

bulletin

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ANTARCTICA: WILDERNESS UNDER PRESSURE



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Cover: Signy Island, Antarctica,
photographed by Nigel Bonner.

Understanding Antarctica:

Land of hope and beauty

For several centuries, Antarctica was a cartographer's fiction: a massive "unknown southern land" drawn from imagination to counterbalance the land masses of the discovered north. Then in 1772-75, James Cook's circumnavigation, mostly at around latitude 60°S, but pushing at two points to around 71°S, struck the word "unknown" from vast tracts of ocean and demonstrated that if there was any extensive land in the far south it must be mantled in perpetual ice and snow. Humanity, as always on the look-out for resources to exploit, had to be content with the devastation of the fur seals that Cook found on the island of South Georgia in 1775.

Sealers, whalers, explorers, scientists, and most recently, tourists, have none the less flocked south in increasing numbers. Today, the world's last great wilderness supports several thousand scientists and those supplying them each summer, and an equivalent number of tourists. There is increasing concern over the impact of all this humanity on an environment whose vulnerability in part counterbalances its vastness.

We have four particular reasons for concern over Antarctica today:

– First, because the seas surrounding it are the subject of a considerable and growing fishery, especially for the shrimplike crustacean called 'krill' (*Euphausia superba*), and with historic lessons of mismanagement of sealing and whaling before us, we need to be sure that any new industry maintains the balance of an already modified marine ecosystem;

– Second, because we have discovered from over 30 years of modern science that understanding Antarctica is important to our understanding of the planetary environment and its history;

– Third, because Antarctica is immensely beautiful. It has inspired artists and poets, and has the power to uplift the spirit and broaden the vision of all who go there. It has seen demonstrations of great heroism. It is a special place, and if it is to keep this quality, it needs to remain wilderness;

– Fourth, because Antarctica is the only major region on earth where nations from east and west, north and south, have set aside their normal political differences to cooperate in peaceful scientific exploration. Antarctica is demilitarized by international agreement, and nuclear-free.

Nearly everybody assents to the proposition that Antarctica should be conserved – but how? The Antarctic Treaty System essentially regulates activities, but it is less clear about the goals worldwide humanity should set itself in the region. Many conservation bodies – and several governments – believe that a new Convention is needed, perhaps declaring Antarctica a World Park, and anyway emphasizing that the paramount objective must be the conservation of the continent as a beautiful wilderness, open only to peaceful and non-destructive science and tourism. The advocates of this policy believe that humanity should at the same time declare that it will not mine or drill for any mineral wealth that may exist in Antarctica.

As a World Conservation Union whose members do not yet agree on the mechanism that should be adopted to secure conservation in Antarctica, we are standing back at present from the advocacy of means: we believe that in any case it is better first to agree on ends, to establish principles, and to set goals. That the draft Antarctic Conservation Strategy which we have now prepared in IUCN does. At the 1990 General Assembly, the membership as a whole will be able to debate how to turn it into action.

More than 60 years ago, Shackleton's lieutenant, Frank Wild, returning from Antarctica for the last time, wrote that he had counted it a privilege "to guide the groping fingers of knowledge on the white edges of the world". Today, those fingers hold Antarctica firmly. It is for us to see that it does not crumble in their grasp.

– Martin Holdgate
Director General, IUCN

Harpoons, drift nets, oil pollution,
garbage dumps, the ozone hole...
what will they think of next?

Maybe they'll find a
way to melt the ice



GA Workshops

Two days of General Assembly workshops will examine the status of IUCN's major programmes and help to guide their development during the coming triennium. Participants will hear papers presented by IUCN staff members, partners and invited experts; workshops may discuss draft motions submitted to the General Assembly, and most will result in subsequent publications.

All workshops will analyse the relevant sections of the World Conservation Strategy for the 1990s (WCS 90s).

Twelve workshops are scheduled:

1. The World Conservation Strategy for the 1990s

This workshop is aimed at providing IUCN members with an opportunity to express their views on the latest draft of the new strategy document (concentrating on those sections not covered by other workshops), and to discuss how they might take part in its implementation. Documentation will include the draft strategy, a draft recommendation for presentation to the General Assembly, plus a review of comments on the strategy received by mail. (Workshop leader: David Munro)

2. Human population dynamics and resource demand

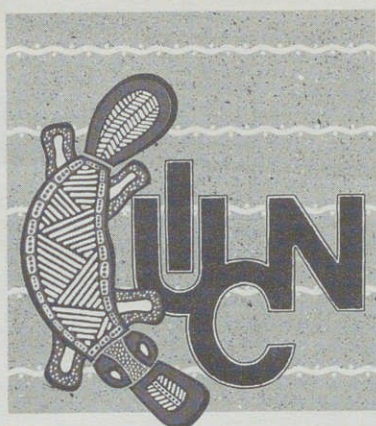
Topics to be covered include: patterns of population growth and distribution in major regions of the world; critical interactions between people and resources; the interactions between average family size and resource demands; and resource management in urban areas.

An information package on selected issues will be distributed, along with a discussion paper.

The workshop is expected to result in strengthening of the voluntary network associated with the IUCN programme on population and natural resources, and a document following up the 1987 Task Force Report on population and sustainable development. (Nelly van den Oever)

3. Designing and implementing the Global Strategy for Conserving Biodiversity

Discussions will focus on the strategy and how it will work to support local, national, and international action by IUCN members. Specific topics may include the Species Action Plan for Africa; the Protected Areas System Plan for the Asia-Pacific; the Botanic Gardens Conservation



IUCN General Assembly logo.

Strategy; Australia's National Strategy for Conserving Endangered Species; conserving genetic resources; marine biodiversity: what it is and what it means; the moral, spiritual and ethical justification for the conservation of biodiversity; and how rural women can contribute to the conservation of biodiversity.

The workshop will contribute to a publication on *Conserving Biodiversity Outside of Protected Areas*, which stresses how IUCN members can apply the approach in their own countries. Costa Rica's efforts to conserve biodiversity will be highlighted. It will also review progress achieved in the preparation of a global convention for the conservation of biological diversity; and discuss the proposed *Global Status Report on Biological Diversity*. (Jeffrey A. McNeely)

4. Conservation of the marine environment

The principal objective of this workshop will be a critical review of IUCN's policy and programme objectives in the marine environment. It will review IUCN's draft programme for marine and coastal areas in the 1991-1993 triennium, and will also examine the oceans and coastal areas chapter of the WCS-90s.

The workshop will hear presentations on the priorities of, and opportunities for cooperation with, many of the organizations active in this field, including UNEP's

Ocean and Coastal Areas Programme, the Intergovernmental Oceanographic Commission, the International Laboratory for Marine Radioactivity in Monaco, Unesco's Division of Marine Sciences and the United Nations Ocean Economic and Technology Office. It will review existing mechanisms for communication and coordination with these bodies. Finally, it will examine IUCN's own network, including the expert groups under the Commission on Ecology and the linkages with members such as the Great Barrier Reef Marine Park Authority and the Centre for Marine Conservation.

Outputs are expected to be: a new IUCN action plan and programme; revision to WCS-90s; a stronger internal and external network; and policy statements on key issues of coastal and marine conservation. (Danny Elder)

5. Realistic strategies for tropical forest conservation

The workshop will enable IUCN's members to examine the Union's programmes on critical tropical forest issues, and to develop IUCN's policies with respect to emerging issues as a basis for the 1991-93 programme. It will be broken down into four sessions. The first will focus on development patterns and their implications for tropical forest conservation, and will allow debate on the Tropical Forest Action Plan, the problems of achieving sustainability in forest management, and strategies for investing in conservation. The second session will consist of three parallel workshops dealing with IUCN's activities and policies in Amazonia, Central Africa and Southeast Asia. The third session will examine deforestation rates and species extinctions, and the last session will review those draft resolutions submitted to the General Assembly which relate to tropical forests. (Jeffrey Sayer)

6. Critical issues for protected areas

The workshop will (1) review the current state of the global protected area system; (2) assess the progress of the protected area system of Australia and review implementation of the World Heritage Convention in Australia, New Zealand and the Southern Ocean; and (3) examine the programme for the 1992 World Congress on National Parks and Protected Areas.

The workshop will result in a series of papers and case studies for publication; a list of priorities for IUCN's Commission on National Parks and Protected Areas in 1991-93; revisions to the protected area database maintained by the World Conservation Monitoring Centre; and contribu-



Cape Tribulation, in Australia's Wet Tropics of Queensland World Heritage Site, is one of the protected areas likely to be discussed in Workshop 6 (photo: IUCN/Jim Thorsell).

tions to the General Assembly resolutions on the global biodiversity strategy and IUCN's action programme for protected areas in the 1990's. It will also provide a chance to identify topics, speakers and funding sources for the 1992 Congress and to promote the event among IUCN members. (Jim Thorsell)

7. Sustainable utilization of wildlife

This workshop will (1) review the status of sustainable wildlife management programmes in seven countries; (2) identify requirements for successful wildlife management; and (3) determine IUCN's role in developing and implementing sustainable wildlife management programmes.

Participants will hear papers on the history and status of wildlife utilization in both developed and developing countries. Laws controlling sustainable management of wildlife, demographic patterns of human populations, and economic and trade factors affecting wildlife utilization will be reviewed, with special reference to national and international markets for wildlife products. Country representatives will present their papers as part of a panel of experts in a general session. Participants will then break up into working groups to address specific issues.

In addition to its report and recommendations, the workshop will result in a number of policy guidelines for those countries and development assistance agencies considering sustainable management of wildlife. (Steve Edwards)

8. Implementing the Global Strategy for Conserving Wetlands

Participants will exchange information on regional wetlands problems and how IUCN is addressing them. They will study how market forces and government pol-

icies contribute to loss of wetlands, consider what IUCN's members are doing to redress the situation, and discuss what the Wetlands Programme can do to encourage action and support members' efforts. Documentation will consist of the report, *Wetland Conservation*, a review of the current issues and required action, and the draft programme document for 1991-93. (Patrick Dugan)

9. The conservation strategy for Antarctica

The workshop will review the content of the draft Antarctic Conservation Strategy (ACS) prepared by IUCN; review and debate the draft resolution on the ACS before its discussion in plenary; and review the content of the programme for 1991-1993 concerning IUCN's follow-up on Antarctic conservation. (Danny Elder)

10. The environmental implications of global change

The workshop will discuss the new IUCN Global Change Programme, and attempt to answer the following questions: How can the Programme increase awareness of the scientific and policy issues implied by climate change, population growth and migration patterns, particularly in developing countries? What are the implications of global change for the work of other IUCN thematic programmes and Commissions? Which areas of the world are most threatened by future global change and how can IUCN best provide scientific advice to policy-makers in these areas?

The workshop will hear commissioned papers and debate issues covering all sections of the programme, including current theories of climate change; the impact of climate change on the sustainability of development; the impact of global change

on vegetation patterns; critical factors in the redistribution of species and their establishment in new environments; the vulnerability of coastal ecosystems to sea level rise; the socio-economic implications of sea level rise in selected countries; and the implications of climate change for Australia. (Elaine Dickinson)

11. Conservation and sustainable development in the Sahel and other arid regions

The multiple goals of this workshop are to guide the future development of the Sahel Programme; to focus the work of the Programme's scientific network; to bolster the links between scientists and institutions within and without the region; to explore the applicability of the Sahelian experience to other arid and semi-arid regions; and to contribute to the arid lands chapter of WCS-90s. Papers will look at such questions as resource management problems and conflicts in the Sahel, rangeland management, participatory land use planning, and the relationship between population distribution and resource use in arid lands. (Per Rydén)

12. Harmonizing environmental conservation and economic development

As economic development continues apace in both the industrialized world and the less developed countries, the need for planning to protect strategic resources from over-utilization, degradation and pollution becomes more acute. This workshop will consider the actions that now need to be taken in order to satisfy the goals of both conservation and development.

Topics to be considered include: approaches to the assessment of natural resources in order to determine their suitability for development and their conservation needs; the valuation of natural resources and the costing of industrial pollution; and corporate policies towards the conservation and development of resources and prevention of pollution.

As the General Assembly entertains the possibility of introducing corporate membership of IUCN, this workshop will provide a platform for discussion of the role of the business/industry sector in achieving the aims of WCS-90s. The workshop will result in a recommended plan of action for IUCN to assist the industrial and development community in that task. (Paul Driver)

All those interested in obtaining more information or participating in a workshop should write to the relevant workshop leader at IUCN headquarters.

The IUCN consultant register

The IUCN consultant register is a computerized database containing details of the expertise and experience of over 2,500 specialists in the field of conservation and development. Each individual's record includes details of their qualifications, areas of expertise, habitats of which they have knowledge, countries in which they have worked and their availability. The computer record is backed up by a physical file containing copies of the individual's CV and documentation.

Over the past six months the consultant register has been completely overhauled and upgraded. The register has been in existence for over eight years and was in need of considerable maintenance. Funding from NORAD has enabled substantial improvements to be made to the system.

Claire Lindsay, who is responsible for the management of the register, explains what has been done:

"The NORAD funding has enabled us to purchase and customize a new, up-to-date software package for the register. We installed this in the autumn of 1989 and began the exercise of updating data and records of the 2500 or so individuals who are listed. This having been achieved, we now have good quality data on 1000 consultants stored on a very efficient system – searches of which can be undertaken quickly and easily. We are now in a position to be able to offer a good search service to other agencies.

"IUCN uses the register frequently to identify personnel for its own assignments and projects worldwide. Other agencies seeking to identify candidates for development projects can request a search of the register. We really want to increase the use being made of it by IUCN members and other agencies such as development banks, bilateral aid agencies and commercial consultancies. We receive requests from these types of organizations at present but I am sure that far greater use will be made of the service when it is realized that the IUCN register is well maintained and managed.

"Criticism is often levelled at computerized registers as being either too general or too specific in their categorization of consultants' specializations and experience. However, we emphasise that it is not the computer that makes the selection. Rather, it is used as a tool in the initial selection process and once a short-list of candidates has been identified each individual's CV is screened by professional staff to check suitability for the position or project. Thus, users gain the benefit, not only of the computerized

register, but also of the extensive IUCN network."

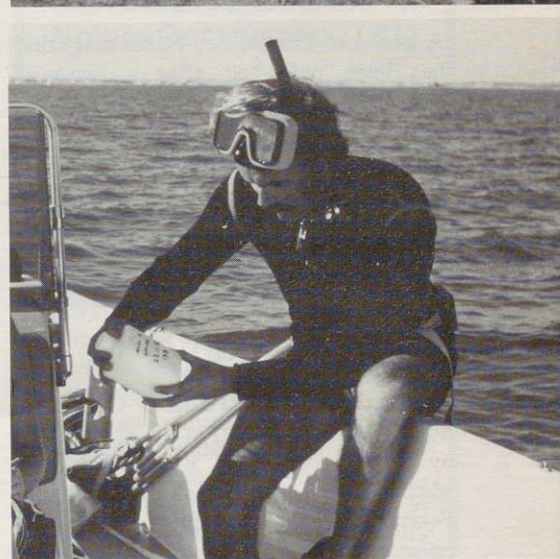
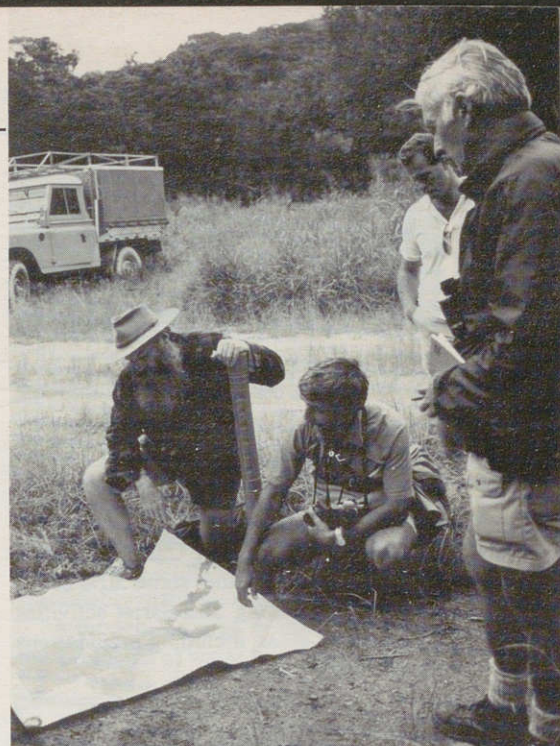
Individuals must meet two basic criteria to be listed on the IUCN consultant register.

They must be qualified and experienced in a natural resource discipline, and have professional experience which combines the fields of natural resource management, conservation and development. Thus, a combination of skills and experience ranging from marine biologists to demographers, rural development planners, foresters, agriculturalists, economists, protected area managers and EIA specialists are all included.

Secondly, individuals must have a knowledge and understanding of development issues and the development process which can only be gained by having worked in less developed countries. Candidates for the register must therefore have at least two years' experience working in such a situation.

All entries are made strictly in accordance with the information provided by the individuals concerned who, in agreeing to be included in the register, also confirm their acceptance of the ways in which it is used.

Registration forms are available in English, French and Spanish from: Claire Lindsay, Consultant Register, IUCN headquarters.



IUCN consultants at work (top photo: IUCN/Jim Thorsell; middle and bottom: IUCN/Paul Driver).

COMMISSIONS

Commission on National Parks and Protected Areas (CNPPA)

Auspicious events

- The 50th issue of the *CNPPA Newsletter* has been published.
- Mongolia has become the 112th country to join the World Heritage Convention.
- Mr Jeffrey McNeely, Chief Conservation Officer, is devoting some 50% of his time to coordinating Secretariat activities on protected areas, including preparations for the 1992 Congress.

Parks relaunched

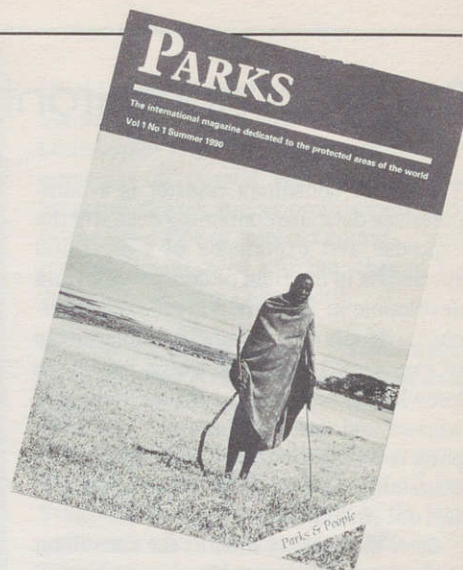
A new and transformed *Parks* magazine has been published after a two-year suspension, thanks to funding from the Canadian and US Parks Services and Australia's Department of Arts, Sport,

Environment, Tourism and Territories (DASETT). The first issue, shown at right, was published in time for the June meeting of CNPPA in Czechoslovakia, and the second is due in November. If you would like to subscribe, write to: Science and Technology Letters, Box 81, Northwood, Middlesex, HA6 3DN, UK.

Two for Trinidad

A joint project of the Forestry Division of Trinidad and Tobago and the Organization of American States will create two new national parks, Matura and Madamas, in north-east Trinidad.

The parks will play an essential role in conserving the island's rich biodiversity. This region encompasses the remainder of the island's tropical rain forests, and has more than 2160 recorded species of flowering plants, out of which 100 are endemic. More than 400 species of birds, 100 mammals, 60 reptiles and 25 amphibians have also been reported.



New game reserve

The Lake St Lucia and Mkuzi conservation areas in Zululand – two of the oldest reserves in Africa – are to be incorporated into a massive game reserve covering more than 275,000 ha, making it the third largest reserve in South Africa.

Species Survival Commission (SSC)

Saving the tamaraw

An evaluation of the Tamaraw Conservation Programme (TCP) in the Philippines by IUCN consultants Roger Cox and Michael Woodford was published in February 1990. The report gave mixed reviews to the effort to save the dwarf wild buffalo *Bubalus mindorensis*, known as the tamaraw, through captive breeding and habitat protection.

The consultants confirmed the existence of only 11 captive tamaraws at the 281 ha breeding facility established in 1980 on

Mindoro island, the tamaraw's native habitat. They observed that project management has become difficult and costly, owing to flood damage, fire encroachment from nearby cattle ranches, and even armed intimidation of TCP staff.

No reliable estimate of the wild population is available, and no effective protection has yet been provided, even in the Mt Iglit-Baco National Park where around 145 animals are thought to survive.

The study was carried out at the request of the Philippine Department of the Environment and Natural Resources, in collaboration with the Zoological Society of London and the Bristol, Clifton and West of England Zoological Society. A five-year project workplan and budget are now being developed by the Philippines Government in consultation with IUCN and the Zoological Society of London. This programme is essential if the remarkable tamaraw is to be saved from extinction.

Steering committee

Members of the SSC steering committee met in Washington, DC on 18-19 March. They agreed on a number of measures to simplify the administration of the Commission, made plans for the SSC meeting in November to be held on the theme of "Making the case for conservation: putting knowledge into action", discussed the IUCN General Assembly Workshops, and reviewed the new proposals for upgrading species information management in the SSC network and in WCMC.

More newsletters

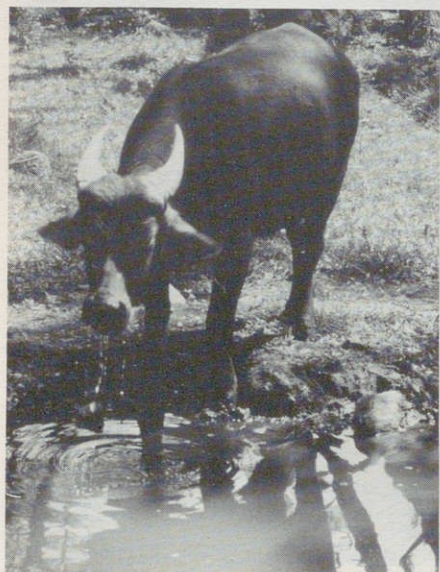
Two more Specialist Group Newsletters have been launched, to make a total of 33.

The 24-page inaugural issue of the *CBSG News* from the Captive Breeding Specialist Group includes a full report of the 1989 CBSG meeting in San Antonio, Texas, an update of kouprey conservation efforts, results of a US workshop on small population biology, an account of recent re-introductions and news from other specialist and working groups. Address: CBSG News, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124 USA.

Fish is produced by the Freshwater Fish Specialist Group. Highlights of the first issue include a discussion of the 596 fish species listed as threatened, and why an inordinate proportion of them are in North America, the problems facing the fishes of African Great Lakes, the decline of native fish in California and New Zealand, habitat degradation in tropical floodplains, the aquarium trade, and reports on mining pollution in Amazonia. Address: Freshwater Fish Specialist Group, c/o London Zoo, Regents Park, London NW1 4RY, UK.

Directory available

The SSC membership directory has been published. It lists the addresses, telephone, telex and facsimile numbers of 1500 members in more than 100 countries, representing each of the SSC's 98 Specialist Groups. Available from: The Chicago Zoological Society, Brookfield Zoo, Golf Road, Brookfield, Illinois 60513 (USA).



The tamaraw (photo: IUCN/Simon Stuart).



Thjorsarver Reserve joins Ramsar list

Iceland's Thjorsarver Nature Reserve is a tundra complex of 37,500 ha in the Central Highlands. Its pristine rivers, lakes, ponds and extensive marshes host an exceptionally rich biota including 10,000 breeding pairs of the pink-footed goose, *Anser brachyrhynchus*.

The Reserve was added to the Ramsar list on 20 March 1990.

Martin Holdgate gives David Davies Lecture

IUCN's Director General, Dr Martin Holdgate, was the latest in a series of distinguished world figures to deliver the Annual Memorial Lecture of the David Davies Memorial Institute.

His address, entitled "The Environment of Tomorrow's World," was delivered in the lecture theatre of the Royal Society in London on 26 February. The Chair for the evening was taken by the Rt Hon. Lord Home, former British Prime Minister.

A limited number of copies of the lecture are available from IUCN headquarters.

New plan for Djoudj

The Djoudj National Park is a magnificent 16,000 ha wetland reserve in the Senegal delta, famous for its resident and migratory bird populations.

An IUCN mission visited Senegal from 25 February to 7 March to advise the National Park Service on a new management plan for the Park, as part of a joint IUCN-WWF initiative. Consultants Albert Beintema, Hubert Matthes and Jamie Skinner helped to define a new programme of research and monitoring, education and tourism.

Project documents will soon be submitted to bilateral and multilateral aid agencies, and it is hoped that the new activities could start later this year.

Members talk business

Several IUCN members – the East-West Centre of the University of Hawaii, the World Resources Institute, and the International Institute for Environment and Development – presented papers at a recent Conference on Environment, Development and Economic Research. IUCN Chief Conservation Officer Jeffrey A. McNeely also presented a paper, on "Biodiversity: the economics of conservation and management".

The Conference was organized by the Overseas Development Institute and held in London, 27-28 March.

East Africa's wetlands

The Rufiji River system is one of the most important in East Africa, and for years has attracted the investment interest of the Tanzanian Government and international development aid agencies.

From 12 to 31 March a joint IUCN-WWF mission visited Tanzania to take part in a Governmental review of the country's wetland management problems and to help identify conservation priorities. Wetlands officer Pat Dugan, who joined Regional Representative Rob Malpas at an end-of-mission round table, reports: "Although it is too early to say what the long-term results of this exercise will be, it does show a growing awareness of the importance of Tanzanian wetlands, including the Kilombero floodplain, Usangu flats and other parts of the Rufiji River system. The National Environmental Management Council of Tanzania is playing a catalytic role in bringing together agencies concerned with these and other wetlands, and IUCN is only too happy to provide advice."

Nigerian floodplain

Large development projects in Nigeria's Hadejia floodplain are likely to bring about profound changes in the way local people exploit the wetland's resources.

From 5 to 10 March, Jean-Yves Pirot from the IUCN Wetlands Programme, and Esko Joutsamo from the Finnish Association for the Protection of Nature, visited the Hadejia-Nguru wetlands conservation project based at Nguru (Borno State). The project aims to provide advice to both State and Federal administrations on ways to sustainably manage their wetlands.

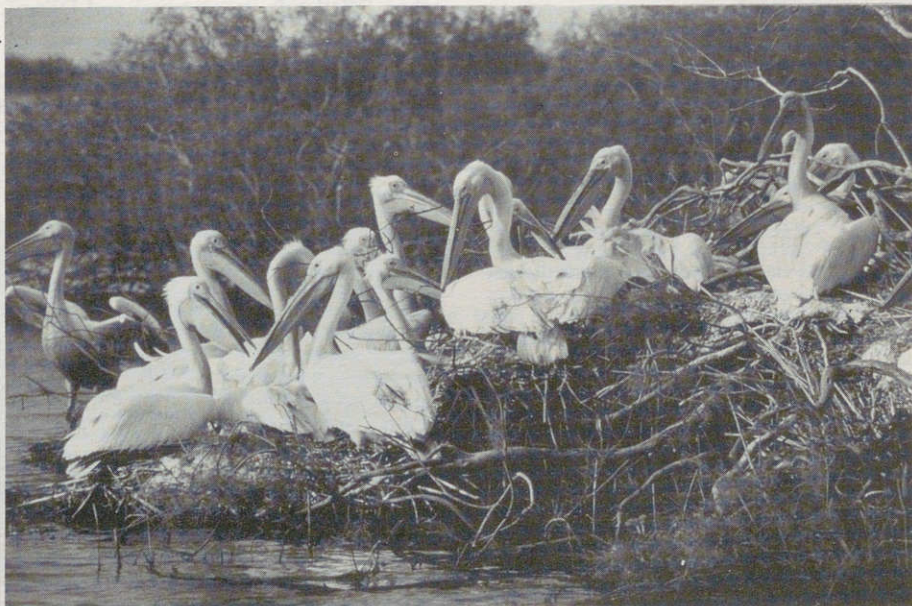
"Although the area is relatively small, the problems of water management

The Finnish Association for Nature Conservation (SLL)

The SLL is the central non-governmental organization for the promotion of environmental conservation in Finland. Many of its 30,000-plus members belong to the Finnish Youth Association for Environmental Protection.

A large part of SLL activities involves environmental education: it publishes educational materials and organizes excursions, study courses and public meetings. The Association also lobbies politicians and officials, organizes demonstrations, and takes a public stand on current environmental issues.

Address: Perämiehenkatu 11A, SF-00151 Helsinki, Finland.



Pelicans at Djoudj National Park, Senegal (photo: IUCN/Patrick Dugan).

WORLD ROUNDUP

and resource use on the floodplain represent a microcosm of wetland management problems in much of arid Africa," explains Dr Pirot. "By working here, IUCN and its cooperating organizations hope to learn a great deal which will be of value not only to Nigeria but to other countries of the Chad basin and the Sahel as a whole."

The project is a joint effort of Borno, Bauchi and Kano States, the International Council for Bird Preservation, the Nigerian Conservation Foundation, the Royal Society for the Protection of Birds and IUCN. It is supported by FINNIDA.



New Ramsar sites in India

On 23 March India added four new wetlands to the Ramsar list, bringing its total to six.

Surrounded by high mountains to the north-east, **Wular Lake** in the States of Jammu and Kashmir is the largest freshwater wetland in India. It is home to a number of migratory and resident birds, and is covered by aquatic plants, including the commercially important water chestnut *Trapa natans*.

Damming the Beas-Sutlej watershed created **Harike Lake**, the biggest wetland system of Punjab. Economically important as a source of fresh water and fish, the lake is threatened by chemical contamination, siltation, and an infestation of water hyacinth.

The ancient **Loktak Lake** in Manipur is the biggest natural wetland in north-east India. It is vital to the region's economy and helps to mitigate the effects of floods and droughts. The south-eastern side is home to the threatened brow-antlered deer *Cervus eldi eldi*.

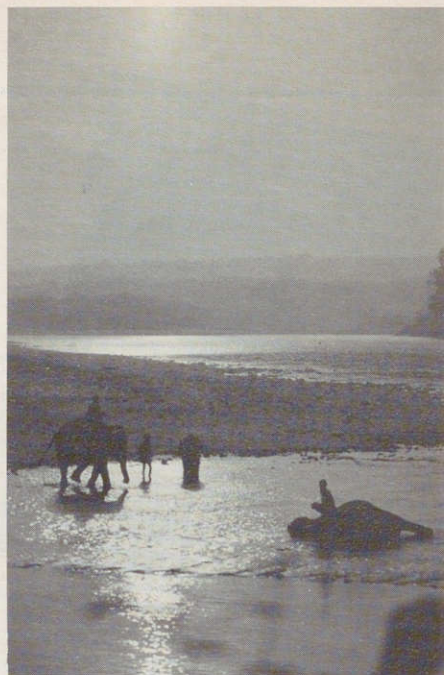
Flamingoes, waders, migratory ducks and other aquatic birds gather in great numbers in **Sambhar Lake**, Rajasthan, a shallow wetland which is also home to the saw-scaled viper, desert cat and desert fox. The wetland is threatened by siltation, soil salination and sewage discharge.

India sets up Ramsar Committee

A non-governmental committee is being established in India to provide a national forum for discussion of wetlands issues and the implications of the Ramsar Convention. It will be developing projects to link the conservation and sustainable development of India's wetlands and assisting in the preparation of a Ramsar newsletter, and is sending a representative to the Fourth Meeting of the Contracting Parties to the Ramsar Convention (Montreux, Switzerland, 27 June-4 July 1990).

Forest economics

Various aspects of forestry and economics in India were examined at a seminar on the Economics of the Sustainable Use of Forest Resources, held in New Delhi, India, 2-4 April. Organized by Anil Agarwal of the Centre for Science and Environment (CSE), the seminar was inaugurated by the Minister of Environment and Forests, Ms. Maneka Gandhi.



A new committee will develop projects on the conservation and sustainable development of India's wetlands (photo: WWF/N. Tellander).

IUCN was represented by Chief Conservation Officer Jeffrey A. McNeely, speaking on "Biodiversity in India: some issues in the economics of conservation and management".

Managing mangroves in Nicaragua

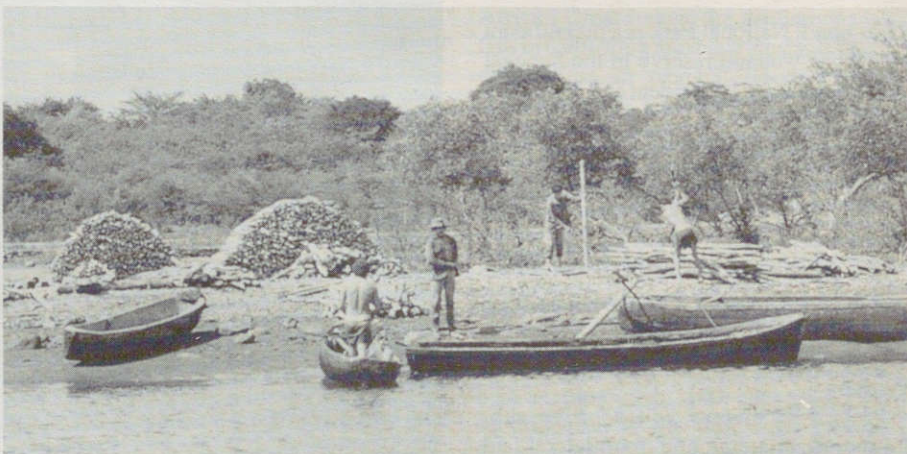
A mangrove management project is under way on the Pacific coast of Nicaragua as part of CATIE's regional "OLAFO" project. IUCN is providing technical assistance in coastal zone and wetlands management through its Central American office, ORCA.

IUCN officers Pat Dugan, Enrique Lahmann (Wetlands Programme) and Danny Elder (Marine Programme) took part in a one-day workshop, after which they visited the project with coordinator Evenor



Martínez. "Our purpose is to help CATIE in its efforts to strengthen natural resource management in Nicaragua and throughout Central America," notes Dr Elder.

The OLAFO project is funded by Sweden and Norway.



Nicaragua's mangroves are harvested for construction, firewood, charcoal, and tannin (photo: IUCN/Patrick Dugan).

Wilderness under pressure



Photo: Greenpeace/Perez

The Nature of Antarctica

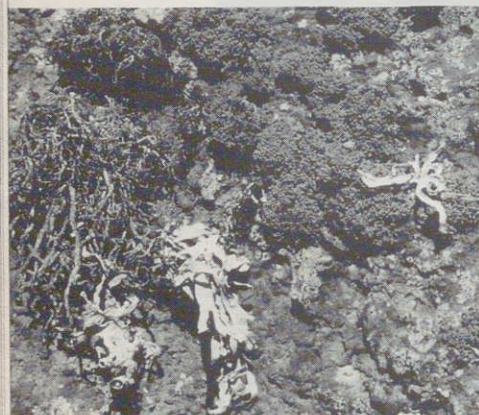
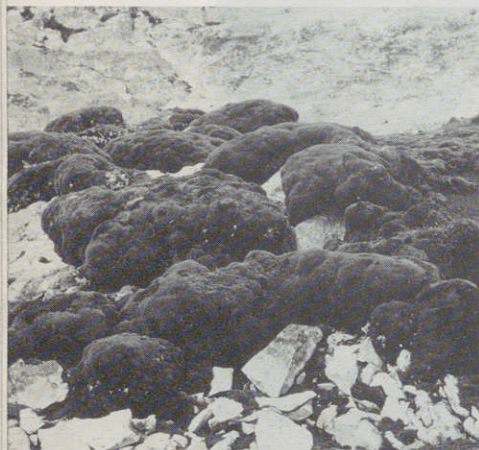
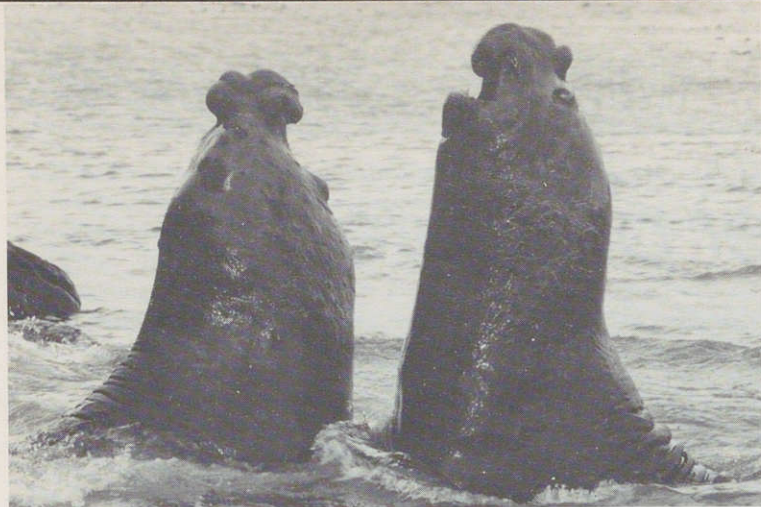
Antarctica is a continent of superlatives. It is the world's highest, iciest, coldest, windiest and remotest land mass. An area as big as the United States of America and Mexico combined lies at the hub of the southern hemisphere, surrounded by an unbroken ring of windswept and ice-battered ocean. Antarctica contains 90 per cent of the world's fresh water, locked up in an ice-cap with an average thickness of almost 2000 metres. Over half the surface lies above the 2000m contour, and a quarter above 3000m. On the high plateau about the South Pole, temperatures can easily drop in winter to between -50 and -70°C , while on a warm summer day you may bask in unbroken sunshine, with the temperature around -15°C .

The continent is the windiest in the world because the cold air over the ice-cap flows down the outer slopes to the sea, and can easily attain velocities of well over 100 km per hour, bearing drift snow in an impenetrable blizzard. The ice flowing slowly out from the hub of the continent nourishes immense floating ice shelves in the Ross and Weddell Seas, from which tabular icebergs up to a 100 km in length calve off from time to time and move northward into the open waters of the Southern Ocean. In winter, up to 20 million sq km of that ocean may be covered by sea ice, and even at the height of summer about five million sq km are encumbered by floating ice pack.

It was not always so. Two hundred and fifty million years ago Antarctica together with Australia, India, Africa and South America formed part of the great southern continent of

Gondwanaland. Its progressive break-up released India to move northward, collide with Asia and form the Himalayas, and Antarctica to move southward to its present position, lying almost symmetrically about the South Pole. Up to about 30 million years ago Antarctica was largely ice-free and the present ice-cap dates only from the last ten to 12 million years. Prior to that time we know from the fossil record that the continent supported a flora not unlike that now present in the wet temperate regions of southern Chile, the south island of New Zealand and southwest Tasmania, with southern beech trees of the genus *Nothofagus* prominent. We can reconstruct what tertiary Antarctic vegetation must have looked like from the scattered remnants now to be found in the southern temperate zone, a fact originally deduced by the botanist Sir Joseph Hooker, who visited Antarctica in the 1840s.

Today the life of the land is severely impoverished. Lichens are the most abundant plants on the two per cent of the surface that is free of ice. There are between 200 and 300 different kinds of lichens in Antarctica. Along the coasts, and especially in the milder climates of the Antarctic Peninsula, where the mean air temperature in the warmest month rises a degree or two above freezing point, mosses and liverworts form extensive green and yellow carpets, and there are two kinds of higher plants: a small grass (*Deschampsia antarctica*) and a low-growing cushion plant (*Colobanthus quitensis*). The Peninsula also has the largest true land animals in the Antarctic – two small wingless midges – while



Top: bull elephant seals fighting, nesting shag; middle: moss bank, krill swarm; bottom: lichen-covered rocks.

Photos: Nigel Bonner

the soil fauna includes tiny nematode worms, and a variety of springtail insects (Collembola) and mites. The freshwater lakes that occur here and in some parts of continental Antarctica contain tiny shrimps, and other small forms of water life, subsisting on the algae and on submerged felts of moss.

This life is so inconspicuous that the casual visitor to Antarctica scarcely notices it. The tourist will observe the orange and grey lichens on the rocks, and in a few places the carpets of moss, but the dominant spectacle of Antarctica is of course the enormous multitudes of penguins and other sea birds, and the

seals that are so conspicuous lying out on the ice-floes in the pack-ice zone and breeding along the shores. Antarctica is the home of the world's commonest seal, the crabeater (*Lobodon carcinophagus*) which, with a population that may be as high as 20 million, probably accounts for about three-quarters by weight of all the seal flesh in the world!

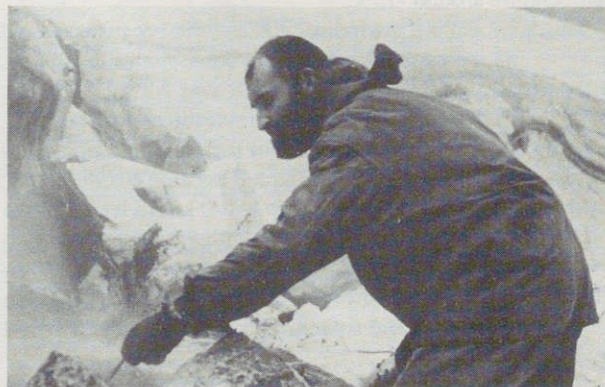
The penguins, sea birds and seals are all nourished by the productivity of the Southern Ocean. It used to be thought that this zone of cool water, fertilized by nutrients welling up from the deeps, was among the most productive seas in the world. We now know that this is not so, but nonetheless the richness of the marine system contrasts sharply with the near-desert conditions on land. Prominent in the marine food web is the unique organism we call krill (*Euphausia superba*), which makes up about half the weight of animal plankton and is the staple food of the great whales, crabeater seals, and many other species. Indeed almost anything that can eat krill does so when the opportunity offers.

Antarctica is the remotest continent, a hub of ice guarded by a girdle of stormy seas, and the continent itself was probably not sighted by human eyes until the 1820s. Even at the height of summer today, there are only a few thousand scientists and tourists, and those operating the ships and aircraft that supply them, in the whole vast area. Most of the Antarctic land remains a wilderness and it might be expected that its living systems would have escaped the depredations of man that have borne so heavily on life in other parts of our planet. Sadly this is not true. When Captain James Cook discovered South Georgia in 1775, he found fur seals there. In the following half century, well over a million of these animals were killed, and the species was driven in the following decades to the brink of extinction. Nigel Bonner documents this story in his article in this number of the *Bulletin*. Later, the whalers had a similarly devastating impact on their quarry, and this is also described in Nigel Bonner's text.

Today we see a distorted ecosystem, with some krill-eating species increasing in abundance, and possibly hampering the recovery of the great whales with which they compete. We see on land an ever-widening and intensifying human impact, even though it is still small in scale compared with the vastness of the continent. We see an international community that has achieved the demilitarization of the continent, the barring from it of nuclear explosions and nuclear waste disposal, and the establishment of a tradition of peaceful scientific cooperation. We see the international system for regulating human impact on Antarctica coming under increasing strain, as the scale and scope of activities and desires broadens.

This number of the *Bulletin* analyses those impacts, and the test question we need to be able to ask and answer at the end is: "Will Antarctica remain wild and beautiful, and its life varied and resilient despite our collective activities?" If not, the world will have lost something truly priceless.

— Martin W. Holdgate
Director General, IUCN



The author measuring the temperature of a fumarole (volcanic vent) in the South Sandwich Islands, circa 1964.

1. Using Antarctica: cold comfort

"Some will tell you that you are mad, and nearly all will say 'What is the use?'" So wrote Apsley Cherry-Garrard to the prospective explorer in 1922.

What resources can we use in Antarctica? In the first of these articles, Nigel Bonner describes how uncontrolled exploitation devastated Antarctic fur seals and whales. The seals have recovered. Some of the whales may never do so. The story is a sharp lesson of the need for care as we turn to new fisheries in Antarctic waters.

What are the wider uses? Science is proving that research in Antarctica is of immense value in understanding our planet, and Claude Lorius describes the insights gained through the study of gases trapped deep in the ice, and through measuring stratospheric ozone. But even science has its impacts, and we need care and control, especially over the logistics that supply the scientists.

And what use can the non-specialist make of Antarctica? As Paul Dingwall explains, tourism is on the increase. Adventurous climbers, ship-borne foragers, and airborne observers are moving south in mounting numbers. They too need to pay heed to the sensitivity of the environment, but few come back untouched by Antarctica's beauty and wonder.

These essays show that we can use Antarctica, but must be ever-vigilant in our care for it.

Past impacts – the hunt for seals and whales

Today there is much serious discussion about the possibility of making Antarctica a "World Park" where exploitation would be outlawed and the Antarctic environment preserved for its own sake. Two hundred years ago, such a suggestion would have been greeted with incredulity. The prevailing view at the time was that the world's resources had been put there by a beneficent providence for human use and their utilization for profit by a few better-developed countries was regarded almost as a duty.

Captain Cook was the first man to probe the limits of the Antarctic when he landed briefly at South Georgia in 1775. Cook was bitterly disappointed at the apparent paucity of the region's resources, and wrote off the *Terra Incognita Australis* as "not worth the discovering". But he did note that the beaches swarmed with fur seals.

Antarctic fur seals flourished on South Georgia and the islands off the Antarctic Peninsula, nourished by the great stocks of krill in the nutrient-rich waters of the Southern Ocean. Cook's passing reference to the seals sparked off a series of visits by sealers, already at work in the Falkland Islands and coastal South America. The first sealers arrived in South Georgia in 1778. By 1821 the fur seals were all but extinct, at least 1.2 million having been taken. The sealers systematically slaughtered the animals as they arrived at their breeding grounds, taking all but the new-born pups, which of course perished as their mothers had been killed. The South Shetlands were discovered in 1819 and by 1822 the seals there had been almost totally wiped out.

The sealers continued their voyages of discovery, looking for new breeding places to exploit. With seal numbers so drastically reduced the hunting pressure was relaxed, allowing for some small recovery of stocks. Unfortunately for the fur seals an alternative resource presented itself –



Once a treasure trove: Main Bay fur seal colony.

Photo: Nigel Bonner

the oil of the huge elephant seals that frequented the same

areas. While hunting the elephant seals, a sharp look-out was kept for any fur seals and if one was seen it was immediately knocked on the head and its skin taken.

There was a brief revival of sealing in the 1870s but by the beginning of this century Antarctic fur seals had been reduced to an all-time low. In 1907 the last of the Yankee sealers took 170 skins from South Georgia. This was the last commercial catch. Fortunately, by this time some sort of law and order had come to this part of the Antarctic and the British authorities in South Georgia instituted a rigid protection of the fur seals and a management scheme for elephant sealing. Elephant seals, never so harshly affected as fur seals, soon recovered but it was not till the 1950s that fur seals became abundant once more in their old haunts. Today the stock of Antarctic fur seals probably numbers between one and two million (it is difficult to count so many animals in the broken terrain they prefer for their breeding grounds), and it is likely that they are now as numerous as they were before the arrival of the sealers, though their distribution is rather different.

The recovery of the fur seals, one of conservation's great success stories, was undoubtedly assisted by the great reduction in the stocks of baleen whales, which fed on the same food resource – krill. Fewer whales meant more krill for the seals, faster growth rates and earlier reproduction. The seals benefited from the whales' misfortune.

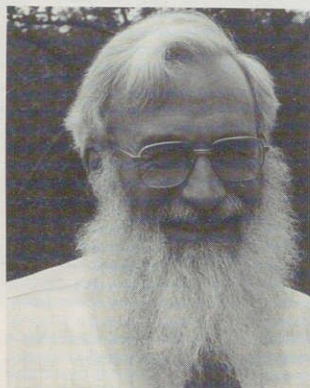
The reduction of whales was a much more severe perturbation of the Antarctic ecosystem and one which so far



Above: flensing an elephant seal on South Georgia; right: tackling a sperm whale.

Photos: Nigel Bonner

shows little sign of being reversed. The first whalers arrived in South Georgia in 1904, searching for new grounds following the collapse of the northern hemisphere whale stocks. Antarctic whaling was an immediate and spectacular success. By 1911 there were eight whaling stations in South Georgia, and nine shorebased factory ships and a shore station were working in the South Shetlands.



Once Nigel Bonner started working on elephant seals in South Georgia in 1953, he never stopped, although his interests expanded to include Antarctic fur seals, whales and other marine mammals. After ten years of field research he returned to England to lead the Seals Research Unit (later to become the Sea Mammal Research Unit, part of the Natural Environment Research Council of the UK), which he headed from 1967-1974. He then joined the British Antarctic Survey as Director of the Life Sciences Division. Since retiring as BAS Deputy Director in 1988, he has served as convener of the SCAR specialist group on environmental affairs and of the Seal Specialist Group of the IUCN Species Survival Commission, and as President of the Mammal Society.

In those days whale processing could be done only from a shore station or from a ship anchored in a sheltered cove. Whaling was thus readily controllable by the authorities administering the area. The British administration, which controlled the entire area in which Antarctic whaling then took place, had a policy of restricting licences for stations or for the number of catching boats that could be employed, so as to conserve the stocks of whales. Despite the pressures of demand created by the First World War this policy held whaling in check until 1925 when the stern-slip factory ship was introduced. These vessels could process whales on the high seas, thus avoiding the British restrictions and, as important to the whalers, the taxes that were levied.

Whaling expanded spectacularly as more and more

companies invested in factory ships. In 1930-31 forty thousand whales were killed in the Antarctic, producing more than half a million tonnes of oil. Over-production of oil created a crisis for the whalers and attempts were made to regulate catches by international agreements in 1935 and 1937. These largely ineffective regulations were more to stabilize the oil market than to protect the whales. They were soon overtaken by the Second World War which effectively put a stop to Antarctic whaling.

However, immediately after the war the shortage of edible oils in Europe led to the Allied powers sending whaling expeditions to the Antarctic. These operated under the newly-agreed 1946 International Convention for the Regulation of Whaling. The Commission set up under this, the International Whaling Commission (IWC), is still the regulating body of whaling today. Unfortunately, commercial pressures from within the industry prevented the cautionary advice of the IWC's Scientific Committee being accepted until it was too late to be of value. A catch quota system designed to stabilize oil production – the infamous Blue Whale Unit – proved ineffectual for conserving whale stocks. One by one the stocks of great whales were exhausted, first the blue whales in the 1930s, then the fins in the 1950s, and finally the seis in the 1960s. Humpbacks and right whales, never very numerous, had earlier been reduced to remnant populations.

But there has been a change in the regulation of whaling. Conservation interests, rather than commercial pressures, dominate the IWC today, and there is a prospect that there will be agreement for the abandonment of commercial whaling, or if whaling is to continue, it will be at a level rigorously controlled to be within the sustainable capacity of the stocks. The magnitude of the present stocks of Antarctic whales is unknown. It is certain, however, that they are far smaller than in pre-exploitation days. Some biologists believe that even with complete protection full restoration of stock levels will not take place since the niche previously occupied by whales has to a large extent been usurped by other krill-feeding animals – seals, penguins and perhaps squid. Whether this is true or not, the recovery of whale populations is certain to be a very long-term process and one which may possibly be overtaken by the effects of global climatic change. We may have saved the seals, but can we hope to save whales?

– Nigel Bonner

Science in the Antarctic

There are numerous areas of research for which Antarctica offers special opportunities. Examples include solar-terrestrial phenomena associated with the magnetic poles, the role of Antarctica in shaping global climate, human behaviour in a harsh environment as a possible analogue for manned planetary exploration, and the dynamics of Antarctic ecosystems and related specific ecological and physiological adaptations.

Much of this work is of considerable value to an understanding of our planetary environment, but this article will consider those areas of scientific research which have caused some discord between scientists and conservationists. It will also examine the criteria which have been suggested as a basis for screening research programmes.

The geology of Antarctica is fundamental to understanding how the continents of the Southern Hemisphere formed from the super-continent of Gondwanaland. This requires geological and geophysical studies, from which we may also gain a more rational assessment of the mineral and hydrocarbon potential of Antarctica – a sensitive issue when debating the future of the continent.

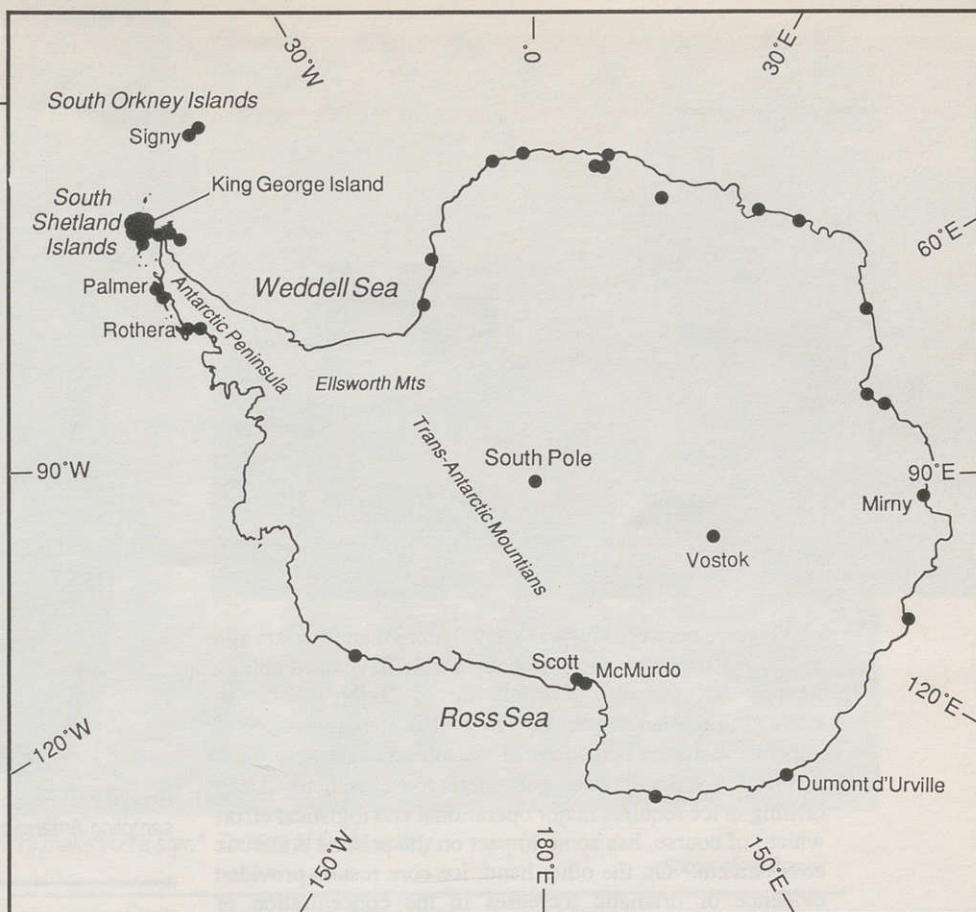
The discovery of the springtime stratospheric ozone hole has had a large impact on both the public and legislators. It triggered governmental decisions to limit the production of chlorofluorocarbons which have been linked to these adverse changes in the atmosphere and, potentially, in the biosphere – in particular since the effects could extend to other areas of the world through changes in radiation

In January 1990 there were 41 wintering stations operated by ATCPs in the Antarctic Treaty area, and five in the subantarctic (only those mentioned in the text are labelled).

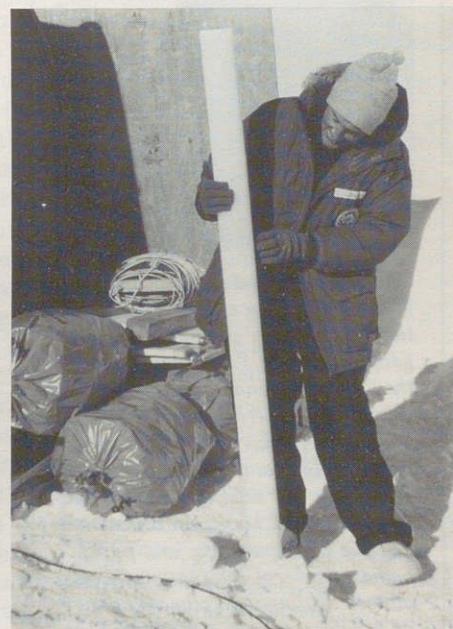
Source: IUCN, A Strategy for Antarctic Conservation

penetration (affecting plant and animal life and human health) and climate (affecting sea level).

But this discovery came after many years of what was considered a more-or-less routine and not very exciting research programme. We may then wonder what would have happened to this discovery if there were regulations to decide *a priori* which programme should be authorized, based on a preconceived notion of what constitutes "good science".



Left: unloading an expedition's supplies by helicopter at Rothera; right: the author with an ice core.



Left photo: Nigel Bonner; right: C. Lorus



When ice core drilling was started more than 20 years ago on the Antarctic ice-sheet, nobody would have been able to foresee that the results would be of major interest in evaluating human impact on our global atmosphere, or in understanding the behaviour of the climate system and the connecting links between geosphere and biosphere. Deep drilling in ice requires major operational and logistical effort which, of course, has some impact on the pristine Antarctic environment. On the other hand, ice core results provided evidence of dramatic increases in the concentration of greenhouse gases (such as carbon dioxide and methane) since the beginning of industrialization, about 200 years ago. The major changes observed in the Antarctic atmosphere are not caused by activities on this continent, but reflect rather an increase in human activities everywhere and the impacts of a world population which is growing exponentially.

Ice core studies have also shown the close association between long-term large climatic changes and greenhouse gas concentrations. It is likely that these changes in the

composition of the atmosphere have played a major role (together with cyclical changes in the orbital parameters of the earth known as the Milankovitch effect) in determining the amplitude of glacial/interglacial climatic changes. High-latitude ice is itself believed to play an amplifying role in climatic change, for example through changes in the extent of sea ice which reflects solar radiation. The Antarctic ice-sheet itself reacts to climatic change. One of the major potential global impacts of climate warming is the foreseen increase in sea level which would affect the living conditions of millions of people. The main uncertainty in explaining sea level rise over the last century may be our insufficient knowledge of the mass balance of Antarctica (i.e. the equilibrium between the amount of



Snocat trains keep scientists mobile under difficult conditions (left); sampling Antarctic waters (right).

Photos: Nigel Bonner

falling snow and the discharge of icebergs). This uncertainty puts some limits on the prediction of sea level increase over the last century; but it is likely that the contribution of Antarctic ice to that increase will mainly depend on forecasted changes in accumulation and not on an increased melting or dramatic collapse of part of Antarctica – sometimes mentioned as a possible impact of increased human activity there.

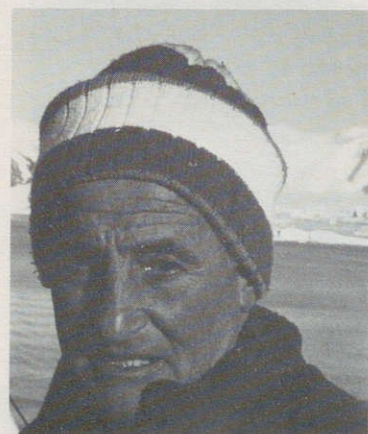
These examples illustrate the contribution of Antarctic research to current problems of global environmental concern. It is obvious that science in Antarctica has unique value in many respects. Efforts to monitor and understand global change must of necessity take account of the geographic importance of Antarctica in the mainly oceanic Southern Hemisphere. It would be crippling to screen scientific programmes on the basis of arbitrary criteria. As shown above, discoveries cannot be foreseen. Predicting what will be "good science" is a difficult exercise.

Of course strenuous efforts should be made to minimize the impact of research activities on the Antarctic environment. It is to the merit of conservation organizations that they have sensitized scientists and logistics people to inadequate controls and misbehaviour in the past. Such defects include the unwise concentration of stations with too many overlapping programmes, insufficient quality of some research activities, and of course deficiency in the management of wastes or in dealing with local fauna or flora.

This has been a matter of concern for the Scientific Committee on Antarctic Research (SCAR) as shown by its role in the development of an Antarctic conservation policy (e.g. its contribution to establishing the "Agreed measures for the conservation of Antarctic flora and fauna" or the recent report on waste disposal).

I believe, like probably all of my colleagues in science, that it is possible to conduct quality research in an atmosphere of freedom and creativity while still staunchly respecting the nature of Antarctica.

– Claude Lorius



Claude Lorius is a specialist in field glaciology and ice core studies at the Laboratoire de glaciologie et géophysique de l'environnement of the Centre nationale de la recherche scientifique (CNRS) in Grenoble, France. He has taken part in 17 polar field campaigns, published more than 130 scientific papers and two illustrated books on Antarctica and the polar regions, and participated in several international committees dealing with climate change and polar science. He has been President of SCAR since 1986.

Antarctic tourism

In February 1990, two European adventurers on skis arrived at New Zealand's Scott Base, on Ross Island, thus completing a three-month traverse of the Antarctic continent. Several weeks later, another six-man party comprising the International Trans-Antarctic Expedition, using sleds pulled by 42 huskies, completed an eight-month crossing of the continent. Their air-assisted 6400 km journey extended from the tip of the Antarctic Peninsula to the Soviet Mirny Station, via the South Pole and the inland Soviet Vostok base, reputed to be the coldest place on earth. These remarkable feats of endurance, reminiscent of the heroic journeys by the pioneer explorers typify the emergence of adventure-style tourism in the Antarctic region.

Tourism is now an integral part of life in Antarctica. Indeed, it is the most rapidly expanding human enterprise there and, along with fishing, the only commercial use of Antarctic resources. When one considers that this remote and hostile land has barely emerged from an era of discovery, the scope of tourist activities is quite remarkable.

Other notable private expeditions in recent years were the 1980/81 Transglobe Expedition (the second crossing of the continent by motorized vehicles) and the 1985/86 Footsteps of Scott Expedition which retraced his 1911/12 journey to the South Pole. Small expeditions have even gone commercial. In January 1989 the Canadian-based Adventure Network International supported the first ski party to reach the South Pole – only the 12th overland trip ever to reach the Pole. Operating ski-planes from an ice runway at their Patriot Hills base camp (which has tents, bunkrooms, and workshop), ANI assisted five mountaineering groups in the 1988/89 summer. The principal attraction for climbers is the 4897m Mt Vinson in the Ellsworth Mountains, Antarctica's highest peak, but ANI also runs guided ski-camping safaris throughout the spectacular mountains of the Antarctic Peninsula.

On the other side of the continent, a six-man team celebrated the Australian bicentennial in 1986/87 with the first ascent of the 4162m Mt Minto, the highest peak in the Trans-Antarctic Mountains. Adventurer David Lewis is renowned for his 1972/74 solo navigation of Antarctica aboard the 10m "Icebird", and a 1978 voyage amidst icebergs and pack ice in the 17m yawl "Solo". From 1981/82 he has led several groups on voyages in the 21m schooner "Dick Smith Explorer", one trip involving ten months icebound in coastal pack ice.

Small sailing expeditions have become common around the Antarctic Peninsula. In most austral summers about half a dozen, based out of ports in Tierra del Fuego or the Falkland Islands, cruise the Peninsula's waters with groups undertaking climbing, skiing, hang-gliding, sledging and scenic touring. During the 1987/88 summer a three-man crew rowed across the 1100 km Drake Passage, from South America to the South Shetlands. All survived, in spite of the fact that their boat capsized three times in the stormy waters around Cape Horn.



"I'll make you a star." Tourists at Port Lockroy.

Photo: Nigel Bonner

While private yacht voyages are a recent phenomenon and carry only small groups, voyages by cruise ships have brought large numbers of tourists to Antarctica over the past 25 years. Today, in a summer season it is not unusual for three or more cruise liners to be operating in Antarctic waters, principally around the Peninsula but occasionally in the Ross Sea and neighbouring areas, including visits to the New Zealand and Australian subantarctic islands. Special purpose cruise ships such as the "Lindblad Explorer" (subsequently the "Society Explorer"), which commenced regular trips in the early 1970s, and the "World Discoverer", which entered the scene in the late 1970s, are around 3000 tonnes in size and carry 100 or so passengers on voyages of several weeks' duration. Larger liners of 6000-10,000 tonnes with up to 800 passengers operate sporadically from South American ports. The Argentinian military vessel "Bahia Paraíso", used for scientific base supply, also operated tourist charters from 1986 until it foundered on a reef and sank in January 1989.

Tourist flights to Antarctica have a briefer history than that of cruise vessels. Day trips by large commercial jet airliners became regular in the mid 1970s when Qantas and Air New Zealand began overflying the Ross Sea region, carrying as many as 4000 tourists each season. But they ceased abruptly following a tragic crash on Mt Erebus in November 1979. Regular tourist flights from South America commenced operations around 1983 and today include (in addition to ANI) non-stop sight-seeing flights by Lan Chile jets, and landings by smaller aircraft at the Chilean Teniente Rudolfo Marsh base on King George Island in the South Shetlands.

Today, some 2000-3000 tourists visit the Antarctic region each year, and while business is thriving the growth of activity has not been as spectacular as some had predicted. What attracts tourists to the icy wastes of Antarctica? The diversity of activities suggests there are several motives, including thrill-seeking in a challenging wilderness environment; exploring uncharted terrain and scaling unclimbed peaks; the experience of awesome vistas of mountains, glaciers, ice-sheets and icebergs, and the remarkable profusion of seabirds, penguins and seals. Some are attracted by the



South Georgia – gateway to the Antarctic. On the left, whale catchers are moored off the abandoned Leith whaling station.

Photo: Martin Holdgate

chance to visit scientific stations, others by the publicity given to ozone depletion and minerals and some undoubtedly by the fashionable ambition to set foot on the world's seventh largest yet least visited continent. Whatever the motivation, there are unquestionable benefits for Antarctic conservation from tourism. Those who visit gain a greatly enhanced appreciation of Antarctica's global importance and the requirements for conservation of its unique wildlife and environment. Science benefits where small independent expeditions undertake research and observations in remote, infrequently visited areas, and scientists may also take advantage of mail and supply drops, transport and communications support provided by tourist groups. Set against the benefits are a number of undesirable impacts, including disturbance of wildlife breeding colonies, trampling of fragile vegetation, and disruption of routines at scientific bases and research sites. The US Palmer Station in the Peninsula area is such a popular tourist destination that restrictions have been imposed on the number of visits allowed. Accidents, particularly shipwrecks in

stormy uncharted waters, place great strain on search and rescue facilities and resulting oil spills are environmentally hazardous and costly. The "Lindblad Explorer" has run aground on two occasions, one requiring the crew to abandon the vessel. Oil leaking from the "Bahia Paraiso" wreck severely damaged an area particularly rich in marine life and disrupted a long-term ecological research programme. The Erebus air disaster strained the resources at McMurdo and Scott Bases.

Despite these problems, experience suggests that environmental impacts of tourism have not been severe, particularly when compared to those associated with station operations. Tourists generally have a sincere interest in conservation and have behaved with care and respect for the

environment and wildlife. Commercial tours are professionally led by experienced people and some companies have collaborated in producing a travellers' code of conduct, which they are promoting as a self-imposed set of rules to minimize harmful environmental effects.

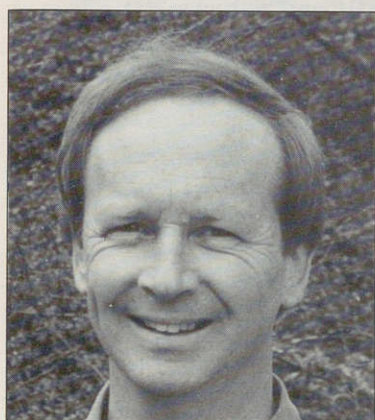
Establishing barriers against tourism development in Antarctica is not an appropriate course of action, but certain constraints are necessary. Existing agreements among the Treaty Parties on tourist regulations are not substantial and far from complete. They have evolved in a piecemeal fashion and largely in response to growing demands. The Treaty nations have acknowledged the need for a review of tourism policies and the drafting of new measures to regulate future activities. IUCN has also stressed the need for

preparation of comprehensive and binding rules, addressing issues such as environmental impact assessment of new developments, safety standards, insurance against accidents, liability for damage, approvals to visit stations, codes of conduct, and the monitoring and reporting of activities.

The future for Antarctic tourism is rather difficult to predict because so many factors will influence it. Weather and sea ice conditions are unpredictable hazards for tourist travel. Access to the region, while improving steadily, is still difficult. The remoteness of Antarctica and the risks associated with travel in the hostile and often unknown territory mean that it is expensive to visit. A berth aboard a cruise ship may cost \$10,000 (not including the cost of airfares to port of departure). The cost of air support for a party of five climbers in the Ellsworth Mountains is around \$70,000 which is roughly equivalent to the cost per person of a commercially guided ski journey to the Pole. The International Trans-Antarctic Expedition raised \$10 million in support, including the cost of building a special purpose yacht.

Despite the financial and logistical hurdles, interest in visiting Antarctica is growing apace, and the potential for expansion of tourism remains high. Currently, the Australian Geographic Society has expressed interest in recommencing overflights, and there are various proposals to establish elaborate tourist facilities on the Antarctic mainland. Reacting to several ambitious proposals to open up the continent, the Australian government recently conducted a federal inquiry into the nature and impact of Antarctic tourism. The principal proposal under investigation was Project Oasis, a grandiose scheme which envisages an airport handling wide-bodied jets flying in twice each week during the summer and carrying a total of some 16,000 tourists per season. Hotel accommodation would cater for 350 tourists and 175 staff, and complementary research centres would be staffed by 70 scientists. Helicopters would ferry tourists locally among sites of interest. The inquiry revealed that most scientists and conservation groups are opposed to the expansion of additional human pressure on the environment. It is clear, however, that there are entrepreneurs keen to exploit what they consider to be a potential tourist boom in the Antarctic. This adds urgency to the need for agreement on comprehensive regulatory measures to ensure that future Antarctic tourism, no matter what form it takes, is guided by sound conservation principles.

– Paul Dingwall



Paul Dingwall is a senior scientist and policy analyst in the New Zealand Department of Conservation. He is vice chairman of the CNPPA for the Antarctic Realm, and has been a consultant to IUCN for several years. Paul has visited Antarctica as a guide aboard the tourist ship "Lindblad Explorer", and has participated in several expeditions to sub-Antarctic islands.

II. The Antarctic Treaty System: full speed ahead or about turn?

The Antarctic Treaty System adopted in 1959 committed its Contracting Parties to formulating, considering and recommending to the governments measures "for the preservation and conservation of living resources in Antarctica". At the Third Consultative meeting under the Treaty, held in 1964, a series of Agreed Measures for Conservation of Antarctic Fauna and Flora were concluded. Many other agreements designed to safeguard the environment have followed.

Supporters of the Treaty System argue that the record shows both the willingness of governments and the ability of the system to deal with any conceivable threat to the Antarctic environment. Its critics argue that it has two major defects: it has dealt with environmental issues piecemeal rather than establish overall guarantees of Antarctic conservation, and it has not been endorsed by the world community as a whole as the instrument for safeguarding the world's only remaining great wilderness.

This divergence came to a head in recent debates over CRAMRA, the Convention on the Regulation of Antarctic Mineral Resources Activities. In the first of the two following articles, Lee Kimball argues that it is at least imperative to ensure that the dispute does not end by allowing minerals activities to proceed under less stringent safeguards than CRAMRA provides. Jim Barnes argues that CRAMRA is simply the wrong approach, and that there are better options. Both make it plain that matters cannot be left where they now are.

Let's build on our strengths

The 1957-58 International Geophysical Year (IGY) served as the catalyst for agreement on the 1959 Antarctic Treaty among the twelve nations then active in Antarctica. Their intent was to build on the IGY's cooperative international scientific investigations as a means to stabilize peaceful relationships among states in Antarctica and ensure that the area would not become the scene or object of international conflict. They were concerned that disputes might arise between any of the seven nations that had staked territorial claims in Antarctica during the period 1908-1943 (Argentina, Australia, Chile, France, New Zealand, Norway, United Kingdom) and the other five nations active there that did not recognize any claims in Antarctica (Belgium, Japan, South Africa, USSR, United States), and that the US/USSR Cold War might spread to activities in Antarctica. The possibility also existed that confrontations might again flare up between Argentina, Chile, and the United Kingdom, whose claims in Antarctica overlap.

The Antarctic Treaty provides that states parties meet to review their Antarctic activities and address pending issues. Traditionally these states have met every two years to adopt measures governing cooperation in science, logistic operations, conservation and environmental protection, including waste disposal, as well as the operation of their "consultative" meetings (ATCMs). In matters of science, operations, and conservation, they have relied extensively on the technical advice of the Scientific Committee on Antarctic Research (SCAR), which, as a subsidiary body of the International Council of Scientific Unions (ICSU), is composed of scientists involved in Antarctic research activities.

Just as the nature of Antarctic science has changed since the IGY, the range of activities there has also grown,



Is her chick safer with or without a minerals convention?

Photo: Nigel Bonner

producing a corresponding growth in the legal instruments and institutions that govern such activities. During the 1960s there was a resurgence of interest in harvesting marine living species. This prompted the Antarctic Treaty Parties to conclude two treaties, the 1972 Convention for the Conservation of Antarctic Seals (CCAS), which entered into force in 1978, and the 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), which entered into force in 1982.

CCAS has never been called upon as a regulatory mechanism, because there has been no commercial sealing since it entered into force. On the other hand, during the 1970s the acceptance of a coastal state's jurisdiction over fisheries to 200 nautical miles displaced a number of major fishing fleets to the high seas of the Southern Ocean. The institutions established by CCAMLR, a Commission and a Scientific Committee, meet every year at their headquarters in Hobart, Tasmania, to review and adopt measures implementing that Convention.

Oversight of scientific research and related logistic activities takes place under the original 1959 Antarctic

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Treaty. Concern over environmental damage from these activities has resulted in a variety of additional measures during the 1980s, including requirements for environmental impact assessment and environmental monitoring, the further development of the system of protected areas in Antarctica, and strengthened regulations governing handling and disposal of wastes in Antarctica and against the threat of marine pollution. Antarctic Treaty Recommendations have also been utilized to provide guidance for Antarctic tourism, whether sponsored by states or private commercial operators, including small, private expeditions. The recent expansion in this type of activity may warrant more extensive development of regulations to avoid interference with scientific research, environmental damage, and the potential for accidents.

In the early 1970s, the combination of the oil embargo by the Organization of Petroleum Exporting Countries (OPEC) and the discovery of traces of ethane and methane in Antarctic offshore drill sites sparked interest among the Antarctic Treaty Consultative Parties (ATCPs) in completing a legal regime to deal with any future expressions of interest in developing minerals in Antarctica. Their intent was to establish controls in advance of possible commercial pressures in order to avoid conflicts that might arise between claimant and non-claimant nations over this issue and to avoid the possibility of unregulated minerals development. This led to the adoption of the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) in Wellington, New Zealand, in June 1988.

Entry into force of CRAMRA has since been called into question by the announcement of the Australian Government in May 1989 that it would not sign the Convention and was strongly committed to the view that no mining at all should take place in and around Antarctica. Although Australia may accede to the Convention at any time, the Convention cannot enter into force if it does not, because its terms require ratification by all participating ATCPs. Australia indicated that it would pursue instead the urgent negotiation of a comprehensive environmental protection convention within the framework of the Antarctic Treaty System. Other governments have joined Australia in expressing concern

about the possibility of minerals development in Antarctica. They have unanimously supported the need to strengthen environmental protection in Antarctica and endorsed a Chilean proposal to pursue consideration of comprehensive measures to this end. The next stage of these discussions is scheduled to take place at a special Antarctic Treaty Consultative Meeting in late 1990 in Santiago, Chile.

Proposals put forward by Australia/France, Chile, New Zealand, the United States, and Sweden at the XV ATCM in October 1989 lay out a detailed agenda for the 1990 meeting and beyond. They variously favour elabora-

tion of a series of basic environmental protection principles applicable to all human activities in Antarctica; updating and supplementing existing measures for environmental protection; strengthening and making more precise the legal obligations such measures entail; strengthening the means to enhance compliance with these measures; and developing additional institutional mechanisms to implement and enforce them. They also stress the importance of promoting directed scientific research and environmental monitoring to support conservation and management decisions and of establishing an integrated information and data base to ensure that environmental protection measures are effectively implemented, revised, and extended as necessary in light of new information.

There are two points, however, on which there is no agreement among the ATCPs: the legal form that further comprehensive environmental protection measures may take, and how to address the possibility of minerals development. With respect to the form, Australia/France have advocated that a new convention be negotiated that would co-exist with existing legal instruments; others that they be incorporated into a protocol to the Antarctic Treaty; and still others that they take the form of Agreed Measures or Recommendations pursuant to the Antarctic Treaty. This issue of form is unlikely to be resolved until the specifics of the substance to be covered have been further considered and agreed.

With regard to the minerals issue: most countries believe that entry into force of CRAMRA is essential to ensuring comprehensive environmental protection in Antarctica, because it establishes institutions and procedures to deal with concrete interest in minerals development and subjects it to stringent environmental standards and safeguards. Many countries are opposed to minerals development in Antarctica but believe that CRAMRA represents the best means to protect Antarctica from the adverse impacts of any development. Some of these countries are willing to consider additional protection in the form of a protocol to CRAMRA in order to achieve the necessary ratifications for CRAMRA to enter into force. The Australian proposal is to negotiate an alternative, replacing CRAMRA, that prohibits minerals development in Antarctica.

Putting aside the questionable feasibility of achieving consensus among the ATCPs to prohibit minerals development, the second problem is how to ensure that if in the future a government changes its views and wishes to undertake minerals activities, the environmental protection rules are at least as stringent as those set out in CRAMRA. The concern is that if the negotiation of applicable rules is left until pressures for development exist, they will fall short of the requirements in CRAMRA.

The Antarctic Treaty System has evolved to address new and expanding activities in the Antarctic. It now requires a major leap forward to strengthen environmental protection and conservation. Satisfactory resolution of the issue of minerals development is a necessary component in strengthened environmental protection. If there is neither agreement on CRAMRA (with or without improvements), nor on an alternative regime addressing minerals development, minerals activities may proceed subject to environmental safeguards far less stringent than those in CRAMRA. Moreover, lack of agreement on the minerals question may slow agreement on the broader conservation agenda. Are we not better off trying to consolidate and improve existing legal agreements rather than prolonging an unresolved situation that may undermine Antarctic conservation?

— Lee A. Kimball



Lee Kimball is Senior Associate with the World Resources Institute in Washington, DC. She has been working on Antarctic law and policy issues since the late 1970s, and served as NGO representative to US Treaty negotiations. She holds a Master's Degree in International Affairs from the Johns Hopkins School of Advanced International Studies.

What's wrong with CRAMRA?

The Antarctic holds many secrets of the earth's past. It also holds a key to its future, as a site for cooperative scientific research, for protecting wildlife and wilderness values, and for monitoring climate change and global pollution.

Members of the Antarctic and Southern Ocean Coalition (ASOC) feel that allowing oil or minerals development in the Antarctic will seriously jeopardise that future. Unlike some conservationists, we strongly believe that CRAMRA will allow and even encourage such development, with devastating impact on Antarctica's vulnerable ecosystems.

Let us take the arguments for CRAMRA one by one.

CRAMRA protects the Antarctic while fulfilling the wish of many governments to keep the mining option alive. We believe this is a shortsighted approach, and, on balance, we submit that CRAMRA does not advance the true interests of any government, particularly when compared to options that have been put on the table by Australia and France.

CRAMRA is a conservation agreement. On the contrary, and as its name implies, CRAMRA would promote the likelihood of mining by its very existence. It would provide an international legal framework in which mining rights can be obtained. If CRAMRA were to come into force, prospecting could begin without a consensus decision of the Commission. Once this occurred, it would be virtually impossible to deter a determined mining state from proceeding.

Without CRAMRA there will be an Antarctic minerals free-for-all, and, in its absence, a country could decide to begin exploration without the legal framework in place. We maintain that without the necessary legal framework in place, any attempt to extract minerals would not be feasible either economically or politically. In the absence of agreed sovereignty in Antarctica, a private corporation would certainly need assured property rights before expending massive sums of money to extract minerals. An expert from the British Antarctic Survey has estimated that exploratory drilling and development would cost US\$1 billion. CRAMRA provides precisely what oil and mining companies need in order to carry out activities: guaranteed rights, secure tenure, and control of information. So without the CRAMRA framework, it is unlikely that any company would be willing to risk the investment.

CRAMRA would provide valuable support to the Antarctic Treaty System. CRAMRA's provisions allowing companies to protect "proprietary information" would undercut a key feature of the Antarctic Treaty System, which is free exchange of information. It also would have a tendency to warp national research programmes toward prospecting.

CRAMRA takes into account the concerns of environmental organizations. As a result of intensive lobbying, the treaty draft contains some sound environmental principles. But it is still flawed in many specific respects:

- the Scientific Advisory Committee will be very weak, because the Convention requires Commission control over too many of its activities;
- there is inadequate provision for a true review of important Regulatory Committee decisions by the Commission and even when a review is theoretically possible, the Commission is powerless to overrule a Regulatory Committee;
- the Convention does not provide for adequate review by Observers outside the treaty system. Given the role of Sponsoring States in preparing draft impact assessments, and



Perched on the crest of the active volcano, Bellingshausen Island, in the South Sandwich group, a survey party makes a long-distance measurement. Many people argue that CRAMRA will open the door to prospecting throughout Antarctica.

Photo: Martin Holdgate

the closed nature of the Regulatory Committees, this will pose a serious problem of accountability to the public, and will likely result in important, relevant information not being available to decision makers.

Perhaps the most important flaw is its **ambiguity** on many key points, including:

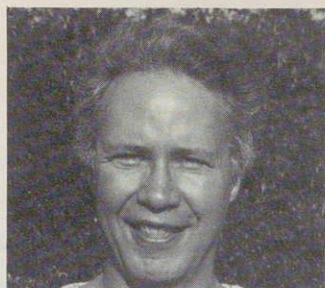
- **Sufficiency of information.** A threshold requirement is that there be information adequate to enable informed judgments to be made. The text does not make clear whether a decision is required by the Commission as to whether "sufficient information" is available, nor does it contain a definition of what "adequate" and "informed judgment" mean;

- **Liability.** The assignment of liability in cases of environmental damage is fuzzy, and the Convention would promote litigation to determine responsibility. It is unclear if there would be liability for an activity which was initially "judged acceptable" and was therefore permitted, but which later resulted in serious damage to the environment. The definition of "damage" and the Convention's liability provisions could lead to only limited liability. ASOC is particularly concerned that should such an event take place, the operator may not be liable for even very serious impacts;

- **Definition of terms.** For example, the word "significant" is the modifier most often used in the Convention, to refer to limitations on key obligations and liability, but there is no attempt to define the term;

- **The possibility of a "no" decision at the development stage.** ASOC has insisted that a Regulatory Committee and the Commission must have the authority not to issue a full-scale commercial development permit to a holder of an exploration licence. But some governments interpret Article 54(5) as requiring the *automatic* granting of permits to mine or drill, once an operator has obtained a licence to carry out exploratory activities. The Commission has no power to override a Regulatory Committee on this fundamental decision;

- **Compliance and enforcement capabilities of the Convention.** There are serious questions about enforceability. When the Commission learns of activities that affect the implementation of the objectives and principles of the



Jim Barnes is Senior Attorney at Friends of the Earth-US, and Executive Director of The Antarctica Project, which he founded in 1982. Since 1978 he has served as Counsel to the Antarctic and Southern Ocean Coalition (ASOC), which has more than 200 member organizations in 33 countries (many of which are also members of IUCN).

Convention or the compliance by any Party with its obligations, it does not have to notify Observers, nor is there any mechanism for informing the public;

– **Requirements regarding public records to be maintained.** A Regulatory Committee is not even required to maintain a record of its meetings, nor must it report on those meetings to the Commission. Outside observers and the public will have no knowledge of

discussions concerning compliance, nor will inspection reports be available.

Not good enough

ASOC will continue to oppose the negotiation of CRAMRA. In spite of improvements, it is simply the wrong approach to the Antarctic future, and we have little hope that it would actually protect the environment. The Antarctic Treaty System has proven to be a resilient set of principles, obligations and instruments. If CRAMRA is not brought into force, numerous other options to fill this "gap" are available and will be explored.

– *Jim Barnes*

III. Antarctic options : desire and reality

Nearly everyone agrees that Antarctic conservation needs to be strengthened. The debate is over the means. Is a new conservation Convention needed, and if so, should it replace or complement the existing Treaty System?

In the following section, John Heap accepts that the Treaty System needs review, rationalization and improvement, but argues that it can provide strong machinery to meet future challenges. Kelly Rigg, for Greenpeace, and Lyn Goldsworthy, for ASOC, both start with the premise that Antarctic conservation has to be put at the top of the agenda, and that World Park designation would emphasise the status of the region as a conservation zone where wilderness values are paramount. Both see tighter controls over logistic and scientific activities, and a prohibition of mining, as essential. Both accept the need to retain the many good features of the Antarctic Treaty System, complemented and extended by the additional measures and the radical new objectives they propose.

This is the essence of the dispute. Can we agree on goals, and so begin to focus on the means to attain them?

A stronger Antarctic Treaty?

What is meant by the "strength" of a treaty? I suggest the following definition: the strength of a treaty is directly proportional to the degree to which it achieves its objectives. A strong treaty achieves its objectives, a weak treaty does not.

The objectives of the Antarctic Treaty are to ensure freedom of scientific investigation and to prevent Antarctica becoming "the scene or object of international discord". To

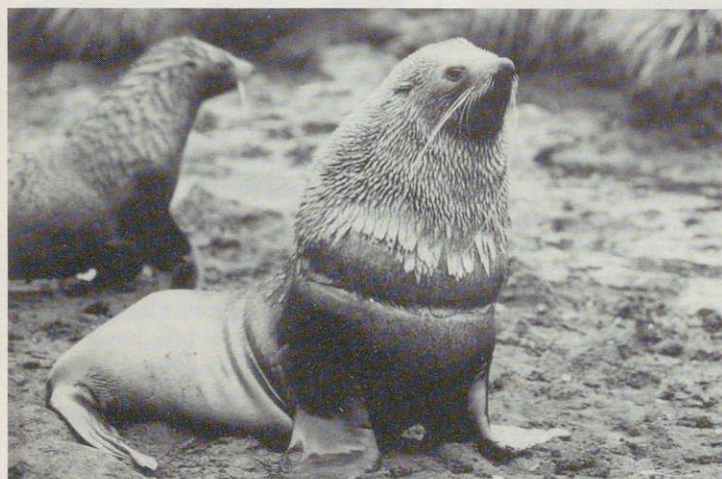
these ends, the Treaty suspends issues of territorial sovereignty, prohibits the use of force in pursuit of national policy and provides for confidence building measures, including exchanges of information about planned activities, inspection and a consultative mechanism. The Treaty does no more than is necessary to achieve its ends.

No one has used force in pursuit of national objectives; trust has been maintained by information exchanges and inspections; and 15 consultative meetings have been held producing 170 recommendations and 3 separate instruments dealing with the conservation of seals (CCAS) and Antarctic marine living resources (CCAMLR) and the regulation of Antarctic mineral resource activities (CRAMRA).

On the evidence, therefore, the Treaty has achieved its objectives and is a strong treaty.

So far, so good; but that is not the end of the story. The recommendations and the three separate instruments constitute what the Antarctic Treaty Consultative Parties (ATCPs) claim to be a "system" – the Antarctic Treaty System (ATS) – for the governance of Antarctica.

The threat to the Antarctic Treaty has always been that economic interest, coupled with misplaced nationalism, could undermine the delicate Treaty mechanism by which issues of Antarctic territorial sovereignty are suspended. Recognition of this threat led the United Kingdom to be active in developing the Treaty's consultative mechanism so that it had the strength to deal with that threat. Thus, successively, the Agreed Measures for the Conservation of Antarctic Fauna and Flora paved the way for CCAS, which paved the way for CCAMLR, which paved the way for CRAMRA.



Seals were the first Antarctic animals to be protected by a conservation convention, but they face new threats. This fur seal will die from the wound inflicted by a constricting packing band.

Photo: Nigel Bonner

While keeping the peace in Antarctica must be the first priority, the claim of the ATS to provide governance raises the question of how well it is doing.

Good government requires that the law be clear, acceptable to the governed and be enforced. While the present stage of development of international law and politics qualifies the attainment of such objectives it is, nevertheless, reasonable to measure the ATS against the criteria of clarity, acceptability and enforceability.

Clarity

Is the system clear? We can look at two aspects: are the terms accessible, and are obligations set out plainly? On both scores the answer in some cases must be no.

If one wants to know the Antarctic Treaty law about tourism, it can be found buried in half a dozen Recommendations in which later ones build on and partially replace earlier ones, and all of which are drafted in hortatory language, using words like "should" or "shall to the greatest extent feasible". But if one wants to know the law about killing or capturing penguins, it is in paragraphs 1 and 2 of Article VI of the Agreed Measures and is set out in mandatory language – "... Government shall prohibit ... except in accordance with a permit". The difference between these two examples points to possible improvements.

Acceptability

Acceptability is provided for by the consensus rule which governs ATS business. A commonly perceived difficulty of consensus is that it slows the pace of development. It would, however, be much more damaging to the governance of the Antarctic if a majority voting procedure were to result in not all states being bound by the same rules. Another element of acceptability concerns the use of hortatory rather than mandatory language. The need for clarity and enforceability speak strongly for mandatory language, but if consensus will not bear mandatory drafting, it is better to go for something, as a basis for further development, rather than nothing.

The Antarctic future:

A Greenpeace perspective

For the past 30 years, Antarctica has been characterized as a continent different from all others, and not only because of its unique physical attributes. It has frequently been described as a zone of international peace and scientific cooperation, where nations traditionally at odds with each other have been able to work together in pursuit of common interests. The Antarctic Treaty prohibits weapons testing and stationing and stipulates that installations be open to inspection – a model to be emulated elsewhere!

In 1990, the Antarctic is under threat. Some would say that the threat has been present for a long time – 30 years of improper waste disposal at some scientific stations has completely altered local environments. Stations have been built in environmentally sensitive and biologically important ice-free areas without regard to potential impacts. Tourists, including off-duty personnel and other recreational visitors, have been wreaking havoc in "interesting" areas such as the Cape Royds Adelie penguin colony for many years. But the impacts of these activities, severe as they may be, would be dwarfed by the devastation that mining operations would bring to the Antarctic environment. Some nations are now

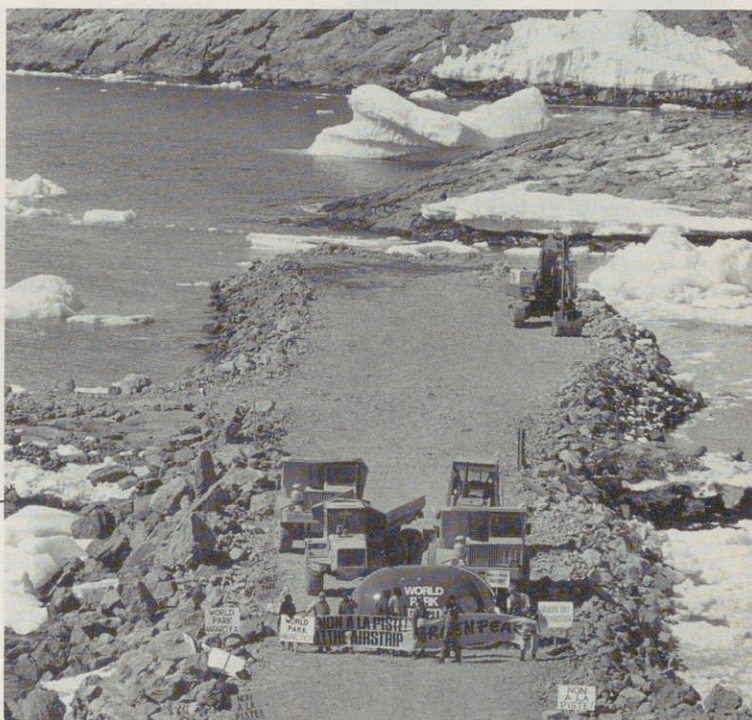
Enforceability

Enforceability requires there to be clear obligations so that it is evident when the law has been broken, that a real prospect exists of being caught and that an allegation that the law has been broken gives rise to consequences which encourage a state to avoid ever being at the receiving end. The essentials are, again, law in mandatory terms, an effective inspection mechanism, and a compulsory dispute settlement procedure.

Considered against these criteria, the Antarctic Treaty system is like the curate's egg – "good in parts". It is time now to take a look at the structure as a whole, rationalize it, fill in the gaps and improve it where necessary. That is the purpose of the meetings in Santiago in November. If the Antarctic Treaty Consultative Parties succeed in such an endeavour, the ATS, as well as the Treaty itself, will warrant the description "strong".

– Dr J. A. Heap

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Greenpeace activists blockading the French airstrip site at Dumont d'Urville, January 1989.

Photo: Greenpeace/Morgan

looking to the region as a possible source of fossil fuels and minerals as supplies dwindle elsewhere. Others, however, want to see Antarctica preserved, in perpetuity, for its wilderness and scientific values.

Environmental NGOs including Greenpeace have been at the forefront of this debate. Just as the Antarctic Treaty has banned military activities, we are calling for the prohibition of minerals and hydrocarbon exploitation in the region. In addition, we are seeking the designation of Antarctica as a World Park, with a comprehensive and integrated approach to regulating human activity there.

An Antarctic World Park would be a conservation zone where wilderness values are paramount and where peaceful cooperation in carrying out approved activities is emphasized. It would be a region recognized for its role in monitoring

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global environmental pollution and atmospheric degradation. Mining would be precluded because it is fundamentally incompatible with these principles.

The two initiatives, a mining ban and World Park designation, are deeply intertwined. The idea that there could be comprehensive environmental protection for the Antarctic if mining were permitted is absurd. Oil spills from the commercial tanker "Exxon Valdez" and the Argentine supply vessel "Bahia Paraiso" stand as testaments to the impossibility of ensuring "safe" oil exploitation. Yet the two issues may also be considered separately: a mining ban could be established under the Antarctic Treaty itself, by amendment or protocol, prior to the completion of negotiations for a World Park regime.

Regardless of the form that a World Park regime would take, Greenpeace and a number of other environmental NGOs believe that incorporation of the following points is essential:

- The wilderness qualities of the region must be preserved, and conservation must be the paramount consideration in all human activity.

- Antarctica would continue to be a non-

militarized, nuclear weapons-free zone. There would also be a ban on the storage, discharge or incineration of toxic or radioactive waste, and the use of nuclear reactors for any purpose would be forbidden. All minerals activities would, of course, also be prohibited.

- Science should be the primary reason for human activity on the continent, but should be limited to that which is benign, unique to Antarctica, and/or globally significant.
- There must be a "precautionary approach"; i.e. the burden of proof should be on those proposing or undertaking any activity to demonstrate that it will not violate the regime's principles of conservation.
- New institutions should be established to ensure that rules are uniformly enforced and environmental impacts are monitored. These institutions should be open to observer status for public interest groups and individuals. A mechanism should be found for the participation of interested states that are currently outside the Antarctic Treaty System.

The proposal of Australia and France to negotiate a comprehensive environmental convention has been widely acclaimed by environmental NGOs, and we regard it as being potentially comparable with our own World Park proposal. However, none of the Treaty States' proposals for "comprehensive measures" to protect the Antarctic environment have yet been articulated in any detail. As Greenpeace and other NGOs refine their ideas for a World Park regime, we look forward to seeing the detailed submissions of governments attending the Special Consultative Meeting to be held next November in Chile. Greenpeace and other environmental NGOs are pinning their hopes on this meeting to begin the process of negotiating a World Park future for Antarctica.

— Kelly Rigg



Kelly Rigg is the Antarctica Project Director for Greenpeace International. She has been working on the World Park campaign for the last seven years, and oversees all aspects of the Greenpeace Antarctic effort, including its annual expedition to Antarctica. She has been on hand at numerous meetings of the Antarctic Treaty System and the United Nations, working to achieve an Antarctic World Park.

Greenpeace International has been an IUCN member since 1985.

Make the Antarctic a World Park!

The need for comprehensive environmental protection of the last great global wilderness – the Antarctic – has finally been acknowledged by Parties to the Antarctic Treaty, who will hold a Special Consultative Meeting in 1990 to "explore and discuss all proposals relating to the comprehensive protection of the Antarctic environment..."

This decision followed the joint Australian/French announcement, in August 1989, which called for the development and implementation of a "Comprehensive Environmental Protection Convention" to ensure the protection of this unique region, including a permanent ban on minerals activities there. These ATCPs had already announced their opposition to mining and to the implementation of the recently concluded Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA).

While stressing the importance of measures already in place, Australia/France have proposed that Antarctic Treaty Parties acknowledge and respond to the increasing local environmental degradation and the increasing awareness of the importance of the region for globally significant scientific



Rubbish at McMurdo Station dump, 1989. France and Australia have called attention to localized environmental degradation.

Photo: Greenpeace/Morgan

study and as a wilderness, by implementing urgently a more integrated, comprehensive system of protection. The joint proposal calls for the establishment of the region as a "nature reserve – land of science", and would incorporate environmental parameters initially developed in the recently negotiated minerals Convention (CRAMRA).

For example, all approved activities would be required to avoid: (1) significant adverse effects on global and regional weather and climate patterns, on air and water quality, on atmospheric, terrestrial and marine environments; (2) significant changes in the distribution, abundance or productivity of populations or species of fauna and flora; (3) further jeopardy to endangered and threatened species or populations of such species; and (4) degradation or substantial risk to areas of special biological, scientific, historic, aesthetic or wilderness significance. Other key elements from the CRAMRA regime – on information requirements for informed decision-making, adequate accident prevention and response capacity – could be included.

Environmental evaluation procedures would include an extensive monitoring programme, to verify 'acceptable' predicted impacts and to detect unforeseen ones. Enforcement procedures, including sanctions in the event of failure to comply with the provisions of the Convention and mechanisms designed to ensure greater accountability, are also proposed.

Australia/France have suggested that Antarctic Treaty Consultative Parties form the Commission of the new Convention, in order to ensure strong links between the two Treaties. The Commission would take decisions on the measures required to implement the Convention or any subsequent Recommendations and would approve (or not) proposed activities according to the environmental criteria as outlined above. The Convention would establish at least two other bodies: a scientific and technical committee to offer advice on Commission decisions, and an arbitration body, to resolve potential conflicts which may arise.

Although the structure of the proposed new Convention remains unclear, Australia and France have repeatedly stressed the importance of integrating their proposal into the existing Antarctic Treaty System, building on values such as the use of the Antarctic for peaceful purposes only, freedom and encouragement of scientific research, suspension of territorial claims, and prohibition of nuclear testing, waste dumping, and military activity.

The Antarctic and Southern Ocean Coalition (ASOC), an international coalition of over 200 environmental groups with an interest in Antarctica, has been campaigning since the late 1970s for Antarctica to be permanently protected as a World Park.

ASOC acknowledges that there is no inherent need to establish a legal entity outside the Antarctic Treaty system to give effect to its demands. However, the existing system's inability to enforce its own rules and regulations is a major flaw. Comprehensive and effective regulation would require the implementation of legal mechanisms, whether they are new legal structures, existing international conventions, or an evolution of the Antarctic Treaty system itself. A Conservation Convention superseding existing Antarctic Treaty system instruments, or working in tandem with those instruments, is one such mechanism for achieving the necessary legal strength.

One important difference between the Australian/French proposal and the ASOC concept is the emphasis placed on science. In the "green" view, an essential concomitant of continued scientific activity in the Antarctic would be a



Never again? An abandoned whaling boat is a reminder of what many hope is a dying industry.

Photo: Nigel Bonner

considerable improvement in environmental standards. The level of environmental impact associated with much past and current scientific activity (largely related to logistical support) would be unacceptable under a World Park Regime. Science activity would also be oriented toward that which is globally significant and/or Antarctic-specific.

ASOC also proposes that the central advisory body of the new Convention be a group with environmental expertise, with the responsibility to review approved activities periodically to determine compatibility with the Convention provisions and to monitor compliance with such provisions directly. This differs from the more general advisory-only scientific body suggested in the Australian/French proposal.

The Antarctic Treaty nations' agreement that better environmental protection of the unique Antarctic environment is required is clearly a response to the growing awareness of global environmental degradation. It also illustrates the importance of Antarctica, for many people, as a 'symbol of salvation'. If we cannot save Antarctica, what hope do we have in lands already struggling with the impacts of gross environmental mismanagement and the huge problems that global warming will bring? Antarctica is the largest remaining wilderness on this planet, and deserves to be permanently protected as our first "World Park".

– Lyn Goldsworthy



Lyn Goldsworthy is ASOC Coordinator and Antarctic and Atmosphere Campaign Coordinator for Greenpeace Australia. She first became involved in the Antarctic campaign in 1983, and has travelled twice to the continent at the invitation of the Australian Government to review environmental management practices at Australian Antarctic bases. She has attended ATC and CCAMLR meetings and CRAMRA negotiating sessions as Australian Environmental Representative.

IUCN and Antarctica

Although the Antarctic Treaty and other legal measures linked to it have had considerable success in constraining unsound practices, pressures on the region continue to increase. There are more and bigger scientific stations, airstrips, supply ships and dumps, and accidental incidents causing pollution.

IUCN has been concerned with Antarctic conservation for many years. Following resolutions at General Assemblies in 1981, 1984 and 1988, we have now prepared a draft Antarctic Conservation Strategy.

The Union's work on the Antarctic Conservation Strategy represents a quite different approach from that used to develop National Conservation Strategies. First, it concerns an entire continent and its surrounding oceans rather than a single nation. Also, it has been prepared within IUCN rather than by a Government with IUCN help. But like all conservation strategies, it has been a process rather than an 'end product' on paper. Where, then, should we as a World Conservation Union go from here?

In this final article, Danny Elder, who has coordinated the Secretariat's efforts in producing the Strategy, and Katya Michos-Ederer of the IUCN Environmental Law Centre in Bonn, review the Union's role in Antarctica and suggest a way forward.



A future Director General of IUCN surveys Antarctica in less troubled times, early in 1964.

Photo: Martin Holdgate

The Antarctic Conservation Strategy

The ACS sets six key objectives for any new convention, or any strengthening of the Antarctic Treaty system to the same end:

1. The essential ecological processes and life support systems of the region must be maintained;
2. Species and genetic diversity must be preserved;
3. Any use of renewable resources must be sustainable;
4. The outstandingly beautiful and unsullied landscape must be protected;
5. Activities in the area – and especially science – must contribute to human benefit and avoid environmental damage;
6. Activities outside Antarctica that could damage the region and which pose a threat to the integrity of the ecosystem, such as the release of greenhouse gases and chlorofluorocarbons that damage the ozone layer, must be controlled.

What next?

How should IUCN be promoting Antarctic conservation? If one were to poll the membership for their views, many would probably say that our first concern should be to promote conservation as the world community's principal goal in this whole great region. Within this primary objective, members would almost certainly suggest that we apply IUCN's special scientific and technical experience in proposals for the protection of ecosystems, establishment of protected areas and safeguarding of Antarctic fauna and flora. It is almost equally certain that we would be urged to look at issues of management mechanisms, law and administration. Such an approach would reflect the Union's traditional concerns, and its strength as a forum and network able to convene expert groups and develop strategies and action plans for a wide range of operational programmes.

The World Conservation Union is well-placed to do this in Antarctica. Nearly all the Antarctic Treaty Parties have some connection with the Union; more significantly, 12 out of 23 Consultative Parties and one-third of the Non-consultative Parties to the Treaty are State members of IUCN.

But our membership is much wider than Governments; it embraces the national and international community of government agencies and non-governmental organizations, and especially major international NGOs that have been active in promoting Antarctic conservation. There are members of the Union in nearly all of the States party to the Antarctic Treaty.

IUCN is, first and foremost, a forum for discussion of conservation priorities in a more flexible atmosphere than that of the council chambers where governments negotiate. With more than a decade of experience in developing conservation strategies around the world, the Union is able to bring together scientists, technical bodies, government officials, advocacy groups, private citizens, local institutions and international agencies to debate issues like those involved in Antarctic conservation. Many people with experience of Antarctic science and conservation are part of the IUCN network. Some have spent a great deal of time in the Antarctic region. IUCN has forged close links with the

Scientific Committee on Antarctic Research (SCAR), which has for decades acted as expert adviser to the Treaty System, and has itself been invited as an expert body to participate in Antarctic Treaty Consultative Meetings (ATCMs) and at other Antarctic fora, such as meetings of the Commission for the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) and its Scientific Committee.

This strength of IUCN as a forum has been evident both in the preparation of the draft Antarctic Conservation Strategy and in compiling this section of the *Bulletin*. All the authors of this special report have been drawn from the IUCN network and, while the views they express here are their own, they represent the mixture of opinions expressed in more formal debates on issues of Antarctic conservation by governmental and non-governmental IUCN members, advisory committees and commissions.

The progressive development of the Union's role as a forum is also evident from the history of its involvement with Antarctica. At the 7th General Assembly held in Warsaw in 1960, IUCN members urged that the then-proposed Antarctic Treaty should set aside inviolable areas for the conservation of the unique polar fauna and its natural environment, and supported the initiative of the International Council of Scientific Unions that SCAR be invited to prepare standard regulations for the protection of Antarctic flora and fauna and their habitats. The need to establish protected areas and implement regulations was stressed again at the 14th IUCN General Assembly (Ashkabad 1978) – with special mention of krill and other marine species.

The case for preparing a Conservation Strategy was subsequently put forward in Christchurch, New Zealand, where the 15th General Assembly suggested that Antarctica be endowed with a status which would recognize the special values of the region and allow coordinated research and conservation. These proposals for action were repeated at the 16th and 17th General Assemblies, and were expanded to cover waste disposal, depletion of fish stocks, and the potential problems associated with tourism and minerals exploitation. IUCN members stressed the need to develop improved measures for environmental impact assessment and environmental monitoring, and to promote compliance with Antarctic Treaty legal regimes.

IUCN elaborated the concept of a Conservation Strategy for Antarctica at a joint IUCN/SCAR Symposium on Antarctica held in Bonn, Germany in 1985; at a similarly joint IUCN/SCAR Symposium on Subantarctic Conservation in Paimpont, France, held in 1986; and at an international conference also held in 1986 on the Lennox-King Glacier, among the Trans-Antarctic Mountains in the heart of the Antarctic continent.

The draft Strategy for Antarctic Conservation is now complete. The consultation process has involved all IUCN State members that are Parties to the Antarctic Treaty as well as non-governmental members with a known interest in Antarctic affairs. The response has been considerable, especially from the Australian and New Zealand National Committees for IUCN, whose Regional Councillors have kept them in touch at each step of the process. The UK National Committee for IUCN has also made extensive comments. There has been substantial contact with the Antarctic and Southern Ocean Coalition, which involves all the NGOs principally concerned with Antarctic affairs. Greenpeace International, the only NGO maintaining a presence in Antarctica itself, has participated in several discussions. The draft is now ready for discussion at a General Assembly workshop, and then in the full session of the Assembly.

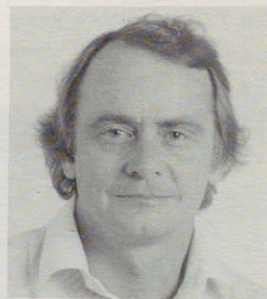


Will we be able to protect the earth's most remote and fragile wilderness? For many it symbolizes humanity's last and best chance.

Photo: Nigel Bonner

What then? The debate will undoubtedly continue. We are some way from consensus on every point and issue involved in Antarctic conservation. The Consultative Parties to the Antarctic Treaty are themselves far from agreed about what should be done. Major differences still remain on fundamental issues, and especially (as we have seen in the preceding articles) over whether exploitative use of Antarctic resources is compatible with conservation and whether the unique qualities of the region should be recognized by a special designation such as World Park, World Heritage Region, or World Wilderness Area. Once these are resolved, there will still be much to do to strengthen the mechanisms needed to achieve the desired goals. □

Danny Elder heads the Union's Coastal and Marine Programme, and is also responsible for its work on global climate change and Antarctic conservation. He has 15 years of experience setting up marine monitoring networks and developing marine policy, and has helped establish regional management strategies for 10 regions of the world for the UNEP Regional Seas Programme.



IUCN Consultant Katya Michos-Ederer focused on the Antarctic Conservation Strategy while at the Institute of International Law in Kiel, FRG. Until recently she worked with the IUCN Environmental Law Centre in Bonn, where she collaborated closely with the Secretariat on Antarctic issues.

Coastal concerns

Half of humanity lives in lowland country, close to the sea coasts. This zone is especially vulnerable to the changes we have been discussing in this series of articles – the pressure of human population growth and the impact of climate change.

Climate change poses a threat in two ways: through the rising level of a warmer sea, fed with water from the melting of mountain glaciers, and through the possible increase in the vigour of tropical storms. As with other threats, the tropical developing nations which are already struggling to maintain, and with luck improve, the quality of their citizens' lives, are most at risk, for it is here that people press most heavily for their share of fertile coastal lands, and here that danger from the sea is greatest and early warning systems least well developed.

In this group of articles, which concludes our three-part series on "Conservation in a changing world," we look with Richard Warrick at the climatic effects most likely to threaten developing countries. Peter Burbridge contemplates the collapse of traditional systems of managing coastal resources in countries which will soon bear the additional burden of sea level rise. Fasih Uddin Mahtab summarizes devastation faced by Bangladesh. Finally, Henri Le Houérou uses the example of the Mediterranean to look more specifically at the tragic consequences of failing to take precautionary and preventive action now.



Say goodbye. This rare remnant forest in Italy, like most Mediterranean coastal vegetation, is unlikely to survive the next century (photo: IUCN/Jim Thorsell).

Climate change and the developing world

It is nearly impossible to predict the regional details of future climates. Perhaps it is more appropriate to ask what are the features of climate which, if changed, could have important implications for the well-being of people – especially in the developing world.

We will look at four possibilities.

- **Increased frequency of extreme events**

Societies may feel sorely any increase in the frequency of droughts, floods and heat

waves. Climatologists now think that small changes in mean precipitation or temperature could bring about large changes in the risk of such extreme events; i.e. a small increase in the mean rainfall could greatly increase the occurrence of flooding.

Precipitation is probably the most crucial climate variable for the tropical and semi-tropical countries, because their economies tend to be dominated by agriculture. Climate models suggest that a doubling of CO₂ in the atmosphere will bring about the greatest changes in precipitation between

30°S and 30°N. According to some climate models, certain countries, such as the Côte d'Ivoire, could face very great changes in its risk of floods and drought.

- **Increased magnitude and frequency of severe tropical storms**

Many millions of inhabitants of developing countries, especially in Asia, the Western Pacific, Central America and the Caribbean, are subject to heavy damage and loss of life from severe tropical storms. It is possible that these will increase in frequency or vigour as a result of ocean warming.

- **Increased intensity of monsoon**

The livelihood of many hundreds of millions of people depend on the timing and intensity of the Asian monsoon. The monsoon is driven by the temperature gradient between continents and oceans, so greenhouse warming may well increase monsoon intensity.

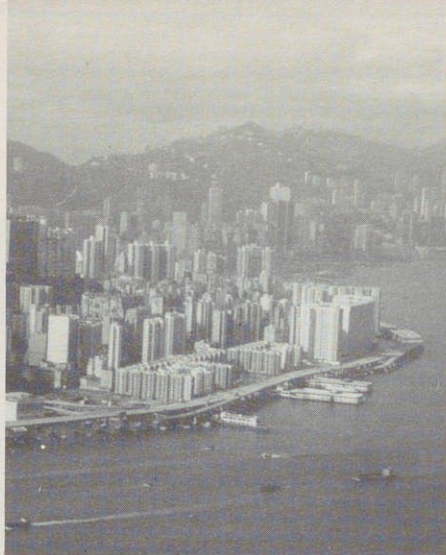
Bangladesh is one country especially sensitive to the monsoon. Four separate climate models show an increase in June-August precipitation in Bangladesh; one predicts a doubling. Should this happen, the impact on river flow, flooding and sedimentation would have enormous consequences for rice production and human settlements.

- **Sea level rise**

A rise in sea level is perhaps one of the more predictable impacts of climate change, and could bring about permanent inundation, temporary flooding, salinization and coastal erosion.



Salinization of coastal soils as the sea rises is a worrisome possibility (photo: WWF/A. Thies).



Hong Kong (above) is one of the major cities most vulnerable to sea level rise, especially in reclaimed areas (below) (top photo: IUCN/Jim Thorsell; bottom: WWF/Lynda Bott).



Although all coasts will be affected in some way, not all will experience the same rate, magnitude or even direction of change. Parts of Scandinavia, for instance, are experiencing a drop in sea level of around 100 cm per century from isostatic uplift of the land following the last glaciation. In contrast, Bangkok has been sinking at a rate of 10-15 cm every year as a result of groundwater pumping. Some reclaimed areas of Hong Kong are undergoing compaction of up to 30% of the thickness of marine mud due to the weight of urban development on the site. In the Nile delta, the sea is encroaching as river control, dams, and decreased riverflow rob the delta of sediments.

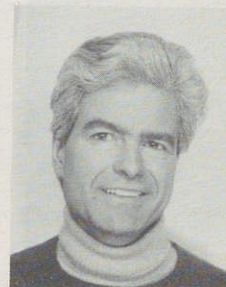
In each situation any change in mean sea level has to be added to trends in relative sea level already under way.

Who bears the brunt?

Climate and sea level strongly influence a country's resource potentials – its soils, vegetation and coastal geography. It is clear that the developing countries are most at risk from the climatic and oceanic conse-

quences of a problem caused primarily by the industrialized nations.

No longer can their development plans be based on the assumption of an unchanging natural environment. Unfortunately, the complexities and uncertainties surrounding the issue of climate change and its economic and social consequences are vast. Only concerted, interdisciplinary, and, in most cases, international research collaboration will serve to unravel those complexities.



– Richard A. Warrick
Climatic Research Unit
University of East Anglia (UK)

A fuller version of this note has appeared in *Transactions of the Institute of British Geographers*, NS 15 (1990), pp. 5-20.

Coastal zone planning and management:

2000 and beyond

Since the early 1970s an increasing number of nations have tried to establish programmes for sustainable utilization of coastal and marine resources. These have had only limited success, and, worldwide, nearly all renewable coastal resources are suffering rapid depletion. The main reason for this is that management has concentrated on controlling how the resources are used, rather than on maintaining the systems that supply them.

This, in turn, has several causes:

First, traditional, community based and ecologically sound methods of resource management have broken down, partly because of population growth, urbanization, external economic demands and centralized decision making at the governmental level;

Second, the importance of resources provided by coastal ecosystems has not been stated clearly by scientists;

Third, resource development and management have not been based on sound science;

Fourth, there has been too much sectoralism in resource management. For example, mangroves, as trees, have been the concern of Ministries of Forestry – which are not interested in their importance as fish nurseries;

Fifth, each sector has tried to maximize its own return. Again taking mangroves as an example, clear cutting to provide wood chips for pulp takes place *regardless* of the consequent reduction in the system's ability to sustain marine fish populations.

While most nations depend to some degree on food and other materials derived from the sea, it is the developing nations which will be most severely affected by the continuing degradation of renewable coastal resource systems. Developing countries derive about half of their animal protein from seafood, most of which is provided by coastal fisheries. For the foreseeable future they will remain heavily dependent on coastal resources to sustain population growth and the expansion and diversification of their economies.

However, the use of coastal land and water resources can alter the dynamics of the systems concerned quite substantially: some examples are the agriculturally-based resettlement programme in the tidal swamp forests of Indonesia, the conversion of mangrove to form brackish water fish and shrimp ponds, the extraction of minerals from beach sands and the exploitation of corals for construction and lime.

The sustainability of these activities is often doubtful. The conversion of the tidal swamp forests to irrigated rice fields has not proved particularly successful owing to problems of soil and water management. The policy of rapidly extending the area of shrimp ponds at the expense of mangroves also causes problems because it removes the nursery grounds, spawning areas and food on which many species of fish and crustaceans depend. High worldwide production of shrimp is leading to a fall in prices, the abandonment of ponds, and a loss both of export revenues and marine protein needed to feed people.

These uncertainties are amplified by the possibility of sea level rise. Because estimates of the rate of rise varies, it is difficult to evaluate its relative impact compared with that of insidious degradation resulting from poorly planned development. Although some countries, such as Bangladesh, could suffer severely, it would be a mistake for most developing countries to be so preoccupied with the threat of sea level change that they fail to better plan and manage the coastal resources they have – at least until sea level rise displaces those uses.

That is not to say we should sit by and do nothing. Looking at the not-too-distant future, we are faced with some important decisions; not least of these is how we can best marshal the available international



resources to assist coastal nations who must plan for the coming changes – including a gradual shift in the location of their people and economic activities away from areas likely to become inundated by the sea.

– Peter Burbridge

IUCN consultant on the management of tidal wetland resource systems in South-east Asia

Dire outlook for Bangladesh

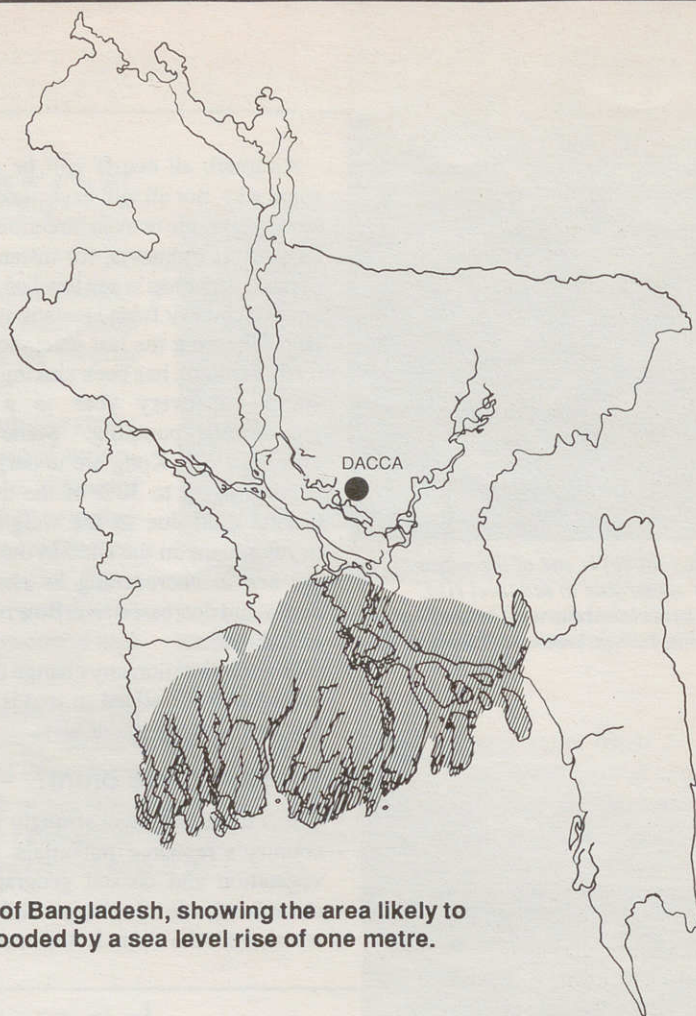
In his 1989 report to the Commonwealth Group of Experts, Fasih Uddin Mahtab looked at the impact of a one-metre rise in mean sea level on Bangladesh. This is what it might mean if it happened *today*, with the present population of 100 million and with present land-use patterns:

1. In the **coastal areas** there would be inundation of 2000 sq km, 16 per cent of Bangladesh's total area and 14 per cent of the net cropped area. The socio-economic consequences would involve:

- displacement of 10 million people;
- loss of land which currently produces two million tonnes a year of rice, 400,000 tonnes of vegetables, 200,000 tonnes of sugar, 100,000 tonnes of pulses and accommodating 3.7 million cattle, sheep and goats.
- loss of 1.9 million homes, 1,470 km of railways, 10,300 bridges, 700 km of metalled road and 19,800 km of unmetalled roads.



The wetlands of Bangladesh will be salinized and flooded; their inhabitants will suffer the consequences (photo: WWF/X. Lecoultré).



Map of Bangladesh, showing the area likely to be flooded by a sea level rise of one metre.

– loss of output equivalent to an estimated 13 per cent of GDP and loss of assets of *circa* 450 billion taka (about US\$13.5 billion).

2. In low lying **mainland areas**, inundation would also be increased from the "back water effect", though the impact is not quantified.

3. The **Sunderbans mangrove forests**, stretching over 400,000 ha, would be destroyed by increasing salinity, then inundation.

4. Salinity problems, already serious, could be aggravated with implications for **drinking water** (especially Khulna and Chittagong) **agricultural yields** (especially for vegetables) and **industrial facilities** (e.g., power stations).

5. **Coastal structures.** The existing 58 polder embankments would need heightening and strengthening, as would drainage systems. Estimated cost: 18 billion taka (about US\$540 million).

6. **Disasters.** The above effects do not include the potentially catastrophic consequences of:

- more extreme and/or more frequent storm surges consequent upon tropical storms like those in 1970 that killed perhaps 250,000 people, and in November 1988 when 30,000 were killed;

- changing regional rainfall patterns in the upper reaches of catchment areas draining into Bangladesh, affecting river flows and increasing the region's vulnerability to river flooding. The result could resemble the floods of September 1988, which inundated 85 per cent of the land area and affected 45 million people.

Source: *Climate Change: Meeting the Challenge*, Report by a Commonwealth Group of Experts (London: Commonwealth Secretariat, September 1989).



Much of the land around the Mediterranean is already marginal, fit only for sparse grazing. If temperatures rise further, vegetation could completely disappear (photo: FAO).

The Mediterranean future:

Two faces of change

In the coming century, major disruptions will occur in particular areas of the globe, the Mediterranean among them. If predictions of climate change are correct, the effects on vegetation, crops and land use will be quite different in the northern and southern reaches of the Mediterranean basin, and so will the impact of population growth.

This article examines what *could* happen if current projections are correct. It may seem alarmist, but it gives an indication of the scale of the problems we may have to face.

The North

The European countries on the northern side of the basin are likely to experience only moderate effects from the increase in temperature of up to 3°C which may occur by the year 2050 (rainfall is not expected to change here, and may even increase slightly). Some effects may even be beneficial, such as enhanced primary production and an expansion of cold-sensitive tropical crops such as citrus, avocados, bananas, papayas and sugar cane.

The zones of natural vegetation would, however, migrate upwards and northwards, by around 550m in elevation and 550 km in latitude. Heat-adapted Mediterranean vegetation now rare on the northern shore would begin to displace native species up to the mountain foothills of the Apennines, Southern Alps, Cevennes and Pyrenees. Nobody can tell how long it will take for these shifts to occur: taking past changes (based on pollen analysis) as a measure, quick changes take about 100 years and slow changes around 1000 years.

Cereal cultivation could well be eliminated from 8 to 10 million ha presently farmed in Mediterranean Europe; these lands will have to be converted to low-input rangelands for livestock breeding, game management, hunting, forestry, tourism and amenities.

Forest and shrubland would grow from the present 53 million to about 76 million ha, if the present rate of expansion (0.7% per year) is sustained. Farmland is now shrinking by 0.4% annually; if this continues the total will decrease from 67.5 million ha today to 51 million.

Sea level would rise by 20-60 cm, which would require some costly, but probably manageable, adjustments. However, coastal areas devoted to tourism are likely to experience serious disruptions. The number of tourists coming to the northern shores is growing by 5.6% per year, and is expected to reach 220 million visitors by the year 2000. The impact will be felt largely in the five-km coastal belt.

The South

The changes faced by the countries on the north side of the basin are dwarfed by those likely to occur south and east in the Afro-Asian countries. Here a population explosion of global magnitude is under way, whose effects will be worsened by increasing aridity from rising evapotranspiration.

The population of these countries will have multiplied 8.5-fold during the 20th century; it will multiply by another 24.5 times the 1900 level by the year 2050. This is a 33-fold increase in 150 years.

The non-desert area of the region represents some 1.51 million sq km of a total land area of 11.26 million sq km, or 13%.

The population density on non-desert land has grown from 29 inhabitants per sq km in 1900 to 182/sq km in 1988; if growth remains unabated it will reach 246/sq km by 2000 and a *minimum* of 539/sq km by 2050 – the maximum figure is 960/sq km.

This is an urban density incompatible with the keeping of any natural vegetation. For the past three decades, forest and shrubland vegetation has been receding by 1-2% per annum. Natural steppe vegetation in the arid rangelands has been destroyed to a very large extent, over the past 30 years, giving way to desert encroachment of more than 2% per year.

By the year 2050, it would seem that only Turkey and perhaps Morocco will have some forest remnants left.

Virtually all land except true desert, rock outcrops and salt marshes is likely to be subjected to speculative cropping with staple cereals.

Without a carefully-planned scheme of environmental protection, erosion, sedimentation and flooding are likely to expand freely and catastrophic events to become more and more frequent as the natural environment deteriorates. Any climatic change resulting from rising temperature will then be trivial in regard to the man-made continuing catastrophe.

Mediterranean societies will be ravaged by these enormous and precipitous changes. Social unrest and conflicts will flourish under the stress; they have indeed begun.

Northern Mediterranean countries would hardly remain unscathed; while facing difficulties of their own, they are likely to experience additional pressures from the growing multitudes on their southern flank which could, in turn, lead to social unrest and political conflict.

Unless the demographic explosion and the environmental impacts of urbanization are mastered shortly, the scourge is certain to occur. Unfortunately, it generally takes 25 years for any attempt to curb population growth to have a significant impact on population numbers.

The time to take strong and determined action to avoid the impending catastrophe is now.



– H.N. Le Houérou
*Centre d'écologie fonctionnelle
 et évolutive (CEFE)*
*Centre national de la recherche
 scientifique (CNRS)*
Montpellier, France

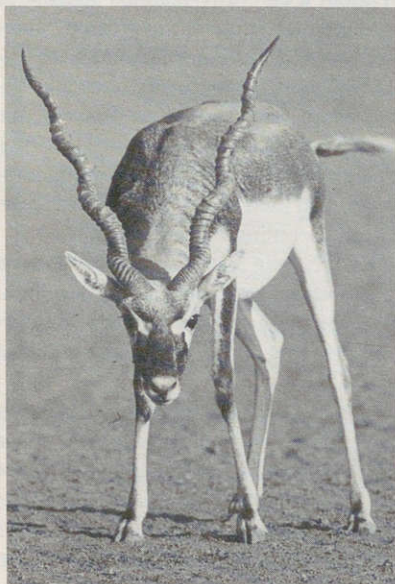
LETTERS

To the editor,

I was pleased to read in your last *Bulletin* [Vol 20 (10-12), October-December 1989, page 26] of the excellent progress now being made in Pakistan. Your report, however, gives the impression that this effort began "in the late 1970s". In fact it began in 1966, when the first working relationship between Pakistan and IUCN/ WWF was established. Pakistan's first wildlife reserve was created in the Salt Range of West Punjab, when H.H. the Nawab of Kalabagh agreed that his property should be gazetted as such, for the protection of the Punjab urial *Ovis orientalis punjabiensis* and the Chinkara gazelle *Gazella gazella*. In the same year the very important Lal Suhanra National Park was created in Cholistan to protect the last of Pakistan's blackbuck *Antelope cervicapra* and other desert animals. Efforts were made that year to introduce protection for the Houbara bustard *Chlamydotis undulata* and the marine life of the Indus estuary and off-shore waters. Recommendations were made for the creation of a national park in the Gilgit, Hunza or Khunjerab regions to protect the high altitude wildlife, but although the then President Ayoub Khan gave his approval, this project was not implemented until the 1970s. In fairness to the Pakistan authorities and the members of my exploratory expeditions of 1966 and 1967, I suggest that these early developments merited inclusion in your otherwise admirable report.

Guy Mountfort
Lyndhurst,
Hants. (UK)

Ed: Thanks for reminding us of this early work. Pictured at left are two of the species concerned.



Top: the blackbuck (photo: WWF/E. Hanumantha Rao).
Bottom: the Houbara bustard (photo: WWF/ Eric Hosking).



been seduced by its beauty. Above is another of the three, taken by G. Moon, which shows the threatened Australasian bittern *Botaurus stellaris poiciloptilus*.

To the editor,

I look forward with anticipation to each copy of the *Bulletin* and have found them to be of high value in advocacy, education and my research contracts work with IUCN/WWF.

It was good to see mention of the three new Ramsar sites for New Zealand (Vol. 21(1), page 6), but, please, a less appropriate illustration could hardly be possible! When sites are being set aside for their intrinsic value, and there is specific mention of threatened species, bitterns and the endemic jointed rush, why illustrate the item with a photograph of imported European willow trees? Willows are not native and in fact are increasingly regarded as detracting from the values of the very wetlands which conventions such as Ramsar are protecting.

With a little advance warning I am sure that a far more suitable photograph could have been provided from New Zealand.

David R. Given
Lincoln Agriculture and Science
Centre, Christchurch (NZ)

Ed: Your point is well taken. However, the photo was one of three provided from New Zealand, and we confess to having

Paul Richards Fund

The family and friends of Professor Paul Richards have set out to raise £120,000 to build an education and information centre at Korup National Park. The Paul Richards Centre will be located at Park headquarters at Mundemba in south-west Cameroon, and will aid the conservation of one of the most important rain forests in Africa.

Paul Richards was a founding father of rainforest ecology, and author of the landmark 1952 book *The Tropical Rain Forest*.

Construction of the Centre will be carried out as part of the technical assistance provided by agreement between WWF - World Wide Fund for Nature and the Government of Cameroon. Contributions (by cheque, bankers order or deed of covenant) should be sent to the Paul Richards Korup Fund, 57 Selwyn Road, Cambridge, CB3 9EA, UK.

New IUCN publications:

Aménagement et gestion des aires protégées tropicales.

The French version of *Managing Protected Areas in the Tropics* translated by Danièle Devitre, is now available.

Compiled by John and Kathy MacKinnon, Graham Child, and Jim Thorsell, the title provides a broad introduction to the multi-disciplinary field of protected area management, containing sections on the biogeographical basis of selection of sites, basic legal and policy requirements, public use and relations with local peoples, resource management guidelines and means of assistance. It includes case studies from throughout the tropics and aims to be a basic source book for middle and senior level managers in the world's 1750 tropical reserves.

ISBN 2-8317-0007-8, 1990, 289pp., photos, maps, tables, £17.50 US\$35.

Lemurs of Madagascar and the Comoros. The IUCN Red Data Book.

This latest volume in the IUCN Red Data Book series, compiled by Caroline Harcourt and edited by Jane Thornback, provides a comprehensive review of all 30 species of lemur found in Madagascar and the Comoros Islands. Information on distribution, population numbers, ecology, threats, conservation measures, and captive breeding are given along with a bibliography for each species. Distribution maps are included for each species along with black-and-white photographs for most of them. The introduction includes a brief description of Madagascar and its mostly

endemic flora and fauna, and of the threats facing this unique and diverse island.

ISBN 2-88032-957-4, 1990, 240pp., photos, maps, £18 US\$36.

Asian Rhinos: An Action Plan for their Conservation. Compiled by Mohd Khan bin Momin Khan, IUCN/SSC Asian Rhino Specialist Group.

For years, the three remarkable species of Asian rhinoceros have been on the edge of extinction. Now, for the first time, there is a coherent programme designed to save these species and to allow their recovery to safe population levels.

ISBN 2-88032-973-6, 1989, 23pp., photos, maps, tables, £5 US\$10.

African Elephants and Rhinos: Status Survey and Conservation Action Plan. Compiled by D.H.M. Cumming, R.F. du Toit and S.N. Stuart, IUCN/SSC African Elephant and Rhino Specialist Group.

Few species receive more publicity for their conservation needs than Africa's elephants and rhinos. And yet, the data behind the conservation crisis have not been readily available. In this publication they are presented, together with appropriate conservation recommendations.

ISBN 2-88032-975-2, 1990, 72pp., photos, tables, £7.50 US\$15.

Environmental Policy and Law Papers:

EPLP 23 *The Ramsar Convention on the Conservation of Wetlands: A Legal Analysis of the Adoption and Implementation of the Convention in Denmark*, by V. Koester.

The Convention of Wetlands of International Importance especially as Waterfowl Habitat was ratified by Denmark over a decade ago, and Denmark has by now designated over 25 Ramsar sites. This study examines the aspects of international, constitutional and administrative law involved in the application and implementation of the Convention in Denmark, providing concrete examples of the major role of the Convention with regard to land-use planning and regulatory and administrative practices.

ISBN 2-88032-999-X, 1990, 105pp., photos, £5 US\$10. Published jointly by the Ramsar Bureau and IUCN.

EPLP 24 *Wild Plant Conservation and the Law*, by C. de Klemm.

Filling a gap in environmental and legal literature, this study of national legislation and international instruments pertaining to the protection of wild plants is based upon responses to a questionnaire sent to over 200 specialists and government agencies in 90 countries, in addition to the texts of the instruments in force obtained from the collection held at the IUCN Environmental Law Centre. The resulting broad scope of the work ensures its usefulness to legislators, lawyers and policy makers, as well as to researchers interested in the field. Part I covers laws referring to the protection of individual species, Part II focuses on land-use and habitat protection legislation, while Part III sets out guidelines for conservation policy, areas of legislation and enforcement possibilities. The book includes three annexes: Bibliography, List of Legal Instruments, and Questionnaire.

ISBN 2-8317-0001-9, 1990, 215pp.

Three new titles from the Tropical Forest Programme:

La Conservation des Ecosystèmes forestiers d'Afrique centrale. ISBN 2-88032-995-7, 124pp., illus., £10 US\$20.

La Conservation des Ecosystèmes forestiers du Zaïre, based on the work of Charles Doumenge. ISBN 2-88032-989-2, 242pp., £10 US\$20.

La Conservation des Ecosystèmes forestiers du Congo, based on the work of Philippe Hecketsweiler. ISBN 2-88032-991-4, 187 pp., £10 US\$20.

Environmental Status Reports: 1988/1989. Volume One: Czechoslovakia, Hungary, Poland.

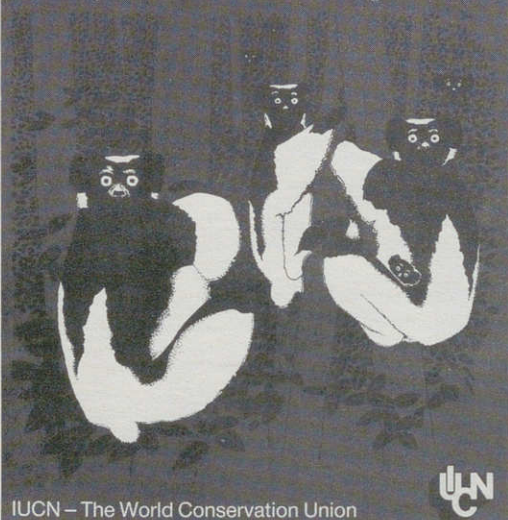
This title from the IUCN East European Programme marks a watershed in the environmental affairs of Eastern Europe and provides a remarkably timely baseline against which to measure the progress of a new environmental era, not just in Eastern Europe, but across the whole continent.

ISBN 2-8317-0006-X, 1990, 127pp., photos, maps, tables, £7.50 US\$15.

Lemurs of Madagascar and the Comoros

The IUCN Red Data Book

Prepared by The World Conservation Monitoring Centre



IUCN - The World Conservation Union

Launch of biodiversity book

On 21 March, *Conserving the World's Biological Diversity*, published jointly by IUCN, the World Resources Institute, Conservation International, WWF-US, and the World Bank, was launched in Washington, DC. Events marking the publication included a briefing for Members of Congress and their staffs, under the chairmanship of Congresswoman Claudine Schneider; and a World Bank round table on biological diversity attended by some 50 senior Bank staff.

CALENDAR

1990

5-9 Aug	Manaus (Brazil)	International Seminar on Hydrology and Water Management of the Amazon Basin (International Water Resources Association)
5-11 Aug	Montreal (Canada)	19th IUFRO World Congress - Science in Forestry for the Next 100 Years (IUFRO)
7-11 Aug	Havana (Cuba)	II Latin American Congress of Biotechnology (Centro de Ingeniería Genética y Biotecnología)
12-18 Aug	Kyoto (Japan)	14th International Congress of Soil Science - Improving Soil Management for Man and the Environment (International Society of Soil Science)
19-23 Aug	Kongsvald (Norway)	5th Consultation of Designated Experts on Flora and Fauna (ECE)
21-30 Aug	Pyongyang (PDR Korea)	Seminar on the Conservation of Biological Resources and Protection of the Environment
22-24 Aug	Anchorage (USA)	6th Annual Assembly of Indigenous Survival International
23-30 Aug	Yokohama City (Japan)	5th International Congress of Ecology (Inst. of Env. Science & Technology, Yokohama University)
25-26 Aug	Copenhagen (Denmark)	Annual Meeting of the Captive Breeding Specialist Group (IUCN-SSC)
26-30 Aug	Copenhagen	45th Annual Conference of the International Union of Directors of Zoological Gardens
26-31 Aug	Riga (USSR)	International Conference on Ecology and Law in the Baltic Sea Area: Sources and Development (International Assoc. of Law Libraries)
27-30 Aug	Sundovall (Sweden)	4th Session of Intergovernmental Panel on Climate Change (WMO/UNEP)
29 Aug	St Lucia	Meeting of IUCN Members in the Island Caribbean (IUCN)
31 Aug-1 Sept	Padua (Italy)	An International Conference: "Ethics and Environmental Policies" (IFIAS)
2-5 Sept	Ibadan (Nigeria)	Symposium on the Conservation of Plant Genetic Resources (University of Benin)
3-7 Sept	Arusha (Tanzania)	Second Conference on Economic, Scientific and Technical Co-operation in the Indian Ocean (IOMAC)
3-9 Sept	Paris (France)	Second meeting of the Scientific Advisory Council of IGBP/ICSU
3-14 Sept	Paris	2nd UN Conference on Least Developed Countries (UN)
5 Sept	Paris	Global Change Forum (ICSU)
5-7 Sept	Bogor (Indonesia)	Workshop on Indonesian Rhino Programme (Govt. of Indonesia/SSC Asian Rhino Specialist Group)
9-30 Sept	UK/France/W Germany	First European Training Seminar for Managers of Protected Areas (Wye College, University of London)
10-14 Sept	Harbin (China)	International Conference on Wildlife Conservation in China (Chinese Wildlife Conservation Association)
10-14 Sept	Roros (Norway)	The International Conference on Conservation of Genetic Resources for Sustainable Development (Norwegian Institute for Nature Research)
10-14 Sept	Palanga (USSR)	International Meeting on Environmental Information Exchange (ICSTI)
10-30 Sept	York (UK)	An International Conference on the Conservation and Management of Rivers (Nature Conservancy Council)
12-15 Sept	Lake Hornborga (Sweden)	International Workshop on Wetland Management and Restoration (Swedish Environmental Protection Agency/IWRB)
14-15 Sept	New York (USA)	Symposium on Antarctica's Future: "The Fate of a Continent" (Sierra Club)
15-20 Sept	Egham (UK)	40th Pugwash Conference on Science and World Affairs
16 Sept-10 Oct	Michigan (USA)	Seventh International Seminar on Forest Administration and Management (US Dept. of Agriculture/University of Michigan)
17-22 Sept	Como (Italy)	Bellagio Conference on "Environment and Third World Aquaculture Development" (ICLARM)
25-28 Sept	Klaipeda (USSR)	Seminar on Particularly Sensitive Sea Areas (IMO/HELCOM/Unesco/UNEP)
26-29 Sept	Padua	International Symposium on Agroecology and Conservation Issues in Temperate and Tropical Regions (University of Padua)
27 Sept-5 Oct	Terrace Bay (Namibia)	20th Regular Meeting of the Standing Committee for Nature Conservation, Wildlife Utilization and Management, and 1990 Meeting of Subcommittee of Rhino & Elephant Populations (SARCCUS)
1-5 Oct	Sofia (Bulgaria)	23rd General Assembly of ICSU (International Council of Scientific Unions)
1-6 Oct	Monaco	International Conference on Large Marine Ecosystems (NOAA/IUCN)
7-10 Oct	Talioires (France)	Sixth Talioires Seminar on International Environmental Issues (Tufts University)
7-13 Oct	Manaus	First International Symposium on Environmental Studies on Tropical Rain Forests: Forest '90 (FBCN/BIOSFERA/SBG)
15-18 Oct	Brighton (UK)	57th Clean Air Conference (National Society for Clean Air)
16-19 Oct	Miami (USA)	International Symposium on Ecological Indicators (US Environmental Protection Agency)
21-25 Oct	Kunming (China)	Second International Congress of Ethnobiology (Kunming Institute of Botany)
23-25 Oct	Brno (Czechoslovakia)	International Ecological Congress "Environment for the 21st Century" (CSVTS)
29 Oct-7 Nov	Geneva (Switzerland)	2nd World Climate Conference (WMO/UNEP/Unesco)
5-7 Nov	Bangkok (Thailand)	International Seminar on Groundwater Management (International Water Resources Association)
7-14 Nov	Alfriston (UK)	Environmental Policy and Management: an International Forum (British Council)
19-22 Nov	Geneva	Meeting of the Executive Body for the Convention on Long-range Transboundary Air Pollution (ECE)
19-27 Nov	Christchurch (NZ)	XX ICBP World Conference (ICBP)
22-23 Nov	Canberra (Australia)	Meeting of Australian members of the Species Survival Commission (IUCN-SSC)
25-26 Nov	Perth (Australia)	Annual meeting of the Species Survival Commission (IUCN-SSC)
28 Nov-5 Dec	Perth	18th General Assembly of IUCN and 29th and 30th Council Meetings (IUCN)

More information on meetings is available to IUCN members upon request. Write to: Delmar Blasco, IUCN headquarters.