorers from different countries.
2. For the purposes of the present report, Antarctica is the southernmost continent, situated about the South Pole, its adjacent ice shelf, the southern extremities of the Indian, Atlantic and Pacific oceans (the so-called Southern Ocean) and its islands. There is no single generally accepted definition of the boundary of the Antarctic region. The Antarctic Treaty of 1959 1/ applies to the areas situated south of 60°S latitude. For scientific purposes, the geophysical boundary of Antarctica is determined mainly by the Antarctic Convergence, a relatively narrow circumpolar zone of the Southern Ocean where cold and low-saline surface water moving north from the coast of Antarctica is pushed beneath warmer, high-saline northern water moving south (see figure 1 on p. 14).
3. From a geographical point of view, Antarctica is an isolated continent. It is 990 km from the southern part of South America and about 2,000 km from New Zealand. The continent covers an area of approximately 13.9 million sq km, one tenth of the Earth's land surface. It is divided by the range of the Transantarctic Mountains, a geological continuation of the Andes, into East Antarctica, presumably a more or less continuous continental mass, and West Antarctica, a much smaller area. The latter lies almost entirely within the western hemisphere and, according to recent geological studies, appears to consist largely of an ice shelf and archipelagos of ice-welded islands.
4. One of Antarctica's most significant physical characteristics is its permanent ice cap, which covers 98 per cent of the continent. It averages 2,160 m in thickness and at some points exceeds 4,500 m. The Antarctic ice contains 70 per cent of the world's store of fresh water. Under the weight of the ice cover, the continent is depressed about 600 m on the average. Although about one third of its land mass appears to lie below sea level, it nevertheless has the highest average elevation of all the continents - 1,800 m. The ice cover flows outward to the ocean from the elevated interior of the continent. The direction and the speed of this ice flow are vastly different and depend on the topography of the continent. The Transantarctic Mountains divide the Antarctic ice cap into two parts: a thicker East Antarctic ice sheet and a thinner partly marine-based West Antarctic ice sheet. Towards the edge of the continent the ice sheet thins considerably. It flows down to coastal cliffs at an average annual rate of between 100 and 1,000 m in mountainous areas and in areas with an irregular subglacial coastal relief. In areas where the subglacial relief is gentle, the rate of movement is considerably slower - approximately 10 m. The movement of the ice sheet has not yet been completely understood. Part of the ice cap extends offshore,

forming vast ice shelves that constitute more than 10 per cent of the continent's area. Their average thickness is 250 m, but in certain areas they reach up to 1,300 m. The largest of the ice shelves are the Ross, Filchner, Ronne and Amery. They move seaward at a rate of from 900 to 1,300 m per year.

5. The Antarctic ice pack originates on or at the edge of the continent and is subsequently pushed by the winds northward into the sea. It grows from an average minimum area of 2.6 million sq km in March to about 18.8 million sq km in September, a much greater annual variation in extent than that of the Arctic ice pack. In winter, the ice pack completely encloses Antarctica and can extend as far north as 55°S. Ice flows extend from 10 to 100 metres across and can be 3.0 m thick; most of the pack ice however is "first year ice", averaging 1.5 m in thickness.

6. Antarctic icebergs, known as tabular icebergs, are usually more numerous and significantly bigger than their Arctic counterparts. Some have been observed to be larger than 60 by 100 km in horizontal extent and vertically may reach 100 m above sea level and 400 to 500 m below it. They split off the front of the ice shelf and move at about 10 nautical miles per day, pushed by the ocean currents; they are found as far north as 40°S in the Pacific Ocean and 35°S in the Atlantic and Indian Oceans.

7. The continental shelf of Antarctica covers an area of about 4 million sq km. It is relatively narrow, with an average width of 30 km as opposed to a 70 km global average. The shelf is deep, two to three times the world average of 200 m, and in places in the Ross Sea plunges on occasion to over 800 m. The weight of the Antarctic permanent ice cap contributes to the shelf depth.

8. The climate in Antarctica is determined primarily by the geographic location of the continent, by its surface elevation and by the presence of the permanent ice cap. The total annual solar radiation received at the South Pole is about equal to that received in the equatorial area, despite the six-month long polar "night". This is a result of the continent's high elevation and thin atmosphere, as well as the unusual clearness of the air. Most of the solar radiation, however, is reflected back into space by the snow-covered permanent ice cap and by the sea ice. Despite the considerable amount of solar radiation received, Antarctica is the coldest of the continents. Lines of equal temperature form a near symmetrical pattern centred over East Antarctica with the sharpest temperature changes appearing along the margin of the ice sheet, particularly in the east. January averages vary from slightly below freezing along the coast to below -30°C on the plateau. Averages in July are about -20°C and below -65°C. The world's record low temperature of -89.6°C was recorded in Antarctica in July 1983 at New Zealand's Vanda Station. Antarctica's highest temperatures occur along the northern fringes of the Antarctic Peninsula. They remain above freezing from one to four months, with winter minimums occasionally plunging into the -30s or -40s.

9. The frequency of cyclonic storms is another characteristic of the antarctic climate. These storms are generated in a belt between 60°S and 70°S and move clockwise around the continent's coast. On the continent, cold air sinks from the elevated interior towards the coasts, producing severe gravity winds lasting several hours and sometimes reaching a velocity of 70 knots or more. Also of

importance is the existence in Antarctica of strong temperature inversions (air temperature increasing with height) in the lowest few hundred metres of the atmosphere. These inversions are well developed in the western part of the continent (especially in the interior) during winter.

10. Precipitation in Antarctica, mostly in the form of snow, is limited. The annual snowfall in the Antarctic plateau is equivalent to less than 5 cm. Coastal areas, especially along East Antarctica and the Antarctic Peninsula, are considerably more humid. The annual snowfall there could be as much as 50 cm. The Onyx, Antarctica's only river, flows in summer from the melted waters of the Wright Glacier in the Ross Dependency over a course of 30 km.

#### Notes

1/ United Nations, Treaty Series, vol. 402, No. 5778, p. 72.

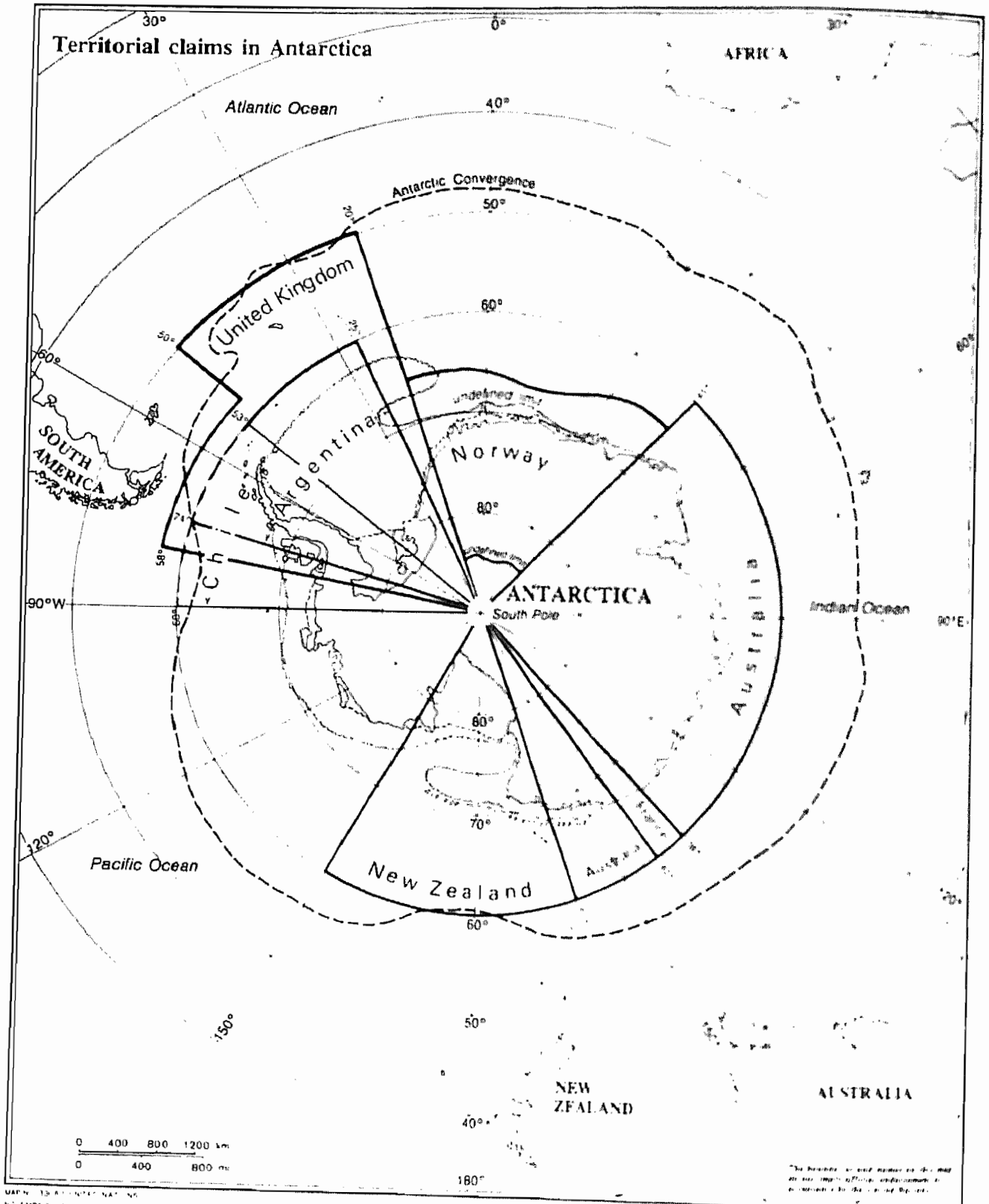
CHAPTER II

ANTARCTICA: LEGAL AND POLITICAL ASPECTS

A. Sovereignty issue

11. The discoveries made by the explorers in Antarctica in the nineteenth century, who reached different parts of the continent and mapped them, opened the era of the scientific exploration in Antarctica and the commercial exploitation of its marine resources, mainly seals and whales, by United States, British, Russian, Norwegian, French and other vessels.
12. In the second half of the nineteenth century those activities increased the possibility of gaining access to some of the distant parts of the area and led States to consider seriously their national interests in Antarctica. Those national interests encouraged a number of countries to advance territorial claims in Antarctica. Since the beginning of the twentieth century, seven nations - Australia, Argentina, Chile, France, New Zealand, Norway and the United Kingdom of Great Britain and Northern Ireland - have made their respective formal, unilateral, territorial claims to parts of Antarctica in both national legislation and in international statements (figure 1).
13. Australia claims the largest area in Antarctica, approximately two fifths of the continent. 1/ The claim comprises two sectors south of 60°S latitude, separated by the area claimed by France. The first is located between 45° and 136°E longitude and the second, between 142° and 160°E longitude.
14. Argentina's claim in Antarctica encompasses the area between 25° and 74°W longitude, extending from the South Pole to the 60th parallel. 2/
15. Chile's claim in Antarctica, in accordance with Presidential Decree No. 1747 of 6 November 1940 marking the frontier lines for the area claimed, "is formed by all lands, islands, islets, reefs, pack-ice, etc., known and to be discovered, and their respective territorial sea, lying within the limit of the sector constituted by meridians of 53° and 90°W longitude". 3/ 4/
16. France lays claim in Antarctica to Terre Adélie (Adelie Land), discovered by Dumont d'Urville in 1840. This area is located between 136° and 142°E longitude south of the 60° parallel. 5/
17. New Zealand's claim in Antarctica embraces the area between 160°E longitude and 150°W longitude south of the 60° parallel. 6/
18. Norway makes a claim in Antarctica over Dronning (Queen) Maud Land, situated between 20°W longitude and 45°E longitude. 7/ It borders territories claimed by the United Kingdom in the west and by Australia in the east. The limits of the Norwegian claim to the north and to the south are not defined.

Figure 1. Territorial claims in Antarctica



19. The claim of the United Kingdom in Antarctica encompasses "all islands and territories situated between longitudes 20° and 50° west, and south of latitude 50° south; and all islands and territories situated between longitudes 50° and 80° west, and south of latitude 58° south". 8/

20. All territorial claims in Antarctica are actually wedge-shaped. The claims of Argentina, Chile and the United Kingdom overlap at the Antarctic Peninsula. About 15 per cent of the Antarctic continent remains unclaimed.

21. The legal grounds on which the seven aforementioned States base their claims vary, being combinations of such arguments and principles as discovery, occupation, contiguity, inherited rights, geological affinity and geographical proximity, formal acts of taking possession, performance of administrative acts, the sector concept etc. 9/

22. Thus, the Government of the United Kingdom, for example, in submitting its application in 1955 to the International Court of Justice contended, inter alia, that the legal titles of the United Kingdom to relevant territories in Antarctica were superior to the claims of any other State:

"by reason of historic British discoveries of certain territories in the Antarctic and sub-Antarctic; by reason of the long-continued and peaceful display of British sovereignty from the date of those discoveries onwards in, and in regard to, the territories concerned; by reason of the incorporation of these territories in the dominions of the British Crown; by virtue of their formal constitution in the Royal Letters Patent of 1908 and 1917 as the British Possession". 10/

23. An official statement from Argentina on the issue dated 20 February 1953 asserted that:

"Argentine ... sovereignty [over Antarctica] is based ... in the aggregate of the historical antecedents of its titles - maintained firmly in all circumstances by the Argentine Government [and] spiritually identified with the feeling of the nation's entire population; in the insuperable geographical portion of the Republic; in the geological continuity of its land with the Antarctic lands; in the climatological influence that the neighboring polar zones exercise over its territories; in the rights of first occupancy; in the pertinent diplomatic measures; and, finally, in its uninterrupted activity in the same Antarctic terrain." 11/

24. The declaration of the Government of Chile made on 11 September 1950 states that:

"The Chilean Government has proclaimed repeatedly its right to a certain sector of the Antarctic continent, called the Chilean Antarctic. In that sector, the Republic exercises sovereignty by right and in fact with prior claim over any other power. This claim is supported by logical geographic continuity and contiguity, and furthermore there have been carried out, in addition to actual permanent occupation (of the territory), acts of government.

and administration that furnish evidence to the international community of the absolute validity of Chile's rights." 12/

25. The major political difficulty faced from the very beginning by the claimant States was that other States, in particular those active in the area, refused to recognize those claims.

26. For example, the United States of America and the Union of Soviet Socialist Republics at the outset categorically rejected the possibility of recognizing any territorial claim in Antarctica. Nevertheless, it should be noted that although neither State has ever made a formal claim to Antarctica, at the same time each has reserved its rights to Antarctic territories based on discoveries and explorations made by Russian and United States scientists and explorers.

27. Thus, when Norway annexed Queen Maud Land in Antarctica in 1939 the Soviet Union sent a note stating that "it would reserve its opinion as to the national status of territories discovered by Russian scientists". 13/

28. At a certain stage, members of the United States Antarctic Service were encouraged to take and record appropriate acts that might later assist the United States in supporting a sovereignty claim.

29. The instructions given in 1939 by President Roosevelt to the Commanding Officer of the United States Antarctic Service contained the following paragraphs:

"(f) The United States has never recognized any claims to sovereignty over territory in the Antarctic regions asserted by any foreign state. No member of the United States Antarctic Service shall take any action or make any statements tending to compromise this position.

"Members of the Service may take any appropriate steps such as dropping written claims from airplanes, depositing such writings in cairns, et cetera, which might assist in supporting a sovereignty claim by the United States Government. Careful record shall be kept of the circumstances surrounding each such act. No public announcement of such act shall, however, be made without specific authority in each case from the Secretary of State." 14/

30. The Acting United States Secretary of State, in a letter dated 14 December 1946 to the Secretary of the Navy, recommended that:

"In order that the maximum advantage in this regard may be gained for the United States from the activities of the Naval Antarctic Developments Project, I suggest that you authorize the expedition to take appropriate steps, such as depositing written claims in cairns, dropping from airplanes containers enclosing such written claims, etc., which might assist in supporting a claim of sovereignty by the United States Government and that you give instructions to the officers in charge of the expedition to keep a careful record of the circumstances surrounding each such act. I suggest that no public announcement with respect to these activities should be made without prior specific authorization in each case from you after clearance with the Department of State." 15/



31. After the Second World War, both the United States and the Soviet Union supported, and in the case of the United States even initiated, discussions aimed at elaborating an international agreement for Antarctica with a view to establishing there some form of international régime. Nevertheless, on certain occasions both States felt it necessary to reiterate their reserved rights in Antarctica.

32. In a note dated 2 May 1958 from the Government of the United States, proposing the international conference on Antarctica that eventually resulted in the adoption of the Antarctic Treaty, it was reiterated that:

"The United States for many years had had, and at the present time continues to have, direct and substantial rights and interests in Antarctica. Throughout a period of many years, commencing in the early eighteen-hundreds, many areas of the Antarctic region have been discovered, sighted, explored and claimed on behalf of the United States by nationals of the United States and by expeditions carrying the flag of the United States. During this period, the Government of the United States and its nationals have engaged in well-known and extensive activities in Antarctica.

"In view of the activities of the United States and its nationals referred to above, my Government reserves all of the rights of the United States with respect to the Antarctic region, including the right to assert a territorial claim or claims." 16/

33. In reply to that note the Government of the Soviet Union stated:

"As to the question of territorial claims advanced by certain states in the Antarctic, the Soviet Government considers it necessary to state once again that it has not recognized and cannot recognize as legitimate any kind of separate solution for the problem of territorial possessions in [state sovereignty over] the Antarctic. In this connection it is appropriate to recall the outstanding merits of Russian explorers in discovering the Antarctic and, in particular, the generally recognized fact that it was the Russian navigators Bellingshausen and Lazarev who were the first to reach the shores of the Antarctic and circumnavigate this continent at the beginning of the 19th century.

"The Soviet Union reserves to itself all rights based on discoveries and explorations of Russian navigators and scientists, including the right to present corresponding territorial claims in the Antarctic." 17/

34. With regard to the position of Japan, once considered a potential claimant State, 18/ it should be noted that, by the Treaty of Peace concluded in San Francisco on 8 September 1951, "Japan renounces all claim to any right or title to or interest in connection with any part of the Antarctic area, whether deriving from the activities of Japanese nationals or otherwise." 19/

35. Non-recognition of territorial claims inevitably led to tension. Confrontation in Antarctica between claimant States and States refusing to recognize these claims, supplemented by the conflict among the United Kingdom, Argentina and Chile over

their overlapping claims, started sparking more and more political controversy after the end of the Second World War when the States concerned were able to pay more attention to their respective interests in Antarctica.

36. In the immediate post-war period, rivalry among three States with conflicting claims led to a number of serious incidents when flags were torn down, stations destroyed and rival expeditions sent to the same areas. 20/

37. In one incident, commemorative bronze plaques installed in 1942 on Deception and Wiencke islands by the expedition of the Argentinian ship Primero de Mayo were removed a year later by the members of the British warship H.M.S. Carnarvon Castle. Crewmen of the British warship also removed the national colours of Argentina from the walls of the former whaling factory located on Deception Island. 21/

38. Each of the three countries, Argentina, Chile and the United Kingdom, actively proceeded in establishing or re-establishing stations and posts in the area under the dispute. That led to the mutual exchange of protests through diplomatic channels.

39. Despite their disagreement, Argentina and Chile succeeded in signing on 4 March 1948 the Joint Declaration on the Antarctic, stating that "until a friendly agreement is concluded concerning the common boundary line of the Antarctic territories of Chile and the Argentine Republic", both Governments "will act in common accord in the juridical protection and defense of their rights in the South American Antarctic, which is included between the 25th and 90th meridians of longitude west of Greenwich, and in these territories Chile and the Argentine Republic mutually recognize indisputable rights of sovereignty". The Parties to the Joint Declaration agreed that they would "continue their action of administration, exploitation, supervision and development in the undefined frontier region of their respective Antarctic zones" 22/ and that they would continue negotiations with a view to arriving at agreement on the demarcation of boundaries in Antarctica.

40. In order to avoid the danger of an open military conflict in Antarctica, the United Kingdom, Argentina and Chile agreed on a Tripartite Naval Declaration, the substance of which was disclosed in the following statement made by the Foreign Office on 18 January 1949:

"Being anxious to avoid any misunderstanding in Antarctica which might affect the friendly relations between the United Kingdom, Argentina and Chile, the Governments of these three countries have informed each other that, in present circumstances, they foresee no need to send warships south of latitude 60 degrees during the 1948-49 Antarctic season, apart, of course, from routine movements such as have been customary for a number of years." 23/

Until 1957 the Declaration was renewed annually by the three countries.

41. The aforementioned arrangements did not end the tension among the three countries caused by their overlapping claims in Antarctica. Continued expansion of activities by each of them in the area finally led to further confrontation.

42. In 1952, an Argentinian party in Hope Bay (South Orkney Islands), resorting to the use of gun fire, compelled a British scientific expedition, attempting to reoccupy a station, to withdraw from the Hope Bay area. 24/

43. A year later, British policemen dismantled huts constructed by Argentinian and Chilean nationals on Deception Island and arrested two Argentines. 25/

44. In 1955, the United Kingdom went to the International Court of Justice contending in its Application that the United Kingdom possessed, and at all material dates had possessed, legal titles to sovereignty over the claimed areas in Antarctica and that the pretensions of Argentina and Chile to any of these areas were illegal and invalid. The United Kingdom asked the Court to declare that Argentina and Chile were bound to respect the United Kingdom's sovereignty over those areas and, if called on by the United Kingdom, to withdraw from them their personnel and equipment. 26/

45. The case was dismissed after both Argentina and Chile declined to submit to the Court's jurisdiction. 27/

46. As already mentioned, relations between claimant States and those refusing to recognize such claims in Antarctica also give rise to difficulties. Exchanges of notes recording sharp divergencies of view were not uncommon.

47. Thus in an aide-mémoire dated 19 July 1955 from the Government of the United States to Argentina, the United States declared that

"The Government of the United States of America notes that legislation recently enacted by the Argentine Congress purports to incorporate into Argentine provincial administration those areas claimed by the Argentine in the Antarctic. The Government of the United States wishes to reiterate that it recognizes no claims advanced in the Antarctic and reserves all rights of the United States in the area." 28/

48. In its reply, the Government of Argentina stressed that reservation and declaration made by the United States did not in any way affect the legitimate and indispensable rights which Argentina exercised in the Antarctic in the sector of sovereignty. 29/

49. With respect to the note from the Government of Australia informing Governments about its decision to apply, by virtue of its membership, the Convention of the World Meteorological Organization to the Australian Antarctic Territory, the United States Secretary of State in a reply dated 30 January 1956 declared:

"My Government wishes to point out, as it has on previous occasions, that it does not recognize any claims so far advanced in the Antarctic and reserves all rights accruing to the United States out of activities of nationals of the United States in the area." 30/

50. In response to a memorandum of 8 June 1950 on Antarctica from the Government of the Soviet Union, 31/ the Government of Chile, in its Declaration of

11 September 1950, reaffirmed that "by virtue of geographical, historical, juridical, diplomatic and administrative rights, Chile exercises full sovereignty over the Chilean Antarctic Territory, and does not recognize within that territory the claims of any other powers". 32/

51. Diversity in the views on the sovereignty issue significantly complicated the work of the First International Geophysical Year (IGY) Antarctic Conference, held in Paris in 1955. The negotiations at the Conference were at one point halted until its president, M. Laclaver, finally succeeded in getting support for a statement saying that the objectives of the Conference were exclusively of a scientific nature. This statement was then reflected in a resolution adopted by the conference on 10 July 1955. 33/

52. In spite of the above-mentioned statement, difficulties persisted during the work of the Conference as a result of differing positions on the issue of sovereign claims in Antarctica. 34/

53. The complexities of the political and legal situation continued to persist and, during the IGY, problems arose caused by the activities of scientists of one State acting in the area claimed by another. 35/ The claimant States started issuing declarations stating that they welcomed activities in their territories in Antarctica. Such statements were rejected by non-claimant States sending scientific expeditions to Antarctica as part of the IGY programme.

54. Thus, a note dated 2 August 1955 from the Government of Australia to the United States Secretary of State said:

"Following the recent meetings of scientists in Paris, the Australian Government understands that the Government of the United States is interested in the possibility of conducting scientific research in the Australian sector of the Antarctic.

"The Australian Government welcomes this interest on the part of the United States Government and will be happy to render any assistance in its power to this end." 36/

55. In reply to this note, the United States pointed out that offer of co-operation made by the Australian side in connection with the activities in the Antarctic during the IGY was appreciated, although the Government of the United States did not, of course, recognize any claims so far advanced in the Antarctic and reserved all rights accruing to the United States out of activities of its nationals in the Antarctic. 37/

56. A similar exchange of letters took place between the United States and New Zealand. 38/

57. By the time the Antarctic Treaty was concluded the situation surrounding territorial claims in Antarctica had reached a point at which some kind of solution assuring peace and stability in the area had become imperative. Differences on the sovereignty issue did not disappear with the signing of the Treaty but at least a

forum had been provided through which situations arising from new activities could be addressed and solutions to emerging problems sought. The information provided in chapter III of the present study, devoted to the operation of the Antarctic Treaty system, will refer to the role of the Antarctic Treaty in dealing with issues raised by conflicting positions between the Parties on territorial claims. The views of some non-Treaty Parties on the sovereignty issue in Antarctica are reflected in section C of the present chapter devoted to the deliberations at the thirty-eighth session of the General Assembly.

## B. Antarctic Treaty

58. Because of the generally unsatisfactory situation in Antarctica originating from the conflicting approaches of States to the sovereignty issue, which was aggravated by the outbreak of serious conflicts described above, attempts were made in the years immediately following the Second World War to initiate discussions aimed at establishing any international régime in Antarctica. These attempts failed. However, in the middle of the 1950s, the increase in tension around the sovereignty issue, accompanied by rapidly developing activities in Antarctica, proved that the Antarctic had dramatically entered into the world of politics. In the light of the position of the claimant States, the active involvement in the region of such non-claimant States, as the Soviet Union and the United States, the political difficulties arising from overlapping claims and other important factors including instances of military rivalry, it was felt that the need for an international agreement with respect to the Antarctic was increasingly urgent. It was also well understood by those concerned that unless an international solution for the Antarctic could be found, a confrontation on a world-wide scale might easily erupt in that area. 39/

59. Serious concern about the situation developing at that time in the Antarctic had prompted India twice, in 1956 and 1958, to make a formal proposal for inclusion in the agenda of the General Assembly of an item entitled "Question of Antarctica", but both times India withdrew the proposal.

60. In 1957, world attention was attracted to the enormous international scientific effort known as the International Geophysical Year (IGY), which culminated in 1958. Under the IGY, Antarctica was selected as one of the priority areas. Despite disagreement on the sovereignty issue and tension in east-west relations, the planning and implementation of the IGY programme in Antarctica were successful international co-operative efforts. A certain modus vivendi was achieved during the IGY between claimant and non-claimant States, allowing scientists from 12 interested States to participate in an unprecedented international venture that resulted in the establishment and expansion of scientific bases. 40/

61. The IGY activities in Antarctica not only made a significant contribution to mankind's scientific knowledge, but in addition prepared the basis for negotiations seeking to assure the establishment of Antarctica as an area of peace, to overcome conflicts resulting from the sovereignty issue and to assure freedom of scientific research in Antarctica. 41/ In May 1958, the Government of the United States proposed to the Governments of Argentina, Australia, Belgium, Chile, France, Japan,

New Zealand, Norway, South Africa, the Soviet Union and the United Kingdom to conclude a treaty designed to preserve the continent as an international laboratory for scientific research and to ensure that it be used only for peaceful purposes.

62. The selection of the countries invited to the Conference was evidently based on their participation in Antarctic research activities during the IGY. Since participation in the IGY was open to any interested State, by this approach none of those wishing to take part in conducting scientific research in Antarctica at that time was excluded. 42/

63. The initiative of the United States was accepted and efforts to elaborate an international agreement governing the situation in Antarctica resulted finally in the convocation in Washington, D.C. of the Conference which, on the first of December 1959, approved the Antarctic Treaty. 43/

64. The Antarctic Treaty entered into force on 23 June 1961 after all 12 Powers invited to the Washington Conference had ratified it. Thus, 12 States - Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom and the United States - became the original Parties to the Treaty. Since then, 20 States have acceded to the Treaty; Brazil, Bulgaria, China, Czechoslovakia, Cuba, Denmark, Finland, German Democratic Republic, Germany, Federal Republic of, Hungary, India, Italy, Netherlands, Papua New Guinea, Peru, Poland, Romania, Spain, Sweden and Uruguay.

65. It is stipulated in the preamble of the Treaty that "it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord" (second preambular paragraph). The preamble also emphasizes that, by ensuring "the use of Antarctica for peaceful purposes only and the continuance of international harmony in Antarctica", the Treaty "furtheres the purposes and principles embodied in the Charter of the United Nations" (fifth preambular paragraph).

66. The Treaty proclaims in article I that it ensures that "Antarctica shall be used for peaceful purposes only" (para. 1). That objective is elaborated in the same paragraph where it is stated that the Treaty prohibits, inter alia, any measures of a military nature, such as establishment of military bases and fortifications, the carrying out of military manoeuvres, as well as the testing of any type of weapons. However, according to paragraph 2 of article I, the use of military personnel or equipment is not completely excluded, but is permitted only in support of scientific research or for any other peaceful purpose consistent with the principles of the Treaty.

67. By prohibiting any measure of a military nature, article I of the Treaty establishes in Antarctica a régime of demilitarization or, more precisely, a régime of non-militarization, since Antarctica has never been the scene of military installations. If any plans to involve Antarctica in the sphere of the arms race ever existed, they have not become reality.

68. For the purposes of further implementation of the objective proclaimed in the preamble and in article I, the Treaty, in paragraph 1 (a) of article IX, imposes on Contracting Parties participating in the work of the Consultative Meetings convened within the framework of the Treaty, an obligation to consider, formulate and recommend measures regarding the "use of Antarctica for peaceful purposes only".

69. The ban on military activities is complemented in the Treaty by the prohibition of any nuclear explosions in Antarctica and the disposal of radioactive waste material there (art. V, para. 1), making it the first international nuclear test-ban agreement. It should be noted that, in paragraph 2 of article V, the Treaty states that "in the event of the conclusion of international agreements concerning the use of nuclear energy, including nuclear explosions and the disposal of radioactive waste material, to which all the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX are parties, the rules established under such agreements shall apply in Antarctica".

70. When reviewing the situation with respect to the application of article V of the Treaty, it was decided at the Eighth Consultative Meeting that every appropriate effort should be exerted so that no one disposed of nuclear waste in the Antarctic Treaty area (recommendation VIII-12).

71. A powerful stimulus to the conclusion of the Treaty was provided by the general desire to maintain the international scientific co-operation built up during the IGY. Acknowledging in the preamble the substantial contributions to scientific knowledge resulting from international co-operation in scientific investigation in Antarctica, the Treaty proclaims in article II the principles of the freedom of scientific investigation in Antarctica and co-operation toward that end. The Treaty emphasizes that the establishment of a firm foundation for the continuation and development of international co-operation on the basis of freedom of scientific investigation in Antarctica as applied during the IGY accords with the interests of science and the progress of all mankind (fourth preambular paragraph).

72. With a view to promoting further international co-operation in scientific investigation in Antarctica, the Treaty requires in subparagraph 1 (a) and (c) of article III the exchange of information regarding plans for scientific research and results of scientific observations. Another important form of international co-operation provided by the Treaty is the exchange of scientific personnel between expeditions and stations in Antarctica (art. III, subpara. 1 (b)). With reference to this provision of the Treaty, it was stressed at the First Consultative Meeting that Governments should make available such of their facilities as might be helpful in promoting the exchange of scientific personnel among their expeditions.

73. In the implementation of the provisions concerning scientific co-operation, the Treaty encourages in paragraph 2 of article III, the establishment of co-operative working relations with those specialized agencies of the United Nations and other international organizations having a scientific or technical interest in Antarctica.

74. Such working relations have been established with the World Meteorological Organization (WMO), the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the International Maritime Organization (IMO), the International Telecommunication Union (ITU), the United Nations Environment Programme (UNEP), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Scientific Committee on Antarctic Research (SCAR), the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Scientific Committee on Oceanic Research (SCOR) of the International Council of Scientific Unions (ICSU). 44/

75. One of the examples of co-operation between the Treaty Parties and other international organizations, on the basis of article III, was the invitation from the Fifth Consultative Meeting to experts from WMO, IOC, ITU and SCAR to attend a meeting of telecommunications experts (recommendation V-2).

76. The principal role in working relations is played by SCAR, which is regarded by the Treaty Parties as a vital source of scientific advice. To demonstrate the interrelation existing between SCAR and Treaty Parties one can mention the elaboration by SCAR of certain conservation principles later embodied at the Third Consultative Meeting into the Agreed Measures for the Conservation of Antarctic Fauna and Flora and submission by SCAR at the invitation of the Eighth Consultative Meeting of the report entitled "A Preliminary Assessment of the Environmental Impact on Mineral Exploration or Exploitation in Antarctica". These close working relations have continued throughout the years of existence of the Antarctic Treaty. 45/ One of the recent cases is the appeal in 1983 by the Twelfth Consultative Meeting to SCAR to examine issues relating to increased use of satellite communications, to examine the adequacy of the Antarctic telecommunications system to meet the demand arising from the expansion of shipping and aircraft activity in Antarctica and to suggest improvements where they might be desirable (recommendation XII-2).

77. In order to promote the objectives and ensure the observance of its provisions, the Treaty establishes a comprehensive system of on-site inspection by observers who have complete freedom of access at any time to any or all areas in Antarctica (art. VII, paras. 1 and 2). All stations, installations, equipment, ships and aircraft at points of discharging or embarking cargoes or personnel in Antarctica are open to inspection by observers designated in accordance with the provisions of article VII of the Treaty. Aerial observation may also be carried out over Antarctica at any time. Article VII states that each Contracting Party participating in the meetings organized under the provisions of article IX of the Treaty has the right to designate observers to carry out inspections provided they are its nationals. Other Contracting Parties should be informed of the names of the observers so designated, as well as of the termination of their appointment (para. 1).

78. Further provisions related to the question of inspection are contained in paragraph 5 of article VII, which were apparently included for the purpose of assisting the performance of inspections in Antarctica by giving the observers the necessary information on all activities in the area. This paragraph provides that



each Contracting Party shall inform in advance other Parties to the Treaty of all expeditions to and within Antarctica, on the part of its ships or nationals, and of all expeditions to Antarctica organized in or proceeding from its territory, of all stations in Antarctica occupied by its nationals and of any military personnel or equipment intended to be introduced by it into Antarctica subject to the conditions prescribed in paragraph 2 of article I of the Treaty. In practice this has proved to be enormously helpful to those conducting scientific research in Antarctica, since it keeps scientists informed of where stations and expeditions are located and has made it easier to help stranded expeditions. 46/

79. The system of observation and inspection is one of the vital elements in the Treaty for assuring its operation in accordance with its terms. The Consultative Parties are convinced that it contributes significantly to the effectiveness of the Treaty and the realization of its principles and objectives, the most important of which is preservation of peace in Antarctica. They believe that the practice of inspection has also served as the best way of assuring the absence of suspicion.

80. Under article VII, inspections of stations in Antarctica have been carried out by New Zealand, Australia, the United Kingdom, Argentina and the United States. 47/

81. The first inspections were carried out by a New Zealand team during November and December 1963. They inspected the United States stations at McMurdo, Byrd and the South Pole. Later in December 1963, teams from Australia and the United Kingdom inspected the same three United States stations and New Zealand's Scott Base. The United States provided these teams with some transportation and accommodation during their inspections.

82. None of the inspections carried out in Antarctica since 1963 has found evidence of activities contrary to the provisions of the Antarctic Treaty. Concrete detailed information of these inspections can be found in part two in the replies of the relevant Governments.

83. One of the most recent inspections was carried out in 1983 by a four-member United States observer team. Between 17 January and 20 March 1983, that team visited the following stations: Leningradskaya, Mirniy, Molodezhnaya and Novolazarevskaya of the Soviet Union; Dumont d'Urville of France; Casey, Davis and Mowson of Australia; Showa of Japan; Sanae III of South Africa; Georg von Neumayer of the Federal Republic of Germany; Halley of the United Kingdom; and General Belgrano II and Vicecomodoro Marambio of Argentina. 48/

84. In its report, the observer team concluded that, without exception, it had been warmly received at each of the stations visited during its tour around Antarctica. The operations of each station had been explained and discussed. Although not every structure could be visited at each station in the time available, there was no doubt that all stations visited exemplified adherence to the peaceful purposes of the Antarctic Treaty. Moreover, each was seriously engaged in increasing man's knowledge of this remote frontier and the larger space environment for which Antarctica served as a window.

85. The report emphasized that what was most important was that at each station the co-operative spirit of Antarctica, as embodied in the Antarctic Treaty system, was alive and strongly affirmed. Frequently the wish had been expressed that the same spontaneous friendships based on shared goals and the same close co-operation founded in free scientific inquiry could exist without inhibition elsewhere in the world. 49/

86. The observer team found that all stations visited were complying with both the provisions and spirit of the Antarctic Treaty and its agreed measures.

87. The Treaty does not settle the issue of territorial sovereignty. It freezes the status quo in Antarctica by providing, in article IV, that nothing contained in it shall be interpreted as a renunciation of previously asserted rights of or claims to territorial sovereignty in Antarctica, as a renunciation or diminution of any basis of claim to territorial sovereignty in Antarctica which any Contracting Party may have whether as a result of its activities or those of its nationals in Antarctica, or otherwise, or as prejudicing the position of any Contracting Party as regards its recognition or non-recognition of any other State's right of or claim or basis of claim to territorial sovereignty in Antarctica (para. 1). In the same article, the Treaty emphasizes that no acts or activities taking place while it is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. According to the Treaty, no new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while it is in force (para. 2).

88. The Treaty addresses the questions likely to arise in the course of scientific activity in Antarctica, but neither article IV nor any other provision of the Treaty solves all potential jurisdictional problems, including those related to commercial exploration and exploitation of Antarctic resources. 50/

89. Article VIII of the Treaty, covering questions of jurisdiction in Antarctica, is closely related to the provisions of article IV on the sovereignty issue. Differences in the positions of principle between claimant and non-claimant States evidently prevented them in 1959 from finding a general solution on how to handle matters of jurisdiction in Antarctica. Nevertheless, they addressed such matters in the areas where the solution seemed to them most needed at that time, namely, with respect to jurisdiction over observers, scientific personnel exchanged under the Treaty and members of the staffs accompanying the first two categories.

90. The Treaty in article VIII, paragraph 1, states that "in order to facilitate the exercise of their functions under the present Treaty, and without prejudice to the respective positions of the Contracting Parties relating to jurisdiction over all other persons in Antarctica, observers designated under paragraph 1 of article VII and scientific personnel exchanged under subparagraph 1 (b) of article III of the Treaty, and members of the staffs accompanying any such persons, shall be subject only to the jurisdiction of the Contracting Party of which they are nationals in respect of all acts or omissions occurring while they are in Antarctica for the purpose of exercising their functions".

91. With a view toward possible future developments that might require common understanding in other areas, the drafters of the Treaty included in article VIII, paragraph 2, the following: "without prejudice to the provisions of paragraph 1 of this article, and pending the adoption of measures in pursuance of subparagraph 1 (e) of article IX, the Contracting Party concerned in any case of dispute with regard to the exercise of jurisdiction in Antarctica shall immediately consult together with a view of reaching a mutually acceptable solution".

92. Elaboration in 1972 of the Convention for the Conservation of Antarctic Seals and, in 1980, of the Convention on the Conservation of Antarctic Marine Living Resources provides examples of mutually acceptable agreements on matters of jurisdiction in the areas not spelled out in the Treaty.

93. Article IV of the Treaty makes it clear that in the areas of activities not covered by the Treaty both the claimant and non-claimant States adhere to their own views.

94. It has been suggested that the claimants may maintain that, while the Treaty requires them to restrain themselves from exercising jurisdiction in certain express situations, they can act in full accord with their claims of territorial sovereignty as to any matter not expressly addressed by the Treaty. Therefore, since in their view the Antarctic Treaty is silent on the territorial sea, continental shelf or jurisdiction in maritime areas adjacent to the Antarctic continent, they are entitled to claim a territorial sea, a 200-mile economic zone and a continental shelf off the coast of their claimed territory in Antarctica. 51/ The claimant States have clearly indicated that within these maritime areas, they would accept only those restrictions to which they have otherwise agreed. 52/

95. From the point of view of the non-claimant States, in the waters adjacent to the Antarctic continent (which they consider entirely as high seas) and corresponding sea-bed areas, there are no territorial seas, 200-mile zones or continental shelves and therefore they are free to conduct any activity not prohibited by the Treaty. Accordingly, their freedoms are restrained either by the requirement to have reasonable regard for the interests of others exercising the same rights and freedoms or by arrangements elaborated and approved with their consent.

96. Other views of some non-Treaty Parties on the status of maritime areas surrounding Antarctica are reflected in section C of the present chapter concerning deliberations at the thirty-eighth session of the General Assembly.

97. It should be noted that the 1982 United Nations Convention on the Law of the Sea, 53/ following upon the Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereon, beyond the Limits of National Jurisdiction (General Assembly resolution 2749 (XXV)), provides for a régime for the exploitation of the resources of the area, as defined in the Convention, beyond national jurisdiction. It further contains provisions on the relationship of the Law of the Sea Convention, which is not yet in force, to other Conventions.

98. Since article IV does not resolve the issue of sovereignty, the Treaty Parties, when starting negotiations for the purpose of elaborating measures regulating their activities not envisaged by the Treaty, have each time stressed that the basic non-prejudicial intent of article IV of the Treaty should be preserved.

99. Thus, while deciding to elaborate an international régime for the conservation of Antarctic marine living resources, the Ninth Consultative Meeting pointed out that the provisions of article IV of the Antarctic Treaty should not be affected by the régime, which should ensure that the principles embodied in article IV were safeguarded in application to the marine areas, south of 60°S latitude (recommendation IX-2).

100. Similar wording was used in the decisions of the Ninth, Tenth, and Eleventh Consultative Meetings concerning the elaboration of an international régime for Antarctic mineral resources. The only difference was that the decisions referred to the need for the régime on mineral resources to safeguard the principles embodied in article IV in application to the whole area covered by the Antarctic Treaty (recommendations IX-1 and XI-1).

101. A peculiarity of article IV is its application not only to the relations between Treaty Parties but also to relations between the parties of two other international multilateral agreements, namely, the Convention for the Conservation of Antarctic Seals and the Convention on the Conservation of Antarctic Marine Living Resources.

102. In paragraph 1 of article 1 of the Convention on Seals, the Contracting Parties affirm the provisions of article IV of the Antarctic Treaty in respect of the seas south of 60°S latitude. In accordance with paragraph 1 of article IV of the Convention on Living Resources, the Contracting Parties, whether or not they are Parties to the Antarctic Treaty, are also bound by article IV of the Treaty in their relations with each other. This article is considered by the Parties to be a pragmatic solution that became possible because the States concerned believed that some kind of mutual approach was better than the chaos of unilateral actions.

103. It follows from article VI of the Antarctic Treaty that it applies to the area south of 60°S latitude and that, subject to the objectives and principles of the Treaty, nothing in it shall prejudice or affect the rights of any State under international law with regard to the high seas within that area.

104. Article VI of the Treaty raises the problem of whether Antarctic ice forms, such as shelf ice and pack ice, should be included in the régime associated with land or with water. The juridical nature of shelf ice, pack ice and undelrying waters is unclear and appears to be a very difficult issue to resolve. 54/

105. For the purpose of the exchange of information, consultations, consideration and formulation of measures in furtherance of the principles and objectives of the Treaty, the Treaty establishes in article IX a special mechanism in the form of consultative meetings. While the Treaty is open for accession by any Member State of the United Nations, full participation in the work of the Consultative Meetings

is accorded to original Parties to the Treaty and those Contracting Parties which demonstrate their interest in Antarctica by conducting substantial scientific research activity there, such as the establishment of a scientific station or the despatch of a scientific expedition (art. IX, para.2)

106. Up to now, consultative status has been acquired, respectively, by Poland and the Federal Republic of Germany in 1977 and 1981, and by India and Brazil, in 1983.

107. Proof of interest in the form of substantial research activity may be regarded by some as a high entrance fee. This test would seem to be an outgrowth of the activities conducted during the IGY which established that the elaboration of measures further the principles and objectives of the Treaty required a degree of knowledge of the nature of the Antarctic environment that could be gained only from actual activity in the region. The Parties to the Treaty believe that the requirement that the acceding Parties must have a continuing research programme to maintain consultative status and to have a right to participate in the formulation of measures for Antarctica helps create a more professional approach, based on the knowledge and appreciation of the unique characteristics of the Antarctic region. 55/ It is to be noted that the requirement does not apply to the original Parties to the Treaty, not all of which have continuing research programmes in Antarctica at this time.

108. Beginning with the Twelfth Consultative Meeting, the Consultative Parties, have invited the acceding Treaty Parties without consultative status to participate as observers in the work of the regular Consultative Meetings as well as in preparatory meetings. In May 1984, in Tokyo, a decision was made to invite the non-consultative Treaty Parties to attend also as observers negotiations on an Antarctic mineral resource régime.

109. In the joint statement at the Twelfth Consultative Meeting, the non-Consultative Parties recorded that their presence reflected the interest of their Governments in the development of the Antarctic system and their willingness to contribute to the maintenance and the further development of the principles and objectives of the Antarctic Treaty. It was pointed out in the statement that the non-Consultative Parties recognized the achievements of the Treaty, for example with regard to co-operation in the field of scientific research, the protection of the environment and demilitarization. The non-Consultative Parties emphasized that, in their view, their participation in the various activities of the Antarctic system was important for the strengthening of the system. 56/

110. The system of Consultative Meetings envisaged under the Treaty allows coverage of all aspects of the activities being carried out in Antarctica in accordance with the Treaty and is intended to provide facilities for the implementation of the Treaty's principles and objectives. The Meetings serve as some kind of mechanism for the discussion and elaboration of measures in furtherance of the principles and objectives of the Treaty, including those regarding:

- (a) Use of Antarctica for peaceful purposes only;
- (b) Facilitation of scientific research in Antarctica;

(c) Facilitation of international scientific co-operation in Antarctica;

(d) Facilitation of the exercise of the rights of inspection provided for in article VII of the Treaty;

(e) Questions relating to the exercise of jurisdiction in Antarctica;

(f) Preservation and conservation of living resources in Antarctica (art. IX, para. 1).

111. It has always been stated by the Consultative Parties that they understood the protection of the unique Antarctic environment to be one of the main objectives of the Antarctic Treaty and that the provisions of paragraph 1 of article IX should be understood in that sense (see recommendations VI-4, VII-1, VIII-1, VIII-13, IX-5 and XII-4).

112. Article IX, paragraph 4, of the Treaty states that such measures (or recommendations, as they are called in practice) "shall become effective when approved by all the Contracting Parties whose representatives were entitled to participate in the meetings held to consider those measures". Once approved, the recommended measures would become norms for conduct in Antarctica. In other words, the recommendation system represents a type of "legislative procedure" making it possible to implement new measures within the framework of the Treaty's principles and objectives. 57/

113. From the First through the Twelfth Consultative Meeting, the Consultative Parties have made 147 recommendations to their Governments. Those recommendations have focused on a wide range of scientific, environmental and operational matters.

114. The subjects covered by these recommendations can be grouped as follows: uses of the Antarctic, preservation and conservation of wildlife and living resources, facilitation of scientific research and scientific co-operation, implementation of Treaty provisions concerning exchanges of information, operation of the Treaty and Consultative Meetings and postal services.

115. The recommendations of the Consultative Meetings, which represent a considerable body of rules, are not automatically binding upon new parties to the Treaty, including those entitled to acquire consultative status. This situation was discussed by the Consultative Parties who found it necessary, in order to avoid a situation in which different Treaty Parties would be bound by different sets of rules, to appeal to other Contracting Parties, inviting them to approve the recommendations in force. In 1975, the Eighth Consultative Meeting, in its recommendation VIII-8 urged "the States that have or will become Parties to the Antarctic Treaty to approve the recommendations adopted at Consultative Meetings".

116. In 1977, the Consultative Parties adopted a stricter approach to this issue with respect to new members at their Meetings. The final report of the First Special Consultative Meeting emphasized that, because of their special obligations under the Treaty, the Consultative Parties might urge a State that considered itself entitled to appoint representatives to Consultative Meetings to make a

declaration of intent to approve the recommendations in force and might also invite such an acceding State to consider approval of the other recommendations.

117. Consultative meetings are held approximately every two years. To date there have been 12 such meetings, the last one being held at Canberra in September 1983. The next, the Thirteenth Consultative Meeting, will take place in 1985 in Belgium.

118. For consideration of matters requiring particular attention, there is a practice of convening special consultative meetings. Thus, in accordance with recommendation IX-2, a Special Consultative Meeting was convened in 1977 in order to elaborate a draft definitive régime for the conservation of Antarctic marine living resources. Another Special Consultative Meeting was convened in 1981, in accordance with recommendation XI-1, to elaborate a régime on Antarctic mineral resources and to determine its form.

119. In accordance with article X of the Treaty, each of the Contracting Parties undertakes to exert appropriate efforts, consistent with the Charter of the United Nations, to the end that no one engages in any activity in Antarctica contrary to the principles and purposes of the Treaty.

120. As a result of thorough discussions of this issue, the Seventh, Eighth and Ninth Consultative Meetings urged the State or States concerned to accede to the Antarctic Treaty, pointing out the rights and benefits they would receive and also the responsibilities and obligations of parties to the Treaty.

121. In certain instances, in the light of article X, the Consultative Parties have felt it necessary to draw attention to the specific types of activities prescribing particular forms of conduct.

122. In recommendation VI-7, the Consultative Parties decided to exert appropriate efforts to ensure that no tourists or other visitors engaged in any activity in the Treaty area which was contrary to the principles and purposes of the Treaty or recommendations made under it.

123. Most important in this respect was the decision of the Ninth Consultative Meeting on mineral resources. Recommendation IX-1 points to the responsibility of the Consultative Parties "to ensure that any activities in Antarctica, including commercial exploration and exploitation in the future, should they occur, should not become the cause of international discord, of danger to the unique Antarctic environment, of disruption to scientific investigation, or be otherwise contrary to the principles or purposes of the Antarctic Treaty". The Consultative Parties decided that, as a consequence of this responsibility, they would "endeavour to ensure that, pending the timely adoption of agreed solutions pertaining to exploration and exploitation of mineral resources, no activity should be conducted to explore or exploit such resources".

124. With regard to dispute settlement article XI, paragraph 1, of the Treaty provides that "if any dispute arises between two or more of the Contracting Parties concerning the interpretation or application of the present Treaty, those Contracting Parties shall consult among themselves with a view to having the

dispute resolved by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement or other peaceful means of their own choice".

125. Paragraph 2 of article XI provides that any dispute over interpretation or application of the Treaty not resolved in accordance with the aforementioned procedures "shall, with the consent, in each case, of all parties to the dispute, be referred to the International Court of Justice for settlement; but failure to reach agreement on reference to the International Court shall not absolve parties to the dispute from the responsibility of continuing to seek to resolve it by any of the various peaceful means referred to in paragraph 1 of this Article".

126. Article XII of the Treaty contains the Treaty's rules on amendment to, revision of and withdrawal from the Treaty procedures. This article has the so-called 30-years clause, marking the dividing line between the amendment and withdrawal procedure, which may be called "normal" for the Treaty, and the special procedure that shall apply after 30 years in the event that a conference is summoned to review the operation of the Treaty. 58/

127. In accordance with the "normal" procedure provided in article XII, subparagraphs 1 (a) and (b), the Treaty may be modified or amended at any time by unanimous agreement of the Contracting Parties whose representatives are entitled to participate in the consultative meetings. Any such modification or amendment shall enter into force when the depositary Government has received notice from all such Contracting Parties that they have ratified it. These modifications or amendments shall thereafter enter into force as to any other Contracting Party when notice of ratification by it has been received by the depositary Government. If any non-Consultative Contracting Party fails to ratify the modifications or amendments within a period of two years, that Party shall be deemed to have withdrawn from the Treaty.

128. As stated in article XII, paragraph 2, of the Treaty, after the expiration of 30 years from the date of its entry into force, i.e., in 1991, any of the Contracting Parties entitled to participate in the consultative meetings may request the summoning of a conference of all parties to the Treaty in order to review its operation. According the Treaty, that conference shall be held as soon as practicable thereafter.

129. Such a conference may approve any modification or amendment to the Treaty. This should be done, according to subparagraph 2 (b) of article XII, by a majority of the Contracting Parties there represented, including a majority of those entitled to participate in the consultative meetings. The modifications or amendments would enter into force in accordance with the requirements of paragraph 1 of article XII, in other words, if ratified by all Treaty Parties with consultative status.

130. If any such modification or amendment has not entered into force within two years, any Contracting Party may withdraw from the Treaty at any time after the expiration of that period. Such withdrawal takes effect two years after receipt of the relevant notice by the depositary Government (art. XII, subpara. 2 (c)).



131. The 30-years clause in article XII is sometimes mistakenly interpreted as establishing a certain automatic time limit for the Treaty. However, the Treaty does not cease to be in force after 30 years. It remains effective whether or not a conference is summoned. The 30-years clause, making it possible to request a revision conference, actually represents an alternative amendment procedure. Therefore, the conference form does not supersede the "normal" amendment procedure of the Treaty, but represents an alternative procedure that may be followed after 30 years. 59/

132. Although it is more than 20 years since the Antarctic Treaty entered into force, no modification or amendment has been proposed to its text by the Contracting Parties.

133. The Antarctic Treaty is open for accession by any Member of the United Nations or by any other State invited to accede to the Treaty with the consent of all the Contracting Parties whose representatives are entitled to participate in the consultative meetings (art. XIII, para. 1). Therefore it gives any of those States an opportunity to join the Treaty and, under its provisions, to take part in scientific research and other activities within the framework of the Treaty.

134. The depositary Government to the Antarctic Treaty is the Government of the United States of America (art. XIII, para. 3).

C. Deliberations on Antarctica at the thirty-eighth session of the General Assembly 60/

135. At their Seventh Summit Conference, held at New Delhi from 7 to 12 March 1983, the Heads of State or Government of the Non-Aligned Countries, while noting that relevant provisions of the Antarctic Treaty of 1959 related to international co-operation in the area, they also considered that, in view of the increasing international interest in the Antarctic, the United Nations should undertake a comprehensive study of the subject. The study was to take into account all relevant factors, including the Antarctic Treaty, with a view to widening international co-operation on the continent (A/39/132-S/15675 and Corr.1 and 2, annex, paras. 122 and 133).

136. On 11 August 1983, the representatives of Antigua and Barbuda and of Malaysia to the United Nations sent a letter to the Secretary-General requesting the inclusion in the agenda of the thirty-eighth session of the General Assembly of a supplementary item entitled "Question of Antarctica" (A/38/193 and Corr.1). On the recommendation of the General Committee, the General Assembly decided to include the item in its agenda and to allocate the item (agenda item 140) to the First Committee.

137. The First Committee held discussions on Antarctica at its 42nd to 46th meetings, from 28 to 30 November 1983 (see A/C.1/38/PV.42-46). The debate on Antarctica in the First Committee provided the first opportunity for Member States to express their views on the subject at the United Nations. The Committee heard statements from 41 delegations, including Consultative and non-consultative parties

to the Antarctic Treaty as well as countries not parties to the Treaty, some of whom intended to accede to the Treaty in the near future.

138. In the First Committee, statements were made on ways and means by which Antarctica could best be administered. Many delegations expressed the view that any international mechanism that administered Antarctica must, first, promote the purposes and principles of the Charter of the United Nations; second, ensure that Antarctica was used for peaceful purposes only, keeping it free from militarization of any kind, including nuclear weapons, and out of the arms race; third, ensure protection of its natural environment; and fourth, promote international co-operation and co-ordination in scientific research and other peaceful activities beneficial to man.

139. Some States were of the view that the Treaty not only satisfied those objectives, but also had served well the international community in all the aspects enumerated above, and that it would continue to do so in the future. Furthermore, the Treaty, in their view, had averted international strife and conflict over Antarctica and had removed the potential for disputes on sovereignty among those countries claiming territorial sovereignty over the area. They emphasized that the Antarctic Treaty was the best legal régime for that area that the present international community could ever agree upon, and they pointed out that the Treaty and other international agreements on Antarctica had proved to be successful, practical and dynamic in the sense that their agreements could accommodate needs that might arise in the future. For those reasons, they believed that the Antarctic Treaty and the existing international agreements on Antarctica must be preserved and that any attempt to revise or replace them would do more harm than good to the international community. Therefore, they had serious reservations about the initiative by the Governments of Antigua and Barbuda and of Malaysia which, in their view, inaccurately represented the Antarctic Treaty of 1959 and implied that there was a need for revision or replacement of the Antarctic Treaty system. They were of the view that revision of the Treaty, if there were any need for it, could be achieved only under international law by the Parties to the Treaty.

140. The States that had brought the question of Antarctica to the United Nations were of the view that Antarctica had considerable environmental, climatic, scientific and potential economic significance to the world, and that there was a need to examine the possibility for wider international co-operation in the region through the framework of the United Nations. In their view, the present management of Antarctica within the framework of the Antarctic Treaty system did not reflect an international decision-making system needed to administer matters of universal concern such as those concerning Antarctica.

141. Several States expressed their appreciation that the Treaty has been successful in keeping Antarctica demilitarized, free from the arms race and from nuclear weapons. Furthermore, in their view, the Treaty had provided a framework for co-operation among those countries with an active interest in scientific research in Antarctica and had kept the continent free from conflicts by imposing a moratorium on competing claims for territorial sovereignty over the area. While recognizing the merits of the Antarctic Treaty and the achievements of the Parties to the Treaty, they nevertheless expressed certain views with regard to the Treaty.

142. Most importantly, they considered that major flaws in the Treaty consisted, on the one hand, of the composition of the parties and, on the other hand, of the exclusive character of the decision-making process which was restricted to the Consultative Parties. In their view, accession to the Treaty without the right of participation in the decision-making process was extremely difficult to accept, as it was beyond the means of most of the countries to meet the requirements for participation in decision-making, namely, a capacity to conduct substantial scientific research in the area. In addition, they felt that the determination of global interests and of ways to safeguard them could best be made by the entire community of nations. They also emphasized that the Parties could not be oblivious to the fact that the present world community had expanded radically since 1959, when a few countries established the current régime on Antarctica, and they stated that insisting on the preservation of this exclusive régime constituted an attempt to maintain a status quo advantageous only to the privileged few. This exclusive nature of the decision-making process in the Treaty was also referred to critically by a country that had recently acceded to the Treaty, but had not acquired the status of a Consultative Party.

143. Several States denied the alleged exclusiveness which some maintained was inherent in the Treaty structure. They noted that the Treaty was open to all countries that wished to accede to it. They further stated that, at the time of the deliberation in the First Committee during the thirty-eighth session of the General Assembly, in addition to the 12 original signatories, 16 countries had acceded to the Treaty since it had entered into force in 1961. (Since that time, four more States have acceded to the Treaty). Of the 20 countries, four - Poland, the Federal Republic of Germany, Brazil, and India - had acquired Consultative Status. They also denied the exclusive nature of the Treaty in so far as the composition of the Parties to the Treaty was concerned. In their view, the Parties to the Treaty represented a wide spectrum of interests: the industrialized countries with free market economies, socialist countries and developing countries in Asia and Latin America. They further stressed that, although a certain confidentiality was necessary in negotiations to reaching decisions on the management of Antarctica, those decisions and any other results of such negotiations were made public and were available to all countries interested in Antarctica. Moreover, they noted that non-consultative parties to the Treaty had been invited to the Twelfth and Thirteenth regular Consultative Meetings as observers, and they expressed the view that representation of Consultative States in the decision-making mechanism of the Treaty was justifiable in view of their vested interest in scientific research in Antarctica and their contribution to the international community. They also felt that the responsibility to manage activities in Antarctica was more of a burden than a privilege, since the Antarctic Treaty system consisted of obligations and not of rights. They further stated that the fact that the Treaty had been successful in managing Antarctica for nearly two and a half decades proved that the Consultative States had provided good management.

144. It was, however, noted that no African State, except South Africa, was a party to the Antarctic Treaty. Moreover, some States found that one of the major flaws of the Treaty was the presence of South Africa among the signatory countries. They expressed serious doubts that a Treaty which provided for the inclusion of a State that practiced the policy of apartheid could be an ideal legal régime for an area

of global concern. They expressed the view that it would be in the interest of the international community to exclude South Africa from the Treaty and not allow it to participate in any future co-operative effort in the region, because, they argued, the apartheid régime of South Africa could not be relied upon to uphold the purposes and objectives of the present Treaty or any future treaty that might emerge.

145. Some States opposed the introduction of political elements into the discussion that, in their view, had nothing to do either with Antarctica or with the Antarctic Treaty.

146. Some States raised questions about the effectiveness of the Treaty in promoting and contributing to the interests of the international community at large, in particular in areas of information dissemination and environmental protection.

147. The States raising those questions pointed out that the flow of information about Antarctica was limited to the Consultative States and was not made available even to non-consultative parties, let alone to the international community at large.

148. Other States noted that the bulk of documentation on treaties, agreements, research projects and a wide spectrum of other activities and problems concerning Antarctica was not only made public but also distributed through well-established and widely known channels by those States involved in Antarctic affairs.

149. Several States raised concerns about the present state of environmental management of Antarctica. They noted that the Treaty system lacked an international mechanism to ensure environmental review and that its enforcement was left to individual States.

150. Some States were of the view that Antarctic environmental management was one of the areas in which the Antarctic Treaty was most successful. Thanks to the consultative process provided by the Treaty, which made it possible to meet developing needs, the Parties to the Treaty had successfully met the requirements to preserve the delicate ecological and environmental balance of Antarctica through the adoption of separate legal instruments. These included the Agreed Measures for the Conservation of Antarctic Fauna and Flora (1964), the Convention for the Conservation of Antarctic Seals (1972) and the Convention on the Conservation of Antarctic Marine Living Resources (1982).

151. Some States pointed to the fact that the Treaty did not deal with the question of mineral resources and they expressed their concern about the future of Antarctica's environment, since they anticipated the likelihood of an emerging scramble to exploit the mineral resources in the region. Some of them stated that current negotiations among the Consultative Parties on a régime for exploiting mineral resources were being carried out in secrecy. In their view, the Consultative Parties, while holding the opinion that Antarctic mineral exploitation would not be technically and commercially feasible until the next century, were nonetheless pursuing seriously and secretly an exclusive mineral régime. They asked the question whether any group of countries should confer upon itself the

moral or legal right to self-elected determination or management of Antarctica. They considered it unfair and unjust that only a handful of countries exclusively controlled access to the vast uninhabited continent of Antarctica.

152. Several States, while expressing the belief that the economic development of Antarctica still belonged to the future, stressed the fact that the primary concern of the present negotiations was to ensure the integrity of the Antarctic environment. They also pointed out the fact that, in keeping with the desire to protect the ecological balance and with the purpose and principles of the Treaty, the Consultative Parties had agreed in 1977 not to explore or exploit mineral resources of the area until a régime was established.

153. Some States referred to the absence of co-operation between the Antarctic Treaty system and the specialized agencies of the United Nations and other international organizations, despite the fact that the Treaty itself recommended such co-operation. They noted the absence of a formal mechanism to ensure that the international community at large was made aware of activities carried out under the Antarctic Treaty.

154. Other States, however, noted that the Antarctica Treaty system provided continuous working relations with those specialized agencies and other international organizations having a scientific and technical interest in Antarctica. These included WMO, WHO, UNEP, FAO, ITU, IOC of the UNESCO, SCAR and SCOR of ICSU.

155. Another major concern expressed by some States was the question of existing claims for territorial sovereignty over Antarctica. In their view, the Treaty did not provide sufficient guarantee that Antarctica would remain free from conflicts and competition because it did not provide for the resolution of the territorial claims but merely put a moratorium on them. They were also concerned that the Treaty would fail to keep the peace in Antarctica once the exploitation of mineral resources became feasible.

156. Several States explained that the moratorium on existing claims had been observed by a delicate agreement among claimant and non-claimant parties to the Treaty. They expressed their concerns that Antarctica might be turned into an arena for international competition and conflicts if and when this delicate agreement was tampered with. They further said that they were more aware than anyone else of the danger that the possibility of mineral exploitation would introduce into the delicate balance now maintained among the parties to the Treaty, whether claimant or non-claimant, and stressed the importance of the elaborating an agreement on a mining régime within the Treaty system designed to preserve the delicate moratorium.

157. Some States viewed Antarctica as the last frontier left for mankind as a whole. They considered Antarctica in the context of the new international economic order and stressed the applicability of the principle of the common heritage of mankind to the region. In their view, the application of that concept was a logical consequence of the established international trend in areas such as outer space and the international sea-bed area. They expressed the hope that the trend

would be further enhanced through the establishment of a global régime for Antarctica based on the principle of the common heritage of mankind.

158. Several States considered that the principle of the common heritage of mankind was not relevant to Antarctica and that its application to the régime governing this area was inappropriate. They argued that there already existed an effective legal system in the region that was open to all States, and they saw no legal vacuum in the area. They further pointed to the fact that seven countries maintained national territorial claims in Antarctica. For those reasons, Antarctica was neither res communis nor res nullius, and the application of the principle of the common heritage of mankind was not acceptable.

159. The debate on Antarctica in the First Committee provided the opportunity to understand the issues, and in this regard many States expressed their view on the possible approaches in relation to the future development of the question. Some States said that they did not intend to disregard the valuable experience provided by the Antarctic Treaty system, nor alter any of its major objectives. They expressed the hope that gaps and inadequacies in the Treaty would be remedied through a more general examination of the question in a forum that allowed for universal representation. Some other States maintained that the elimination of any flaws in the Treaty and changes and adjustments of the existing system should be of an evolutionary nature to be undertaken from within and not from outside with the aim of changing or replacing the system.

160. On 15 December 1983, the General Assembly adopted resolution 38/77 entitled "Question of Antarctica". For that resolution, the Assembly, affirming the conviction that, in the interest of all mankind, Antarctica should continue forever to be used exclusively for peaceful purposes and that it should not become the scene or object of international discord, requested the Secretary-General to prepare a comprehensive, factual and objective study on all aspects of Antarctica, taking fully into account the Antarctic Treaty system and other relevant factors; also requested the Secretary-General to seek the views of all Member States in preparing the study; requested those States conducting scientific research in Antarctica, other interested States, the relevant specialized agencies, organs, organizations and bodies of the United Nations system and relevant international organizations having scientific or technical information on Antarctica to lend the Secretary-General whatever assistance he might request for the purpose of carrying out the study; and requested the Secretary-General to report to the General Assembly at its thirty-ninth session.

#### Notes

1/ The United Kingdom ceded the rights to these territories to Australia on 7 February 1933 by an Order in Council. These rights were then confirmed by the Australian Antarctic Territory Acceptance Act of 13 June 1933. See British and Foreign State Papers, 1933, vol. CXXXVI, p. 293.

2/ Decreto 8944 del 2 de septiembre de 1946; Boletín Oficial del 19 de noviembre de 1946; and Decreto 292191 del 28 febrero de 1957; Boletín Oficial del 19 de marzo de 1957.

Notes (continued)

- 3/ Pinochet de la Barra, La Antartica Chilena (Santiago, 1944), pp. 23-24.
- 4/ See A/38/PV.3 and 16. See also M. M. Whiteman, Digest of International Law (Washington D.C., 1963), vol. 11, p. 1260.
- 5/ France laid claim to Adelle Land by a presidential Decree of 27 March 1924. The boundaries of the areas claimed by France were established by Decree of 1 April 1938. See part two of the present study, reply of the Government of France (A/39/583 (Part II), vol. II).
- 6/ The United Kingdom ceded to New Zealand the rights to this area, known as the Ross Dependency, on 30 July 1923 by an Order in Council. See British and Foreign State Papers, 1923, vol. XVIII, p. 91. The Order in Council vested in the New Zealand Governor-General executive and legislative power in respect of the Ross Dependency. Acting pursuant to this Order, the Governor, on 14 November 1923, made regulations respecting the Ross Dependency which had the effect of adopting as the law of the Ross Dependency all future enactments of the New Zealand Parliament Dependency. For more details, see part two of the present study, reply of the Government of New Zealand.
- 7/ "Proclamation of King Haakon of Norway", 14 January 1939. See British and Foreign State Papers, 1939, vol. CIVIII, p. 663. See also part two of the present study, reply of the Government of Norway (A/39/583 (Part II), volume III).
- 8/ International Court of Justice, "Antarctica Cases" (United Kingdom v. Argentina; United Kingdom v. Chile), Pleadings, Oral Arguments, Documents, 1956, pp. 15, 16, 39-41.
- 9/ See Russell W. MacKechnie, "Sovereignty in Antarctica: The Anglo-Argentine Dispute", Syracuse Journal of International Law and Commerce, vol. 5:119 (1977), pp. 119-148; Christopher C. Joyner, "The Exclusive Economic Zone and Antarctica", Virginia Journal of International Law, vol. 21:4 (1981), pp. 704-711; Barbara Mitchell and Richard Sandbrook "The Management of the Southern Ocean", (International Institute for Environment and Development, London, 1980), p. 6; and Evan Luard, "Who owns the Antarctic?", Foreign Affairs, vol. 62, No. 5, (1984), pp. 1177-1178. For the more precise information on the grounds put forward by each claimant country, see also part two of the present study, replies submitted by the Governments of Australia, Argentina, Chile, France, New Zealand, Norway and the United Kingdom.
- 10/ International Court of Justice, "Antarctic Cases", p. 37.
- 11/ Quoted in Joyner, "The Exclusive Economic Zone and Antarctica", p. 705.
- 12/ Quoted in Whiteman, Digest of International Law, pp. 1257-1258.

Notes (continued)

13/ See part two of the present study, reply of the Government of the Union of Soviet Socialist Republics (A/39/583 (Part II), vol. III). See also John Hanessian, "The Antarctic Treaty, 1959", International and Comparative Law Quarterly, vol. 9, p. 439. The Norwegian act met also with objection from Chile, Germany and the United States. See Finn Solle, "The Antarctic Treaty System: the Political Problem and Potential Resource Development", p. 11.

14/ Quoted in Whiteman, Digest of International Law, p. 1248.

15/ Ibid, p. 1249.

16/ Ibid, p. 1250.

17/ See Pravda, 4 June 1958. The synthesis of the position of the Government of the Soviet Union was first fully presented in the memorandum dated 8 June 1950 to the United States Department of State, which stated that:

"... the Soviet Government deems it necessary to call to mind the outstanding services rendered by Russian navigators in discovering the Antarctic. It is a universally recognized fact that at the beginning of the nineteenth century the Russian voyagers Bellingshausen and Lazarev were the first to reach the shores of the Antarctic and circumnavigate this continent, thereby proving that the widespread view existing at that time to the effect that there was allegedly no land beyond the South Polar Circle was erroneous. This service rendered by the Russian navigators is no less important than the explorations conducted later on the continent itself and around its shores by expeditions of certain countries whose representatives now declare their interest in defining the régime in the Antarctic." See Pravda, 10 June 1950.

18/ With respect to Chilean Decree No. 1747 marking frontier lines of the territories claimed by Chile in Antarctica, the Japanese note verbale dated 13 November 1940 stated that "Japan considers itself one of the countries which have an interest and rights in the said zone, for which reason it reserves the right to assert its point of view in this matter". See Whiteman, p. 1260.

19/ Quoted in Whiteman, Digest of International Law, p. 1261.

20/ Luard, "Who owns the Antarctic?", p. 1178.

21/ See International Court of Justice, "Antarctic Cases", p. 28; see also MacKechnie, "Sovereignty in Antarctica: The Anglo-Argentine Dispute", p. 138.

22/ Quoted in Whiteman, Digest of International Law, p. 1259.

23/ Ibid., p. 1238.

24/ See MacKechnie, "Sovereignty in Antarctica ...", p. 138.



Notes (continued)

25/ See Whiteman, Digest of International Law, p. 1238. In explanation of actions taken, the Secretary of State for Foreign Affairs of the United Kingdom stated:

"No, we have not in any way infringed the arrangements under the Tripartite Naval Declaration. We adhere to those, and the presence of a British frigate south of that latitude is quite customary during the Antarctic summer. I ought to add, to make the position quite plain, that these men were expelled not as invaders but as illegal immigrants. They were dealt with under the civil law of the Dependencies themselves." Quoted in Whiteman, Digest of International Law, p. 1239.

26/ See International Court of Justice, "Antarctic Cases", pp. 38 and 75.

27/ International Court of Justice, "Antarctica Cases", Order of 16 March 1956. In a letter dated 1 August 1955 from the Government of Argentina to the Registrar of the Court it was stated:

"... the Argentine Government has several times had occasion to indicate in notes addressed to Her Britannic Majesty's Embassy in Buenos Aires that it cannot consent to the question of sovereignty over the Antarctic territories of Argentina which it is sought to raise being referred for decision to any International Court of Justice or Arbitration Tribunal. By this present note, my Government reaffirms its refusal in the most express way with regard to the jurisdiction of this Court and with regard to any possibility that it should be seized as such to deal with this case."

28/ Quoted in Whiteman, Digest of International Law, p. 1251.

29/ Whiteman, Digest of International Law, p. 1251.

30/ Ibid, p. 1252.

31/ See Pravda, 4 July 1958.

32/ Quoted in Whiteman, Digest of International Law, p. 1257.

33/ Whiteman, Digest of International Law, p. 1242.

34/ R. E. Guyer, "The Antarctic System", Recueil des cours de l'Académie de droit international (Leyden, 1974), vol. 139, p. 166.

35/ Ibid, p. 167.

36/ Quoted in Whiteman, Digest of International Law, p. 1243.

37/ Ibid., p. 1244.

Notes (continued)

38/ Ibid., pp. 1244 and 1245.

39/ See Lawrence M. Gould, "Antarctica in World Affairs", Headline Series, Foreign Policy Association, March-April 1958, Number 128; S. V. Molodtsov, "Sovremennoye mejdunarodno - pravovoye polojenije Antarktiki", Jurisdatt, Moskva 1954; Report of the Secretary of State to the President on the Antarctic Treaty and the Final Act of the Conference, 4 February 1960 (United States Department of State, Pub. No. 7060; Bernard H. Oxman "The Antarctic Régime: An Introduction", University of Miami Law Review, December 1978, vol. 33, No. 2, p. 296; David A. Colson, "The Antarctic Treaty System: The Mineral Issue", Law and Policy in International Business, vol. 12, No. 4 (1980), p. 845; and Roberto E. Guyer, "Comment", Antarctic Challenge: Conflicting Interests, Co-operation, Environmental Protection, Economic Development - Proceedings of an Interdisciplinary Symposium, Kiel, Federal Republic of Germany, 22-24 June 1983, pp. 52-57.

40/ Barbara Michell and Richard Sandbrook, The Management of the Southern Ocean (London, International Institute for Environment and Development, 1980), pp. 6-7.

41/ Finn Sollie, "The Antarctic Treaty System: The Political Problem of Potential Resource Development", pp. 15 and 16.

42/ R. E. Guyer, "The Antarctic System", p. 177.

43/ United Nations, Treaty Series, vol. 402, No. 5778, p. 72.

44/ References to relations with these organizations are contained in the relevant recommendations of the Consultative Meetings. See Handbook of Measures in Furtherance of the Principles and Objectives of the Antarctic Treaty, Third Edition (Department of Foreign Affairs, Canberra, April 1983).

45/ For more detailed information on co-operation between SCAR and the Antarctic Treaty Parties, see Charles R. Bentley "International Science Programs in Antarctica", University of Rhode Island, Center for Ocean Management Studies, Eighth Annual Conference, 17-20 June 1984. The Twelfth Consultative Meeting adopted recommendation XII-8 entitled "SCAR Assistance to Consultative Parties".

46/ Guyer, "The Antarctic System", p. 180.

47/ These facts are based on the Annual Exchange of Information under the Antarctic Treaty. See also Sollie, "The Political Experiment in Antarctica", Bulletin of the Atomic Scientists, (December 1970).

48/ See the Report of the United States Observer Team in Antarctica, 1983.

49/ Ibid., p. 48.

Notes (continued)

50/ Fernando Zegers Santa Cruz, "The Antarctic System and the Utilization of Resources", University of Miami Law Review, vol. 33, No. 2 (December 1978), pp. 456-461.

51/ See Colson, "The Antarctic Treaty System, the Mineral Issue", p. 849; Zegers Santa Cruz, "The Antarctic System ...", pp. 459-460; Joyner "The Exclusive Economic Zone and Antarctica"; and Ralph L. Harry "The Antarctic Régime and the Law of the Sea Convention: An Australian View", Virginia Journal of International Law, vol. 21:4 (1981).

52/ It appears that such agreed restrictions follow from the provisions of the Convention for the Conservation of Antarctic Seals and the Convention on the Conservation of Antarctic Marine Living Resources and would follow from the mineral resource régime as presently discussed. See chap. III, sect. F of the present study.

53/ Official Records of the Third United Nations Conference on the Law of the Sea, vol. XVII (United Nations publication, Sales No. E.84.V.2), document A/CONF.62/122.

54/ Frank C. Alexander, Jr., "Legal Aspects: Exploitation of Antarctic Resources", University of Miami Law Review, vol. 33, No. 2 (December 1978), pp. 382-387; and Joyner, "The Exclusive Economic Zone ...", pp. 711-714.

55/ Sollie, "The Antarctic Treaty System ...", pp. 6-10.

56/ Report of the Twelfth Consultative Meeting, Canberra, 13-27 September 1984, annex C.

57/ Finn Sollie, "Jurisdictional Problems in Relation to Antarctic Mineral Resources in Political Perspective", Conference on Antarctic Resources Policy in Antarctic Station "Teniente Marsh", October 1982, in Antarctic Resource Policy, Scientific, Legal and Political Issues (Cambridge University Press, 1983), pp. 47-50; and Colson, "The Antarctic Treaty System ...", p. 851.

58/ Finn Sollie, "The Duration of the Antarctic Treaty - An Analysis of the Amendment and Revision Procedures in a Political Perspective", the Fridtjof Nansen Foundation, Arctic/Antarctic Project Study 1973, pp. 8, 9 and 19-28.

59/ Sollie, "The Duration of the Antarctic Treaty ...", pp. 28-38.

60/ For earlier views regarding Antarctica, see in particular sect. F 2, chap. III.

### CHAPTER III

#### THE ANTARCTIC TREATY SYSTEM IN PRACTICE

##### A. Peaceful uses of Antarctica

161. On 1 December 1959, all the countries involved in the Antarctic region, including the United States and the Soviet Union, signed the Antarctic Treaty and accepted the principle that it was in the interest of all mankind that Antarctica should continue to be used exclusively for peaceful purposes and should not become the scene of international discord. Since then, for nearly two and a half decades, Antarctica and its surrounding maritime areas have been free from militarization of any kind, including nuclear weapons. No armed conflict has taken place in the area. Peace on the continent has been maintained to a large extent through the agreements embodied in the Antarctic Treaty. The Treaty has provided a framework for the Parties to the Treaty to carry out peaceful activities related to scientific research, exploitation of marine resources and protection of the environment, and to promote co-operation among them in carrying out such activities in the region.

162. In order to prevent tension and political conflict on territorial claims, sovereign rights and jurisdiction, the Treaty formally set aside disputes between States claiming territorial sovereignty in Antarctica and disagreements between claimant States and States not recognizing such claims.

163. To secure the goals of scientific co-operation, the Treaty provided for the exchange of information on plans, programmes and results of investigations, as well as of scientific personnel.

164. The Treaty provided comprehensive disarmament measures for Antarctica. It not only prohibited the establishment of military bases in Antarctica, but it also prohibited the carrying out of military manoeuvres so that no military conflict would originate within the region. In fact, the Antarctic Treaty represented the only post-war international agreement for the complete demilitarization of a sizeable geographical region. At present, it includes all the countries involved in Antarctic issues as its Parties, among them the five permanent members of the Security Council and all the countries that maintained claims to territorial sovereignty over Antarctica. The conclusion of the Treaty has been invoked as a precedent for numerous initiatives and proposals for regional disarmament measures which have been made since the end of the Second World War.

165. The importance of maintaining Antarctica as demilitarized and free from nuclear weapons and strategic competition was clearly stressed by all the representatives that took the floor during the deliberations on Antarctica at the thirty-eighth session of the General Assembly. In particular, the representatives from the countries situated in geographic proximity to Antarctica emphasized the importance of peace in Antarctica in the context of their own national security. No one challenged the fact that two and a half decades of peace in Antarctica were attributable to the achievements of the Parties to the Treaty in implementing effectively the far-reaching disarmament measures of the Treaty. In this regard,

several States emphasized the role of the consultative process which enabled active and continuous international co-operation despite various differences in the political relations among the Consultative Parties to the Treaty.

#### E. Antarctica as a nuclear-weapon-free zone

166. To date, Antarctica has been free from nuclear weapons and has been spared the threat of involvement in the global nuclear arms race. The complete absence of nuclear weapons in Antarctica has been ensured since 1959 by the Antarctic Treaty and, in fact, the Treaty was the first international agreement which, by establishing a demilitarized zone, contained provisions ensuring that nuclear weapons would not be introduced into a specifically defined geographical area.

167. The Antarctic continent and its surrounding maritime areas south of 60°S latitude therefore became a forerunner of nuclear-weapon-free zones. Since then, several international agreements have been concluded and numerous proposals have been made with a view to securing the complete absence of nuclear weapons from various areas. The agreements are the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (General Assembly resolution 2222 (XXI), annex), the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco) 1/ and the Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil Thereof (Assembly resolution 2660 (XXV), annex). Furthermore, there are currently proposals to establish nuclear-weapon-free zones in Central Europe, the Balkans, the Mediterranean, Africa, Northern Europe, the Middle East, South Asia and the South Pacific.

168. Compared with subsequent international agreements establishing zones free of nuclear weapons, the Antarctic Treaty enjoys the concurring support of all five nuclear-weapon Powers of the world, including the United States and the Soviet Union. It was noted during the deliberations on Antarctica at the thirty-eighth session of the General Assembly that the Antarctic Treaty represented an important example of co-operation between the United States and the Soviet Union in the field of arms control, and that such an agreement between the two leading nuclear Powers would be extremely difficult to attain were it to be negotiated under the present international political climate. There was a clear consensus among all the delegations participating in the General Assembly's deliberations that maintaining Antarctica free from nuclear weapons and from involvement in the nuclear arms race was vitally important for the peace and security of the entire world.

169. The Antarctic Treaty, besides banning nuclear weapons, nuclear explosions and the dumping of nuclear waste, provides for a comprehensive verification system based on on-site inspection; for safeguards on future nuclear activities for peaceful purposes (by applying the rules established in international agreements concerning nuclear energy if and when all the Consultative Parties are parties to such agreements); and for the clear demarcation of the geographical area free from nuclear weapons agreed upon by all the Parties to the Treaty.

170. Since the signing of the Antarctic Treaty in 1959, Parties to the Treaty have assumed the obligations of the Treaty to keep Antarctica free from nuclear weapons. All nuclear-weapon Powers have refrained from carrying out nuclear explosions, dumping nuclear waste materials or installing nuclear weapons in Antarctica; in fact, no country, whether or not a Party to the Treaty, has attempted to violate the provisions that make Antarctica free of nuclear weapons. The successful implementation of the Antarctic Treaty in keeping Antarctica free from nuclear weapons is one of the significant post-war contributions toward averting nuclear weapon proliferation and halting the nuclear arms race.

### C. Facilitation of international scientific co-operation

171. In article III, paragraph 2, the Antarctic Treaty encourages the establishment of co-operative working relations with the specialized agencies of the United Nations and other international organizations having scientific or technical interest in Antarctica.

172. By way of implementation of that provision of the Treaty, the Consultative Parties at their First Consultative Meeting decided that it should be an individual obligation of each of their Governments to encourage the work of such international organizations and to promote on a bilateral basis the establishment and development of co-operative relations with those organizations (recommendation I-5).

173. Over the years, active co-operation has been promoted, with attention being focused on meteorology, telecommunications, oceanography (in particular, marine science) and protection of the environment. In this respect, close relations with WMO, ITU, IOC, and, in particular, SCAR deserve particular mention.

174. One example of this co-operation was the active support and participation of the Consultative Parties in the World Weather Watch Programme carried out under the auspices of WMO (see recommendations V-2, VI-3, IX-3 and X-3). The Consultative Parties recognized that their participation in the World Weather Watch required, on the one hand, a thorough review and improvement of the meteorological data collection and dissemination network operating in the Antarctic and, on the other hand, support of meteorological activities in Antarctica to the greatest extent feasible by transmission of processed data to the Antarctic from the World Weather Watch. In support of the World Weather Watch some of the Consultative Parties created Antarctic Meteorological Centres at their stations.

175. Telecommunications is an area of close co-operation between the Consultative Parties and interested international organizations. Experts from WMO, ITU and SCAR have been invited to be observers at the meetings of the Antarctic Treaty group of experts on telecommunications (see recommendations III-5 and V-2). Certain arrangements have been adopted by the Consultative Parties to facilitate transmission with minimum delay of meteorological information from Antarctica to the Global Telecommunications System (see recommendation X-3).

176. Of all international organizations, the closest relations maintained by the Antarctic Treaty Parties has been with SCAR. While there is no formal, direct link

between SCAR and the Consultative Meetings, there is an effective interchange and SCAR is frequently invited to provide scientific advice to the Consultative Parties through recommendations of representatives at the Consultative Meetings to their Governments that, through their national committees for SCAR, they invite SCAR to undertake particular activities. 2/ This mechanism is perhaps unusual but it has been reviewed from time to time and found to be satisfactory by the Consultative Parties and SCAR. It should also be noted that recommendations of the Consultative Meetings are made widely available through publication in the SCAR Bulletin.

#### D. Exchange of information

177. With a view to promoting international co-operation in scientific research, the Antarctic Treaty provides that information regarding plans for scientific programmes, observations and results "be exchanged and made freely available" (art. III, subpara. 1 (c)).

178. The Consultative Meetings are convened under the Treaty, inter alia, for the purpose of elaborating measures to facilitate scientific research in Antarctic, thus giving effect to the provisions of article III of the Antarctic Treaty. At an earlier stage of activity, those Meetings adopted numerous decisions on the question of the exchange of information (see recommendations I-1, I-3, I-5, I-7, I-13, II-1, II-8, IV-8, IV-27, VI-2, VI-3, VI-6, VI-7 and VI-12). Unfortunately, a lack of proper co-ordination resulted in the inclusion of sometimes conflicting or overlapping provisions in these decisions; 3/ therefore, the exchange of scientific information at the initial stage had a somewhat unsystematic character.

179. It should be noted that, in addition to exchanging scientific information, Parties to the Antarctic Treaty, in accordance with its article on inspection and observation, are under the obligation to provide each other with extensive information on expeditions, stations, military personnel and equipment (art. VII, para. 5). A standard form for such information to be circulated under the Antarctic Treaty, drafted in very general terms, was adopted by the First Consultative Meeting in recommendation I-6. Additions to that form were later approved by the Third and Sixth Consultative Meetings in recommendations III-1 and VI-13.

180. For several years there was no single standard form for exchange of information on different activities in Antarctica. However, the Seventh Consultative Meeting decided that the whole subject needed to be examined with a view to consolidating all the various provisions into one recommendation.

181. This was done in 1975 at the Eighth Consultative Meeting in Oslo, where the Standard Format for the Annual Exchanges of Information was elaborated (annexed to the present chapter). It was decided that the report containing information described in the Standard Format should be exchanged through diplomatic channels not later than 30 November of each year. All extensions, reductions or other modifications in the development of activities, circulated before 30 November, should be reported prior to 30 June following the season of those activities (recommendation VIII-6).

182. The system of the exchange of information on activities in Antarctica existing under the Antarctic Treaty is being supplemented by a similar exchange of information exercised in accordance with the provisions of the Convention for the Conservation of Antarctic Seals, the Convention on the Conservation of Antarctic Marine Living Resources, and through existing channels of co-operative working relations established with such international organizations as SCAR, SCOR, WMO and ITU.

#### E. Protection of the environment

183. The Antarctic exerts a critical influence on oceanic and atmospheric circulation and thus on the global climate, most especially on the Southern Hemisphere. Although the effect that Antarctica has on the formation of the world's climate is complex and not fully understood, its role in the process of global heat circulation is evident. Most of the solar energy received in Antarctica is reflected back by its ice and snow cover, a process greatly facilitated by the thin and relatively unpolluted atmosphere. The Antarctic ice sheet stabilizes climate and is the principal factor controlling world sea levels. Because of its high albedo or reflectivity (proportion of solar light incident upon an element of the surface, which is again reflected by it), only a small proportion of the sun's radiant energy falling on the Antarctic is absorbed. Further, half of the bottom waters of the world's oceans are formed around Antarctica. Scientists speculate that the continent may play a major role in determining general climatic changes over periods as short as 10 to 100 years.

184. Antarctic ecosystems are extremely vulnerable to disturbance. A decrease in albedo of the Antarctic ice sheet, for example, because of industrial pollution, could result in an increase in heat input to the geosphere, 4/ possibly leading to some melting of the ice sheet and to a rise in ocean levels and consequent climate changes. 5/ Because of the extreme conditions there, Antarctic ecosystems are less able to withstand any change induced by human activities than other ecosystems. Areas of Antarctic land damaged by human activity cannot be rehabilitated in the fashion adopted in other areas, including the Arctic. The rehabilitation of disturbed ice sites does not appear feasible except by a slow natural process. 6/

185. Antarctica is now regarded as the best site for monitoring the world's pollution, because its environment so far has been kept virtually unspoiled. No commercial industrial activities have developed in the area, and the geographic isolation of the continent has kept Antarctica virtually unaffected by the major sources of pollution, both natural and "man-made". The purity of the Antarctic environment, as well as its unique physical characteristics, makes the region particularly suitable for wide-ranging scientific research activities.

186. In recent years, environmental concern has given rise to proposals, mainly from non-governmental organizations, to apply in Antarctica some conservationist concepts, including suggestions to declare the continent a World Park, 7/ to place certain sites under the 1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 8/ and to set aside particular areas as biosphere reserves, established under the UNESCO Man and the Biosphere Programme. 9/



187. It would appear that no major damage has so far occurred to the Antarctic ecosystems. 10/ Human activities in Antarctica remain very limited, are still confined to narrow areas around the scientific stations and are being carried out in accordance with the strict rules and regulations imposed on such activities by the Antarctic Treaty Consultative Parties.

188. Since 1961, environmental protection of Antarctic ecosystems has constituted a central issue on the agenda of the Consultative Meetings. It has been clearly understood by the Consultative Parties that the steadily increasing number of people working in Antarctica and the associated logistic support facilities would place more and more stress on Antarctic ecosystems. The Consultative Meetings have devoted their attention to this subject and have adopted very important measures aimed at protecting the unique and exceptionally vulnerable Antarctic environment.

189. Inspired by SCAR, the Consultative Parties first concentrated on the elaboration of measures for the conservation of Antarctic fauna and flora. At their First Consultative Meeting, in 1961, they set forth provisional guidelines on this subject (recommendation I-8). The Third Consultative Meeting in 1964 approved the so-called mini-convention, Agreed Measures for the Conservation of Antarctic Fauna and Flora. That document became the first significant contribution by the Consultative Parties to the protection of the Antarctic environment.

190. The Agreed Measures proclaimed the Antarctic Treaty areas as a Special Conservation Area. It should be noted, however, that the Agreed Measures actually apply only to Antarctic land areas, since they do not affect the rights, or exercise of the rights, of States under international law with regard to the high seas within the Antarctic Treaty area (art. I, para. 2).

191. Under the Agreed Measures, Governments are required to take appropriate measures to minimize harmful interference with the normal living conditions of any native mammal or bird, or any attempt at such harmful interference. The following acts and activities are considered as harmful interference: allowing dogs to run free; flying helicopters or other aircraft in a manner that would unnecessarily disturb bird or seal concentrations, or landing close to such concentrations; driving vehicles unnecessarily close to the concentrations of birds and seals; use of explosives close to concentrations of birds and seals; discharge of firearms close to bird and seal concentrations; any disturbance of bird and seal colonies during the breeding period by persistent attention from persons on foot (art. VII, para. 2). However, the Agreed Measures envisage that some of the above activities may be exceptionally permitted to the minimum extent necessary for the establishment, supply and operation of the scientific stations.

192. The Agreed Measures prohibit bringing into the area of application of non-indigenous animal or plant species except by permit. Such a permit can be issued to allow importation only of the animals and plants listed in annex C to the Agreed Measures (art. IX). The Agreed Measures provide that Governments prohibit within the area of application the killing, wounding, capturing or molesting of any native mammal or native bird, or any attempt at any such act, except with a permit. Such a permit may be issued only for the following purposes: to provide indispensable food in limited quantities for men or dogs; to provide specimens for scientific study or scientific information; and to provide specimens for museums, zoological gardens or other educational or cultural institutions or uses (art. VI).

193. In order to preserve the unique natural ecological systems of certain areas, the Consultative Parties agreed that such areas should be granted special status and designated as "Specially Protected Areas". In addition to the general restrictions listed in the Agreed Measures, in these areas Governments should prohibit the collection of any native plant, except with a permit, the driving of any vehicle and entry by their nationals, except with a permit (art. VIII).

194. In accordance with the above-mentioned provisions of the Agreed Measures, the subsequent consultative meetings have designated a large number of sites in Antarctica as "Specially Protected Areas", among them, the Rookery Islands, Cape Hallet, Lynch Island and Litchfield Island etc. (recommendations IV-2, IV-7, IV-14 and VIII-1 and others).

195. For the purposes of having a single, systematic approach to the selection of Specially Protected Areas, the Consultative Parties, at their Seventh Meeting, approved in recommendation VII-2 the criteria to be met for designation of such areas. In accordance with that decision, the areas suggested for designation as specially protected should meet the following requirements:

- (a) Represent examples of the major Antarctic land and freshwater ecological systems;
- (b) Have unique complexes of species;
- (c) Be the type locality or only known habitat of any plant or invertebrate species;
- (d) Contain especially interesting breeding colonies of birds or mammals;
- (e) Be kept inviolate so that in the future they may be used for purposes of comparison with localities that have been disturbed by man.

196. Article X of the Agreed Measures repeats almost exactly the text of article X of the Antarctic Treaty. It declares that each participating Government should undertake to exert appropriate efforts, consistent with the Charter of the United Nations, to the end that no one engages in any activity in the area of application contrary to the principles or purposes of the Agreed Measures. By including this article, the Consultative Parties evidently wished to record that they would make every effort to assure effective application of the Agreed Measures by everyone exercising any activity in Antarctica.

197. The general policy of the Consultative Parties with respect to protection of the Antarctic environment was formulated at the Sixth Meeting, which, in recommendation VI-4, recognized the following principles:

- (a) In the Antarctic Treaty area the ecosystem is particularly vulnerable to human interference;
- (b) The Antarctic derives much of its scientific importance from its uncontaminated and undisturbed condition;

(c) There is an increasingly urgent need to protect the environment from human interference;

(d) The Consultative Parties should assume responsibility for the protection of the environment and the wise use of the Treaty Area.

198. By adopting those principles, the Consultative Parties institutionalized the protection of the Antarctic environment as a matter of common concern and agreed that that responsibility would be assumed jointly without regard to any party's status as a claimant or non-claimant. 11/ In the same recommendation, the Consultative Parties invited SCAR to identify the types and assess the extent of human interference with the environment that had occurred as a result of human activities in Antarctica and to propose measures to minimize harmful interference (recommendation VI-4, para. 1).

199. On the basis of the response of SCAR, the Consultative Parties at their Eighth Meeting, in 1975, made further progress in protecting the Antarctic environment by approving the Code of Conduct for Antarctic Expeditions and Station Activities (recommendation VIII-11, annex). The Code recommended procedures for waste disposal, reaffirmed certain provisions of the Agreed Measures concerning the introduction of alien species and disturbance of breeding colonies of birds and mammals and, in an important step toward evaluating environmental impact, provided guidelines for organizations planning major Antarctic projects.

200. Noting the increase in the number of tourists visiting Antarctica, the Eighth Consultative Meeting restricted places where large numbers of tourists might land so that the ecological effects might be monitored. It was recommended that Governments request all organizers of tourist groups, except in an emergency, to visit only those Antarctic stations for which permission had been sought and granted and to land only within "Areas of Special Tourist Interest" to be designated by the Consultative Parties (recommendation VIII-9).

201. At the Eighth Consultative Meeting, the Parties stressed once again their responsibility, as States active in Antarctica, to protect the Antarctic environment. It was emphasized that their Governments, in exercising this responsibility, should act in a way to ensure that measures for the wise use and protection of the Antarctic environment were consistent with the interests of all mankind (recommendation VIII-13).

202. At their Ninth Consultative Meeting, in 1977, after thorough examination of the information and suggestions submitted by SCAR, the Consultative Parties elaborated some new environmental principles, thus extending the number of principles first formulated at the Sixth Meeting. Recommendation IX-5 declared:

"1. The Consultative Parties recognise their prime responsibility for the protection of the Antarctic environment from all forms of harmful human interference;

"2. They will ensure in planning future activities that the question of environmental effects and of the possible impact of such activities on the relevant ecosystems are duly considered;

"3. They will refrain from activities having an inherent tendency to modify the Antarctic environment unless appropriate steps have been taken to foresee the probable modifications and to exercise appropriate controls with respect to harmful environmental effects;

"4. They will continue to monitor the Antarctic environment and to exercise their responsibility for informing the world community of any significant changes in the Antarctic Treaty Area caused by man's activities."

203. The Tenth Consultative Meeting concentrated on consideration of three concrete aspects related to protection of the Antarctic environment, namely, oil contamination of the Antarctic marine environment, effects of tourist and non-governmental expeditions in the Antarctic Treaty area and ecological aspects arising from discussions on the mineral resource régime.

204. The ecological aspects concerning mineral resource activities are dealt with in section F 2 of chapter III, "Antarctic mineral resources", of the present study. The Consultative Parties agreed at the Tenth Consultative Meeting that a future régime on mineral resources should provide strict guarantees for protection of the Antarctic environment and, moreover, should include means for determining whether mineral resource activities would be acceptable at all (recommendation X-1).

205. On the question of oil contamination, it was concluded that for the time being, the most significant introduction of oil unto the Antarctic marine ecosystem appeared to be from the operation of ships. It was decided to invite SCAR, in consultation with other appropriate international organizations, to keep under review the possibility of developing a programme for the determination of baseline measures of hydrocarbon content relevant to the needs for such determinations in the Antarctic marine environment. The Consultative Parties also agreed to review their respective obligations under existing international agreements which related to the reduction of contamination of the sea by oil, in the light of the particularly hazardous nature of Antarctic ship operations, and to consider whether their compliance with those obligations adequately minimized the risk of oil contamination of the Antarctic marine environment (recommendation X-7).

206. With reference to the effects of tourist and non-governmental expeditions, the Tenth Consultative Meeting approved the text of the Statement of Accepted Practices and the Relevant Provisions of the Antarctic Treaty, including Guidance for Visitors to the Antarctic (recommendation X-8). The main aim of that document is to assure that all visitors to Antarctica are aware of existing practices, rules and regulations in the Antarctic Treaty area and to provide them with guidance for proper conduct in Antarctica.

207. The most recent Consultative Meeting, the Twelfth, held at Canberra in September 1983, concentrated on the question of assessment procedures for determining whether the activities planned by the Consultative Parties in Antarctica were likely to have significant impact on the environment. The discussions proceeded from the assumption that those procedures should not prejudice one of the fundamental principles of the Antarctic Treaty, providing for freedom of scientific research, and that such procedures should not encroach upon

or prejudice provisions for the protection of the environment and the conservation of living resources contained in instruments that had been or might be negotiated as parts of the Antarctic Treaty system. The conclusion was reached that if a preliminary determination indicated that a planned research or logistic activity could have potentially significant impacts on the environment, the relevant agencies of the Consultative Parties should undertake a detailed environmental assessment with a view to determining the factors likely to cause such impacts. If, as a result of such assessment, the seriousness of such impacts was determined, they should elaborate feasible research and logistic alternatives aimed at minimizing harmful effects on the environment (recommendation XII-3).

#### F. Antarctic resources

##### 1. Conservation of Antarctic living resources

208. From the very beginning, the Consultative Parties to the Antarctic Treaty have shown their concern about the conservation of Antarctic living resources and have recognized the urgent need for measures to accomplish this goal. As stated in the decisions adopted by the Consultative Meetings, the participants feel themselves under obligation, deriving from the provisions of paragraph 1 (f) of article IX of the Treaty, to elaborate measures regarding preservation and conservation of living resources in Antarctica. The Consultative Parties have stressed on several occasions, that while proceeding in this matter, they are acting without prejudice to their positions of principle on the sovereignty issue (see recommendations III-8, IX-2, X-2 and XI-2).

209. Living resources of the Southern Ocean have attracted the interest of commercial enterprises since the early years of the nineteenth century, with seals and whales having become the object of wide-scale exploitation that has not been extended to other species.

210. In the periods from 1820 to 1830 and from 1870 to 1880, millions of seals were killed in Antarctica, to the extent that unrestricted harvesting of seals almost totally destroyed their population in the area. Since that time and because of the drastic depletion of seal herds, only a minor revival of seal harvesting occurred at the beginning of the twentieth century.

211. Starting from 1904, when the first whaling station was opened on one of the Antarctic islands, and for almost 60 years following, whales were the main object of commercial enterprises in Antarctic waters. <sup>12/</sup> A decline in whale herds throughout the world and a growing understanding of the need for internationally agreed upon measures regulating their exploitation led to the conclusion in 1931 of the International Convention for the Regulation of Whaling, which entered into force in 1935.

212. After the Second World War, a new International Convention for the Regulation of Whaling was signed in 1946, establishing the International Whaling Commission which was given global responsibility for setting quotas on the catch of whales, including Antarctic waters. Management of the world's whale stocks by the

Commission has been increasingly more conservative. Due to this policy, whaling in Antarctic waters has been drastically reduced.

213. Since whales are a highly migratory species, it is logical that the Convention on whaling has been applied world-wide and Antarctic waters are only one of the areas covered by it.

214. The first international agreement concluded solely for the purposes of the conservation and rational utilization of Antarctic living resources is the 1972 Convention for the Conservation of Antarctic Seals.

215. In accordance with modern international law, States have a duty to co-operate with each other in taking necessary measures for the conservation and management of living resources of the high seas. Those provisions of general international law were recently confirmed in the 1982 United Nations Convention on the Law of the Sea. 13/ Article 118 of the Convention provides, inter alia, the following:

"... States whose nationals exploit identical living resources, or different living resources in the same area, shall enter into negotiations with a view to taking the measures necessary for the conservation of the living resources concerned. They shall, as appropriate, co-operate to establish subregional or regional fisheries organizations to this end."

216. The various measures taken by the Consultative Parties for the conservation of Antarctic living resources have evidently aimed at fulfilling this goal.

217. There has been no commercial exploitation of Antarctic seals for many years, but the fear persists that growing populations of seals may attract the attention of commercial enterprises and that unrestricted harvesting could be resumed at some time in the future. In order to forestall a recurrence of destructive exploitation of seals, the Consultative Parties, in their efforts to protect the living resources of Antarctica, first focused attention on drafting an international régime for the conservation of Antarctic seals.

218. As an interim measure in the process of elaboration of that régime, they suggested, at the Third Consultative Meeting, held at Brussels in 1964, that Governments should voluntarily regulate pelagic sealing by their nationals in order to ensure that the natural ecological system was not seriously disturbed (recommendation III-11).

219. At the Fourth Consultative Meeting, held at Santiago in 1966, the Consultative Parties approved Interim Guidelines for Voluntary Regulations of Antarctic Pelagic Sealing. Those guidelines set limits on seals to be taken, sealing zones and seasons, prohibited killing certain species of seals and required that Governments exchange information on any steps taken in accordance with the guidelines (recommendation IV-21).

220. Finally, in 1972, at the initiative of the Consultative Parties, an international conference was convened in London during which the Convention for the Conservation of Antarctic Seals was negotiated. The Consultative Parties were

motivated by a belief that a separate international agreement opened for accession by other States might better serve the purposes of effective management of Antarctic sealing than would recommendations approved under article IX of the Antarctic Treaty. 14/

221. As in the case of the Antarctic Treaty, 60°S latitude was chosen for the northern boundary of the Convention for the Conservation of Antarctic Seals, which thus applies to the seas south of this latitude. The Convention reaffirms the provisions of article IV of the Antarctic Treaty relating to the sovereignty issue with respect to these seas (art. 1, para. 1). That provision reflects the ability of claimant and non-claimant States, due to the existence of the Antarctic Treaty and despite their disagreement on the status of some of the marine areas, to reach an understanding on conservation measures applicable to these areas.

222. The Convention provides that a commission and a scientific advisory committee will be established if commercial sealing begins in Antarctica (art. 6, subparas. 1 (b) and 1 (c)). Until that time, SCAR was invited to assess information received from the Contracting Parties, to recommend programmes for scientific research and to recommend statistical and biological data to be collected by sealing expeditions. SCAR was also authorized to report on the basis of statistical, biological and other evidence available when the harvest of any species of seals was having a significantly harmful effect on the total stocks of such species or on the ecological system in any particular locality (art. 5, para. 4). Should SCAR estimate that the permissible catch limits for any species were likely to be exceeded, the Contracting Parties should then take appropriate measures to prevent further sealing by their nationals and vessels (art. 5, para. 5).

223. It was recorded in the preamble to the Convention that SCAR had agreed to carry out the tasks requested of it in the Convention.

224. The Convention provides for the establishment of an effective inspection system once commercial sealing begins (art. 6, subpara. 1 (a)).

225. Specific measures for the conservation of Antarctic seals are listed in the annex to the Convention, which forms an integral part thereof. Those measures forbid all sealing for six months of each year during the period between 1 March and 31 August. They restrict sealing to certain areas. The killing or capturing of three species of seals is completely forbidden and the total catch of three other species is limited to 192,000. SCAR for its part had a higher figure as a permissible catch in 1972. 15/

226. In accordance with article 3, paragraph 3, the conservation measures set out in the annex can be reviewed in the light of scientific assessments and in accordance with the procedures mentioned in article 9 of the Convention.

227. The Convention establishes a comprehensive system for exchanging information by imposing on each Contracting Party an obligation to provide to other Contracting Parties and to SCAR each year, before 31 October, a summary of statistical information on all seals killed or captured by their nationals and vessels (art. 5, para. 2, and annex).

228. Conservation measures and other provisions of the Convention are to be enforced through the adoption by each Contracting Party of such laws and regulations as may be necessary to implement the Convention (art. 2).

229. The Convention for the Conservation of Antarctic Seals came into force on 11 March 1978. It is open for accession by any State invited to accede by the Contracting Parties (art. 12). Since there is no commercial sealing now in Antarctica, the Convention plays a preventive rather than regulatory role.

230. In the early 1970s, the potential for exploiting the living resources of the Antarctic region other than whales and seals began to attract interest. While it was realized at that time that some years of experimental fishery and technological development would be necessary before commercial large-scale exploitation would start in Antarctica, SCAR felt the need to expand substantially the scientific understanding of Antarctic marine living resources and in particular the relationship between potentially exploitable species and other elements of the marine ecosystem. 16/

231. The efforts of SCAR to a certain extent were inspired by the Antarctic Treaty Consultative Parties. Being concerned with the inadequacy of the information available on stocks of the Antarctic marine living resources and being aware of the need to develop a good scientific foundation for appropriate conservation measures, they urged SCAR, at the Eighth Consultative Meeting, to consider convening a meeting to discuss current scientific work and report on programmes to study and conserve Antarctic marine living resources (recommendation VIII-10).

232. At the initiative of SCAR and with the co-sponsorship of the Scientific Committee on Oceanographic Research (SCOR), an international scientific conference on the living resources of the Southern Ocean was convened in August 1976 at Woods Hole, Massachusetts, United States. The major part of the conference, as well as the subsequent session of a group of specialists, was devoted to discussions on the finalization of an international programme for the Biological Investigation of Marine Antarctic Systems and Stocks (BIOMASS).

233. The BIOMASS proposal became the first major international effort to co-ordinate research for the development and proper management of the living resources of the Southern Ocean. Its principle objective was to gain a deeper understanding of the structure and dynamic functioning of the Antarctic marine ecosystem. 17/ At the Ninth Consultative Meeting, the participants decided that their Governments should give sympathetic consideration to the provision of practical measures (such as ships, ship time, personnel and finance) in support of the implementation of the BIOMASS programme (recommendation IX-2).

234. The United Nations Development Programme (UNDP) in 1976 approved a \$202,000 Southern Ocean Fisheries Survey Programme (GLO/75/006) executed by FAO. The major output of that project was three extensive reports, published in 1977, on the biology, harvesting and processing of living resources of the area. 18/ From 1976 to 1978, FAO actively tested a proposal for a \$45 million 10-year programme the goal of which was to assist in the exploration, exploitation and utilization of the living resources in the areas south of 45°S latitude. In the outcome, FAO did not



pursue the idea because its members felt that priority should be given to assisting developing countries in promoting development of their own economic zones. 19/

235. In light of the growing attention to the potential of living resources, the prospects of commercial harvesting, the unknown effects of such harvesting and the gaps in the data required for effective management of Antarctic marine living resources, the Antarctic Treaty Consultative Parties took steps for the preservation and conservation of those resources at the end of the 1970s in order to meet their responsibilities under article IX of the Treaty.

236. At the Ninth Consultative Meeting, in 1977, the Consultative Parties expressed their recognition of the urgency of ensuring that the Antarctic marine living resources be protected by the establishment of sound conservation measures that would prevent overfishing and protect the integrity of the Antarctic ecosystem. The Consultative Parties decided that three sets of steps should be taken to implement this aim (recommendation IX-2).

237. First, the Consultative Parties agreed to negotiate, as a matter of urgency, a definitive régime for the conservation of Antarctic marine living resources, and stated that such a régime should take into account, inter alia, the following key elements:

- (a) The prime responsibility of the Consultative Parties for the protection and conservation of the environment in the Antarctic Treaty area;
- (b) The provisions of article IV of the Antarctic Treaty on sovereignty issues;
- (c) The need to provide effective conservation of the marine living resources of the Antarctic ecosystem as a whole;
- (d) The régime should cover the area of specific competence of the Antarctic Treaty;
- (e) The régime should, however, extend north of 60° S latitude where necessary for the effective conservation of species of the Antarctic ecosystem, without prejudice to coastal state jurisdiction in that area;
- (f) The régime should not apply to species already regulated pursuant to existing international agreements but should take into account the relationship of such species to those species covered by the régime.

238. The report of the Ninth Consultative Meeting casts additional light on plans for the "definitive régime". It states that the term conservation, as used in the above-mentioned recommendation, includes rational use, in the sense that harvesting would not be prohibited but the régime would exclude catch allocation and other economic regulations of harvesting. The report also makes reference to the understanding that the word "resources" is not limited to commercially exploitable species.

239. Second, pending entry into force of a definitive régime, the Consultative Parties set up interim guidelines for conservation which consisted of co-operation in mutual exchange of statistics relating to catches of Antarctic marine living resources, agreement to show the greatest possible concern and care in harvesting so that it did not result in the depletion of stocks or in jeopardizing the Antarctic marine ecosystem as a whole, and an appeal to those Governments that were not parties to the Antarctic Treaty and that engaged in activities involving the use of Antarctic marine living resources to take account of the guidelines.

240. Third, they adopted several recommendations intended to intensify co-operation in scientific investigation of Antarctic marine living resources and in the exchange of information thereon. They also agreed in planning marine activities in Antarctica to have regard to the advantages that would accrue from the BIOMASS programme.

241. In accordance with the aforementioned recommendation IX-2, the elaboration of a "definitive régime" was entrusted to special Consultative Meetings, which succeeded in producing the text of a draft convention on the conservation of Antarctic marine living resources.

242. As in the case of seals, a decisive step in the elaboration of the régime for the Antarctic marine living resources was taken at a diplomatic conference. That international conference, called by the Government of Australia, was held at Canberra from 7 to 20 May 1980 and was attended by the 15 States actively engaged in research and exploration of Antarctic marine living resources as full participants with observers from the European Economic Community (EEC), FAO, SCAR, IOC, SCOR, the International Whaling Commission (IWC) and the International Union for the Conservation of Nature and Natural Resources (IUCN). The Conference adopted the Convention on the Conservation of Antarctic Marine Living Resources, which entered into force on 7 April 1982. As at 30 June 1984, the following States are parties to the Convention: Argentina, Australia, Belgium, Chile, France, German Democratic Republic, Germany, Federal Republic of, Japan, New Zealand, Norway, Poland, South Africa, Spain, Sweden, Union of Soviet Socialist Republics, United Kingdom and United States. EEC also acceded to the Convention.

243. The Convention provides that States whose nationals exploit identical living resources should, as appropriate, co-operate to establish regional fisheries organizations with a view to taking measures necessary for the conservation of the living resources concerned in the light of article 118 of the United Nations Convention on the Law of the Sea. The Convention can be characterized as a regional agreement for the conservation and management of the living resources. It fits neatly into this general requirement of international law. At the same time, the Convention differs from other fishery agreements.

244. The traditional approach to management of living resources envisaged in most current fisheries agreements and reflected in the Law of the Sea Convention is the maximum sustainable yield concept, aiming for that level of harvesting that will maximize the catch of the species plotted over a time series of estimated species productivity. 20/ It is based on the species-by-species approach and focuses largely on a single species in formulating standards for management.

245. The unique structure of the Antarctic ecosystem and the complex interactions between different species, all competing for food consisting mainly of krill, required different standards for the management of the Antarctic living resources. Therefore a new approach, based on the ecosystem, was chosen as the policy for the management of those resources. In light of its ecosystem conservation standard, as well as the fact that it was negotiated prior to heavy commercial pressure on the resources, the Convention on the Conservation of Antarctic Marine Living Resources represents an interesting development in international law. 21/

246. The preamble to the Convention recognizes the importance of safeguarding the environment and protecting the integrity of the ecosystem of the seas surrounding Antarctica. Article I, paragraph 3, defines the Antarctic marine ecosystem as the complex of relationships of Antarctic marine living resources with each other and with their physical environment. Article II of the Convention sets forth its general objective, the conservation of Antarctic marine living resources (para. 1), which, by definition, includes rational use of the resources (para. 2). The Convention provides several means to achieve this objective, of which the main ones are the principles of conservation, extended area of application and the establishment of suitable international machinery.

247. The ecosystem approach envisaged by the Convention is laid down in the following principles of conservation contained in paragraph 3 of article II: prevention of decrease in the size of any harvested population to levels below those which ensure its stable replacement; maintenance of the ecological relationships between harvested, dependent and related populations and the restoration of depleted populations to the levels of their stable recruitment; and prevention of changes or minimization of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades.

248. The ecosystem approach is also reflected in the area of application of the Convention. As a geographic boundary of Antarctica and the natural boundary of its ecosystem, the Convention adopts the Antarctic Convergence - a strip of water lying somewhere between 47° and 63° S latitude, where the surface temperature of ocean waters changes sharply within a short distance as cold Antarctic waters mix with warmer sub-Antarctic waters.

249. For the purposes of achieving the objective of the Convention and implementation of its principles, the decision was made to apply the Convention to the Antarctic marine living resources of the area both south of 60° S latitude and between that latitude and the Antarctic Convergence which form part of the Antarctic marine ecosystem (art. I, para. 1). Although the Antarctic Convergence is a seasonally movable zone, for the purposes of the Convention it was decided to define a list of co-ordinates that were deemed to be the line of the Antarctic Convergence (art. I, para. 4). 22/

250. The ecosystem approach is also indicated in the very broad definition of marine living resources under the Convention, which includes "fin fish, molluscs, crustaceans and all other species of living organisms, including birds, found south of the Antarctic Convergence" (art. I, para. 2).

251. To give effect to its objectives and the principles of conservation the Convention, like the majority of other international fishery agreements, set up a Commission, with headquarters in Hobart, Tasmania, Australia, and a Scientific Committee.

252. The Commission for the Conservation of Antarctic Marine Living Resources is composed of the original signatories to the Convention, acceding States engaged in research or harvesting activities and acceding regional economic integration organizations whose States members are entitled to participate in the work of the Commission (art. VII, para. 2).

253. The Commission has a broad array of functions, which include, *inter alia*, facilitation of research, identification of conservation needs, formulation, adoption and revision of conservation measures, implementation of systems of observation to be elaborated by the Commission and such other activities as are necessary to fulfil the objectives of the Convention (art. IX, para. 1).

254. The illustrative list of the functions of the Commission does not include a provision on allocation of catches. This was done largely because of the desire to avoid matters that raised directly the sovereignty issue. It was felt that agreement on such allocations might prove impossible in the Commission without directly challenging the alleged rights of claimant States. 23/

255. Decisions of the Commission on matters of substance, including in particular conservation measures, are taken by consensus (art. XII, para. 1). The choice in favour of a consensus procedure, rather than the traditional majority voting, was influenced by the 20 years experience that had already been acquired by the Antarctic Treaty States. 24/

256. The conservation measures adopted by the Commission became binding upon members of the Commission in accordance with the procedures established in paragraph 6 of article IX, which are similar to the relevant provisions of other fisheries agreements.

257. The Commission is authorized to draw the attention of any State not a party to the Convention to any activity undertaken by its nationals or vessels which, in the opinion of the Commission, affects the implementation of the objectives of the Convention (art. X, para. 1).

258. The Convention establishes a Scientific Committee for the Conservation of Antarctic Marine Living Resources as a consultative body to the Commission. Its main functions include providing criteria and methods to be used for determinations concerning conservation measures, assessing the status and trends of the populations of the resources involved, formulating proposals for national and international scientific research programmes, and transmitting assessments, analyses, reports and recommendations to the Commission regarding measures and research to implement the objectives of the Convention (art. XIV, para. 1, and art. XV, para. 2).

259. Many articles of the Convention foresee very strong links between the Convention and the Antarctic Treaty. In a certain sense the Convention complements the Treaty. Article III of the Convention, for example, provides that all its Parties, "whether or not they are Parties to the Antarctic Treaty, agree that they will not engage in any activities in the Antarctic Treaty area contrary to the principles and purposes of that Treaty and that, in their relations with each other, they are bound by the obligations contained in Articles I and V of the Antarctic Treaty" concerning the use of Antarctica exclusively for peaceful purposes. According to article V of the Convention, its Contracting Parties also agree to pay due regard to the special responsibility of the Antarctic Treaty Consultative Parties for the protection of the Antarctic environment. The Commission, in its work pursuant to article IX of the Convention, is to take full account of any relevant measures or regulations of the Consultative Meetings. The Convention provides that Parties to it, in their relations with each other, are bound by articles IV and VI of the Antarctic Treaty.

260. In drafting the Convention the claimant and non-claimant States disagreed on the question of whether attempts to establish fishery or exclusive economic zones must be regarded as impermissible under article IV of the Antarctic Treaty as an enlargement of existing claims. The situation was in addition complicated by the existence, within the prospective area of application of the Convention, of certain islands over which individual States have undisputed sovereignty. 25/

261. The conferees decided to sidestep the sovereignty issue by adopting a pragmatic solution through the use of the so-called "bifocal" approach which permitted all interested States to participate in the Convention. The language of paragraph 2 of article IV of the Convention is analogous to article IV of the Antarctic Treaty, with the exception of subparagraph 2 (b). This subparagraph states that

"2. Nothing in this Convention and no acts or activities taking place while the present Convention is in force shall:

...

"(b) be interpreted as a renunciation or diminution by any Contracting Party of, or as prejudicing, any right or claim or basis of claim to exercise coastal state jurisdiction under international law within the area to which this Convention applies;".

262. The key element which distinguishes the language of the Convention from the provisions of article IV of the Antarctic Treaty is the use in subparagraph 2 (b) of the words "to exercise coastal State jurisdiction under international law within the area to which the Convention applies". According to the opinions of some scholars, these words in the context of the "bifocal" approach mean that claimant States could interpret article IV, subparagraph 2 (b), as referring to both undisputed islands and disputed territorial claims. At the same time, non-claimant States could argue that a right to exercise coastal State jurisdiction under international law exists only as to undisputed islands north of 60° S latitude. 26/

263. Another difficulty which the drafters of the Convention had to resolve related to the rights of States to coastal jurisdiction in areas north of 60°S latitude. The problem was how to preserve the ecosystem approach, covering all Antarctic waters by the régime of the Convention, and at the same time accommodate the interests of States having the right to coastal jurisdiction in 200-mile areas around islands over which the existence of State sovereignty was generally recognized, for example, the French islands of Kerguelen and Crozet.

264. This matter was not resolved in the Convention since it was extremely difficult to satisfy the needs of those States without encroachment on the issue of territorial claims. The compromise solution was found through inclusion in the Final Act of the Conference of a statement by its Chairman regarding the application of the Convention to waters adjacent to the islands, within the Convention area, over which the existence of State sovereignty was recognized by all parties to the Convention. In accordance with the statement, each time the Commission undertakes examination of the conservation needs within these waters, it is left to the coastal State to decide whether the waters in question should be included in the area of application of any specific conservation measure or if they should be excluded. The Commission cannot proceed to the adoption of such a measure if the coastal State concerned raises an objection to it.

265. The Convention is open for accession by any State interested in research or harvesting activities in relation to the marine living resources to which it applies (art. XXIX, para. 1). The Convention is also open for accession by regional economic integration organizations, such as the European Economic Community, on which members of such organizations have conferred competence with regard to the matters covered by the Convention. The accession of those organizations is not automatic and is subject to consultations among members of the Commission (art. XXIX, para. 2). EEC has acceded to the Convention and become a member of the Commission in accordance with the provisions of article VIII of the Convention.

266. With other international organizations which do not have the right to accede to the Convention, the Commission and the Scientific Committee should, in accordance with the Convention, develop appropriate co-operative relations (art. XXIII). In this respect, it may be noted that observers from FAO, IOC, IUCN and IWC attended the second sessions of the Commission and of the Scientific Committee.

267. Dealing with a great many serious issues concerning legal, political and biological aspects of the conservation and rational utilization of the Antarctic marine living resources, the Convention, like many other similar international agreements, is a compromise that represents a practical solution for the parties to the Convention.

## 2. Antarctic mineral resources

268. The hidden mineral wealth of Antarctica has been a subject of interest for many years. It has still to be proved that there are mineral resources in Antarctica worth exploiting, and at the present time prospects for developing such resources appear to be remote. 27/ However, in recent years, as a result of the scarcity of global resources coupled with technological advancements in resource exploration and exploitation, interest in the economic potential of the Antarctic region has increased substantially. As a result, concern for and tensions over the fate of the world's last unexploited continent are rising rapidly.

269. One of the major problems regarding exploration and exploitation of Antarctic mineral resources is that the environmental hazards attached to the use of these resources may be very serious. The Antarctic has a critical influence on oceanic and atmospheric circulation and thus on global climate. At the same time, Antarctic ecosystems are extremely vulnerable to disturbance. For example, a huge spill of crude oil altering the rate of formation and degradation of sea ice could conceivably affect planetary albedo (reflectivity), 28/ with global climatic implications. In addition, the severity of local conditions, such as the cold and the presence of ice and icebergs, increases the likelihood of accidents and would complicate remedial measures. 29/ At present only a number of preliminary studies have been conducted on the environmental impact of mineral resource exploration and exploitation in Antarctica but they indicate that measures for protection of the Antarctic environment should be worked out prior to any commercial exploration for or exploitation of mineral resources in Antarctica, should such activities ever begin there. 30/

270. The Antarctic mineral resource issue revives an old problem of claims for territorial sovereignty in Antarctica and non-recognition of such claims, because claimant States assert ownership over resources in their claims, while non-claimant States argue for freedom of access. 31/ The possibility of unilateral actions by both sides, and therefore of conflicts, is quite real and should not be discounted. In this respect, the prospect of the use of Antarctic mineral resources raises the question of the need for elaboration of an international régime for management of the exploration and exploitation of potential Antarctic mineral resources.

271. It should be noted that in light of the sovereignty issue it could prove to be much more difficult, in comparison with marine living resources, to approach the question of management of mineral resources, since they are non-renewable and are fixed in location. It should also be remembered that the development of mineral resources will involve problems and require regulation and control of a scale and nature different from the measures required in regard to marine living resources. 32/

272. Problems and conflicts raised by the emerging interest in the economic potential of Antarctic mineral resources revolve mainly around one issue, namely, how Antarctic mineral resources should be managed. There are two main approaches to the consideration of this issue, which reflect also to a certain extent, differences in attitudes towards management of resources.

273. The supporters of one approach insist on the discussion of the Antarctic mineral resource issue in a global international forum, preferably established by the United Nations. They consider the Antarctic Treaty mechanism too restrictive for the purposes of such discussions. As their objective, they claim to ensure that the exploration and exploitation of mineral resources should be carried out for the benefit of all mankind. 33/

274. Others, while also convinced of the need for an open international approach, favour the discussion of the questions of the management of Antarctic mineral resources within the framework of the Antarctic Treaty, which is, in their opinion, particularly designed for such discussions and can assure their meaningful and responsible character. They hold the view that, in such considerations, one should not ignore the realities of the Antarctic Treaty, including, inter alia, the provisions of article IV of the Treaty which puts at rest the sovereignty issue, and the long presence in Antarctica of certain countries which have invested large resources as well as the efforts and talents of their people in the scientific investigation and development of this continent. 34/

275. Both approaches are reflected in the debates on the Antarctic issue at the thirty-eighth session of the General Assembly. A summary of those debates is given in section C of chapter II of the present study. Below are listed some of the statements or summaries of such statements made by the advocates of these approaches prior to the thirty-eighth session. They may be helpful in a better understanding of the opinions advanced.

276. It can be assumed 35/ that initiators of the discussion of the Antarctic mineral resource management issue in a wide international forum were inspired by the adoption, on 17 December 1970, by the General Assembly of the Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction and by the deliberations at the United Nations Conference on the Law of the Sea. The views set out below, some of which were made in a broader context, are nevertheless included because they are relevant to the mineral resource issue.

277. In 1975, in a speech before the General Assembly, Shirley Amerasinghe, who was then the President of the United Nations Conference on the Law of the Sea, stated:

"There are still areas of this planet where opportunities remain for constructive and peaceful co-operation on the part of the international community for the common good of all rather than for the benefit of a few. Such an area is the Antarctic continent. ... there can be no doubt that there are vast possibilities for a new initiative that would rebound to the benefit of all mankind. Antarctica is an area where the now widely accepted ideas and concepts relating to international economic co-operation, with their special stress on the principle of equitable sharing of the world's resources, can find ample scope for application, given the co-operation and good-will of those who have so far been active in that area" (A/PV.2380, pp. 13-15).

278. Christopher Pinto, the delegate of Sri Lanka to the United Nations Conference on the Law of the Sea, vigorously advocated in his statement in 1977 to a press briefing seminar in London that Antarctica's resources should be made subject to a



régime of rational management and utilization to secure optimum benefits for mankind as a whole and, in particular, for the developing countries, in accordance with appropriate global international arrangements and within the framework of the new international economic order. 36/

279. In 1979, Alvaro de Soto, the delegate of Peru to the Law of the Sea Conference and one of the co-ordinators of the Group of 77 at that Conference, warned that "a comprehensive political debate on the question of Antarctica is inevitable and it may well be desirable". Speaking at a press briefing seminar in Washington, he said that "the temptation to apply to Antarctica the same principles which are the basis for the régime of the sea-bed is very great, and some have not been able to resist it. ... Certainly there is no such thing as a perfect analogy. The sea-bed principles would probably require some adaptation in order to be applied to Antarctica". 37/

280. In 1982, the Prime Minister of Malaysia, Dr. Mahathir bin Mohamad, while congratulating the General Assembly on the successful conclusion of the United Nations Conference on the Law of the Sea, said that it was time now for the United Nations to focus its attention on the uninhabited lands of Antarctica. He added that, like the sea-beds, these uninhabited lands belong to the international community and "the United Nations must convene a meeting in order to define the problem of these uninhabited lands, whether claimed or unclaimed, and to determine the rights of all nations to these lands" (A/37/PV.10, p. 18).

281. The aforementioned approach is opposed by those who consider it questionable that the legal situation of Antarctica is really analogous to the deep sea-bed. They emphasize that, contrary to the deep sea-bed area, a legal system already exists with respect to the Antarctic area. 38/

282. Speaking in a personal capacity in 1977 at a press briefing seminar, Mr. Leigh Ratiner, administrator in the United States Ocean Mining Administration, stressed:

"Antarctica is not a no-man's-land, and a foundation upon which to build an alternative regime already exists and cannot in truth be ignored. For a very long time, this continent has been a sphere of political activity. Nations have, through forethought and initiative, developed substantial vested interests in Antarctica's future. ... The political difference between the deep seabed and Antarctica and between the moon and Antarctica is stated quite simply - territorial sovereignty, and a sovereignty claim, be it valid or dubious under international law, is nonetheless the grist of the international law mill." 39/

283. Mr. Fernando Zegers Santa Cruz, former head of the delegation of Chile to the Law of the Sea Conference in his 1978 article on "The Antarctic System and the Utilization of Resources" strongly argues against the comparison between Antarctica and, as he put it, other "human frontiers such as for example the ocean floor". While recognizing the existence of certain elements in common, he states that vast differences overshadow any possible similarities. He continues, saying that

"Antarctica is not a territory without legal norms, remote to man and res nullius. To the contrary, there exists a real Antarctic system, which integrates perfectly with the general international system, conforms to the principles and objectives of the United Nations and has proven its efficiency in both time and place. Consequently it is through the Antarctic system, and in close cooperation with it, that the solution to the question of utilization of the resources of the area should be found." 40/

284. It is also argued that the common heritage concept cannot be applied to Antarctica by analogy, because the United Nations has not declared this concept to be a universal principle applicable to all spaces beyond generally recognized national sovereignty but has restricted it to two particular instances: the deep sea-bed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, as well as its resources; and the moon and its resources. 41/

285. At the interdisciplinary symposium entitled Antarctic Challenge: Conflicting Interests, Cooperation, Environmental Protection, Economic Development, held at Kiel, Federal Republic of Germany in 1983, the opponents of the consideration of the mineral resource issue within the framework of the Antarctic Treaty were criticized for basing their approach solely on the suggestion of sharing profit and benefit while neglecting the consideration of burden and responsibility sharing. According to those views, they have not envisaged the need for a delicate balance between responsibilities and obligations, on one side, and rights, on the other. It was commented, in that regard, that some of those who most strongly advocated the possibilities of Antarctica as an area for international co-operation for the benefit of all mankind, rather than for a few rich States, were reluctant to use the opportunity to join the Antarctic Treaty and to take part in the research activities, to the extent that they were capable and willing within the Treaty's framework, for the benefit of all mankind. 42/

286. The Antarctic Treaty makes no special reference to Antarctic mineral resources. However, the Consultative Parties have recorded their view that it would be ironic not to allow them to address the question of exploration and exploitation of these resources once it became an urgent issue of public concern.

287. The specific character of the Antarctic Treaty and the system established by it are mentioned by some authors as one of the reasons why the claimant States seem more prepared to compromise in favour of a joint solution on the mineral resource issue within the framework of the Treaty. 43/

288. The issue of commercial activities related to exploitation of Antarctic resources was brought up during negotiation of the Antarctic Treaty in 1958-1959, but it became apparent that, at that time, the States concerned were not willing to accept provisions regulating such activities. 44/

289. In 1959, no urgent need was felt for negotiations on the mineral resource issue. Therefore, it was considered preferable to avoid them for fear that disagreement on the sovereignty problem might halt the conclusion of the Antarctic Treaty. 44/ However, with the passage of time, the Consultative Parties concluded that the balance established by the Antarctic Treaty and implementation of some of

its principles, such as freedom of scientific research and protection of the environment, could be threatened by possible unilateral commercial development of Antarctic mineral resources by some States. 45/ Thus, they felt that the need had emerged to take measures in order to assure implementation of the Antarctic Treaty Principles and to meet the requirement of the Treaty that Antarctica should not become the scene or object of international discord.

290. The question of Antarctic mineral resources was first brought up informally in 1970, at the Sixth Consultative Meeting, held in Tokyo, where several representatives voiced concern about inquiries regarding Antarctic minerals that their Governments had received from private firms. 46/

291. Two years later, at the Seventh Consultative Meeting, its participants, "noting the technological developments in polar mineral exploration and the increasing interest in the possibility of there being exploitable minerals in the Antarctic Treaty area", decided to include in the agenda of that meeting the issue "Antarctic resources - effects of mineral exploitation". The Consultative Parties acted on the agreed assumption "that mineral exploration is likely to raise problems of an environmental nature and that the Consultative Parties should assume responsibility for the protection of the environment and the wise use of resources" (recommendation VII-6).

292. The decision of the Seventh Consultative Meeting on the mineral resource issue, although a very general one, was a consensus between both claimant and non-claimant States to act collectively and address jointly the mineral resource issue within the framework of the system established by the Antarctic Treaty.

293. At the Eighth Consultative Meeting, held at Oslo in 1975, the Consultative Parties once again pointed out that mineral resource exploration and exploitation could adversely affect the unique environment of Antarctica and of other ecosystems dependent on the Antarctic environment, and reaffirmed that they bore a special responsibility for environmental protection in the Antarctic Treaty area. Since available scientific information on the possible impact of mineral resource exploration or exploitation on the environment of the Treaty area, if that was to occur there, was completely inadequate, SCAR was invited to prepare a study in that respect (recommendation VIII-14).

294. In that decision, the Consultative Parties emphasized that a close link between the operation of the Antarctic Treaty and an accommodation on the mineral issue should serve as a key-stone for any resolution of the Antarctic mineral resource issue. They stressed their intent "to seek to develop an approach to the problems raised by the possible presence of valuable mineral resources in the Antarctic Treaty area, bearing in mind the principles and purposes of the Antarctic Treaty" (preamble, recommendation VIII-14).

295. The Consultative Parties came to the joint conviction that there was a need to refrain from actions of commercial exploration and exploitation while they would also seek timely agreed solutions to the problems raised by the possible presence of valuable mineral resources in Antarctica. That conviction was expressed in the preamble of recommendation VIII-14 and in its report.

296. At the Ninth Consultative Meeting, held in London in 1977, the question of mineral resources was one of the major subjects. The decision taken by the Meeting on the issue (recommendation IX-1) reflects the substantial progress achieved by the Consultative Parties on fundamental issues relating to mineral resource development.

297. First, the Consultative Parties emphasized that the framework established by the Antarctic Treaty had proved effective in promoting international harmony in furtherance of the purposes and principles of the United Nations Charter, in ensuring the protection of the Antarctic environment and in promoting freedom of scientific research in Antarctica. They thus reiterated that Consultative Meetings could and should serve as a proper forum for consideration of the mineral resource issue.

298. Second, they gave an explicit definition of what they considered to be their responsibility under the Antarctic Treaty with respect to mineral resource development, in stating that "the special responsibilities of Consultative Parties are to ensure that any activities in Antarctica, including commercial exploration and exploitation in the future, should they occur, should not become the cause of international discord, of danger to the unique Antarctic environment, of disruption to scientific investigation, or be otherwise contrary to the principles or purposes of the Antarctic Treaty" (preamble, recommendation IX-1).

299. Third, the Consultative Parties established a set of principles on which to base the future régime for the Antarctic mineral resources. They endorsed the four following principles elaborated in 1976 in Paris at the meeting held in preparation for the Ninth Consultative Meeting:

- "(i) the Consultative Parties will continue to play an active and responsible role in dealing with the question of the mineral resources of Antarctica;
- "(ii) the Antarctic Treaty must be maintained in its entirety;
- "(iii) protection of the unique Antarctic environment and of its dependent ecosystems should be a basic consideration;
- "(iv) the Consultative Parties, in dealing with the question of mineral resources in Antarctica, should not prejudice the interests of all mankind in Antarctica" (recommendation IX-1, para. 4).

300. The aforementioned basic elements of the future régime were supplemented in the decision by one more principle assuring "that the provisions of Article IV of the Antarctic Treaty shall not be affected by the régime" and "that the principles embodied in Article IV of the Antarctic Treaty are safeguarded in application to the area covered by the Antarctic Treaty" (recommendation IX-1, para. 5).

301. Fourth, the Consultative Meeting transformed the appeal adopted at the previous meeting, of the need for restraint in commercial development of Antarctic mineral resources while a timely agreed solution was being sought, into a direct legal obligation on the Consultative Parties. The participants of the Ninth Consultative Meeting agreed to "urge their nationals and other States to refrain

from all exploration and exploitation of Antarctic mineral resources while making progress towards the timely adoption of an agreed régime concerning Antarctic mineral resource activities" and by this to "endeavour to ensure that, pending the timely adoption of agreed solutions pertaining to exploration and exploitation of mineral resources, no activity shall be conducted to explore or exploit such resources" (recommendation IX-1, para. 8). The decision of the Meeting also mentions that these matters will be kept under continuing examination by the Consultative Parties.

302. The above-cited recommendation lacks any definition of what should be considered as timely progress toward the adoption of the régime. Therefore, it leaves the door open to different interpretations regarding the progress required. 47/

303. The mineral resource issue dominated the discussion at the Tenth Consultative Meeting, held in Washington D.C. in 1979. At the Meeting, emphasis was placed on consideration of the environmental aspects of the future régime. The Consultative Parties agreed that a régime for mineral resources should include means for assessing the possible impact of mineral resource activities on the Antarctic environment and for determining whether mineral resource activities would be acceptable. It was stated that rules relating to the protection of the Antarctic environment and the requirement that mineral resource activities be undertaken in compliance with such rules should constitute an important part of the régime (recommendation X-1, para. 4).

304. Objectives were defined in paragraph 6 of the recommendation for studies to improve "predictions of the environmental impacts of activities, events and technologies associated with mineral resource exploration and exploitation in the Antarctic, should such occur" there.

305. At the Tenth Consultative Meeting the participants succeeded in progressing one step further in the elaboration of a joint understanding of the general scope of the régime on mineral resources. They decided that it should include "means for governing the ecological, technological, political, legal and economic aspects of the mineral resource activities in cases where they would be determined acceptable" (recommendation X-1, subpara. 4 (iii)).

306. The Eleventh Consultative Meeting, held at Buenos Aires in 1981, played a final and decisive role in identifying the goals of the Consultative Parties with respect to the régime on the Antarctic mineral resources. That Meeting marked the end of a preparatory stage during which the Consultative Parties had developed a joint general approach to the mineral resource issue and the start of negotiations on the substance of the concrete provisions of the régime.

307. In paragraph 2 of recommendation XI-1, the Consultative Parties concluded that the elaboration of the régime had become a matter of urgency. Therefore, to facilitate their work, they decided, as in the case of the marine living resources, to convene a Special Consultative Meeting "in order to elaborate a régime and to determine the form of the régime including the question as to whether an international instrument such as a convention is necessary" (para. 3) and endorsed guidelines for the Special Consultative Meeting.

308. It was reaffirmed that the régime should be based on the five principles approved at the Ninth Consultative Meeting and that it should include the agreements on requirements for the protection of the Antarctic environment reached at the Tenth Consultative Meeting.

309. As in the past, when starting a round of negotiations on a new issue, the Consultative Parties felt it necessary to restate that the mineral resource régime should not prejudice their positions of principle on the question of sovereign rights claimed in Antarctica. Since a simple reaffirmation of the Antarctic Treaty, as suggested by the Ninth Consultative Meeting, was not found sufficient, the following formula was included in paragraph 6 of the recommendation, specifying the meaning of the principle of the non-prejudicial approach:

"Any agreement that may be reached on a régime for mineral exploration and exploitation in Antarctica elaborated by the Consultative Parties should be acceptable and be without prejudice to those States which have previously asserted rights of or claims to territorial sovereignty in Antarctica as well as to those States which neither recognize such rights of or claims to territorial sovereignty in Antarctica nor, under the provisions of the Antarctic Treaty, assert such rights or claims."

310. As to the question of protection of the environment, an additional requirement was included in subparagraphs 7 (v) and (vii) of the recommendation, providing that the régime should also include the means:

(a) To promote the conduct of research necessary to make the environmental and resource management decisions required;

(b) To ensure that the special responsibilities of the Consultative Parties with respect to the environment in the Antarctic Treaty area were protected, taking into account responsibilities that might be exercised in the area by other international organizations.

311. With respect to the area of application of the mineral resource régime, the Consultative Parties appear to have proceeded from the assumption that the Antarctic continent and the surrounding islands and adjacent sea-bed areas constitute a single unity, and that the adjacent sea-bed areas constituting the natural prolongation of the Antarctic continent under the sea should be governed by the same régime as the continent. Using this concept of interrelation between the land mass and its natural prolongation undersea, the Consultative Parties concluded at the Eleventh Meeting that the régime for Antarctic mineral resources should "apply to all mineral resource activities taking place on the Antarctic continent and its adjacent offshore areas but without encroachment on the deep sea-bed" (subpara. 7 (iv)). The precise limits of the area of application of the régime were to be determined in the course of its elaboration. 48/

312. That understanding among the Consultative Parties on the area of application of the régime apparently became possible because it allowed both claimant and non-claimant States to preserve their positions of principle stated in article IV of the Antarctic Treaty.

313. Recommendation XI-1 contains a provision indicating that the participants were "mindful of the negotiations that were taking place at the Third United Nations Conference on the Law of the Sea" (preamble). In that regard, it could be concluded that the definition adopted of the area of application of the mineral resource régime was not considered by the Consultative Parties as contradictory in any way to the draft Convention on the Law of the Sea.

314. On the question of participation in the régime, the Consultative Parties agreed that the régime should include procedures for adherence by States other than the Consultative Parties, which would ensure that those States were bound by the basic provisions of the Antarctic Treaty and would make entities of those States eligible to participate in mineral resource activities (subpara. 7 (ii)).

315. With respect to the activities embraced by the mineral resource régime, the Consultative Parties decided that the régime should "cover commercial exploration (activities related to minerals involving, in general, retention of proprietary data and/or non-scientific exploratory drilling) and exploitation (commercial development and production)" (subpara. 7 (vi)).

316. That definition of the term "exploration" may appear rather vague. Nevertheless, it could be helpful and should be considered a first step in drawing a precise distinction between "exploration", which is understood as a part of commercial activity and therefore subject to regulations under the mineral resource régime, and "scientific investigation", which can be conducted freely in accordance with the Antarctic Treaty. A clear understanding of that point is important in light of the restriction imposed in 1979 at the Ninth Consultative Meeting, namely, that "pending the timely adoption of agreed solutions pertaining to exploration and exploitation of mineral resources, no activity shall be conducted to explore or exploit such resources" (recommendation IX-1, para.8).

317. Since 1981, the Consultative Parties have continued negotiations on the mineral resource régime within the framework of the Special Consultative Meeting. Official sessions of it and informal consultations were held in June 1982 and January 1983 in New Zealand, in July 1983 in the Federal Republic of Germany, in January 1984 in the United States and in May 1984 in Japan. No official reports have been published on the deliberations which took place at these meetings. At the meeting in Tokyo, a decision was reached that the Antarctic Treaty Parties without consultative status should be invited to attend the next meeting on the Antarctic mineral resource negotiations as observers.

ANNEX TO CHAPTER III

Standard Format for the Annual Exchanges of Information

"1. Information in as complete a form as possible under the categories listed below is to be exchanged as early as possible but in no case later than 30 November each year.

"2. Under Recommendations II-VI any extensions, reductions or other modifications of activities (in the categories marked below with an asterisk (\*)) previously reported are to be furnished as soon as possible and in any case prior to 30 June following the season of activity.

"3. If a category is not applicable to the activities of a particular country (for example, if it has no airfields or does not intend to use research rockets) this fact should be stated.

"I.\* The names, types, numbers, descriptions and armament of ships, aircraft, and other vehicles, introduced, or to be introduced, into the Antarctic Treaty Area, and information on military equipment, if any, and its location in the Area. (List only vehicles used for transport to and from Antarctica. Vehicles at individual stations are described under category VIII below.)

"II.\* Dates of expeditions leaving for, and arriving in, the Antarctic Treaty Area, duration of stay, itinerary to and from the Area and routes followed within the Area.

"III.\* The names, locations, and dates of opening of the Party's bases and subsidiary stations established or planned to be established in the Antarctic Treaty Area, listed according to whether they are for summer and/or winter operations.

"IV.\* The names of the officers in charge of each of these bases, subsidiary stations, ships and aircraft; the number, occupations and specialisations of personnel (including any designated by other Governments), who are or will be stationed at each of these bases and subsidiary stations and on board these ships and aircraft, including the number of personnel who are members of the military services, together with the rank of any officers and the names and professional affiliations of personnel engaged in scientific activities:

A.\* Officers in charge of bases.

B.\* Officers in charge of ships.

C.\* Officers in charge of aircraft.

D.\* Number, occupations and specialisations of personnel:



1.\* Summer personnel (listed according to base or ship at which working);

2.\* Winter personnel (listed according to base at which working).

E.\* Number of personnel who are members of the military services together with rank of any officers.

F.\* Names and professional affiliation of personnel engaged in scientific activities (listed according to base or ship at which working. It would be useful to list each person's scientific disciplines as well as his affiliation).

"V.\* The number and types of armaments possessed by personnel.

"VI.\* The programme of work, including scientific investigation, being done and planned at each of these bases and subsidiary stations and on board those ships and aircraft; and also the area or areas of operation to be covered by such programme (this may be included as an Annex).

"VII.\* Principal scientific equipment, which may be listed according to the base at which it is customarily used (this may be included as an Annex).

"VIII.\* Transportation facilities and communication equipment for use within the Antarctic Treaty Area:

A.\* Surface, marine, and air transport vehicles at each base.

B.\* Description of communications facilities using the standard form in accordance with Recommendation VI-2.

C.\* Description of airfields in accordance with Recommendation III-I, including particulars of location, operating conditions and limitations, radio aids to navigation, facilities for radio communications and instrument landing (this may be included as an Annex).

"IX.\* Facilities for rendering assistance (medical and transport services and shelter available in emergencies).

"X.\* Notice of any expeditions to Antarctica not organised by the Party but organised in, calling at, or proceeding from the Party's territory (including tourism in accordance with Recommendations IV-27 and VI-7).

"XI.\* Description of unoccupied refuges in accordance with Recommendation III-II, including name, position, description of location, date established, date last examined and estimate of available accommodation, facilities, food, fuel, and supplies of other kinds (this may be included as an Annex).

"XII. Annual return of the numbers of each species killed or captured in the Antarctic Treaty Area in accordance with Article XII of the Agreed Measures for the Conservation of Antarctic Fauna and Flora, using the format annexed to Recommendation IV-19 (this may be included as an Annex).

"XIII. Notice of the intended use of radio-isotopes in scientific investigations in the Antarctic Treaty Area. (Note: under Recommendation VI-6 this information is to be provided by Consultative Parties as early as possible, preferably six months in advance, but in any case annually.)

"XIV. Notice of intended use of scientific research rockets in the Antarctic Treaty Area in accordance with Recommendation VI-12 including inter alia geographical co-ordinates of the place of launching; the time and date of launching or, alternatively, the approximate period of time during which it is planned to carry out the launchings; the direction of launching; the planned maximum altitude; the planned impact area; the type and other specifications of the rockets to be launched, including residual hazards; the purpose and research programme of the rocket.

"XV.\* Notice of ships which are carrying out substantial oceanographic research programmes in the Antarctic Treaty Area, in accordance with Recommendation VI-13 including information required under categories I, II, IV, VI and VII above."

#### Notes to chapter III

1/ United Nations, Treaty Series, vol. 634, No. 9068, p. 326.

2/ See Charles R. Bentley, Statement, Eighth Annual Conference, Center for Ocean Management Studies, University of Rhode Island, 17-20 June 1981; and Tore Gjelsvik, "Scientific research and co-operation in Antarctica", Antarctic Challenge - Proceedings of an Interdisciplinary Symposium, 22-24 June 1983, Kiel, Federal Republic of Germany, pp. 41-51.

3/ See R. E. Guyer, "The Antarctic System", Recueil des cours de l'Académie de droit international (Leyden, 1974), vol. 139, p. 201.

4/ See Ludger Kappen, "Ecological Aspects of an Exploitation of the Non-Living Resources of the Antarctic", Proceedings of an Interdisciplinary Symposium, p. 212.

5/ See Dick Laws, Earthscan Press Briefing Seminar on the Future of Antarctica, 25 July 1977, p. 2.

6/ See report on the Group of Experts on Mineral Exploration and Exploitation, Report of the Ninth Consultative Meeting (London, 19 September-7 October 1977, pp. 69-72; see also "Preliminary Assessment of the Environmental Impact of Mineral Exploration/Exploitation in Antarctica (EAMREA) - Report of the

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SCARIS Group of Specialists", 1979; and Katherine H. Green, "Environmental Aspects of Potential Petroleum Exploration and Exploitation in Antarctica: Forecasting and Evaluating Risks", United States Marine Mammal Commission, Washington, D.C., February 1982.

7/ James N. Barnes, "Let's Save Antarctica", Richmond, Australia, 1982, p. 30.

8/ See "Protected Areas in the Antarctic", Antarctic and Southern Ocean Coalition (a workshop for delegates to the Antarctic Mineral Negotiations), Washington, D.C., 23 January 1984, pp. 4-5.

9/ A biosphere reserve is a protected area of land or coastal environment displaying one or more of the following characteristics: (a) representative examples of natural biomes; (b) unique communities or areas with unusual features of exceptional interest; (c) examples of harmonious landscape resulting from traditional patterns of land-use; (d) examples of modified or degraded ecosystems that are capable of being restored to more or less natural conditions. See "Looking at biosphere reserves - a 1983 Perspective", Nature and Resources (19(2) April-June 1983), UNESCO.

10/ See Boleslav A. Boczek, "The Protection of Antarctic Ecosystem", Ocean Development and International Law, Journal of Marine Affairs, vol. 13, No. 3 (January 1984), pp. 358-359; Report of the Group of Ecological, Technological and Other Related Experts on Mineral Exploration and Exploitation in Antarctica, Report of the Tenth Consultative Meeting, Washington, D.C. (17 September-5 October 1979), p. 111.

11/ See David A. Colson, "The Antarctic Treaty System: the Mineral Issue", Law and Policy in International Business, vol. 12, No. 4 (1980), p. 858.

12/ See R. Tucker Scully, "The Marine Living Resources of the Southern Ocean", University of Miami Law Review, vol. 33, No. 2 (December 1978), p. 346; see also "Polar Regions Atlas", Central Intelligence Agency, United States of America, May 1978, pp. 52-53.

13/ See chap. II, note 53.

14/ Colson, "The Antarctic Treaty System: the Mineral Issue", p. 869.

15/ V. V. Golitsyn, "Antarctica-mejdunarodnopravovoy rejim", Mejdunarodniye atnosheniya, Moskva 1983 str. 109.

16/ Biological Investigations of Marine Antarctic Systems and Stocks, Volume I: Research Proposals, SCAR-SCOR Working Group 54 (August 1977), p. ix.

17/ Ibid., pp. ix and 5.

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18/ I. Everson, "The Living Resources of the Southern Ocean", FAO GLC/SO/77/1; G. O. Eddie, "The Harvesting of Krill", FAO GLO/SO/77/2; see also Barbara Mitchell and Richard Sandbrook, "The Management of the Southern Ocean" (International Institute for Environment and Development Publication, London, 1980), p. 28.

19/ Mitchell and Sandbrook, "The Management of the Southern Ocean", pp. 28 and 29.

20/ Ronald F. Frank. "The Convention on the Conservation of Antarctic Marine Living Resources", Journal of Marine Affairs, vol. 13, No. 3 (January 1984), p. 303.

21/ Ibid., pp. 300-301.

22/ See David M. Edwards and John A. Heap, "Convention on the Conservation of Antarctic Marine Living Resources: A Commentary", Polar Record, vol. 20, No. 127 (1981), p. 354.

23/ James N. Barnes, "The Emerging Convention on the Conservation of Antarctica Marine Living Resources: An Attempt to Meet the New Realities of Resource Exploitation in the Southern Ocean", MCRC, 20 April 1982, p. 263.

24/ Colson, "The Antarctic Treaty System", p. 876; Edwards and Heap, "Convention on the Conservation ...", p. 358.

25/ Frank, "The Convention on the Conservation ...", p. 304.

26/ Rainer Lagoni, "Convention on the Conservation of Marine Living Resources: A Model for the Use of a Common Good?", Proceedings of an Interdisciplinary Symposium, p. 97; Edwards and Heap, "Convention on the Conservation ...", pp. 359-361; and Barnes, "The Emerging Convention ...", pp. 265-266.

27/ See Barbara Mitchell, "Frozen Stakes - The Future of Antarctic Minerals" (International Institute for Environment and Development, London, 1983), p. 7; James H. Zumberge, "Mineral Resources and Geopolitics in Antarctica", American Scientist, vol. 67 (January-February 1979); John A. Dugger, "Exploiting Antarctic Mineral Resources - Technology, Economics and the Environment", University of Miami Law Review, vol. 33, No. 2 (December 1978), pp. 315-340; and Franz Tessensohn, "Present Knowledge of the Non-Living Resources in the Antarctic, Possibilities for their Exploitation and Scientific Perspectives", Proceedings of an Interdisciplinary Symposium, pp. 189-210.

28/ See Ludger Kappen, "Ecological Aspects of an Exploitation of the Non-Living Resources of the Antarctic", p. 212; Boczek, "The Protection of the Antarctic Ecosystem", p. 363; and "The Future of the Antarctic", background for a United Nations debate, 1 October 1983, Greenpeace International publication, p. 5.

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- 29/ Report of the Group of Experts on Mineral Exploration and Exploitation, annexed to the final report of the Ninth Consultative Meeting, London, 1977, pp. 69-72.
- 30/ Ibid., p. 67.
- 31/ Colson, "The Antarctic Treaty System: The Mineral Issue", p. 849.
- 32/ Sollie, "Jurisdictional Problems in Relation to Antarctic Mineral Resources in Political Perspective", p. 32.
- 33/ C. W. Pinto, "The International Community and Antarctica", University of Miami Law Review, vol. 33, No. 2 (December 1978), pp. 475-487; see also Pinto, "Comment on Professor Wolfrum's presentation 'The Use of Antarctic Non-Living Resources: The Search for a Trustee?'" , Proceedings of an Interdisciplinary Symposium, pp. 164-168.
- 34/ Fernando Zegers Santa Cruz, "The Antarctic System and the Utilization of Resources", University of Miami Law Review, vol. 33, No. 2 (December 1978), p. 471; see also Wolfrum, "The Use of Antarctic Non-Living Resources ...", p. 163.
- 35/ Mitchell, "Frozen Stakes ...", p. 41; see also Ralph L. Harry, "The Antarctic Régime and the Law of the Sea Convention: An Australian View", Virginia Journal of International Law, vol. 21-4, pp. 727-728; and Scharnhorst Müller, "The Impact of UNCLOS III on the Antarctic Régime", Proceedings of an Interdisciplinary Symposium, pp. 169-176.
- 36/ C. W. Pinto, Statement "Earthscan", Press Briefing Seminar on Antarctic Resources and Development, London, 25 July 1977.
- 37/ Alvaro de Soto, Statement, "Earthscan", Press Briefing Seminar on Antarctic Resources and Development, Washington, D.C., 14 September 1979.
- 38/ Wolfrum, "The Use of Antarctic Non-Living Resources ...", p. 145.
- 39/ Leigh Ratiner, Statement, "Earthscan", Press Briefing Seminar on the Future of Antarctica, London, 27 July 1977.
- 40/ Zegers Santa Cruz, "The Antarctic System ...", pp. 431, 470 and 471.
- 41/ Müller, "The Impact of UNCLOS III ...", p. 171.
- 42/ Sollie, Statement, "Earthscan", Press Briefing Seminar on the Future of Antarctica, London, 25 July 1977. See also statements by Croharé, Sollie and Wolfrum, "The Use of Antarctic Non-Living Resources: The Search for a Trustee?", Proceedings of an Interdisciplinary Symposium, pp. 179, 184 and 187.

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43/ Colson, "The Antarctic Treaty System ...", pp. 882-884. See also Zegers Santa Cruz, "The Antarctic System ...", pp. 470-472.

44/ Sollie, "Trends and Prospects for Régimes for Living and Mineral Resources in Antarctica", Statement at the Twelfth Annual Conference, Law of the Sea Institute, The Hague, October 1978, p. 12.

45/ Sollie, "Jurisdictional Problems in Relation to Antarctic Mineral Resources in Political Perspective", p. 39; see also Mitchell and Kimball, "Conflict over the Cold Continent", Foreign Policy, No. 35 (1979), p. 140.

46/ Colson, "The Antarctic Treaty System ...", p. 884.

47/ Ibid., pp. 894-895.

48/ V. V. Golitsyn, "Antarctica-mejdunarodnopravovoy rejim", Mejdunarodniye atnosheniya, Moskva 1983 str. 145-146.

## CHAPTER IV

## SCIENTIFIC RESEARCH AND NATURAL RESOURCES IN ANTARCTICA

A. Antarctic science1. Introduction

318. If scientific research is broadly defined as the pursuit of the unknown, one could assume that scientific interest in Antarctica was evident more than 2,000 years ago when the ancient Greek philosophers had postulated that the land masses of the Northern Hemisphere must be balanced by an equivalent continental mass to the south. The name Antarctica itself indicated that this land was to be found opposite Arctos, the Polar Bear constellation.

319. Antarctica, as yet unseen and unknown, appeared on maps in the Middle Ages; under the name Terra Australis Incognita, it was shown stretching as far north as the Equator. The voyages of the great mariners of the fifteenth and sixteenth centuries, though not directed at exploration of the southern continent, pushed its undefined boundaries farther and farther south. The first voyager was Bartholomew Dias of Portugal, who, in 1487, sailed around the Cape of Good Hope, thus "cutting off" Africa from the Terra Australis Incognita. South America was separated from it on maps when another Portuguese, Ferdinand Magellan, sailed from the Atlantic Ocean into the Pacific through the passage that later acquired his name. However, cartographers of that time took the land on the southern side of the passage for the coast of the southern continent. It took more than 50 years before Francis Drake of Great Britain discovered in 1578 that Tierra del Fuego, mistaken by Magellan for the coast of Antarctica, was actually an archipelago, to the south of which lay vast expanses of ocean. The final separation of the Terra Australis Incognita from the known land masses on maps was made when the Dutch Captain, Abel Tasman, sailed to the south of Australia in 1642.

320. It was the famous voyages of British Captain James Cook, at the end of the eighteenth century, that first highlighted Antarctica as the object of scientific investigation. In 1768 and again in 1772, Captain Cook left England with specific orders to find the as yet undiscovered southern continent. Although the famous voyager did not sight land to the south of the Antarctic Circle, his expeditions were the beginning of the purposeful scientific study of Antarctica. Since then, interest in the scientific exploration of Antarctica has evolved through three distinct stages. The first, which can be described as a response to the challenge of the unknown, corresponded to the late eighteenth and nineteenth century ship voyages to the coast of the icy continent. For the most part, those expeditions to Antarctica were journeys for geographical exploration, coastal mapping and the adventure of opening up a new continent.

321. The next stage reflected a realization of the region's scientific significance for the fundamental study of global phenomena such as the Earth's electricity and magnetism. An awareness of the scientific importance of Antarctica can be linked to advances in the natural sciences in the late nineteenth and early twentieth

centuries. Those trends were a major catalyst for the multidisciplinary programme of basic scientific investigation undertaken during the International Geophysical Year (IGY) of 1957-1958.

322. The IGY made Antarctica somewhat more familiar and accessible to scientists. As a result, the early post-IGY scientific activity in Antarctica had a more diversified scope and included such disciplines as geology and marine ecological studies not envisaged by the IGY programme. Together with the programmes of the IGY, those investigations have yielded a vast amount of new data on Antarctica. Included in this new information was data on natural resources of the region. Since that time, interest in the exploration of Antarctica has reached the latest stage, namely, that of the search for energy and other mineral resources that may be present there.

323. Chronologically, the evolution and scope of scientific research in Antarctica can also be divided into three phases. The 18-month period of the IGY served as a watershed, representing not only a transition from the voyages of adventure and exploration to structured scientific investigation, but also a uniquely successful experiment in international scientific collaboration whose results continue to be applied. The other periods can be termed simply periods of pre- and post-IGY scientific activities, each with its characteristic dominant features in the evolution of scientific research in Antarctica.

324. As the scope of Antarctic science became increasingly diversified and as more nations began to conduct scientific research in the region, the need for concerted planning and co-ordination of these efforts became evident. This was accomplished by a number of international organizations whose relevant activities are described in the last part of this chapter.

## 2. Pre-International Geophysical Year scientific research

325. After the failure of Captain James Cook's attempt to find the southern continent, the first definite sighting of Antarctica was made on 28 January 1820 near the area of the continent now known as Queen Maud Land by the Russian expedition under the command of Captains Thaddeus Von Bellinghausen and Mikhail Lazarev.

326. During the 1820s and 1830s the Antarctic region was visited by British and American sealers. Although their activity cannot be regarded as scientific, their mapping, especially along the shores of the Antarctic Peninsula, extended knowledge of the continent.

327. In the 1840s Antarctic expeditions were mounted by Britain, France and the United States. New portions of the continent discovered by Admiral Jules Dumont d'Urville (France), Lieutenant Charles Wilkes (United States) and Captain James Clarke Ross (Britain) were considered by them to be separate islands, prompting cartographers of that time to draw maps of Antarctica as an archipelago. Antarctica regained its status as a continent after the British scientist John Murray postulated, on the basis of the geological data collected during the voyage of the steam corvette Challenger to the South Seas in 1874, that there was a vast land mass at the South Pole.



328. Serious investigation of the continent began after the Sixth Geographical Congress in 1895 urged the promotion of Antarctic research. Within two decades, the South Pole had been reached by Roald Amundsen of Norway, and scientists had begun to explore the interior of the continent. Those early years of full-scale Antarctic research were full of dramatic events, including tragic deaths and demonstrations of moral and physical heroism by the explorers. From the period of the 1890s to the decade beginning in 1910, expeditions to Antarctica were despatched from Argentina, Belgium, Britain, France, Germany, Japan, Sweden and Norway.

329. Two distinct features of Antarctic research developed at that time that were to exert a major impact on exploration of the continent. The first was a realization of the importance of, and reliance on, the latest technical advances for the success of scientific inquiry in the harsh Antarctic environment. During that period, radio communication and new technical means of transportation represented such advances. The second important aspect was the concept of establishing base stations from which scientific parties made their inland explorations. That concept later became the main prerequisite for the regular conduct of substantial scientific activity in Antarctica.

330. The 1920s marked the introduction of aviation in Antarctic research. In 1928-1929, Admiral Richard E. Byrd of the United States flew from the edge of the continent to the South Pole and routinely used radio communication and aerial photography for his surveys. Thereafter, aviation became one of the most efficient means for Antarctic research.

331. In the 1920s and 1930s long-term Antarctic scientific programmes were also developed. Those were exemplified by British-Australian-New Zealand continuous scientific investigations conducted by the research vessel Discovery in 13 voyages to Antarctica between 1923 and 1939. Scientific activity in Antarctica dwindled during the 1940s with the outbreak of the Second World War, but then received a new impetus with the launching in 1946 of a large-scale United States Navy expedition, "Operation High Jump". That expedition included 13 ships, 25 aircraft and more than 4,000 men and produced a vast amount of new scientific data, some of which dealt with previously unseen Antarctic areas. A similar United States Navy project was held in 1947-1948.

### 3. The International Geophysical Year

332. The idea of the IGY evolved in the early 1950s from the concept of the International Polar Year, a worldwide scientific undertaking that had taken place twice before, first in 1882-1883 and then in 1932-1933. The more immediate impetus was a geophysical study that predicted an outburst of solar activity in the period 1957-1958. In order to study associated terrestrial phenomena, a global network of scientific observations had to be set up with special emphasis on high latitudes. Thus, it was inevitable that Antarctica would become the site of a major part of this network, as well as an object of thorough geophysical investigations.

333. In order to co-ordinate national activities in preparation for the IGY, compile its combined programme and facilitate its execution, in 1951-1952 the International Council of Scientific Unions (ICSU) set up the Comité Spécial de l'Année Géophysique Internationale (CSAGI). National IGY committees were also created in the participating countries. From the outset, CSAGI emphasized the scientific significance of Antarctica, which it described as a region of almost unparalleled interest in the fields of geophysics and geography, and urged that as many countries as possible should conduct geophysical studies on the continent.

334. Officially the IGY started on 1 July 1957 and ended on 31 December 1958. At the first CSAGI meeting in 1953, there were 22 participating nations in the IGY. By the time field operations started, there were 67. More than 25,000 scientists and technicians were mobilized for the IGY programmes.

335. When the Antarctic part of the IGY began, 12 nations were participating: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom and the United States. Fifty-five stations were established around the continent and on subantarctic islands.

336. Nine major scientific programmes were planned for Antarctica, comprising investigations on the aurora, cosmic rays, geomagnetism, glaciology, gravity, ionospheric physics, meteorology and seismology and an international weather station. There were also programmes dealing with oceanography, biology and the medical sciences.

337. It was already recognized during the planning stages of the IGY that, owing to a lack of fundamental data on Antarctica and the harshness of its environment, it was imperative that scientific co-operation in the area and the free exchange of information and views should be facilitated and maintained at the highest possible level. This idea was successfully implemented during the IGY, and scientific personnel and information were exchanged openly through such programmes as the Antarctic Weather Central. In addition, scientific stations were open throughout Antarctica for access to all interested scientists. When, in 1981, representatives of the Antarctic Treaty Consultative Parties commemorated the twentieth anniversary of the Treaty's entry into force, they cited the IGY as the model for the Treaty's foundation of continued peaceful co-operation and freedom of scientific investigation. In fact, aspects of scientific activity in Antarctica during the IGY, such as the freedom of scientific investigation and co-operation, the exchange of information regarding plans for scientific programmes, the exchange of scientific observations and results from Antarctica and the free access to all stations, installations and equipment, were later embodied in the language of the provisions of articles II, III and VII of the Antarctic Treaty.

338. As the results of the Antarctic programme began to emerge during the IGY, the importance of providing for continuous international efforts in the scientific investigation of Antarctica became apparent. It was notable that even during the IGY, all of the countries that had carried out investigations on Antarctica had also decided at the end of the IGY to continue and extend their programmes indefinitely. National co-ordinating committees and special polar research

institutes were established at that time in countries conducting Antarctic investigations. Accordingly, in the fall of 1957, CSAGI recommended to ICSU that a Scientific Committee on Antarctic Research (SCAR) be established to continue international co-ordination of and collaboration in Antarctic research following the close of the IGY. ICSU approved the formation of SCAR, and the latter held its first two meetings in 1958.

339. According to its own constitution, SCAR is a scientific committee of ICSU charged with furthering the co-ordination of scientific activity in Antarctica, with a view to framing a scientific programme of circumpolar scope and significance. SCAR is made up of one scientific delegate nominated by each country that is actively engaged in Antarctic research, one delegate from ICSU, three from scientific unions federated in ICSU, and one from WMO.

340. Following the pattern of the IGY, SCAR established scientific objectives for research in Antarctica which served as an overall guide for the development of annual programmes by each country. The role of SCAR in formulating and co-ordinating scientific programmes in Antarctica was acknowledged by the Antarctic Treaty signatories in the following statement from a resolution adopted in 1960:

"(1) The free exchange of information and views among scientists participating in SCAR and the recommendations concerning scientific programmes and co-operation which have been formulated by SCAR, constitute a most valuable contribution to international scientific co-operation in Antarctica.

"(2) The Governments recognize that these activities of SCAR constitute the kind of activity contemplated in Article III of the Antarctic Treaty, now pending ratification.

"(3) It is the intention of the Governments to encourage SCAR to continue this advisory work which is so effectively facilitating international co-operation in scientific investigation in Antarctica."

#### 4. Post-International Geophysical Year scientific research

341. At the conclusion of the IGY the 12 nations that had participated in the Antarctic programme formally recognized the co-operative spirit of their scientific venture by drafting the Antarctic Treaty, which was signed by their representatives in Washington, D.C. on 1 December 1959. Freedom of scientific access and research and international scientific co-operation in Antarctica, which are enshrined in the Treaty, have been developed in a number of ways since 1959. SCAR co-ordinates scientific activity in the area and forms a continuing non-governmental forum for scientific collaboration. The high degree of collaboration created during the IGY has been maintained and developed, with sharing of data, co-ordination of research and regular exchanges of scientific personnel between national research stations.

342. Although the number of permanent scientific stations in Antarctica has been reduced from 55 to 34 since the end of the IGY in 1958, the scientific scope of investigation has been expanded and diversified. Antarctic science programmes for the most part fall within five main areas; each is described here briefly.

(a) Solid earth sciences

343. The solid earth sciences group is probably the most diversified, comprising cartography, geodesy, geology and solid earth geophysics. The latter two geosciences in turn embrace a number of disciplines, including seismics, magneticS, gravimetry, geochemistry, volcanic geology, glacial geology and paleontology etc. Areas of special interest include the geologic relationship between East and West Antarctica, the evolution of the Southern Ocean and major continental features, the geologic history of the Southern Hemisphere as it is preserved in fossils, and the assessment of Antarctica's mineral resource potential. For geophysicists, Antarctica is a uniquely stable platform for investigating global geodynamics and for studying the deep structure of the Earth.

344. As a result of the efforts of geoscientists, a vast amount of data on Antarctica has been collected. The surface of the continent was completely mapped on a scale of 1:6,000,000, and work is in progress on compiling larger scale maps for different scientific purposes. One of the latest compilations of measured physical information about Antarctica contains, for example, a number of maps ranging in scale from 1:2,500,000 to 1:25,000,000 that show, for example, the newly compiled coastline, fully integrated subglacial bedrock and ocean bathymetric contour map; new calculations of the area of Antarctica; mean ice thickness and ice volume; the internal structure of the Antarctic ice sheet; a complete contour map of Antarctica after removal of the ice load and isostatic recovery; over 300 determinations of depth to the magnetic basement in West Antarctica; and the delimitation of the principle crustal plates as derived from geophysical studies. Geophysical methods combined with field geology have disclosed the main features of the disintegrated supercontinent Gondwanaland, consisting also of South America, Africa, India, Australia and New Zealand, has been proved.

(b) Glaciology

345. Glaciology stands prominently among sciences in Antarctica. What makes it unique is, of course, the amount of ice cover or the degree of glaciation which covers the continent almost completely, extending well out into the adjoining oceans along much of the coast. It has been estimated that Antarctic glaciers constitute about 90 per cent of the Earth's glaciation. The Antarctic ice shield, covered with snow which almost completely reflects the sun's radiation, causes a negative heat balance. In other words, it makes Antarctica a vast sink of heat. This heat is constantly supplied to the continent from northern latitudes by water and air masses, only to be dissipated into space. Hence, the special importance which Antarctica bears with regard to the Earth's climate in general and its heat and water budget in particular.

346. Glaciologists study the structure and dynamics of Antarctica's ice sheet, its reactions to past climatic changes and the record contained in the ice of the variation of atmospheric constituents over time. Over the past two decades, researchers have attempted to define the size and thickness of the ice sheet and to determine whether it is growing or shrinking. Ice coring and isotopic analyses have given information on climatic conditions of thousands of years ago. Using airborne radio-echo sounding, coupled with seismic studies, scientists have measured the thickness of the ice-cover (up to 4.7 km) and have mapped the subglacial topography of Antarctica.

(c) Atmospheric sciences

347. Atmospheric processes in Antarctica have distinctive global effects on the Earth's climate, and the region may also play an important role in long-term climatic variability. Scientists in Antarctica are investigating physical processes in the lower atmosphere and the atmosphere-ocean-continent interaction and their influence on climate and weather. Synoptic meteorological data enable scientists to probe large-scale atmospheric dynamics, to model atmospheric processes and to improve long-range weather forecasting in Antarctica. The remoteness of the continent from anthropogenic sources of air pollution makes it an ideal place to gather data on atmospheric aerosol transport and precipitation, and on the variability of trace gas constituents and their effect on climate.

348. The fact that Antarctica sits on one of the two geomagnetic poles of the Earth makes it unique for upper atmosphere research, which is concerned with geomagnetism, cosmic rays and auroral and ionospheric physics. Magnetic field lines that intersect the surface of the continent almost vertically provide tracks for solar waves and particles and are associated with ionospheric and magnetospheric phenomena. These cannot be observed as well elsewhere.

(d) Ocean studies

349. Antarctic oceanography is the oldest and most traditional part of scientific research in the region. With time, its methods and scope have expanded but its object is still the Antarctic (or Southern) Ocean. It is the only great ocean whose east-west extent is not interrupted by continental land masses. Its southern boundary is Antarctic itself, whose ice sheet in all but a few points extend to the water's edge. These ice sheets cover in certain areas what, in a warmer climate, might be deep embayments or Mediterranean-type seas. At its northern boundary, it is in open communication with the three major ocean systems of the temperate and tropical regions. This suggests the great role played by Antarctic waters in the polar-tropical water exchange and in the heat and water budgets of the Earth as a whole.

350. Oceanographers conduct hydrophysical research aboard specialized vessels, using long-term autonomous buoy stations equipped with meters and recorders. Their studies are directed towards elucidating the circulation pattern in the Antarctic circumpolar current in large-scale cyclonic eddies, the mechanism of mass exchange across the Antarctic and ice-border convergences and the Antarctic divergence. A better understanding of this mechanism, which brings cold, nutrient-rich Antarctic waters to temperate latitudes, is necessary to assess some of the largest stocks of fish in the world.

351. Another component of Antarctic ocean studies is marine biology. Scientific data suggest that the oceans surrounding Antarctica comprise one of the world's richest regions of marine life. Although over recent decades biologists have gathered much data on the types of Antarctic marine life, more information is needed on the interactions among species, their life histories, abundance and distribution and special adaptations to the environment. Current research emphasizes the study of the structure and function of this ecosystem, as well as an

understanding of adaptations to Antarctic environments, particularly low temperatures. With the entry into force in 1982 of the Convention for the Conservation of Antarctic Marine Living Resources a better understanding of this marine ecosystem will have direct application in its operation. Such data would provide the international community with the information necessary to manage and conserve Antarctic marine life.

(e) Biological and medical sciences

352. Compared to the flourishing animal world in Antarctic waters, terrestrial life in Antarctica is meagre. In the ice-free regions of the continent, a few terrestrial species and ecosystems have evolved over several million years and have adapted to the extreme cold and dryness. Bacteria, algae and lichens survive just below the surface of some rocks. The inland animal world in Antarctica is represented by several insect species. Among them, a 5 mm long wingless mosquito, which was found in the Antarctic Peninsula, is the largest Antarctic terrestrial animal.

353. Poor though it is, terrestrial life in Antarctica has been demonstrated by biological research to be linked to the abundant marine ecosystems through penguins and other birds.

354. The simplicity of the terrestrial ecosystems provides an opportunity for analyses that are difficult or impossible in more complex systems. By studying these organisms and ecosystems, biologists are learning more about adaptations that may be applicable to more complex organisms, the response of these systems to human intervention, and their distribution, abundance and dynamics.

355. Finally, there is also one aspect of Antarctic science, the biomedical aspect, where the human being itself has been an object of research. The harshness of Antarctic conditions and the isolation of scientific communities working on the continent provide biomedical researchers with opportunities to study human physiology and behavioural reactions in this extreme environment.

5. Scientific activities of international organizations in Antarctica

356. Beside SCAR, which is an advisory body to the Antarctic Treaty parties and whose activities have been described elsewhere, there are several other international organizations that have acquired distinct co-ordinating and data-communicating roles in scientific activities in Antarctica. The following description of their activities is based on their responses pursuant to General Assembly resolution 38/77.

(a) Commission for the Conservation of Antarctic Marine Living Resources

357. In the field of research in Antarctic marine living resources and the Antarctic marine ecosystems, an active role is played by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), an intergovernmental

organization, established pursuant to the Convention on the Conservation of Antarctic Marine Living Resources which was signed in 1980 and entered into force in 1982. Its objective is to conserve the Antarctic marine ecosystem through scientifically based management. It facilitates relevant research by compiling data on the status and development of Antarctic marine living resources; acquiring catch and effort statistics on harvested populations; analysing, disseminating and publishing data; identifying conservation needs; evaluating the effectiveness of conservation measures; formulating and adopting conservation measures on the basis of the best scientific evidence available; and implementing a system of observation and inspection.

358. A Scientific Committee has been established to give expert advice to the Commission and to provide a forum for consultation and co-operation concerning the collection, study and exchange of information on Antarctic marine living resources. In its activities for co-ordination and dissemination of research and data, the Commission establishes working relations with United Nations-affiliated organizations and agencies, including FAO and IOC. The Commission and its Scientific Committee also seek to develop co-operative working relationships with intergovernmental and non-governmental organizations, including SCAR and SCOR of ICSU and the International Whaling Commission.

(b) International Whaling Commission

359. The International Whaling Commission (IWC), created in 1946, co-ordinates research activities and has available the results of its own sponsored research programmes and those of its member Governments, relating to the population dynamics, and status and trends of stocks of several large whale species. However, its main field activity in the Antarctic (Southern) Ocean is the collection of whale catch statistics through the Bureau of International Whaling Statistics of Sanden fjord, Norway.

(c) Scientific Committee on Oceanic Research

360. Also working on marine ecosystems and their living resources as well as on hydrological problems of the Southern Ocean is the Scientific Committee on Oceanic Research (SCOR) of ICSU. Its working groups have recently been planning and co-ordinating such projects as the Second International BIOMASS Experiment (SIBEX), within the framework of which 11 countries have committed 17 ships to study mesoscale hydro- and bioprocesses in the Southern Ocean; the problem identification study on the status of physical and chemical oceanography of the Southern Ocean; and the problem identification study, co-sponsored by SCAR, on the Antarctic pack ice zone.

(d) World Meteorological Organization

361. Closely related to and often interconnected with the Southern Ocean studies of SCOR are the Antarctic meteorological activities of the World Meteorological Organization (WMO). Due to Antarctica's influence on the world weather and climate referred to earlier, all the global programmes of the First WMO Long-Term Plan (1984-1993) include activities in Antarctica. These fall within two categories:

(a) Meteorological and ocean-related activities physically carried out in the Antarctic area, defined in the WMO General Regulations as comprising the area south of 60°S latitude;

(b) Scientific and research activities related to atmospheric and other geophysical (including ocean) phenomena specifically related to the Antarctic. These activities may also be conducted outside of Antarctica.

362. WMO has been developing arrangements for Antarctica similar to those for other parts of the world with respect to the planning and operation of the World Weather Watch (WWW), which is the main programme of the First WMO Long-Term Plan and on which most of the other WMO programmes depend. The operational components of WWW are the Global Observing System, part of which is also to be established and maintained in Antarctica, the Global Data Processing System and the Global Telecommunications System.

363. At present, the extension of activities into Antarctica is regulated through a number of resolutions of the WMO Executive Committee. These resolutions deal specifically with a meteorological observation network in the Antarctic, the collection and transmission of meteorological data in the Antarctic and adjacent areas, and meteorological data processing activities at stations on the continent.

364. In addition, data are collected through the WMO Marine Meteorological Service from voluntary observing ships in sea areas south of 60°S latitude, and Marine Meteorological Services are provided by stations located in and outside Antarctica. There are also important sea-ice activities in the area. The Joint WMO/IOC Integrated Global Ocean Station System programme is also concerned with ocean data collection and ocean services in Antarctica waters.

365. In addition to meteorological and related geophysical scientific research activities with specific reference to Antarctica, the following activities are carried out by stations in Antarctica or outside:

(a) Research, in particular, under the World Climate Research Programme (WCRP), using data from Antarctica;

(b) Development of instruments and methods of observation for use in Polar regions, including Antarctica;

(c) Studies of the climate in Antarctica.

366. The above-mentioned activities are closely co-ordinated with SCAR. In particular, WMO is participating in the work of the SCAR Working Group on Antarctic Meteorology.

367. The Ninth World Meteorological Congress, held at Geneva in 1983, invited Members of the Organization which are parties to the Antarctic Treaty and Members having active meteorological programmes in Antarctica to continue, if possible, to enlarge their meteorological observing programmes in the area. In order to meet the needs for co-ordinating meteorological activities in the zone, the WMO



Executive Council was requested to maintain its Working Group on Antarctic Meteorology for dealing with all routine meteorological matters and aspects of meteorological research. This Working Group is composed of experts, designated by Permanent Representatives to WMO, from countries that are parties to the Antarctic Treaty, and experts designated by Permanent Representatives of members who have not yet acceded to the Treaty, but who have active meteorological programmes in Antarctica. All recommendations of the Group are transmitted to all members who are parties to the Antarctic Treaty prior to their consideration by the Executive Council and prior to implementation by members.

368. WMO recommendations or resolutions on antarctic meteorology are brought to the attention of the Consultative Meeting of the Antarctic Treaty through the Permanent Representatives of the members to WMO. Similarly, requests and recommendations of the Consultative Meetings of the Antarctic Treaty are conveyed to WMO through the Permanent Representatives of the parties signatory to the Treaty. This mechanism ensures that Antarctic meteorology is a full part of WMO programmes and that the special conditions of the Antarctic Treaty are fully respected.

(e) Committee on Space Research

369. With remote sensing via satellites playing an ever-increasing role in oceanic, climatic and other Earth sciences, the Committee on Space Research (COSPAR) of ICSU has entered the field of Antarctic science. Together with WMO, SCAR, SCOR and other organizations that served as co-sponsors, COSPAR organized a Symposium on Space Observations for Climate Studies, held at Graz, Austria, from 25 June to 7 July 1984, during which a separate session was held on the "cryosphere", consisting of the presentation of several papers related to research in Antarctica. Also, a joint COSPAR/SCAR workshop was organized at that time on the topic "Satellite observations of the Antarctic: past, present and future".

B. Antarctic resources

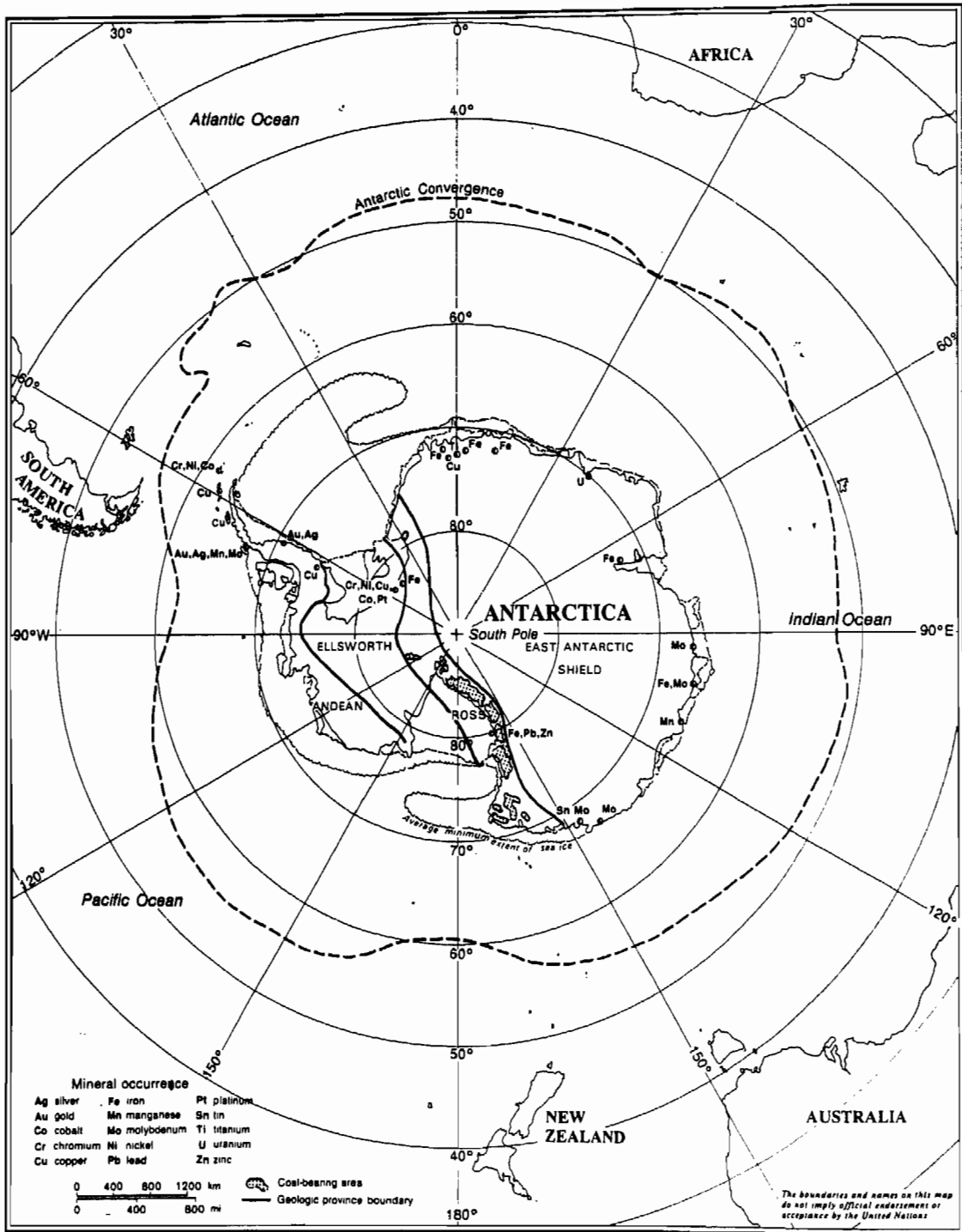
1. Minerals on land\* (see figure 2)

370. Minerals have been known to exist in Antarctica since coal was first discovered there in 1907-1909. However, mineral exploration in Antarctica is made difficult by the obvious geological constraint that most of the rock structure is inaccessible because it is buried beneath hundreds of thousands of metres of moving ice. Only 1 to 2 per cent of the Antarctic continent is considered more or less ice free. The remaining exposed land consists of high mountains deep in the continental interior.

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\* The major reference source for the survey of minerals on land is Rowley, Williams and Pride, "Mineral Occurrences of Antarctica" in Petroleum and Mineral Resources of Antarctica, Behrendt and others, United States Geological Survey Circular 909 (for other sources, see reference section, pp. 113-116).

Figure 2. Known mineral occurrences



Source: Polar Regions Atlas, Central Intelligence Agency: National Foreign Assessment Center, 1978, p. 57.

371. Four major geological provinces are generally recognized and rocks from most of the major geological periods have been identified. Field exploration to date has located only two mineral accumulations that are large enough to be considered deposits: iron in the Prince Charles Mountains and coal in the Transantarctic Mountains.

372. In discussing this subject, economic geologists usually use two sets of terms that should be explained. First, one must distinguish among mineral occurrences, deposits and reserves: (a) an occurrence is the presence of a mineral, often in extremely small quantity. It is of geological interest and may be a pointer to something more, but of itself is not a foundation for commercial activity; (b) a deposit is a more substantial quantity of a mineral that may merit commercial exploitation depending on where it is (and hence how difficult it is to extract) and on the world market for that particular mineral. At present, no deposit economically worth extracting has been found in Antarctica; (c) a reserve is a deposit whose size and extent have been measured or calculated and that is known to be of commercial value today or is expected to become so in the future.

373. The second point of nomenclature is the transition from exploration to exploitation. There are generally four stages in this process. The first is one of regional geological exploration - a basic scientific activity. This is likely to reveal mineral occurrences and may indicate local concentrations. These may be sufficiently interesting to stimulate the second stage: an intensive local geological survey, which may reveal or suggest deposits. The third stage is exploratory drilling to determine subsurface structure and perhaps prove the deposit. If that indicates the presence of commercially valuable reserves, preparations may be made for commercial development, leading to the fourth and final stage: exploitation. Antarctic geological research so far has been confined to the first of the four stages noted above.

374. Occurrences of a wide range of minerals have been recorded in the process of exploration. Copper and molybdenum, with lesser amounts of gold, silver, chromium, nickel and cobalt have, for example, been recorded in the Antarctic Peninsula. Chromium, platinum, copper and nickel have been recorded in the Dufek Massif, and copper, lead, zinc, silver, tin and gold occurrences have been recorded elsewhere in the Transantarctic Mountains. Occurrences of copper, molybdenum, tin, manganese, titanium and uranium have been reported in the East Antarctic Shield.

375. Predictions about the likely occurrences of minerals in Antarctica have been based, in addition to regional geological exploration, on extrapolation from other southern continents of comparable structure and age. This is known as the Gondwanaland thesis. It is now generally accepted among geologists that some 200 million years ago, Antarctica was united with South America, Africa, Australia and India in a single land mass known as Gondwanaland. The mountains of the Antarctic Peninsula were once continuous with the Andes, suggesting that the former might likely be a location for copper deposits similar to those of Peru and Chile. The continental shelf beneath the Ross Sea was at the time of Gondwanaland adjacent to the shelf between Tasmania and Australia, where it has been reported that oilfields have been discovered. Structural similarities between the East Antarctic Shield

and those parts of Australia and South Africa with which it was once contiguous have similarly led to the speculation about the possible Antarctic occurrence of uranium.

(a) Iron

376. Iron is the commodity forming the potentially largest deposits in Antarctica. Its distribution suggests the presence of an iron metallogenic province in East Antarctica. The largest known deposits of iron-formation in Antarctica are in the Prince Charles Mountains, MacRobertson Land (Grew, 1982; Ravitch et al., 1982). The largest deposits occur on Mount Ruker. Intensely faulted beds of banded iron-formation (iron formations showing marked banding) were noted by Ravitch et al. (1982) at Mount Stinear north-east of Mount Ruker. Tingey (1982), however, found only low-grade iron-bearing rocks at Mount Stinear. The banded iron ore formation in the Prince Charles Mountains, which has been described in detail by Soviet geologists (Ravitch et al., 1982) is about 70 m thick. It is exposed in a rock cliff over two and a half kilometres long. The ore contains 30 to 40 per cent iron and in some places up to 0.2 per cent nickel.

377. Iron occurrences are abundant in Enderby Land, although none have been described in detail. Most iron occurrences are in the Napier Complex, but some are in the adjacent Rayner Complex. In 1977, Australian geologists reported the discovery of the largest deposit of banded iron-formation in Enderby Land, at Newman Nunataks (a nunatak is a mountain peak surrounded by ice). The deposit is 750 m long, 150 m wide and 20 m thick and has an average iron content of 34 per cent (Lovering and Prescott, 1979).

378. Glacial boulders of banded iron-formation have been found along the coastline of East Antarctica between longitudes 78° E and 93° E. For example, in the Vestfold Hills of the Ingrid Christensen Coast, banded iron-formation of greenschist facies (an assemblage of minerals formed between 300° and 500° F during regional metamorphism) occurs as boulders as large as 2 m (Ravitch et al., 1982).

379. The iron-oxide vein subprovince of Queen Maud Land contains numerous iron occurrences whose origins are not well understood. Iron occurrences are also abundant outside the East Antarctic Shield. Magnetic-type iron is found in the Dufek Intrusion of the northern Pensacola Mountains, Transantarctic Mountains.

380. Magnetic iron is associated with other stratiform intrusions in Antarctica, especially in the Antarctic Peninsula.

381. It should be pointed out that, under more favourable economic conditions, banded iron-formations similar to those occurring in Antarctica are being mined as iron ores. However, problems associated with mining, adverse climatic conditions, the remoteness of the continent and the existence of more accessible and significant reserves of iron elsewhere in the world tend to make the existing low-grade iron ore in Antarctica not economically attractive for the foreseeable future.

(b) Coal

382. According to Spletstoeser (1980) the coal deposits of the Transantarctic Mountains, possibly the largest in the world, cover an area of about 100,000 sq km. It may extend even farther under the ice cover of the East Antarctic Shield. The coal is considered to be low-grade with a high ash content. It is also well inland. Coal of the same type is commercially exploited in Australia.

383. Coal is widespread in Antarctica. Thick beds of coal are known in the Transantarctic Mountains and in the Beaver Lake area of the Prince Charles Mountains. None of the deposits are reported to be economically recoverable; those near the coastal areas may have the greatest potential for development. The deposits in the Prince Charles Mountains may be somewhat more favourable for development because of their proximity to promising iron deposits and to the coast. Coal has also been reported in sediments at Horn Bluff in George V Land, the Meimefront Range in Queen Maud Land and at the Ellsworth and Horlock Mountains. It is reportedly quite conceivable that coal measures extend from coast to coast under much of the great ice cap of East Antarctica. Given the restricted distribution, quality and difficulties associated with mining and transporting coal in Antarctica, it is believed extremely unlikely that this coal will constitute a viable energy resource for the world before alternative energy sources become available.

(c) Copper

384. The geological similarities between the Andes and the Antarctic Peninsula have lent considerable weight to speculations that the immensely rich copper deposits of the Central Andes, which can be traced northward to the western regions of North America, may also extend into the Antarctic Peninsula.

385. Occurrences of disseminated copper, molybdenum and related metals are common in the Antarctic Peninsula, but most are deeply eroded or poorly known. Secondary copper minerals, especially those called malachite by many authors, are abundant in the peninsula and to a lesser extent in other parts of Antarctica. The most promising copper occurrences are on islands west of the mainland Antarctic Peninsula (Rowley and Pride, 1982). Much detailed exploration of the Antarctic Peninsula has yet to be completed before major copper deposits in the region can be ruled out. Some authors regard this as a good prospecting area for porphyry copper deposits. This is a type of copper in which the copper iron sulphides called chalcopyrite and bornite occur with the iron sulphide called pyrite in highly fractured and altered zones in granite intrusions.

386. The copper occurrences in the Pacific margin of West Antarctica define a copper subprovince within the Andean metallogenic province. Two copper occurrences have been reported in south-central Livingston Island of the South Shetland Islands. Numerous scattered areas of copper and iron minerals occur farther south along the east coast of the Antarctic Peninsula, on the Foyen and Bowman coasts.

387. The British Antarctic Survey (1982) noted several localities containing copper and iron minerals in rocks of the Antarctic Peninsula on the west coast of northern Palmer Land. The British Antarctic Survey (1982) noted copper and iron minerals at

localities in the Wilkins Coast, northern Black Coast, the Baterbee Mountains and Journal Peaks.

388. Rowley and Pride (1982) and the British Antarctic Survey (1981) summarized reports of small amounts of metallic (mostly copper and iron) minerals in numerous places in and north of the Marguerite Bay area of the west central Antarctic Peninsula. Minor pyrite and secondary copper minerals have been noted at two localities in the southern Marguerite Bay area.

389. Elsewhere in West Antarctica, "copper shows" are reported by Wade (1976) along joints on nearly all mountains and nunataks in Marie Byrd Land.

390. In the Transantarctic Mountains, copper and related base and precious metals define the Ross subprovince of the Transantarctic metallogenic province.

391. Before one can say definitively that there are no major copper deposits in Antarctica, a greater detailed geological examination of the region is needed.

(d) Molybdenum

392. Trace associations of molybdenite with the porphyry copper-type occurrences in the Antarctic Peninsula region have been recorded by Rowley and Pride (1977). In addition to the occurrences of molybdenite associated with copper mineralization, molybdenum is widespread in the Mirny Station area, the Bonger Hills and Queen Maud Land. Molybdenite also occurs in granite near Ainsworth Bay (Ravitch and others, 1965). Molybdenite is associated with pyrite, sphalerite and arsenopyrite in quartz veins at Cape Denison, Adélie Coast. It is believed that none of these molybdenum occurrences contain economic concentrations.

(e) Nickel, chromium and cobalt

393. Many of the world's most important chromium, nickel and cobalt deposits are associated with huge igneous intrusions of basalt-like composition and showing a generally horizontal layering like a sedimentary rock.

394. One of the world's largest igneous complexes makes up nearly the entire northern third of the Pensacola Mountains and is known as the Dufek Intrusion. As Wright and Williams (1974) indicate, although no significant metal deposits are yet known in this complex, it must still be considered a prime exploitation target. Another similarly layered complex of the Dufek type has been reported in the Warren Range in Southern Victoria Land, but it has not been examined in detail (Lovering and Prescott, 1979).

395. Chromium is present on Gibbs Island and South Shetland Islands. The intrusion may contain nickel and cobalt minerals and perhaps graphite and asbestos.

(f) Precious metals

396. Significant concentrations of precious metals have not been recorded in Antarctica. Minor gold and silver have been noted in the Antarctic Peninsula. Traces of gold and silver occur in pyrite-quartz veins in the Cape Denison area of

the Adélie Coast. Platinum-group metals may be present within the exposed part of the Dufek intrusion. To date, however, none has been identified from the intrusion, although anomalous trace amounts of these metals show up in some rock analyses (Ford, 1983). Lead and zinc as well as manganese and tin have been found on the continent.

(g) Other non-metallic minerals

397. Wright and Williams (1974) have catalogued the occurrence of a number of non-metallic minerals, none of which occurs in amounts sufficient to be considered of economic importance, even if the occurrence were situated elsewhere in the world.

398. Green translucent beryl crystals have been noted in many parts of East Antarctica. The largest known occurrence is in the Marble Nunataks north-west of the Humboldt Mountains of central Queen Maud Land. Rock crystal (clear quartz) occurs in the Humboldt Mountains. Evaporite salts are forming in many places in Antarctica, generally on sea ices, on rocks and within lakes along coast areas. Pure coarse-grained white marble occupies a 200 m by 100 m area in the Hektor Glacier area off Graham Land. Graphite has been found in two localities in Queen Maud Land. Phosphate rock bands up to 1 m thick occur in sandstones in the Pensacola Mountains.

(h) Uranium and thorium

399. Eucenite occurs as an accessory mineral in the Lutzow-Holm Bay area of eastern Queen Maud Land (Wright and Williams, 1974). French geologists have noted anomalous amounts of radioactivity in the Adélie Coast (Wright and Williams, 1974). Airborne gamma-ray surveys of parts of Antarctica have disclosed radioactive anomalies in a number of sections of the continent. Some of those surveys also found radioactive anomalies that proved, on field inspection, to be underlain by thorium- and uranium-bearing minerals as well as rare earth and tin minerals. Stump and others (1981) noted uranium minerals in the upper Scott Glacier area of the Transantarctic Mountains. It is believed, however, that no occurrences in Antarctica contain commercial quantities of radioactive minerals.

(i) Summary

400. Exploration for mineral deposits has barely started in Antarctica. There has been little incentive to search for economic deposits because of the harsh environment (blizzards, ice, winds), the lack of infrastructure (poor existing facilities; if better ones are built, they could not be used for more than two months of the year), tremendous transportation problems (the continent is distant from potential markets) and the extreme cost of exploration and mining operations.

401. Some authors and geologists point out that there are reasons to believe that Antarctica contains many and high-quality mineral deposits. As noted earlier, the Gondwanaland theory suggests that some of the known ore belts of South Africa, India, Australia and South America may continue into Antarctica. Some geological formations appear to give promise of potential deposits; for example, the Dufek Massif south of the Weddell Sea is considered favourable for chromium, nickel and platinum and the Prince Charles Mountains for iron.

402. Nearly all of the mineral occurrences on the continent are considered to be isolated and small. In addition, severe environmental conditions causing general inaccessibility, the state of polar exploitation technology and current world reserves situated in other more accessible continents lead to a widely shared view that Antarctic mineral deposits and occurrences are not likely to be exploited in the near future.

## 2. Offshore resources\*

### (a) Petroleum (see figure 3)

403. There are no known petroleum resources in Antarctica (Behrendt and Masters, 1983). None the less, because of the current concern for and scarcity of supplies of oil and gas, Antarctica has begun to attract increased international interest.

404. The continental shelf is generally less than 200 km wide around East Antarctica, while in some stretches of West Antarctica it is 300 to 400 km wide. The average depth of the shelf is 500 m below sea level, which is more than twice the average of continental shelves elsewhere in the world (200 m) (Zumberge, 1979). In the Ross Sea, for example, it is up to 800 m deep.

405. Except for the part of the continental shelf beneath the Ross Sea and the western side of the Antarctic Peninsula, very little geophysical data on the geological structure and thickness of sediments are available. Much of the available geophysical data was obtained from cruises of the USNS Eltanin and the drilling vessel Glomar Challenger under the auspices of the United States National Science Foundation (NSF) between 1962 and 1973. Those data are confined to the deeper waters of the Southern Ocean, where pack-ice conditions are less severe than in the shallower waters overlying the continental shelf.

406. Nevertheless, the SCAR group of specialists has suggested that the continental shelf on either side of the Antarctic Peninsula and beneath the Ross and Weddell seas may attract exploration activities for hydrocarbons sometime in the future.

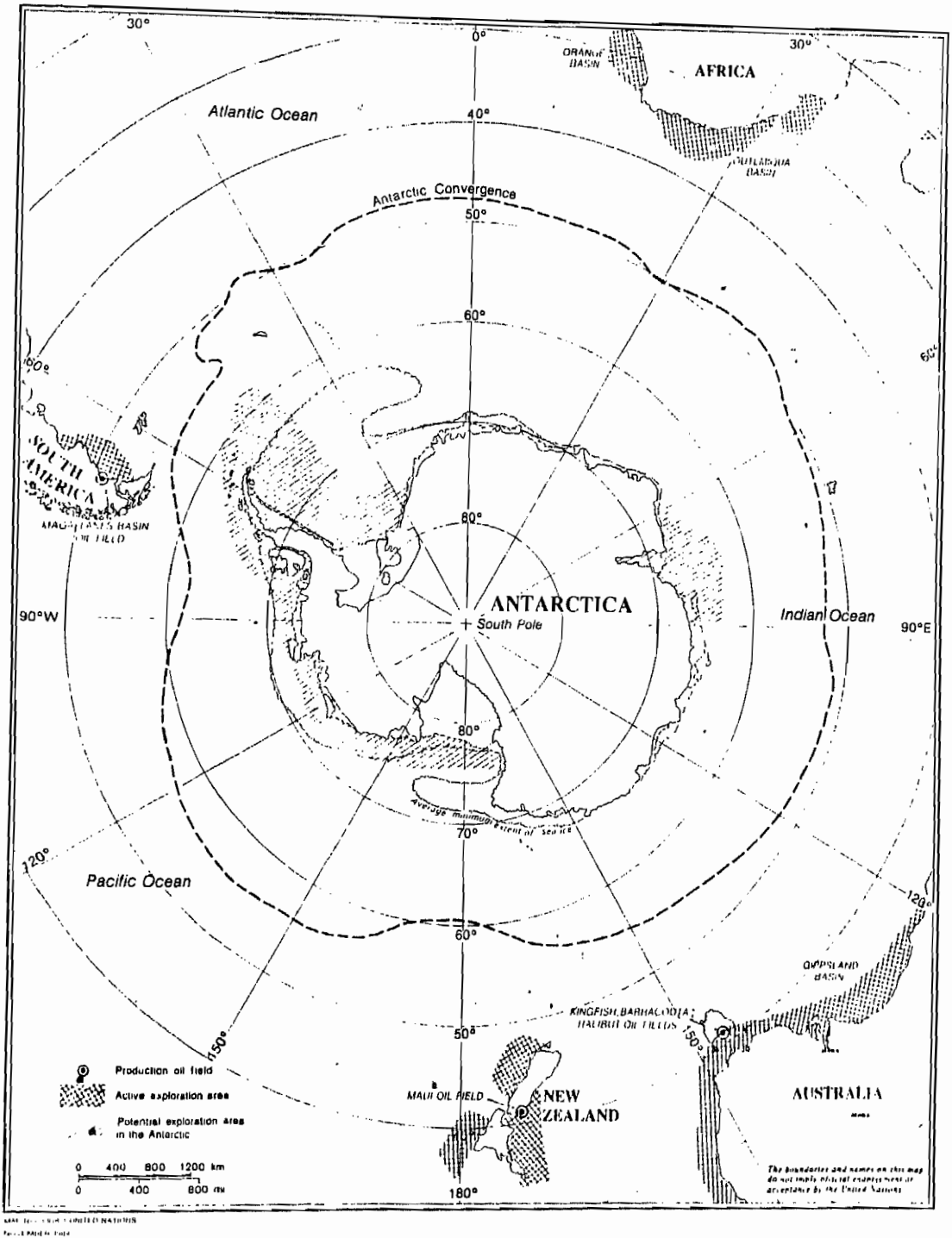
407. Exploration for offshore hydrocarbons is currently active and, in some cases, successful, off the coasts of southern Argentina, South Africa, Australia and New Zealand. Hydrocarbon discoveries off Argentina, South Africa, Australia and New Zealand have resulted in oil production. As Zumberge points out, even though those offshore deposits of hydrocarbons are far distant from Antarctica, the juxtaposition of the land masses containing them during the existence of Gondwanaland suggests to some that the Antarctic continental shelf may not be barren of similar deposits.

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\* Much of the information used in the preparation of this section comes from Zumberge, James K., "Mineral Resources and Geopolitics in Antarctica", American Scientist, 1979 (for other sources, see reference section, pp. 113-116).



Figure 3. Oilfields and areas of present or potential oil exploration in Antarctica and contiguous areas



Source: Holdgate, M. W. and Jon Tinker, Oil and Other Minerals in the Antarctic. The Environmental Implications of Possible Mineral Exploration or Exploitation in Antarctica. Report of a workshop sponsored by the Rockefeller Foundation, 1979, p. 17.

408. The Ross Sea sector of the continental shelf is reported to be perhaps the most promising. It is generally considered the least difficult area to exploit because sea ice conditions, compared with other areas, are less severe, thus making it more accessible (Spletstoeser, 1977). It is by far the best known in terms of its gross geological structure and the thickness of its sedimentary strata. Moreover, the continental shelf beneath the Ross Sea was contiguous with the Kingfish, Barracouta and Halibut oil fields (Franklin and Clifton, 1971) between Tasmania and Australia at the time of Gondwanaland. Those three offshore fields, discovered between 1965 and 1967, are located in what is known as Australia's Gippsland Basin, in easternmost Bass Strait in south-eastern Australia.

409. In 1972-1973, the drilling vessel Glomar Challenger, in connection with the NSF Deep Sea Drilling Project, drilled four holes in the Ross Sea continental shelf in shallow water around 470 m deep. It should be pointed out that the drilling sites were chosen to avoid the most likely oil-bearing structures because the Glomar Challenger could not prevent an oil blowout (Zumberge, 1979). In three of the holes, ethane, ethylene and methane were found in trace amounts. Methane is a common occurrence in deep-sea cores and does not necessarily indicate the nearby presence of crude oil. Ethylene, on the other hand, often occurs with petroleum (Heitzler, 1975). It must be noted that the Ross Sea sediments in which the hydrocarbon gases were found are of Miocene age and were deposited long after the separation of Antarctica from Australia. Though unlikely, it is believed not impossible that the gases migrated from older sediments at greater depth, which could be of the same geological age as those from which hydrocarbons are now being produced off the coast of southern Australia.

410. The possibility of offshore hydrocarbons being extracted from Antarctica has led to a number of widely quoted and varied reports and statements about the extent of Antarctic oil and gas. A Wall Street Journal article reported that the United States Geological Survey "reckons that 45 billion barrels of oil and 115 trillion cubic feet of natural gas could be recovered from the continental shelf of West Antarctica; the oil figure almost matches the proven reserves of the entire United States" (Spivak, 1974).

411. The United States delegation to the special preparatory meeting of the Treaty nations estimated that "it appears that the Antarctic continental shelf could contain potentially recoverable oil in the order of a magnitude of tens of billions of barrels" (United States Department of State, unpubl.). For the sake of comparison, the North Slope of Alaska is believed to contain 8 billion barrels of oil (some sources give 9.6 billion barrels) (Mitchell, 1983). Also by way of illustration, proven reserves in the British sector of the North Sea came to 19.8 billion barrels of oil in 1982 (The Petroleum Resources of the North Sea, United States Department of Energy, 1983, cited in Mitchell, 1983).

412. Other estimates of potential Antarctic oil and gas reserves have been made. At the end of 1974, the former Director of the Institute for Arctic Geology of the Soviet Union predicted that oil exploration on the Antarctic continental shelf would take place in the very near future and be followed by production. In the same year, Evgeny Tolstikov, deputy head of the Hydrometeorological Survey of the Soviet Union, suggested that oil resources of Antarctica would surpass those of

Alaska. In February 1979, a representative of Gulf Oil stated that the oil potential of the two most promising areas in the Ross and Weddell Seas was in the range of 50 billion barrels, but could be much more (Mitchell and Tinker, 1980).

413. Prospecting for petroleum on the Antarctic continental shelf presents unique problems. Much of the shelf is covered with sea ice for most of the year, and some parts always contain moving pack ice that makes the manoeuvring of exploratory vessels difficult and the use of the geophysical sensing arrays towed by such ships almost impossible. The Ross Sea is ice-free during part of the austral summer and there is a three-month window between mid-December and mid-March during which shipping access is generally possible (Lavminic, Goodman and Sanderson, 1983). The Weddell Sea has heavy pack ice year-round.

414. Icebergs of enormous size and draft present another hazard to exploration, especially exploratory drilling. Antarctic icebergs are typically about 700 m across but have been known to exceed 150 by 70 km. Their thickness is typically 250-450 m. Smaller icebergs can be pushed aside by icebreakers and tugs, but the larger ones present obvious hazards to drill ships. Icebergs also present a hazard to the tankers that would transport crude oil from production wells to refineries.

415. Thus, no matter how geologically attractive the continental shelves of West Antarctica might appear, the combined hazards of severe pack ice, prolonged storms of high intensity, transportation difficulties and bottom-scouring icebergs present technological difficulties of immense proportions for anyone contemplating petroleum exploration and, ultimately, extraction in the high latitudes of the Southern Ocean. Moreover, as mentioned before, the Antarctic continental shelf is much deeper than that of other continents. One positive factor, however, is the constant advances being made in deep-sea drilling technology in the Arctic experience which may be useful in Antarctica. In fact, one expert, Mr. Joseph Fletcher, former head of the NSF Office of Polar Programs, said that "negotiating the Antarctic ice, most of which breaks up each year, would be less difficult than getting through the more permanent ice pack in the Arctic. Moreover, some requirements, such as development of deep-sea drilling platforms and underwater storage tanks, have already been met by the oil companies" (Spivak, 1974).

416. Consideration of the known geology of Antarctica and inferences from sparse geophysical work suggest the presence of significant thicknesses of sedimentary rock in areas throughout West Antarctica and several areas in East Antarctica. The Amery Ice Shelf area of East Antarctica might be considered analogous to the petroleum-rich Benue Trough area of West Africa. Marie Byrd Basin may be a direct continuation of the rift of the Ross Basin. Due to thick ice, however, it is known only from radio-echo surveys. The Amundsen and Bellingshausen seas' continental margins are also considered a prospective area in a hydrocarbon context (Bersager, 1983). Geophysical data for part of the Weddell Sea shelf, combined with the analogy that has been advanced with the Lake Maracaibo area in Venezuela, a major petroleum-producing area in the world, are considered positive factors in viewing this area as a prospective hydrocarbon producing area (Spletstoeser, 1977).

417. In the absence of any other exploratory drilling, there are at present no data to permit any meaningful estimates of potential Antarctic oil or gas reserves. A number of nations, inter alia, Japan and the Federal Republic of Germany, are actively carrying out multi-channel seismic reflection surveys (which measure the return of artificial shock waves sent through the materials below the sea floor) of the Antarctic continental margin, those surveys are believed to be focused on petroleum resource studies and have concentrated on the Weddell Sea and Ross Sea areas (Bersager, 1983).

#### Summary

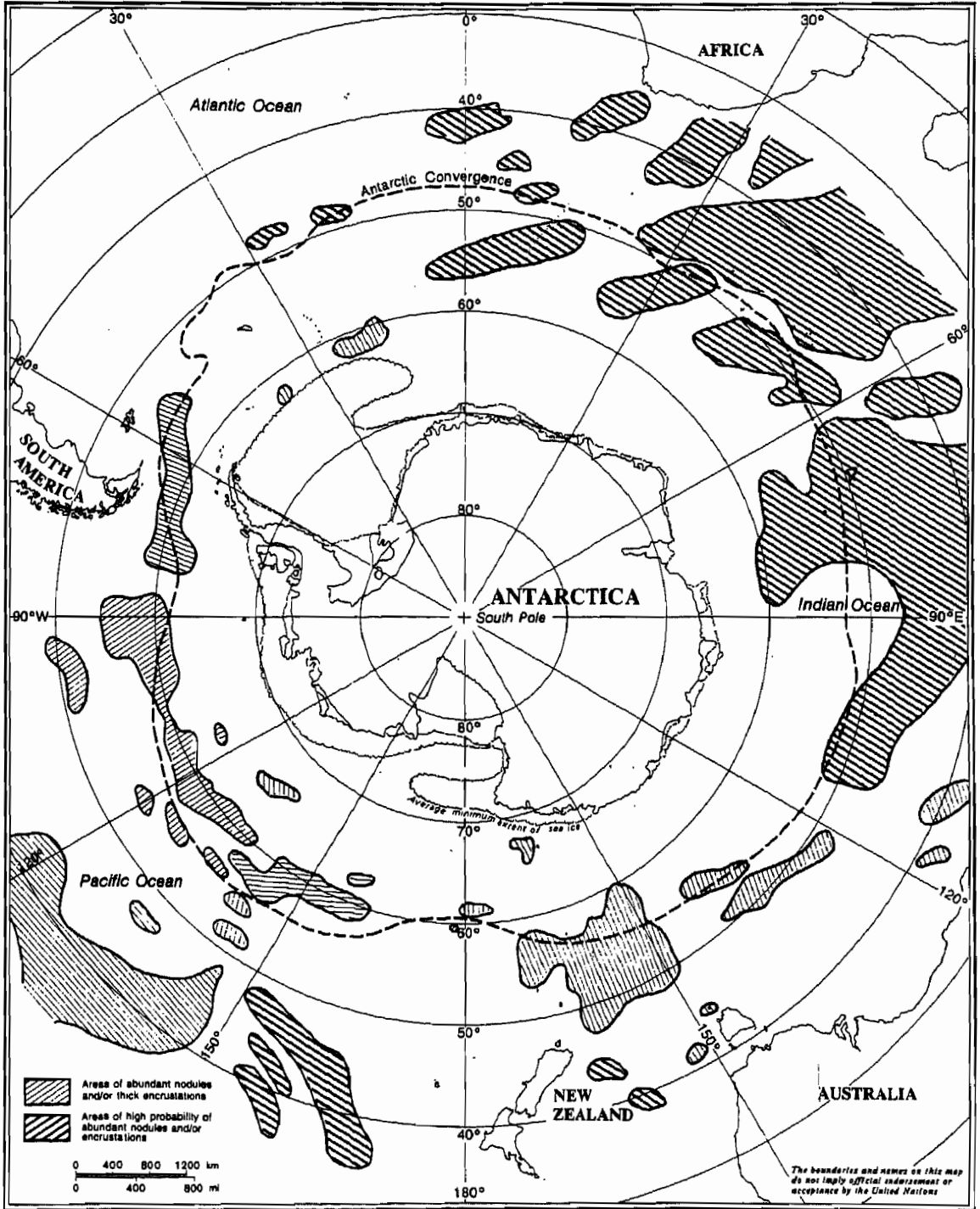
418. There is very little direct information available on the petroleum geology beneath the Antarctic continental shelves, with the possible exception of the shows of gas noted earlier beneath the Ross Sea continental shelf. However, the information that is available suggests that quantities of oil or gas or both are present in the Antarctic continental shelf. In addition, the Gondwanaland thesis, accompanied by the fact that oil and gas exploration and exploitation are going on from the continental shelves of New Zealand, Australia, South Africa and the southern tip of South America, provide a degree of indirect evidence that there may be reserves of oil and gas on Antarctica's shelves.

419. There appears to be a wide consensus that West Antarctica (the Ross, Weddell, Amundsen and Bellingshausen seas) is probably the most promising area of Antarctica for petroleum. The Amery Ice Shelf area in East Antarctica may also contain oil reserves. However, due to the extremely thick moving ground-ice sheet that covers most of Antarctica, the only practical areas for possible exploitation, if petroleum exists, are the continental margins (possibly including the parts covered by ice shelves). Although there has been technical progress in deep sea drilling in the Arctic, technical and environmental difficulties exist in any venture to produce Antarctic oil. These include, inter alia, the greater than average depth of the Antarctic shelf, extreme cold, blizzards, isolation, icebergs and the lack of facilities. These problems lead one to conclude that Antarctic oil exploitation is not imminent.

#### (b) Manganese nodule deposits

420. In the deep ocean around Antarctica are found significant concentrations of manganese nodules and encrustations that have attracted some attention. The most abundant areas, forming a more or less continuous belt up to 500 km wide beneath the Antarctic Convergence, are at about 60° S latitude (Goodell, 1973). Other fields of lesser extent are found north and south of this belt; the present knowledge of the distribution of important manganese nodule areas is illustrated in figure 4. There are, however, vast areas of the floor of the Pacific Ocean that are more amenable to exploitation than the hostile regions of the Southern Ocean. Moreover, there is some evidence that the copper, cobalt and nickel content of the ferromanganese nodules of the Pacific Ocean is latitude-dependent (Horm et al., unpubl.) and that these minerals occur in significantly smaller amounts in Antarctic nodules than in those closer to the equator (Mitchell, 1983). Although it is not impossible that further exploration near such features in Antarctic waters would uncover deposits of more desirable mineral content, on the basis of present knowledge it seems unlikely that manganese nodules in the Southern Ocean will be a prime target for exploration or exploitation in the foreseeable future.

Figure 4. Manganese nodule deposits of the Southern Ocean



Source: Lovering, J. F. and J. R. V. Prescott, Last of Lands ... Antarctica, Melbourne, Melbourne University Press, 1979, p. 97.

(c) Icebergs

421. The mineral resource of immediate economic interest in the Antarctic oceans is the ice in the icebergs themselves. The 27 million cubic kilometres of ice in the Antarctic ice cap make up about 70 per cent of the usable fresh water on Earth. Countries with fresh-water deficiencies have thought of Antarctic icebergs as a potential fresh-water resource. The idea of transporting icebergs to water-deficient parts of the world was examined in 1973 by Weeks and Campbell, and Hult and Ostrander. In 1977, the idea of towing icebergs to arid regions of the world became respectable when the First International Conference on Iceberg Utilization was held at Iowa State University (Husseiny, 1977). The Conference was sponsored by several organizations, including the National Science Foundation and the King Faisal Foundation in Saudi Arabia.

422. Prince Mohammed Al-Faisal of Saudi Arabia provided the impetus for further research and development on the feasibility of using icebergs as a source of fresh water. In 1977, a commercial enterprise, Iceberg Transport International Ltd., was created with capital from Saudi Arabia and technical expertise from French sources. An associated international non-profit research foundation, Icebergs for the Future (IFF), has also been set up to encourage research into the problems associated with the formation, selection, delivery and total utilization of icebergs. Until the first iceberg is delivered to a port, however, it will be impossible to assess the future potential of iceberg harvesting.

423. As Weeks and Campbell have pointed out, a satisfactory cost benefit analysis of using Antarctic icebergs as a fresh-water resource is extremely difficult, since much remains to be done to develop suitable methods to harvest the water once the icebergs have been delivered. The large tabular icebergs of the Antarctic appear to be the most suitable for transport by towing.

424. The prime Antarctic sites for tabular icebergs are considered to be the Amery, Ross, and Filchner ice shelves. The Ross Ice Shelf is the largest (530,000 sq km) and the most accessible in the area and constitutes about one third of the total Antarctic ice shelf area. The second largest shelf, the Filchner (400,000 sq km) is considered by Weeks and Campbell as the best source of icebergs for transport to the Namib Desert on the southwest coast of Africa. The Amery Ice Shelf, although smaller, is considered to be the best supplier of icebergs for Australia. At the Iowa Conference, many of the researchers estimated costs for various aspects of iceberg transport, tugboat and tanker operations, insulation etc.

425. The magnitude of initial expenditures for an iceberg project for Saudi Arabia was estimated in 1978 at anywhere from \$10 to \$50 billion in the model developed by Ahmed, Cho and Abdul-Fattah (United Nations Study, Natural Resources Water Series No. 14, 1984). Allowing for inflation, that project would cost in the neighbourhood of \$16 to \$80 billion. According to researchers this would, in the long term, result in relatively low costs for water at today's prices, because of the massive amount of water transported. However, the initial investment for facilities, dredging and port modification would be so great that it is believed

there are few nations that could even contemplate such an expenditure. More research on the subject is likely to be conducted in the near future.

(d) Geothermal energy

426. The heat produced near the Earth's surface from geologically young intrusions of molten igneous rocks can naturally heat circulating ground waters to high temperatures; this water can then be tapped as a source of geothermal energy. Electrical power is currently being produced from geothermal sources in New Zealand, Italy and Iceland.

427. Wright and Williams (1974) have concluded that Antarctica has a low potential for geothermal development. However, some observers have speculated that suitable areas for geothermal power could exist on Ross Island and might serve nearby McMurdo and Scott bases, if technically and economically feasible.

3. Living resources\*

(a) Krill

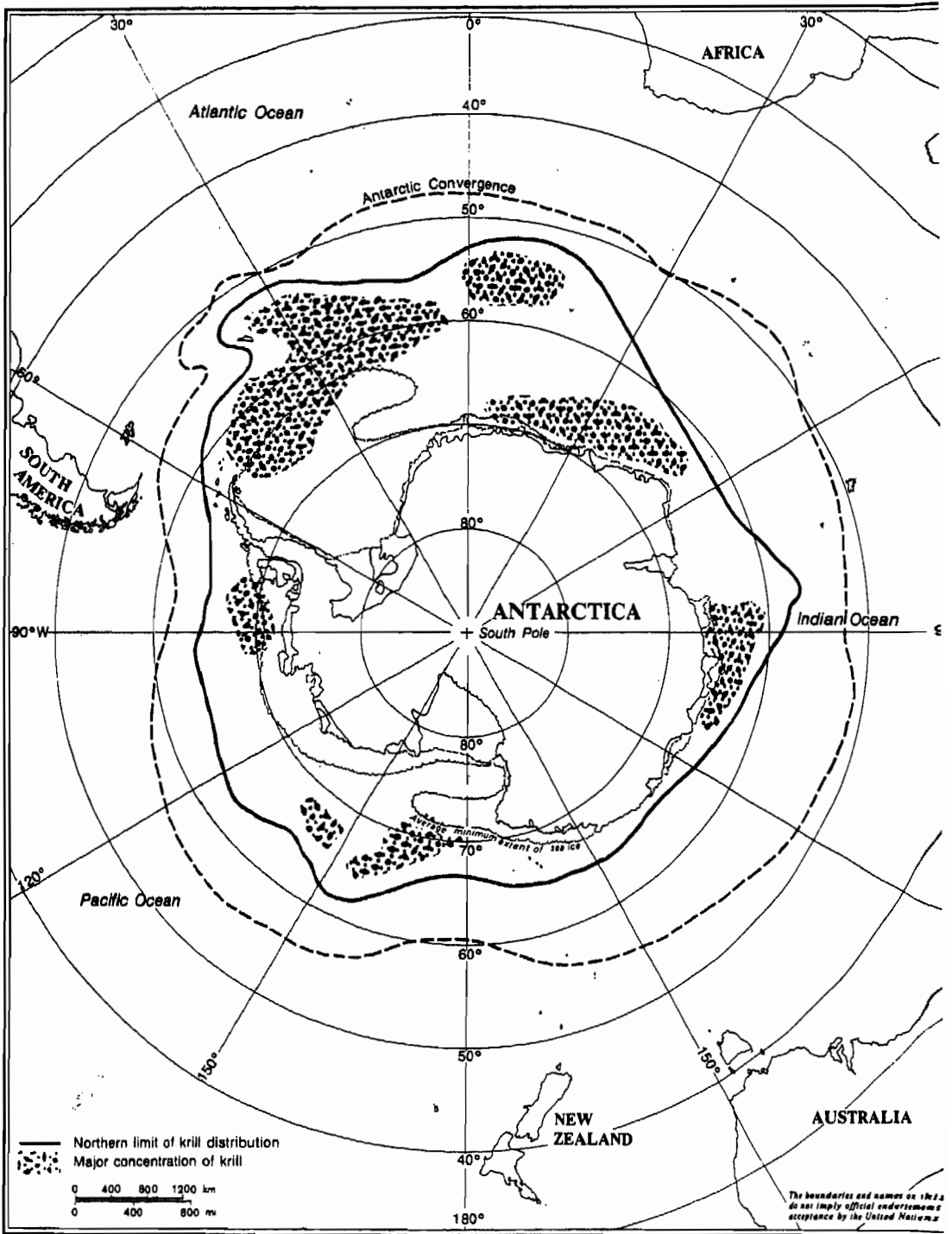
428. Krill is originally a Norwegian whaling term meaning "tiny fish" (krill resemble shrimp in appearance). Of the 11 species of krill (euphausiid crustaceans) in Antarctic waters, the most important are Euphausia superba, E. crystallorophias, Thysanoessa macrura and E. vallentini. Of these, the most important quantitatively is E. superba, and the term krill is often considered to apply to this species. The E. superba is the largest species of krill and by far the most dominant in the ocean. It is the only species that is commercially important, mostly because of its abundance and its large swarming patterns (Fogelman, 1983). References to krill as a potential food source are always made with respect to this particular species.

429. Krill are found both north and south of 60°S latitude (the northern boundary of the Antarctic Treaty area). Krill occur only south of the Antarctic Convergence (see figure 5). They have a circumpolar distribution, but seem to be most abundant in the South Atlantic. Marr (1962) describes the major concentrations as occurring in the East Wind Drift, Scotia Sea, Weddell Sea Drift and South Georgia areas. Although MacKintosh has demonstrated the existence of huge concentrations in the vicinity of the Kerguelen-Gaussberg Ridge and also around latitude 150°W, recent fishing expeditions have identified concentrations regularly in clearly defined areas such as the mixing zone between the circumpolar and Weddell currents and, in particular, north of the South Orkney Islands, on the lee side of the islands and submarine ridges, in areas of descending currents bordered by ascending currents and in the vicinity of South Georgia.

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\* Much of the information used in the preparation of this section comes from Knox, George A., The Living Resources of the Southern Ocean: A Scientific Overview in O. F. Vicuña, Antarctic Resources Policy, 1983 (for other sources, see reference section, pp. 113-116).

Figure 5. Principal concentrations of Antarctic krill



Source: Knox, George, "The Living Resources of the Southern Ocean", in O. F. Vicuña, Antarctic Resources Policy, 1983, p. 29.



430. Krill is a particularly rich source of food since it contains approximately 65 per cent high quality protein on a dry weight basis or 13 per cent on a wet weight basis. Processing of the catch must take place within three hours, otherwise rapid decomposition of the krill will occur. Krill reach a maximum body length of about 6 cm. Krill has reportedly been marketed as a paste and as fishmeal and is suitable for the production of dried protein concentrates.

431. Since krill form the major food basis for the baleen whales, most of the seals, Antarctic birds (penguins), most of the Antarctic fish species and also for squid, the quantity and distribution of those resources are directly dependent on the availability of krill. In addition, predators at higher levels of the ecosystem depend indirectly on the krill resources. This holds true for the elephant seals and sperm whales living on squid, for the leopard seals living mainly on penguins, krill, fish and squid and for the small-toothed whales living on squid, penguins and seals. There is therefore serious concern that major exploitation of krill may cause substantial stress for other biological species in the Antarctic ecosystem. For example, some scientists contend that man's increased exploitation of krill could compete with its consumption by whales and other species in the Antarctic aquatic chain, thereby affecting the already decimated whale population.

432. Estimating krill standing stock is difficult due to the widely variable krill densities caused by swarming. Scientists have estimated that the standing biomass of Antarctic krill may range from 44.5 million to 7.5 billion tons. Potential yield estimates are as varied as biomass estimates, ranging from 25 million to 2.25 billion metric tons annually. Figures 6 and 7 present krill biomass estimates and krill annual production respectively. From the wide range of values in these figures it can be seen that there are no reliable estimates of krill standing stock. Techniques employed to estimate krill abundance include net sampling, trawling, acoustic sounding, estimating amounts consumed by predators and estimating the phytoplankton availability and consumption. Phytoplankton is believed to be the major food consumed by krill.

433. Fishing for krill has now been in progress since the early 1960s when the Soviet Union sent the first krill fishing ship to Antarctica. In recent years, countries that have been known to engage in krill fishing, either experimentally or commercially, include Chile, the Federal Republic of Germany, Japan, Poland, the Republic of Korea and the Soviet Union. Total catches have risen from 22,343 tons in 1973-1974 to 477,025 tons in 1979-1980. However, in 1980-1981, the catch fell slightly to 448,000 tons, rising again to 529,505 tons in 1981-1982 (FAO, 1982).

434. Recent experiences of the Federal Republic of Germany, Japan and Poland have shown that there is no difficulty in echo-location of krill swarms, and impressive catch rates have been achieved. As noted earlier, one limitation on catch rates is the need to process the catch within an hour or two of capture; otherwise, once landed, krill spoil rapidly because their organs contain highly active enzymes which cause rapid breakdown (Knox, 1982).

Figure 6. Estimates of krill biomass and annual production

Krill biomass estimates

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Biomass (million metric tons)

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44.5-521  
750  
5 000-7 500  
953-1 350  
800  
125-200

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Estimates of krill annual production

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Production (million metric tons)

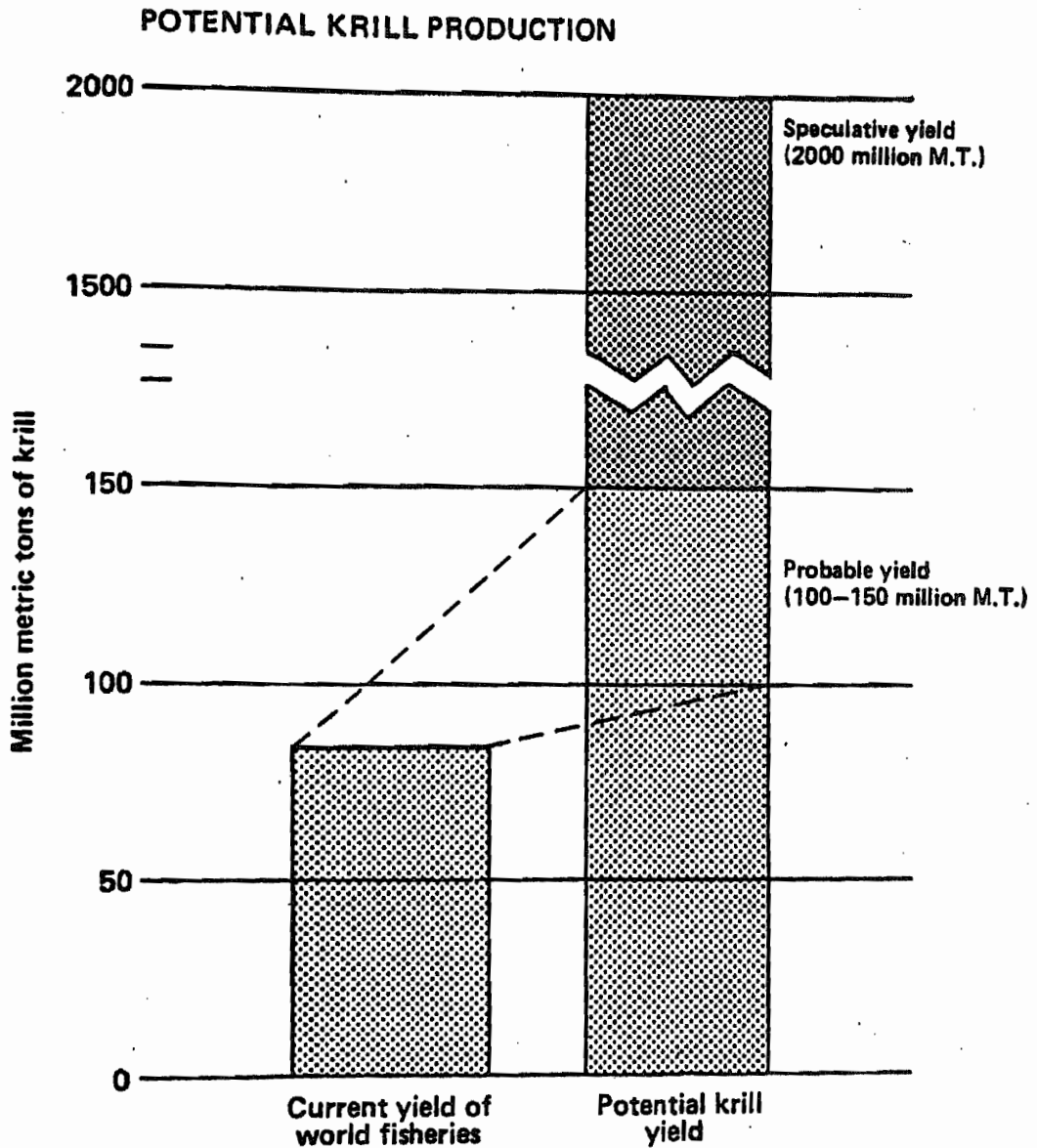
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110  
50-500  
153  
1 500-2 250  
25-50

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Source: Knox, George, "The Living Resources of the Southern Ocean" in O. F. Vicuña, Antarctic Resources Policy, 1983. p. 10.

Figure 7. Potential krill production



Source: Alverson, D. L., Tug-of-War for the Antarctic Krill. Paper delivered 22 February at a meeting sponsored by the Federal Bar Association in conjunction with the University of Virginia, Center for Ocean Law and Policy, Washington, D.C., 1979, p. 9.

435. Considerable progress has been made in the technology of krill processing and the development of various krill products. The problem of high fluoride content, which has presented certain difficulties in using krill meat for human consumption, has been overcome because it is known that the fluoride enters the meat only after the death of the krill; therefore meat can be produced almost free of fluoride if the shell is removed quickly after the catch. These technical developments have led to the establishment of a commercial krill fishery which presently produces about 450,000 tons annually. Most landings come from the Atlantic sector of the Antarctic seas. Catches in the Southern Pacific Ocean are minimal so far. About 87 per cent of the total landings are made by vessels from the Soviet Union, about 6 per cent by Japanese fishing boats and the rest by vessels from Poland, the German Democratic Republic and possibly others. The factors limiting expanded fishery activities are the high fuel costs involved in operating in such remote areas and, perhaps, a limited world market at the prices that must be charged for an economic return on investment.

436. Krill is sold in many forms. The Soviet Union has marketed canned krill. The Japanese population is accustomed to eating small shrimps and whole krill has been accepted as well, while krill paste has not. A Swedish company is also marketing processed krill as "crabmeat".

(b) Seals

437. Seals are another component of the Antarctic ecosystem. There are six species of seals found south of the Antarctic Convergence. The most numerous of these is the crabeater seal, which numbers about 15 million and lives almost exclusively on krill. The other five species, the leopard, Weddell, Ross, elephant and fur seals, are much less numerous.

438. Ross and Weddell seals live near the Antarctic continent in dense pack-ice areas. There is no important history of exploitation of these two species. Crabeater seals are found in the pack ice and in open waters in small ice flow environments. The leopard seal, living in similar areas, often solitary, feeds on the other seals. Fur and elephant seals breed further north on the Antarctic and sub-Antarctic islands, even north of the Antarctic Convergence.

439. Fur seals were hunted from the early nineteenth century on, almost to extinction. That hunting faded by the year 1919, and later there was a steep increase in population, particularly on South Georgia. At present, there are 600,000 to 700,000 fur seals, with some indication that the rate of increase is slowing down.

440. The elephant seal, the largest seal in Antarctica, was almost exterminated in the nineteenth century on South Georgia. Management measures restricted hunting between 1910 and 1964 to adult males only, and since then there has been no harvesting. The population has increased considerably over the past 50 years. Crabeater, Weddell, leopard and Ross seals on the Antarctic continent have been protected under the terms of the Agreed Measures for the Protection of Antarctic Fauna and Flora arising out of the Antarctic Treaty. The Convention for the Conservation of Antarctic Seals, signed in 1972, was designed to ensure control of

any new exploitation. This Convention was drawn up by the Antarctic Treaty States and establishes regulations for exploitation before actual exploitation begins. The Convention came into force in 1978 and protects fur, elephant and Ross seals from commercial exploitation, prohibits the taking of seals in the water except in limited numbers for scientific purposes and sets annual quotas, seasons and sealing zones for the taking of crabeaters (175,000), leopards (12,000) and weddells (5,000).

(c) Squid (cephalopods)

441. Cephalopods (which include squid, cuttlefish and octopus) make up a substantial proportion (perhaps 20 per cent) of the biomass in the Southern Ocean (Tinker and Mitchell, 1980). The very common occurrence of squid remains in the stomach contents of whales, seals and birds in the Antarctic indicates that the group is of major importance in the Antarctic ecosystem. In spite of this, there is very little information about their distribution, stock, biomass and reproduction.

442. In the Antarctic it is clear that squid feed on krill, although fish and other squid form an important part of the diet of the larger species. Clarke lists 15 species for the Antarctic region. Squid themselves are an important part of the diet of the major predators, and in spite of the paucity of information estimates have been made of the present-day consumption of cephalopods by whales, seals and birds. Currently there is no fishing for cephalopods in the Southern Ocean. There are, however, substantial fisheries in areas adjacent to the Southern Ocean which could expand their range south, and there is also the likelihood that squid fishing could develop as an offshoot of krill fishing (Knox, 1982).

(d) Fish

443. Because commercial exploitation of Antarctic fish is relatively recent, little detailed information exists on the stocks and their ecology. Those fish species considered to have potential commercial importance in the Southern Ocean are listed in figure 8.

444. Antarctic fish are present in fewer species than in other oceans, but some 100 species of fish, out of 20,000 known world wide, have been recorded south of the Antarctic Convergence. Of these, the dominant group is known as Nototheniiformes, comprising five families that make up nearly three quarters of all coastal fish species. Other Antarctic fish groups include the Zoracidae (eel pouts), Liparidae (sea snails), Macrouridae (rat-tailed fish), Gadidae (cod-like fish) and Rajidae (skates). In contrast to other oceans of the world, the Southern Ocean does not appear to contain dense shoals of pelagic fish (Andriashev, 1975; Everson, 1977).

Figure 8. Fish species of potential commercial importance in the Southern Ocean

FAMILY	SPECIES	COMMON NAME
Rajidae	<u>Raja georgiana</u> <u>R. murrayi</u> <u>R. eatonii</u>	
Gadidae	<u>Micromesistius australis</u>	Southern blue whiting or southern poutassou
Merlucciidae	<u>Merluccius hubbsii</u>	Patagonian hake
Nototheniidae	<u>Notothenia gibberifrons</u> <u>N. coriiceps</u> <u>N. neglecta</u> <u>N. rossii rossii</u> <u>N. rossii marmorata</u> <u>N. magellanica</u> <u>Dissotichus mawsoni</u> <u>D. eleginoides</u> <u>Pleuragramma antarcticum</u>	Marbled notothenia Antarctic tooth fish Patagonian tooth fish
Channichthyidae	<u>Champscephalus gunnari</u> <u>Channichthys rhinoceratus</u> <u>Pseudochaenichthys georgianus</u> <u>Chaenocephalus sp.</u> <u>Chionodraco sp.</u>	

Source: Lovering and Prescott, Last of Lands ... Antarctica, p. 66.

445. The great majority of the species of economic importance are demersal (bottom dwelling) species. Three types of skate (Raja georgica, R. murrayi and R. cationi) are primarily limited to the South Georgia, Kerguelen and South Sandwich shores. Members of the genus Notothenia - N. gibberifrons, N. cirriceps, N. neglecta, N. rossi and N. magellanica - are found in the Scotia arc from South Georgia to the South Shetland Islands and around the continent to the Bouvet, Marion, Kerguelen and Heard islands. Of minor importance are members of the family Chanichthyidae, characterized by pelagic and/or demersal modes of life. Evidence also suggests that species spawning on the continental shelf of Patagonia, especially the Southern Blue Whiting, make extensive summer migrations south to feed in Antarctic waters (Everson, 1977).

446. The Antarctic herring (silverfish) and cod and the Antarctic tooth fish are considered to have the greatest commercial potential of the Antarctic fin fish.

447. Data on Antarctic fish biomass and productivity are very limited. Reported catches have led to estimates of an initial standing stock of about 500,000 metric tons for the South Georgia shelf area (which may have been reduced to as much as 80 per cent by intensive fishing). Similar data indicate an initial standing stock of 220,000 metric tons, with an estimated maximum sustainable yield (MSY) of 80,000 metric tons per year for the Kerguelen shelf. However, trawl surveys suggest an initial standing stock of 120,000 metric tons, with a MSY of 20,000 metric tons annually.

448. The disparity in those estimates underlines the need for further research and reporting of complete catch information (Everson, 1977). Because of their slow growth and longevity, it is believed that fish stocks are especially susceptible to over-exploitation.

(e) Whales

449. Southern Ocean whale stocks, once abundant and diverse, supported the world's largest whale fishery, eventually leading to their marked decline. The peak exploitation of the Antarctic whaling grounds, extending mainly from 60°W to 70°E longitude in the Atlantic sector of the Southern Ocean, occurred in the 1930s, when the catch accounted for some 12 per cent by weight of the total harvest of fish and other animals from the sea. The largest single catch occurred around 1937, when more than 45,000 whales were killed south of the Antarctic Convergence.

450. The main period of Antarctic whaling began in the 1920s. Since that time, the industry has been based on each of the major whale species in turn, beginning with the largest species, the Blue Whale. As stocks of the preferred larger species declined, the industry moved before the Second World War to the next largest species, the Fin Whale. Then in 1965, the Sei Whale became popular and finally the Minke Whale has become an important contributor to the Antarctic catch since about 1972. The shift to catching smaller whales has been due to the decline in demand for species providing whale blubber oil and a rapidly increasing demand for species, such as the Sei Whales, that provide the most abundant meat of the highest quality. At present, only about 15 to 20 per cent of the total value of a whale comes from its oil. The major requirement is for whale meat, both for human consumption and, increasingly, for pet food (Lovering and Prescott, 1979).

451. Of the exploited species, the Blue Whale grows to the largest size (30 m long and 160 metric tons in weight) and was the most valuable to the whaling industry. As noted above, as catches of that species declined, the industry turned in succession to the smaller Rorvals, Fin, Sei and Minkè. This decline in stocks occurred in spite of the efforts of IWC to regulate the whaling industry. A moratorium on whaling has been adopted recently by the IWC, to come into effect in 1985-1986 and to be reviewed by 1990. Some countries have objected to this moratorium, and Japan and the Soviet Union remain the only countries still whaling in the Antarctic. The small Minke whale is the only species now abundant enough to catch.

(f) Penguins and other birds

452. Until early this century, 150,000 penguins a year were reportedly boiled down for oil on Macquerie Island. This lasted for 25 years until public opposition in Australia ended it. Seven species of penguins (spheniscidae) - Emperor, King, Adélie, Gentoo, Chinstrap, Rockhopper and Macaroni - occur within the region; and three of these (Emperor, Adélie and Chinstrap) are confined within the limits of the pack ice. Penguins comprise 31 per cent of the stock of birds in the Southern Ocean (El-Sayed, 1977). The remaining 69 per cent of the stock consists of albatrosses, petrels, shags, gulls and terns. The bulk of the krill is taken by the penguins.

453. Data on bird population counts and breeding success of birds on South Georgia, Signey and Bird islands indicate increases in King, Emperor, Macaroni, Adélie, Chinstrap and Gentoo penguin populations in the Scotia arc region.

454. Birds are considered here because they play a critical role in the Antarctic marine ecosystem. The literature on Antarctic birds is very large and they are among the well documented groups. Thirty-eight species have breeding and/or feeding ranges extending south of the Antarctic Convergence and many of these have a circumpolar zonal distribution pattern. Restriction of breeding sites results in the concentration of a large proportion of the population (breeding birds) in relatively small, concentrated areas.

4. Tourism

455. The only commercial activity on the Antarctic mainland at present is tourism. It has been estimated that approximately 950 people a year visit the region (Mitchell and Tinker, 1980). Since 1966, various cruise ship lines have operated cruises from several South American ports. Commercial overflights have been operated by Qantas and Air New Zealand since 1976. The planes do not land, but spend about one and three-quarter hours over Antarctica itself. Four or six trips are arranged each season, and over 2,000 people took part in 1978.

456. The lack of accommodation and the high cost of travel present two immediate problems associated with increasing tourism. Although some authors have said that if access were developed there could arise strong pressures for expanding tourism, it should not be overlooked that other authors believe that an increase in tourists could impede scientific research on the continent.



457. At the Tenth Consultative Meeting in 1979, the Treaty nations agreed to some general recommendations for visitors and tour organizers (recommendation X-8). They warned that airline and aircraft navigation and rescue systems in the Antarctic were minimal and insufficient to deal with the present level of overflights.

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