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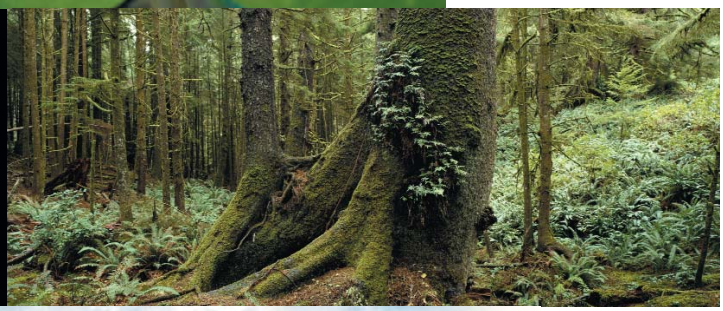
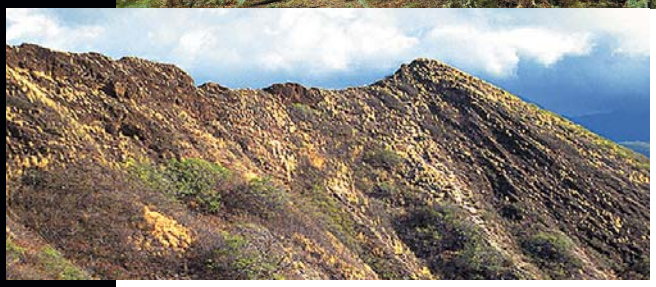
Biological Diversity

CBD Technical Series No. 9

FACILITATING CONSERVATION AND SUSTAINABLE USE OF BIOLOGICAL DIVERSITY

Abstracts of poster presentations on protected areas and technology transfer and cooperation at the ninth meeting of the *Subsidiary Body on Scientific, Technical and Technological Advice*





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FOREWORD

Technology transfer and cooperation and protected areas are the main themes of the ninth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) in November 2003, and of the seventh meeting of the Conference of the Parties to the Convention on Biological Diversity, in February 2004. For this reason, the poster session organized in the margins of the ninth meeting of SBSTTA will focus on these two issues.

Protected areas are vital for the conservation of the world's natural and cultural resources and for achieving the three objectives of the Convention. They also have an essential role to play in achieving the target of significantly reducing the rate of biodiversity loss by 2010. Their values range from the protection of natural habitats and associated flora and fauna, to providing essential ecosystem services and goods. Protected areas can contribute to poverty alleviation and sustainable development, thereby supporting the objectives of the Strategic Plan of the Convention, the Plan of Implementation of the World Summit on Sustainable Development and the Millennium Development Goals. There is, however, a need to exchange information and experience in the planning, establishment and management of protected areas.

Science and technology have long been recognized as essential driving forces in the development process. With the adoption of the Convention, countries have emphasized the need to advance its crucial technology transfer provisions. Technology transfer under the Convention provides both opportunities and challenges for international cooperation. To achieve an effective transfer of technology there is a need to overcome many technical, economic, political, cultural, social, and/or institutional barriers at national, regional and international levels. Scientific and technological capacity-building in developing countries continues to be a matter of great urgency under the Convention. New institutional and practical arrangements need to be made to explore ways of helping facilitate the transfer of new technologies, including biotechnology, and to promote and advance priority access to the results and benefits arising from technology especially for developing countries.

It is a pleasure to provide you with the ninth issue of the CBD Technical Series. This issue compiles the abstracts presented during the ninth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice as a way of sharing information and experiences on technology transfer and cooperation, and on the planning, establishment and management of protected areas.

I thank all who contributed their ideas and expertise to this endeavour.

Hamdallah Zedan
Executive Secretary

CONTENTS

Protected Areas

1
APPLYING THE ECOSYSTEM APPROACH IN PROTECTED AREAS IN GERMANY

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Keywords: protected areas, sustainable use, implementation, management of biodiversity

Introduction

This study, prepared within the scope of the R&D project 'Developing Concepts for Sustainable Use in Selected Subdomains of Biological Diversity' commissioned by the German Federal Agency for Nature Conservation aims at analyzing the current state of protected areas in Germany. The study investigates the compatibility of the principles of the Ecosystem Approach with the implementation of protected areas of various categories in Germany.

Protected area legislation in Germany

In Germany, the Federal Act for Nature Protection (Bundesnaturschutzgesetz BNatSchG) defines the different categories of protected areas. The 16 federal states ('Laender') – in the Exclusive Economic Zone (area beyond the territorial sea) the Federal Government- are responsible for the selection and designation of individual protected areas and the implementation of protection and management measures.

Table 1 lists the different categories of protected areas with their major characteristics and aims (from BNatSchG §§ 23 to 30). The categories differ in size, the level of protection and their aim.

As Germany is a member of the European Union, the EU-directives on the protection of fauna, flora and habitats (Directive 92/43EEC) and the Birds Directive (Directive 79/409/EEC), are relevant (EU 2003). Each EU member state has to designate areas as their national contribution to the European protected areas network 'Natura 2000'. The process of site selection and area designations, based on scientific criteria, is nearly finished. Information on actual numbers of sites and total area can be found under: http://europa.eu.int/comm/environment/nature/barometer/barometer.htm.

Additionally, for Germany 31 Ramsar sites are listed, which sum up to more than 820.000 ha (BfN 2002). These sites do not form a protection category in Germany. Mostly they are protected by the different categories provided by the national legislation (e.g. National Parks, Biosphere Reserves, Nature Protection Areas).

Compatibility of the principles of the Ecosystem Approach with the implementation of protected areas in Germany

As can be concluded from Table 2, the principles of the Ecosystem Approach of the CBD are generally well considered in protected areas in Germany. In the various categories of protected areas following national legislation, international conventions and programs and European directives (FFH and Birds Directive), some principles are more strongly stressed than others, depending on the protection or development goals (undisturbed nature, cultural landscapes, endangered biotope types, recreation).

When strict protection of untouched areas or recovery of areas from human influence are the main goals, the balance between conservation and sustainable use is clearly shifted towards conservation. In other protected areas or different management zones of the same protected area the management concepts focus on sustainable use.

The wide range of possible conservation categories (ranging from strict protection to sustainable development and the permission of non-destructive economic activities) provides a good basis to save the variety of ecosystems in Germany for future generations. Many principles of the ecosystem approach are already implemented in the different area conservation categories. Due to individual circumstances it may not be possible to implement all principles of the Ecosystem Approach in each protected area equally.

Table 1:

Major Characteristics of Categories of protected areas in Germany

Category	Major Characteristics	Objectives
Nature Conservation Areas	Areas of different size for strict protection of biotopes or wild living species which are rare or special.	Mainly for nature conservation purposes. Traditional or customary uses can be allowed on individual sites.
National Parks	Large areas with special characteristics, largest part should be without direct human influence.	Allows natural dynamics, research and educational activities. To some extent recreational activities are allowed.
Biosphere Reserves	Large areas of characteristic landscapes. Zonation with different levels of protection and sustainable use.	Maintenance of important cultural landscapes. Model regions for economic activities that are especially conserving of natural resources.
Landscape Reserves	Areas of different size of natural and cultural landscapes with special cultural or historical characteristics.	Preserve, develop or restore the efficiency and proper functioning of the ecological balances; special importance for recreation; because of the diversity, singularity and beauty of a landscape.
Nature Parks	Large areas including Nature and Landscape Protection Areas managed for recreational purposes.	Sustainable tourism and sustainable land use included in a concept of regional development.
Nature Monuments	Small areas or singularities with special characteristics, beauty or rareness.	For reasons of science, natural history or national heritage; because of uniqueness, singularity or beauty.
Protected Parts of Landscapes	Parts of landscapes of different size with special function as defence against damage or as habitat of wild species.	Conservation of these elements of landscapes. Any action endangering the special character is forbidden.
Legally Protected Biotopes	Areas of different size outside of protected areas, hosting a type of biotope considered as especially endangered or rare.	Allows for natural dynamics. Management actions must not endanger size or characteristics of these biotopes.

Please note that the amount and kind of human activities which are permitted in protected areas depends to a larger extent on specific protection objectives of the particular protected area than on the category of protection.

Table 2:

Compatibility of the sustainability principles of the Ecosystem Approach with categories of protected areas under German legislation.

(● = well considered, ◗ = partly considered, [ ] = not considered)

Category of protected area	Nature Protection Area (NSG)	National Park	Biosphere Reserve (BR)	Landscape Protection Area (LSG)	Nature Park	Nature Monu-ments	Protected parts of Land-scapes	Legally Protected Biotopes	FFH Sites	Ramsar Sites
Separate Administration		●	●		◗					
Management Plan		●	●		◗				●	◗
Principle 1 Societal Choice	●	●	●	●	●	●	●	●	●	●
Principle 2 Decentralization	●	●	●	●	●	●	●	●	●	●
Principle 3 Effects		●	●		◗				●	●
Principle 4 Economic Context	◗	●	●	◗	●				●	◗
Principle 5 Ecosystem Functioning	●	●	●	●	◗		◗	●	●	●
Principle 6 Limits	●	●	●	●	●	●	●	●	●	●
Principle 7 Scales	◗	●	●	◗	◗		◗	◗	◗	●
Principle 8 Long term	●	●	●	●	●	●	●	●	●	●
Principle 9 Changes	◗	●	●	◗	◗			◗	●	●
Principle 10 Balance Conser-vation Use	◗	◗	●	●	●				◗	◗
Principle 11 Relevant Information	●	●	●	●	●	●	●	●	●	●
Principle 12 Relevant Sectors	●	●	●	●	●	●	◗	◗	◗	●

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2
A VISION FOR A WEB OF CONSERVATION LANDS ACROSS CANADA'S FOREST

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Keywords: conservation lands, web of conservation lands, sustainable forest management

Approaches to conservation of forest biodiversity

Approximately two thirds of Canada's wildlife species occur in forest ecosystems. Conservation of forest biodiversity is a Canadian priority and forests play an important role in our commitment under the Convention on Biological Diversity (CBD) and its Canadian counterpart the Canadian Biodiversity Strategy (CBS) for the conservation and sustainable use of biodiversity. Currently in Canada, two distinct but additive strategies are used to conserve forest biodiversity. The first strategy involves the setting aside of parcels of land to provide appropriate protection to environmentally sensitive areas as well as to ensure representation through conventional protected areas. The classification system developed by The World Conservation Union (IUCN) has been widely used by countries to report on protected areas, with various degrees of success and consistency. The second approach to biodiversity conservation practiced in Canada considers those activities within a sustainable forest management framework that contribute to the maintenance of biodiversity. Harvesting guidelines for the retention of wildlife trees, snags and coarse woody debris, spatial and temporal considerations with regard to species composition and age class distribution and areas in the operational forest that are considered non-timber productive are examples of such activities.

Areas where these two strategies are achieved, either singly or combined, using any of a broad array of policies, legal instruments and targeted management practices are referred to as Conservation Lands.

Determination of the conservation status of an area

A series of 12 guiding questions were developed to assist in the determination of the conservation status of a given area. The questions largely reflect the IUCN eligibility criteria while focusing on goals for biodiversity conservation (representation, ecological integrity, connectivity and ecological management to maintain biological diversity) and the need for appropriate management actions that serve as guidance for the recognition of the conservation status of a given area.

Five classes of conservation lands can be distinguished based on their management priorities. A framework, defining these classes, outlining the associated conservation activities with their management priorities and identifying links to international reporting mechanisms has been developed for planning and reporting. The framework reflects an integrated ecological approach to conservation of biodiversity and considers the growing recognition, within the scientific and conservation communities, that the cumulative impact of all conservation mechanisms are required to ensure ecological functioning in forest ecosystems. Wilderness areas (Class 1), Nature Reserves (Class 2), Environmentally Significant Areas (Class 3), and Conservation Management Areas (Class 4) are types of conservation areas, designated through legal or policy mechanisms, where the conservation target is determined through management objectives. The Conservation Landscape (Class 5) is a mosaic of areas that collectively maintains biodiversity across the landscape.

The Web of Conservation Lands

Each Canadian province is responsible for retaining the integrity of its forests using different tools (and terminology) related to the diversity of forest types across the country. Assuring the resilience of forest ecosystems and the life support services they provide requires spatial and temporal planning for the maintenance of:

- the full spectrum of major ecosystem types (representation);
- natural disturbance regimes (ecological integrity); and,
- links between natural areas (connectivity across landscapes).

To be effective, these conservation goals should be framed within an ecological approach to management (ecological management action).

Parks, ecological reserves, wilderness areas and other dedicated conservation areas are identifiable areas across the forested landscape that can be mapped, assessed and evaluated for biodiversity conservation. These conservation lands (Classes 1-4) are the individual components that when strategically linked extend to form a Web of Conservation Lands across the country. In addition to these conservation lands, there are also specific activities, within both managed portions of the commercial forest and the non-timber productive portion of the commercial forest which, while outside of legally protected areas, are critical to the conservation of biodiversity, but are not easily quantified. When biodiversity management planning and objectives are strategically linked with the components of the Web of Conservation Lands, a Conservation Landscape (Class 5) can be achieved and recognized for its contribution to biodiversity conservation.

3
BIODIVERSITY: A NATURAL PATRIMONY THREATENED IN SANTA CATARINA'S COAST, BRAZIL

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Keywords: coastal zone, antropic pressure, Zimbros' reservation

Introduction

The Brazilian biodiversity is so rich as ignored; nevertheless, Brazil is denominated the country of the mega diversity. It has 357 thousand hectares of tropical forests, representing 30% of that forest type in the planet. It counts with the most several flora of the world, having 55.000 described species. The vertebrates are represented thoroughly with 394 species of mammals, 1.622 of birds, 516 of reptiles, 502 of amphibians and more than 3.000 species of fish. The arthropods are counted in more than 2.500.000 species.

Atlantic forest

In this universe of extensive exploration of the natural resources, the forest is had as one of the biomes with larger biodiversity indexes in the world and it occupies the second place among the threatened tropical forests. Today it has an extension of approximately 52.000 km^2, corresponding at 5% of its original covering. Although reduced and very broken into fragments, the remainders have a significant social and environmental importance. Almost 70% of the Brazilian population lives in its domains and they depend on the flows of the springs that exist in it. From the forest it makes sure the fertility of the soil and the control of the regional climate and local microclimate. It protects against the erosion and from the collapses the scarps and the slopes of the mountain. The Atlantic Forest is part of the fifteen areas globally identified as hotpots (areas with high biodiversity, discharge endemism rates and, at the same time, with high antropic pressure). And for that it occupies a priority position in the world efforts for the conservation of the biodiversity. This took UNESCO to declare, in 1991, the remainders of this Brazilian biome, as Natural Patrimony of the Humanity. Rizzini (1997) stands out some numbers from what has survived, just considering the group of the angiosperms; there are about 20.000 species, being 50% of those endemic ones to the biome. The avifauna surpasses 680 species, where 199 are had endemic and 144 in extinction menace (ROSARIO, 1996).

Characterization of the Place of Study

The study area, Coastal of Zimbros, includes a belt of forest of 30 km2. It is a remainder of the Atlantic Forest that forms the divisor of waters in the limit between the municipal districts of Bombinhas and Porto Belo in Santa Catarina's State. It is formed by several fisiographics environment as slopes, valleys, shores and beaches, exposed to an intense predation. It is influenced by a mesotermic semi-humid climate, without stations of droughts, with hot summers and annual medium temperature of 18ºC, with maximum of 38ºC and minimum of 10ºC and annual medium pluviosity of 1.500 mm (RIZZINI, 1997).

The study involved interdisciplinary methodologies, including Geomorphology, Edafology, Hydrology, Climatology and Biology, among other, seeking the scientific knowledge to develop the use and maintainable handling of this coastal area. The results of a first phase try to relate the information obtained with the handling tools, subsidizing the taking of decisions. In relation to the biological aspects, in Zimbros Coastal the

qualitative composition of the biodiversity of superior vertebrates was characterized and of the flora, looking for to esteem the distribution and relative frequency of the species and its variations. It was also tried to compare the importance of the only unit of conservation in that area, the of the Natural Patrimony Hill of Zimbros' Reservation, that takes twenty years of conservation and regeneration of an area of 50 ha, approximately. The Reservation was used for agro pasture and, in more recent times, it suffered hunters' invasion and illegal extractives. At the present time it has the recognition of the legal environmental organs as Particular Reservation of the Natural Patrimony and, starting from it, was transmitted to the inhabitants of the area the respect and the importance of preserving, what doesn't happen with the remaining of the area.

Final considerations

The agriculture is co-responsible for extensive cut down of the native forest in the area, followed by the real state speculation. The phenomenon of loss of the biodiversity is noticed mainly in the less structured nuclei and isolated as in different points of the Coastal of Zimbros. The researchers' efforts, however, is not enough to stop the degradation of the forest. To minimize that problem, it urges the need to deepen the knowledge about the forest and its functionality, objectifying the creation of alternatives for the preservation. The described scenery sketches the urgency and the importance of the studies on characterization, evaluation of the impacts and maintainable development. The presence in the area of a Particular Reservation of the Natural Patrimony serves as a reference mark for the local inhabitants and for the tourists that visit the coastal zone of the Municipal districts of Bombinhas and Porto Belo. Besides the educational aspects, the Reservation also contributes as reservoir to the flora maintenance and autochthonous fauna.

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4
BIODIVERSITY CONSERVATION IN A WORKING LANDSCAPE: AN OVERVIEW OF COOPERATION IN THE MIXED GRASS PRAIRIE OF SOUTHWESTERN SASKATCHEWAN, CANADA

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Keywords: biodiversity conservation, grassland, ranching, rangeland, working landscape

Introduction

Land owners, lessees, interest groups, and government agencies have formed cooperative relationships to advance biodiversity conservation in the southwest region of the Province of Saskatchewan, Canada. These networks, which extend into neighboring jurisdictions, share an appreciation for the inherent value of the prairie landscape, the importance of biodiversity reach and monitoring and land management approaches aimed at social, economic, and environmental sustainability.

Dominated by Brown Chernozemic soils and a semiarid climate, southwest Saskatchewan lies in the centre of the Prairie Ecozone and is part of the Mixed Grassland Ecoregion of North America. Major features include the Frenchman River and Battle Creek valleys, and 46% of the landscape is publicly owned rangeland in Grasslands National Park, federal Prairie Farm Rehabilitation Administration (PFRA) Community Pastures, and Saskatchewan's Community Pastures and grazing leases (Figure 1). Of the publicly owned lands, about 87% are managed cooperatively with private interests, for cattle production and wildlife habitat. Significant effects due to climate change are predicted for the area.

The human population is relatively sparse and is in decline, and there are few communities in this 'working landscape. The area's ranching history pre-dates Saskatchewan's entry into the Canadian Confederation in 1905, and the ranching way of life continues, despite relentless hardships. About 60% of the land is managed for cattle ranching, and 40% is cultivated for annual crops. Federal and provincial government initiatives encourage the conversion of marginal cultivated land to forage and pasture.

Significant Cooperative Efforts for Biodiversity Conservation

Voluntary and cooperative approaches to land management have evolved in this area, to the benefit of all partners. Ranching has helped to conserve the prairie against fragmentation, because large blocks of land are needed due to low productivity. Private and leased lands managed as single units, with long ranching histories and multi-generational lease tenures, are proving to be crucial to the maintenance of the remaining prairie ecosystems. Biodiversity is one indicator of land management performance. Experience shows that Mid-Good Range Condition provides the optimum resource for livestock grazing, and conservation of biodiversity. For this region, the rangeland is mostly in the Good or Excellent range condition classes.

Canada's Habitat Stewardship Program for Species at Risk is an effective catalyst in fostering cooperation and promoting biodiversity conservation in this priority landscape. Ranchers are involved in stewardship activities through the Saskatchewan Prairie Conservation Action Plan (PCAP) and the Saskatchewan Watershed Authority. The PCAP is action-oriented, driven by 25 partners, and chaired by the Saskatchewan Stock Growers Association. The vision is a native prairie sustained in a healthy state in which natural and human

values are respected. Other examples of cooperative stewardship actions include: Nature Saskatchewan's Operation Burrowing Owl, the Nature Conservancy of Canada and the Frenchman River Biodiversity Project being developed by the Royal Saskatchewan Museum and the Canadian Museum of Nature.

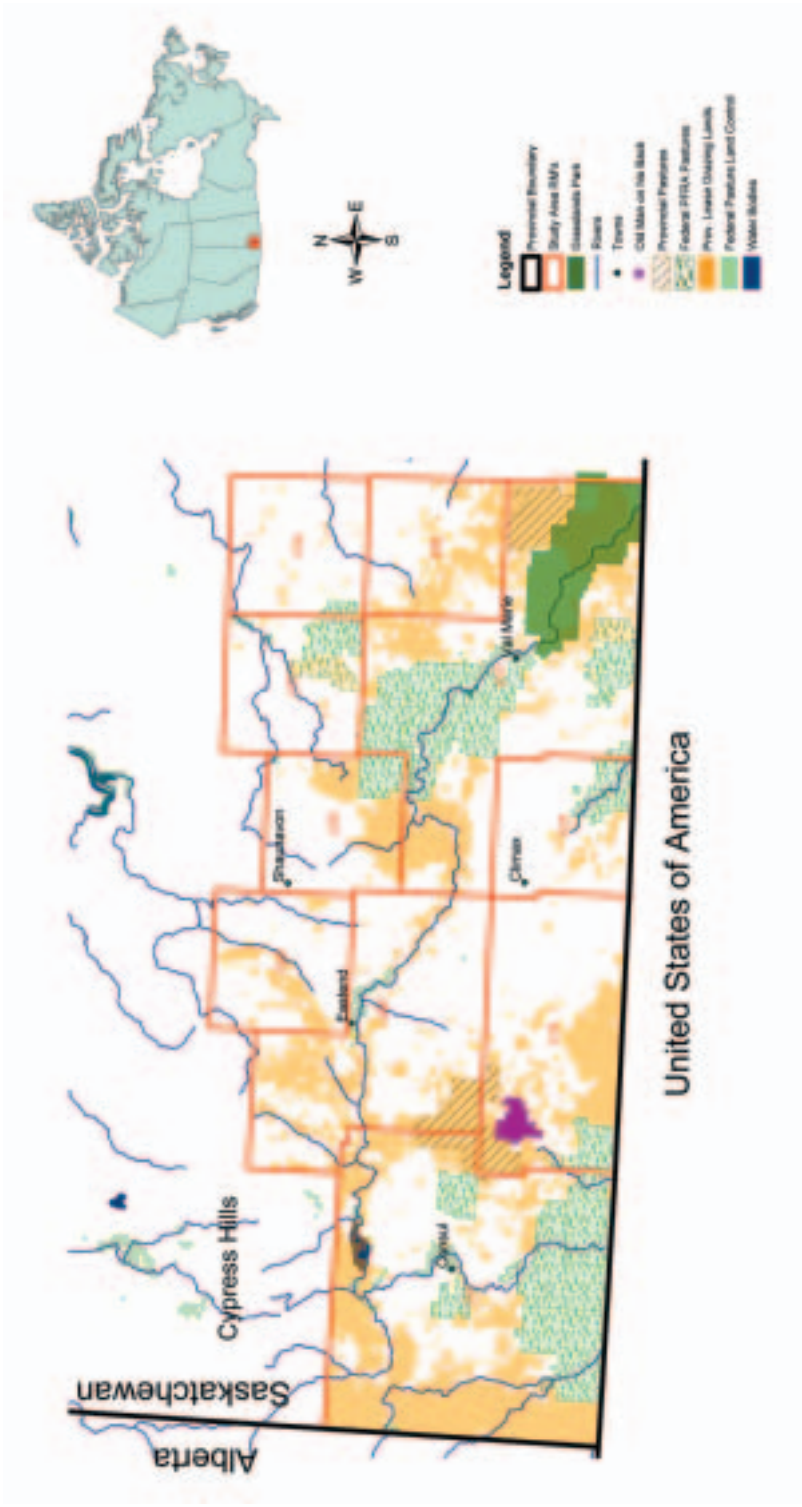
Grasslands National Park is one of the only intact prairie landscapes that invites all Canadians to connect to grassland ecosystems. Upon completion, the Park will encompass 906 km^2 and protect some of North America's most endangered habitats. More than 400 plant species are found in the Park, including 36 that are rare in the province. Species at risk include: Black-tailed Prairie Dog, Sage Grouse, Burrowing Owl, Ferruginous Hawk, Sprague's Pipit, Prairie Rattlesnake and Eastern Short-horned Lizard. The Park's management plan outlines a role for grazing and prescribes the use of bison and, when necessary, domestic livestock. The intent is to complement the management of surrounding rangelands and increase the ecological integrity of the whole region by brief and less frequent periods of intensive grazing. This will represent the range of disturbance patterns that led to the evolution of prairie ecosystems. The Park works in partnership with a variety of conservation initiatives, including the PCAP, the Nature Conservancy of Canada, the Frenchman River Biodiversity Project and species at risk recovery strategies.

Canada's PFRA Community Pasture Program has operated in this area since the 1930s to rehabilitate and conserve severely eroded and drought-prone lands. This program represents Canada's largest management effort on native prairie. PFRA cooperatively manages 207 890 hectares in the region, of which 87% is native vegetation. These pastures offer large, contiguous blocks of native prairie and contribute to a mix of management approaches and grazing intensities at the landscape level. Govenlock, Nashlyn and Battle Creek pastures have been awarded Important Bird Area designations for the presence of birds and their intact natural environments.

Nature Conservancy of Canada's (NCC) primary focus in southwest Saskatchewan is to work with landowners who wish to enter into conservation easement agreements on their privately owned grassland. NCC also owns and manages, with the Saskatchewan Government, the Old Man on His Back Prairie and Heritage Conservation Area - a project designed to showcase the positive relationship of sustainable agriculture and grassland conservation. Also, NCC is a key sponsor of the Northern Mixed Grass Conservation Planning initiative.

Summary

Southwest Saskatchewan is a valuable landscape for the conservation of biodiversity in the northern mixed grass prairie. Cooperative approaches to land management support both private and public interests, partly through the maintenance of large contiguous blocks of native prairie in good condition. Actions aimed at the social, economic and environment sustainability of this working landscape face the challenges of declining human populations, development interests, income issues, and the potential effects of climate change.


Legend
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United States of America
Alberta
Saskatchewan
Cypress Hills

5
BIODIVERSITY OF MARINE FISH LARVAE AT THE SOUTHERN TIP OF PENINSULAR INDIA, NEEDS CONSERVATION AND FURTHER STUDIES

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Keywords: marine fish larvae, conservation, marine protected area, hot spot

The magnitude of marine biodiversity is large and much studies has to be carried out to get an understanding of the life in the Oceans. Only about 7% of the Oceans has been sampled. India is one of the mega biodiversity countries. The marine diversity in India is large and specific measures needs to be taken to conserve it. Fishery technology is getting modernized day by day, and also the harvesting of marine fishes. Since very less attention is paid to conservation, the danger of fish stocks being eliminated is eminent if conservation is not put into force.

The southern most tip of India is surrounded by the Bay of Bengal in the east, Indian ocean in the south and the Arabian sea in the west. The kannyakumari to Trivandrum coast (76°55` to 77°35`E and 08°5` to 08°30`N) is rich in marine biodiversity, especially the fish species belonging to it. Every year, during November to March (post North East Monsoon period) post larvae of hundreds of species occur abundantly in the inshore waters of the above coast of India. Samples of young fishes were collected for identification during an extended period of time of more than two decades.

Post larval stages of 72 bony fish families represented by 243 species were collected during this study. *Lutjanidae* ranked first comprising 32 species followed by *Serranidae* 26 sps., *Carangidae* 19 sps., *Engraulidae* 13 sps., *Sciaenidae* 9 sps., *Pomacentridae* and P*latycephalidae* represents each 8 sps., *Leiognathidae* and *Bothidae* represent 7 sps. each, A*pogonidae* and *Nemipteridae* represents 6 sps. each, *Siganidae*, *Sphyraenidae* and *Tunnidae* represented 5 sps each. All the other families represented below 5 sps. each.

The most important species of post larval stages of fishes which regularly occur every year in this region are *Scomberomorus commerson, S.guttatus, S. lineolatus, Auxis thazard, A. thynnoides, Sarda orientalis, Euthynnus affinis, Neothunnus macropterus, Rostrelliger kanagurta, Sphyraena jello, S. piguda, S. obtusata, Lutjanus spp, Epinephelus spp ,Siganus spp, Caranx spp* etc. The spawners and spent specimens of the above occur in the fishery. The full life history stages of *Trichiurus lepturus* and *Lepturacanthus savala* collected from this region by the authors were studied (unpublished). During November to January every year the traditional fisherman of the locality are engaged in "Nonna" fishery. The post larvae of *Engraulidae, Dussumieridae, Clupeidae* and *Synodontidae* occur in several tonnes at the near shore waters and constitute "Nonna" fishery.

An assessment of the diversity of fauna & flora of this fragile system is important. The resources and habitats of this area has to be thoroughly studied before being depleted. The abundance of young fish assemblage at these area clearly indicate the quality of water prevailing at the inshore waters of South west coast of India. An estimated 60 percent of the global population lives within roughly 100 kilometers of the shore. This means that about 3.4 billion people rely heavily on marine habitats and resources for food. IUCN World Commission on Protected Areas (WCPA) considers that perhaps as many as two-thirds of all marine species have yet to be catalogued, establishing representative protected spaces seems essential. Considerable efforts are also being directed worldwide to establishing marine protected areas (MPAs). Studies such as identification of breeding grounds of the mature females, studies on the breeding habitat ecology, studies on the larval nutrition, ecological parameters which keep the plankton abundance and diversity for the fish larvae to feed, mapping of the sea bottom etc has to be undertaken to understand this region in its full aspect. These would pave way for conservation of the biodiversity of fishes in the kannyakumari and Trivandrum region of the southern tip of peninsular India and would make way for making it a **Marine Protected Area/Hot Spot** for fish eggs and larvae.

6
CONSERVATION OF BIODIVERSITY IN THE PROTECTED AREA NETWORK OF IRAN

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Keywords: biodiversity, conservation, protected area, Iran

Geographical and Land Characteristics

The Islamic Republic of Iran comprises a land area of 1.64 million km^2. It lies in the northern part of the temperate zone, between latitudes 25^o 03' and 39^o 47' north and longitudes 44^o 14' and 63^o 20' east. The average altitude is over 1200 m. Iran is bordered by Turkmenistan, the Caspian Sea (over 900 km of coastline), Azerbaijan, and Armenia in the north, Afghanistan and Pakistan in the east, the Persian Gulf and the Sea of Oman in the south, and Iraq and Turkey in the west.

Iran has a varied but generally harsh climate - arid with large temperature fluctuations. Many species and varieties are adapted to surviving in these harsh conditions (Graph 1).

The Iranian habitat supports over 8,000 recorded species of plants (of which almost 2,500 are endemic), over 500 species of birds, 160 mammals, 164 reptiles (26 endemic species), and 375 species of butterflies. A large number of the plant and animal species indigenous to Iran are the wild relatives of commercial species, confirming Iran's status as a center of genetic biodiversity. Also, a large number of Iran's plant and tree species have traditional medicinal, aromatic and pigment uses.

The National Protected Area System

The protected areas and reserve systems provide the core areas for biodiversity conservation. This reserve system is not sufficient in itself for long-term conservation, and must be harmonized with conservation efforts in other areas and land-uses. In Iran, areas protected by the Department of Environment (DoE) cover almost 12 million hectares that covering over 8% of the national land area (Map 1).

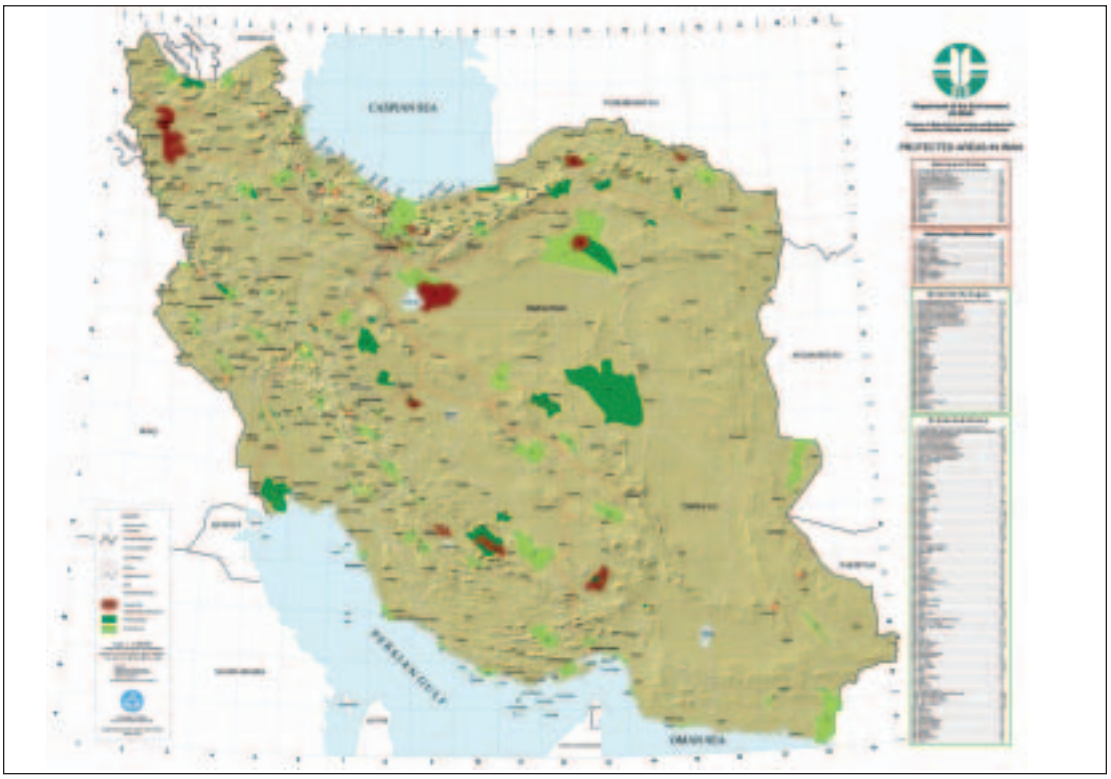
In order to preserve domestic biodiversity throughout the vast territory of Iran, the DoE-managed areas have been classified as: "National Parks," "Wildlife Refuges," "Protected Areas" and "National Natural Monuments".

In addition, until now there are more than 100 non-hunting areas under management of the Department of Environment, with a total area of more than 5 million hectares. Iran participates in the UNESCO Man and the Biosphere Programme, and designated 9 Biosphere Reserves covering a total area of 1.9 million hectares. Also there are 21 Ramsar Sites and several Important Bird Wintering Areas in the country. Four of these Biosphere Reserves (Arjan, Hara, Uromieh and Miankaleh) contain internationally important wetlands. The Department of Environment's goal is to increase this proportion to 10% of the national land area. It is a priority to make this network Comprehensive, Adequate and Representative (CAR).

Controlled (depends on the type and capacity of the area) tourism and research occurs in these areas. By this time, the system of protected areas in Iran includes 16 National Parks, 33 Wildlife Refuges, 90 Protected Areas, 13 National Natural Monuments and five Protected Rivers. Details of different categories of protected area managed by the Department of Environment are given in Table 1.

Map 1.

Protected Area in Iran



Graph 1.

Main Climate Zones (percent of the country)

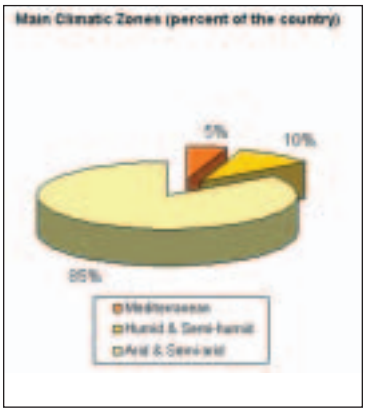


Table 1.

Type and Area of the Protected Areas in Iran

Type	Area (million ha)	% of Iran	% of protected Areas
National Parks	1.620	0.98	13.93
Wildlife Refuges	3.434	2.09	29.53
Protected Areas	6.556	3.99	56.40
National Natural Monuments	0.016	0	0.14
Total	11.626	7.06	100.00

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7
CORRIDOR DEVELOPMENT FOR BIODIVERSITY LANDSCAPE CONSERVATION

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Keywords: transboundary, participatory, protected-areas, corridors, conservation

Kanchenjunga Conservation Landscape

The landscape surrounding Mount Kanchenjunga spreads over a wide spectrum of ecological zones in eastern Nepal, Darjeeling and Sikkim Himalaya (India) and western Bhutan. It has nine important protected areas covering about 10,000 sq km. The area is considered as part of one of the 25 Biodiversity Hotspots of the world (Myers, 2000). It has a unique situation where within 100 km N-S stretch covers tropical to alpine vegetation. Considering the importance of the landscape, biodiversity conservation has been made as top priority in the national agendas for Nepal, India and Bhutan. India has brought the Kanchenjunga area under a protected area network by managing it as Kanchenjunga Biosphere Reserve and other five wildlife Sanctuaries in Sikkim; Singhalila National Park, Senchel Wildlife Sanctuary, Mahananda Wildlife Sanctuary and Neora Valley National Park in Darjeeling; Kanchenjunga Conservation Area in Nepal and Toorsa Strict Nature Reserve, and Jigme Dorji National Park in western Bhutan. The area has contiguity on the habitat of many umbrella species such as Snow Leopard, Takin, Tigers and Elephants which otherwise are restricted in the individual existing protected areas. It is among one of the 169 complexes of two or more adjoining protected areas that are divided by international boundaries (Sandwith et. al., 2001). Therefore, transboundary cooperation helps countries to meet their obligations under international agreements such as the Convention on Migratory Species and the Convention on Biological Diversity (Shengji and Sharma, 1998).

Despite of the ecological importance of the landscape, they have been subjected to great stress and continue to face multiple threats (Brooks et al., 2002). Connecting these PAs with corridors has important role on both vertical (altitudinal) and horizontal coverage for conservation in this important landscape. To address this critical issue, ICIMOD with its past experience from Mt Everest Ecosystem (see Sherpa et al, 2003) has initiated the work on developing corridors between the existing PAs in southern half of the Kanchenjunga landscape.

Project goals and processes

Sustainable participatory conservation of globally significant biodiversity area by developing strategies, plans and linkages to establish corridors between protected areas in southern half of Kanchenjunga landscape.

Activities to be carried out

Identification of potential corridors
Identified corridors of legitimate biodiversity links between protected areas in mountainous terrains of the Kanchenjunga landscape covering parts of Nepal, India and Bhutan through participatory processes involving all tiers of stakeholders.

Landscape elements and tenures
Information on different landscape elements and tenures such as protected areas, community forests, natural forests; agroforestry, rangelands, agricultural lands and tea-gardens are generated for each of the identified corridors.

Develop participatory strategy and action plans
Strategies and action plans for effective conservation of biodiversity in the identified corridors and options for socio-economic development of the people living therein are identified.

Policy analysis in transboundary issues
Issues and recommendations on local and transboundary policy that could facilitate effective transboundary cooperation on participatory biodiversity conservation to be provided to each of the member countries.

Capacity building
Capacity of the local communities and organizations on optional micro-enterprises developed through trainings, demonstrations and exposure visits.

Information sharing to member countries
The information generated through the processes shared among the developmental agencies, conservation organizations and policy makers through consultative workshops in local, national and regional levels.

Develop participatory corridor plan
A comprehensive landscape level corridor development plan will be prepared and facilitate communities and local development agencies to bring the action plans into implementation.

Expected outcomes

Transboundary biodiversity conservation landscape development through capacity building and corridor management plans and mutual trust among Nepal, India and Bhutan.

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8
ECOSYSTEMS AND HUMAN WELL-BEING: A FRAMEWORK FOR ASSESSMENT

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Keywords: ecosystems, well-being, assessment, framework, scale

Ecosystems and Human Well-being: A Framework for Assessment is the first product of the Millennium Ecosystem Assessment (MA), a four-year international work program designed to meet the needs of decision-makers for scientific information on the links between ecosystem change and human well-being. It was launched by United Nations Secretary-General Kofi Annan in June 2001, and the principal assessment reports will be released in 2005.

The MA focuses on ecosystem services (the benefits people obtain from ecosystems), how changes in ecosystem services have affected human well-being, how ecosystem changes may affect people in future decades, and response options that might be adopted at local, national, or global scales to improve ecosystem management and thereby contribute to human well-being and poverty alleviation. The specific issues being addressed by the assessment have been defined through consultation with the MA users.

The MA will:

- Identify priorities for action;
- Provide tools for planning and management;
- Provide foresight concerning the consequences of decisions affecting ecosystems;
- Identify response options to achieve human development and sustainability goals; and
- Help build individual and institutional capacity to undertake integrated ecosystem assessments and to act on their findings.

The MA synthesizes information from the scientific literature, datasets, and scientific models, and makes use of knowledge held by the private sector, practitioners, local communities and indigenous peoples. All of the MA findings undergo rigorous peer review. The MA is governed by a Board comprised of representatives of international conventions, UN agencies, scientific organizations and leaders from the private sector, civil society, and indigenous organizations. A 13-member Assessment Panel of leading social and natural scientists oversees the technical work of the assessment supported by a secretariat with offices in Europe, North America, Asia, and Africa and coordinated by the United Nations Environment Programme. More than 500 authors are involved in four expert working groups preparing the global assessment and hundreds more are undertaking more than a dozen sub-global assessments.

The first report of the Millennium Ecosystem Assessment describes the conceptual framework that is being used in the MA. It is not a formal assessment of the literature, but rather a scientifically informed presentation of the choices made by the assessment team in structuring the analysis and framing the issues. The conceptual framework elaborated in this report describes the approach and assumptions that will underlie the analysis conducted in the Millennium Ecosystem Assessment. The framework was developed through interactions among the experts involved in the MA as well as stakeholders who will use its findings. It represents one means of examining the linkages between ecosystems and human well-being that is both scientifically credible and relevant to decision-makers. This framework for analysis and decision-making should be of use to a wide array of individuals and institutions in government, the private sector, and civil society that seek to incorporate considerations of ecosystem services in their assessments, plans, and actions.

The conceptual framework for the MA places human well-being as the central focus for assessment, while rec-

ognizing that biodiversity and ecosystems also have intrinsic value and that people take decisions concerning ecosystems based on considerations of well-being as well as intrinsic value (See Figure 1.).

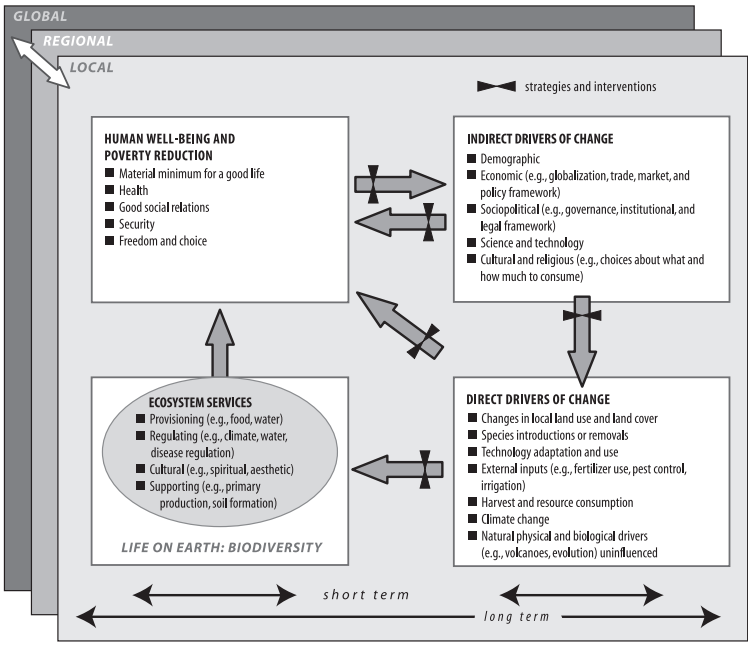
The assessment framework developed for the MA offers decision-makers a mechanism to:

- Identify options that can better achieve core human development and sustainability goals.
- Better understand the trade-offs involved—across sectors and stakeholders—in decisions concerning the environment.
- Align response options with the level of governance where they can be most effective.

With its focus on ecosystem services and human well-being, the MA framework can be useful for decision-makers faced with choices concerning protected areas, and can help countries to assert the important contributions of their protected areas to global agenda on sustainable development. As the recent Vth World Parks Congress in Durban affirmed, protected areas can not be isolated from their surroundings or from the economic activities in and around them. The MA framework provides the mechanisms needed to assess exiting conservation and management strategies for protected areas, and can provide information needed for the design of new plans. The conceptual framework also serves as a useful tool to help identify new areas for protection based on information that it will provide about biodiversity, habitats and ecological processes across multiple scales.

Figure 1.

Millennium Ecosystem Assessment Conceptual Framework



Changes in factors that indirectly affect ecosystems, such as population, technology and lifestyle (upper right corner of figure), can lead to changes in factors directly affecting ecosystems, such as the catch of fisheries or the application of fertilizers to increase food production (lower right corner). The resulting changes in the ecosystem (lower left corner) cause the ecosystem services to change and thereby affect human well-being. These interactions can take place at more than one scale and can cross scales. For example, a global market may lead to regional loss of forest cover, which increases flood magnitude along a local stretch of a river. Similarly, the interactions can take place across different time scales. Actions can be taken either to respond to negative changes or to enhance positive changes at almost all points in this framework (black cross bars).

9
EVALUATING THE POWER OF TIME OF SERIES OF LINE TRANSECT SURVEYS TO DETECT CHANGE IN POPULATION OF DORCAS GAZELLE *(GAZELLA DORCAS)* IN SOUTH SINAI EGYPT

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Keywords: dorcas gazelle, population trend, statistical power

Introduction

Population of dorcas gazelle *(Gazella dorcas)* has suffered a decline in numbers and shrinkage of range and distribution all over Egypt through the 80s and the early 90s (Saleh, 1987). Current efforts of conserving the species in its Egyptian range involved many procedures including protecting the species by law, and declaring protected areas where the species is known still to occur (ex, Wadie El Rayan 1988, Gabal Elba Protected Area 1982, Nabaq Protected area 1996, St. Katherine Protectorate 1996 and Siwa Protected area declared in 2002). A systematic survey with annual estimates of gazelle population was put in place to monitor the gazelle population in south Sinai using line transects since 1999. The current work utilizes these data sets to assess the power of this program to detect change (increase or decrease) of this population.

Methods

In general, for any statistical test, power is a function of sample size (n), the probability of Type I error α, and the magnitude of the difference between the null hypothesis and reality (the effects size) (Cohen 1988). In population studies, the effect to be measured is often the change in population size (r), which may be negative or positive. In ecological studies, population size cannot be measured precisely, and a practical power calculation must account for the amount of uncertainty in estimating abundance. This uncertainty is quantified by the coefficient of variation (CV).

For the purpose of calculating power in population and abundance studies Gerrodette (1987) formulated six equations that define the relationship between r, n, α, CV and power. These equations can be used to calculate the value of any one of these parameters if the other four are known. However, certain assumptions must be fulfilled. It should be known whether the trend under consideration is linear or exponential to choose the right family of equations. In addition, the trend should be uniform over the whole study period. Using these equations several vital questions about the design of field study programme (such as how many samples are required? how precise should they be?) can be answered. A more frequently asked question is how precisely can a certain trend be detected by a particular programme?

Link and Hatfield (1990) suggested that the t-distribution rather than the z-distribution should be used as the underlying model for estimating the power of the linear regression to detect a trend in population size. They showed that assuming the variance of the abundance estimate is normally distributed may cause overestimation of the power, especially for small sample size ($n<20$). They suggested that the t-distribution provides more appropriate values for the 97.5th percentile to be used in estimating. When =0.05, the t-distribution yields 97.5th percentiles of 3.182, 2.306 and 2.101 for n = 5,10 and 20 respectively, whereas the equivalent value for the z-distribution is 1.96 for all values of n. Also, the t-distribution is more correct, because it provides a better approximation of the distribution of the test statistic under the alternative hypothesis and it does not involve the assumption that the variance is known, which the z distribution does.

There are no historical estimates of the abundance of dorcas gazelles in the area of south Sinai. Estimates are only available from 1999, 2000 and 2001 in the Qa'a plain and Nabaq area. Figure (1) shows the available time series for the two study areas. The current study has used these data sets to detect for change using Gerrodette equations and assuming t-distribution. Calculations were done using TRENDS 3.0 software. Due to small time series available both linear and exponential trends were investigated. According to Link & Hatefield (1990) the amount of annual change in abundance (r) was calculated as $r=b/(a+b)$ for the linear model and $r=\exp(b)-1$ for the exponential model , where (a) and (b) are the intercept and slope of the linear regression of abundance on time for the linear mode and (b) in the slope of the exponential regression for the exponential model.

Results

Power Calculation for the monitoring program in Qa'a plain and Nabaq protected area showed low statistical power over the conducted 3 years of population assessment. The power for the population monitoring program did no exceed 0.15 for either the linear or exponential patterns. However, lower values of power are obtained when having lower values of alpha. Values of the power calculated are listed in Table 1.

The power of the program is increasing sufficiently with the progress in number of annual surveys. Assuming rates of annual change of 25%, 50% and 95% and calculating power of the program through progressive annual surveys shows that it requires the program 11 years to detect a 25% linear change in Qa'a plain, and 8 years to detect a 95% linear change . If the underlying trend is exponential, the equivalent figures are 8, 6 and 4 years for the program to detect exponential changes of 25%, 50% and 95% respectively. Enhancement of Power of the program with progressive number of annual surveys for the three assumed rates of annual change is shown in Figure (2).

The program has also shown modest capacity of detecting small changes underlying the population size provided the three estimates available to date. However the program has shown a potential capacity of detecting much smaller and finer changes in the population with the progress of annually surveys and adding more points to the time series. For example the program is capable of detecting changes in the magnitude of 150% in Qa'a plain over 4 years of surveying if the exponential pattern is assumed while its capable of detecting changes of 600% in the same 4 years in Nabaq protected area if the exponential pattern is assumed. These minimum detectable changes are much more enhanced with the progressive addition of number of annual surveys where the program is expected to detect changes as fine small 30% after 10 years in Qa'a plain under the assumption of linear change and as small as 16% after the same period if the trend is exponential. The same enhancement of the minimum detectable change with progressive number of annual surveys is noticed in case of Nabaq where the program is capable of detecting a change as small as 24% for both linear and exponential trends if the survey effort is continuous for 10 annual surveys. Figure (3) shows the enhancement of the minimum detectable change of the population with the progressive number of annual surveys.

Discussion

The current monitoring programme has low power to detect changes over a small period of time because of the relatively low precision associated with the estimates of dropping density. Nevertheless, the minimum change that can be detected improves as the number of annual surveys is increased.

Decreasing the coefficient of variation of the estimates could substantially enhance the power to detect changes in population size. It may be possible to do this by re-stratifying the study region, although this would result in the loss of the currently estimates. However, due to the fragmented habitat and the food resources available for gazelles being in scattered patches any stratification design will still show high variance, thus the CV is unlikely to be enhanced to reach the 30% or 15% levels. Enhancing the CV to 30% is expected to yield in detecting change after 7 years with starting from scratch while the current value of CV is expected to yield

in the same result after 8 or 9 years but with the advantage of 3 years of data are already available. So carrying on with the same design is recommended as a trade off over re-stratifying the study region in Qa'a plain.

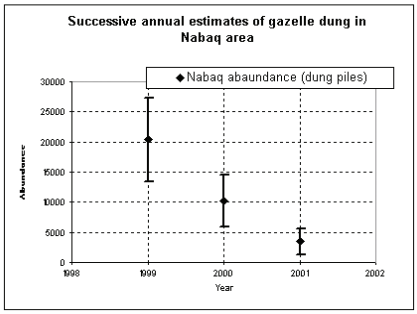
Table 1 Values of power (1-β) for gazelle dung surveys in Qa'a plain and Nabaq protected area over the period 1999-2001.

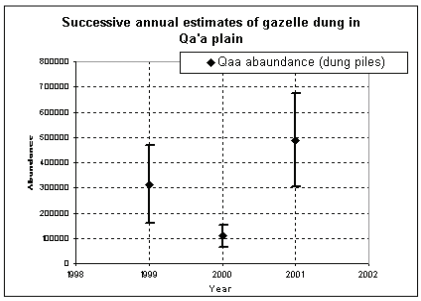
Trend	$t_{1,025}$, $t_{1,0.05}$	CV_1	n	r	Power at α=0.05	Power at α=0.1
Linear (Qaa)	12.706 , 6.314	0.48	3	0.40	0.07	0.14
Exponential (Qaa)	12.706 , 6.314	0.48	3	0.25	0.06	0.13
Linear (Nabaq)	12.706 , 6.314	0.44	3	-0.23	0.05	0.11
Exponential (Nabaq)	12.706 , 6.314	0.44	3	-0.57	0.07	0.13

Table 2 minimum detectable change (r) for gazelle dung surveys with power of 0.9 in Qa'a plain and Nabaq Protected area over the period 1999-2001.

Trend	$t_{1,.025}$, $t_{1,0.05}$	min. detectable r at α=0.05	min. detectable r at α=0.1
Linear (Qaa)	12.706 , 6.314	51.61	13.67
Exponential (Qaa)	12.706 , 6.314	117.30	10.80
Linear (Nabaq)	12.706 , 6.314	43.52	11.62
Exponential (Nabaq)	12.706 , 6.314	81.27	8.26

Fig (1) Available time series of estimates of gazelle dung abundance from:
a) Nabaq protected area and
b) Qa'a plain





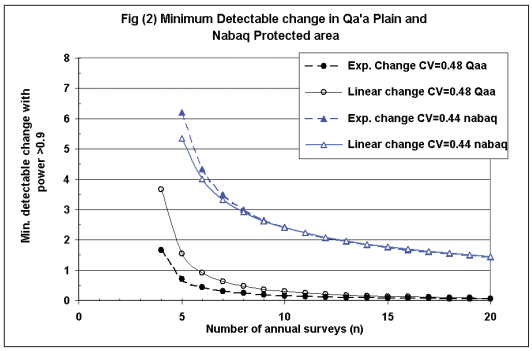
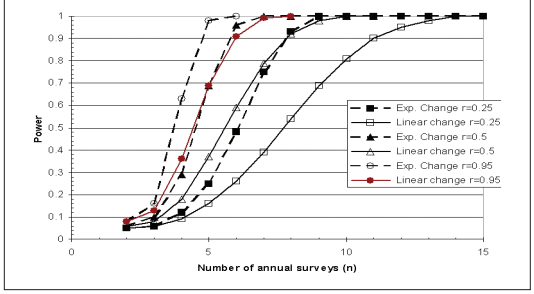


Figure 3 Relationship between number of surveys and power of programme to detect trends of 25%, 50% and 95% assuming linear or exponential trends, and CV=0.48 (Qa'a plain)



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10
FACTORS THAT INFLUENCE THE MANAGEMENT OF PROTECTED FOREST SUMACO, CANTON LORETO - ECUADOR

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Keywords: correspondence analysis, demographic structure, dynamic of land use, land tenure, Ecuador

Introduction

Forest resources share attributes with many other resource systems that aggravate their governance and management in a sustainable, efficient and equitable manner (ORSTROM, 1999). Destruction or degradation of forest resources is most likely to occur in open access forests where effective governance has not been established. Nevertheless, state property is generally the tenure from that is most severely exposed to degradation and, if the land can be claimed for property, to deforestation, sometimes regardless of any formal protection status it may have. State enforcement of forest tenure and access rules tend to be less efficient and more costly (LEACH and MEARNS, 1988). This research is trying to determinate, what factors have an influence on the relative efficiency of the management of Protected Forest in the canton Loreto – Ecuador.

Materials and Methods

A map of the *Instituto Nacional de Desarrollo Agropecuario* INDA 1995 at scale 1:100,000 was digitalized using the program ARC/INFO for the analysis of the tenancy of the different areas in the Protected Forest Sumaco. The satellite image LANDSAT of CLIRSEN dated October 1995 and September 1997 was used to determinate the dynamic of the land use in the Protected Forest Sumaco. Correspondence analysis was applied to determinate the development of the dynamic of land use. The census was realized to obtain demographic structures of the community 10 de Agosto by groups of ages and sex in 2000 (CAÑADAS, 2001).

Results and Discussion

Land tenure of the Protected Forest Sumaco

In spite of the limitations of the land use within the Protected Forest anticipated in the law (M.A., 1999), the Protected Forest Sumaco was divided into communities. The organization of the communities consist of Socios (Partners). The title to this land is held communally, but the usufruct is individually allocated. It is necessary to point out that landholding in the Protected Forest Sumaco is characterized by different levels of land access: The Socios, who have land, voice and vote in the community; candidates, who are usually children of the Socios who try to gain access to the land reserve of the community; and the individuals that are families who live in the community but are not members of it, and therefore they do not have any right on territories. This structure has imposed a class – structure – with radical access to land and institutional resources.

The effective distribution of the land is represented by an accumulated curve showing the percentage of the area of the Protected Forest that is received by the Socios of the communities, according to the surface of their communities within the protected forest (Lorenz curve). In Figure 1 it is shown that more than 50% of the partners of the communities have received less than 22% of the area of the protected forest. The coefficient of GINI was calculated with a value 0.6. This fact shows a clear inequality with reference to the distribution of land in the Protected Forest Sumaco.

Demographic structures of the community 10 de Agosto in the buffer zone of the National Park Sumaco
The combined effect of population growth and the gradual impoverishment have exerted pressure on the structures of possession of land. An example is found in the community of 10 de Agosto as well as in other communities with land distribution problems.

According to the data obtained in 1996 by GARCES and WRAY (1997), 565 persons represented the total population in the community 10 de Agosto. In 2001 the registered number of inhabitants living in the community was 683 (CAÑADAS, 2001). The distribution of this population by age and sex is shown in Figure 2. The Kichwa community 10 de Agosto does not have land reserves and cannot solve the access necessities to the land for the future generation between 1-15 years old, which represents more than 49% of the inhabitants. The alternative for the young groups is to invade lands of other communities, which is knows for the case of community Alto Chacayacu and/or of the National Park Sumaco Napo - Galeras.

The annual growth rate in the community 10 de Agosto was 4.8%. This rate can be compared to the numbers presented by RIVADENEIRA (1997) with an annual growth of 5.8% and THAPA et. al. (1996) with 6.7%. It is necessary to establish a relation between the surface of the territory and the population in order to determine the possible pressure of the population for natural resources. The number of the population was calculated using the formula of compound interest: $Q_x = Q_0 \ (1+ i)^n$, *where* Q_x = *Population in the year x*, Q_0 = *Population Base,* i = *Rate of Population Growth and* n = *Projection a year n.* The results of this projection are summarized in Table 1. The gradual decrease of land disposition was obtained and is presumed to be 5 ha per inhabitant in 2004. As rule of thumb, Myers 1980, (cited in WCMC 1992) suggests a population density of 5 inhabitants per km^2 of tropical moist forest as the upper limit for a sustainable shifting cultivation system. The obtained results show that the inhabitants exert pressure on the natural resources of the community. It has a direct relation to the loss of biodiversity and genetic erosion. But on the other hand, one important aspect, which calls the attention of ethnologists, namely a type of migration. It characterizes the Kichwas nations, which leave their towns of origin, and go further into the forest (MOYA 1997).

Development of the dynamic land use of the communities of Protected Forest Sumaco
The result of correspondence analysis which illustrate the different endowments in the canton Loreto are depicted in Figure 3 and 4. This explains the stimulation of inter regional trade and production specialization according to a region´s comparative advantage. First, the weather condition improves the production of naranjilla (*Solanum quitoense*). Secondly, livestock production clearly proves to be the best return. During that period prices rose relatively more and remained more stable. Thirdly, cheap coffee production through full proletarianization of family work and the increase of coffee prices. Furthermore, it has a great development potential and provides a powerful reason for forest loss.

Conclusions

The GINI coefficient 0.6 shows a clear inequality with reference to the distribution of land in the Protected Forest Sumaco. An annual growth rate of 4.8% with a typical pyramid about 49% between 1–15 years old is generalized in the Amazon region of Ecuador. Under these conditions the forest resources are polarized. Some communities like 10 de Agosto without any land reserves have too scarce and deteriorated resources. The only alternative for young people is to invade lands from other communities or from the National Park, which is left to open access. The complete inexistence of management plans in order to legalize its position of the land and a lack of participation directly influences the scarce degree of autonomy and organizational experience. The actual law is only generating a strong opposition from the settled population in the Protected Forest Sumaco, since it has not shown any practical benefits for Sumaco so far. This fact has a negative influence on the common understanding and trust between communities and the Ministry of Environment. Finally, the dynamic and growing society cannot be expected to live with static land use patterns.

Figure 1.

Lorenz curve for the distribution of land in Protected Forest Sumaco.

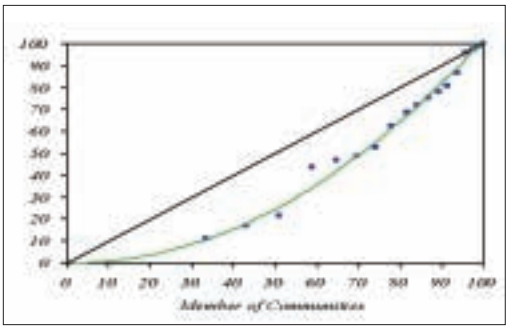

Figure 2.

Demographic structures of the community 10 de Agosto by groups of ages and sex, year 2001

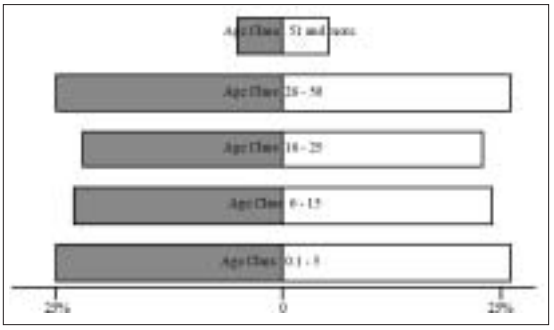

Figure 3.

Correspondence analysis of land use and communities year 1995

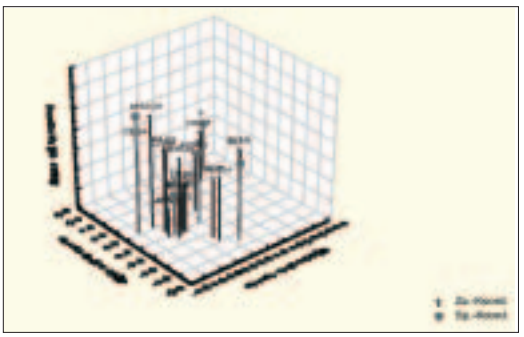

Figure 4.

analysis of land use and communities year 1997

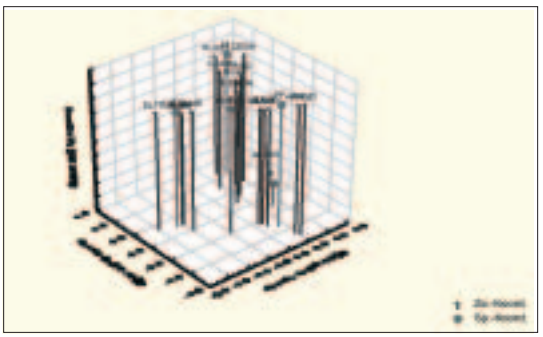

Table 1.

Relationship between total extension of earth and population in the community of 10 de Agosto in the period understood between 1996 and 2004.

Year	Extension in has	Population	ha/Inhabitant
1996	3,690.0	565	6.5
2001	3,690.0	683	5.4
2004	3,690.0	716	5.1

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11
IMPORTANT BIODIVERSITY RESEARCH ISSUES IN PROTECTED AREAS

European Platform for Biodiversity Research Strategy
Represented by Horst Korn, Chairman of the EPBRS Steering Committee,
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Keywords: research, Europe, strategy, policy

Research needed to halt biodiversity loss by 2010

Ecological and social context of the Protected Areas (PAs)

- investigate socio-economic (including ethical, cultural, and religious concerns) and ecological processes and their interactions to improve the design, implementation, monitoring and management of PAs;
- develop appropriate management guidelines for human recreation, education, and economic activities in and adjacent to PAs;
- analyse past experience and investigate new methods, including policy appraisal, for ensuring that human communities located within PAs or buffer zones are involved in the decision-making process about the management of the area and receive an equitable sharing of social or economic benefits from the sustainable use of the PA;
- improve and develop methodologies to analyse the socio-economic effects of PAs for the regions outside the PA and to evaluate the threats for the PA that have their origin outside the designated area;
- increase the effectiveness and reliability of different management methods (i.e. adaptive management and the ecosystem approach) to meet the main objectives of the PAs.

Ecological understanding of PAs

- improve the application of ecological theory, including landscape ecology and biogeographical knowledge in the designation of areas to protect both the survival of endangered species/habitats, and the sustainable use of locally scarce biotic resources in managed systems;
- strengthen the scientific foundations for the specification of protection regimes: understand how to manage, maintain and if necessary restore the favourable condition of PAs;
- develop and investigate methods to monitor, evaluate and assess whether favourable condition of habitats and species are maintained by PAs;
- identify and assess hazards and risks to biodiversity in the PAs;
- refine existing knowledge about the scales at which networks of PAs will guarantee the favourable condition of species and habitats within each major ecosystem, including the scale necessary to maintain natural processes and migratory species;
- understand how to design and manage buffer zones around PAs so that they help to maintain ecological integrity within the PAs;
- investigate methods including habitat creation or restoration for achieving connectivity in various ecosystems under different regimes of human exploitation;
- predict the ecological consequences and understand the implications for conservation objectives of projected climate changes, including their influence on disturbance regimes and on conditions of and connectivity between PAs.

Ensure effective exploitation of research on these priority areas

- improve communication about PAs among scientists, local communities, decision makers, resource managers and other stakeholders including the general public;

- develop training and awareness programmes to expand consciousness and appreciation of PAs, especially with regard to biodiversity and its value and significance.

Main considerations taken into account:

- areas (PAs) support biodiversity by maintaining essential ecosystems and ecological processes;

- PAs are suitable for scientific research to inventory biodiversity and prevailing ecological processes;

- the appropriate size of PAs and the human activities within and near the PAs are crucial factors to conserve habitats and populations;

- the area available for conservation is constrained by competing demands for resource or land use, so that new PAs are typically designated in areas that include human populations or are the location of economic activities, which makes it essential to reach compromise between local human needs and the protection of ecosystems;

- the benefits derived from PAs are not always equitably distributed and local communities found within PAs have often received a disproportionately small share of those benefits.

Basic principles for the design of terrestrial PA networks

- networks of PAs should be representative of a country's eco-regions and bio-geographical and endemic or relict zones;

- buffer zones adjacent to or surrounding PAs in which human activity is regulated may increase the effectiveness of the PA;

- ecological corridors improve the efficiency of PA networks especially with regards to the conservation migrating species.

12
PEOPLE-PROTECTED AREA INTERFACE: SOME LESSONS IN POLICY- MAKING AND PRACTICE FROM PROTECTED AREAS IN CHINA AND INDIA

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Keywords: people-protected area interface, biodiversity conservation, indigenous knowledge, sustainable livelihoods, grassroots institution building, eco-tourism and public - private - government - NGO partnership

The topic of biodiversity conservation in wetlands and sustainable livelihoods of local communities has attracted considerable attention in recent years. This is in view of the fact that in the two largest Asian countries - China and India, where nearly 2 billion people of the world reside, there are large areas of wetlands, which play crucial role on 3 accounts. One, they as biological world constitute habitats not only for rare species of plants, animals and birds and breeding areas for migratory birds; two, they make for basic functioning of eco-systems in terms of water storage, climate control; and three, they provide and extend into man-made habitats of sociological world. For this reason the biological world can no longer be looked upon as an isolated and exclusive world of biodiversity conservation. It has multiple functions to perform. Though biological functions for conservation of biodiversity and that of maintaining eco systems are of supreme importance its major sociological function i.e. providing habitat and livelihood opportunities to the local communities, is assuming considerable significance in recent years (Claridge & Callaghan: 1997; Ghimire & Pimbert: 1997; Mukherjee: 1997; Swanson: 1997).

The present poster- paper addresses issues in bio-diversity conservation based on local community participation in wetland management. Based on case studies from China and India, the poster – paper draws policy implications for local community participation in wetlands and different forms of partnerships including community – Government/NGO partnership/s and public-private partnerships for biodiversity conservation and sustaining local livelihoods activities consistent with the principles of sustainable wetland management. The topic of this poster paper is significant in view of the fact that the present understanding amongst many wetland policy makers, managers and practitioners about the complexities of wetlands as a social problem embedded within the biological world is abysmally low. One case study is based on the Longxi-Hongkou National Nature Reserve (of giant panda), located in the Sichuan Province of China near Chengdu where many Tibetans live. The second case study is based on the Ghana Keoladeo Bird Sanctuary in Rajasthan, India, a haven for 200 species of migratory birds. The paper is based on case studies from China (Mukherjee:2000) and India (WWF: 1997, Mukherjee: 2002). The case studies are based on the methodology of PRA (Participatory Rural Appraisal), which is being used extensively for field research and community participation (Mukherjee: 2002, Zhengmuo: 1996; Hengfang: 1998).

On the level of paradigm shift, local communities have been recognized as major stakeholders in wetland conservation and hence their perspectives have become important to reckon with (Ghimire & Pimbert: 1997; Mukherjee: 1997). Eco-tourism, amongst others, is emerging as one major route to conserving bio-diversity and sustaining livelihoods options for those local communities residing in and around wetlands. In terms of local livelihoods both the National Nature Reserves/Parks of China and India are engaged in different activities in eco-tourism for tourists visiting them.

There are three basic challenges generally faced in these areas: ways of bio-diversity conservation, promotion of community development and management of local livelihoods e.g. eco-tourism as a viable option. One issue is how to develop and manage the 'know-how' for sustainable livelihoods for local people without posing threat to the bio-diversity in the wetlands. The other issue is how to integrate such sustainable livelihoods practices with conservation of bio-diversity and ways of preserving the basic functioning of eco-systems of wetlands and at the same time utilizing such resource base for supporting sustainable livelihoods of local communities.

Drawing lessons from the case studies from China (Mukherjee:2000) and India (Mukherjee: 2002), the paper shows the need to integrate wetlands functions, eco-tourism and sustainable livelihoods for which capacity building at the local and other levels is a critical factor. However, these are necessary conditions though not sufficient for there are policy issues at the national and global level, which also need synchronization with sincere efforts at the local level.

Wetland-based livelihoods activities depend on their carrying capacities and ways in which opportunities are exploited in a sustainable manner. For any collaborative arrangement with local communities in wetlands it is important to identify mutual benefits and costs and negotiate on that basis for a win-win situation. Awareness building on best environmental practices is an integral part of the whole process. Opportunities for partnerships are immense where National Parks and Nature Reserves can collaborate with local communities for sustainable livelihoods –related activities and also create space for nurturing other types of partnerships such as public-private partnerships, partnerships with NGOs etc. on a mutually beneficial basis for supporting bio-diversity conservation activities and sustainable livelihoods.

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13
REPORTING ON DESIGNATED AREAS AT EUROPEAN LEVEL: THE COMMON DATABASE ON DESIGNATED AREAS (CDDA)

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Keywords: designated areas, reporting, harmonization, data flow, coordination

Reporting on designated areas in Europe, a need for co-ordination

It is estimated that Europe as a whole accounts for about 65 000 designated areas. The picture is getting more and more complex as, beyond national initiatives, various protective instruments are been applied at international, European, regional as well as at the specific European Union level.

Three major organisations acting in Europe, the European Environment Agency, UNEP-WCMC and the Council of Europe, had started to compile information on designated areas, each one according to its own agenda. Since 1995 however, the collaborative project on a Common Database on Designated Areas (CDDA), has been jointly launched. It aims at better co-ordinating and streamlining information on designated areas resulting from these various legal frameworks. The initiative is in line with priority action 27 of the IUCN "Parks for Life" report on Action for protected Areas in Europe.

Why, What and How ?

Why streamlining the reporting on designated areas?

While avoiding duplication in requests to countries, streamlining the reporting on Designated areas in a co-ordinated way serves different purposes:

- Designated areas are considered as a "Response indicator"
- As such, data have been regularly published by OECD, EUROSTAT
- Regular publication of the UNList of Protected Areas at the global level
- With the development of regional conventions (Barcelona, Alpine, Helsinki, OSPAR…), need to gather data on designated areas on a supra-national basis
- "Protected Forest Areas" is one of the indicators for Sustainable Forest Management selected within the Ministerial Process for the Protection of Forests in Europe (MCPFE)
- Various requests are addressed by country representatives on comparisons between a national system of designations and others in Europe

[1] The European Environment Agency is a European Union organisation involved in gathering environmental data for all Europe, including data on designated areas
[2] UNEP-WCMC is a UNEP body in charge for gathering biodiversity data world-wide
[3] The Council of Europe is an intergovernmental organisation with 45 states, covering all democratic states of Europe

What is taken into consideration?
There are basically three broad categories of designations to report upon:

- legal country commitment in the framework of international or regional conventions and programmes (Ramsar, World Heritage, UNESCO Biosphere Reserves, Bern, Barcelona, Helsinki conventions;)
- legal country commitment under European Union Directives (Birds and Habitats Directives)
- specific national designations, with considerable variability in designation-types from one country to another (National parks, nature reserves, regional parks etc…)

Very often, the same site is designated totally or partially, under several legal frameworks, often with different boundaries and surface areas. Thus, if site designations are not identified individually in a database, general statistics on designated areas in Europe are wrong, with many overlaps and double-counting. On the other hand the CDDA approach allows analysis on multiple designations.

Information collected on each designated area relates to:

- Site code (CDDA: international) ; Site code (national: link with national data base); Area name; Designation type; Surface area; Site co-ordinates; IUCN category; Year of establishment;

and progressively on:

- habitat types in designated areas; altitude and digitised boundaries.

Collection of information is shared among the three partners of the CDDA

Depending on the type of designations, specific mechanisms are in place to collect the information:

- International and regional designations: through the Secretariats of corresponding conventions and programmes, via UNEP-WCMC, as well as Council of Europe for Pan-European designations
- Community designations: European Environment Agency through the European Commission
- National designations: European Environment Agency for the 35 European countries which participate in the European Information and Observation Network (EIONET) and UNEP-WCMC for other European countries

Main results
The most significant work achieved relates to collection of information on Nationally Designated Areas. A major sub-product of the CDDA is the identification of the various national designation types specific to each European country. Out of 45 000 Nationally designated sites recorded so far, 600 different national designation-types have been recognised and entered into the database.

Data flow on nationally designated areas is streamlined through a well-organised intranet reporting system which involves all 35 European countries member of the European Environment Agency. An update is organised on a yearly basis.

For international, regional and European Union designations, the issue is to collaborate with conventions secretariats for a regular update.

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14
STATUS AND EFFECTIVENESS OF PROTECTED AREAS IN CANTON LORETO - ECUADOR

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Keywords: classification of slope, GIS, monitoring of land use, spatial model, Ecuador

Introduction

According to BUSTAMANTE and VIDAL (1999) most of the protected areas in Ecuador are created with a social burden. These areas have often been declared without the people's knowledge and without considering the costs of the declaration. For these reasons, most of the protected areas are created with a deficit of genuineness and a social debt. On the other hand, several authors (WHITE and MALDONADO, 1991; PERREAULT, 1996; WUNDER, 1996 and WUNDER and SAYER, 2000) mention that this type of planning from above, by the Ministry of Environment, has been severely criticized, because of a lack of objectivity, budget and analysis of the necessities of the people settled in these areas. It requires a legal revision of park – dweller' land tenure (AMEND and AMEND, 1995). Furthermore, a new field of sustainability science is emerging, which seeks to understand the fundamental character of interactions between nature and society. Such an understanding must encompass the interaction of global processes with the ecological and social characteristic of particular places and sectors (WBGU, 1997).

Because of the dynamic population, a monitoring of the current situation in protected areas is still insufficient in the canton Loreto. The aim of the present study was to adapt the classification of the slopes to the conditions of the Ecuadorian Amazon region in the canton Loreto. Using this toll, the different management areas such as the National Park Sumaco Napo-Galeras and the Protected Forest Sumaco were analysed. In addition, the changes of the land use in the Protective Forest Sumaco and the current situation of the Patrimony of Forest State were determined.

Materials and Methods
The topographic maps of the Geographic Military Institute were digitalized through the program ARC/INFO. By using the program ARC/VIEW the digital landscape model and the classification of the slopes were obtained. A map of the Instituto Nacional de Desarrollo Agropecuario INDA at the scale 1:100,000 was digitalized through the program ARC/INFO for the analysis of the tenancy of the different areas in the Canton Loreto. The satellite image LANDSAT of CLIRSEN dated October 1995 and September 1997 was used to determinate the dynamic of the land use in the Protected Forest Sumaco. A supervised classification of land use was carried out using our knowledge of land use and of the Participative Rapid Appraisal (PRA) method. PRA was used with a 45% intensity of samples of total communities living in the Protected Forest Sumaco and the Patrimony Forest of State.

Results and Discussion
The protected areas, which belong to the Ministry of Environment in the canton Loreto, are presented in Fig 1. The National Park consists of 16.1% of the Protective Forest Sumaco –and of 16.4% of the Forest Patrimony of the States -1.5% of the total territory.

National Park

The area of the National Park Sumaco Napo - Galleras in the canton Loreto covers 35.273,7 hectares. According to GUTIERREZ (1999) and CAÑADAS (2000) some areas of the forest have been invaded by "Colonos" (small farmer immigrants) as well by Indian people in the sectors of Copales del Suno, San José de Payamino and the reserve Juan Montalvo. The law prohibits any activity within the national park. It is necessary to point out that the National Park Galeras is under military control, through the existence of aerial monitoring antennas. But according to the classification of the slopes in the National Park Sumaco, Class IV and VI comprise 51.4% of the area. This territory has strong limitations as far the agricultural use is concerned, which confirms the possibility that it can be protected by itself. Class I, II and III consist of 48.6% of the National Park (Table 1). These areas are extremely appropriate for agricultural use. Without any doubt, this part of the National Park is and can be the potential access of the land for the inhabitants of the communities who lack reservation lands.

Protective Forest

The division of the capacity of land use within the Protective Forest is presented in Table 2. Classes I – IV correspond to 93.3 % of the Protective Forest and only 6,7% is left for the territories of Class V and Class VI. According to the law the areas of Class V and VI are areas of permanent protection and therefore they cannot be used. This data clearly shows that only 6,7% of the Protective Forest meet the requirements, described by law and needs, to be declared as a type of protected area. On the other hand, in article 15 of the Protected Forest law states that: "the only activities allowed inside the forests and vegetation protectors, previous authorization of the forest national program, will be the following ones: a.-the opening of fringes short fire; b.- Fitosanitary control; c.-Fomentation of the flora and wild fauna; d.-Execution of high-priority considered public works; and e.-Spacing out, low control and supervision of the forest national program; and, f.- Science, touristy and recreation"(M.A., 1999).

The changes of land use in the Protective Forest Sumaco observed in 1995 and 1997 are presented in Table 2. The transformation of forest cover to agriculture use is evident. (agriculture with a rate of 8.2% p.a. and cattle ranch with a rate of 4.4% p.a.. The rate of deforestation has been 6.2% p.a., with total contradiction to the law of the Protected Forest. Nevertheless, it is necessary to point out that the observed increase of secondary forest areas was small, at about 0.1% p.a.. It demonstrates the expansive character of land use in the Protected Forest Sumaco. The sale of agricultural works (Venta de trabajos), especially, for new immigrants is very popular in the colonos communities.

Forest patrimony of the State

The forest patrimony, a native timber, is an important area of the country controlled by state, but both its contribution to the economy and the production is non-existent. There is only the demand of expenses to the national treasury. At present the areas of the Forest Patrimony of the State in the canton Loreto are possessed by the indigenous groups.

Conclusions

In the canton Loreto 33,8% of the total land area belongs to the state. 16,1% has been declared as a National Park, 16,4% as a Protected Forest and 1,5% of the total land is declared as a Forest Patrimony of the State. Almost 40% of the National Park appear to be suitable for agriculture, and the surrounding communities could consider the Park as a potential area for colonization. Only about 6% of the Sumaco Protected Forest fulfill what is stipulated in the Forest Law and deforestation rate of 6% p.a. , which totally contradicts the Forest Law. The Forest Patrimony of State has been invaded by indigenous communities. The establishment of a monitoring system could give the possibility of reviewing the inappropriate politics at a national level, which often causes the most serious threats to biodiversity.

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Table 1.

Classification of slopes, area and percentages of the National Park Sumaco Napo – Galeras

Land use	Slopes	SUMACO		GALERAS		TOTAL NATION	
		AREA	%	AREA	%	AREA	%
Class I	0 – 5 %	9,631.0	38.8	3,081.9	31.5	1,2713.0	36.8
Class II	5.1 – 12 %	495.5	2.0	113.9	1.2	609.4	1.8
Class III	12.1 – 20%	1,910.8	7.7	510.2	5.2	2,421.0	7.0
Class IV	20.1 – 50%	7,247.9	29.2	2,313.0	23.6	9,560.9	27.6
Class V	50.1 – 70%	2,940.9	11.8	1,516.3	15.5	4,457.2	12.9
Class VI	> 70%	2,581.8	10.4	2,250.4	23.0	4,832.4	14.0

Table 2.

Classification of slopes area and percentages inside the Protective forest Sumaco inside the canton Loreto

Land use class	Slopes	AREA in ha	PERCENTAGE %
Class I	0 – 5 %	21,051.3	59.7
Class II	5.1 – 12 %	4,033.2	11.4
Class III	12.1 – 20%	2,128.3	6.0
Class IV	20.1 – 50%	5,663.9	16.1
Class V	50.1 – 70%	1,603.0	4.5
Class VI	> 70%	794.0	2.2

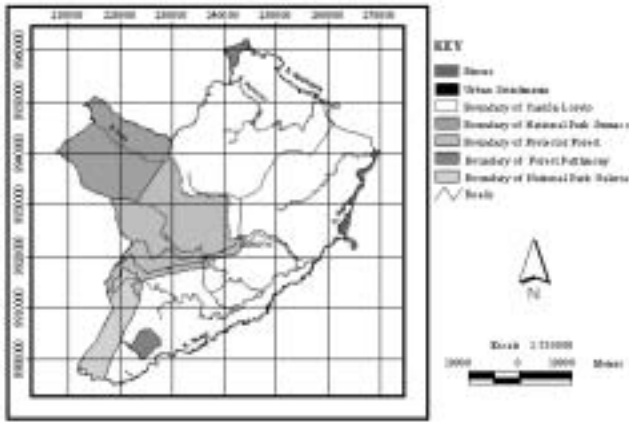
Table 3.

Dynamics of the land use area and percentages inside the Protective Forest Sumaco inside of Canton Loreto

USE OF SOIL	YEAR 1995		YEAR 1997		DIFERENCE	PERCENTAGE
	AREA	%	AREA	%	Ha	%
Intervened forest	8,879.4	25.2	8,852.6	25.1	26.7	+ 0.1
Not Intervened forest	18,749.6	53.2	14,331.6	40.6	-4,417.9	- 12.5
Production Grass	2,057.9	5.8	3,609.3	10.2	1,551.4	+ 4.4
Agriculture Production	5,586.8	15.8	8,479.8	24.4	2.893.0	+ 8.2

Fig. 1.

Geographical position of National Park Sumaco Napo – Galeras, Protected Forest Sumaco and Forest Patrimony into canton Loreto.



15
SUPPORTING NATIONAL PROTECTED AREA SYSTEMS INTERNATIONALLY - THE GLOBAL ENVIRONMENT FACILITY AS A MECHANISM OF TRANSFER

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Keywords: Global Environment Facility, international coordination, protected areas, transfer

Global benefits from national protected area systems

Valuable biological diversity can sometimes be preserved only if sensitive natural areas as their carriers are withheld from land development. Such a protection of natural areas is in the interest of the individual state and has led to the establishment of national protected area systems in most states. However, national policies in this regard also create significant benefits at the global level, in particular when ecosystems in economically less developed states which typically host great parts of global biological diversity within their territories are protected. In attempting to bring forward economic development, these states often have limited interest in the protection and do not want to relinquish the use of natural areas. In this respect, there is a need for a suitable incentive mechanism which revokes cases of land development leading to a loss of biological diversity that is undesirable from a global perspective and organizes protection on behalf of the community of states by reconciling national and international interests with respect to the protection of biological diversity.

For this purpose, the traditional protected area approach with its conventional definition has to be endorsed by mechanisms which provide transfers as a compensation for the forgone land development. Examples for such mechanisms that are currently in practice are Debt for Nature-Swaps but also mechanisms of transfer which are associated with international environmental agreements like the Ramsar Small Grant Fund, the World Heritage Fund or the Global Environment Facility (GEF). The latter is of particular interest since it serves as the mechanism of the CBD. Considering recent claims for a spatial expansion of protected area systems worldwide, mechanisms of transfer are of growing importance. To evaluate the practices and to identify or formulate potential improvements, there is a need for a precise understanding of the functioning of the current mechanisms of transfer, in particular of the GEF.

An empirical analysis of the Global Environment Facility (GEF) as a mechanisms of transfer

The funds the GEF is able to spend as transfers is provided by several industrialized and developing countries whereas the major industrialized states (G-7) provide more than three quarter of the total funds. Since the GEF represents a sinking fund, its resources have to be replenished from time to time. In 2002, the donors have agreed on a third replenishment of the GEF of US$ 2.9 billion for the period until 2006. In the preceded periods, about 40% of the GEF's total funds have been spent on the focal area of 'biodiversity'. Funds are provided conditionally on proposed protection actions which are summarized in projects. Since 1991, the GEF has supported more than 500 biodiversity projects.

For the empirical analysis, data on 541 projects approved during 1991 to 2002 has been taken from the GEF's online "Project Database" as well as from Project Documents published by the GEF and the Implementing Agencies, i.e. World Bank, UNDP and UNEP. The total project cost summed over all these projects amounts to US$ 4.4 billion. Thereof, US$ 1.5 billion has been recovered by the GEF.

Concerning the natural areas which are covered by the projects, it has been shown that only about one half of the projects addresses the protection of natural areas in a narrow sense. In the remaining projects, the focus is

on the support of sustainable management in already modified ecosystems or on the establishment of institutional capacities which may favor protected area policies only indirectly. Furthermore, projects on protected areas have in effect attracted the larger part of funds in the GEF biodiversity portfolio. They have primarily been implemented in economically less developed states in sub-tropic and tropic regions but also in Eastern European and Continental Asian countries with economies in transition. Considering the proposed activities, a spatial expansion of protected areas has only been a project goal in some cases. In the majority of the projects, the focus has been on the establishment of an effective management system in (at least legally) already established protected areas. Expenditures for managing the protected areas address one-time investment like training or infrastructure development and recurrent tasks like guarding the areas. In this context, it has been found that on average substantially larger project funds are spent on investments than on the recovery of the recurrent management costs.

According to the incremental cost principle, the provision of funds by the GEF aims at funding those parts of the project activities which are essential for generating ecosystem services of global importance. In this regard, the contribution by the GEF adds to efforts of the recipient state in preserving its own natural endowments of biological diversity. Considering the funding sources in the projects with protected area measures, it is shown that, in addition to contributions by domestic governmental institutions and the payments by the GEF, co-financing by bilateral and multilateral donors plays an important role. Depending on the socio-economic and ecological environments, the percentage shares of the different funding sources vary significantly between the projects. The average share for each funding source are indicated in Figure 1. "The funding of GEF projects with protected area components."

Concluding remarks

The results of the empirical analysis indicate that the current funding by the GEF mechanism is rather directed to the management of existing protected areas than to the expansion of protected area systems. In this regard, the provided GEF grants in most cases do not serve as compensations for private or public landowners for forgone payoffs from land development but for remunerating capital and labor inputs which would not have been employed in the protection of natural areas if a contract between the GEF and the host state had not been concluded.

It can be observed that investments as components of the GEF projects often aim at establishing facilities (in particular with regard to ecotourism) that generate income from protected areas which can be used to recover management costs. Since projects usually run only for 3-7 years, a further question is whether this income generally suffices to ensure a sustainable funding of the recurrent management tasks and accordingly enable an effective long-term management. If this was not the case, there would be an ongoing demand for resources in existing protected areas. This again would imply that future GEF payments as well cannot be allocated to a spatial expansion of protected area systems but will have to be bound to the existing areas if the management quality and accordingly the level of protection in these areas should not diminish.

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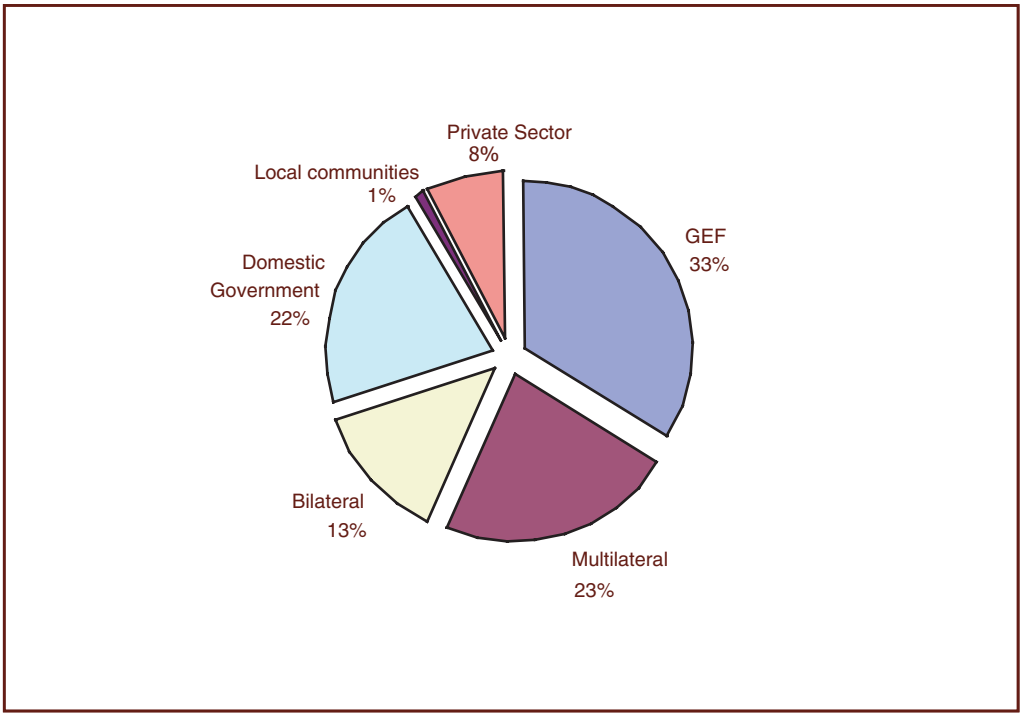
Figure 1.

The funding of GEF projects with protected area components



16
TRANSBOUNDARY COOPERATION IN THE EVEREST MOUNTAIN ECOSYSTEM

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Keywords: transboundary, cooperation, conservation, sustainability, mountain

Mount Everest Ecosystem

The Everest Mountain ecosystem, occurring in the Himalayan range, is one of the Earth's most sensitive mountain landscapes. It lies in the border region between Nepal and the Tibet Autonomous Region (TAR) of China; and the highest mountain, Mount Everest – Sagarmatha in Nepal and Qomolangma in TAR – forms the natural barrier. But ecosystems existed long before national jurisdictions, and species and communities of plants and animals are not limited by political boundaries and landscapes. As a result of the remote, mountainous landscape and high altitude environment, the people living in this region are some of the most isolated and poorest in the world. These two areas have more in common naturally and culturally than either area does with its adjacent lowland areas. Thus, there arises the need of transboundary cooperation to conserve the biodiversity as well as to find ways for sustainable development i.e., reconciling the needs of these local communities with conservation of ecosystem and biodiversity. Further, transboundary cooperation helps countries meet their obligations under international agreements such as the Convention on Migratory Species and the Convention on Biological Diversity (Shengji and Sharma, 1998).

The activities towards transboundary cooperation started in 1994/1995 by The Mountain Institute (TMI), International Center for Integrated Mountain Development (ICIMOD), and the Governments of Nepal and China, under TMI's 'Transboundary Biodiversity Conservation in the Eastern Himalayas Programme' and ICIMOD's 'Programme on Regional Collaboration for Biodiversity Management in the Eastern Himalayas', which were both funded by the MacArthur Foundation.

Protected areas

Both governments have independently established protected areas around Mount Everest and nearby – The Qomolangma Nature Preserve (QNP) in Tibet; and Sagarmatha National Park (SNP), Makalu Barun National Park (MBNP) and Langtang National Park (LNP) in Nepal. Together these form a contiguous system of protected areas that conserve a large, continuous ecosystem and rich cultural and natural heritages on both sides of the Himalayas. It is among one of the 169 complexes of two or more adjoining protected areas that are divided by international boundaries (Sandwith et. al., 2001).

Transboundary Issues

The transboundary issues were identified during the official meeting of representatives of the Protected areas; endorsed by the government representatives; and these were also at the center of the discussion in the joint participatory study carried out in the five border villages. The four main transboundary issues that are most in need of cooperation are: 1. Illegal Poaching and Trade in Endangered Species; 2. Cross-border Spread of Forest Fires; 3. Cross-border Spread of Livestock Disease; and 4. Improving Local Livelihoods.

The Path Forward

Achievements

Promoting transboundary eco-tourism opportunities
TMI's Langtang Ecotourism Project and LNP collaborated for three years to plan and promote community-based ecotourism in the Langtang area. In a participatory workshop, officials and community members from Kyirong on the Tibet side, began collecting information and planning for cross-border ecotourism, if the border were to open. The opening of cross border trekking routes is supported by the QNP Tourism Master Plan Study and suggests four sites including Kyirong-Langtang area.

Coordination between different programmes
With the coordination between TMI's Qomolangma Conservation Programme and Peak Enterprise Programme, and ICIMOD's Natural Resource Management Programme, all these three programmes give conservation education along with options for improving local livelihoods.

Challenges

The challenges that hinder transboundary collaboration are Travel across border, Communication, Follow-through and broad-level participation in exchanges.

Recommendations

The main recommendation was to consolidate and expand transboundary activities, specifically by consolidating and regularizing the interaction and communication of protected area professionals and managers and following up on the recommendations for activities at the community level. Also recommended were promoting joint World Heritage site designation for QNP, expanding transboundary cooperation beyond QNP and expanding transboundary activities to contiguous valley that are not included in the protected areas. Immediate activities that were suggested include - offering incentives for information on poaching activities, training in the identification of species that are traded illegally, providing veterinary services for livestock and conducting a workshop on forest fire management.

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Technology Transfer

17
BIODIVERSITY AND RANGELAND IN CANADA – THE EVOLUTION OF BENEFICIAL MANAGEMENT PRACTICES (BMPS)

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Keywords: best management practices, BMPs, rangeland biodiversity, agriculture, Canada

Background

The Canadian Biodiversity Strategy (1995) recognizes that Canada's 346 000 farmers and ranchers are addressing the issues of soil erosion, water contamination, wildlife habitat destruction, energy efficiency, pollution and waste management. The Strategy encourages producers "through research, training and technology transfer, to facilitate the further adoption of environmentally sustainable farm practices…". The Strategy also encourages "the sharing of experiences and expertise among farmers to promote BMPs that favour the conservation of biodiversity and the sustainable use of biological resources."

Recent History of Agricultural Environmental Programs in Canada

The late 1970s and early 1980s ushered in a new environmental awareness in agriculture with a focus on soil conservation. In 1989, Canada initiated the National Soil Conservation Program and the Permanent Cover Program. From 1990-1997, Canada's Green Plan expanded environmental sustainability in the agriculture sector and sponsored projects on grazing systems and grazing BMPs. In addition, core research on rangeland sustainability expanded. In June 2002, Canada announced the Agricultural Policy Framework (APF) designed to make the agriculture sector a world leader in food safety and quality, environmentally responsible production, and innovation.

Rangeland Biodiversity in Canada

There are significant pressures on biodiversity in Canada's remaining 20 million hectares of tame and native rangeland. These include: depressed net incomes, land use conversion, fire suppression, invasion by woody and alien species, long term idling, grazing management designed for domestic livestock, residential and industrial developments, linear developments such as roads and pipelines and climate change. The overall impacts are reduction and fragmentation, and impaired natural ecosystem functions. Conserving biodiversity comes at a cost, and most producers using rangelands cannot capture economic returns for many biodiversity-friendly actions. Experience shows that the key to conserving biodiversity, is to work with producers to develop cooperative, incentive-based solutions, where the BMP can save time or money and contribute to healthy rangeland.

Five Beneficial (Best/Better/Good) Management Practices on Rangeland

Planned Grazing Management
Canadian livestock producers use various approaches to manage grazing and developing a management plan is the first step. The plan should incorporate accepted range management practices such as timing, duration,

intensity of grazing, and rest/recovery of the range. The plan controls livestock impact and therefore influences biodiversity, economic benefits, and range health and function. One, or a combination of several grazing systems, are often applied, including complementary, twice over, deferred, rest-rotation, or other regimes.

Riparian Management

Agriculture and human settlement have also had a large impact on Canada's waterways. Effective management of riparian systems benefits biodiversity conservation, erosion control, water quality, ecosystem health, and forage production. BMPs improve riparian health and include: installing remote watering systems to help manage livestock; enhancing natural riparian buffers by planting native, non-invasive grasses, shrubs or trees; noxious weed control; and fencing to manage livestock access. Streambank and water quality degradation, sedimentation, nutrients and pathogens, and herd health problems can be minimized through relocation of livestock away from sensitive areas. Producers using riparian conservation practices are reporting improved carrying capacity and herd health, higher calf weight gains, and better cattle condition.

Exotic Invasive Plant Management

Invasive plant species threaten rangeland health and biodiversity, while diminishing economic potential. For example, leafy spurge on the Canadian Prairies and purple loosestrife around wetlands can completely displace native vegetation, reducing biodiversity values and forage production. Damage can be minimized through one or a combination of the following BMPs:

- Cultural Methods -grazing rotations, grazing intensity and timing, planting competitive forages
- Mechanical Methods- mowing, hand-picking, burning
- Biological Methods - enhancing or introducing natural herbivores, parasites, pathogens
- Integrated Approaches -combining above BMPs

Establishing or Restoring Native Rangeland

Depending on a producer's particular management goals, this BMP can improve ecological integrity through seeding or transplanting native species. These plantings will reduce habitat fragmentation, and provide greater habitat patch size — by joining native habitats, and widening both riparian areas and associated adjacent upland vegetation).

Conversion of Marginal Cropland to Rangeland

Biodiversity and range sustainability remain at risk because a significant amount of environmentally sensitive lands in Canada (about 4.5 million ha) remains under annual cultivation. From 1989 to 1992, Canada's Permanent Cover Programs (PCP I and II) encouraged landowners to grow perennial vegetation on more than 400 000 ha where annual cultivation was causing soil degradation. These PCP lands continue to be used for agricultural production through grazing and haying but are also enhancing biodiversity. Studies show that PCP lands provide a richer and more diverse community of grassland birds than cropland. Canada's APF will encourage more conversion to pasture and hayland through cash incentives to do so, plus provide technical assistance, greater riparian management, and more shelterbelt plantings. In addition, reseeded marginal lands provide a conservation buffer around native prairie, protecting against future cultivation.

Outlook for Biodiversity Conservation on Canada's Rangeland

Even though only 23% (15 391 000 ha) of Canada's agricultural land remains in Natural Pasture (Statistics Canada, 2003), the outlook for biodiversity conservation on these rangelands appears to be improving. Recent initiatives such as: the Habitat Stewardship Program for species at risk; the Canadian Ecological Gifts Program; the Agricultural Policy Framework; Provincial Protected Area Strategies; - and increasing stewardship initiatives by thousands of Canadian landowners and land managers – will help conserve and enhance Canada's natural biodiversity.

18
BIOPROSPECCIÓN, TRANSFERENCIA DE TECNOLOGÍA Y CONSERVACIÓN DE LA BIODIVERSIDAD: LA EXPERIENCIA DE INBIO-COSTA RICA

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Palabras clave: bioprospección, uso sostenible, compensación, transferencia de tecnología

INBio: su misión y actividades

El Instituto Nacional de Biodiversidad (INBio), es una organización no gubernamental de interés público cuya misión es "promover una mayor conciencia sobre el valor de la biodiversidad, como un medio para lograr su conservación y mejorar la calidad de vida del ser humano". Las actividades del INBio se realizan de acuerdo a un proceso medular que involucra la captura y generación de información sobre biodiversidad, su procesamiento y sistematización y su transferencia a la sociedad. A través de estas actividades la institución busca apoyar la estrategia nacional de conservación de la biodiversidad costarricense que se fundamenta en tres principios: salvar, conocer y usar (Fig. 1).

INBio está organizado en unidades estratégicas de acción que desarrollan actividades en cinco grandes áreas temáticas:

- El inventario nacional de biodiversidad que es responsable de la generación de información sobre las especies, su taxonomía y distribución geográfica en las áreas protegidas del país, así como algunos elementos de su historia natural.
- Bioinformática que busca ordenar la información proveniente del inventario y de otras fuentes, utilizando tecnología informática, para ponerla en diferentes formatos según sean los distintos usuarios, tanto a lo interno como a lo externo de la institución.
- Gestión social que fomenta la bioalfabetización, divulgando y utilizando la información sobre biodiversidad del país para fines intelectuales y espirituales, poniéndola en diferentes formatos para distintas audiencias, principalmente niños y estudiantes universitarios, utilizando para ello materiales desarrollados para estos fines y distintas metodologías educativas y recreativas.
- Gestión de la conservación que promueve el desarrollo de procesos de planificación tanto en el ámbito nacional como institucional en materia de conservación y manejo de biodiversidad y coordina procesos conjuntos entre el INBio y el Sistema Nacional de Áreas de Conservación del Ministerio del Ambiente y Energía (MINAE).
- Bioprospección que promueve el desarrollo de usos sostenibles, novedosos y rentables de recursos de la biodiversidad, mediante investigaciones científicas desarrolladas en colaboración con otras entidades académicas estatales y del sector privado, nacionales y extranjeras.

La interrelación de las actividades y productos generados por cada una de las unidades del INBio es lo que ha permitido el éxito alcanzado y sobretodo el proveer valiosos aportes y beneficios a la sociedad costarricense.

Prospección de la biodiversidad

En el campo de la bioprospección el Instituto ha sido considerado pionero y líder, sobretodo en los aspectos técnicos, legales y contractuales que llevan al establecimiento de una alianza Norte-Sur de beneficio mutuo y que involucra acceso, uso y distribución de beneficios. Este proceso se inició en INBio en 1990 cuando no existía un marco de política y de legislación nacional o internacional que le diera sustento. Lo que medió en la primera e histórica negociación con la empresa Merck & Co, fue la lógica y el apego a la justicia y la equidad. Desde ese momento INBio opta por compartir en partes iguales los beneficios económicos que pudieran sur-

gir con el Estado y por asegurar que los beneficios futuros por el uso de los recursos de la biodiversidad se destinen en su totalidad al conocimiento y a la conservación de la biodiversidad (Gámez, 1999).

En las negociaciones con la industria INBio actúa como socio en los proyectos de investigación conjunta y no como proveedor o suplidor de materia prima. Es decir, procura agregar valor a los elementos biológicos que utiliza, el cual debe ser reconocido por el socio al momento de establecer el esquema de distribución de beneficios.

Para el acceso a los elementos genéticos y bioquímicos de la biodiversidad costarricense y para garantizar una justa y equitativa distribución de beneficios, INBio desarrolla sus actividades de investigación con la industria sólo en áreas protegidas del Estado, cumpliendo para esto con los requisitos exigidos por la legislación vigente en esta materia. La sostenibilidad del recurso se garantiza negociando con la industria un acceso limitado en tiempo y en cantidad de muestras a evaluar.

La compensación por el acceso a la biodiversidad costarricense comprende tanto beneficios monetarios como no monetarios. Los contratos establecen que las empresas interesadas deben cubrir los costos de investigación y compensar monetariamente al Estado y al INBio, pagando un 10 % del presupuesto de investigación que se establezca, para ser trasladado directamente al fondo de parques nacionales; así como un porcentaje de regalías y de "pagos por avance" ("milestone payments") que se repartirían en partes iguales entre INBio y el MINAE, en caso de que un producto avance en la línea de investigación o de que llegue al mercado. Esto con el objetivo de continuar la investigación en este campo y de seguir apoyando la gestión del Estado en la conservación de la biodiversidad costarricense. Al año 2002 cerca de $ 600 000 se han trasladado al MINAE producto del 10 % de los presupuestos de investigación establecidos.

Transferencia de tecnología para la conservación y el desarrollo

El equipamiento, la transferencia de tecnología y el entrenamiento del recurso humano han sido los beneficios no monetarios más importantes que ha recibido el INBio, producto de su relación con la industria. Actualmente se cuenta con laboratorios de investigación debidamente equipados para ejecutar proyectos de prospección química y biotecnológica, incluso para realizar un "highthrouthput screening" para la búsqueda de compuestos químicos a partir de fracciones obtenidas de diversas muestras de la biodiversidad. Además la industria ha capacitado a los investigadores y ha transferido al Instituto tecnologías propietarias, amparadas a cláusulas de confidencialidad, que pueden ser utilizadas por el INBio para el desarrollo de sus propios proyectos.

Actualmente la tecnología transferida y el know how están siendo aprovechados para el desarrollo de proyectos de investigación con la pequeña industria nacional, cuyo objetivo es obtener productos innovadores o con mayor valor agregado a partir de la biodiversidad costarricense. El esquema contractual de acceso y uso es el mismo que se sigue con las compañías extranjeras, de modo que se garantice la sostenibilidad por el uso económico del recurso y que haya una justa compensación monetaria para las áreas protegidas que proveyeron el recurso. De esta forma se está apoyando el desarrollo nacional, se están abriendo oportunidades a la industria costarricense y se está contribuyendo a la conservación de la biodiversidad.

Las tecnologías transferidas están permitiendo también generar un mayor conocimiento científico sobre los usos potenciales de los recursos genéticos y bioquímicos del país, información esencial para continuar interesando a la industria en el mercado de productos naturales y para brindar a la sociedad nacional e internacional los elementos necesarios para que sigan conservando su biodiversidad, no sólo por su valor de existencia sino por la fuente de riqueza y bienestar que representa.

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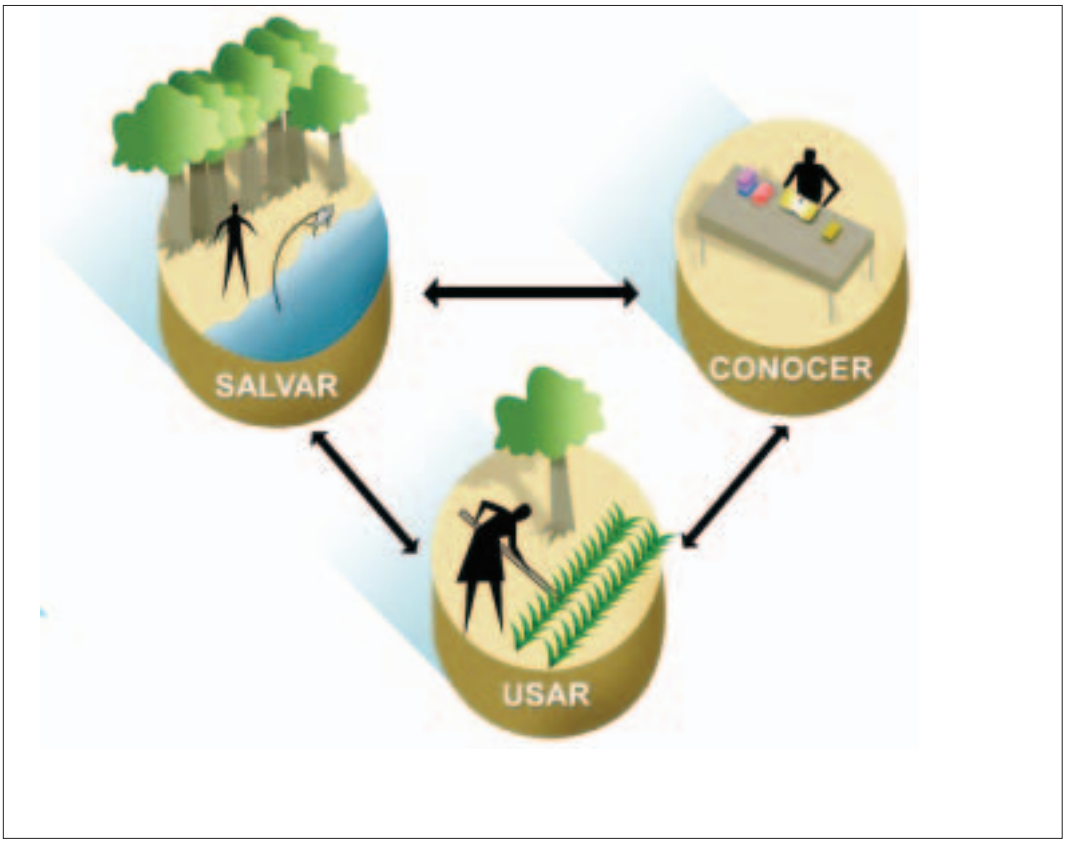
Fig. 1

Principios de la estrategia nacional de conservación de la biodiversidad costarricense en los cuales se basa la misión del INBio



19
BIOSYSTEMATICS IN FORESTRY: INVASIVE PESTS AND NATIVE BIODIVERSITY

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Keywords: alien species, biodiversity, biosystematics, quarantine

INTRODUCTION

The introduction of alien species is inevitable, because of today's worldwide trade and travel. Some aliens become invasive, with devastating impacts on our forests, native species, and economy in general (Scudder 2002). But how do you know whether a species is foreign? A comprehensive knowledge of the native fauna and flora of a country is a prerequisite to answering this question. A quarantine program may prevent entry of undesirable exotic organisms, but its effectiveness depends on rapid, accurate, and reliable identification of introductions. Taxonomists, supported by comprehensive biological collections and associated literature, are essential to providing reliable species identifications.

BIOSYSTEMATICS

Biosystematics is the science of identifying, describing, naming, classifying, and cataloguing species. Taxonomic research provides basic support for various biological disciplines by providing the correct scientific name of a species (Huber *et al.* 2002). Identifications provided by qualified taxonomists are used in forestry, agriculture, and human and animal health to retrieve the relevant biological literature on a species. The biology of undescribed species may be correctly inferred by comparison with known species, provided that the biological classifications are well founded. If the classifications are poorly founded, i.e., species are not grouped together correctly into higher categories such as genera, then incorrect inferences will be made about the biology of new species that are misclassified with species whose biology is known.

BIOLOGICAL COLLECTIONS

Biological Collections such as the Canadian National Collection of Insects and Arachnids in Ottawa, and collections held by the Canadian Forest Service, Universities, and Provincial Museums are essential for biosystematics research. The specimens and associated data are the physical evidence (voucher specimens) for a species occurrence at any given time and place and are used to validate taxonomic, faunistic and ecological research, including the earliest collection records of alien species (Wheeler 2003).

CONCLUSIONS

Sufficient numbers of biosystematists (taxonomists) are needed if a county wishes to understand its fauna and flora sufficiently to use wisely and slow down or prevent alien introductions, and communicate accurately the results of biological research by using the correct scientific name for the organisms studied. Loss of taxonomic expertise compromizes a country's ability to make accurate species identifications, and reduces the effectiveness of quarantine programs. Canada needs to improve its biosystematics capacity to help meet the challenge of reducing or preventing alien species introductions.

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20
CANADIAN COLLECTION OF FUNGAL CULTURES (CCFC/DAOM) MICROBIAL GENETIC RESOURCES

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Keywords: biodiversity, microbial genetic resources, lyophilization, cryopreservation

Introduction

The Canadian Collection of Fungal Cultures (CCFC/DAOM) maintains @12,000 plant pathogenic and wood rotting fungal cultures representing @3,000 species from the major fungal groups. This diversity is the foundation for research and development activities such as: plant disease resistance, identification of plant pathogens, identificaiton of invasive species, allergenic organisims, screening and bioprospecting studies, surveys, development of identification keys, and molecular species characterization.

The collection serves as a primary Canadian repository for research strains and functions as a gene bank for this microbial genetic resource. Authenticated isolates are available for distribution to researchers throughout the world working in agriculture, forestry, medicine, private industry and biotechnology. The CCFC is supported by the taxonomic expertise of one of the largest groups of systematic mycologists in North America, with internationally recognized expertise in most major taxonomic groups. Research is concentrated on solving agricultural problems.

Preservation

Living cultures are preserved for the long term by at least two methods of preservation following international standards and protocols. Cryopreservation provides the most reliable method of preservation for most fungal strains although certain organisms such as the mycorrhizal fungi are fastidious and do not survive this method well. The CCFC grows plate cultures, cuts plugs and uses a 10 % glycerol solution as the cryoprotectant. Vials are then stored in the vapour phase (-160°) of liquid nitrogen (-196°) and recovered as required. Sporulating strains are also preserved using lyophilization (freeze-drying) techniques using a 20 % skim milk solution as the protectant. Ampoules are easy to store and safe to distribute to clients. The collection maintains extensive living slants and oil tube collections as alternate methods and backup. All methods are aimed at longevity and the stabilization of genetic properties.

Client Services

The collection provides advice and consulting services for all clients, information on preservation protocols and deposition facilities. The collection takes a leadership role for Microbial Genetic Resources in Canada and internationally. The CCFC/DAOM is involved jointly with the Centraalbureau voor Schimmelcultures, Utrecht, Netherlands in a yearly fungal identification course (http://res2.agr.gc.ca/ecorc/fungi/04_e.htm) available to anyone. The collection database of strains is available for viewing on the internet at the following site:(http://sis.agr.gc.ca/brd/ccc/). In conjunction with the culture collection, the Mycology group (6 researchers) provides an identification service. Fees are charged based on the request.

21
NEW APPROACHES TO TECHNOLOGY TRANSFER AT THE AAFC PLANT COLLECTION

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Keywords: plant collection databases, GIS, internet mapping

Introduction

The AAFC (Agriculture and Agri-Food Canada) plant collection (i.e. the vascular plant herbarium) includes one million dried plant specimens each with collection information including location, date, habitat and sometimes much additional information. Most specimens are from Canada (62%) and Eurasia (20%).

The collection is part of an international network that serves in three general areas: (1) Classification - It is an essential resource for research on naming and determining the relationships between plants because it contains many thousands of exemplary specimens including over 4000 type specimens used to define names precisely. (2) Identification - Expert identifications of vascular plants require reference to material in the collection to help assess variation, understand identification characteristics and provide correctly identified examples. Accurate identifications are needed for biocontrol research, pest management, international trade with regard to commodity contaminants, protecting Canada's borders against possible importation of noxious weeds, enforcement of federal regulations, and for health and safety. (3) Information - Applying import and export regulations, developing crops, protecting biodiversity, and many other activities require information on occurrence and characteristics of plants. The major client is Agriculture and Agri-Food Canada representing 35 %. Other clients include researchers studying plant classification in universities and museums worldwide representing 25 %, other Canadian Federal Agencies representing 20% and provincial and territorial agriculture and natural resource departments representing 20%.

Each year the herbarium processes approximately 600 information requests, and 2000-3000 identifications. There are about 1000 users annually. Information has been provided through the xeroxing or transcribing of specimen label data, which is time-consuming and often has to be done without any data improvement.

New approaches to technology transfer

Increased requirements for information from the collection to support biodiversity protection have stimulated the development of some new and more efficient approaches to technology transfer. These new approaches include: (1) development of databases, (2) use of GIS (Geographic Information System) technology and (3) improved access to label data using the internet. Each has had the effect of providing new information not readily available in the collection itself, adding value to the collection and providing this information in an efficient manner. The effect is to increase the use of biological data in research and policy development.

Collection databases

The current database projects of the collection include (1) the Mustard Family (including Canola and related crops) in Canada in connection with crop development, germplasm protection and classification, (2) the catalogue of over 4000 type specimens which are an essential reference for the correct application of plant names and the definition and identification of plant species, (3) invasive alien species in connection with control, monitoring and predicting spread, (4) native Canadian crop relatives in connection with germplasm protection in situ and ex situ, and (5) graminoid plants of the Northwest Territories and Yukon in connection with

status ranks for native flora required by the territorial governments.

The cost of data input is substantial with a single person able to input data on 4,000 specimens in a year including data upgrading and need for verification and updating of specimen identifications by scientists. Despite the costs, it is estimated that the most efficient way for collections to continue to adequately serve national and international needs will be through the extensive development of databases. Immediate access through the internet supports very rapid decision-making. The type database is accessed through the internet a few hundred times a month without any time required of herbarium staff. Before this database was completed, providing information on type material required 2-3 full work days each month. Even databases not available on the internet vastly improve the speed of providing information which is already available in a downloadable form, or as a transportable database, or as a database query. The advantages of databases extend beyond such vast improvements in technology transfer to a partial backup for a lost specimen. Analysis of databases provides a way of obtaining new information and making discoveries very quickly. In particular the rapid querying of geospatial data and organization into comparable categories enables new information to be gleaned in seconds that previously required hours.Through addition of database fields, such as flowering condition, to the label information, the specimen data and the collection itself are vastly enhanced in value as an information resource.

GIS technology

Geospatial capabilities that have developed over the past several years now allow rapid interfacing of collection specimen data with plotted information on landscape features such as bioclimatic zones, soils, land use, and population density. Layers of many kinds of landscape information have become available recently. Thus maps are not just a compelling framework for communication, they have become an effective method of acquiring new information. GIS technologies connect data, analysis and policy and they will have increased use in documenting changes in status to support decisions, regulations, and legislation, especially with regard to alien invasive species and native species at risk.

Internet access to herbarium specimen data

Environmental management, teaching and research could be much more effective if the georeferenced information on biodiversity in major collections was complete and readily available. At the present time it is fragmentary. As a consequence its use in decision-making, teaching and research is limited.

Through the Canadian Biodiversity Information Facility (CBIF), the AAFC collection has initiated participation in a global project to allow internet access to information on billions of specimens housed in the world's natural history collections. CBIF contributes to global networks by supporting distributed query technologies such as the Species Analyst (TSA) and Distributed Generic Information Retrieval (DiGIR), by maintaining a search and map engine to specimens and observations, and by making available a generic point mapper (see http://www.cbif.gc.ca for more details).The internet ability to plot geographic data quickly at a variety of scales and to query geographic data points with regard to the information on specimen labels with immediate results is a breakthrough in data access. It saves the time of collection staff and satisfies the need to obtain information quickly, particularly in the area of decision making for landscape planning, resource protection and management. The contribution of collection data to a global internet project with standard framework, along with similar contributions, will enable the presently fragmentary data to be complete, readily useable and widely available for the first time.

Figure 1.

Collections manager G. Mitrow in the AAFC collection demonstrating a plant specimen.

Figure 2.

Use of the AAFC collection to document the rate of spread of an invasive alien species. This provides a basis for prediction of future spread and impact thus allowing early remedial actions and planning for management.

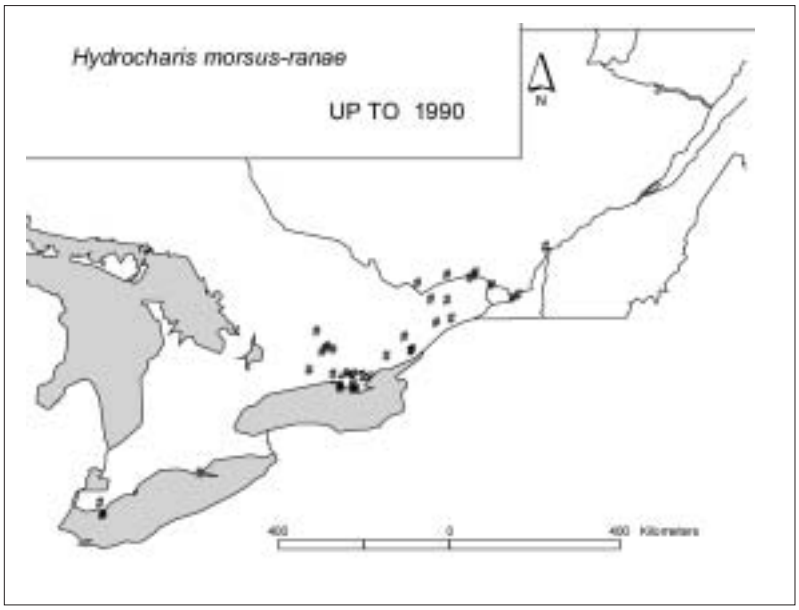


Figure 3.

Map correlating the distribution of *Sporobolus heterolepis*, an "at risk" species, with the distribution of limestone plateaus in Ontario. This map helps to explain a very restricted distribution in terms of a strict habitat requirement and provides support for "at risk" status. It also provides a clue to the restriction of many other species to open limestone plateaus (alvars). Once in a database, specimen collection sites can be readily compared with other geospatial information to assist clients in ways not previously possible.

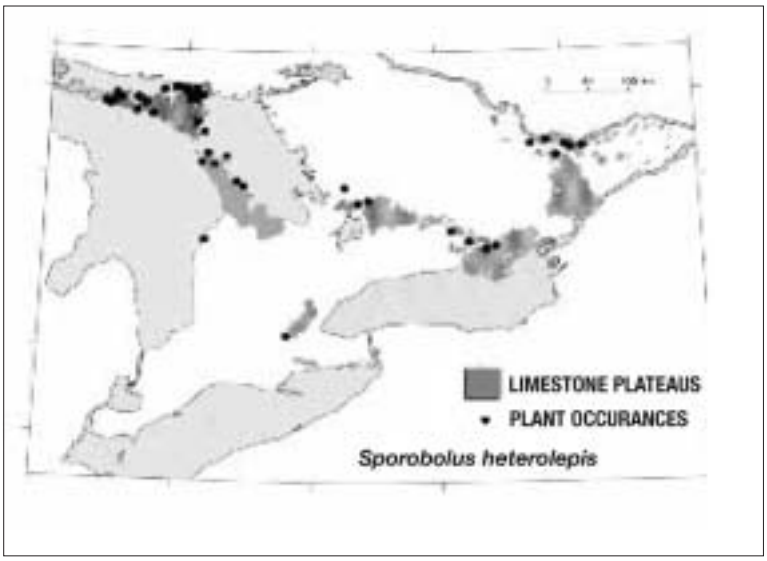
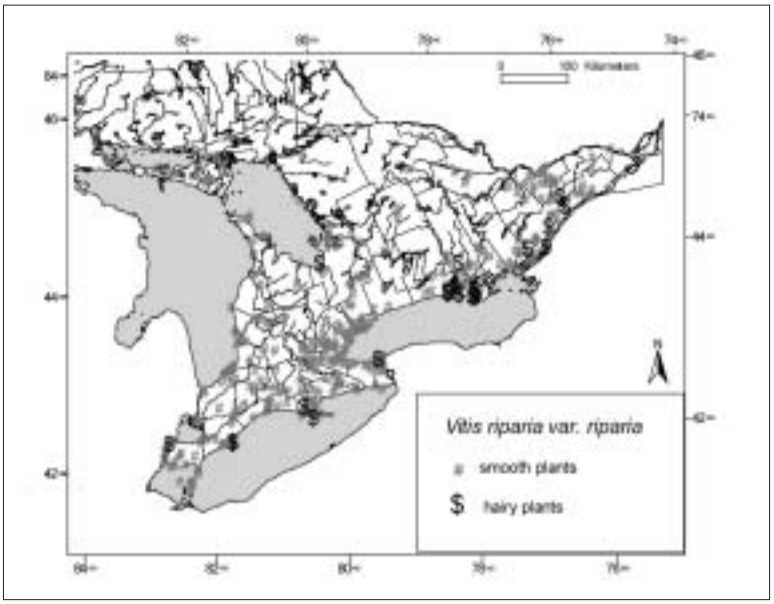


Figure 4.

Native distribution of the riverbank Grape in Ontario showing occurrences of a race with hairy leaves and stems which may serve to enhance resistence to drought and pests. The hairy genotypes are of value in breeding superior cultivated grapes. The collection data identifies specific locations and indicates hairy genotypes are rare, deserving *in situ* and *ex situ* protection.



22
PROVIDING INCENTIVES FOR BIODIVERSITY CONSERVATION BY THE RURAL POOR IN UNIQUE HABITATS (NAMIBIA)

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Keywords: biodiversity conservation, economic incentives, poverty alleviation

Introduction

Many of the world's biodiversity hotspots are found in developing countries where a majority of the human population lives in absolute poverty. The prevailing poverty and inability of these populations to afford alternative life support goods and services constitutes a major threat to biodiversity conservation because:

- these populations are directly dependent on the natural environment for their sustenance;
- equally, age-old traditional value for the local biodiversity and sustainable use thereof is continuously being replaced with more opportunistic, survival-driven resource-utilisation regimes that have a negative impact on the local biodiversity.

There is therefore a dire need to institute mechanisms and programmes that allow for value-addition to biodiversity conservation. Such efforts should seek to demonstrate the inextricable link between biodiversity conservation and socio-economic development in poverty-stricken areas so as to provide incentives that would bring about the desired commitment to biodiversity conservation.

The Namibian experience

The government of the Republic of Namibia recognises that biological diversity and traditional knowledge are key strengths that can be used to alleviate the prevalent poverty and environmental degradation in Namibia, and to improve food production, human health and overall quality of life of the country's inhabitants, DEA (1995) and Barnard (1998). The government also recognises that about 70% of the county's inhabitants lead a rural lifestyle and therefore depend directly on the extraction and exploitation of natural resources for their basic needs. It therefore follows that effective biodiversity conservation in Namibia will best be achieved by empowering rural communities to oversee the sustainable utilisation of the country's natural resources. This is being achieved through the creation and implementation of Community-based Natural Resources Management policies (CBNRM) that seek to devolve the management of natural resources to organised groups of resource users through conservancies while maintaining resource planning and decision-making at national level, DEA (1995).

To date, fifteen conservancies covering about 4 million hectares have been initiated and some economic, social and ecological benefits are being attained. Some of these benefits include the recovery of endangered species such as the black rhino, and other wildlife such as giraffe, springbok and zebra that were almost exterminated from these areas due to excessive hunting, GRN (2002).

In some cases, wildlife numbers have recovered sufficiently to allow for occasional hunting- providing food for local consumption and additional income-generation through trophy hunting.

The conservancies are also providing data such as long-term environmental monitoring indicators that is

being used in national and international state-of-environment programmes such as the Observatories Network of Namibia (EONN), Environmental Monitoring and Indicators Network (EMIN) and the Global Terrestrial Observation System (GTOS).

The way forward

Our experiences indicate that even the poorest rural communities can be motivated to conserve biodiversity. However, it is worth noting that most of the conservancies are still dependent on government and aid agencies for their operational capital, and that, meaningful long-term self-sustaining biodiversity conservation would require a more diversified approach. This is currently being investigated in some parts of the country such as the Namib Desert where we are investigating potential natural resources-based industries such as development of pharmaceuticals and other evolution-based technologies to supplement the income derived from tourism, Shanyengana (2002 & 2003). The latter includes, among others, the development of water collecting equipment that is based on the adaptations of fog-collecting beetles and development of pharmaceuticals and other health products from extracts of local species such as Acanthosicyos horridus. All the above have potential to enable realisation of a multi-million dollar natural resources-based industry similar to some of the local species such *Hoodia* and Devil's claw (*Harpagophytum procumbens*) that are currently being exploited in a three billion and multi-million US dollar pharmaceutical industry, respectively.

In conclusion, our experiences indicate that biodiversity conservation in poor and marginalized areas requires a people-centred approach that goes beyond income-derivation through eco-tourism. The development of viable products and services from local natural resources through e.g. biotechnology provides immense potential for creating incentives for biodiversity conservation and as such, should be given due consideration in the CBD's programmes.

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23
TECHNOLOGY TRANSFER: DIALOGUE BETWEEN SCIENCE AND POLICY

European Platform for Biodiversity Research Strategy (EPBRS)
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Keywords: research, policy, Europe, dialogue, strategy

The European Platform for Biodiversity Research Strategy

is a forum for scientists and policy makers to ensure that research contributes to halting the loss of biodiversity by 2010. It aims to achieve this by:

- focusing on aspects of science policy and science issues relevant to wider policy,
- identifying policies for which biodiversity science knowledge is important,
- identifying significant gaps in knowledge that reduce the effectiveness of policy,
- identifying resulting issues of major importance for biodiversity science policy,
- establishing priorities for biodiversity research in Europe, and
- promoting communication between scientists and end-users.

Objectives

The EPBRS strives to promote strategically important biodiversity research with concern for reduction of biodiversity loss, conservation, protection, restoration and sustainable use of the components of biodiversity. The EPBRS is an important element in the European Research Area (ERA) for biodiversity research.

The EPBRS aims to

- be the main European forum at which prominent natural and social scientists, influential policymakers and stakeholders exchange views and combine forces to plan, implement and exploit the research needed to underpin the conservation and sustainable use of components of biodiversity in Europe.
- be widely known and its activities widely appreciated by the science community and by the science policy makers of the EU and Associated States.
- produce agreements that collectively have a significant impact in the Commission, Council and Parliament on the debate on the follow-up to the 6th framework programme.
- provide helpful science policy advice for the European delegations to the CBD and to the Council Environment working group (biodiversity).
- be the natural contact point for relevant organisations with a similar mandate outside Europe, and should provide support for a co-ordinated European contribution to international programmes such as ICSU and initiatives such as the Millennium Ecosystem Assessment.
- be the "European voice in biodiversity science policy."

Context

The main policy frameworks for the EPBRS are common EU policies including in particular science research policy, the EU Biodiversity Strategy, the 6th Environmental Action Programme, the EU environmental Directives (notably the Birds, Habitats and Water Directives), the Convention on Biological Diversity and the various national biodiversity action plans.

Status

The bi-annual EPBRS meetings are linked to the EU presidency. The EPBRS keeps close connections with the EU institutions, national governments, and relevant international bodies.

Since its inception in 1999, the agendas of the meetings of the EPBRS balance science and policy. The organisers of the successive meetings of the EPBRS set the work programme. The themes addressed in the meetings have been chosen because they are of particular relevance to the organising country, while also having a European relevance. In some cases they were also chosen because they were important items on forthcoming CBD meetings.

It approaches its topics with the aim of identifying scientific work of policy relevance that is needed to support the implementation of the CBD, the EU Directives on Birds and Habitats, EU and national Biodiversity Action plans, NATURA 2000, and the EC Clearing House Mechanism.

The recommendations of successive meetings focus on the thematic issue under discussion.

The EPBRS encourages and helps to establish national biodiversity platforms for research strategy, whose forms and functions are adapted to the needs and administrative landscape of their country. In this activity it is strongly supported by the thematic network "BioPlatform," funded by the European Community to provide scientific, logistic and financial support to the activities of the EPBRS.

Membership, organisation and funding

Membership in the EPBRS is open to all states that participate in the EU Framework Programmes and to the European Union Institutions. The EPBRS is also open by invitation to organisations whose mission involves them in biodiversity science policy at a European scale. Other stakeholders are invited to participate at appropriate meetings.

The EPBRS Steering Committee is responsible for discussing the political and strategic orientation and activities of the EPBRS, and for making suggestions to the EPBRS to help to improve the relevance and impact of its work.

Contacting the EPBRS

The EPBRS can be contacted via the Secretary of its Steering Committee
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24
TECHNOLOGY TRANSFER FOR PLANT CONSERVATION

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Keywords: GIS, micropropagation, seed banking, herbaria

Introduction

The Royal Botanic Gardens, Kew is a scientific, amenity and educational organisation devoted to increasing knowledge and public understanding of plant and fungal diversity - how it came to be, what its current status is, how it can be conserved for future generations, and how it can be used in sustainable ways for human benefit. It is recognised globally as a unique centre of excellence for the study of plant diversity - based on its large collections and a breadth and depth of staff expertise built up over almost 250 years. A primary business aim is to support the activities of partners, both in the UK and overseas, in conservation and sustainable use of biodiversity through capacity building, joint research, training and advice. Last year almost 9 000 staff days were spent in contact with partners on these activities.

RBG Kew has developed a number of technologies for the conservation and sustainable use of, and the equitable sharing of benefits arising from, biodiversity. These are mostly skills, processes, standards and methods - otherwise known as 'soft' technologies. For example, Kew's Micropropagation Unit was set up in 1974 to propagate plants that are endangered or difficult to grow conventionally. The techniques used include *in vitro* laboratory propagation and cryogenic storage techniques. Expertise has been developed in growing over 3000 species, many of which have never been studied before. The techniques are being used to rapidly multiply individuals and for re-establishment of species in the wild.

Facilitating Technology Tranfer

RBG Kew uses a range of means to facilitate technology transfer from simply providing advice by telephone or email, to training courses, joint research and formal capacity building partnerships. Answering requests for help is a significant element: the Kew Micropropagation Unit answers about 500 enquiries for information and technical advice every year.

Training courses are an important vehicle for technology transfer. In particular, Kew has developed four International Diploma courses covering: Herbarium Techniques, Plant Conservation Techniques, Botanic Garden Management, and Botanic Garden Education. 300 students from 98 countries have participated in these courses. RBG Kew staff also organise and participate in a range of training courses, workshops and joint fieldwork trips, both in the UK and overseas. Whenever possible, RBG Kew hosts visitors in its departments for informal, on-the-job training. Collaborative research, including the supervision on MSc and PhD research is another important activity.

One important lesson that RBG Kew has learnt is the value of long-term commitment to technology transfer activities. For this reason contact is maintained with and between all trainees that have completed the International Diploma courses. In addition, in a number of cases technology transfer and co-operation commitments have been formalised into long-term partnerships, including the signing of agreements with partner organisations outlining activities and obligations for each party. In cases where the partnership involves the collecting and transfer of genetic resources, it is based on a legally-binding access and benefit sharing agreement which mentions elements of technology transfer and technological co-operation as benefits to be shared. This is the case for all partners of the Millennium Seed Bank Project.

Madagascar Case Study

Kew scientists have worked in Madagascar for over 20 years, working with local botanists and conservation organisations to catalogue plant species and identify conservation priorities. Over this time strong, long-term collaborations have formed with a number of local institutes, in particular the Parc Botanique et Zoologique de Tsimbazaza (PBZT), the University of Antananarivo, Silo National de Graines Forestières (SNGF), the Antsokay Arboretum, the Projet de Structuration des Filières Horticoles (PSFH) and the national parks service (ANGAP). Many of these partnerships are formalised under mutually agreed project documents outlining responsibilities, including for technology transfer activities. Kew has signalled its intention to continue working with these organisation by registering itself as a recognised NGO in Madagascar through the signing of an Accord de Siege. Kew also maintains a permanent office in Madagascar, and employs 7 full time staff there.

Work has particularly focused on those plant groups where Kew has greatest expertise: the palms, legumes, Rubiaceae (Coffea), orchids and succulents. Much of the activity has aimed at building capacity in taxonomic research, the propagation of plants and in the conservation management of living plant collections. For example work on orchids with PBZT set up a nursery and developed appropriate propagation methods for threatened orchids. More recently, provision of equipment and expertise to PSFH will enable local micropropagation of threatened orchid species, eventually leading to species being reintroduced to the wild.

Similarly the Spiny Forest Conservation project aimed to develop the Antsokay Arboretum (the best collection of endemic succulent plants in Madagascar) and conserve the surrounding areas of spiny forest. Under this project the arboretum owner took part in the Kew Plant Conservation Techniques course. In addition a horticultural specialist spent six months at the arboretum training local staff in propagation techniques. Other aspects were the improvement of the accessions database, and the building and establishment of a reference herbarium.

Kew Geographical Information Systems (GIS) experts and taxonomists are currently working with ANGAP, SNGF and other partners to develop novel applications of this technology. GIS is being used to map the vegetation of the country, and to interpret and analyse plant distribution using herbarium records. The latter part is particularly exciting as it involves the establishment of large databases of distributions within key plant groups using records from herbaria in Antananarivo, Paris, Missouri and Kew. A suite of programmes have been developed to interpret this data in a way that has never been possible before, and to an extent that Kew may now be considered a leader in this field. The results are being made available directly to SNGF to plan seed collecting expeditions for the Millennium Seed Bank Project. The vegetation mapping project will produce up to date digital and paper versions of a new vegetation map for Madagascar, based on latest technology. Training workshops in its use will be given to all participating organisations.

Through SNGF, Madagascar is one of 16 partner countries of Kew's Millennium Seed Bank Project. This partnership is based on a legally binding access and benefit sharing agreement, which includes training, technical expertise and scientific study as benefits to be shared. As part of this project, one trainee from SNGF has benefited from formal and informal training at the Millennium Seed Bank.

Since 2001, RBG Kew has funded and supported (through co-supervision and research attachments) three PhDs and four Masters students in Madagascar.

INDEX BY AUTHOR

INDEX BY KEYWORDS

The Convention on Biological Diversity (CBD), negotiated under the auspices of the United Nations Environment Programme (UNEP), was adopted in 1992 and entered into force in 1993. Its aims are the conservation of biological diversity, the sustainable use of biological resources, and the fair and equitable sharing of benefits arising from the use of genetic resources. One of the major challenges facing the Convention on Biological Diversity is the communication of research results in a way that provides the policy makers, their advisors, the scientific community and other stakeholders with helpful insights

Major factors leading to biodiversity loss are habitat loss and degradation, invasive alien species, overuse of resources and pollution. Due to the complexity of these factors, various approaches and strategies are being used to reduce biodiversity loss. All, however, require the best available scientific information that allows the development and implementation of sound management strategies.

The goal of the CBD Technical Publications Series is to contribute to the dissemination of up-to-date and accurate information on selected topics that are important for the conservation of biological diversity, the sustainable use of its components and the equitable sharing of its benefits. A large and growing body of evidence has clearly established the need to disseminate synthesis publications relevant to CBD objectives and selected reports presented at CBD meetings.

The Technical Publications Series is intended to:
- Foster scientific and technical cooperation;
- Improve communication between the Convention and the scientific community;
- Increase awareness of current biodiversity-related problems and concerns; and
- Facilitate widespread and effective use of the growing body of scientific and technical information on conserving and using biological diversity.

The CBD Technical Publications Series comes at a time when the international community through the Conference of the Parties to the Convention has committed itself to achieving tangible results in all aspects of the sustainable management of biological diversity for social and economic purposes. We therefore believe that this series will be useful to the broader scientific community and those concerned with biodiversity management.