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17

WORKING TOGETHER FOR BIODIVERSITY: REGIONAL AND INTERNATIONAL INITIATIVES CONTRIBUTING TO ACHIEVING AND MEASURING PROGRESS TOWARDS THE 2010 TARGET

Abstracts of Poster Presentations at the tenth meeting of the *Subsidiary Body on Scientific, Technical and Technological Advice* of the Convention on Biological Diversity

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FOREWORD

In adopting the Strategic Plan for the Convention, the sixth meeting of the Conference of the Parties (COP) made the commitment to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level, as a contribution to poverty alleviation and to the benefit of all life on Earth. In paragraph 3 of decision VII/31, the COP decided that at each of its meetings until 2010, as part of its multi-year programme of work, it should assess developments, including obstacles, in achieving the goals of the Strategic Plan and making progress towards the achievement of the Convention's 2010 target and the Millennium Development Goals (MDGs).

The theme chosen for the poster session at the tenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA-10) "Working Together for Biodiversity: Regional and International Initiatives Contributing to Achieving and Measuring Progress towards the 2010 Target," reflects these priorities in implementing the Convention. Authors were invited to contribute poster papers and extended abstracts that either describe ways in which their work addresses biodiversity loss, summarizes progress achieved in the reduction of the rate of biodiversity loss, and/or describes findings on trends in components of biodiversity. The contributions you will read in this volume share experiences and research from Parties, other governments and relevant United Nations, intergovernmental, non-governmental, regional and international organizations, indigenous and local communities and the private sector.

Many of the authors acknowledge that a tremendous effort is needed to achieve the 2010 target. Indeed, biodiversity is being lost at rates unprecedented in history as a result of human activities. This includes the loss of species, ecosystems and the services they provide. Some 12% of bird species and about a quarter of mammal species are globally threatened. Species extinction rates currently exceed the background rates by two to four orders of magnitude. Moreover, most of the direct causes of biodiversity loss are projected to either remain constant or to increase rapidly.

These sobering figures highlight the importance of turning to the Convention as the framework for action and the source of tools for achieving the 2010 biodiversity target. Realizing this achievement will require the combined efforts of as many stakeholders as possible, acting in concert, with the momentum generated by new research, novel field work and findings in monitoring progress towards our common objectives.

It is my hope that this publication will make a modest contribution to generating this dynamic, will raise awareness about new initiatives and research and will inspire readers to consider the manner in which science can support the process of documenting and developing indicators necessary to assess and reach the 2010 target.

I wish to express my sincere gratitude to all those who have contributed in one way or another to the preparation and production of this latest volume in the CBD Technical Series.

Hamdallah Zedan
Executive Secretary

INTRODUCTION

Under the theme of « Working together for biodiversity: Regional and international initiatives contributing to achieving and measuring progress towards the 2010 target », more than a hundred authors contributed extended abstracts of their poster presentations to be displayed at the tenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA-10) to be held in Bangkok, Thailand, from 7 to 11 February 2005. In this issue of the CBD Technical Series all abstracts are presented in the form in which they were submitted, with only minor edits where necessary.

In decision VI/26, the Conference of the Parties (COP) adopted the Strategic Plan for the Convention on Biological Diversity. In its mission statement, Parties committed themselves to a more effective and coherent implementation of the three objectives of the Convention, « to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth »[1].

In decision VII/30, the COP provided guidance on the review and evaluation of progress made in the implementation of the Strategic Plan and, in particular, its mission statement and adopted a framework that should:

- facilitate the assessment of progress towards the 2010 target and communication of this assessment;
- promote coherence among the programmes of work of the Convention;
- provide a flexible framework within which national and regional targets may be set, and indicators identified.

The COP adopted, through decision VII/31 its multi-year programme of work up to 2010. In paragraph 3 of that decision, the COP decided that, at each of its meetings until 2010, it should assess the state of progress, including obstacles, in achieving the goals of the Strategic Plan and progress towards the achievement of the Convention's 2010 target and the Millennium Development Goals (MDGs).

The theme for the poster session at SBSTTA-10 reflects the priorities in implementing the Convention. Contributions aim to share experiences and research from Parties, other governments and relevant United Nations, inter-governmental, non-governmental, regional and international organizations, indigenous and local communities, and the private sector. Poster papers and extended abstracts were invited to (i) describe ways in which they address biodiversity loss, (ii) summarize progress achieved in the reduction of the rate of biodiversity loss, and/or (iii) describe the findings on trends in components of biodiversity.

The 47 extended abstracts presented in this publication have been separated in two main sections related primarily to: (A) Status of biodiversity and monitoring progress towards the 2010 target and (B) ongoing and planned work to achieve the 2010 target. Many papers present both monitoring activities as well as expected achievements at various levels. Within the two categories, papers have been ordered as much as possible in accordance with the seven focal areas identified by the COP as part of the framework for assessing progress towards the 2010 target (decision VII/30).

[1] For more information on the 2010 Biodiversity Target : http://www.biodiv.org/2010-target/default.asp

These focal areas are:

(a) Reducing the rate of loss of the components of biodiversity, including: (i) biomes, habitats and ecosystems; (ii) species and populations; and (iii) genetic diversity;

(b) Promoting sustainable use of biodiversity;

(c) Addressing the major threats to biodiversity, including those arising from invasive alien species, climate change, pollution, and habitat change;

(d) Maintaining ecosystem integrity, and the provision of goods and services provided by biodiversity in ecosystems, in support of human well-being;

(e) Protecting traditional knowledge, innovations and practices;

(f) Ensuring the fair and equitable sharing of benefits arising out of the use of genetic resources; and

(g) Mobilizing financial and technical resources, especially for developing countries, in particular least developed countries and small island developing States among them, and countries with economies in transition, for implementing the Convention and the Strategic Plan.

Scientists are faced with the challenge of finding ways to apply the agreed goals and targets to the national situation and to introduce them into policies, plans and projects relevant to biodiversity management. This publication aims to provide information on approaches taken in a variety of situations and environments and to elucidate the scientific rationale of the methods applied. It presents – often preliminary – results and thereby generates discussion and, hopefully, new initiatives and research on ways in which science can support the monitoring of progress and activities to achieve the 2010 target.

CONTENTS

Status of biodiversity and monitoring progress towards the 2010 target

DARWINNET – A BINATIONAL, ECOREGION-BASED CLEARING-HOUSE MECHANISM FOR THE DRY FORESTS OF PERU AND ECUADOR

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Keywords: CHM, dry forest, Tumbesian, Peru, Ecuador, communities

Introduction

The equatorial dry forests of northwest Peru and southwest Ecuador or the Tumbesian Endemic Bird Area (Fig. 1) have been identified as one of the most threatened ecosystems on earth and a global conservation priority. The region (covering c.130,000 km^2) has exceptional levels of endemism, but widespread habitat destruction has resulted in many globally threatened species (Fig. 2). The region also has some of the highest poverty levels for each country. Balancing conservation with sustainable development that meets the needs of rural communities is the challenge now faced if this unique region is to be conserved. The 1998 Peace Agreement between the two countries now facilitates bilateral initiatives to promote conservation and influence regional development. Responding to the critical status of this region, a binational, ecoregional-based clearing-house mechanism (CHM) has been initiated, called *DarwinNet*.

Funded by the Darwin Initiative of the British government, the project is implemented by BirdLife International through local institutions and in collaboration with the CBD National Focal Points of Peru (Consejo Nacional del Ambiente CONAM) and Ecuador (Ministerio del Ambiente). Considered the first of its type globally this multinational, transboundary and stakeholder driven initiative will efficiently gather, repatriate, analyze and disseminate information on this region. This will raise awareness of its importance, establish conservation priorities, and build capacities for its conservation amongst stakeholders thereby consolidating policies for land use and development that are consistent with the conservation and sustainable use of biodiversity. The mechanism also responds to recommendations of the CBD to the COP for a decentralized network of sub-regional and thematic focal points, as well as CHM development to assist developing countries in gaining access to information. It also embraces several thematic areas and cross-cutting issues as outlined by the CBD, as well as regional strategies within the Comunidad Andina de Naciones (CAN).

The role of BirdLife International in the documentation of global biodiversity, global conservation programs and policy-making is widely accepted, and it is now recognized as an international thematic focal point of the CBD. Global directories of Endemic Bird Areas (EBAs) and Important Bird Areas (IBAs) as well as a constant reassessment of threat status of bird species prove essential tools for governments, NGOs, donor agencies and alike. Within this framework of actions the Tumbesian Endemic Bird Area is of particular importance. Ranked in the top four of the 118 EBAs identified globally, few EBAs have more endemic and threatened species. With the area's importance clearly established there is now the need to mobilize activities towards a more concerted approach towards its conservation and sustainable development. Therefore DarwinNet represents the next logical step in a process of information exchange, experience sharing and, importantly, empowerment at local and regional levels within Peru and Ecuador. This article presents an overview of the mechanism, with emphasis on its operational components and community-level participation.

Structure of DarwinNet

As is generally accepted a CHM is not solely based on an internet portal, but involves (or should) other important components, such as meetings, general monitoring activities and dissemination mechanisms. The DarwinNet mechanism will function through four principal components:

1) *webpage*: this will gather and disseminate information from within and without the region, as well as providing factsheets on threatened species, experiences in conservation and development, and other relevant information in digestible formats with *public-friendly* text.
2) *meetings*: here emphasis is placed on *taking the mechanism to the people*. (a) Twenty training presentations throughout the region in early 2005 will foster stronger relationships with stakeholders, these presentations will then be repeated in 2006 to gather feedback and assess progress. (b) Within the region the mechanism has three DarwinNet offices (Fig 1.), strategically placed to cover certain geopolitical areas. These provide a physical space for direct consultations with DarwinNet institutions responsible for information compilation within its respective area. (c) In 2005 the mechanism is co-funding two important conferences; the 2nd International Conference on Dry Forests (in Loja, Ecuador) and the 6th National Peruvian Ornithology Conference (Chiclayo, Peru), where side-events will further develop DarwinNet. (d) The mechanism will also promote and attend other relevant meetings.
3) *monitoring*: with a longer-term outlook, the mechanism will start to gather information in order to provide general status reports on the region every two-to-three years. General indicators will include (amongst others): status of protected areas; changes in threat status of species, hectares of forest lost, reforested, protected, with management plans; and positive or negative changes in national legislation.
4) *bulletin*: produced and available via the webpage, direct e-mailing and hard copies, bulletins will provide concise information on conservation, sustainable development and the mechanisms advances.

The above approach ensures that the information required reaches the correct stakeholder and information compilation is facilitated at all levels. Above all it is important to recognize that stakeholders are not just users of the information (demand), but also its source (supply), thereby stimulating a two-way interaction.

Integrating communities

Rural communities are the stakeholders most dependent on the adequate conservation and development of the remaining natural resources. With limited technological capacities special consideration needs to be given to how they will participate in (and benefit from) the mechanism. This is an important issue to be addressed by the mechanism and is broadly summarized by Fig. 3, where general stakeholders are listed by their direct dependence on natural resources and their IT capacities, and where the triangle approximates the total number of people involved at each level, i.e. the number of people in communities and civil society far outweighs people in the scientific community, but their IT capacity is low. To integrate communities the mechanism will develop a network of associate institutions and individuals throughout the region (Level 1 participant in Fig 4.), who through the project's training presentations will align themselves with the mechanism, creating a common approach to information exchange and management. These institutions will then act as the link with communities in their work areas, permitting a two-way flow of information and experiences from communities (Level 2 participant) to regional DarwinNet offices and vice versa. Also, depending on the proximity of a community the DarwinNet offices are available for direct consultations as well.

Conclusion

Although at an early development stage, through DarwinNet Ecuador and Peru will have taken a major, resource efficient and innovative step towards meeting their obligations under the CBD. It will catalyze binational co-operation for management of biodiversity and will serve as a model for similar critical ecosystems shared by more than one country. By creating a greater awareness of the values, functions and services of forests amongst all stakeholders DarwinNet will help promote their sustainable use. The outcome will be enhanced conservation of the region's environment based on a fair and equitable sharing of knowledge and resources.

Figure 1.

Tumbesian EBA and location of DarwinNet offices in the region

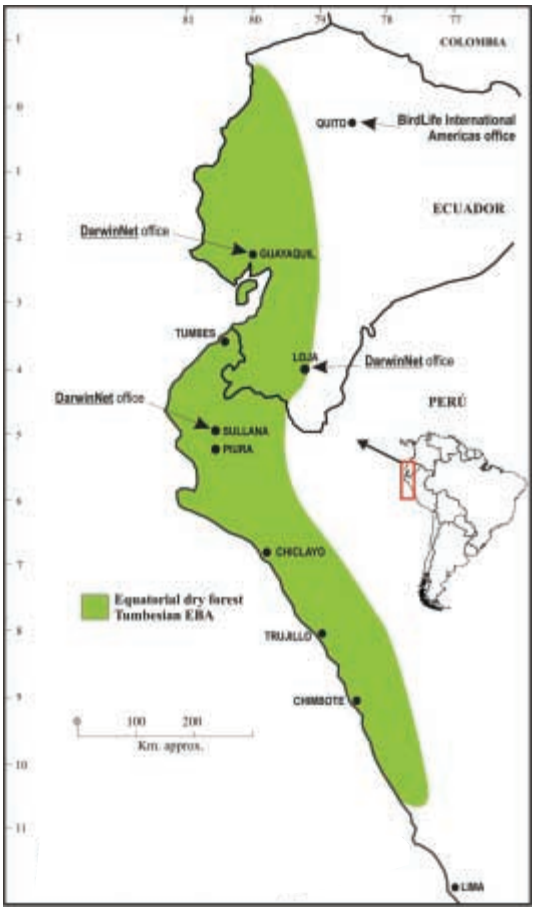


Figure 2.

Overview status of Tumbesian EBA

PRIORITY: CRITICAL
Key habitats: Tropical lowland to montane evergreen forest, deciduous forest, arid lowland scrub
Main threats: Severe habitat loss (e.g. due to cultivation, grazing, logging)
Biological importance: High
Threat level: High
Estimated remaining forest cover: 5-10%

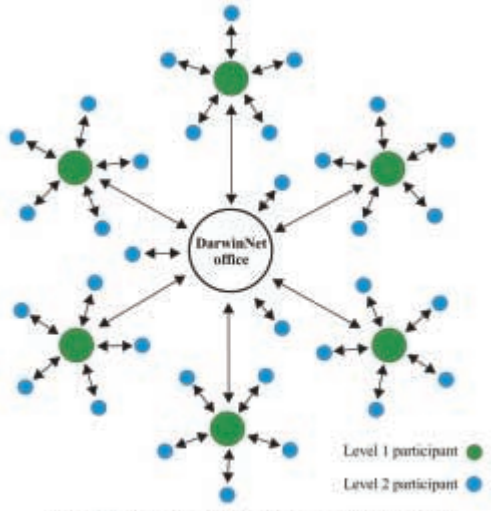
Endemic bird sp.	Threatened	Total
Confined to Tumbesian EBA	14	45
Shared with other EBAs	1	10
Total	15	55

Figure 3.

Stakeholder IT capacity and natural resource dependence

Figure 4.

Network of associates and communities



DIVERSITY AND DOMINANT SPECIES USED IN CULTURAL FORESTS IN RURAL NORTHEASTERN THAILAND

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Keywords: public forest, dominant species, cultural forest, importance value, rural areas

Introduction

Thailand has only 26.6 % forest cover left. More than 70 % of the forest is not protected. Much of the non-protected areas have less biodiversity than protected areas due to human disturbance, but they are very important to people in rural areas. Traditionally, Thai people in the northeastern region build their villages inside or close to forests. These are called *"cultural forest"*, because, people used everything in the forest for subsistence. These cultural forests are classified as secondary forests.

It is desirable to study the diversity of species in non protected areas and conserve the biodiverse areas for sustainable use in the future. Cultural forests consists of 3 distinct areas each with a specific function to society: (1) Public forests where villagers go to find food, medicinal plants, wood for construction of houses, furniture, fire wood, hunting game and livestock grazing; (2) *"Don Pu Ta"* forests are sacred forests not to be utilized by the villagers who are not permitted to take anything out from this forest; (3) Cemetery forests are used for cremations (Fig. 1) (WBRI, 1997).

Plant diversity and dominant species

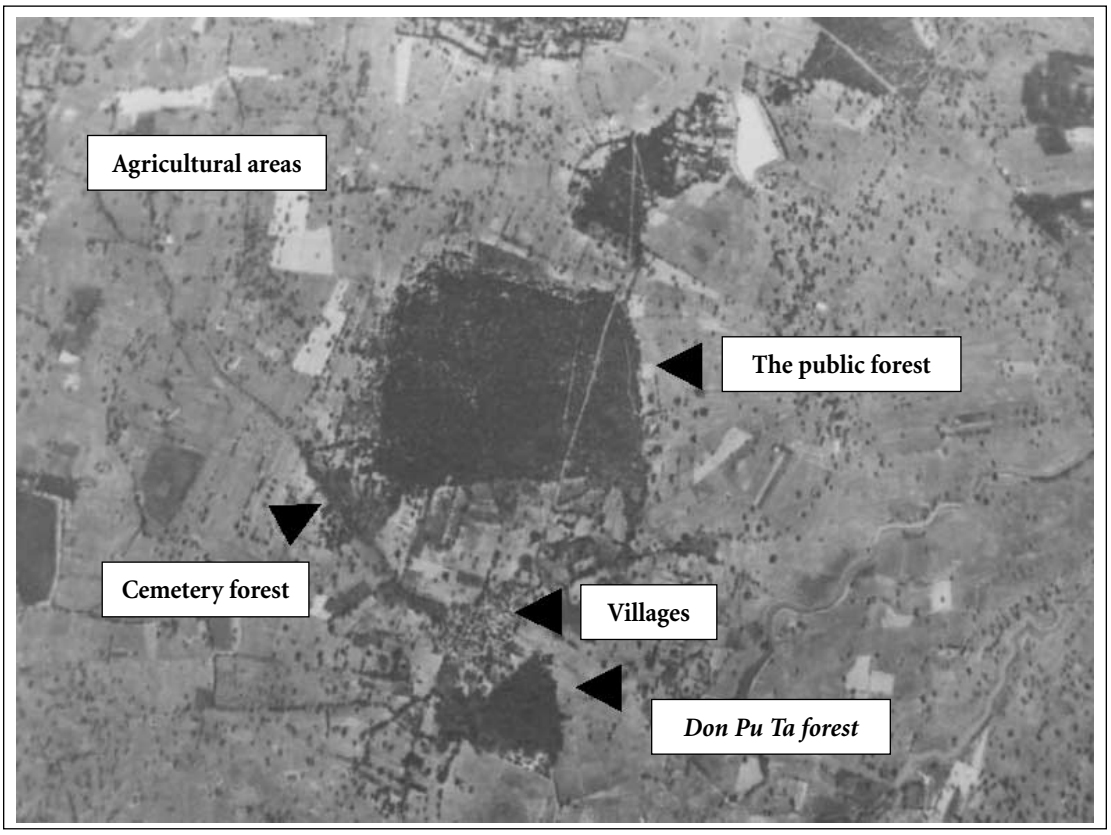
The plot sampling method (20x20 m) in 25 sub-plots in 30 ha conducted a study of species diversity of flora in the cultural forest (deciduous forest) of Na Doon, Mahasarakham Province. Trees with a diameter at breast height (DBH) of over 4.5 cm were counted and the diameter at breast height was measured. The diversity index (Shannon, CE and Weaver, W., 1949), evenness (Brower, J. E. and Zar, J. H., 1984), importance value index, relative frequency, relative density and relative dominance were calculated. (Krebs, C.J., 1989,). The dominant species used were identified through traditional knowledge. The results showed that among 101 species, there were 50 trees species, 10 woody shrubs species, 18 shrubby trees species, 7 annual plants species, 10 woody climbers species, 3 herbaceous climbers species and 3 grasses species. The data was analysed for species diversity, diversity index and importance value index. The diversity, diversity index, and evenness were 2.6140, 13.6568, and 0.6334 or 63.34 %, respectively. The most important value species index were *Sindora siamensis* var. *maritima* K. & S.S Larsen, *Cratoxylum formosum* (Jack) Dyer., *Pterocarpus macrocarpus* Kurz and *Shorea roxburghii* G.Don. The dominant species used were *Cratoxylum formosum* (Jack) Dyer., *Sindora siamensis* var. *maritima* K. & S.S Larsen, Shorea *roxburghii* G.Don. and *Pterocarpus macrocarpus* Kurz

Monitoring biodiversity in the long term

Monitoring biodiversity in cultural forests by permanent plots was done to collect data in the following year, to determine more detailed changes in the cultural forest. Transfer methods of monitoring by people participating from the villages to collect data and analysis was adopted.

Figure 1.

Map of a Cultural forest in rural area of northeastern Thailand. Traditionally, Thai people built their villages in the middle of forests. (Model Na Doon cultural forest 1:50,000)



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BIODIVERSITY INDICATORS IN THE GLOBAL FOREST RESOURCES ASSESSMENT

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Keywords: forest resources, indicators, assessment, monitoring

The Forest Resources Assessment Programme of the FAO

The Food and Agriculture Organization of the United Nations (FAO), at the request of its member nations and the world community, regularly monitors the world's forests through the Forest Resources Assessment Programme (FRA). The overall objective of the FRA Programme is to provide high-quality information on the status and trends of forest resources and all the products and services they provide, in order to support policy decisions. Global Forest Resources Assessments has been carried out since 1947, and the latest one, the Global Forest Resources Assessment 2000 (FRA 2000) reviewed the situation of the world's forest by the end of the millennium. For the first time, the FRA 2000 provided information and analyses on forest biological diversity. The main report is available on the World Wide Web (www.fao.org/forestry/fra).

The FRA Programme is closely related to sustainable forest management and the ecosystem approach, and fulfils an important role in monitoring progress towards sustainable forest management at global and regional level. Data from FRA on the extent of forests, biomass and carbon are also used for climate modelling.

The FRA Programme also cooperates with other ongoing international programmes, processes and conventions and contributes actively to the efforts to reduce the international reporting burden on countries within the Collaborative Partnership on Forests, which includes the CBD Secretariat. This includes leading the ongoing work on harmonization of forest-related definitions between international reporting processes.

The Global Forest Resources Assessment 2005

Currently, FAO is preparing the Global Forest Resources Assessment 2005 (FRA 2005) which will be published in 2005. The reporting framework will be based on the seven thematic elements of sustainable forest management derived from the nine regional criteria and indicator processes and acknowledged by the United Nations Forum of Forests[2]. Biological diversity is one of these thematic elements.

In order to obtain high-quality information on the forest resources and to enhance the country participation in the global assessments, FRA 2005 has established a network of 172 national correspondents. These correspondents are officially nominated by their respective country and are responsible for the compilation of the country reports to be submitted to FAO. In November 2003, a training workshop was held in Rome to which all the national correspondents were invited. This was followed by a series of regional workshops during 2004 in order to further strengthen the capacity of the national correspondents, to validate national information and to exchange experiences between countries.

The countries are requested to complete a set of fifteen national reporting tables following a standardized methodology. They are also asked to document original data and data sources used and the methodology applied so that the figures to be published in the FRA 2005 report can be traced back to the original data. This should facilitate the interpretation and use of data for other purposes than FRA.

[2] Report of the United Nations Forum on Forests Fourth Session (E/CN.18/2004/17/Corr.1 • E/2004/42/Corr.1)

As of December 1, 2004, 85 country reports have been received, and it is expected that by the end of the year 2004, most countries will have submitted draft reports. These reports will undergo a review by FAO and will then be sent back to the countries for final revision, validation and official approval. Once validated, the country reports will be available on the World Wide Web. The final report will be published during the second half of 2005, and will contain global summaries and analysis.

Biodiversity indicators in FRA 2005

The FRA 2005 plans to provide information on biodiversity indicators both at ecosystem level and at species level.

At ecosystem level the main indicators are:

- Extent of forests (Area of forest and other wooded land, area changes, trends)
- Characteristics of forests (degree of naturalness, intensity of management).
- Designated function of forests (including areas specifically designated for the conservation of biological diversity)

At species level, FRA 2005 focuses on the number of tree species as the main biodiversity indicator. In particular, the following information will be presented:

- Total number of native tree species
- Number of endangered and vulnerable tree species according to the IUCN classification
- Growing stock composition (growing stock of each of the 10 most common species, which can be related to the total growing stock and constitute a biodiversity index)

Indicators on genetic biodiversity are not included in FRA 2005, as it has been difficult to find good indicators for which the countries are able to provide standardized information.

Perspectives for FRA 2010

Based on the experiences from the FRA 2005 process, the collection of national information for biodiversity indicators is expected to be further supported and improved in the FRA 2010. A major challenge will be to find biodiversity indicators that are globally applicable and where information can be obtained from a large number of countries, particularly regarding indicators at the genetic level.

GENETIC EROSION IN THE CANADIAN GENE POOLS OF FLAX, OAT AND WHEAT

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Keywords: genetic erosion, gene pool, plant germplasm, flax, oat, wheat, molecular markers

Introduction

Analysis of genetic diversity changes in existing gene pools of cultivated crops is not only important for understanding the impacts of plant breeding on crop genetic diversity, but also for monitoring the genetic erosion in crop gene pools. However, little attention has been paid to such analysis, particularly with applications of molecular markers. With the hope to assess the genetic bases of the Canadian crop cultivars, we initiated in 1999 a series of molecular diversity analyses in existing Canadian gene pools of flax, oat, wheat, soybean, and canola. At present, we have completed the diversity analyses for flax, oat, and wheat. In this paper, we will highlight the major findings obtained from the diversity analyses of the Canadian flax, oat, and wheat cultivars.

Genetic erosion in the Canadian flax gene pool

Diversity changes in 22 Canadian flax (*Linus usitatissimum* L.) cultivars released from 1947 to 1998 was assessed using 53 random amplified polymorphic DNA (RAPD) markers. The proportion of fixed recessive RAPD loci was calculated for each cultivar and regressed on the registration year of each cultivar. This analysis revealed a trend of fixing 1.7% variable RAPD loci in every ten years of the Canadian flax breeding (Figure 1; Fu et al. 2002). When this analysis was extended to the several older cultivars released before 1947, the rate of loss was reduced to 0.72 variable RAPD loci (Fu et al. 2003a). While these rates of loss were not statistically significant from zero, the trend of fixing genetic variation in the Canadian flax gene pool established over the 90 years of flax breeding was obvious (Fu et al. 2002; Fu et al. 2003a).

Genetic erosion in the Canadian oat gene pool

Diversity changes in 96 Canadian oat (*Avena sativa* L.) cultivars released from 1886 to 2001 were analysed using 30 simple sequence repeat (SSR) and 10 amplified fragment length polymorphism (AFLP) primer pairs. A total of 62 alleles were found from 11 informative SSR loci and 442 AFLP bands were scored. Analyses of AFLP variability revealed a trend of fixing about 1% AFLP variation during the 115 years of oat breeding (Figure 2; Fu et al. 2004a). Analyses of the dynamics of SSR alleles over time revealed random, shifting, increasing and decreasing patterns of allelic change at 3, 1, 2, and 5 loci, respectively (Fu et al. 2003b; Figure 3). Significant allelic reduction was detected in the cultivars released after 1970 (Table 1) and also in some specific breeding programs. However, three different band-sharing analyses of the SSR variability of the grouped cultivars failed to detect significant diversity changes among cultivars released from different breeding periods or programs. These findings indicate allelic diversity at particular loci, rather than average genetic diversity, is sensitive to the oat breeding practices (Fu et al. 2003b).

Genetic erosion in the Canadian wheat gene pool

Diversity changes in 76 Canadian hard red wheat (*Triticum aestivum* L.) cultivars released from 1845 to 2004 were analyzed using 28 SSR primer pairs (Fu et al. 2004b). A total of 269 SSR alleles were detected from 31 loci and their allelic frequencies ranged from 0.01 to 0.99 with an average of 0.14. Significant allelic reduction was

observed at five SSR loci for the cultivars released from 1970 onwards (Table 1). Sixty alleles (about 24%) present in the cultivars released before 1910 were undetected in those cultivars released after 1990 and were spread over 27 SSR loci. Grouping cultivars to six breeding periods accounted for 12.5% of the SSR variation, to six ancestry families for 20.4%, and to eight breeding programs for 8.4%. The average genetic diversity measured by three different band-sharing methods did not change significantly among cultivars released from different breeding periods, breeding programs, and ancestry families. However, the genetic shift was obvious in the cultivars released over the six breeding periods, reflecting well various breeding efforts over years. These results clearly showed the allelic reduction and genetic shift in the Canadian hard red spring wheat germplasm released over time.

Concluding remarks

Molecular analyses completed so far on the Canadian flax, oat, and wheat germplasm clearly demonstrate the existence of the genetic erosion in these Canadian crop gene pools. With the genetic narrowing of the cultivated plant gene pools, there is a need for continuous diversification of plant breeding materials for sustainable breeding programs in the future. To facilitate the diversification of plant germplasm, conservation of genetically diverse germplasm is a prerequisite and is critical for long-term breeding efforts. Eventually, the introgression of new genes or incorporation of new gene complexes will be needed in some breeding programs to overcome a possible "genetic ceiling" in crop improvement, to avoid genetic vulnerability to biotic stresses, and to widen crop adaptation to new environments. Thus, integrated efforts are needed in the conservation of plant germplasm and in the exploration for new sources of desirable alleles.

As demonstrated in these analyses, various applied molecular techniques were effective in assessing plant genetic diversity and thus provided a useful means of monitoring genetic changes in the domesticated plant gene pools. Further applications of effective molecular tools such as microsatellite techniques would enhance the efforts of conserving and diversifying breeding materials for sustainable crop improvements.

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Table 1.

Comparisons of the observed microsatellite alleles adjusted by 100 over the expected allele counts under random scenario with a given group size for the Canadian oat and hard red spring wheat cultivars of different breeding periods.

Percent of adjusted alleles for oat §				Percent of adjusted alleles for wheat			
Period	Total	Lost	New	Period	Total	Lost	New
pre-1930(13)	102			pre-1910(9)	94		
1930s(7)	108	112	158	1910-1929(11)	118	81	149
1940s(11)	111	126	176	1930-1949(10)	90	139	123
1950s(12)	91	177	130	1950-1969(10)	93	141	134
1960s(5)	93	109	69	1970-1989(12)	76***	174	100
1970s(13)	76**	201	79	1990-2004(24)	70***	271	85
1980s(21)	87*	247	108				
1990s(14)	79**	214	96				

§ Period=breeding period (and the number of cultivars assayed for the period); Total=the total number of alleles detected and adjusted for the cultivars of a specific period; Lost (and New)=the total number of lost (and new) alleles adjusted for the cultivars of a specific period relative to those of the earliest period. *, **, *** for significance at $P < 0.05$, 0.01, 0.001, respectively, as obtained from 10,000 random permutations.

Figure 1.

Observed relationships between the proportion of fixed recessive RAPD loci and the registration year of the 22 Canadian flax cultivars developed from 1947 to 1998.

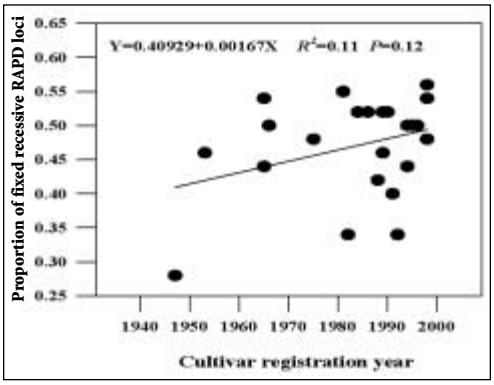


Figure 2.

Observed relationship between the proportion of fixed recessive AFLP bands and the release year of the 96 Canadian oat cultivars developed from 1886 to 2001.

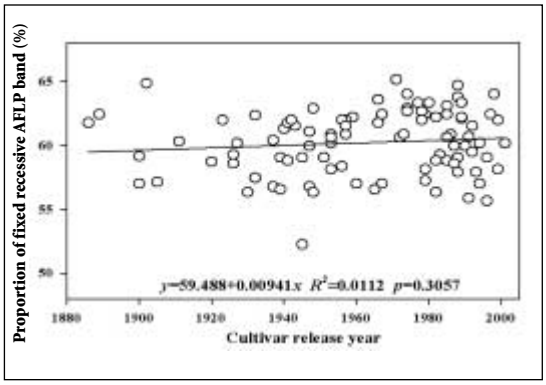
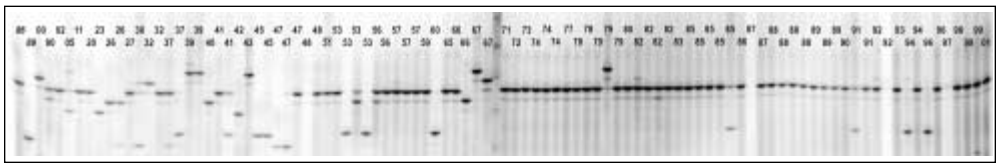


Figure 3.

A silver-stained gel that illustrates the allelic reduction at a microsatellite locus over the 115 years of the Canadian oat breading. Samples of the 96 Canadian oat cultivars are arrayed from left to right in a chronological order from 1886 to 2001 with only the last two digits of the release year given for each cultivar. M is the DNA ladder.



EUROPE AND THE 2010 TARGET

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Keywords: indicators, Europe, coordination, implementation, 2010 target

Implementing European 2010 biodiversity indicators

Implementing European 2010 Biodiversity Indicators (IEBI2010) is a joint pan-European activity with countries and other interested bodies to develop and implement biodiversity indicators for assessing, reporting on and communicating achievement of the 2010 target to halt biodiversity loss.

Background

Recent years have seen political agreements on halting or significantly reducing the current rate of loss of biodiversity by 2010 (the 2010 target). This is accompanied by a growing consensus on the need for structured European coordination of biodiversity monitoring, indicators, assessment and reporting efforts, with a long-term perspective and sound funding basis.

The activities and outputs proposed as part of the IEBI2010 work address three policy contexts:
1. European Union: by implementing the European Union biodiversity headline indicators, response is given to the Message from Malahide as endorsed by the EU Environment Council, as well as support to the Lisbon Agenda, the sustainable development strategy, the habitats and birds directives and the biodiversity strategy;
2. Pan-European: as a follow-up to the Kyiv Resolution on Biodiversity IEBI2010 is directly responding to the UNECE Environment for Europe process and the Pan-European Biological and Landscape Diversity Strategy;
3. Global: the EU biodiversity headline indicators are based on the CBD trial indicators, customized to the European needs. Therefore IEBI2010 also responds to CBD Decision VII/30.

A common element in these three processes is the 2010 target and a common tool is the agreed set of indicators.

Objectives

The objectives of IEBI2010 are:
1. to consolidate, test, refine, document and help produce workable sets of policy-relevant biodiversity indicators meaningful in the context of the 2010 target;
2. to help ensure adequate funding for monitoring, indicators and assessments to support implementation and achievement of the policy decisions and targets;
3. to improve coordination, exchange of information and collaboration on biodiversity-related indicators and monitoring activities building on current activities and good practice;
4. to consider the wider use of the indicators, and their applicability within other relevant indicator frameworks and assessment processes.

Example of indicators developed for 2010

Results for three indicators for the 2010 target are shown. These correspond directly to the following three trial indicators of CBD Decision VII/30:

1. Trends in extent of selected biomes, ecosystems, and habitats.
2. Trends in abundance and distribution of selected species.
3. Coverage of protected areas.

Using Corine Land Cover (CLC) data we show the trend of major habitat types in Europe between 1990 and 2000. The CLC is based on photo interpretation of satellite images and the resulting database builds on standard methodology and nomenclature across Europe. The strongest decrease is in proportion of wetland habitats compared to the 1990 levels. The biggest increase is found in constructed, industrial and artificial habitats.

European-wide data on species trends are limited. Using data on birds and butterflies linked to particular habitat types in Europe, the trends of species populations are shown per habitat type on the regional level. Birds and butterflies are present in most habitat types in Europe and their close link to these habitat types make them good indicator species of the habitat quality. Butterflies linked to the wetland habitats show the strongest decline in abundance from 1980-2000 and both birds and butterflies of the farmland habitat have declined by more than 15 % in the same period.

On the European level, Natura 2000, a regional network of protected areas, responds directly to the European Union's Birds and Habitats Directives. In addition protected areas are designated in response to national legislation. An indicator is developed to show the overall coverage of protected areas in Europe following both European and national legislation. The Natura 2000 now covers between 15 and 20 % of the European Union territory, and national designated areas cover about 15 % of the same area. Since the value of this indicator by definition is finite (i.e. at some point in the near future it is not expected to increase), it requires relation to achievement of other targets to be meaningful.

The three indicators are examples of a regional initiative to develop indicators for the 2010 target. The data behind each of the indicators allow for a hierarchical approach to the assessments. Results can be shown on regional level, on sub-regional level, or disaggregated per country or per habitat type. Results from species trends and from trends in extent of habitats can be combined to highlight the overall trends in biodiversity in a particular habitat type in Europe.

The indicators' concept, methodology and data sets will be proposed for consideration by the expert groups under IEBI2010 to facilitate their further development.

MEASURING PROGRESS TOWARDS CONSERVATION GOALS AT MULTIPLE SCALES

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Keywords: conservation project measures, ecoregional measures, Conservation by Design

The Nature Conservancy's Conservation Approach

The mission of The Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Our vision is to conserve portfolios of functional conservation areas within and across ecoregions. Through this portfolio approach, we work with partners to conserve a full array of ecosystems and viable native species.

To fulfill our long-term vision and achieve our goals, The Nature Conservancy employs an integrated conservation process known as Conservation by Design that is comprised of four fundamental components:

- Setting priorities through ecoregional planning and global habitat assessments;
- Developing strategies at multiple scales to address ecoregional priorities and threats at all scales;
- Taking direct conservation action; and
- Measuring conservation success.

Goal for 2015

In an effort to pursue more globally representative conservation results, The Nature Conservancy has established the following goal to guide our own organizational priorities and support the targets of the Convention on Biological Diversity:

By 2015, The Nature Conservancy will work with others to ensure the effective conservation of places that represent at least 10% of every major habitat type on Earth (* note this percent will further refined for each habitat type after further analysis).*

That goal commits us to systematic assessment of global conservation priorities, implementation of strategies that will lead to effective conservation and measurement of our progress towards the goal. This paper focuses on how the measures of progress towards effective conservation are implemented from site to ecoregional to global scales.

Ecoregion Level Measures

For purposes of assessing progress toward our mission, The Nature Conservancy defines effective conservation as the sustained maintenance of sufficient numbers of viable populations or representations of species or ecosystems (biodiversity health status), the long-term abatement of critical threats to that biodiversity (threat status), and the establishment of appropriate enabling conditions (or capacity) for biodiversity conservation (enabling environment). Biodiversity health status is based on whether biodiversity targets (focal species or ecosystems) meet established conservation goals- the desired number and distribution of viable biodiversity occurrences across the region. Threat status is determined by looking at the severity and geographic extent of current and future threats to biodiversity. Finally, enabling environment considers such conditions as presence of adequate management (e.g. protected areas), sustainable conservation financing, sufficient conservation

capacity for biodiversity management, and supportive policy environments for biodiversity. All three outcomes - meeting biodiversity health goals, abatement of threats, and establishment of a supportive and enabling management environment – must be met at defined thresholds for conservation targets to be considered 'effectively conserved'.

Project Level Measures

The Nature Conservancy implements a process to measure the status and effectiveness of biodiversity conservation projects. A conservation project is defined by a set of strategies taken by a group of practitioners working to achieve a set of goals and objectives for specific conservation targets at single or multiple sites within the ecoregional portfolio. A fundamental question facing any conservation project is: Are the conservation strategies being implemented having their intended impact? This question is important to the practitioners implementing the strategies, their managers, their organizations, and the stakeholders and donors that support them.

The Conservancy's process includes: 1) Selecting a limited set of focal conservation targets (ecological systems, communities, and species) and assessing their ecological status based on analysis of a set of key ecological attributes; 2) Identifying and ranking direct threats to these targets and assessing their underlying causes; 3) Developing results-oriented objectives and implementing strategies aimed at abating threats and improving target status; 4) Tracking measures that gauge the success of these strategies and changes in target and threat status; and 5) Adapting strategies based on measures feedback and sharing lessons learned across the Conservancy and with the broader conservation community. This robust project-level planning and measures process provides an objective, consistent and transparent accounting of conservation actions and the intended and actual outcomes of conservation projects. It enables project staff to responsively adapt their actions to improve strategy effectiveness and achieve greater conservation impact. Strategy effectiveness and the status of the focal conservation targets biodiversity at the site or project are measured by indicators selected to assess whether the targets occur with sufficient size, with appropriately functioning ecological processes, and with sufficiently natural composition, structure, and function to persist over the long term.

Collectively, these measures seek to quantify our conservation impact — the direct contribution of the Conservancy and our partners to conserving biodiversity. They enable us to report our contribution to the 2010 biodiversity target by creating the data to inform the indicators for assessing progress that have been adopted by Parties to the Convention on Biological Diversity.

Reference

The Nature Conservancy (2004) Conservation by Design,
http://nature.org/aboutus/howwework/cbd/index.html

REMOTE SENSING AND THE MONITORING OF TRENDS IN THE EXTENT OF SELECTED BIOMES, ECOSYSTEMS, AND HABITATS

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Keywords: remote sensing, biomes, monitoring, indicators, satellite monitoring

In decision VII/30, the Conference of the Parties identified trends in the extent of selected biomes, ecosystems and habitats as an indicator of the 2010 goal. Subsequently, the Ad Hoc Technical Expert Group on indicators for assessing progress toward the 2010 target identified remote sensing as a means for measuring biome, ecosystem and habitat trends (AHTEG, October 2004). While biological diversity cannot be directly monitored from space or from high altitudes, maps of land cover change from satellite data can approximate rates of habitat loss and/or conversion from which species loss can be inferred. A judicious combination of remotely sensed data, ground sampling, expert knowledge of species trends and species use of habitats form a solid basis for assessing biodiversity.

National Level Trends

Traditionally, change detection has been conducted by comparing maps of habitat cover in different years. In the last few years newer methodologies have been used to more directly map change from multiple years of satellite data. Many national agencies, international programs and non-governmental organizations have produced maps of habitat cover, fragmentation and change for entire countries (e.g. Figure 1). This has been greatly facilitated by a growing data archive and reduced data prices, often free, in recent years (e.g. glcf.umiacs.umd.edu, www.geocover.com). However there are many differences in the methods used and working definitions of various habitats. These differences cause problems when attempting to compare data from different countries and from different time periods.

Global Level Trends

The first global estimates of forest habitat cover and rates of loss were produced by the FAO. Several Forest Resource Assessments have been published, and methods have evolved over the past decade. An updated estimate of global forest change based on a sample of satellite images will be published in 2005. This is based on a sample of high-resolution satellite data, providing statistically validated estimates of rates of change but not providing global maps of where changes have occurred. These estimates will provide an important baseline estimate for trends in the extent of selected habitats.

Alternative estimates are needed both for forests and for other biomes. Measurements based on satellite monitoring are in production. One example—based on 20 years of data satellite data—is a global map of deforestation at 8km resolution (figure 2). Comparisons of existing global estimates are also underway. Table 1 represents a preliminary attempt. New work has begun to produce baseline estimates of forest loss from similar data throughout the 1990s. Others will involve newer satellite data from 2001 through 2005. Much of this work has been coordinated through international collaborations such as the International Geosphere-Biosphere Program (IGBP), Global Observation of Forest Cover and Land Cover Dynamics (GOFC-GOLD), and the Millennium Ecosystem Assessment (MEA) projects. Thus, there will soon be a set of global estimates of habitat cover and change that can be used as baselines for comparison with future mapping of change.

Still, numerous technical issues arise before these data can be used confidently for such a purpose as to measure progress toward the 2010 goal. These issues include comparing different data products, resolution and scale, varying definitions of habitats, validation, etc. These must continuously be addressed and communicated as an issue by CBD Parties. The creation of the AHTEG enables regular communication with liaisons from the scientific and biodiversity NGO communities.

NASA-NGO Conservation Working Group

The NASA-NGO Conservation Working Group includes representatives of ten different NGOs and research organizations who routinely use remote sensing to support biodiversity conservation. NASA has provided support to this group to conduct a set of review studies and case studies to address many of the technical issues related to use of remote-sensing products for the indicator on "trends in the extent of selected biomes, ecosystems and habitats." This will include new information available at the global scale as well as examples and guidelines for conducting independent national-level monitoring. The results of these studies will be provided in a handbook on using remote sensing for monitoring the 2010 target, in coordination with UNEP-WCMC. When completed this will be available at http://nasango.umiacs.umd.edu

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Figure 1.

Example of a national-scale habitat change map: forest and woodland loss in Madagascar. Insets also show fragmentation, revealed by habitat in small patches or near edges. From Steininger et al. 2004.

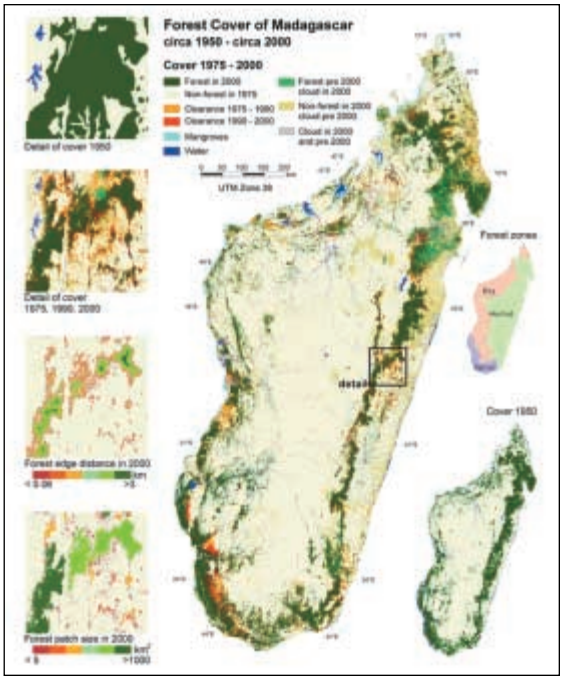

Figure 2.

Example of a global habitat change map: tropical America extracted from an 8-km resolution map of global forest change. Varying tones of yellow to green indicate dry to moist forest zones. Areas in red are sites of rapid change from 1990 to 2000. From Defries et al. 2001).

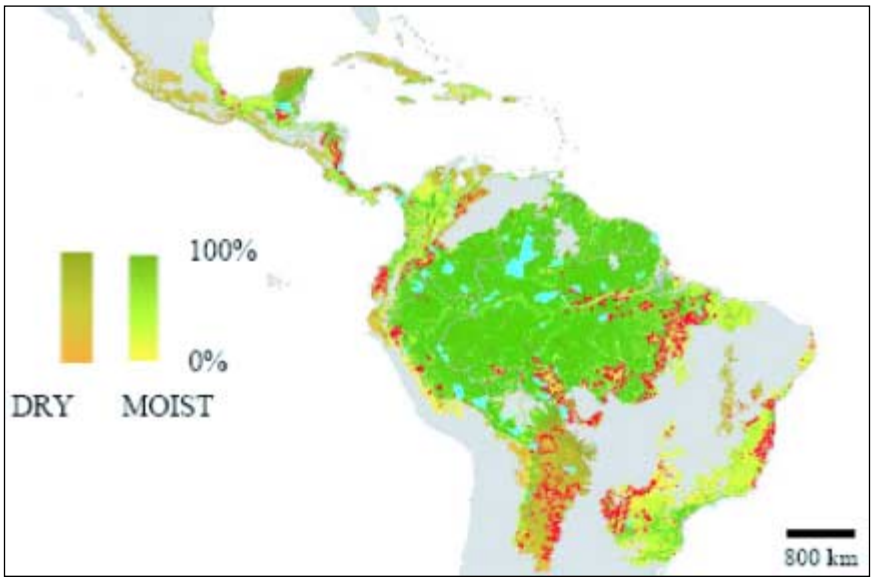

Table 1.

Example of comparisons of global habitat change estimates: FAO reports versus satellite estimates of tropical forest cover change. Data for UMD are from the University of Maryland (Defries, et al 2002); TREES are from the Joint Research Committee of the European Union (Achard, et al 2002); and FAO are from the Forest Resouces Assessments of the Food and Agriculture Organization (FAO 2000, 2001). Table reproduced from Defries and Achard (2002).

	Net Change 1990 - 2000		Net Change 1990 - 1997	
Region	UMD	FAO	TREES	FAO
Southeast Asia	-2.0 +-1.2	-2.4	-2.0 +- 0.8	-2.5
Africa	-0.4 +-0.3	-5.2	-0.8 +-0.3	-1.2
Latin America	-3.2 +-1.2	-4.4	-2.2 +-1.2	-2.7
Global	-5.6 +-2.7	-12.0	-4.9 +- 1.3	-6.4

COVERAGE OF PROTECTED AREAS AS AN INDICATOR FOR ACHIEVING GLOBAL BIODIVERSITY TARGETS

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Keywords: protected areas, biodiversity indicators, coverage, effectiveness

Introduction

One of the more obvious actions that mankind can take to conserve biological diversity is the establishment of protected areas, and governments and non-government organizations all over the world have been designating sites for conservation purposes for many years. Because designation of protected areas is such a clear action, coverage of protected areas has previously been identified as an indicator of achievement of Target 9 of Millennium Development Goal 7, and at the CBD Conference of Parties in February 2004; coverage of protected areas was identified as an "indicator for immediate testing" (decision VII/30). This paper aims to explore further the value of coverage of protected areas as an indicator.

Data on the number and extent of protected areas

There are now over 100,000 sites worldwide that meet the most widely accepted definition of a protected area, and these cover more than 12% of the Earth's land surface. Basic information on these sites is widely available at national and international levels, and has been compiled internationally for many years. The World Database on Protected Areas, managed by the UNEP World Conservation Monitoring Centre, provides a comprehensive global inventory of the world's protected areas.

The data is gathered from a broad range of sources, with major updates undertaken every 3-5 years in preparation for the publication of the *United Nations List of Protected Areas*. Critical sources include those government agencies with direct responsibility for protected areas and the WPDA Consortium of international conservation organizations. The World Database on Protected Areas is available online and on CD-ROM.

The data show a continued increase in both the number of protected areas and the area that they cover, and, while there are clear differences between regions, this is a global phenomenon. However, simple presentation of the number of sites and the area that they cover, while being a useful measure of political commitment gives no real indication of how well biodiversity is being protected. In order to address how well these protected areas are conserving biological diversity, we need two further pieces of information, the extent to which these protected areas include all elements of biodiversity, and the effectiveness of their management.

Coverage of biodiversity by protected areas

A first crude estimate of coverage of biodiversity can be made using a map-based analysis, overlaying protected areas data over biogeographical or ecoregional maps. For example, an initial comparison made using the biogeographical framework devised by Udvardy in 1975 shows that while nine of the 14 terrestrial biomes have more than 10% protected, some biomes are falling well behind the global average include temperate grasslands. Similar analyses can be made using other maps, such as those for the WWF Global 200 Ecoregions, Conservation International's Biodiversity Hotspots, BirdLife International's Endemic Bird Areas, etc.

It is important to be aware that analysis using biome and ecoregion maps provides only a crude measure of 'potential' natural vegetation or habitat at a coarse level, as these maps do not take account of the fact that vast areas of land have now been altered by human activity, and they do not provide sufficiently detailed resolution to pick up fine-scale variation in habitat. Increasingly, new, global-level land-cover maps are enabling a more detailed analysis of the actual habitats protected. Preliminary analysis using these maps shows similar, but perhaps slightly higher, levels of protection of the remaining areas of natural habitats, and work on this analysis is continuing and will provide a valuable interpretation of the protected areas statistics.

Several recent analyses have similarly demonstrated that current protected area systems do not adequately cover key biodiversity features. For example, gap analyses carried out for the World Parks Congress in 2003 demonstrate that at least 300 critically endangered species, and at least 237 endangered and 267 vulnerable species of birds, mammals, turtles and amphibians have no protection in any part of their ranges. This suggests the need to consider an additional sub-indicator for protected areas and biodiversity, which would be based on the percentage of species whose ranges (by grid cell) are overlapped by protected areas.

Another approach is to consider the protected area coverage of key biodiversity areas such as the Important Bird Areas identified by BirdLife International, or the Important Plant Areas identified by PlantLife International. These are sites identified according to agreed international criteria based on threat and geographical concentration. Again, overlay of mapped information on these sites and on protected areas will give percentage protection which could provide a baseline for a future indicator, and this is described further in another paper in this volume.

Management effectiveness

Objective assessment of protected area management effectiveness is a far more difficult process, but one that is being actively developed in a number of countries to help in improving management national protected area systems. This is an area in which the IUCN World Commission on Protected Areas has been very active, as have the World Bank and several conservation NGOs including WWF and The Nature Conservancy. It is likely that data will improve significantly over the coming years based on national-level reviews, but at present time series do not exist, and a baseline is only possible for a sample of sites (perhaps 2,000-3,000 out of more than 100,000 protected areas). Nevertheless, a meeting taking place in January 2005 will review the different methods being used and how information from these reviews might be compiled and used globally, assuming the willingness of countries to make this information more widely available.

Meanwhile, a proxy for this issue may exist in information that can be readily easily compiled on investment in protected areas in terms of finance and staffing. A review was carried out in the mid 1990s, and a further review soon would provide information on trends provided it was carried out in a comparable manner.

Conclusion

This paper stresses the importance of a comprehensive approach to the use of protected areas as an indicator for meeting global biodiversity targets. Measurements of numbers and extent must be combined with assessments of coverage and management effectiveness to achieve meaningful results. Monitoring methodologies are being applied by different organizations and national agencies in a number of the world's protected areas that have the potential for use in measuring the status of protected areas at the global level. The challenge is to define a standard methodology and apply it consistently in countries so that meaningful results can be derived to determine if global biodiversity targets are met.

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THE ECO-PARTNERSHIPS FOR MEASURING PROGRESS TOWARDS THE 2010 TARGETS: STRENGTHENING A NETWORK OF DATA USERS AND PROVIDERS IN CHINA

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Keywords: indicators, trends, networks, monitoring, biodiversity status

Vision and institutional support

Southwest China contains an abundance of information, active researchers, and a vision and desire for conserving biodiversity. The majority of past and current monitoring efforts have focused on site specific and management effectiveness monitoring. Where biodiversity status monitoring is occurring, information is not often disseminated among all the necessary audiences. Therefore, in October of 2004, representatives from various local and international NGOs, government, scientific academies, and universities came together to discuss strengthening collaboration of monitoring efforts that would be applicable at the local, national and international level[3]. The indicators proposed by the CBD feed directly into the information needs and interests of the national institutions, as participants at the workshop are eager to track and report on how the status of biodiversity is changing over time. Not only will the information be useful for global reporting, but also, it will help to better manage the National Reserves, identify research needs, and provide information on trends for biodiversity status in relation to trends in threats and conservation actions. The major objectives for the workshop were identified as: (1) understanding the current state of biodiversity in the Southwest China Hotspot[4]; (2) introducing the CBD indicators and identifying how local monitoring activities provide data potentially valuable for global datasets to improve reporting at the global scale; (3) developing an action plan for overcoming challenges associated with data sharing issues; and (4) drafting a fundraising strategy to ensure sustainability of monitoring initiatives.[5]

Key elements of the initiative

Knowing the status of biodiversity and current monitoring initiatives is essential prior to outlining a plan of action for monitoring biodiversity in the region. During the workshop, gaps in capacity, information and funding were identified through a partner survey and discussions were held on how to overcome major gaps. Prior to identifying a set of indicators for monitoring our progress towards achieving biodiversity conservation, the participants focused on data sharing issues and challenges that had been faced in the past. Concerns with stolen and manipulated data as well as lack of credit were expressed and solutions proposed. A group of representatives was identified for developing a protocol for sharing biodiversity data. They will work with government, various institutions and NGOs to set up a mechanism for standards and rules in order to improve the process for which indicator data is reported and distributed. In order to effectively move towards a regional monitoring initiative, the participants elected to formalize the partnership to better attract donors,

[3] A complete list of workshop participants will be provided at SBSTTA-10
[4] The 25 biodiversity hotspots (soon to be 32) contain 44%of all plant species and 35% of all terrestrial vertebrate species in only 1.4 % of the planet's land area. To qualify as a hotspot, a region must support 1500 endemic plant species (0.5% of the global total) and have less than 30% of its "original" habitat remaining.
[5] A full workshop report will be made available at SBSTTA-10

approach government, and collaborate on efforts. The data sharing agreements and formal partnership will provide the network of data users and providers a strong foundation for better collecting and reporting data on indicators. Specific indicators that were discussed and which are likely to move forward in the immediate term include:

1. Percent change in number of threatened species in each IUCN Red List category, number of species downlisted, and number of species that have gone extinct. *(CBD focal area: status and trends of the components of biological diversity)*
2. Percentage and total number of all key areas that are protected with (a) legal recognition and (b) biodiversity conservation as an official goal. *(CBD focal area: status and trends of the components of biological diversity)*
3. Percent change in baseline habitat cover at key areas. *(CBD focal area: status and trends of the components of biological diversity)*
4. Change in fragmentation statistics. *(CBD focal area: status and trends of the components of biological diversity)*

The key objectives of the partnership include:

- Data sharing and dissemination
- Accumulation of knowledge
- Standardization of an information system
- Coordination and unification of a monitoring scheme
- Heightened awareness
- Increased transparency of information

Factors for success: lessons learned and next steps

Key next steps include drafting a memorandum of understanding for the China "Ecopartnership", developing data sharing and use protocols, identifying and implementing indicators that meet the local and international needs, preparing workplans, and further engaging donors and the private sector. Three potential committees have been identified to move this work forward in the region: Coordination and Networking; Fundraising; and Validation. These committees will need to be further defined, and workplans developed for each member institution.

The participants of the October workshop plan to meet again in March or April of 2005 to select a final set of indicators, finalize workplans and refine the fundraising strategy. It will be essential for donors and private sector to participate in this second workshop, as their voices were missing from the table at the October meeting. In addition to stakeholders already identified, donors and private sector will be key in assessing progress towards the 2010 target as well as implementing other local monitoring needs in Southwest China.

SCALING UP REGIONAL INITIATIVES FOR MEASURING PROGRESS TOWARDS THE 2010 TARGET: TOWARDS A NATIONAL BIODIVERSITY MONITORING SYSTEM FOR MADAGASCAR

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Keywords: indicators, trends, networks, monitoring, biodiversity status

Vision and institutional support

In March of 2004, under the leadership of the Ministry of Environment, Water and Forest, a variety of Madagascar-based national and international institutions (including NGOs, universities, researchers, government agencies and donors)[6] met to discuss a monitoring agenda and strategy for the Madagascar Biodiversity Hotspot.[7] Stakeholders in Madagascar see a national biodiversity monitoring program not only as a reporting requirement, but also as a means to track the conservation progress at multiple levels, conceptualize trends, and develop responsive actions for biodiversity management. It is recognized that a successful monitoring program will require coordinated efforts between many partner organizations.

The objective of the March 2004 meeting was to reach agreement on the key elements of a monitoring program applicable at local, regional, and international levels, which will provide data to local communities, and support implementation of national and international agreements such as the National Environmental Action Plan (PNAE), the Durban Vision (involving a tripling of Madagascar's protected areas), CITES, RAMSAR and CBD[8]. To achieve this, the workshop reviewed biodiversity-monitoring needs, proposed revisions and enhancements of existing efforts to monitor the status of biodiversity, and initiated the development of an action plan for biodiversity monitoring. The set of global-level indicators agreed at COP-7 (Decision VII/30 and "CBD 2010 indicators") were used to help select scalable indicators that could contribute to monitoring efforts from local to global levels.

Key elements of the initiative

Prior to the selection and prioritization of national or global indicators, it was necessary to identify current monitoring initiatives in Madagascar, acknowledge gaps in capacity and information, and outline needs and interests of institutions working in the country. This background information provided participants with the necessary knowledge and tools to select indicators that would provide the best set of biodiversity status data for the region and to identify and prioritize action needed for biodiversity monitoring. The participants were then introduced to the current set of national and global indicators.

The national set of environmental indicators was refined in early 2004 through a collaborative effort led by the government to monitor biological, social, economic, and political indicators, as well as some indicators of threat. Through review of these indicators, it was acknowledged that several of the CBD 2010 indicators were not included in the national efforts, but could easily be incorporated to complement the current national set.

[6] A complete list of participants will be included on the poster.
[7] The 25 biodiversity hotspots (soon to be 32) contain 44% of all plant species and 35% of all terrestrial vertebrate species in only 1.4% of the planet's land area. To qualify as a hotspot, a region must support 1500 endemic plant species (0.5% of the global total) and have less than 30% of its "original" habitat remaining.
[8] The workshop report will be made available at SBSTTA-10.

Through discussions, working groups and interactive sessions, participants also identified further indicators necessary for collecting additional information needs on the status and threats to biodiversity. Examples of additional indicators that need to be developed include: species inbreeding, species illness, tourism, management plans and intervention capacities. Because the final list of indicators was quite extensive, participants engaged in a prioritization exercise looking at indicator feasibility and information value. The prioritized indicators, as well as the national set and CBD 2010 indicators, were then integrated into new joint workplans for all stakeholders, which identify who is responsible for monitoring, frequency of data collection and reporting, and predicted budget. Indicators that were identified as beneficial for monitoring efforts at local, national and international levels include[9]:

5. Percent change in the number of threatened species in each category of the IUCN Red List, number of species for which conservation status has improved, and number of extinct species *(CBD focal area: status and trends of the components of biological diversity)*
6. Change in protected area coverage *(CBD focal area: status and trends of the components of biological diversity)*
7. Nitrogen deposit (CBD focal area: threats to biodiversity)
8. Trophic index: marine and terrestrial *(CBD focal area: ecosystem integrity and ecosystem goods and services)*
9. Change in coral reef coverage *(CBD focal area: status and trends of the components of biological diversity)*
10. Human development indicator *(CBD focal area: status and trends of the components of biological diversity)*
11. Illiteracy and education indicator *(CBD focal area: status and trends of the components of biological diversity)*

A key outcome of these discussions was support for the revival of CORE (Comité d'Orientation de la Recherche Environnementale), a steering committee designed to mitigate the challenges associated with the validation and distribution of data. This committee will be essential to ensuring the quality and dissemination of data collected through the monitoring of biodiversity indicators.

Factors for success: lessons learned and next steps

Clearly described indicators are a prerequisite for coordinated implementation of a monitoring program. Without detailed descriptions of stakeholder expectations and information needs, participating institutions are often unclear on how to proceed with the monitoring efforts, and results may not be comparable across regions due to different methods or analyses used. Therefore, the consortium of workshop participants identified responsible institutions and developed workplans for the description of indicators not previously described. In addition, they updated national indicators through the integration of global level indicators, such as those of CBD, into national level indicators, such as PNAE. In addition, ONE was named as the lead information institution and also agreed to act as a link between the government and NGOs collaborating on the monitoring initiative.

Workshop participants are continuing to refine workplans and further develop budgets. Major needs over the next few years will be securing funds for the sustainability of monitoring indicators (training, staff time, data collection, analysis) and ensuring a continued collaboration between local and international NGOs, donors, government, private sector, etc., to provide data on the status of biodiversity that is relevant at the local, national and international scale.

[9] A complete list of indicators will be available at SBSTTA-10

THE GLOBAL BIODIVERSITY INFORMATION FACILITY

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Keywords: Biodiversity data digitization, free and open access, conservation planning, decision-making, research

The Global Biodiversity Information Facility (GBIF) currently makes over 45 million data records (see http://www.gbif.net) of species-occurrence and names data available for use. This number will continue to grow as more natural history museums, culture collections and other data providers digitize their data. These data are being provided by 95 institutions or organizations in 27 countries, and these numbers are steadily increasing (see Figure 1).

By making biodiversity data openly and freely available via the Internet, GBIF is facilitating the sharing of data with the countries of origin of specimens and observations of biodiversity.

The data made accessible by GBIF, combined with other sources of information, can be used in the generation of benchmarks for measuring the rate of biodiversity loss. In addition to contributing to the 2010 Initiative, GBIF data are useful to the Global Strategy for Plant Conservation and other science-based policies.

GBIF is also promoting development of open-source analytical tools that can be applied to the data. With these tools, GBIF data can be used to, for example:

- predict areas in which populations of endangered species might be found, beyond those already known;
- predict the introduction and spread of invasive species;
- study and understand the spread of emerging and other diseases (see Figure 2);
- in regulatory decision-making, for example in permitting or not permitting GM crops (see Figure 3); and
- in conservation planning (see Figure 4).

By coordinating efforts around the world to develop standards for data and metadata, GBIF is enabling data-mining and scientific research, and supporting the Global Taxonomic Initiative and other activities of the Convention on Biological Diversity, as well as decision-making by national governments.

GBIF provides biodiversity data that are fundamentally important both to science and to governance that will lead to a sustainable future.

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Figure 1.

Growth of the GBIF data network, October 2003 to December 2004 (source: GBIF Secretariat).

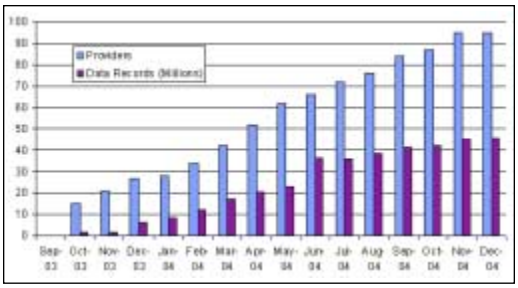


Figure 2.

GBIF data can be used to predict the spread of emergent diseases (source: CDC and USGS, U.S.A.).

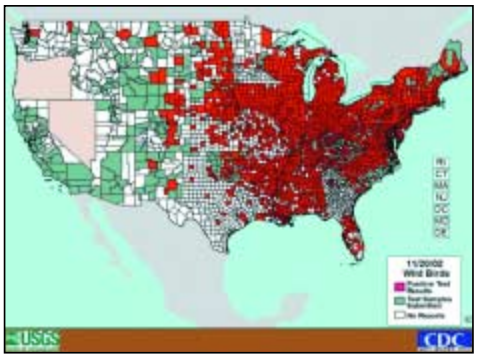


Figure 3.

GBIF data can be used in science-based regulatory decisions (source: CONABIO, Mexico).

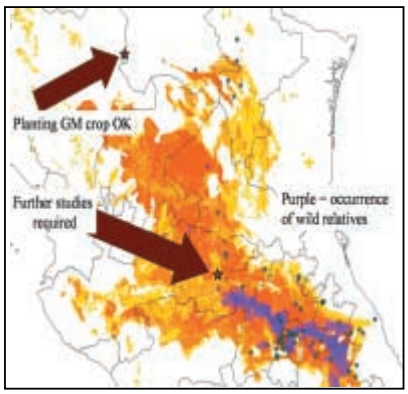
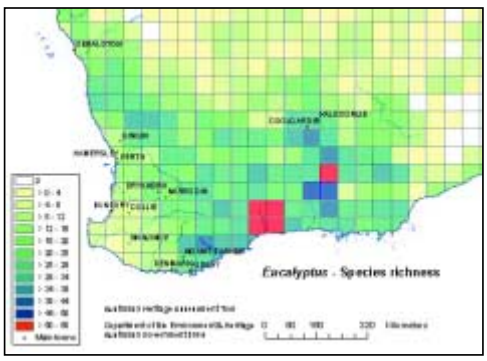


Figure 4.

GBIF promotes the development of user-friendly tools for conservation planning (source: Australian Biological Resources Study)



THE TROPICAL ECOLOGY ASSESSMENT AND MONITORING (TEAM) INITIATIVE: UNDERSTANDING THE FUTURE OF BIODIVERSITY THROUGH A GLOBAL SCIENTIFIC NETWORK

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Keywords: forest biodiversity, global change, indicators

Introduction

The importance of tracking environmental indicators to gauge the condition of the Earth's beleaguered ecosystems is now widely acknowledged as a necessary component of creating sound, science-based environmental conservation policies. An important result of the Convention on Biological Diversity was the declaration that repeated monitoring is needed to track indicators of biodiversity at multiple scales, including trends in selected species populations, communities, and ecosystem functions. Biological monitoring fulfills multiple functions: to assess progress being made towards specific goals of the CBD, and to quantify and abate the ongoing process of rapid biodiversity loss due to global change.

Responding to the need for a coordinated network for biodiversity monitoring, the Tropical Ecology Assessment and Monitoring (TEAM) Initiative was formed in 2002, with a grant from the Gordon and Betty Moore Foundation to Conservation International. TEAM's mission, focused in tropical forest ecosystems, is to monitor long-term trends in biodiversity through a global network of tropical field stations, providing an early warning system on the status of biodiversity that can effectively guide conservation actions. TEAM Initiative ultimately aims to track how ecosystem processes may be altered, and species assemblages may undergo changes, range shifts, phenological shifts, and extinctions, all believed to be possible effects of global change on biodiversity .

Network of field stations

Conducting conservation research from field research facilities elevates the visibility and protection of the protected area. The field stations serve as foci for in-country professionals dedicated to biodiversity conservation, and the TEAM project at any given site provides a base for scientific and conservation capacity building and environmental education efforts. Currently the network is focused in the Neotropics, with future plans for expansion to the Paleotropics. The Neotropical regions in which TEAM sites are located include areas designated as biodiversity hotspots and tropical wilderness areas . These include the Amazon Tropical Wilderness area, the Mesoamerican Hotspot, the Tropical Andes Hotspot, and the Atlantic Forest Hotspot.

Standardized protocols

Standardized protocols to monitor indicator variables are the key mechanism by which TEAM systematically gathers data that can be compared across sites and regions. TEAM Network participants use a 1 km2 permanent plot design, called the Integrated Monitoring Array (Figure 1) to assess and monitor several climatic variables, soils, ecosystem processes such as biomass change and phenology, as well as community composition of trees, large terrestrial vertebrates, birds, primates, ants, arboreal acoustic insects, and butterflies. Additionally, the use of satellite imagery allows monitoring of landscape change at large spatial scales. Comparable

monitoring data will empower the conservation science community to conduct collaborative analyses to detect trends in species assemblages and critical ecosystem processes over time; to make comparisons of trends within and among different regions; and to detect correlations of patterns and trends in climatic, biotic, and physical variables.

Data management and data sharing

Data archiving and management are crucial considerations in a global network that is dependent on standardized data . The effectiveness of an early-warning system requires standardized metadata to ensure the longevity and utility of the data, as descriptions of datasets are crucial to interpreting the data . Furthermore, the success of the TEAM Initiative relies on the conviction of participating scientists that global collaboration will provide a powerful means to answer conservation science's most pressing questions. Thus, all TEAM participants are committed to a policy of data sharing and public access to data.

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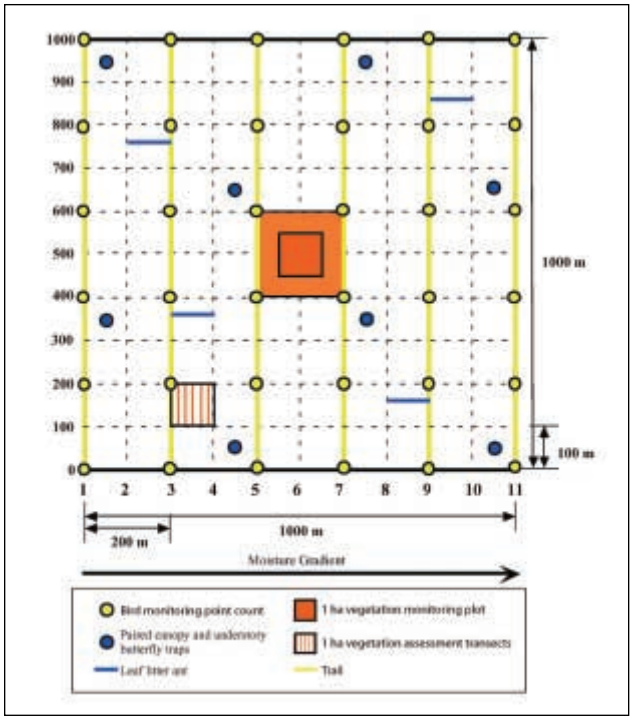
Figure 1.

TEAM Integrated Monitoring Array (IMA)



THE FAO COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE: MAINSTREAMING BIODIVERSITY FOR FOOD SECURITY

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Keywords: United Nations intergovernmental forum, genetic resources, food security, agriculture.

Biodiversity: our food supply depends on it

In our "globalizing world", the critical importance and value of biodiversity in agriculture, forestry and fisheries becomes ever clearer. But population pressure, climatic change, and evolving production systems are putting ecosystems and genetic resources at risk, and poses great challenges to food security, socio-economic stability and the environment. Facing these challenges will require the adaptation of, and innovation in, agricultural production and the wise management of agro-ecosystems.

Genetic resources and biodiversity for food and agriculture and the ways in which these are managed by farmers and others are an invaluable resource and the basis to meet the end of hunger. At the dawn of the new millennium, the international community needs to build consensus on how to apply science, technology and knowledge to genetic resources for food and agriculture, including through complementarity with local ecological knowledge systems and farmer technologies, for the benefit of all humanity. Our growing dependency on biodiversity requires increasing international cooperation and coherent policy. FAO is the main world forum for actions to bring biodiversity and food security together.

The FAO Commission on Genetic Resources for Food and Agriculture

The Commission was the first inter-governmental body dedicated to the conservation and sustainable use of genetic resources, and remains the only such body dealing specifically with biodiversity for food and agriculture. It has 166 Member countries. Observers attend from inter-governmental, civil society and industry organizations.

By its Statutes, the Commission has a coordinating role and advises FAO on its sectorial and cross-sectorial policy, programmes and activities related to genetic resources of relevance to food and agriculture, and the equitable benefit-sharing. It has established so far two subsidiary Intergovernmental Technical Working Groups, on Plant Genetic Resources, and on Animal Genetic Resources.

The Commission's first focus was on plant genetic resources. In 1983, the FAO Conference adopted the International Undertaking on Plant Genetic Resources for Food and Agriculture, and decided to establish the Commission. By 1991, the Commission had negotiated the agreed interpretation of the Undertaking, which included an FAO resolution on Farmers' Rights, the first international recognition of local communities contribution to developing the biodiversity that feeds the world. In 1995, the FAO Conference broadened the Commission's mandate to cover all components of biodiversity of relevance to food and agriculture. During the mid-nineties, the Commission decided to give priority to the negotiations that led to the adoption, at the 2001 FAO Conference, of the International Treaty on Plant Genetic Resources for Food and Agriculture, but in 1998, the Commission initiated systematic work on animal genetic resources.

Future work and milestones to mainstream biodiversity in food and agriculture: the Multi-year Programme of Work of the Commission

The Commission's Tenth Regular Session in 2004 marked its twentieth anniversary. Member countries reflected on its past achievements in order to lay the basis for its future activities, and to plan for its future work. The Commission decided to establish a Multi-year Programme of Work, including to contribute to the achievement of the Millennium Development Goals, especially to the eradication of extreme poverty and hunger, and to ensure environmental sustainability. The Multi-Year Programme of Work of the Commission will include:

Assessments
The Commission is guiding the preparation of the first *State of the World's Animal Genetic Resources* and the second *State of the World's Plant Genetic Resources*. These country-driven assessments identify gaps and constraints in national and international efforts to safeguard and use plant and animal genetic resources, to ensure food security and the sustainability of agriculture. Some 165 countries have already contributed with countries reports to the *State of World's Animal Genetic Resources.*

The Commission has also requested FAO to review status and needs of other relevant sectors of genetic resources, including the cross-sectoral matters and other areas of biodiversity for food and agriculture, such as the agro-ecosystem approach, as basis for future action.

Priority setting and mobilization of financial resources
The Commission recommends priorities in relation to genetic resources for food and agriculture and promotes coordination efforts to fill identified gaps, overcome constraints and face emergency situations. The Commission facilitates and monitors the implementation of the *Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture*, which was adopted in 1996 by 150 countries at the Leipzig Conference. The Plan comprises twenty priority activity areas, covering in situ and ex situ conservation, plant genetic resources utilization, and institution and capacity building. It is a supporting component of the International Treaty.

The Commission is developing *Strategic Priorities for Action on Animal Genetic Resources*, to be adopted with the first *State of the World's* at the first International Conference on Animal Genetic Resources in 2007.

Negotiation of international agreements, guidelines and codes of conduct
The Commission aims to reach international consensus on areas of global interest, and has accordingly negotiated a number of international agreements, codes of conduct and scientific standards.

The International Treaty on Plant Genetic Resources is perhaps the greatest achievement of the Commission. It is a legally binding agreement for the conservation and sustainable use of plant genetic resources for food and agriculture, and the fair and equitable sharing of benefits arising out of their use, in harmony with the CBD, for food security and sustainable agriculture. It has entered into force in June 2004, the first meeting of its Governing Body is planned for 2005/2006. In establishing its multi-year programme of work, priority is given to the Commission's support to the implementation of the International Treaty. The Commission is negotiating other instruments, such as the Code of Conduct on Biotechnology as it Relates to Genetic Resources for Food and Agriculture, to maximize the positive effects and minimize the negative risks of biotechnologies.

Cooperation with other international organizations and enhancing partnerships
The Commission facilitates and oversees cooperation between FAO and other international governmental and non-governmental bodies dealing with genetic resources, in particular with the Convention on Biological Diversity, the World Intellectual Property Organization and the Consultative Group on International Agricultural Research Centres. It develops appropriate mechanisms for cooperation and coordination in consultation with such bodies.

THE RED LIST INDEX: MEASURING GLOBAL TRENDS IN THE THREAT STATUS OF BIODIVERSITY

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Keywords: IUCN Red List, extinction risk, indicator, 2010 target, birds, amphibians

SUMMARY

- Red List Indices (RLIs) illustrate the relative rate at which sets of species change in overall threat status (i.e. projected relative extinction risk), based on population and range size and trends as quantified by categories on the IUCN Red List.
- RLIs are based on the number of species in each IUCN Red List category, and the number changing categories between assessments as a result of genuine improvement or deterioration in status.
- RLIs show a fairly coarse level of resolution, but for fully assessed taxonomic groups they are highly representative, being based on information from a high proportion of species worldwide.
- The RLI for the world's birds shows that that their overall threat status has deteriorated steadily during 1988–2004. A preliminary RLI for amphibians for 1980–2004 shows similar rates of decline.
- By 2010, RLIs will be available for at least mammals, birds, amphibians and cycads, plus first assessments for reptiles, fish, freshwater mollusks and legumes.
- A sampled RLI is also being developed, based on a stratified sample of species from a broad suite of major taxonomic groups, realms and ecosystems. This will provide trends in extinction risk more representative of all biodiversity.

How are Red List Indices calculated?

1) For species assessed in two consecutive assessments, the total numbers of species in each Red List category in the earlier assessment (excluding Data Deficient, Extinct and Possibly Extinct) are multiplied by a category weight (NT=1, VU=2, EN=3, CR=4, EW=5)[10], and these are summed to give a total score for the assessment. (2) Over the time period between assessments the net number of genuine changes (losses and gains) in each category is calculated, multiplied by the category weight and summed to give the % change in the total score. (3) The index value of the previous assessment (set to 100 for the first assessment: 1988 for birds and 1980 for amphibians) is then scaled up or down by this % change to give the new value (Butchart *et al.* 2004). Error bars show the estimated degree of error associated with the most recent index value owing to time-lags before genuine status changes are detected. For amphibians, categories for 1980 were retrospectively assigned by considering information on the spread of disease, habitat degradation and loss, the introduction of alien invasive species and population trends. A conservative approach was adopted, and category changes were only recorded as having taken place when the evidence was considered to be strong (Butchart *et al.* 2005).

[10] NT: Not Threatened; VU: Vulnerable; EN: Endangered; CR: Critically Endangered; EW: Extinct in the Wild.

The Red List Index for the world's birds

The RLI for birds shows that there has been a steady and continuing deterioration in the threat status (projected extinction risk) of the world's birds between 1988 and 2004, with an overall change in the index value of -6.90% over this period (Fig. 1, Butchart *et al.* 2004). This is equivalent to about 10% of species (in categories NT to CR) deteriorating in status sufficiently to be uplisted one category between 1988 and 2004. Disaggregating the RLI shows that the threat status of birds has deteriorated worldwide with a more-or-less similar rate and proportional extent in most biogeographic realms (Fig. 2). The Indomalayan realm shows a steeper rate of deterioration during the 1990s, owing to the intensifying destruction of forests in the Sundaic lowlands of Indonesia, which led to many species being uplisted owing to rapid population declines. RLIs for sets of species relevant to three international treaties highlight the recent dramatic deterioration in the status of albatrosses and large petrels (Fig.3). This is closely linked to the expansion of commercial longline fisheries, which causes incidental mortality of albatrosses and other seabirds when they get caught on baited hooks and drown.

A preliminary Red List Index for the world's amphibians

A preliminary RLI for amphibians shows that their threat status has deteriorated substantially since 1980, to an extent equivalent to c.30% of species (in categories from NT to CR) being uplisted by one category (Butchart *et al.* 2005). The rate of deterioration is likely to have been underestimated because a conservative approach was adopted in identifying genuine deteriorations. Furthermore, 23% of amphibians are listed as Data Deficient, and with better information many of these may well prove have undergone serious declines through this period. Amphibians in the Australasian/Oceanic realm have shown the steepest deterioration in status, followed by those in the Palearctic and Neotropical realms (Fig. 4). The decline in the Palearctic realm is largely driven by the increasing levels of exploitation of amphibians in China over the period, while the steep decline in the Neotropical and Australasian/Oceanic realms largely reflects the severe impacts of the fungal disease chytridiomycosis.

Interpreting RLIs in terms of the 2010 target

How can the RLI be interpreted in relation to the CBD's target of reducing the rate of loss of biodiversity by 2010? The IUCN Red List criteria are based on absolute population or range size, rates of decline in these values, or both. These criteria are used to assign species to IUCN Red List categories that can be ranked according to relative projected extinction risk, and the RLI is calculated from changes between these categories. Hence RLI values relate to the rate at which species are slipping towards extinction at particular points in time. To show that the 2010 target has been met, the RLI must therefore show a positive trend. A downward trend, even if becoming less steep, shows that the slide of species towards extinction is accelerating, not slowing down. The negative trends in the RLI values for birds and amphibians thus show that in 2004 we are losing biodiversity at an increasing rate, at least as far as these groups are concerned.

Strengths and weaknesses of RLIs

RLIs are highly representative, being based on assessments of a high proportion of species in a taxonomic group across the world including those that are rare, localized, or difficult to survey. However, RLIs show fairly coarse temporal resolution of status changes because of the broad nature of Red List categories. The size, trend or distribution of populations may have to undergo quite substantial changes before crossing the criteria thresholds to qualify for a higher or lower IUCN Red List category, and hence before changing the RLI value. For these reasons, RLIs complement population trend-based indices: the former are derived from (potentially) cruder data that can be collected for nearly all species in a taxonomic group, the latter are based on much more

detailed information that can only be collected for a small (and often biased) subset of species. Time-lags owing to delays before status changes are detected or become known to assessors are a small and decreasing problem for birds. The uncertainty they give to the 2004 RLI value is 0.21–0.37%: a small and acceptable margin of error.

What indicators will be available by 2010?

The taxonomic coverage of the IUCN Red List is rapidly expanding. By 2010, RLIs will be available for at least birds, amphibians, mammals and cycads. First assessments will be available for all reptiles, fish, freshwater molluscs and legumes.

A sampled RLI

Regularly repeated complete assessments are currently only possible for better-known species groups. To address this, a sampled RLI is being developed based on a stratified sample of species from a broad suite of major taxonomic groups, including mammals, birds, reptiles, amphibians, fish, insects, spiders, crustaceans, molluscs, plants, algae and fungi. Species will be representative of all biogeographic realms and ecosystems. It is intended that preliminary results will be available by 2010. This will provide a global index of extinction risk which will be more representative of all biodiversity.

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Further information: www.iucnredlist.org, www.globalamphibians.org and www.birdlife.org

Figure 1.

RLI for the world's birds

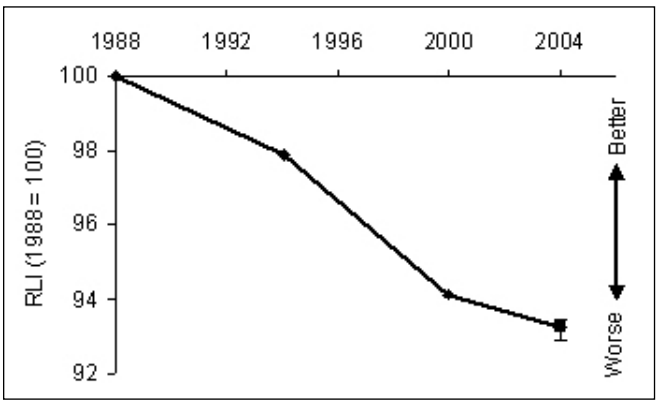


Figure 2.

RLI for birds in different biogeographic realms

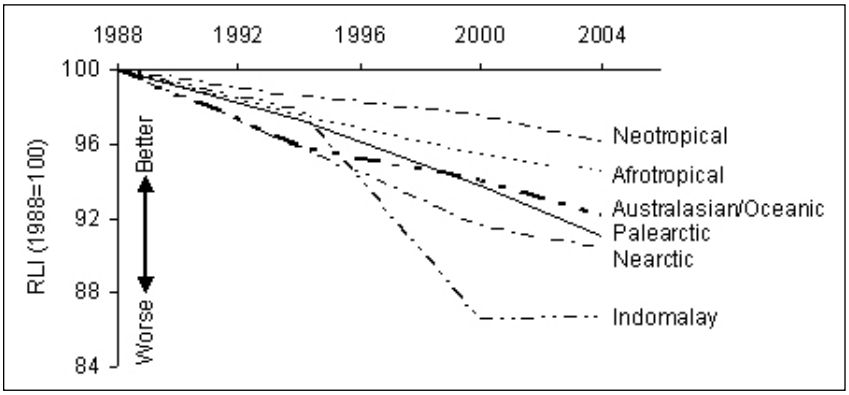


Figure 3.

RLI for birds covered by three international treaties

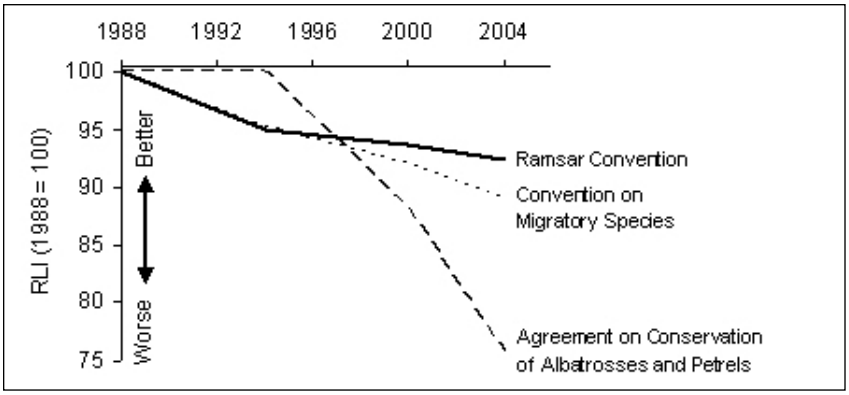
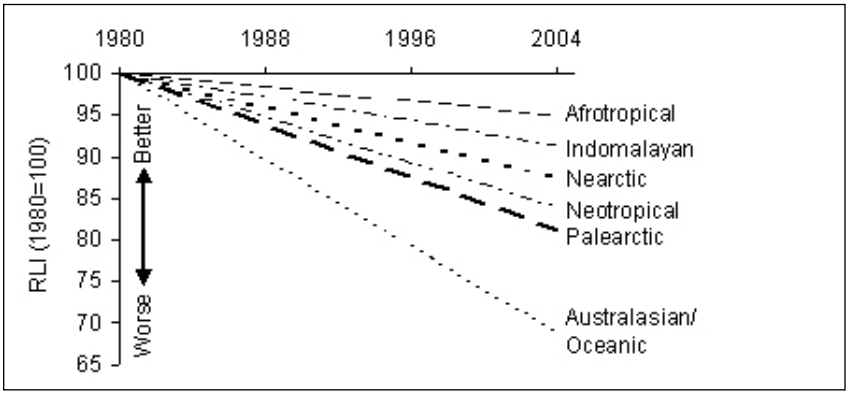


Figure 4.

Preliminary RLI for amphibians in different biogeographic realms



TOWARDS REGIONAL/INTERNATIONAL MANAGEMENT OF THE WHALE SHARK

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Keywords: Whale sharks, Rhincodon typus, marine and coastal biodiversity, sustainable use, ecotourism.

Introduction

The whale shark *(Rhincodon typus)* has been shown to have an extensive migratory range. Although protected in some regions of the Indian Ocean this wide ranging habit, coupled with late maturation and low fecundity, makes these sharks vulnerable to targeted fisheries (Norman, 2002).

The Marine Conservation Society, Seychelles (MCSS) has been monitoring the occurrence and relative abundance of whale sharks to ascertain their ecology and to elaborate the extent of their migrations. This generates information to allow better conservation and management of the species and thereby reduce biodiversity loss, at the same time as guiding the wise development of sustainable use of the species.

Addressing Biodiversity Loss: An Ecosystem Approach

In order to ascertain the ecology of whale sharks around Seychelles, the MCSS has been monitoring the occurrence and relative abundance of the sharks around Mahe island and also the ecosystem and habitats the sharks are found in. For the last four years a variety of methodologies have been utilized including daily synoptic aerial surveys, to define distribution patterns throughout the months of peak whale shark numbers, and in water identification and tagging studies, to elucidate localized patterns of recruitment and migration (Rowat and Talma, 2004).

Their ecosystem has been monitored both directly, by regular plankton surveys to evaluate the amount and type of potential food organisms in the area, and remotely by Advanced Very High Resolution Radar (AVHRR) satellite imagery to give corroborative data on regional plankton density and sea surface temperature. Their immediate habitat has also been sampled by "Pop-off Archival" satellite tags attached to five sharks recording depth and water temperature relative to time; these data have provided information about the environment that the sharks inhabit and the ranges most frequented.

Additional information about their movements around Seychelles, outside of the direct study area, was generated by a national information network set up by a public meeting of stakeholders. To further elaborate the extent of their habitat and thus the range of their migrations, the sharks were also tracked by the deployment of position locating Argos system satellite tags that allowed the monitoring of the sharks out of the coastal study zone and away from Seychelles territorial waters.

Progress Achieved In Reducing The Rate Of Biodiversity Loss

Based on data collected the species has been protected by Government decree within Seychelles territorial waters. Complementary to this a code of conduct has been developed through a public stakeholder driven process that has enabled the informed development of an eco-tourism industry, based on the sustainable use of the species. The income from these eco-tourism activities is directly contributing to the costs of continued monitoring as well as imbuing real worth to the living shark.

In other regions their utility as a surface indicator for the presence of pelagic tuna has been well documented (Matsunaga, 2003) and similarly increases the worth of the live shark to local communities by making pelagic tuna available to demersal fishers. A similar project has been formulated by MCSS and endorsed by Seychelles Government, based upon cooperative work by MCSS and the *Institut de recherche pour le développement* (IRD) utilizing data on whale shark occurrence from the pelagic tuna fleets.

The long range tracking data from the satellite tags and data from the pelagic tuna fleet have emphasized the need for additional data on the status of these sharks throughout their range states, which is markedly lacking. In consequence MCSS conducted an outreach programme contacting interested individuals and organizations in the Indian Ocean and South East Asian region and an informal network has been set up to share information to enhance the conservation status of the species. Similarly, the available information has encouraged the Government of Seychelles to support moves for a more formal approach to conservation and collaborative research on whale sharks under the auspices of the Convention on Migratory Species, to which Seychelles acceded in October 2004.

Discussion on Findings and Trends

Ecosystem monitoring has shown spatial and temporal distribution patterns that appear to be influenced by oceanographic and meteorological factors controlling zooplankton production and location. In-water resightings confirm that the sharks can spend up to 60 days in the coastal waters prior to moving away; inter-annual resightings of 14 to 23% of sharks tagged confirms a high degree of site fidelity. Aerial sighting data showed that there were areas where sharks were regularly found, however, occurrence in these areas varied from one year to the next and comparison of monthly data indicated a movement of sharks between areas.

Correlations of sightings with meteorological data indicate that shark occurrence is apparently influenced both by wind-speed and barometric pressure. However, it is most likely that the primary factor is the cumulative effect of both meteorological and oceanographic factors, particularly upwellings that influence the production and location of zooplankton blooms and the abundance of Lucifer shrimps and Chaetognaths. Data gathered from Pop-Off Archival Tags showed that overall the sharks spend 89% of their time in water of from 25-35°C and 92% of the time in water shallower than 50 metres, (figure 1). This agrees with previously reported findings, (Eckert, 2001 and Heyman, 2001). However, a number of deeper dives were noted in excess of 300 metres with the deepest dive being over 1000 metres.

Data from the Argos location satellite tags confirms that the animal do in fact move considerable distances away from Seychelles: 3 sharks were tracked to the coast of Thailand, Somalia and Zanzibar respectively.

The surface swimming and benign nature of these sharks makes them accessible and thus a potential resource for non-consumptive sustainable utilization, which would imbue value to local communities. Unfortunately, these same surface loving habits make them very vulnerable to targeted fisheries. This is particularly of concern in a species with such a wide range, late maturation and low fecundity. There is an urgent need to continue current monitoring activities and encourage additional research throughout their range states. This would allow a more informed regional approach to their conservation and management with an agreement such as is being suggested under the Convention on Migratory Species.

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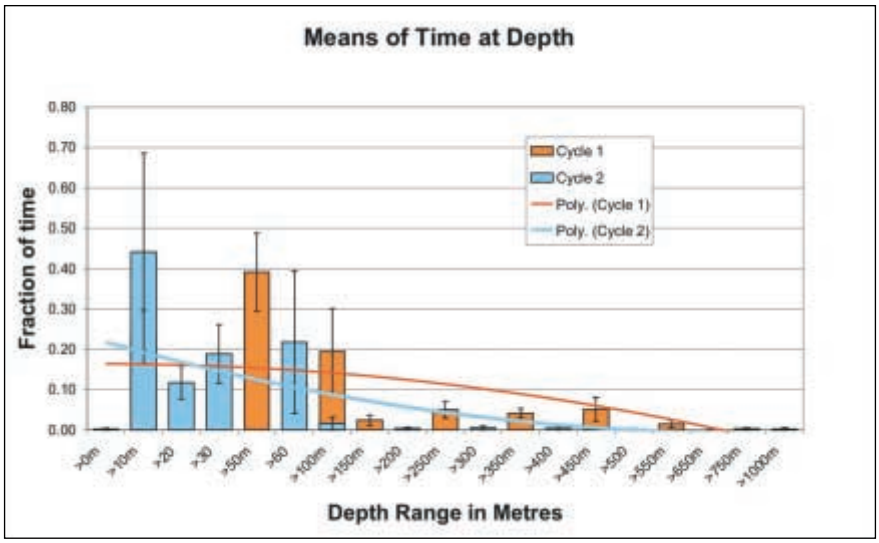
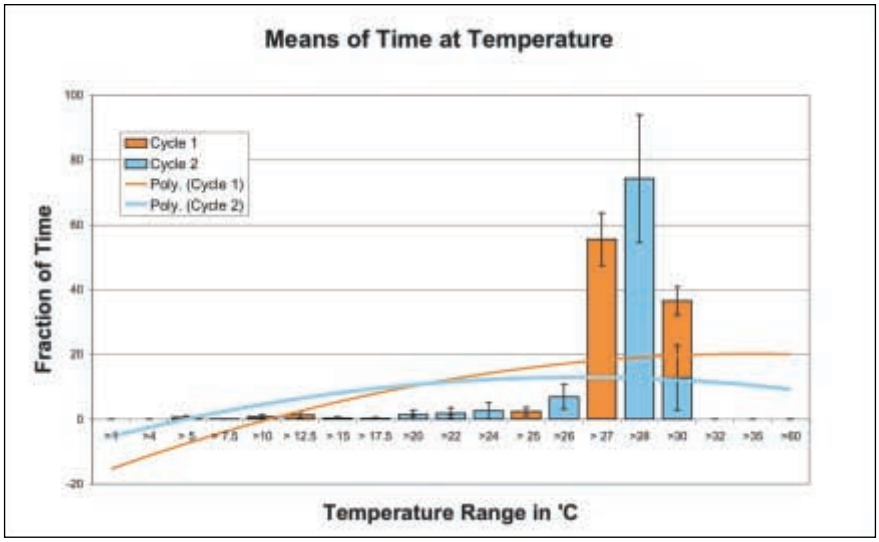
Figure 1.

Means of time at depth and time at temperature from both study cycles showing standard error and polynomial trend line.





COMMON BIRD INDICATORS CAN HELP TRACK PROGRESS TOWARDS THE 2010 TARGET

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Keywords: indicators, common birds, biodiversity, populations, farmland

Common bird indicators

- Common bird indicators show the average **trends in abundance of a selected set of species**. They are especially useful in showing change in the overall condition of ecosystems, which is difficult and expensive to measure directly.
- Using birds has many advantages: **excellent data**, based on the volunteer efforts of skilled birdwatchers; a stable **taxonomy**; a thorough knowledge of **ecology and behaviour; meaningful responses** to environmental change, and **great resonance** and symbolic value with the public and decision-makers.
- Bird populations integrate a set of environmental changes, because they are mobile and often wide-ranging. Bird numbers also respond more slowly than those of smaller organisms, and at a larger spatial scale.
- Common bird indicators can help measure progress towards reducing the rate of biodiversity loss at the **national, regional** and **global** levels.

National example: The UK common bird indicator turning science into policy

The UK common bird indicator, which is based on population trends of common breeding birds, has been adopted by the UK Government as one of 15 headline indicators of the sustainability of lifestyles in the UK. It shows that common birds have increased by 10% on average, while woodland and farmland birds have fallen by 15% and 42% respectively, from 1970 to 2002 (Fig. 1). The UK Government has adopted a Public Service Agreement to "reverse the long-term decline in the number of farmland birds by 2020". UK land-use policy is now coupling agricultural production with the needs of maintaining and restoring biodiversity.

Regional example: The Pan-European common bird indicator: a structural indicator for Europe

The Pan-European common bird indicator shows average population trends of a suite of common breeding birds across 18 European countries. Data are collected by through national annual breeding bird surveys conducted by skilled volunteers. National species' indices are weighted by national species population sizes; regional indicators calculated by averaging the resulting indices. They show that common farmland birds in Europe have declined steeply over the last two decades, whereas common woodland birds have not (Fig. 2). The farmland bird index has been formally adopted by the European Union as a long-list Structural Indicator for Europe. A number of studies show that bird populations are good surrogates for trends in other farmland biodiversity.

Why have farmland birds declined both in the UK and across Europe?

Compelling evidence shows that recent farmland bird declines in north and west Europe have been driven by changes in agricultural methods and specialization. The most important changes affecting birds have been hedgerow loss, land drainage, increased mechanization, increased fertilizer and pesticide use, reduction of spring cultivation, simplification of crop rotations, changes in crop use, and loss of farm diversity. This hypothesis is supported by a contrast in population trends in EU and EU Accession countries (Fig. 3). In Accession countries, farmland birds showed signs of recovery from 1990, as the former Eastern Bloc broke up and agricultural intensity was reduced. There has been no similar recovery of farmland birds in the EU, where intensification has continued (Gregory *et al.* in press).

Global examples: scaling up common bird indicators

Data from common bird indicators can feed through to, and help improve, global indicators based on species' population trends, such as the Living Planet Index. The scope of common bird indicators could be expanded in three ways:

- Methods used in Europe can readily be applied in **other regions** with similar data sets, such as North America and Australia. Recent analysis of trend data in the USA, for example, has shown severe declines in grassland birds, but a mixed picture in other habitats.
- Indicators are under development for **species groups** that have been counted in many countries for many years, such as waterbirds (led by Wetlands International), seabirds and birds of prey.
- Thousands of birdwatchers around the world make **bird lists**, which can provide an index of species abundance changes. Such lists are now being captured through web-based systems in a number of countries: see www.worldbirds.org.

Conclusions

- Common bird indicators complement other biodiversity indicators.
- Strengths include statistical robustness, relative simplicity, efficient use of existing data, sensitivity to environmental change, ease of communication, and ease of update.
- These indicators are very cost-effective. However, the data-collection networks need a long-term commitment of resources for co-ordination and support.

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For further information, see: www.birdlife.org, www.rspb.org.uk and www.ebcc.info

Figure 1.

The UK Common bird indicator shows large declines in common farmland and woodland birds since 1970

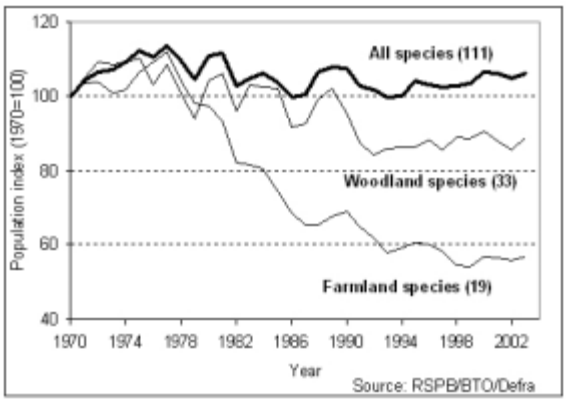


Figure 2.

The Pan-European common bird indicator shows that common farmland birds in Europe have declined steeply over the last two decades, while common woodland birds have not

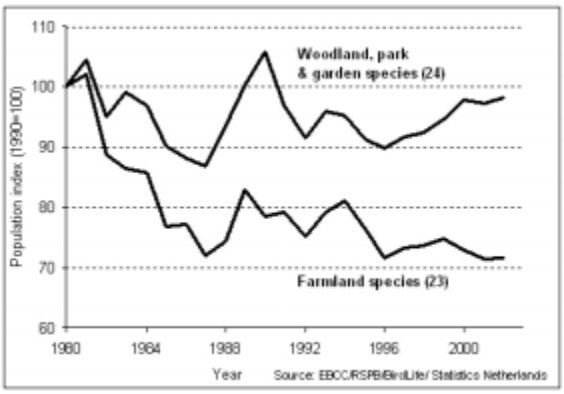
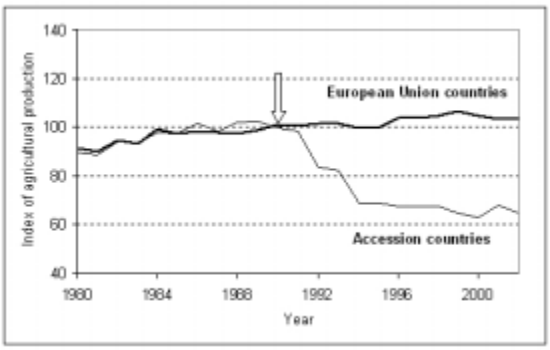
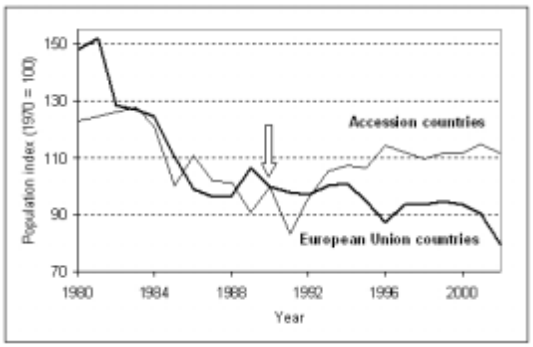


Figure 3.

Farmland birds in EU Accession countries have recovered since 1990 as agricultural production has declined.





INDICATORS OF CROP BIODIVERSITY

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Keywords: indicators, agricultural biological diversity

Summary

In most of the studies that have been published on the decrease of crop diversity during the past century, the indicator used for evaluating diversity within a crop was the number of local varieties at the disposal of farmers in a given country or region.

Several publications of the past ten years suggest that the number of local varieties is not the most relevant indicator. In particular morphological analysis, genealogical indication and DNA markers suggest no diversity decrease during the past 50 to 70 years.

Morphological analysis of local varieties in Europe

In the early 1930s, several European countries decided to establish variety catalogues to police seed production and trade.

In the 1935 German Catalogue (German Catalogue, 1935), the number of wheat varieties dropped from 454 to 17 accepted cultivars and 54 cultivars accepted with reservation. According to the German Authorities, the decrease was mainly caused by name redundancies or absence of distinctness of local varieties in field comparison.

In 1933, the total number of varieties in the French Catalogue (Simon, 1999) was 562, including 393 landraces and derived cultivars. In 1937, after examination, the number dropped to 170, and in 1945 to 40.

In both cases the decrease of number of varieties available to farmers was not caused by a displacement of landraces by modern varieties but by the elimination of redundancies in the lists.

Genealogical indicators

In the past, selection was made by farmers in gene pools limited to what was available at the village or, at a maximum at the region level. During the 20th century the situation changed drastically and breeders have used germplasm from very diverse regions to increase the diversity of the varieties put on the market.

In France (Simon, 1999), breeders were required to give information on the parents of the varieties they wanted to have listed on the national catalogue or, after 1972, to have protected under plant breeder's rights. The number of parents used in the breeding programmes compared to the number of varieties listed was relatively stable in the years 1930s to 1960s and increased significantly in the 1970s and 1980s. In addition, the exotic germplasm represented less than one third of the parents in the 1960s but almost 50% in the 1980s.

In a more systematic approach, the genetic diversity of wheat in the United States and India, based on coefficient of parentage, was analysed (Smale, 1995).

At the turn of the 20th century, US farmers planted foreign landraces and farmers selections from those landraces, mainly from Poland and the Crimea. The average coefficient of parentage of hard red spring cultivars was around 70% in 1920. As scientific plant breeding programmes developed over the course of the century, the dominance of foreign introductions in farmers' fields diminished with an average coefficient of parentage of about 20% in the 1980s.

Indian wheat appears to have more diverse parentage than US wheat, as the Asian subcontinent was an important historical source of genetic diversity in wheat. At the beginning of the 20th century, the average coefficient of parentage among releases was about 10%. An increase was noted in the mid-1960s (green revolution), up to 20%. The increase remains at a relatively low level. The effect of the green revolution was clear when considering the weighted average coefficient of parentage of the top five cultivars. It reached a little more than 50% in the mid-1960s, but rapidly dropped to less than 30% in 1985, several new varieties being put on the market.

A more recent study (Lang and Bedö, 2004), conducted on Hungarian wheat varieties registered over the last 50 years, indicates a great increase in genetic diversity of the varieties at the disposal of farmers. This is due in particular to shorter life of top varieties with a more rapid turnover and to the development of varieties with increasingly complex pedigrees. This has resulted, as suggested by the authors, in a reduction in genetic vulnerability, while the large number of genetically diverse varieties makes it possible to respond rapidly with a change of variety in case of biotic stress or new market demands (Figure 1).

Except in the cases of "technical revolution" where few varieties are available at the beginning, the general trend during the 20th century has been a significant decrease of the coefficient of parentage, due to the use of more diverse parents. Constraints on use of germplasm and international flows, however, could contribute to increases in the similarity of parentage of releases in the future.

Molecular markers

More recently molecular markers such as Restriction Fragment Length Polymorphism (RFLP), Randomly Amplified Polymorphic DNA (RAPD), Amplified Fragment Length Polymorphism (AFLP), microsatellites and now Single Nucleotide Polymorphisms (SNPs), have been used to analyse crop diversity.

A study was made in the United Kingdom on varieties listed in the recommended list since 1920 for spring barley, since 1930 for wheat and since 1973 for oilseed rape (Law, 1998). The conclusions of the study are: "The data from this project demonstrate that modern plant breeding, Plant Breeder's Rights (introduced in the United Kingdom in the 1960s) and the "Recommended List" systems that deliver varieties to farmers have not resulted in any statistically significant narrowing of overall levels of genetic diversity in the UK crops over the past 60 to 70 years". The analysis of the two graphs clearly shows that at some period (e.g. the 1970s) there was a narrow range of diversity in varieties available to farmers. The shifts have been driven by changes in husbandry techniques and plant ideotype that have occurred over this period; for instance move to semi-dwarf habits in wheat, to erucic-free rapeseed. However, after such narrowing or shifts, new diversity is rapidly added after a narrowing period (Figures 2 and 3) (results consistent with the above-mentioned analysis on wheat in India).

More recently (Reeves, 2004), a study was conducted in the European Commission Framework 5, on the evolution of genetic diversity in four major European crops, barley, maize, potato and wheat over the latter half of the 20th century using various DNA markers. The main conclusions of the study are as follows: "Barley genetic diversity was quantitatively unchanged over the time period in question with more diversity found amongst varieties actively in commerce. Similarly wheat genetic diversity was greatest in varieties actively in commerce and an overall increase in diversity over time was noted. An initial increase in German maize genetic diversity was identified followed by a subsequent decrease. French maize genetic diversity showed

qualitative rather than quantitative changes and no overall reduction was found. Potato genetic diversity was found not to decrease; indeed a slight increase was found when measured by Nucleotide Biding Site profiling".

Similarly, samples of cultivated wheat collected in intervals of 40 to 50 years in four comparable regions of Europe and Asia were analysed using microsatellite markers (Börner, 2004). The material was originated from Albania, Austria, Nepal and North India. For the total number of year-specific alleles detected, there was no clear tendency, with numbers slightly higher for the early missions in Albania and Nepal, but slightly lower for Austria and India. At the single locus level and applying the U-test, no significant differences were detected both in number of alleles per locus and in the mean PIC values, comparing the material of the repeated collection missions in all four regions.

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Figure 1.

Weighted diversity (calculated from COP, number of varieties and market share of varieties; range 0 to 1) in the Hungarian wheat production

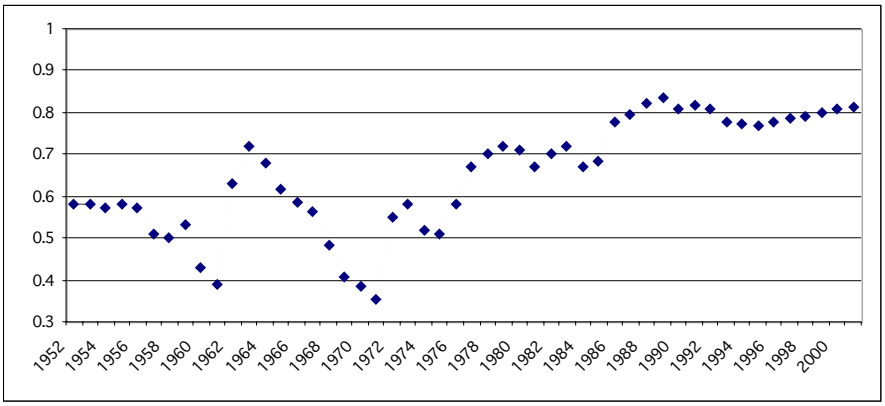


Figure 2.

PCO analysis of the AFLP data for the major wheat cultivars grown in the UK from 1934-1994. The convex hulls represent the extremes of the cultivars from each decadal period, indicated by D5 (=1950s) etc. For clarity, only the convex hull for the 1990s wheat cultivars is shown, along with that of the world wheats (W).

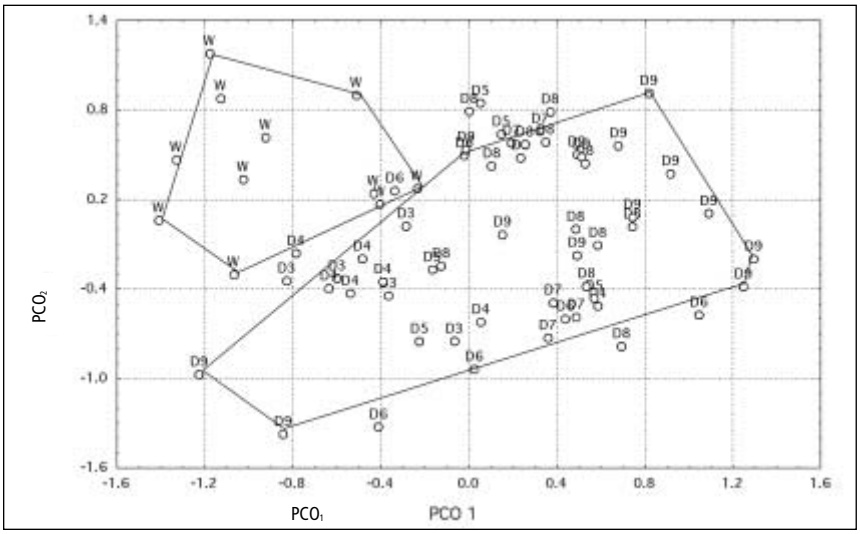
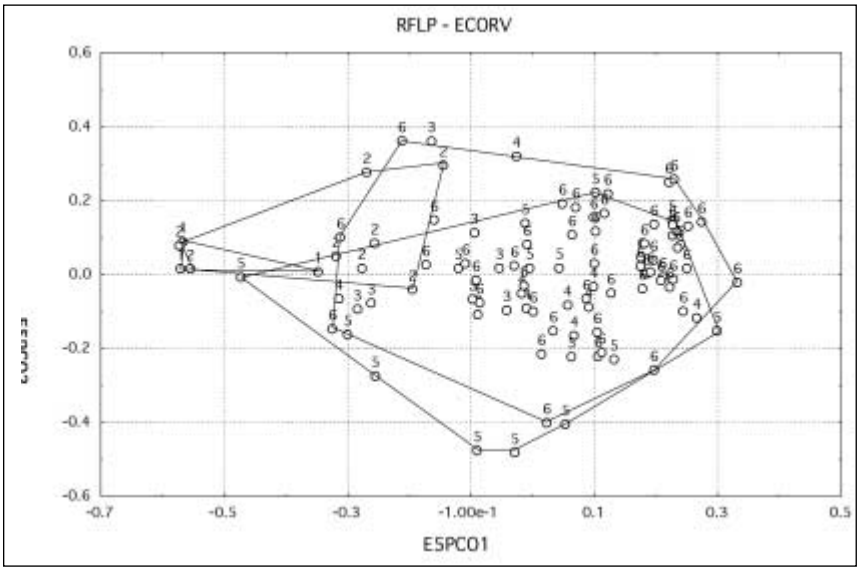


Figure 3.

Range of genetic diversity available in commercial Oilseed Rape Cultivars (RFLP data). Varieties are numbered by five-year period: 1 = early 1970s, 2 = late 1970s, etc.



SAVING WILDLIFE IN THAILAND'S WESTERN FOREST LANDSCAPE THROUGH A LIVING LANDSCAPE APPROACH

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Keywords: Wildlife, living landscape approach, transboundary conservation, UNESCO World Heritage Site

Introduction

Thailand's western forest landscape supports high diversity of fauna and flora due to its location as a crossroad of different biogeographical realms such as Indochinese, Indian, Himalayan, and Sundaic (The Western Forest Complex Ecosystem Management Project 2004). It has been protected in forms of national parks and wildlife sanctuaries for more than 20 to 30 years with the total area under legal protection of over 25,000 km^2. Two biodiversity hotspots in this forest can be recognized including 1) Thung-Yai and Huai Kha Khaeng Wildlife Sanctuaries, a UNESCO natural world heritage site, of the northern portion and 2) Kaeng Kra Chan forest complex of the southern portion. These hotspots still support viable populations of large and endangered species such as elephants, tigers, leopards, gaurs, bantengs, tapirs, hornbills, and green peafowls. The landscape is also contiguous with a large tract of forest in Myanmar increasing its value of a transboundary conservation. Unfortunately, the area has been facing with complicated threats especially encroachment and poaching albeit an extensive protection effort by the government. To guarantee long-term integrity of the landscape management and conservation resource managers and conservation scientists are working together to closely link science and management. One of the innovative solutions is to use "the living landscape program" as guidance for managing the landscape.

Methodology

The living landscape program (LLP) is a Wildlife Conservation Society (WCS) initiative dedicated to developing wildlife-based strategies for conservation of large, wild ecosystems that are integrated in wider landscapes of human influence. Conservation of wildlands is the main goal. The approach explicitly places wildlife at the cntre of conservation strategies, but recognizes that few places on earth remain free from human influence. It links monitoring of wildlife directly to assessing conservation progress. The program steps include 1) selecting the wildland site of global and regional conservation priority setting efforts, 2) selecting a suite of landscape species for the site, 3) defining the biological landscape by mapping and describing resource-use by each landscape species population, 4) defining the human landscape by mapping pattern and intensity of human land and resource use practices that occur within, or affect, the area defined by biological landscape, 5) examining the conflicts, 6) Focusing conservation actions on avoiding or mitigating key conflicts, and 7) monitoring the effectiveness of conservation actions and changes in threats to wildlife and wildlands conservation (Wildlife Conservation Society 2001-2002).

Beginning in 2004-5, WCS Thailand is working closely with the Department of National Park, Wildlife, and Plant Conservation, academics, and other conservation NGOs through the World Heritage Management Project (WHMP) to set up monitoring systems for tigers and prey in Thung Yai and Huai Kha Khaeng Wildlife Sanctuaries. The monitoring system is aimed to understand status of populations and distribution of tigers and prey, and to understand the intensity and distribution of threats. It is planed to support and improve protection efforts, mainly patrolling scheme. The result will be used to promote conservation awareness among local communities, local NGOs, and education institutes. In order to reach the goal of sustainable conservation of the western forest landscape, this effort needs long-term commitment and dedication from all key stakeholders.

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GLOBAL DIVERSITY OF TREES

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Keywords: world dictionary of trees, taxonomic diversity, native trees, North America

Introduction

Trees are of exceptional value: as the source of many products essential to society, as providers of environmental services such as oxygen production and carbon sequestration and as partners of a wealth of other life forms. However, their present global diversity has not yet been reported. Here we describe the current taxonomic diversity, distribution, and threat status of native trees of North America.

Materials and methods

According to Whittaker (1972), the number of taxa, also called richness, is the most generally appropriate measure of diversity. Our measurement is based on information compiled in a database on living trees, excluding fossils and more recently extinct taxa, hybrids, and cultivars (Grandtner & Laplante 1997-2004). In the database, trees are defined as woody plants with a single erect and persistent stem (Little Jr. 1979) of at least 5 m in height and 10 cm diameter at breast height. They are considered native, if they were wild in the spontaneous vegetation before the arrival of Europeans (Little Jr. 1979). Scientific names follow current principles of nomenclature. Finally, North America is taken in its global geographical sense, that is: from Alaska and Greenland to Panama, including the Caribbean islands, but not Hawaii, and subdivided into 9 zones (Fig 1).

Results and discussion

The native tree taxonomic diversity of the North American continent comprises 6918 species, 324 subspecies, and 488 varieties (including the typical subspecies and varieties). They belong to 1048 genera, and 151 families. The 7730 subgeneric taxa include 1412 endemics of very limited distribution and 152 which are in danger of extinction. The legume family (Leguminosae, 103 genera) is the most important, while oak (Quercus, 241 species) is the most important genus. There are also 367 monospecific genera.

The highest taxonomic diversity (6195 or 80%) of all subgeneric taxa was found in the south-eastern zone (Fig. 1a). This is the warmest, wettest, and topographically most fragmented part of the continent. To the west, where the climate becomes dryer, and to the north where it is cooler, specific diversity is lower,. The distribution of endemics (Fig. 1b) follows a similar pattern. More than 1325 or 94% occur in the south-eastern zone, especially the Caribbean islands, with less than 1% present in the middle and northern continental zones. The greatest proportion (99 or 65%) of the endangered taxa (Fig. 1c) is found again in the south-eastern zone, but 30% of them are also present in the south-central or Mexican zone, and 8 to 14% in the middle zones. These latter areas have been subjected over centuries to intense human pressures.

A comparison between North America and other continents shows that 2115 taxa (27%) are also native to South America. This is due to similar climatic conditions, the existing terrestrial link, and the amphipanamanian taxa present at both ends of the Isthmus of Panama. The proportion of taxa common with Eurasia, Africa, and Oceania is much lower (<1%).

Final considerations

The data presented provide an initial baseline for the study, and monitoring of the dynamics of tree taxonomic diversity in the CO_2 – induced warmer world, and its conservation and sustainable use. Based on the measurement of the number of taxa present in a given area (Dansereau 1997) or zone, this information can contribute to research addressing the definition of a harmonious balance to satisfy increasing human needs while maintaining biological diversity, especially in those most fragile and endangered zones such as the Caribbean and Mexican. The aim of the project is to provide similar data for the native trees of the remaining four continents (South America, Eurasia, Africa and Oceania). Combined with the web site www.wdt.qc.ca entitled "World Dictionary of Trees" (Grandtner & Laplante 1997-2004) and the Elsevier's Dictionary of Trees (Grandtner 2005) this project will present, in addition, the complete checklist by continent of families, genera, species, subspecies and varieties, their Latin and common names, distribution, height, foliage type, ecology, potential uses and threats of extinction.

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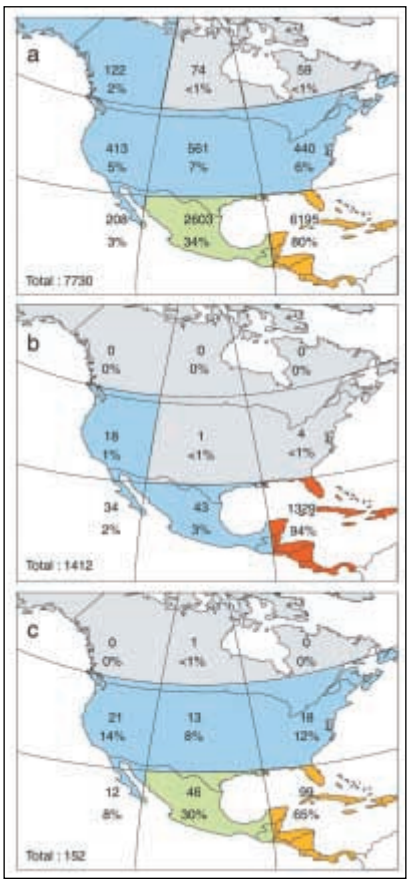
Figure 1.

Distribution of the native tree species, subspecies and varieties in North America.
a. Total number, b. Endemics, c. Endangered.



IMPLEMENTING THE GTI PROGRAMME OF WORK IN GERMANY

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Keywords: Global Taxonomy Initiative, GTI national focal point, Germany, regional workshop

The German National Focal Point of the Global Taxonomy Initiative (GTI-NFP) was first established in late 2002, with a supporting grant from the German Federal Ministry for the Environment, Nature Protection and Nuclear Safety (BMU) administered by the Federal Agency for Nature Protection (BfN). The overall goals of the NFP are: 1) to make the scientific community aware of the GTI process and international developments; 2) to establish a specific GTI website and information portal; 3) to compile a roaster of taxonomic experts working in Germany and relevant taxonomic resources available; 4) to organize co-operation for GTI at the European level including the hosting of a Regional Workshop; 5) to support national and local authorities implementing the CBD with input from taxonomy; and 6) to improve communication within the taxonomic scientific community. The German NFP is based at a natural history museum, which is actively involved in taxonomic research, and thereby benefits from being at the interface of biodiversity research and policy.

In order to make the GTI process better known within the scientific community, the NFP first targeted learned national and regional scientific societies which are actively supporting or covering the field of taxonomy by attending annual meetings and conferences, and co-operating with their councils and executive bodies, e.g., the Gesellschaft für Biologische Systematik / Society for Biological Systematics (GfBS, www.gfbs-home.de), the Deutsche Botanische Gesellschaft / German Botanical Society (www.deutsche-botanische-gesellschaft.de/), and the Deutsche Zoologische Gesellschaft / German Zoological Society (www.dzg-ev.de). By publishing contributions on the GTI in their newsletters and regularly inviting society representatives to GTI-NFP workshops and meetings, it was possible to establish quickly close working relationships with theses organizations. Raising awareness for GTI within the scientific community has been quite effective through these links to relevant learned societies, and the work of the NFP also benefits from the regular information exchange especially with regard to upcoming projects and new developments.

A national GTI website (www.gti-kontakstelle.de) has been established by the NFP, which also provides information bilingually in English (fig. 1). Apart from the official CBD and GTI documents and some background information, the portal includes a regularly updated news column, a compilation of databases and information sources on taxonomists, a glossary and a comprehensive link list, as well as a database of biodiversity-related acronyms. This database which has been developed in co-operation with BioNET-INTERNATIONAL and other partners, currently contains more than 2.300 acronyms covering all areas from research to politics, and can be searched through the website also using geographic and subject key words.

A comprehensive roaster of experts comprising taxonomists working in Germany is currently being build up and holds about 2,200 records. The effort of building this database is supported through exchange of information with several scientific societies, organizations, and related projects, such as the ZEFOD initiative (Inventory of biological research collections in Germany, www.genres.de/zefod/). The database will shortly be available on the internet can be searched for individual names, as well as geographic and taxonomic area of expertise.

In June 2004, a first European workshop entitled '*Building Capacity for the Global Taxonomy Initiative (GTI) in a larger Europe*' was held on the International Academy for Nature Conservation (INA) on the Isle of Vilm (www.bfn.de/en/06/index.htm) with representatives of 16 European countries (Belgium, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Lithuania, Poland, Switzerland, Spain, Sweden, Ukraine) and

three international organizations (CETAF, www.cetaf.org; FishBase, www.fishbase.org; GBIF, www.gbif.org) in attendance. The current state of taxonomic resources in each country were discussed and next steps for the effective implementation of the GTI Programme of Work both nationally and regionally were considered.

In result of the workshop, a European GTI toolkit is being developed, which will be made available to all European and interested GTI-NFPs and will contain apart from relevant CBD and GTI documents, a list of references, a compilation of addresses of local and regional stakeholders, links to taxonomic information sources, and a template to facilitate the implementation of a separate GTI-NFP website. The workshop also adopted a "Vilm Statement", urging for more and sustained support for the GTI at national and regional European levels, in order to support realization of the CBD's objectives and especially the "2010 biodiversity target", to significantly reduce the rate of biodiversity loss by the year 2010.

Latest developments of the German NFP include the compilation, editing and publication of good "case studies" for taxonomy, demonstrating to the general public the importance of sound taxonomic expertise for solving actual problems and threats, and the immense potential costs and benefits involved. About forty such case studies have been collected jointly by BioNET-INTERNATIONAL (www.bionet-intl.org/) and the German GTI-NFP, and are now made available online on both websites. Convincing cases include stories from agriculture, engineering, fisheries, human health, as well as nature conservation and invasive alien species are available, and can also be searched dynamically for full text and key words through the NFP website. In addition, recently a list of available taxonomic identification keys and for different organisms was added to the website, already covering unicellular organisms, plants, fungi, animals, and special habitats. The information content will be further expanded and updated, and any additions or contributions to the goals of the GTI-NFP from third parties are welcome.

Fig. 1:

Screenshot from the GTI NFP website.

THE 2010 TARGET: TOWARDS INDICATORS ON TRADE, PRODUCTION AND CONSUMPTION PATTERNS AND BIODIVERSITY

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Keywords: trade, consumption patterns, indicators, export markets, organic agriculture

Summary

To follow up the 2010 target of achieving a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth, the members of the Convention of Biological Diversity found a consensus on the identification of a set of indicators for immediate application and others for future development.

The development of indicators on the relationship between trade and biodiversity will allow highlighting the effects on biodiversity of current policies in the economic development base of export trade. UNEP and the International Institute of Sustainable Development (1998) have developed an analytical framework examining the effects of trade liberalization on biodiversity. To establish a set of indicators around the complex link between trade (sustainable and unsustainable production and consumption) and biodiversity is a theoretical and methodological challenge. The main goal of this research is to develop a set of indicators on this relationship. These indicators will be concentrated within the food commodity sector and will be a contribution to the process of assessing the progress made toward achieving the CBD 2010 target from an NGO perspective in the framework of a research program.

The theoretical background

1. Organic agriculture and local markets favours biodiversity

A recent study demonstrates that species abundance and or/richness across a wide range of taxa, tend to be higher on organic farms than on locally representative conventional farms. The global food system needs a centralized gathering of enormous quantities of a single type of crops conducting to the creation of monocultures. Monocultures need at the same time of massive inputs of pesticides, herbicides and chemical fertilizers. This type of practices eliminates in a systematic way farm biodiversity, induces erosion, eutrophication of water flows and poisons the surrounding ecosystems. The local products are food produced for local or regional consumption. Food security increases when people depend on local food. Shortening the links between farmers and consumers could be one of the ways to attain a strategic and more enjoyable change for the better (Helena Norberg-Hodge and Steven Gorelick, 2002).

2. Export markets for international trade harms biodiversity

High prices and increasing demand for palm oil and soybean derivatives have spurred the growth of oil palm and soybean area dramatically. In the last decade, the annually harvested global area of oil palm increased by 43% from approximately 6 million ha in 1990 to 10.7 million ha in 2002 While annually harvested global area of soybean increased by 26% from 57 million ha in 1990 to 77.1 million ha in 2002 (FAO, 2003) in Indonesia, the oil palm expansion has occurred at the expense of Indonesia's tropical forest cover. The 2000 IUCN Red List of threatened species of the world highlights habitat loss as the main threat to biodiversity, with agricultural activities affecting 70% of all threatened bird species and 49% of all plant species (Hilton-Taylor, 2000).

On the other hand, industrial aquaculture is one of the direct and indirect causes of conversion and degradation of mangroves. It is about monoculture also: breeding few species with a strong market value booked to feed the international market.

3. Trade and independent effects on biodiversity

Trade policies that countries adopt, and the relationship of these trade policies to other macro-economic factors, such as national debt, can accentuate certain trading patterns and relationships that will have an important direct and indirect effects on biodiversity. Trade liberalization agreements are the most important category of trade policies when considering the effects of trade on biodiversity because, through the framework of rules they establish, they encourage certain types of trade patterns and limit the use of certain trade and trade-related public policies that might alter these patterns. The effects of trade on biodiversity should be assessed at three levels:

- the indirect effects of trade on biodiversity through trade's primary effects on economic activity;
- the direct or independent effects of trade on biodiversity; and
- the effects of trade and trade rules on public policy. (Conway, 1998)

Method and potential indicators

Hypothesis 1: The impact on biodiversity of an export production (for example, shrimps and agriculture) is more negative that the one of sustainable and certified production aiming local markets

Measures: a) FAO Database « on-line » 'Fish Stat' (food production and trade 1972-2002) FAO. This database includes trade flows of world countries (import quantity, import value, export quantity, export value). b) Database of certified export shrimps and/or of an organic product (database to be identified). C) Database of local markets on shrimps and organic agriculture d) Database of INFOAM.

Indicators: a) Proportion of shrimp consumed globally derived from sustainable sources. b) Proportion of shrimp harvested that is consumed locally versus for export trade. c) Area % of organic food and fair trade production and consumption in the world.

Hypothesis 2: Indicators on the links between international trade and consumption and their effects on biodiversity are more effective to follow the drivers of biodiversity loss than those linked to trade of certified products.

Measures:
a) Landsat images. b) National databases on local markets and jobs

Indicators
a) Area of the country on monoculture industrial agriculture compared to the total area cultivated (%)
b) Area of the country used to biological agriculture compared to the total area cultivated (%).
c) Number of jobs dedicated to local markets versus number of jobs dedicated to export markets.
d) Number of subsidies and credit facilities for export agriculture versus those for local market.
e) Area of industrial aquaculture related with the total area of coastal land.
f) Area used for industrial aquaculture versus total area of coastal land (%).
g) Area of mangroves globally under sustainable community management (%).

Hypothesis 3: The life cycle analysis of food sector (agriculture and aquaculture) that have an impact on biodiversity is a tool to define indicators on sustainable and non-sustainable use.

Measures:
Based on the work of Lebel (2003) who made a cycle analysis map on the production, transformation and consumption phases quantify the materials and procedures to fix an indicator.
-Identify an agricultural organic product to make a life cycle analysis .

Case Studies

Taking into account the possible difficulties finding the global data, 4 case studies would be developed in different parts of the world applying the identified indicators. These case studies will be developed in collaboration with the NGO CBD Alliance.

Analysis and results

A model representing the interactions of the driving forces of biodiversity changes resulting from the variations of international and local markets and of trade will be issued with indicators associated to it.

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FROM OUTPUTS TO OUTCOMES: RECENT PROGRESS IN MEASURING AND MONITORING BIODIVERSITY IN NEW ZEALAND

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Keywords: classification, ecological integrity, management system, monitoring, outcomes

Introduction

The New Zealand Biodiversity Strategy (DoC and MfE 2000) aims to halt the decline in indigenous biodiversity by 1) maintaining and restoring a full range of remaining natural habitats and ecosystems to a healthy and functioning state, enhancing critically scarce habitats, and maintaining modified ecosystems in production and urban environments and 2) maintaining and restoring viable populations of all indigenous species and subspecies across their natural range and maintaining their genetic diversity. Our poster describes the past and current condition of New Zealand's indigenous biodiversity, outlines the associated conservation challenges, and reports recent progress to improve the measurement and monitoring of biodiversity to help us know whether we are halting the decline.

Physical and Biogeographical Context

New Zealand is an island nation 270,000 sq. km in size that lies between 40(-50(S latitude and 170°- 180° E longitude, It consists of three main islands (North, South, and Stewart), numerous inshore islands, and seven offshore island groups. Falling along the Indo-Australasian and Pacific plate boundary, New Zealand experiences high rates of uplift, volcanism, and geothermal activity that created the axial mountain ranges running through both the North and South islands. The climate is oceanic and somewhat mild, with average temperatures ranging from <0°C in the Southern Alps to >15°C in the north. Predominantly westerly winds create west-east rainfall gradients; some western coastal areas receive >10 m and some eastern areas receive <300 mm of rainfall per year. Forest dominated in prehuman times, with over 80% total cover, and shrub or grasslands occurred in areas subject to more frequent disturbance or cooler temperatures. Having split from the Gondwanaland supercontinent about 80 million years ago, New Zealand's flora and fauna evolved in isolation and without mammals except for three species of bat. This has resulted in high rates of endemism (80% of plants and 60% of terrestrial vertebrates), loss of functional groups, and lack of defences against exotic species, particularly mammalian herbivores and predators.

Conservation Challenges

Humans colonized New Zealand relatively recently. Polynesians arrived first about 1,000 years ago, followed by Europeans beginning in the 19th century (McGlone 1989). Both cleared land for agriculture and introduced exotic species for food (e.g. rabbits), resources (e.g. possum fur), recreation (e.g. deer hunting), and later biocontrol (e.g. stoats to eat rabbits). These events substantially changed New Zealand's biodiversity. The main islands now have 50% non-native cover, as forest and wetlands declined by 70% and 75%, respectively. Although legally protected conservation land accounts for 30% of total area, it is biased to cooler, wetter, and

steeper environments with little productive use. Half of main island bird species are extinct, and remaining flora and fauna face continued pressures from habitat loss/fragmentation and exotic species. For example, New Zealand now has a similar number of native and naturalized plants, more than 2,000 each, and 20,000 more in gardens.

Recent Progress in Measuring and Monitoring Biodiversity

Past research and management in New Zealand tended to focus on outputs, such as number of papers published, workshops held, total area protected, or number of hectares of pest control. The focus is now shifting to outcomes that achieve the aims of the Biodiversity Strategy by maintaining and enhancing states, functions, and processes. This new focus requires stronger links between research and management, continuing efforts to understand the underlying fundamental ecology, and development of improved systems, methods, and tools for biodiversity measurement and monitoring.

Natural Heritage Management System

The Department of Conservation manages over 80,000 sq. km of Crown estate or nearly one-third of New Zealand for public good conservation purposes. The Department is currently designing a Natural Heritage Management System (NHMS) that will help them monitor biodiversity trends and report the difference made by their conservation actions (Figure 1). The system consists of a decision-making process centred on government & community consultation, complimented by a toolbox that provides information to different stages in the process. The system will allow the Department to 1) specify monitoring techniques, 2) collect, coordinate, and curate data, 3) report on and plan for conservation outcomes at a range of geographical and organizational scales, and 4) build agency accountability for knowing what progress has been made towards conservation goals.

Biodiversity Inventory and Monitoring

A recent review of national and international inventory and monitoring systems has produced a draft framework for biodiversity inventory and monitoring. The framework links accepted biodiversity outcomes with explicit performance measures (Table 1). It provides a clear, logical, and ecologically credible system that bases higher-level reports of biodiversity status and policy response on verifiable, accessible evidence. The highest goal, which reflects the overall aim of the New Zealand Biodiversity strategy, is to maintain ecological integrity. Ecological integrity consists of three main elements: indigenous dominance, species occupancy, and environmental representation. Each can be measured at a range of scales and are not linked to any specific baseline, such as pre-human or pre-European conditions. Nine outcome objectives provide more specific criteria for monitoring, reporting, and assessing progress made towards the targeted and national outcomes. The framework also provides an initial suite of 24 indicators and relates each to outcome objectives.

Land Environments of New Zealand

Land Environments of New Zealand (LENZ) is an example of a new system that improves biodiversity monitoring (Figure 2). It objectively and quantitatively classifies areas with similar climate, landform, and soil characteristics within a scalable, 4-level hierarchy of 20 to 500 environments nationally (Leathwick et al. 2003). By using underlying abiotic drivers of biodiversity pattern, LENZ provides a stable classification for monitoring and reporting on progress to represent the full range of terrestrial environments in the conservation network. LENZ also provides a basis for identifying threatened terrestrial environments and prioritizing future protection efforts. Nearly two-thirds of New Zealand's 500 LENZ Level IV environments fall within five threat categories based on indigenous cover loss or poor legal protection (Figure 3).

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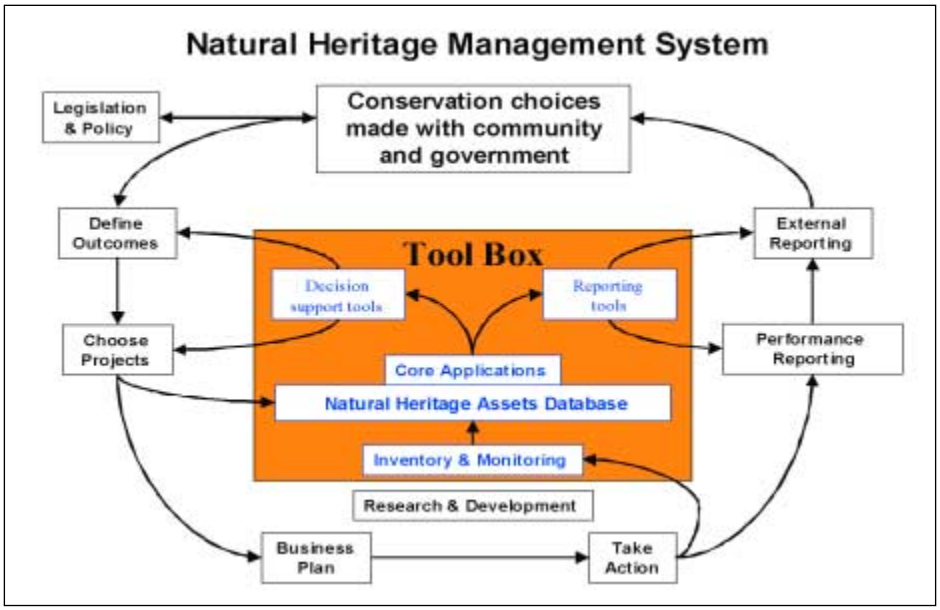
Figure 1.



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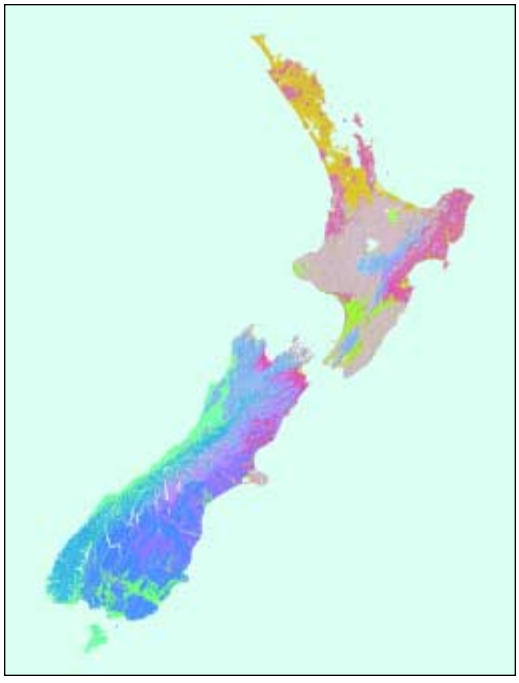

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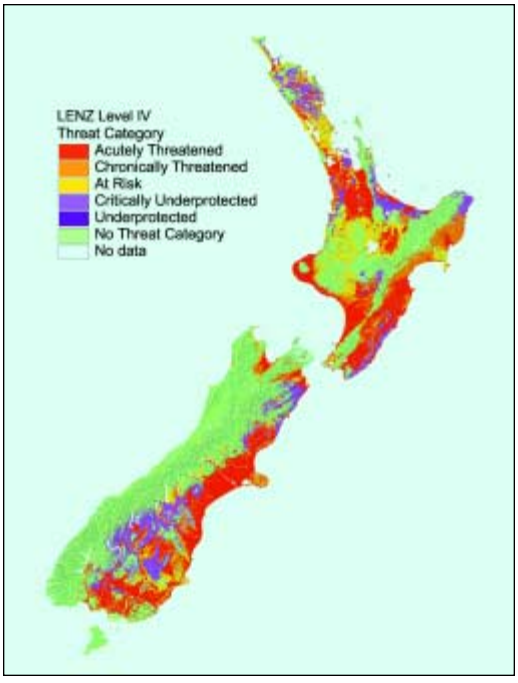

AWARENESS OF THE POTENTIAL THREATS TO THE BIODIVERSITY OF TAAL LAKE, PHILIPPINES

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Keywords: inland water, Taal Lake, biodiversity loss, Harengula tawilis, lake management

Abstract

Taal Lake is one of the increasing number of strained freshwater ecosystems in the Philippines today. It is listed in the highest, most urgent category of conservation targets in the Philippine National Biodiversity Strategy and Action Plan.

The disturbance of the lake's ecology due to the environmental threats, which could be considered as natural and man-made, affects its present endemic and indigenous biota resulting in biodiversity loss. The diminishing number of *Harengula tawilis*, which is said to be the world's only freshwater sardine and which is an endemic species of the lake, is greatly affected by the ongoing changes. Another concern is the movement of the migratory indigenous species in the lake (e.g. *Caranx ignobilis*). Man-made threats include (1) aquaculture and fish cage sprawl; (2) overfishing; (3) domestic and agricultural pollution; (4) watershed deterioration; (5) irrigation and water supply; and (6) tourism. One natural threat to the lake's ecosystem is (7) Taal Volcano, which is located at the centre of the lake and which is now considered active. This may cause a modification in the lake's limnology which in turn affect the productivity of the species.

Strategic actions such as lake management plans, restoration, control and eradication, research, and the development of legal support for implementation are contributory factors in controlling and preventing the potential threats in Taal Lake's biodiversity.

Introduction

Taal Lake is the 3rd largest lake in the Philippines. It covers an aggregate area of 24,236 ha excluding the islands. On its centre lies the Taal Volcano, 23.8 sq. km, and at the southern part of the lake is the Pansipit River, giving it a sea ward connection to Balayan Bay which is at the origin of most of the diversification of fresh water and marine species in the lake. It consists of 32 families of fish consisting of 101 species. However, 73% of fish species have disappeared. Total fish production has slowly declined from 8292 mt. in 1992 (Aypa, 1993) to 1058 mt. in 1999. The fish reached peak performance in 1988 when only around 2% of the lake area had cages. The total tawilis production today is only 13% that of 1988.

Results and Discussion

The following threats to the ecology of the Taal Lake and its aquatic species can be identified:
1. Aquaculture and Fish Cage Sprawl – Fish cage production rose from 36% in 1993 to 96% in 1998 (Mutia, M.T 1996-2001). The increasing number of fish cages in the early 1990s facilitated the introduction on exotic species such as: Tilapia *Oreochromis niloticus*, Milkfish *Channa striata*, Hito *Clarias batrachus, Poecilia shenops, Trichogaster pectoralis* and Carps *Carassius auratus auratus*. The dominance of cage-cultured tilapia disturbs spawning ground for the endemic fish species. 600 million fry of Tilapia are stocked in the lake annually and 50% die in the first month (Clark, undated). Due to the continuous sprawl of cage culture and overcrowding of alien fishes, the water quality shows oxygen depletion also resulting from increasing feed wastes left at the bottom of the lake. Additionally, the increasing mortality rate in fish cages due to overcrowding and diseases contributes to

the contamination of the water and the species within. The effect of escaped tilapia, commonly cultured, and carps on the population of the endemic species are also being monitored for they are potential invasive alien species. Local fishermen claim that carps are predators to the diminishing endemic tawilis.

2. Overfishing - The Tagaytay-Taal Area harbours many indigenous, endemic and unique life forms one which is now considered endangered is *Harengula tawilis* (Philippine Star, 1993) due to unsustainable harvesting. Bull sharks (*Catcharhinus leucas*) once inhabited Lake Taal but were diminished by overfishing in the 1930s (Hargrove, 1991).

3. Domestic and Agricultural Pollution - Improper disposal of domestic wastes (e.g. garbage, animal wastes) and agricultural fertilizers worsened the water quality of the lake and the land surrounding it. Dead fish and wasted fish feeds from overfeeding are pollutants on the lake.

4. Watershed deterioration - Soil erosion due to the construction of golf courses, development of residential and agricultural areas adds pressure on the lake's water condition and fish sanctuary.

5. Irrigation and Water Supply - Taal Lake is the water source for Tagaytay and some municipalities of Batangas, and in the development plan, is considered as a possible water source for domestic supply for Metro Manila. Aquaculture and agricultural institutions also benefit from the lake water.

6. Tourism – Aquatic recreational spots are constructed on the lake contributing to the disturbance of the sanctuary of many species.

7. Taal Volcano - Water quality changes radically after each eruption (Zafaralla, 1999). The change in the lake's limnology can alter the primary productivity - phytoplankton growth, which in turn may affect secondary productivity – the tawilis life cycle (Davies, 1990).

Conclusion

Development of legal support, lake management plans and regulations must be implemented and observed in Taal Lake especially to control the ongoing aquaculture production which threatens the existence of some indigenous and endemic fish species. These measures can help prevent the damage which could be caused by these fish cages and alien fish species introduced. The current threats to biodiversity discussed may produce serious impacts on the lake's natural ecosystem in the future. We propose additional research and studies on the restoration and conservation of the present condition of Taal Lake, of its biota as well as the Taal Volcano. For this reason, it is essential to count on the cooperation of government, local community institutions and, most importantly, of the people who, as consumers of the resources, can participate responsibly to avoid existing and future threats to Taal Lake's biodiversity.

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PLANT DIVERSITY IN AGRICULTURAL AREAS OF SOME ETHNIC GROUPS IN NORTHEASTERN THAILAND

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Keywords: survey, plant diversity, ethnic group, agricultural area, Thailand

Introduction

In Thailand and other developing Asian countries, mostly located in the tropics, the agricultural sector is fundamental. It is not only a major source of goods and foreign exchange, but is a way of life for the majority of the population. Agriculture provides an occupation, culture, traditions and values for rural people, who have long existed in harmony with nature. Agriculture is also part of the natural capital of the country, in terms of natural resources, biodiversity and the environment. Whatever changes occur in the agricultural sector, in one way or another they are likely to affect the rest of the country. (Jitsanguan, 2001). The northeastern region of Thailand covers 170,000 km^2 and is bounded on the north and east by the Mekong River, which also forms the border with Laos, on the west by the Phetchabun Mountain Rang and on the south, by the Dangrek Mountain Range where it borders with Kampuchea. The region contains approximately 17 million people, or about one third of the population of Thailand. Ethnic groups of Thailand describe 38 non-Tai peoples residing in Thailand. In the northeastern and central lowlands (Bru, Cham, Chaobon, Chong, Gong, Kaleung, Kui, Mon, Saek, So, Thavung, Nyo, Phuthai). Their language family and a description given of here classify these various ethnic groups each one's history, costume and crafts, houses and villages, agriculture and economy, society, ceremonies, myths and beliefs. (Schliesinger, 2000). Sustainable agriculture and rural development has been defined by FAO as "The management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in agriculture, forestry, and fisheries sectors) conserves land, water, plant and animal genetic resources, and is environmentally non-degrading, technically appropriate, economically viable and socially acceptable" (FAO, 1991). The data about plant diversity and traditional knowledge in agricultural areas are importance in sustainable agricultural system and environment.

Plant diversity of agricultural areas

The total count method was used to prepare a checklist of plants in agricultural areas and a questionnaire was used to collect data on problems in the ethnic agricultural system by semi-structured interview and open interview (Cotton, 1996). The study surveyed and collected data in Sakon Nakhon and Nakhon Phanom provinces (Fig. 1) and four ethnic groups (Kaleung group, Nyo group, Phuthai group and Saek group). The diversity of plants in agricultural areas included 89 species in 40 families. Poaceae (Gramineae) and Zingiberaceae were the most common family (8 species). *Oryza sativa* L. was the most common variety in agricultural areas of all ethnic groups.

Traditional knowledge of agricultural system

All four ethnic groups were traditional knowledge cultivators in their choice of species/varieties. For example, the Kaleung group, had improved forest plants (Wild plants) for cultivates in agricultural areas and mixed cultivation in main cash crop plots. There were more than 20 species, found in the Home vegetable garden: e.g. *Garcenia cowa* Roxb., *Tiliacora triandra* (Colebr.) Diels., *Melientha suavis* Pierre and *Boesenbergia pandurata* Holtt., Horticultural species: e.g. *Calamus acanthophyllus* Becc., *Antidesma thwaitesianum* Mull.

Arg., *Baccaurea ramiflora* Lour., *Mitrephosa* sp. And Herb/Medicinal plant: e.g. *Zingiber montamun* (Koenig) Ling ex Dietr., *Curcuma longa* L. and C. *xanthorrhiza* Roxb.. A presentation of some indigenous plants cultivated is found in Table 1.

Conclusions

- All agricultural products were used for food and for supplementary income in the household.
- People in the four ethnic groups were cultivating major economic plants including *Oryza sativa* L., *Manihot esculenta* Crantz, *Saccharum officinarum* L., *Zea mays* L. and *Hevea brasiliensis* (Willd. ex A.Juss.) Mull.Arg. Especially with *Oryza sativa* L., a wide genetic diversity of indigenous varieties was found to be cultivated.
- The main problems for the ethnic agricultural systems were soil fertility and land use management, poor irrigation systems, and a poor marketing system.

Figure 1.

Map of study area, Northeastern Thailand

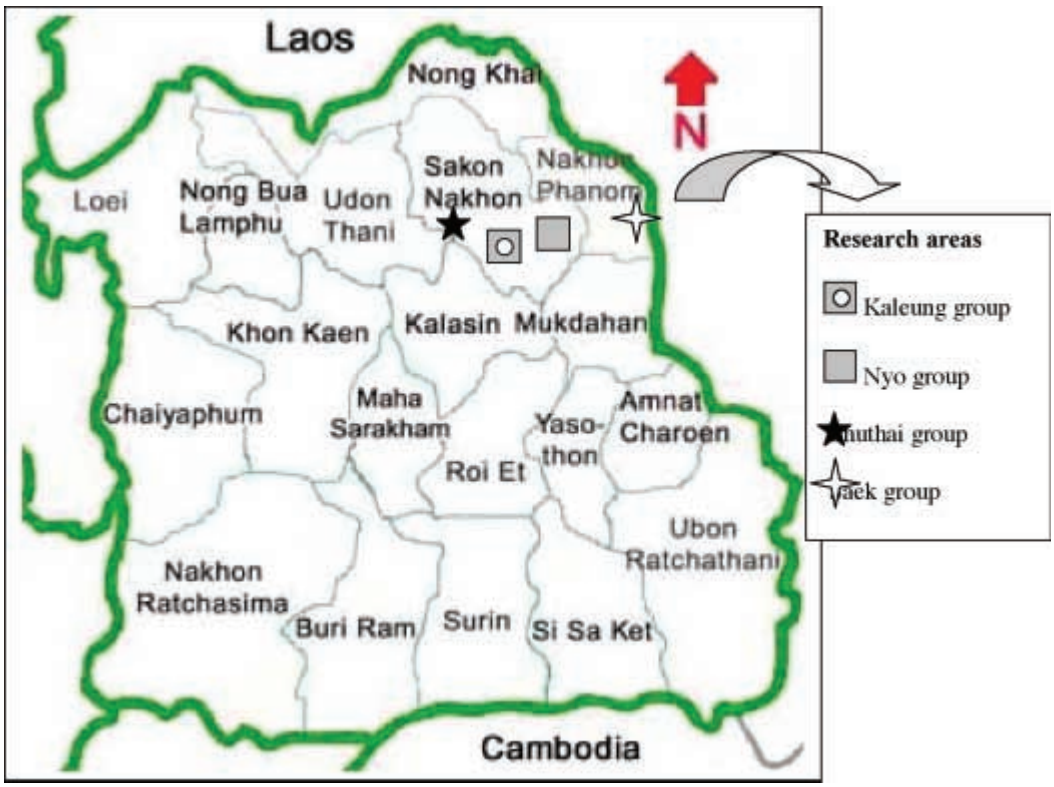

Table 1.

List of some indigenous plants cultivated from native forest in agricultural areas, Northeastern Thailand

Botanical name	Family	Traditional knowledge in cultivated method	Ethnic groups			
			Kaleung	Nyo	Phuthai	Saek
Mitrephosa sp.	Anonaceae	Seedling	X	-	-	-
Calamus acanthophyllus Becc.	Arecaceae	Seedling, Post harvest	X	X	X	X
Garcenia cowa Roxb.	Clusiaceae	Seedling	X	-	-	-
Blumea balasamifera (L.) DC.	Compositae	Seedling	X	X	X	X
Diospyros mollis Griff.	Ebenaceae	Seedling	X	-	-	-
Antidesma thwaitesianum Mull.Arg.	Euphorbiaceae	Seedling, Cutting, Post harvest	X	-	X	-
Baccaurea ramiflora Lour.	Euphorbiaceae	Seedling	X	X	X	X
Sauropus androgynus (L.) Merr.	Euphorbiaceae	Seedling	X	X	X	X
Bambusa sp1.	Graminae	Sapling	X	X	X	X
Bambusa sp2.	Graminae	Sapling	X	-	-	-
Cratoxylum formosum (Jack) Dyer.	Guttiferae	Seedling	X	-	-	-
Tiliacora triandra (Colebr.) Diels.	Minispermaceae	Seedling	X	X	X	X
Melientha suavis Pierre	Opiliaceae	Seedling	X	-	X	-
Feronia lucida Teysm & Binn.	Rutaceae	Seedling	X	X	X	-
Alpinia galanga (L.) Willd.	Zingiberaceae	Pv., Post harvest	X	X	X	X
Boesenbergia pandurata Holtt.	Zingiberaceae	Pv., Post harvest	X	X	X	X
B. rotunda (L.)	Zingiberaceae	Pv., Post harvest	X	X	X	-
Curcuma longa L.	Zingiberaceae	Pv., Post harvest	X	X	X	X
C. xanthorrhiza Roxb.	Zingiberaceae	Pv., Post harvest	X	X	X	X
Zingiber montamun (Koenig) Ling ex Dietr.	Zingiberaceae	Pv., Post harvest	X	X	X	X
Z. zerumbet (L.) Smith.	Zingiberaceae	Pv., Post harvest	X	-	X	-

Pv. = Preserved of variety

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EDIBLE PLANTS IN CULTURAL FORESTS OF NORTHEASTERN THAILAND

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Keywords: edible plants, indigenous peoples, classification, economic value, nutritional value

Introduction

Thailand is located in Southeast Asia and has an area of 513,115 sq. km. At present, approximately 25 % of the land is under forest cover, including forest plantations (Luangjame et.al, 1997). It is estimated that there are about 11,000 species of vascular plants of which 10,200 are flowering plants, with 2,500 tree species and 1,100 orchid species (7-10 % of which) are reportedly endemic (WCMC, 1994; OEPP, 2000). More than 70% of Thailand's forest is not protected (referred to as "cultural forest"). In the Northeast, cultural forests are almost all deciduous forests. They constitute patches of forested public lands near villages. Traditionally, each village has its own cultural forest and local residents may use its resources (WBRI, 1998).

Cultural forest: Biology diversity area and utilization

The total area of Thailand's forest is decreasing at an alarming rate. Statistics compiled over the past (1961-1991) suggest that an area of 0.46 million ha has disappeared. These rapid and profound changes endanger both species diversity and genetic resources of Thailand's forested ecosystem. Most parts of Northeast Thailand have the same problem. Indigenous people in the Northeast have conserved cultural forest for subsistence purpose. The cultural forest constitutes an integral part of daily life in rural areas. Forest resources are used for ceremonial purposes as well as for providing numerous products necessary for survival, including food, firewood/charcoal, fiber, tools, building materials and forage for livestock.

Edible plants in the cultural forest

Field collection of edible plants in cultural forests of Northeastern Thailand was conducted during 2001-2003. Dry and living specimens were collected for identification at Walai Rukhavej Botanical Herbarium. Data of people gathering vegetables in the day and household consumption was survey by using the open-ended and semi-structured questionnaire (Cotton, 1992). Nutritional values were analyzed by method of AOAC (2000). The following list of plants has been compiled from the cultural forest as being indigenous used for consumption were classified into 78 species and 43 families as: trees 26 sp. shrubs 11 sp. herbs 21 sp. climbers 16 sp. and aquatic plants 1 sp. (Table 1.) The species of local economic value in the markets were *Champereia manillana* (Blume) Merr., *Telosma minor* Craib, *Colubrina asiatica* L. ex Brongn., *Adenia viridiflora* Craib, *Garcinia cowa* Roxb. ex DC., *Cratoxylum formosum* (Jack) Dyer, *Cissampelos pareira* L., *Tiliacora triandra* (Colebr.) Diels. (Parts of plant used and method of preparation are presented in Table 2.). The highest nutritional values for protein and calcium was *Sesbania grandiflora* Desv., for fiber was *Crateva religinosa* G.Forst., for iron (Fe) was *Senna siamea* (Lam.) Irwin & Barneby and vitamin C was *Oroxylum indicum* (L.) Kurz . (Table 3.).

Sustainability for the future

Increasing population, decreasing forest area and massive shifts from subsistence lifestyles to an industrial producer/consumer model of development are all potential threats to attaining the 2010 target. We should start activities to conserve cultural forests through technology transfer, sustainable management and the maintenance of knowledge systems for collected edible plants from *in situ* and *ex situ* habitats.

Table 1.

List of edible plants and vegetable gathering duration.

All seasons	Wet season (May - Oct.)		Dry season (Nov.-Apr.)
Adenanthera pavonina L.	*Acacia concinna* (Willd.) DC.	*Droogmansia godefroyana* (Kumtze) Schindl.	*Amorphophallus paeoniifolius* (Dennst.) Nicolson
Aganosma maginata G.Don	*A. harmandiana* (Pierre) Gagnep.	*Emilla sonchifolia* (L.) DC.	*Azadirachta indica* var. *siamensis* Valeton
Amaranthus lividus L.	*Adenia viridiflora* Craib	*Feroniella lucida* Swingle	*Champereia manillana* (Blume) Merr.
A. tricolor L.	*Aegle marmelos* (L.) Correa ex Roxb.	*Ficus racemosa* L.	*Colubrina asiatica* L. ex Brongn.
Ardisia aprica Fletcher	*Aganonerion polymorphum* Pierre ex Spire	*Ficus* sp.	*Cratoxylum formosum* (Jack) Dyer
Barringtonia acutangula (L.) Gaertn.	*Amorphophallus saraburiensis* Gegnep.	*Garcinia cowa* Roxb. ex DC.	*Dialium cochinchinense* Pierre
Cissampelos pareira L.	*Amorphophallus* sp.	*Glinus oppositifolus* (L.) A.DC.	*Lobelia begonifolia* Wall.
Clausena harmandiana Pierre	*Ardisia amherstiana* var. *pubescense* (Fletcher) K.Larsen & C.M.Hu	*Hydrolea zelanica* (L.) Vahl.	*Oroxylum indicum* (L.) Kurz
Micromelum minutum (G.Forst.) Wight & Arn.	*Asparagus racemosus* Willd.	*Kaempferia rotunda* L.	*Senna siamea* (Lam.) Irwin & Barneby
Momordica charantia L.	*Bauhinia malabarica* Roxb.	*Limnocharis flava* Buch.	*Telosma minor* Craib
Phyllodium pulchellum (Benth) Desv.	*Blumeopsis flava* (DC.) Gagnep.	*L. aromatica* (Lamk.) Merr.	*Xanthophyllum lanceatum*
Sesbania grandiflora Desv.	*Boesenbergia* sp.	*Limophila* sp.	
Tiliacora triandra (Colebr.) Diels	*Buchanania lanzan* Spreng.	*Memecylon edule* Roxb.	
	B. siamensis Miq.	*Millingtonia hortensis* L.f.	
	Caesalpinia mimosoides Lam.	*Momordica cochinchinensis* Spreng.	
	Calamus sp.	*M. varginalis* var. *plantaginea* Solms.	
	Cardiospermum halicacabum L.	*Moringa oleifera* Lam.	
	Careya arborea Roxb.	*Olax psittacorum* (Willd.) Vahl	
	Cassytha filiformis L.	*Paederia foetida* L.var. *foetida*	
	Celastrus paniculatus Willd.	*Sarcostemma secamone* (L.) Bennet	
	Cissus hastata Miq.	*Sauropus androgynus* Merr.	
	Costus speciosus (Koen.) Sm.	*Smilax* sp.	
	Crateva adansonii subsp. *trifoliata* (Roxb.) Jacobs	*Spondias pinnata* (L.f.) Kurz	
	C. religinosa G. Forst.	*Syzygium gratum* (Wight) S.N. Mitra var. *gratum*	
	Croton roxburghii N.P.Balakr.	*Tacca leontopetaloides*	
	Curcuma sp.	*Zygostelma benthami* Baill.	
	Diopyros filipendula Pierre ex Lecomte		
	Dolichandrone serrulata (DC.) Seem.		

Table 2.

Part of plant used and method of preparation (including local economic value in markets)

species	part of plant used			method of preparation	
	young leaves	flower	young fruit	raw	boil
Adenia viridiflora	/	/	/	-	+
Champereia manillana	/	/	/	-	+
Cissampelos pareira	/	-	-	+	-
Colubrina asiatica	/	-	-	+	-
Cratoxylum formosum	/	/	-	+	+
Garcinia cowa	/	-	-	+	+
Telosma minor	/	/	/	-	+
Tiliacora triandra	/	-	-	-	+

Table 3.

Edible plants nutritional value of leafy vegetables (per 100 g).

species	fiber (g.)	protein (g.)	Ca (mg.)	Fe (mg.)	Vitamin C (mg.)
Adenanthera pavonina	1.8	0.5	365	5.0	35
Crateva adansonii subsp. *trifoliata*	0.5	1.0	15	0.5	15
Crateva religinosa	5.0	3.5	124	5.5	5.0
Cratoxylum formosum	1.5	2.5	67	2.5	55
Garcinia cowa	-	1.9	27	1.1	29
Oroxylum indicum	4.3	0.2	12	-	485
Senna siamea	3.7	7.8	155	5.8	11
Sesbania grandiflora	2.0	8.7	401	-	58
Telosma minor	-	5.0	70	1.0	45

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MEASURING NATIONAL PROGRESS TOWARDS THE 2010 TARGET IN SOUTH-EASTERN EUROPEAN COUNTRIES FROM AN NGO POINT OF VIEW

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Keywords: 2010 target, national implementation, monitoring, South-East Europe, NGOs

BACKGROUND

The process leading to the global commitment to significantly reduce the current rate of loss of biological diversity by 2010, which was adopted as part of the Strategic Plan for the CBD and endorsed by the World Summit on Sustainable Development in Johannesburg in 2002, also resulted in a "2010 target" on the European level. Already in 2001, EU Heads of States, at the Gothenburg Summit of the European Council, set the goal to halt the loss of biodiversity by 2010, which was reinforced in Kyiv, at the Fifth Ministerial Conference in May 2003 by European Environment Ministers and Heads of States. Although the European adoption of the 2010 target suggests progress towards implementation, it is still doubtful if results on national policy and decision-making level are visible after more than two years.

The project

The Central and East European Working Group for the Enhancement of Biodiversity (CEEWEB) started a project on the 2010 target in December 2003 in South-East Europe (SEE) (Albania, Bulgaria, Moldova, Romania, Serbia and Montenegro). Activities in the participating countries focused on the following areas: identifying needs of NGOs for public participation in international processes, capacity building among NGOs, awareness raising, as well as carrying out an assessment of national efforts in each participating country towards the 2010 target. The results and experiences of the national assessments and activities were exchanged and presented at the event *TIME IS LIFE – Conference on halting biodiversity loss by 2010*, which was organized by CEEWEB from 3-4 November in Budapest. The "Position paper on NGO involvement in actions towards the 2010 target to halt biodiversity loss" was adopted by the conference participants. It will be disseminated to GOs and NGOs and will be used for further cooperation and lobby work.

National assessments

National assessments of governmental efforts toward the 2010 target were carried out by the national NGO coordinators based on desk studies and personal interviews with representatives of ministries of environment and other officials. The role of NGOs was also closely looked at. The assessment reports were compiled following the report template provided by the CEEWEB Policy Office.

General overview of efforts towards halting biodiversity loss

As the ongoing nature of conservation activities and the sectoral integration process clearly contribute to the 2010 target, in the first part of the assessment these achievements were summarized. A general assessment of the situation, the efforts made as well as the basic needs and major problems is also necessary for placing the identified national results of the 2010 target into context. This part of the assessment thus provides some baseline information.

National progress resulting from the commitment under the 2010 target

In the second part of the assessment only the progress and efforts are found relevant, which explicitly follow from the 2010 target and would not take place without it. Such direct effects can take place if the outcomes of

such high-level conferences change the attitude of decision-makers, are communicated widely within and to other sectors, as well as to the public (visibility) or gain high political priority (high political commitment within the government). Results directly following from the target, such as policies and decisions, partnerships among stakeholders, providing financial resources, the start of practical projects, were also accounted for. The outcomes of this part of the assessment show if it makes a difference on the short term at the national level to make such international commitments.

Recommendations
On the basis of the findings of the above assessment, recommendations are formulated in the third part of the report. They should consider all aspects of the issues that are covered in the assessment, and point out how progress could be enhanced and the positive impacts multiplied by governmental and NGO activities.

Results of the national assessments

General overview of efforts in SEE countries towards halting biodiversity loss
Although all these the SEE countries participating in the project possess rich biodiversity, the level of nature conservation and sectoral integration show fairly different status. In many cases nature conservation legislation provides a good legal basis for protection, which is generally further enhanced by the upcoming EU accession in candidate countries through legal harmonization (Bulgaria, Romania, and started in Serbia). However, insufficient law enforcement is a general and major shortcoming. Generally there are no institutionalized frameworks for sectoral integration. In most countries intersectoral cooperation takes place in an ad hoc manner.

NGOs have a strikingly different role in these SEE countries, in some of them the NGO movement is still largely underdeveloped (e.g. in Albania), while in other countries NGOs partly overtake the implementation of some governmental tasks (such as Natura 2000 sites designation in Bulgaria).

National progress in SEE countries resulting from the commitment under the 2010 target
In all participating countries, the 2010 target is the responsibility of ministries of environment, but generally it is not raised to a high level of their agendas. This would be needed, however, to attain the target. The target is hardly known at all, sometimes not even the ministry officials are aware of it. The target is mentioned in some documents (Bulgaria), but such good examples are rare. It has not led to any change in the policy making priorities, or in the attitude of policy and decision makers. In EU candidate countries the preparation for accession overshadows other commitments.

Direct results are difficult to assess, but the target may have given impetus for some efforts (e.g. preparation of NBSAPs and other plans). However there is no monitoring of the implementation of the 2010 target in these countries, in some countries there is not even a biodiversity monitoring system in place.

NGOs are only poorly informed about the 2010 target, thus their participation in communication needs and implementation is generally weak and they do not play a watchdog role over governments. In EU candidate countries, the 2010 target is not among the top priorities of NGOs either. However, the current project contributed to increased awareness about the target among NGOs, particularly through the capacity-building workshops held in each country.

Recommendations
Ample recommendations were formulated in the NGO assessments. The major common point is to focus on and achieve better law enforcement in all SEE countries and to expand protected areas. The need for better laws and protected area management, capacity-building and the signing of international conventions and agreements were also frequently mentioned. NGOs have also expressed their demand for better cooperation with governmental institutions, capacity building and better financing possibilities to governmental institutions.

MEDITERRANEAN WOODLAND BIODIVERSITY: ASSESSING THE POTENTIAL OF ADOPTION OF MULTI-SPECIES AGROFORESTRY PRACTICES TO SINGLE-SPECIES AGRICULTURAL LANDS

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Keywords: agroforestry, adaptive sampling, Mediterranean biodiversity, medicinal plants, Asparagus, Pyrus

GEOGRAPHIC LOCATION

The study area is located in Central Greece, at the watershed of Boagris Stream, a few kilometers east of Thermopile, or the Gates of Fire, as it is commonly known. The location is inhabited since early historical times. Today, the primary land uses of the upper part of the Boagris watershed are agriculture and grazing. The experiment is taking place at a small seasonal water stream and its watershed, which is included at the wider runoff area of Boagris. Woodlands and open forest formations share the landscape with agricultural areas. Using as an example the biodiversity of these natural plant communities, agroforestry structures could be created, that could enhance the ecologic sustainability in an economically viable way for the local community.

SAMPLING DESIGN

A combined strip and adaptive sampling design was followed. Transect lines were carried parallel to the main stream of the small watershed, surveying for different ecosystem types. The transect lines were carried from both stream sides, adjacent to the stream, at middle slope, and along the hill tops of the U shaped watershed. Dense woodland formations and evergreen sclerophyllous sites were excluded from the second stage of the sampling design. When a site of the desired characteristics (see below) was observed, additional sampling was applied to gather information on the stand structure and plant species diversity, following the method of adaptive sampling (Thomson, 1992).

At second stage, the woodland sample sites were chosen subjectively in relation to:

- their position, chosen to be adjacent to single crop species agricultural land holdings (The fact that the sample sites are adjacent to the cultivated areas reduces the possibility that any ecological differences occur between the woodland and the agricultural land site-beyond the ones depending on their plant composition. Thus, agroforestry analogs of the tree-grass systems observed in the woodland site can be applied to the agricultural lands with economically important species of similar ecology);
- the site plant diversity and structure (Key observation was the presence of full grown trees with the occurrence of at least one native and non cultivated perennial or annual plant species at the ground stratum).

Within each site further sampling was carried accounting for the number and the kind of existing plant species.

DISCUSSION

The difference in biodiversity between various land use systems is observed by other scientists in semi-arid areas (Higgins *et al.*, 1999) and it is also apparent here. The potential of introducing agroforestry practices promoting biodiversity is examined.

In early September 2004, towards the end of the year's driest period, green grass was observed below the wild pear (*Pyrus* spp.) trees, at one of the sampling sites, while the same plant species was dried outside the shadow effect area of the open grown tree. Sun radiation was enough for them to grow under the tree's shadow, while the reduced emission and increased humidity extended their life period in comparison to the ones growing at an open field. Transferring that effect to an agroforestry setting, a species with similar ecophysiological characteristics could be used in combination with a tree species. The long sunshine periods of the Mediterranean basin result in adequate radiation and net photorespiration (Barnes *et al.*, 1980) levels for ground plants to develop and grow at a tree-grass system.

In the tree layer, *Quercus* spp., *Pyrus* spp. and *Platanus* spp. were the main species observed, with oaks being most abundant. The same species or ones with similar characteristics can form the tree plant community layer at a developed agroforestry system. *Pyrus* spp. trees serve as the root basis for "grafting" domestic varieties of pear producing fruits while also able to produce timber of good quality with appropriate management. Pines (*Pinus halepensis, Pinus nigra*), native in the area, and Cypress (*Cupressus sempervirens*), native and cultivated also, could be the trees used in an agroforestry setting. *Quercus* spp. such as the ones observed, can be also used for an agroforestry system, when long harvesting periods and high quality round wood are some of the managerial objectives.

Medicinal and edible wild plant specimens were observed in the shrub layer of the sampled sites. *Asparagus* spp., which is also a component of the shrub layer of other oak ecosystems in the Mediterranean basin (EUFORGEN, 2000) could be cultivated at the ground stratum surrounding the trees, producing the highly valued edible product, while an annual cereal crop could be used for cultivation of the open field between the planted trees. Medicinal herbs could be used at the ground stratum since they occur natively to the site; an example of it could be the thyme (*Thymus vulgaris*), which is native to the site, or others with products of use in the food industry, while promoting the sustainable use of these wild plants (Heywood *et al.*, 1999).

The proposed systems do not require additional water resources, since the species used are natively grown at the sites, where intensive single species agriculture requires a significant input of water resources and fertilizers. The local biodiversity will be enhanced, and its preservation will create economic interests to the local communities.

Further studies and field trials are needed to examine the proposed agroforestry systems, such as canopy cover and ground species relationships, tree spacing guidelines to permit annual crop harvesting, and selection of native species with economic importance. Therefore, a well-developed agroforestry system based on the economic and ecologic potential of the area is possible to be adapted voluntarily from the local community, contributing to the sustainability of rural development, practice and product diversification, and overall biodiversity of the agricultural practices.

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DEVELOPMENT OF A CANADIAN BIODIVERSITY INDEX

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Keywords: Indicators, index, measuring biodiversity

PURPOSE OF THE CANADIAN BIODIVERSITY INDEX

Context

The Canadian Biodiversity Strategy (CBS), Canada's agenda to implement the Convention on Biological Diversity (CBD) has five goals:

- To conserve biodiversity and sustainably use biological resources;
- To enhance both our understanding of ecosystems and our resource management capability;
- To promote an understanding of the need to conserve biodiversity and sustainably use biological resources;
- To provide incentives and legislation that support the conservation of biodiversity and the sustainable use of biological resources; and
- To work with other countries to conserve biodiversity, use biological resources sustainably and share equitably the benefits that arise from the utilization of genetic resources

The strategy requires jurisdictions to report periodically on progress towards attaining these goals. Assessing the status of biodiversity, in a country of 9.2 million km2, presents a unique challenge. Since the adoption of the Canadian Biodiversity Strategy in 1996 some progress has been made on reporting specific aspects of biodiversity. For example, *Wild Species 2000: The General Status of Species in Canada* reports on the status of all terrestrial vertebrates as well as ferns (Filicopsida), Orchids (Orchidaceae), Butterflies (day flying Lepidoptera) and Freshwater Fishes. As well, many Canadian organizations working at a variety of scales, have begun reporting on suites of indicators covering some aspects of biodiversity, from species to habitat or ecosystems. However, even with all of these efforts, an answer to the simple question, "What is the state of biodiversity in Canada?" has remained elusive.

Draft Framework for the Canadian Biodiversity Index

A Canadian Biodiversity Index (CBI) is being developed to fill this gap. It is intended as a tool to facilitate communicating the state of biodiversity in Canada in a meaningful, concise, and easy-to-understand way. It will simplify the complexity of biodiversity for non-technical policy makers, provide a high level assessment of the success of biodiversity management in Canada and meet some of the reporting requirements of the Canadian Biodiversity Strategy. The CBI is being developed under the auspices of the Federal/Provincial/Territorial Biodiversity Working Group, a group which provides technical support for Canadian Ministers responsible for wildlife and biodiversity.

A draft framework, completed in May 2003 (Fig. 1) (http://www.cbin.ec.gc.ca/) comprises four theme areas: species and genes; animal habitats and plant communities; global and landscape influences; and human influences. A small suite of indicators is established for each theme and measured against attainment of a 'desired future state'. Qualitative assessments are aggregated at the theme, ecounit and national levels to form a national-scale picture of the status of biodiversity and how it is changing over time. This index is intended to consider biodiversity more broadly than some existing indices that focus on only one aspect of biodiversity, such as species diversity (e.g. Shannon-Wiener index, Margalef index).

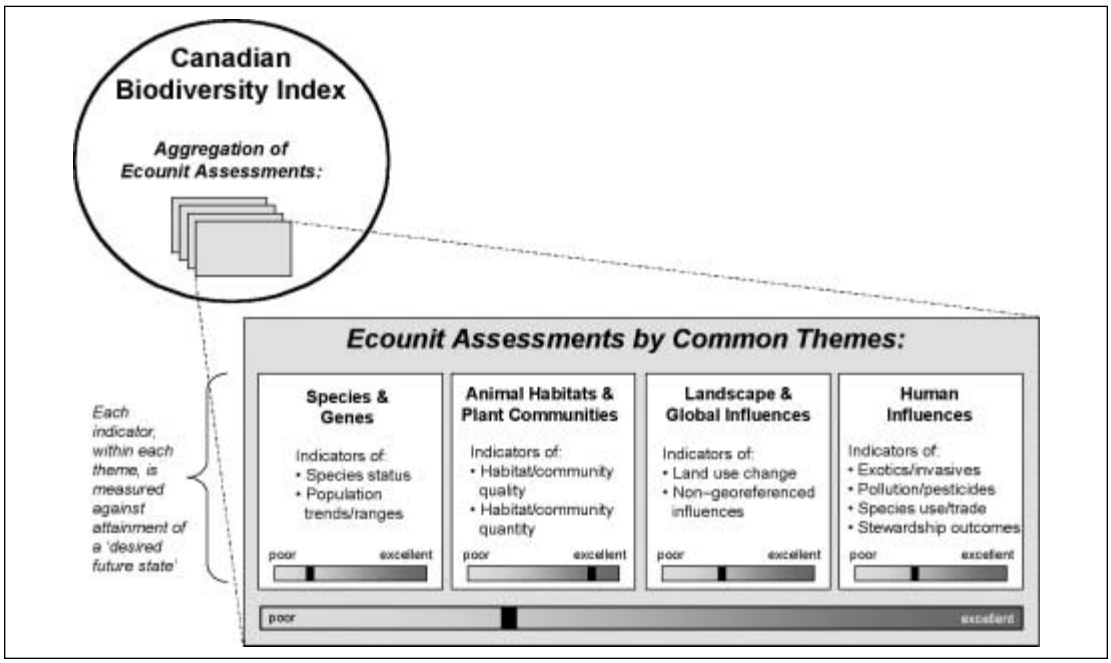
The CBI is envisioned as a tool for capturing and conveying credible information on changing status and trends in biodiversity in a consistent, accessible, and regular manner (annually, for example). It will provide general "big picture" information at the national level, while allowing easy access to cascading levels of detail on particular topics, themes or geographic areas.

We are currently in the "Proof of Concept" testing phase. A Manual for Proof of Concept Testing has been developed (available at http://www.cbin.ec.gc.ca/) . Existing monitoring data, from a wide range of ecosystems and organizations, is currently being matched with the results of objective setting or other 'desired future state' exercises to test the index framework.

The development of the CBI is anticipated as a multi-stepped, iterative process, in which proof of concept testing on a wide range of available datasets, and in different types of ecosystems will results in adjustments to the framework.

Figure 1:

Draft Framework for the Canadian Biodiversity Index.



Ongoing and planned work to achieve the 2010 target

AGRICULTURAL GENETIC RESOURCES OF THE CZECH REPUBLIC - THEIR CONSERVATION AND SUSTAINABLE USE

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Keywords: genetic resources, agriculture, conservation, access and benefit-sharing, programmes

Introduction

Conservation of genetic resources, their sustainable use and the protection of the landscape character represent the principal part of biodiversity conservation in agriculture and a way through which the agricultural sector could contribute to the countdown towards the ambitious 2010 target.

History and Current Situation

In the Czech Republic, similarly as in other central and eastern European countries, since the early 1950s, a central planning system and collective responsibility for land management resulted in many environmental threats to the rural areas and their biodiversity. Activities connected with intensive agricultural production such as excessive use of fertilizers and pesticides, use of huge machinery and large-scale drainage operations all had a negative impact on biological diversity. Large-scale production with its huge production units changed totally the aspect of agricultural landscape and often destroyed the traditional landscape patterns. The disappearing of shelterbelts, small wetlands or ponds and field margins with permanent vegetation led to a decrease in diversity in agricultural landscapes. Certain fragile ecosystems were degraded, such as grasslands or wetlands. In agricultural production broad choice of local cultivars and landraces has been decreased in many crops and relatively narrow spectra of crops and modern cultivars are grown at present. Some local genetic resources were lost, however, other have been saved and can even be found in remote areas. Rich diversity still exists in ecotypes of grasses, fodder legumes and other dicots and selected valuable genotypes can be utilized to increase the diversity of meadows and pastureland or provide new forms of fodder crops. Also valuable landraces of fruit trees (especially apples, cherries, plums and pears) have survived in some areas.

Many valuable genetic resources have been conserved thanks to research and breeding institutions which begun to collect local landraces and traditional bred crop cultivars since the beginning of the 20th century, in broader scale since 1930s. Systematic collecting of landraces and wild relatives of agricultural crops begun in the 1960s. In 1976, a long-term storage under controlled conditions started. A modern Gene Bank of the Research Institute of Crop Production, Prague, with a storage capacity of 100,000 accessions, has been functioning since 1988. Genetic resources have been studied with respect to the most important biological and agronomical characters and their effective utilization in breeding and agricultural practice.

Since the 1990s, when the Czech Republic became the Party to relevant international conventions, activities have aimed to implementation of related international and regional commitments. The Convention on Biological Diversity (CBD), ratified by the Czech Republic in 1993, was adopted into the Czech legal system through the Act No. 134 in 1999. Principles of the Convention on Biological Diversity related to agro-biodiversity are reflected in the Act No. 148 on Conservation and Utilization of Genetic Resources of Plants and Micro-organisms Important for Food and Agriculture adopted in 2003 and in the corresponding Regulation No. 458/2003. In 2004, the Czech Republic ratified the International Treaty on Plant Genetic Resources Important for Food and Agriculture (ITPGRFA).

Activities

The first Czech National Programme on Plant Genetic Resources Conservation and Utilization was launched by the Ministry of Agriculture in 1993. A new National Programme on Conservation and Utilization of Genetic Resources of Plants and Micro-organisms Important for Agriculture, enlarged in its scope, is implemented since January 2004. Eleven Czech institutions participate in this Programme, coordinated by the Research Institute of Crop Production (RICP), Prague. National collections represent in total over 50 000 accessions, among them 18 % species propagated in a vegetative way. More than half of all collections belong to the collections of the RICP. This Institute is charged by the operation of the national information system on plant genetic resources and a long-term storage of all seed-propagated collections within the country. Dry seeds are stored in the Gene Bank under -5°C or -15°C respectively. Majority of vegetatively propagated species are maintained in field collections or in vitro (potatoes). In selected vegetatively propagated species cryo-conservation is being developed. All Czech collections are fully documented in passport data and evaluation data (based on National descriptor lists for 40 crops) are available for 53 % of accessions. Systematic characterization and evaluation of conserved genetic resources enhance their utilization in breeding and in agricultural practice. Annually 2000 - 3000 genetic resources samples are provided to local and foreign users, respecting the principles of CBD and ITPGRFA.

Conservation and monitoring of valuable resources *in situ* contribute to conservation and evaluation of local genetic resources. Local landraces and cultivars are considered as valuable part of collections and as a unique contribution to the crop gene pool. Collecting missions in the field are organized to enrich *ex situ* collections. Selected materials are tested with the aim to find convenient forms for *on farm* conservation and for utilization in agricultural practice with the aim to enrich the existing diversity of crops and cultivars. National grant agencies (National Agency on Agricultural Research, Grant Agency of the Czech Republic) projects enable to study local ecotypes of grasses and legumes and use them to enrich diversity of meadows and pasture land. Cultivars and landraces of neglected crops (buckwheat, millet, and hulled wheat species) are successfully utilized for agro-biodiversity enrichment as well as in a healthy human nutrition. Close collaboration with producers (often organic farmers) and processing industry has been established. Also selected alternative crops and catch crops were studied with the aim of introducing them to growing and to contributing to soil fertility improvement. A new segment of the programmes concerns the study and selection of appropriate local tree species and their use in landscaping.

Due to still prevailing intensive agriculture production, *in situ* conservation is mainly restricted to areas less favoured for agriculture, e.g. to border regions, usually corresponding to protected areas. Hence collaboration with the nature protection authorities is necessary. The spectrum of wild crop relative species is also relatively narrow in the Czech Republic. Fruit trees and prospective fodder crops are the main candidates for conservation *in situ*. The mapping and documentation of fruit trees, grasses and fodder legumes have been funded through a special project by the Ministry of Agriculture. Collecting and monitoring in border regions are developed in close cooperation with neighbouring Slovakia, Poland and Austria and comparable studies are implemented in collaboration with Slovenia.

On farm conservation is restricted to selected landraces of fruit trees (apples, pears, cherries, plums etc.) and neglected field crops (e.g. hulled wheat species). Outputs of inventory and monitoring of landraces (especially fruit trees) will serve as a basis for further development.

Within the ongoing UNEP/GEF Project Biodiversity Enabling Activities – Access to Genetic Resources and Benefit-sharing, Conservation and Sustainable Use of Biodiversity Important for Agriculture, Forestry and Research – the surveys on genetic resources are prepared, regarding not only agricultural plants, but also animals, forest species and *ex situ* collections in botanical and zoological gardens (with special attention to rare and endangered species). Proposal of conservation strategy, principals on access and benefit-sharing (model of Material Transfer Agreement on plant genetic resources) and future cooperation are the expected outcomes of the project.

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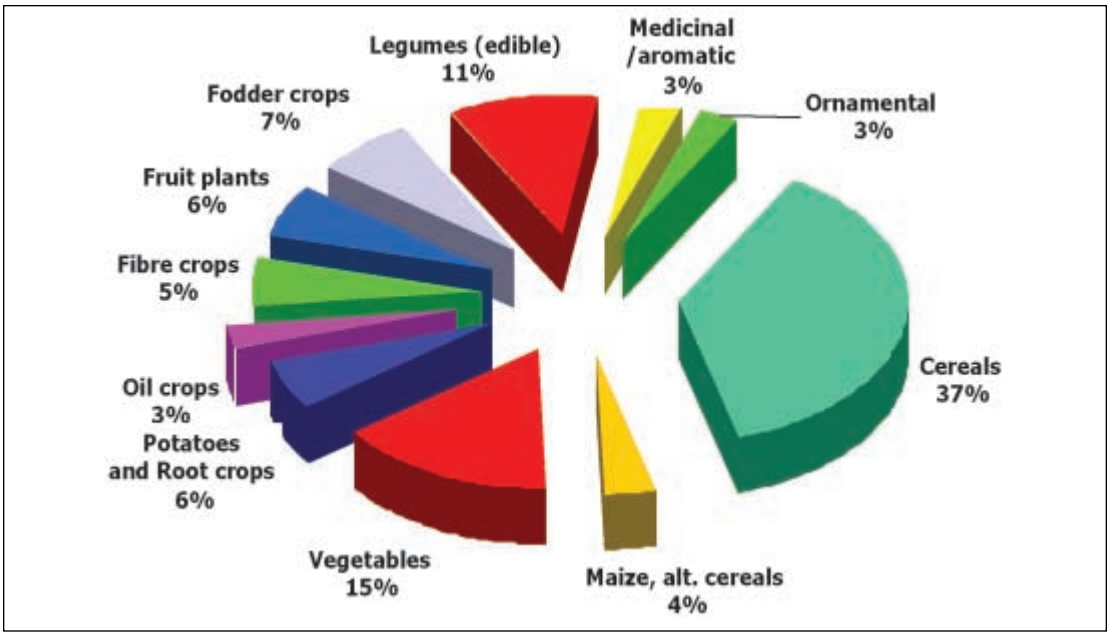
Fig. 1.

Crop Structure of Agriculture Plant Genetic Resources in the Czech Republic ex situ Collections (2003)
(Source: National Programme on PGRFA- Annual Report)



THE MILLENNIUM SEED BANK PROJECT: DEVELOPING SEED CONSERVATION PARTNERSHIPS IN AFRICA, THE AMERICAS, ASIA AND AUSTRALASIA

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Keywords: Seed banking, technology transfer, drylands, GSPC

Introduction

The Millennium Seed Bank Project (MSBP) is a ten-year, international plant conservation project. Catalysed by the Seed Conservation Department of Royal Botanic Gardens, Kew, the MSBP currently involves partnerships with over 40 organizations working in 17 countries in Africa, the Americas, Asia and Australasia. The Project seeks to conserve, as seed, 24,200 species by 2010, principally from the Drylands.

By providing insurance against loss of plant species in the wild, the MSBP is contributing to the CBD 2010 biodiversity target to significantly reduce the rate of biodiversity loss at the global, regional and national level. Specifically, the MSBP is contributing to the targets laid out in the Global Strategy for Plant Conservation (GSPC) and the Programme of Work on Dry and Sub-Humid Lands.

Role of seed banking

Seed banking is one in a series of tools that can be employed in the conservation of plant species (Heywood and Iriondo, 2003). Seed banking cannot directly protect biological diversity of ecosystems but it can ensure the protection of diversity between, and within, plant species. In particular seed banking provides an insurance against the loss of plant species and populations in the wild. Seed banking has several advantages including ease of storage, economy of space, relatively low labour demands, and consequently the capacity to maintain large samples, with wide genetic representation, at an economically viable cost. Seed banks provide a controlled source of material, of high quality and genetic diversity, for research and for the rehabilitation and restoration of degraded ecosystems and the recovery of threatened species. Terms and conditions can be attached to the supply of this material which ensures the fair and equitable sharing of the benefits of its use.

Working with partners

In accordance with the CBD, and 2010 goal 10, the MSBP partnerships recognize states' sovereign rights over their own genetic resources. Each partnership is based on a legally-binding Access and Benefit Sharing Agreement (ABSA) which sets out the mutually-agreed terms under which RBG Kew and the partner will access, use and transfer the material, and will share fairly and equitably any benefits which arise from the collection, study and conservation of the material. Material collected under these partnerships is held both in the country of origin and at RBG Kew. Both partners also share the non-monetary benefits arising out of the collections such as information on the collections and knowledge of how to better collect, process and store them. These benefits are shared through technology transfer activities including collaborative research, training activities, joint field work and technical attachments. The ABSAs forbid commercialization of the collections by RBG Kew

The development and agreement of these ABSAs involves detailed discussions with a variety of scientists, government officials and lawyers. The major delay in starting project activities can reflect an uncertain government position and process in this fast-moving policy area.

Working together allows the MSBP partners to fill gaps to meet agreed conservation goals. Partners pool their knowledge, contacts, skills and experience, facilities and data, meaning the overall partnership is far greater than the sum of its parts.

The strong focus on technology transfer and networking amongst conservation organizations makes a significant contribution to 2010 goal 11 on the provision of adequate resources. More specifically it is helping countries meet GSPC targets 15 and 16 related to building capacity for the conservation of plant diversity.

Conservation outcomes

To date MSBP partnerships have conserved over 5000 species, making a significant contribution to the 2010 goals 2 and 3 in the Focal Area related to protecting the components of biodiversity.

GSPC Target 8 requires 60% of threatened species to be held in accessible ex situ collections, preferably in the country of origin, by 2010, and for 10% of these to be used in restoration and rehabilitation. Already many threatened species have been conserved by the MSBP and additional work is underway to specifically target threatened species for collection and conservation. Experience is being gained in the use of seed collections in recovery and restoration programmes and this use of collections is expected to grow in the coming years.

There are many additional benefits to the MSBP seed banking activities which meet other 2010 goals and GSPC targets. In many countries seed-banking fieldwork is contributing to a better understanding of the conservation status of plant species. In some countries traditional knowledge associated with plants and seeds is being protected alongside the seeds. In all cases the conservation of seeds, and the development of germination and propagation protocols offers the potential to promote sustainable use of these species in the future.

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PREVENTING EXTINCTION IN ONE OF THE MOST THREATENED ISLAND ECOSYSTEMS: INTENSIVE RESTORATION OF TWO GLOBALLY IMPORTANT ISLET NATURE RESERVES OF MAURITIUS, ILE AUX AIGRETTES AND ROUND ISLAND

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Keywords: Mauritian Wildlife Foundation, Grannum Road, Vacoas, Mauritius

Introduction

Mauritius, in the Mascarene archipelago is part of the Indian Ocean Islands hotspot (Conservation International). The island has one of the most threatened island biotas in the world due to habitat destruction and predation or competition by introduced species that are still the major threats to the unique Mauritian biota.

There are about 685 flowering plant species which are native to Mauritius including 8 endemic genera. Approximately 300 of these native species are endemic to Mauritius, and an estimated 80% are threatened and 12% are already extinct. Before human settlement, Mauritius and its offshore islets were home to 23 taxa of endemic land-birds, 12 reptiles (including 2 endemic giant tortoises, skinks geckos and snakes), as well as 2 species of fruit bats. At least 50% of these endemic animal species have since become extinct.

Offshore islets represent very important areas in terms of long-term conservation. These isolated areas of land often act as last refuges of the plants and animals that were once common in the lowland and coastal regions of the mainland. The relative isolation of the islets has meant that they have been less affected by the introduction of exotic species that followed colonization. Eradication of those exotics that arrived there is also possible providing safe areas for the long-term survival of plants and animal species.

Conscious of the rich biodiversity and their international importance for conservation, a strategic plan has been prepared for most of the islets of conservation importance and there are intensive restoration programmes on two of these islets.

Ile aux Aigrettes, a 26ha offshore islet of Mauritius has the last remnant of coastal ebony-rich forest, which is under constant threat of degradation from invasive plant species. Despite human-induced degradation on this islet over the last 400 years, it still has the best-preserved native vegetation cover amongst all the coralline islands of the Mascarenes. The island is also a refuge for many rare plants, such as Gastonia mauritiana (CR), *Diospyros egrettarum* (CR), *Sideroxylon boutonianum* (CR), and *Dracaena concinna* (EN).

Round Island is an islet of 219 ha located north of Mauritius. The island was heavily degraded by introduced goats and rabbits, but is of exceptional biological importance because it supports the last remnants of a palm rich forest once characteristic of the northern plains of Mauritius. It is also home to at least ten threatened native plant species, and eight endemic taxa of native reptiles including five that are only found on the island. It is the only known breeding ground in the Indian Ocean for the rare Round Island petrel (*Pterodroma arminjoniana*) and an important breeding site for three other species of seabird; *Puffinus pacificus, Phaethon rubricauda & P. lepturus*.

Because of their importance in terms of conservation, both islands have been declared as Nature Reserves and are under active management to restore the degraded habitats and protect the remaining biodiversity on the islets.

Methods and Results

Restoration of Ile aux Aigrettes

In 1985, restoration work was started on Ile aux Aigrettes. Following a grant from the Global Environment Facility (1996-2000), it was possible to eradicate rats and initiate full-scale restoration of the island's vegetation.

In order to carry out this work a grid system of 12.5m x 12.5m was set up on the island and the island was divided into a core area and a coastal area. The core area was least invaded and had the best remnant forest of the islet. The coastal area was the most invaded and restoration was focused in these areas. The coastal area was divided into 12 blocks and weeding was done block-wise. Native and endemic plants produced from the island nursery were planted in the weeded areas to accelerate the restoration process.

Regular weed surveys were done during this period to make an inventory of weed species and evaluate extend of invasion. Weeding was done using manual, mechanical and chemical methods. Man-hours spent on weeding per grid cell were recorded to quantify hours spent and costs of restoration of the islet. For the yrs 2000-2002, 29,088hrs were spent to weed a surface area of 12.3 ha. ArcView GIS 3.2 software was used to produce maps that helped to monitor progress of restoration annually (Figure 1). Fixed-point photographs were also taken to have a record of changes of vegetation type and cover over time. A number of noxious species, which had not yet spread all over the island, are targeted as a priority for weeding.

The restoration programme involved up to 40 paid Mauritian staff and is supported by Mauritian volunteer community groups. Regular low intensity maintenance weeding is supported by income from the island's ecotourism.

Restoration of Round Island

Active restoration of Round Island began in 1970s with the eradication of goats and rabbits, both of which had almost totally devastated the native palm forest. In 2000 funding was secured from the Global Environment Facility (GEF), through the World Bank, for *The Restoration of Round Island Project*. The GEF grant has provided funds for investment in infrastructure (notably a semi-permanent field station and materials for water catchment and storage) and personnel who have been employed permanently on the Round Island project.

The ultimate goals of the Restoration of Round Island Project were:

- The establishment of a largely self-sustaining ecosystem with a minimal influence of alien flora and fauna.
- The attainment of the maximum sustainable level of native plant and animal diversity.
- A significant level of conservation of threatened species.

A thorough quarantine system has been put in place, the vegetation has been mapped (figure 2) and over 4000 plants have been planted over the last three years, research is ongoing on the natural history of the reptile species to provide baseline information before translocation to other islets and there is a long-term monitoring project on the Round Island petrel.

Conclusions

Successful restoration techniques have been developed, quantified, and implemented on both islets. 80% of IAA's forests have been restored and now require only periodic weeding. Only 5ha of highly degraded forest needs to be intensively restored in order to complete the restoration of the island and funding has recently been secured from the IUCN Sir Peter Scott Fund, and Maurice Laing Foundation to allow this. Once, this area has been weeded, the island will reach a state in which the only management necessary will be regular maintenance weeding, financed by the ecotourism.

The GEF project on Round Island finished at the end of 2004; the project is now being considered for funding from the Government of Mauritius with active management slowly decreasing as the island restores itself. The next phase will be the translocation of reptiles to other islets to aid in the long-term survival of these species.

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Figure 1.

Number of man hours spent on weeding in 2003

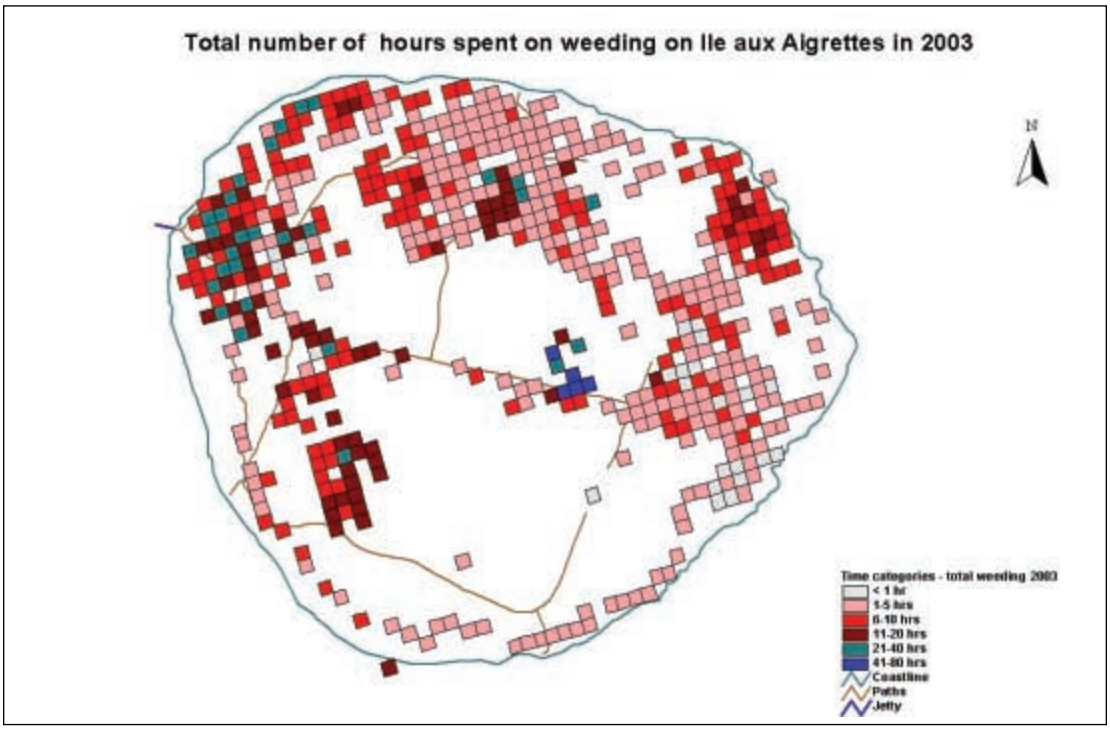
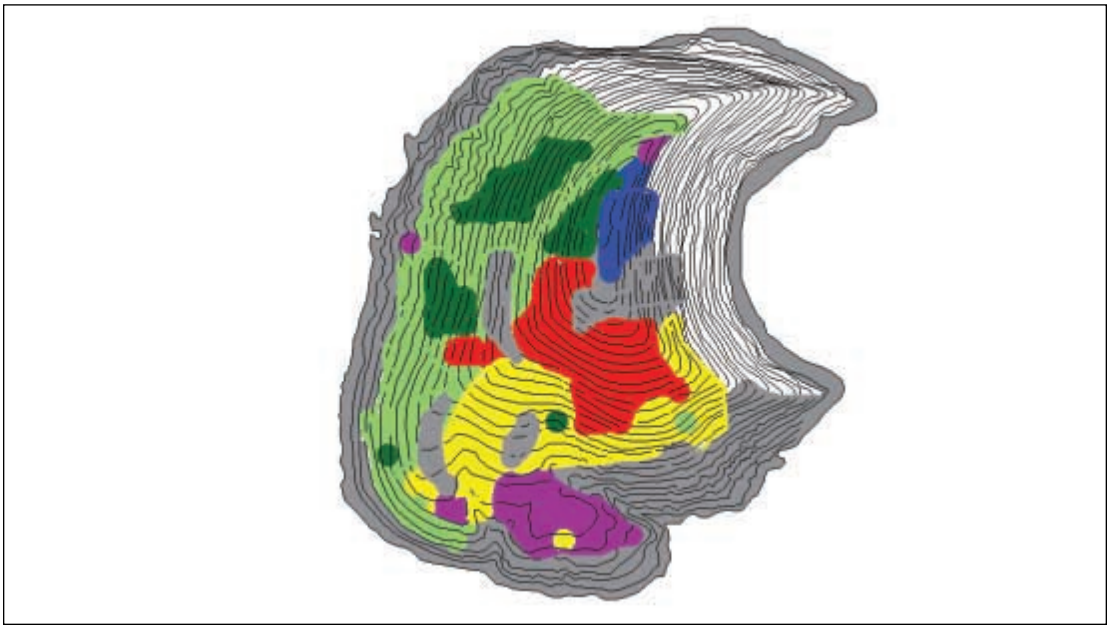


Figure 2.

Vegetation map of Round Island, as determined by TWINSPAN analysis



THE GLOBAL PARTNERSHIP FOR PLANT CONSERVATION

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Keywords: Global Strategy for Plant Conservation, GSPC, 2010 target

Introduction

At the sixth meeting of the Conference of the Parties to the Convention on Biological Diversity the Global Strategy for Plant Conservation (GSPC) was adopted. The ultimate and long-term objective of the Strategy is to halt the current and continuing loss of plant diversity. The GSPC includes 16 outcome-orientated targets to be achieved by 2010. These were the first ever internationally agreed targets in biodiversity conservation, and with their adoption, the GSPC has been recognized as an innovative model approach to target setting for the CBD.

The Global Partnership for Plant Conservation (GPPC) is a voluntary initiative that brings together international, regional and national organizations in order to contribute to the implementation of the GSPC. The GPPC was launched at an event held on Friday 13th February 2004 during the 7th CBD COP meeting in Kuala Lumpur, Malaysia.

Founding members of the Partnership

- BioNET International
- Botanic Gardens Conservation International (BGCI)
- Earthwatch
- Fauna and Flora International (FFI)
- Food and Agriculture Organization of the United Nations (FAO)
- Global Biodiversity Information Facility (GBIF)
- Global Invasive Species Programme (GISP)
- International Plant Genetic Resources Institute (IPGRI)
- IUCN - The World Conservation Union - Species Survival Commission
- King's Park and Botanic Gardens, Australia
- Missouri Botanical Garden, St Louis, U.S.A.
- National Botanical Institute, South Africa
- People and Plants International (PPI)
- Plantlife International and Plant Europa
- Royal Botanic Gardens Kew, U.K.
- Royal Botanic Garden, Edinburgh, U.K.
- Smithsonian Institution Natural History Museum, Washington D.C., U.S.A.
- UNEP World Conservation Monitoring Centre (UNEP-WCMC)
- World Agroforestry Centre, ICRAF
- WWF International (WWF)

Aims of the Partnership

The partnership aims to provide a framework to facilitate harmony between existing initiatives aimed at plant conservation, identify gaps where new initiatives are required, and promote mobilization of the necessary resources.

Status of the Partnership

The Partnership has no existing legal status but represents a voluntary commitment by member organizations. The Partnership does not seek to compromise the independence of any of its members but aims to create synergies and add value to existing initiatives, particularly in support of national GSPC implementation and in supporting efforts being made by Parties in responding to the GSPC. An important role of the partnership will be to enhance communication and collaboration between members. The priority will be to minimize duplication of effort, maximize available limited resources and ensure clarity in communication.

Activities of the Partnership

Since its establishment, the members of the Partnership have continued to assist in the implementation of the Global Strategy for Plant Conservation through their own programmes. Where appropriate, members have also been involved in facilitating stakeholder consultations on the GSPC targets, which have involved several hundred stakeholders. In this respect, substantial progress has been made for many targets in elaborating sub-targets and milestones, clarifying baselines and identifying indicators.

In addition, specific activities supported or organized by Partnership member organizations have included:

- Preparation of several language versions of the GSPC brochure, (French, Chinese, Russian and Spanish) and the establishment of a website for the Global Partnership for Plant Conservation: http://www.plants2010.org (under construction);
- Review of progress in the implementation of the European Plant Conservation Strategy and its contribution to the GSPC
- Support for national workshops in the Seychelles and China to develop National Plant Conservation Strategies;
- A regional training course for plant conservation practitioners in Africa;
- Development of GSPC-related 2010 targets for botanic gardens;
- Continued work towards defining criteria for designating Important Areas for Plant Diversity (IPAs) in various European and other countries
- Development of a proposal for the Global Environment Facility (GEF) involving 10 countries to identify important and threatened plants and their Important Plant Areas (Target 5), as well as to put in place sustainable management plans for these areas;
- A 'Gap Analysis' meeting to review progress towards GSPC Target 1;
- Completion of a pilot project investigating ways of accelerating production of a working list of known plant species (Target 1) and preliminary assessments of conservation status of selected species (Target 2);
- Investment in completion of global checklists for Leguminosae, Rosaceae and Rubiaceae and all monocot families as contributions to Target 1;
- Establishment of a European network of seed banks for the conservation of wild species and on-going collaboration with 31 institutes in 17 countries engaged in ex situ seed conservation (Target 8).

A Secretariat for the Partnership is being hosted by Botanic Gardens Conservation International (BGCI), and is supported by HSBC through the Investing in Nature programme.

STRATEGIC ACTION PROGRAMME FOR THE CONSERVATION OF BIOLOGICAL DIVERSITY (SAP BIO) IN THE MEDITERRANEAN REGION

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Keywords: Mediterranean, Barcelona Conventions, SPA Protocol, Coastal, Marine, Conservation, Sustainable use

About 150 million people, one third of the population of the Mediterranean coastal states, live in the coastal regions and islands. Economic activities in the coastal areas are constantly expanding. In addition, the Mediterranean region is the destination of about 200 m. tourists per year. A permanently increasing pollution has already resulted in disruption of or highly negative impacts on fragile ecosystems, impacts on quality of life of resident populations and loss of habitats and species. The resulting impacts on the might be considered as dramatic. Present and future trends concerning adverse global phenomena, climate change in particular, are expected to worsen the situation.

The Mediterranean Sea covers only 0.7% of the world's oceans. Its continental-cradled position makes this "Inland Sea" a unique reservoir of European waters, connecting Europe to Asia and Africa in a biodiversity melting pot. It hosts 7.5% of the world's marine animal taxa and 18% of the world's marine flora and is possibly one of the richest seas for biodiversity in the world. The Mediterranean Sea may be considered as a hot spot of marine species diversity. The Mediterranean marine fauna and vegetation have evolved over millions of years in a unique mixture of temperate and subtropical elements, with a large proportion (28%) of endemic species. The uniqueness of Mediterranean biota comes from a combination of historical, morphological, chemical and biotic characteristics.

Also the biodiversity of the Mediterranean coastal ecosystems and wetlands is considered to be significant, because of the many sensitive habitats it includes for both flora and fauna species:

- Approximately 150 wetland sites have been recognized as of International Importance,
- Extensive sand dunes can be found all around the Mediterranean,
- There are thousands of islands –very important for marine and migrating birds
- The region is reputed to have 13,000 endemic plants.

The rich variety of life in the waters and coastal zone of the Mediterranean Sea faces a bleak future due to growing human exploitation of nature and natural resources; the heaviest pressure connected to human activity is now to a great extent concentrated along the coast. The sea and the coast can be considered among the most threatened sites in the Mediterranean region.

Moreover the knowledge of Mediterranean biodiversity cannot be considered satisfactory, being neither complete nor systematic. Gaps in knowledge on Mediterranean biodiversity are evident at individual/population (genetic diversity), species and community/habitat level.

When the problems of biodiversity loss are defined in terms of their immediate causes, the response is to take defensive and often confrontational action, such as enacting laws, closing access to resources and declaring additional protected areas. Such responses are necessary in times of uncontrolled over-exploitation. They are seldom really suitable for changing the social and economic causes of the threats to biological diversity. When problems are defined in terms of their root causes a more constructive response can be stimulated, one that

seeks cooperative effort to address the social and economic foundations of resource depletion. Conserving biological diversity needs to address both proximate and ultimate causes.

The complex threats to biological diversity call for a wide range of responses across a wide spectrum of public and private sectors, the implementation of national and regional actions and the participation and involvement of all the countries, stakeholders and users.

The answer to this wide and complex need is the elaboration of the present Strategic Action Plan for the conservation of marine and coastal biodiversity in the Mediterranean, achieved starting from the needs identified by countries, the available results and outputs so far attained and with the participation and contribution of the widest number of actors. The elaboration process of SAP BIO consisted in an assessment at national and regional level of Mediterranean coastal and marine biodiversity, based on existing inventories and databases.

OBJECTIVE OF THE STRATEGIC ACTION PLAN FOR THE CONSERVATION OF MARINE AND COASTAL BIODIVERSITY IN THE MEDITERRANEAN (SAP BIO)

The principal objective of SAP BIO is establishing a logical base for implementing the new Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean Sea (1995), that is providing Contracting Parties to the Barcelona Conventions, international and national organizations, NGOs, donors and all other actors involved in the protection and management of the Mediterranean natural environment, with principles, measures and concrete and coordinated actions at national, transboundary and regional level for the conservation of the Mediterranean marine and coastal biodiversity, within the framework of sustainable use and through the implementation of the 1995 SPA Protocol. Furthermore, SAP BIO complies with the recommendations and approaches of the Johannesburg Earth Summit.

The basic objective of this Strategic Action Plan is to be used within the context of the SPA Protocol to :

(i) foster the improving of knowledge of marine and coastal biodiversity,

(ii) improve the management of existing, and favour the creation of new, Marine and Coastal Protected Areas,

(iii) enhance the protection of endangered species and habitats,

(iv) contribute to the reinforcement of relevant national legislation and national and international capacity building,

(v) contribute to fund-raising efforts.

Reference

UNEP-MAP-RAC/SPA: Strategic Action Programme For The Conservation Of Biological Diversity (SAP BIO) In The Mediterranean Region, Tunis, 2003

AGROFORESTRY INNOVATIONS FOR BIODIVERSITY CONSERVATION AND SUSTAINABLE LANDSCAPES

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Keywords: Agroforestry Practices, biodiversity conservation, land productivity, livelihoods, sustainable landscape

Introduction

In addition to its well-established role in promoting sustainable agriculture (Buck et al. 1999; Franzel et al. 2002; Nair et al. 2004), agroforestry is increasingly being recognized as a crucial vehicle for enhancing biodiversity conservation and fostering environmental sustainability (Schroth et al. 2004). **Agroforestry is about the many roles of trees on farms and in rural landscapes to increase food security, provide income and assets, protect the environment and regenerate the land**. These include fertilizer tree systems, fruit tree systems, timber tree systems, fodder trees and medicinal trees. By putting trees to work on their farms to enhance their livelihoods, rural farmers in the developing world are also playing an increasingly crucial role in mitigating land degradation, reducing loss of biodiversity, and combating desertification and climate change.

The practice of agroforestry has a major role to play in achieving the Millennium Development Goals (Garrity 2004), as well as implementation of several Programmes of Work of the Convention on Biological Diversity (CBD), including those on Agricultural Biodiversity and Protected Areas, and the Global Strategy on Plant Conservation. This poster highlights examples of the innovations being developed with farmers through agroforestry research and development initiatives at the World Agroforestry Center (ICRAF). They include the following practices:

- *Enhancing sustainability of smallholder farms through improved fallows and fertilizer tree systems*. In addition to replenishing soil fertility and increasing food security, these innovations also control land degradation and reduce the need for farmers to convert additional areas of fragile habitats. In addition, the fertilizer tree systems also play a key role in climate change adaptation and mitigation by helping to buffer smallholder farming against biophysical impacts while contributing to carbon sequestration. ICRAF's work with national and regional partners in the Sahel and drylands of Eastern and Southern Africa has lead to improved fallows that maximize productivity of smallholder farms while reducing pressure on the fragile ecosystems such as the Miombo woodlands and Sahelian Parklands.

- *Enhancing improved use and management of trees on farms, including fruit tree systems that enhance health, nutrition and incomes, smallholder timber that enhance assets and incomes, and fodder trees to increase livestock productivity and reduce costs*. ICRAF's work with farmers and partner institutions in the humid tropics of Central and Western Africa has made tremendous strides in domesticating high value tree species to diversify productive options on smallholder farms. In Eastern Africa, ICRAF and its partners are helping dairy farmers to grow fodder trees on their farms as practical and cost-effective alternatives for feeding their cattle. These innovations are helping to diversify on-farm biodiversity while maximizing effective use of existing farmlands.

- *Advocating for improved policies to benefit smallholder farmers*, including systems for improving and supplying tree germplasm, input and output markets favourable to small producers. ICRAF and partners also work to influence changes in land tenure policy at local, regional, and national levels that provide an enhancing environment for families and communities to plant useful trees. Changes in forest and trade policy reduce the constraints to farming with trees, and enable the trees that smallholders grow to be more competitive in national and international markets. Furthermore, ICRAF's work with rural poor farmers engaged in agroforestry practices in Southeast Asia is helping to develop

reward mechanisms for environmental services that they provide to society protection of watershed resources, biodiversity conservation, and increasing resilience to climate change.

About the World Agroforestry Centre (ICRAF)

The World Agroforestry Centre (ICRAF) is one of the leading, science-based research and development institutions in Africa. For more than 25 years, ICRAF has pursued and pioneered innovative ways to help poor farmers throughout the tropics manage their very limited resources by advancing the science and practice of agroforestry. Agroforestry innovations developed by ICRAF with scores of institutions in the developing world have helped transform the lives of millions rural farmers in Africa, Southeast Asia and Latin America, while at the same time conserving biodiversity and creating sustainable landscapes. Our long-term goal is to poor farmers throughout the developing world with sustainable ways to improve their livelihood and protect the environment. We believe that this goal resonates very well with the strategic agenda set out by the World Summit on Sustainable Development and outlined in the Millennium Development Goals. Our strong emphasis on scientific research for development will help unravel the complexity while delivering innovations to pressing environmental problems throughout the developing world – **land degradation, desertification, invasive species, biodiversity loss and impacts of climate change.**

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SCIENCE GUIDING BIODIVERSITY CONSERVATION IN PRAIRIE CANADA: SUCCESSES OF THE PRAIRIE HABITAT JOINT VENTURE PARTNERSHIP

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The Context: Prairie Canada

The Canadian Prairie Region encompasses roughly 57 million hectares of southern Alberta, Saskatchewan and Manitoba and includes portions of the Mixed and Tall-grass Prairie, Aspen Parkland, and Boreal Transition ecoregions. This area overlies some of the most agriculturally productive land in North America and is recognized as one of the most highly altered and fragmented ecosystems in the world (Samson and Knopf 1996). Approximately 80% of the land is under private ownership. Since settlement by Europeans in the early 1800s, an estimated 2/3 of the native uplands and many of the associated wetlands have been lost to cultivation. Cereal and oilseed production, and pasture (tame and native grasses/forages) for beef cattle, are primary land uses. This region contains primary breeding and migratory staging areas for waterfowl, water birds, shorebirds and land birds (Canadian Prairie Partners in Flight 2004, Gratto-Trevor et al. 2001, Beyersbergen et al. 2004). Due to habitat alteration and loss, declines in all bird groups have been documented. Biodiversity continues to be threatened by invasive species and non-natural disturbance regimes. Currently, there are 22 threatened and endangered species listed in Prairie Canada (www.sararegistry.gc.ca).

The Prairie Habitat Joint Venture

The North American Waterfowl Management Plan (www.nawmp.ca; USFWS and CWS 1986) is a landmark agreement between Canada, the United States and Mexico to conserve and enhance the habitats most critical to the annual life cycle needs of waterfowl. The North American Bird Conservation Initiative (NABCI; www.nabci.net) is a framework for promoting and facilitating cooperation and action to advance all bird conservation. Joint Ventures are regional partnerships designed to implement NAWMP and NABCI activities. One of the largest Joint Ventures is the Prairie Habitat Joint Venture (PHJV) focusing on Prairie Canada. The PHJV vision is a healthy prairie, parkland and boreal landscape that supports sustainable ecological and economic benefits for society. Key goals include achieving bird population objectives by arresting further loss of wetlands and native upland habitats, and restoring functional habitats for bird populations. PHJV partners include the Canadian federal government, provincial governments, crown corporations, and non-government organizations working cooperatively with thousands of participating landowners.

Science Guiding Conservation

The application of ecological science has advanced the effectiveness of PHJV conservation efforts. The PHJV is guided by the Adaptive Management Approach (Walters 1986). Conservation efforts are tested through implementation and follow-up evaluations of their effectiveness. Directed studies answer specific bird/habitat questions, contributing to improved planning and program delivery (e.g., Anderson et al. 1996). This includes construction of models that link landscape change and condition to population processes (e.g. habitat suitability and reproductive success, Davis 2004, Devries et al. 2004).

Population monitoring is a key measure of success, especially for species of special concern and species at risk. When linked to habitat associations, this monitoring can identify key species/habitat relationships, and allows landscape-scale modelling of biodiversity potentials and responses. Habitat monitoring (e.g., Watmough et al. 2002) documents the loss of important habitats such as wetlands and native prairie, instances where positive land use changes have occurred, and provides indicators of habitat condition (e.g., grazing lands condition monitoring; PFRA 2000).

The PHJV is developing priority habitat models for each of the four bird groups to target conservation efforts. Broader biodiversity benefits are expected from Joint Venture actions.

Partnership Activities

Partner activities include direct habitat securement through purchase, conservation easements and management agreements, wetland and grassland restorations, and promotion of environmentally sustainable agricultural practices. Because farm income considerations ultimately drive land use decisions by private landowners, agricultural policy is critically important. Currently, Agriculture and Agri-Food Canada's "Agricultural Policy Framework" (APF; AAFC 2003) is playing a key role in branding Canada as a global leader in environmentally sustainable agriculture. APF initiatives include conversion of environmentally sensitive lands to perennial forages, promotion of environmental farm planning, watershed management planning, and development of landscape level biodiversity indicators. Promotion of environmentally responsible land management practices will significantly broaden the reach of biodiversity conservation.

Challenges

Significant future conservation challenges are presented by uncertain impacts of climate change, introduction of exotic species, and social/cultural/economic forces. Further success of the PHJV partnership will require the continued application of sound science, reduction of institutional barriers, communication of habitat/biodiversity benefits to broader society, and continued commitment of Prairie landowners.

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COLLABORATING TO INTEGRATE BIODIVERSITY INTO OIL AND GAS DEVELOPMENT

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Keywords: oil and gas, private sector, energy and biodiversity, impact assessment, indicators

Increasingly, areas of interest for oil and gas development are also being recognized and valued for their biodiversity resources. While oil and gas operations are often not the biggest threat to biodiversity in an area, they can have a wide range of negative impacts on ecosystems. In some cases, company activities may also make a positive contribution to biodiversity conservation. With increasing demand for energy and the likelihood that oil and gas will be used to meet much of this demand over the next several decades, the risk to biodiversity from energy development projects is expected to increase. For that reason, a number of environmental organizations and companies have begun to undertake collaborative efforts to integrate biodiversity conservation into oil and gas development.

THE ENERGY AND BIODIVERSITY INITIATIVE

Background

The Energy and Biodiversity Initiative (EBI) was launched in January 2001 with the goal developing and promoting biodiversity conservation practices for integrating biodiversity conservation into upstream oil and gas development. EBI membership includes five conservation organizations and four oil and gas companies — BP, ChevronTexaco, Conservation International, Fauna and Flora International, IUCN — The World Conservation Union, Shell, Smithsonian Institution, Statoil, and The Nature Conservancy. Following two and half years of collaborative efforts, the EBI member organizations released a report "Energy and Biodiversity: Integrating Biodiversity Conservation into Oil and Gas Development" in August 2003. The EBI report and its accompanying eleven products provide guidance for integrating biodiversity conservation into upstream oil and gas development, including specific guidance on environmental and social impact assessment and indicator development.

Current Activities

Since the release of the report, the EBI has been working closely with oil and gas companies and associations, EBI member companies and conservation organizations to pilot test, gain feedback on, and promote the tools and guidelines. Member and outside organizations are pilot-testing the EBI products at a number of locations globally. And EBI is also actively seeking feedback, including through questionnaires, the EBI website, and other less formal means. In addition, EBI has actively promoting the EBI guidance at number of global forums. EBI is also working on developing further workshops in China (Spring 2005), West Africa (September 2005), and North America. The EBI plans to conclude these current activities in June 2005.

IPIECA-OGP BIODIVERSITY WORKING GROUP

The Biodiversity Working Group (BDWG) was established by the International Petroleum Industry Environmental Conservation Association (IPIECA) and the International Association of Oil and Gas Producers (OGP) in 2002. Members of these two organizations produce more than half the world's oil and

about one third of its gas. The working group provides a unique forum for members to share information, enhance understanding and develop input on how the oil and gas industry can improve performance on biodiversity related issues and contribute positively to biodiversity conservation. IPIECA & OGP hold formal United Nations consultative status enabling their members to attend all UN negotiations, including those surrounding the Convention on Biological Diversity. The BDWG also acts as a focal point for external organizations to discuss biodiversity issues with the oil and gas industry.

Global Efforts

Based on workshop discussions and feedback from member companies, IPIECA and OGP have agreed to work with the EBI representatives to carry out the following activities:

1) Increase awareness of the EBI products within the oil and gas industry through dissemination at workshops, conferences and other association channels where appropriate;

2) Review the EBI products relating to the business case for biodiversity action, environmental impact assessments and significant indicators for the industry; and develop additional guidance documents on these issues as needed;

3) Act as a forum for those companies piloting the EBI products so they can share experiences, gather feedback and consider future refinement.

These activities aim to promote awareness of biodiversity issues and the EBI products, but do not imply IPIECA or OGP member company endorsement.

SITE-BASED COLLABORATIONS

Shell and Smithsonian Institution in Gabon

The Smithsonian Institution - Monitoring and Assessment of Biodiversity Program (SI/MAB) and Shell are working together to increase understanding of biodiversity and energy resource development in Gabon.

ConocoPhillips and Conservation International in Venezuela

ConocoPhillips is operator of a petroleum concession — held in consortium with Eni Venezuela and OPIC — in the Gulf of Paria off the coast of Venezuela. CI and ConocoPhillips signed an agreement in 2002 to use the Initial Biodiversity Assessment and Planning (IBAP) methodology.

BP and Partners in Indonesia

BP Indonesia, along with a number of partners, is implementing a Biodiversity Action Plan (BAP) for its Tangguh project in Papua.

THE GREAT LIMPOPO TRANSFRONTIER PARK: A VISION SET TO CREATE BENEFITS FOR CONSERVATION AND LOCAL COMMUNITY LIVELIHOODS

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Keywords: transboundary, conservation, protected areas, community empowerment, poverty

The Legal basis for the development of the Great Limpopo Transfrontier Park

Within Southern Africa interest in the management of natural resources and biological diversity has shifted from site level focus to broad landscape approaches. With this shift in focus, transboundary natural resources management (TBNRM) is now realized as a tool in broad landscape management (van der Linde et al., 2001) with the potential to unlock development opportunities. The Declaration Treaty and Protocol (SADC, 1992) of the Southern African Development Community (SADC) which calls for inter-sector co-operation and economic integration between member countries sets the legal basis for focus on TBNRM approaches. The Treaty also forms the policy framework which has been the basis for the development of (i) the SADC Policy and Strategy for Environment Sustainable Development (SADC, 1996), (ii) the Protocol on Wildlife Conservation and Law Enforcement in the Southern African Development (SADC, 1999), and (iii) the Treaty on the Establishment of the Great Limpopo Transfrontier Park between the Governments of the Republic of Mozambique, the Republic of South Africa and the Republic of Zimbabwe which was signed on 9 December 2002.

Southern Africa has a big potential for transfrontier conservation areas (Cumming, 1999) and the Great Limpopo Transfrontier Park (GLTP) is the largest of the TBNRM areas.

The Great Limpopo Trans-frontier Park and its objectives

The GLTP was created through the merger of the Kruger National Park including the Makuleke region in South Africa; the Limpopo National Park in Mozambique and the Gonarezhou National Park (including the Malipati Safari Area, the Manjinji Pan Sanctuary and the communal areas which constitute the biodiversity corridor linking Gonarezhou to Kruger National Park) in Zimbabwe. This constitutes the core protected area of 32 000 sq. km. and is surrounded by a conservation area of 100 000 sq. km. making it one of the biggest transfrontier conservation areas in the world. The conservation area includes the Banhine and Zinave National Parks in Mozambique as well as the interlinking regions as well as communal areas and privately owned land bordering Gonarezhou and Kruger National Parks (see Map 1).

The GLTP lies in an arid ecosystem in the remote and marginalized regions of the three countries with poor infrastructure such as roads, poor health and education facilities, and low employment opportunities. Historically they are marginalized areas with low agricultural and industrial potential that were sighted for the development of protected areas in southern Africa. The conservation area has a biological diversity with over 100 mammal species, 1 000 plant species, 500 bird species and an array of interesting amphibians, reptiles, fish and wildlife (Cumming, 1999). The areas also have a variety of scenic landscapes that include mountains, rivers, valleys, cliffs, rocky outcrops and undulating plains.

The GLTP is mostly bordered by communal areas with poor communities in terms of low income, lack of asset ownership, lack of opportunities for gainful employment, lack of empowerment in decision making processes and high vulnerability to man-made and natural disasters. Poverty constitutes a threat and a challenge to biodiversity conservation in the area.

The Objectives of the Transfrontier Park and conservation area include:

(i) the need to promote transfrontier collaboration and co-operation between the three countries to facilitate ecosystem management,
(ii) the need to promote alliances in the management of biodiversity by encouraging social, economic and other partnerships between the three countries, the private sector, local communities and non-governmental organizations. This will underwrite the success of the initiative.
(iii) the need to enhance ecosystem integrity and natural ecological processes by harmonizing environmental management procedures across the international boundaries, and
(iv) the need to promote sustainable socio-economic development with a focus on improving local livelihoods.

At the moment the three Parks are in different stages in development. The Kruger National Park has better road and tourism infrastructure with the Limpopo Park being the least developed, as it was formerly a hunting area.

Potential for conservation and sustainable development

The three Governments want to see the GLTP be a foundation for conservation and sustainable economic growth. The potential socio-economic and ecological impact of the GLTP at all scales is enormous. Benefits to conservation include the restoration of linkages in ecological landscapes that cross borders and creating opportunities for the joint management of these at different levels of scale. Firstly, communities sharing borders are able to develop common objectives and develop harmonized biodiversity management approaches. Southern Africa has community based natural resources management (CBNRM) approaches such as Campfire in Zimbabwe that promote the Ecosystem Approach. CBNRM provides a framework for decentralizing conservation management and decision-making and links authority, responsibility, duty and benefits. The benefits (the major incentive) must exceed the cost and make a difference at the household level. CBNRM development is at various stages of implementation between the three countries in the transboundary area. The Governments, non-governmental organizations, the private sector and donors have supported CBNRM to various extents. Current focus of support by these various groups in the GLTP is on:

(i) empowerment and skills development.
(ii) formation of legal community entities such as Community Development Trusts.
(iii) development of strategies to improve livelihoods such as enterprise development at the grass roots level, promoting community / private sector business partnerships e.g. the partnership tourism accommodation between the Mahenye community and the Zimbabwe Sun Group of Hotels.
(iv) Building the capacity of and assisting communities to participate in policy formulation.

The Africa Resources Trust (ART) is one of the NGOs promoting community based biodiversity monitoring and sensitizing journalists on environmental reporting. This year's (2004) annual ART workshop with journalists is focused on developments within the GLTP. The above activities are currently taking place but at a low scale and are not coordinated across the borders. The transboundary initiative will lead to increased empowerment activities and will promote meaningful participation of communities in the GLTP development. Already communities from the three countries have formed a tri-country community-working group accountable to national forums.

Secondly wildlife populations are not evenly distributed and a major benefit of the transboundary initiative would be the potential for some areas to increase their animal numbers through migration from areas with relatively large wildlife populations. Thirdly, at a higher level of scale, due to larger areas there is increased ecological complexity and hence ecological sustainability reducing chances of extinction due to inbreeding and stochastic disturbances. This leads to significant global benefits.

The concept of the GLTP has given conservation and tourism a common agenda with the backing of the governments. Wildlife based tourism is the highest valued land use option for this arid area The competitive

advantages of the region is the internationally well known Kruger National Park, and the rich and varied wildlife. As the three parks become better integrated the public and private sectors will need to come together and create linkages that cross borders. They need to co-operate in tourism product and infrastructure development, marketing and investment promotion. Product packaging must link world famous tourism destination sites in the region such as the Victoria Falls and Hwange National Park in Zimbabwe, the Okavango Delta in Botswana, Cape Town and the Kruger National Park in South Africa.

Measuring progress towards 2010 target

The current work of Governments, non-governmental organizations, the private sector and donors in supporting CBNRM in the GLTP and its conservation area is important as it will provide baseline data on species diversity and population levels, poverty levels, infrastructure development, etc. The improvements which will follow the development of the GLTP will be monitored on the basis of the baseline data.

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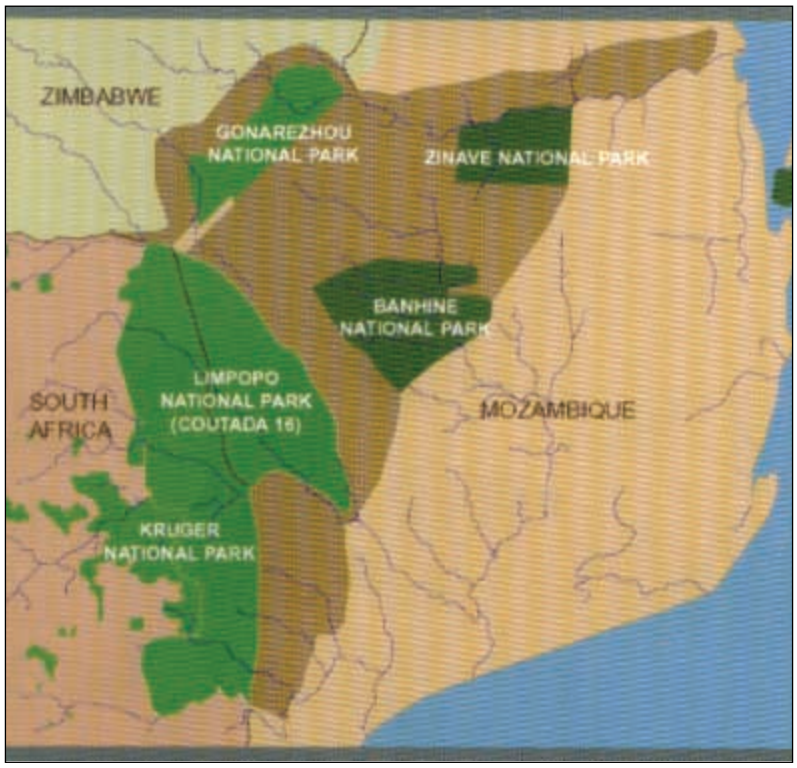
Map 1:

The Great Limpopo Transfontier Park including the conservation area.



ACHIEVING THE 2010 BIODIVERSITY TARGET: THE ROLE OF FOREST PROTECTED AREAS AND MARINE RESERVES

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Keywords: Protected areas, marine reserves, Amazon, North Sea, Baltic Sea

Introduction

The future of the world's remaining ancient forests and marine ecosystems lies in the balance. Protected areas have been recognized as a critical tool in order to address the intensifying loss of biodiversity, as well as to achieve the global Biodiversity Target to reduce the rate of biodiversity loss by 2010 (CBD, 2002; WSSD, 2002). Currently only about 4.5% terrestrial ecosystems have been given strict protected-area status, whereas less than 0.5% of marine ecosystems come under similar protection (IUCN-UNEP, 2003). Greenpeace has been campaigning to end the uncontrolled destruction of life on earth by promoting the creation of forest protected areas and marine reserves.

Forests

The world's forest ecosystems are in crisis. Half of the original forests are now gone, and only 20% remain as large tracts of forest which have largely been shaped by natural events and with comparatively little human impact (WRI, 1997). These 'ancient forests' provide the natural habitat to two-thirds of the Earth's known terrestrial species (WRI, 2000), and maintain the livelihoods and cultural foundation for indigenous peoples and other traditional forest dwellers. There is an urgent need to protect the ecological integrity of the remaining ancient forests for current and future generations.

The Amazon- "Extractive Reserves"

The Amazon rainforest is the largest remaining tropical forest in the world. Amazon regions have amongst the highest species richness in the world in terms of trees, insects, fish and other animals, making it probably the world's richest ecosystem in terms of biodiversity (UNEP, 2002). The Amazon rainforest in Brazil alone is also home to about 20 million people, including an estimated 180,000 indigenous people. In the past years, the rate of deforestation has climbed to the equivalent to 11 football fields per minute (Laurance et al., 2004), and huge areas are being lost every year to illegal and destructive logging, mining, industrial agricultural plantations and other human industries such as road building.

Of all Brazil's Amazon regions, the State of Pará has suffered the worst impact from logging, and forest loss has shot up by 48% in the past two years (Laurance et al., 2004). In addition, there are serious conflicts over land and forest resources. Illegal occupancy of public land, violence, murder and modern-day slavery is rife. Greenpeace has been working alongside local inhabitants and rubber tappers in the Amazon regions of Porto de Moz and Prainha to propose the creation of protected areas of forests known as "Extractivist Reserves" in the region in order to guarantee their land rights and protect their natural resources. These areas are established by the Brazilian Government and are protected by Federal law for conservation and sustainable use by traditional communities. Groups have been demanding an increase in these areas from under 1% to 10% of the Brazilian Amazon Rainforest.

Together, local communities and Greenpeace have been producing detailed maps of the forest areas; monitoring deforestation in the forest frontiers; mapping social conflicts; carrying out Community Mapping; demarcating Deni Indian Lands and campaigning for the creation of a network of protected areas in forest frontiers (see Figure 1). With the protection of indigenous lands through demarcation and other initiatives, such as the creation of more Extractivist Reserves, as much as 30 % of the Amazon would be legally off-limits to industrial logging and large-scale industrial development.

Oceans

The world's ocean ecosystems are also in crisis. Over-fishing, habitat destruction, widespread pollution, the impacts of oil and gas drilling and human-induced climate change threaten the survival of marine biodiversity. 75% of the world's commercial fish stocks are already overexploited or at the brink of collapse (FAO, 2002). Rich coastal ecosystems such as coral reefs and mangrove forests– the biological nurseries of the oceans – are being degraded at an alarming rate (NOAA, 2002). There is an urgent need to protect large parts of the most heavily exploited marine areas. This will provide refuge zones for the restoration and conservation of depleted fish stocks and damaged habitats. At the same time, there is a need to give strict protection, based on the precautionary principle, to pristine or relatively untouched areas, such as those in the Polar Regions or on the High Seas in areas beyond national jurisdiction.

Marine Reserves- North Sea/Baltic Sea

The North and Baltic Seas are in crisis. Once healthy and thriving seas are now among the most degraded seas in the world. Overfishing and other activities such as oil, sand and gravel extraction, waste dumping and chemical pollution are all taking a serious toll on the health of these large marine ecosystems.

In 2004, Greenpeace undertook an expedition in these seas to document the rich marine life in the area and its threats. At the same time, Greenpeace has been calling on EU governments to urgently create a network of new large-scale marine reserves (with the strictest form of protection - IUCN level 1) in the Northern European waters in order to protect the marine environment. Divided into core and buffer zones, these networks would amount to 40% of the sea area that would be closed off to extractive uses such as fishing and mining (see Figure 2). Some areas could be opened to small-scale ecological sustainable fishing (Greenpeace, 2004).

Marine reserves, where fishing and all other extractive and damaging activities are banned, are recognized by the international scientific community as a crucial method of preserving remaining habitats in areas of intensive human use, protecting rare and valuable species and allowing recovery of devastated habitats. They could be key to reversing global fisheries declines by enhancing fishery yield in adjacent grounds and increasing the abundance, average size of target organisms, reproductive output and genetic diversity of fish. They are vital to provide undisturbed control sites for monitoring and assessing human impacts in other areas, as well as creating or enhancing non-extractive, non-destructive uses, such as tourism. These reserves have an important role to play, not only in areas of national jurisdiction, but also in those areas beyond national jurisdiction such as the High Seas.

Figure 1

Protected Areas: Greenpeace's Proposals for the Middle Land, Parà State

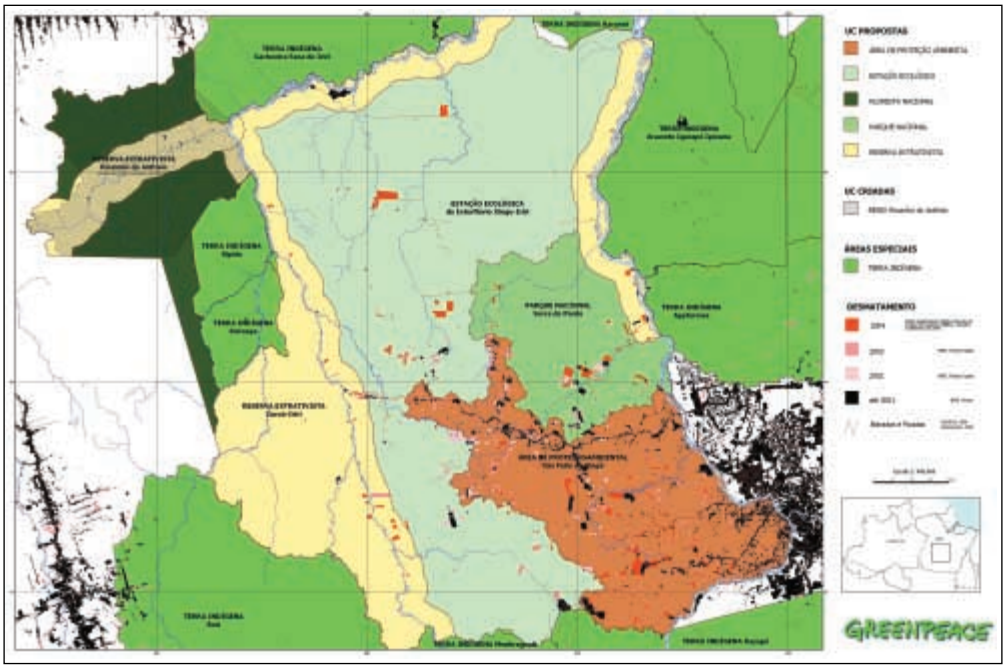
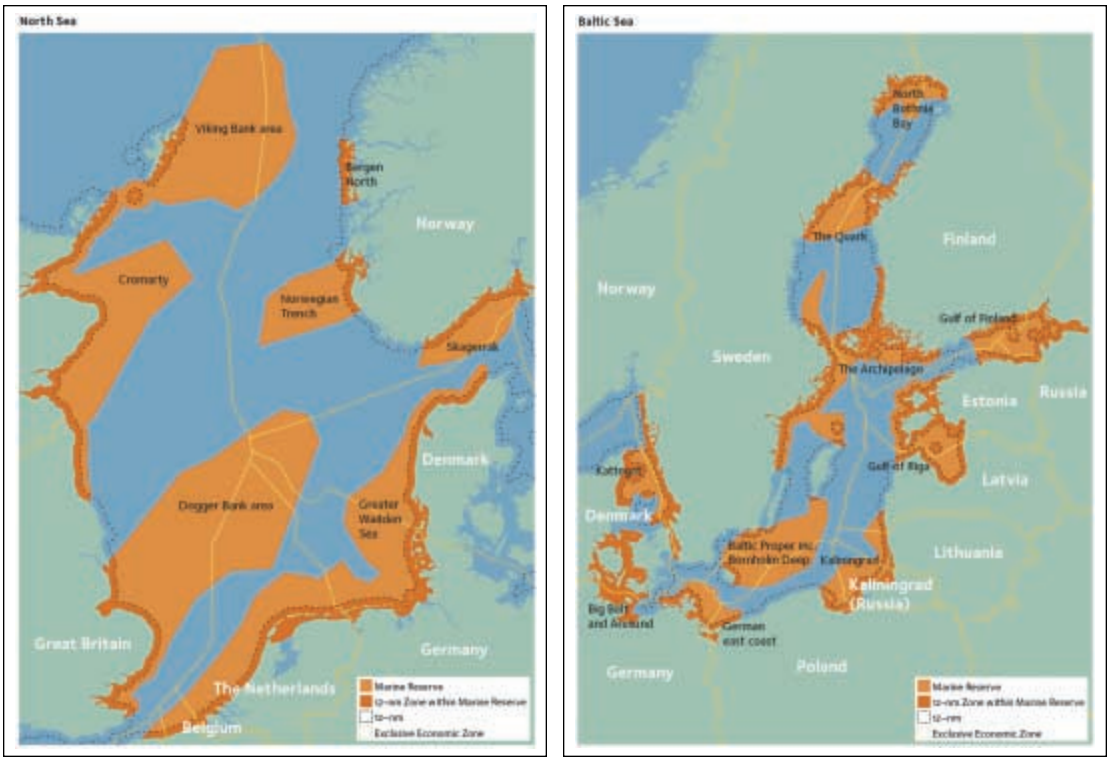


Figure 2

Greenpeace's proposals for marine reserves in the North and Baltic Seas



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THE CONSERVATION COMMONS: CONNECTING PEOPLE WITH THE DATA, INFORMATION, AND KNOWLEDGE THEY NEED

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Keywords: Information Sharing and Knowledge Management

Comprehensive data, information and knowledge are essential for the conservation and sustainable use of biodiversity. Unfortunately, difficulties in accessing information limit our ability to plan and implement successful conservation strategies.

Working together, individuals and organizations are finding new ways to share their knowledge and successful practices to promote effective conservation at a local, national and regional level.

The Conservation Commons is a new paradigm for sharing of biodiversity data, information, knowledge and technology to facilitate the conservation and sustainable use of biodiversity. By participating in the Commons, you gain access to the data, information, knowledge and experience of others. As a provider of data and information, you let others in the conservation community learn from your knowledge and experience. Through cooperation and common principles, governments, non-governmental organizations, indigenous peoples, academia, the private sector, and local communities are collaborating in new ways to share conservation information.

PRINCIPLES OF THE CONSERVATION COMMONS

Open Access

The Conservation Commons promotes free and open access to data, information and knowledge for all conservation purposes.

Mutual Benefit

The Conservation Commons welcomes and encourages participants to both use resources and to contribute data, information and knowledge.

Rights and Responsibilities

Contributors to the Conservation Commons have full right to attribution for any uses of their data, information, or knowledge, and the right to ensure that the original integrity of their contribution to the Commons is preserved. Users of the Conservation Commons are expected to comply, in good faith, with terms of uses specified by contributors.

Any organization, large or small, can participate in the Conservation Commons as a provider or user of data. Members of the conservation community and others can provide free and open access to their knowledge and find and use data that is critical to their conservation decisions.

The following organizations are among a growing number that recognize the need to change the way we store and disseminate conservation data and information, and who have endorsed the Principles of the Conservation Commons:

American Museum of Natural History; London Natural History Museum
BirdLife International
Chevron Texaco Corporation
Center for International Forestry Research
Centro de Referência em Informação Ambiental (CRIA), *Brazil*
Conservation International
Fauna & Flora International
Friends of Nature Foundation, Bolivia
Global Biodiversity Information Facility (GBIF)
Global Invasive Species Database
INBio, *Costa Rica*
IUCN - The World Conservation Union
NASA, *United States*
National Botanical Institute, *South Africa*
National Commission of Biodiversity, *Mexico*
The Nature Conservancy
NatureServe
Red Hat - Open Source Affairs
Rio Tinto
Shell International Exploration & Production
Species Survival Commission, and the Species Information Service
UNEP World Conservation Monitoring Cntre
United Nations Development Programme (UNDP)
PALNet
Wildlife Conservation Society
WWF International

REGIONAL INITIATIVE FOR CONSERVATION OF BIOLOGICAL DIVERSITY IN THE MIDDLE-EAST, WITH AN APPROACH TO DIVINE AND SPIRITUAL INSTRUCTIONS

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Keywords: cooperation, ecosystem approach, benefit sharing, religious teachings, spiritual values, NBSAP

Introduction

Modern life has weakened the connection between man and nature. Man has busily exterminated valuable species on earth and unfortunately, the trend is continuing. Modern technologies have made the remotest areas on earth accessible to man, causing vast destruction of habitats and ecosystems at an ever-increasing rate. Destruction of ecosystems and depletion of habitats will result in eventual extinction of living species on Earth. The history of human interaction with natural ecosystems demonstrates numerous cases of environmental mismanagement. Many actions, in spite of good intentions, ended in disastrous consequences.

In the global context, the increasing rate of habitat destruction and loss of species prompted a new global vision of wildlife and habitat conservation. The Convention on Biological Diversity changed protection priorities from species to ecosystems. This may be clear in approach, but the implementation of regulations faces many problems, mostly due to inadequate size of protected areas, technical and administrative management inadequacies, and discouraging rigidity of protected area acts. However, the new approach to the protected areas and to conservation of biological diversity calls for inclusion of environmental concerns in any national and regional development policies.

The Region

Because the Middle-East region benefits from valuable religious teachings and a system of cultural and traditional values for conservation of nature and its components, the initiative should address the divine and spiritual vision of conservation. From Islamic perspective, there are many verses in the Holy Koran, which emphasizes the importance of nature and wise use of resources. Based on Islamic teachings, the earth is a cradle for mankind and should be a safe, peaceful and happy place. Lack of insight and in-depth knowledge is a critical issue in the contemporary era. Islam addresses human needs at all times and offers practical mechanisms with regard to coexistence of man and the environment (*Khorasani & Mohammadi Fazel, 1996*).

Knowledge and practices of biodiversity resources management related to religious precepts, moral and spiritual values and cultural taboos could support activities in the real world. In this Initiative an inventory of knowledge and practices related to divine and spiritual (as well as cultural and traditional) values that contribute to the ecological sustainable development should be drawn up (*Mohammadi Fazel, 2001*).

In the biodiversity resources management approach, some of the important environmental problems of the Middle-East region are as follows:

- Inadequate general knowledge on the environment and biodiversity,
- Lack of accessible data/information on national environmental conditions,
- Irregular exploitation of resources,
- Incompatible production and consumption patterns with environmental conservation,

- Inappropriate establishment of economic activities,
- Ignorance of the environmental considerations in sectoral, national and regional programs,
- Weakness in executing the environmental acts, regulations and agreements,
- Weakness in or lack of indicators and monitoring programs,
- Lack of accepted environmental standards,
- Lack of information and of clear definition of land use,
- Population concentration in several ecosystems,
- Shortage of experts in environmental protection and management.

The activities which pose an environmental threat to the biodiversity of many countries of the region include: overgrazing, poaching, tree felling, removal of shrubs and bushes for fuel, conversion of land for agriculture, road construction, mining, power transmission and military activities. Many of these practices have neither ecological justification nor economic rationality. Improved land use and management practices and also Communication, education and public awareness are urgently required.

The Initiative

This Project was accepted in the Research Committee of the Environment faculty of Azad University of Tehran in 1998 after receiving official support from UNDP and the Department of the Environment of Iran, as the second phase of National Biodiversity Strategy and Action Plan (NBSAP) of the Islamic Republic of Iran, to be used as a model for the Regional initiatives. The initiative will be developed under supervision of a Regional Committee, including representatives of governments, universities, NGOs and MEAs to meet the obligations under the Convention on Biological Diversity. It should feed into the National Development Plans and NBSAPs.

The Initiative will start with an initial assessment at country level which includes:

- Current Status of Sustainable Development in the Region:
  - Geographical and land characteristics,
  - The national protected area systems,
  - Non-protected public and private areas,
  - Ex-situ conservation,
  - Cultural and religious affairs and
  - The economic situation.

- Policies, Management and Future Implementation:
  - Laws,
  - Management,
  - Development Plans and
  - International, regional and bilateral cooperation.

Next Steps

The next phases of the Initiative are the development of an action plan at regional level, implementation at national level, implementation at neighboring countries level and implementation at regional level.

The results of consultations, roundtables and workshops will incorporate the viewpoints of national and regional stakeholders in preparation of the Regional Initiative under different themes and sub-themes of the Convention. Some strategies should be formulated for conservation of biodiversity in the region, and are to be incorporated into the national development plans. A series of Action Plans will also be developed for the implementation of these strategies.

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ITTO'S APPROACH TO EFFECTIVE BIODIVERSITY CONSERVATION

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Keywords: conservation, forest, sustainable, transboundary, tropical, forest-based industries

Introduction

The International Tropical Timber Organization (ITTO) is an intergovernmental organization promoting the conservation and sustainable management, use and trade of tropical forest resources. Its 59 members represent about 80% of the world's tropical forests.

ITTO develops internationally agreed policy documents to promote sustainable forest management and forest conservation and assists tropical member countries to adapt such policies to local circumstances and to implement them in the field through projects.

Biodiversity project work

ITTO's action program, including its very broad suite of field-based projects, is designed to assist tropical member countries to manage and conserve the resource base for tropical timber. It embraces aspects of sustainable forest management such as planning, reduced impact logging, community forestry, fire management and biodiversity and transboundary conservation.

For example, an ITTO project (PD094/90) being conducted in the newly created Antimary State Forest in the state of Acre in Brazil has helped in the preparation and early implementation of a forest management plan for sustainable, multiple use. This project warrants attention for three particular achievements. First, it has resolved longstanding land ownership and tenure problems, granting legal rights to the forest's inhabitants—106 rubber-tapping families—to participate in the management of the forest and to benefit from its use. Second, it has facilitated the organization of these families into associations and provided them with financial and technical assistance to improve their production of and trade in non-wood products, including rubber, Brazil nut and oils such as copaiba oil. And, third, it has established a system of sustainable commercial timber production—the first ever in a publicly owned forest in the Brazilian Amazon—in which a large share of the timber stumpage revenues is paid to the rubber-tapping families. This project now serves as a model for the development of a sustainable forest-based industry in the rest of Acre state.

Transboundary Conservation Activities

Successful conservation initiatives need to influence land management across the broader landscape and empower local communities to improve their livelihoods. One element of this is transboundary conservation, which is the management and conservation of ecologically important areas that straddle international borders. Transboundary conservation can include a wide variety of conservation approaches, from the coordinated management of two protected areas in different countries sharing a border, to a mosaic of land-uses in two or more countries contributing to biodiversity conservation.

ITTO assists its member countries to set aside and manage totally protected areas. In particular, it supports about ten million hectares of tropical forest transboundary conservation areas.

For example, ITTO PROJECT PD 17/00 is assisting in the development of the Tambopata (Peru)–Madidi (Bolivia) transboundary conservation area. The System of State-Protected Natural Areas (SPNA) of Tambopata–Madidi comprises the Tambopata Candamo Reserved Zone and the Bahuaja Sonene National Park in Peru and the Madidi National Park in Bolivia. In its first, 2-year phase, the project is collecting environmental and socio-economic information on the SPNA and incorporating such information into a geo-referenced database. These data will form the basis of coordinated participatory processes between the two countries to ensure the planning and management of conservation areas and the development of sustainable economic alternatives such as ecotourism and, in buffer zones, the supply, processing and marketing of forest products.

Area of influence: 2.85 million hectares
Funding sources: Japan, Switzerland
Implementing agencies: INRENA (Peru) and SERNAP (Bolivia) and others

Lanjak-Entimau Wildlife Sanctuary (Sarawak, Malaysia)–Betung Kerihun National Park (Indonesia)
Area of influence: 1.1 million hectares
ITTO projects: PD 16/99 [Malaysia]; PD 44/00 [Indonesia]
Funding sources: Japan, Switzerland
Implementing agencies: Sarawak Forest Department (Malaysia) and Park Management Unit of Betung Kerihun National Park, WWF (Indonesia)

The Lanjak-Entimau Wildlife Sanctuary in Sarawak, Malaysia and Betung Kerihun National Park in West Kalimantan, Indonesia for a transboundary biodiversity conservation area (TBCA) that constitutes the most important sanctuary in Borneo for orang-utan—perhaps up to 10% of the remaining wild population—and other rare and threatened plant and animal species.

Two ITTO projects are helping to raise management standards on both sides of the border. In Sarawak, the Forestry Department is implementing ITTO PROJECT PD 16/99 with the aims of improving management inside Lanjak-Entimau, supporting sustainable livelihoods among residents living on its periphery and developing a cooperative transboundary management arrangement with Betung Kerihun; this project began in 1993. On the Indonesian side, the World Wide Fund for Nature (Indonesia) and the Directorate General of Forest Protection and Nature Conservation are collaborating in the implementation of ITTO PROJECT PD 44/00, which commenced in 1995 with similar aims.

Policy work on biodiversity

Guidelines on the Conservation of Biodiversity

In the early 1990s ITTO worked with IUCN – the World Conservation Union to develop the ITTO guidelines for the conservation of biological diversity in tropical production forests. These guidelines provide advice on planning at the landscape level, such as linking reserves with corridors of natural forest to allow wildlife to move between reserves. At the field level, they present principles and actions to maximize biodiversity conservation during management activities. A process to revise these guidelines was initiated recently.

ITTO also compiles and analyses data on the extent of sustainable forest management in the tropics. It is now preparing the first 'Status of tropical forest management' report, which will be published in the first half of 2005. This will give the most up-to-date overview of the state of forest management in the Organization's 33 tropical member countries and estimate the extent of sustainable forest management.

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CAPACITY BUILDING FOR THE GLOBAL TAXONOMY INITIATIVE: THE APPROACH OF THE BELGIAN GTI FOCAL POINT

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Keywords: taxonomy, capacity building, GTI, developing countries, Belgium

Introduction

The Royal Belgian Institute of Natural Sciences (RBINS), as GTI National Focal Point (GTI NFP), contributes to Belgium's GTI engagements by being: (i) an information centre; (ii) a facilitation centre, (iii) a partnering centre and, (iv) a tutoring centre. Even though the RBINS is the largest of Belgium's high quality taxonomic research institutes, it can only come to terms with its obligations through synergistic cooperation with other national taxonomic research institutes such as the Royal Museum for Central Africa in Tervuren and the National Botanic Garden in Meise, as well as with various other national and international partners.

This contribution sketches the *modus* with which the GTI NFP installs taxonomic capacity in developing countries together with a synopsis of some of our first results, as well as some of the lessons learned so far.

The Belgian approach

Privileged partner countries

Funded by the Belgian Development Cooperation, the GTI NFP is focusing its capacity building to developing countries. Countries eligible for support are considered with the aid of the OECD-DAC List of Aid Recipients as at 1 January 2003. From this list Belgium has further chosen to have privileged relations with 18 countries, the majority of them in Africa, but also some in South America, Asia and the Middle East (figure 1A).

Two tactics for installing taxonomic capacity

The GTI NFP is using a twofold approach to identify and remediate local taxonomic impediments (Samyn *et al.* 2004; Belgian GTI National Focal Point, 2004).

The first approach is experience-driven and adopts a top-down tactic: qualified taxonomists from one of Belgium's taxonomic research institutes identify important taxonomic impediments and tackle these by carrying out an in situ research project that incorporates clear-cut human and/or institutional capacity building.

The second approach is demand-driven and works bottom-up: through an external call for proposals interested parties from developing countries explicit key taxonomic and/or collection management needs. The GTI NFP and other Belgian taxonomic bodies make available their expertise, collections and collection-based information to meet the needs. Support can be given either in Belgium either in the developing country pending on the type of support requested; the first possibility is for instance appropriate for individuals who seek access to important collections that are housed in a Belgian museum; the second possibility is appropriate when group-training through workshops or establishment of *de novo* collections is required.

Synopsis of the first results

Our programme is operational since January 2004, hence results are only preliminary.

The top-down tactic

In 2004 the GTI NFP gave financial and logistic support to three one-year projects. The total amount of funding allocated amounts to 40.000 EURO. Table 1 recapitulates the project titles, the partners and the capacity building components. The possibility of recurrent one-year funding for these projects is ipso facto not excluded, but will to a large extend depend on the achieved results of the awarded projects as well as on the needs that will be identified in the next annual call.

The bottom-up tactic

In 2004 two calls for proposals have been launched (closure end of March and end of November). In total 51 proposals were received (11 for the first call; 40 for the second round). The geographical origin of these calls are visualized in figure 1B. To date eight visitors have received non-taxon specific as well as taxon specific training in Belgium. In addition the GTI tutor, assisted by colleagues, carried out one visit to a developing country that requested field training. Following the second call for proposals, eight to ten additional trainees will benefit from a capacity building visit to Belgium and one to two regional capacity building group-trainings will be organized in a developing country.

Lessons learned so far

As our project has been running for less than a year, lessons learned are limited. Nevertheless, it seems that we largely meet the operational objectives of the programme of work for the GTI. First, our twofold approach allows multi-level identification of taxonomic needs and capacities. Second, our synergetic approach allows us to respond with added value to the identified taxonomic impediments. Third, adopting the spirit and letter of sharing and cooperation with developing countries access improves taxonomic information steadily. Fourth, the training component in our approach arms researchers as well as policy-makers to better implement the CBD.

The largest challenge for the immediate future will be to find a way to ensure that our trainees remain fully functional and in the long run become trainers themselves.

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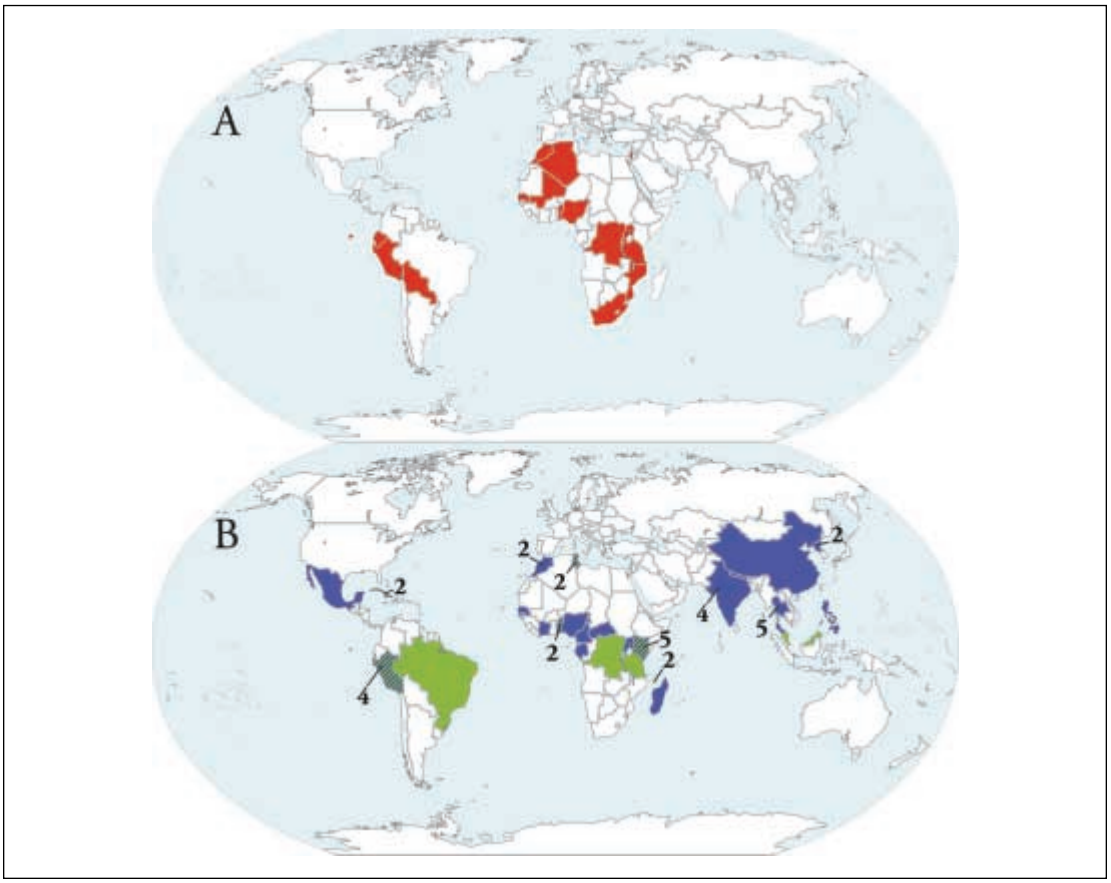
Table 1.

The three selected top-down projects from the first annual call for research-oriented taxonomic projects with a capacity building component.

Project title	RBINS	Partner	Capacity building
Herpetological species richness and community structure on the Kaieteur National Park Tepui	Vertebrate Section	CEIBA Biological Center, Guyana	- Training (parataxonomists, taxonomists) - Collections development - Tools production (keys, guides)
Biodiversity assessment at three protected areas in northwest Cambodia	Entomology Department	Sam Veasna Center for Wildlife Conservation, Cambodia	- Training (parataxonomists, taxonomist) - Collections development - Methodology development
Biodiversity and management of rodents and shrews in Eastern Congo	Vertebrate Section	University of Kisangani, DR Congo	- Training (taxonomist) - Collections development - Dissemination of knowledge

Figure 1.

Geographic impact of the Belgian GTI project. A. Countries with which Belgium has privileged relationships; B. Countries that have submitted a proposal whereby green applies to the first call, blue to the second call; numbers indicate responses higher than one.



ARE WE REALLY ACHIEVING THE RESULTS WE CLAIM? – THE CASE FOR CONSERVATION AUDITS

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Keywords: conservation audits, quality assurance, credibility, learning, adaptive management

What is a Conservation Audit?

The Conservation Measures Partnership (CMP) defines a conservation audit as:

An independent review of the process of conservation based on a set of predetermined standards.

In essence, a conservation audit determines the extent to which a given project adheres to some predefined process "gold standard" set forth by a particular organization or the conservation community in general. The assumption, therefore, is that this gold standard clearly defines "quality" from a process point of view – that is, it articulates the necessary steps and requirements for designing, managing, and monitoring effective conservation projects. Audits are contrasted with more traditional forms of evaluation in which the progress or impacts of a project are assessed relative to its own goals and objectives, independent of the process that was employed.

Conservation audits form the basis of being able to look at a specific project or consistently and comparably across a suite of projects with the intent of answering the question: "are the project results credible?" The overall aim of undertaking audits is to raise the quality of the conservation process and to increase the likelihood of success of conservation efforts. Audits also assess how project managers analyze, use, and, share information, thus emphasizing adaptive management and learning. Periodic assessments of project progress are seen as an important opportunity for field projects to benefit from the insights and suggestions of peer experts, but the auditors themselves benefit as well, making these two-way learning experiences.

Origins and Context of Conservation Audits

Although many conservation organizations and donor institutions have undertaken monitoring and evaluation (M&E), program reviews, *ex poste* evaluations and other kinds of assessments for decades, none of these efforts has been based on a predetermined and general definition of quality standards of practice. Over the past two years, CMP members have developed and adopted a set of *Open Standards for the Practice of Conservation* that bring together common concepts, approaches, and terminology in conservation project design, management, monitoring, and learning in order to help practitioners improve the practice of conservation. These "quality" standards form the basis of many the current audit efforts conducted by the two leading organizations in the field of conservation audits – The Nature Conservancy (TNC) and WWF. While the standards are crucial to their work, the audits they have conducted have also served as the testing ground to refine and improve the standards themselves.

To date, TNC and WWF have undertaken their conservation audits on a voluntary basis—that is, individual projects have requested an audit. Over time, this may evolve to a more systematic process, similar to financial audits, in which all projects have an equal requirement or must meet certain criteria to participate. This decision is indicative of the many choices our organizations have to make as audit programs move from pilot projects to mainstream institutional practice.

The Evolving Process of Conservation Auditing

Audits are typically undertaken in three distinct phases: preparation, implementation, and follow-up. In the preparation phase, terms of reference are agreed, the audit team formed and preparations made for implementation. Conservation audits are conducted by temporary, multi-functional, "peer-review" teams of practitioners from within and among conservation organizations. Audits typically involve teams of 3-6 people and are undertaken over the course of 5-8 days. During the implementation phase teams visit field sites, review project design, strategies, actions and results, consult with partners and sponsors and present back preliminary findings. In the follow-up phase, the audit report is finalized and formally conveyed to the client for formal adoption and implementation. Results from the audit are also made available within the organization and selectively with key partners and stakeholders. To ensure that audit recommendations are incorporated in ongoing project practice, follow-up checks are scheduled.

Progress to Date

The following audit activities have been undertaken jointly since 2002:

- establishment of an audit committee of the Conservation Measures Partnership;
- some 12 cross-organization and 15 within organization audits have been undertaken;
- presentation of audit findings at 2004 Society for Conservation Biology annual meeting and the 2004 World Conservation Congress;
- presentation of audit approach and common findings to key global biodiversity agencies and internal partners;
- completion of an audit process review workshop in which some 45 audit team members, clients and external partners reviewed the three phases of the audit approach and proposed a set of 'best practices' for future audits – these are currently being reviewed and will form the basis of a 'standard audit protocol' that will guide future audits.

Project and program manager reaction to audits has been positive. These practitioners have found real value in using the audit mechanism to identify strengths and weaknesses in their projects and to promote adaptive management. Audits have made a significant contribution to program strategy and in many cases have enabled a breakthrough in program development. An equally significant benefit of our conservation audit programs has been the remarkable learning by audit team members themselves. Importantly, a key lesson is how far we still need to go in order to determine the extent to which we are achieving the results we claim.

Further Information

For more information on the Conservation Measures Partnership and our collaborative work on audits, visit www.conservationmeasures.org

THE CONSERVATION MEASURES PARTNERSHIP: IMPROVING THE PRACTICE OF CONSERVATION

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Keywords: conservation audits, monitoring and evaluation, open standards

What is the Conservation Measures Partnership (CMP)?

The Conservation Measures Partnership (CMP) is a joint venture of conservation NGOs and other collaborators that are committed to improving the practice of conservation. The mission of CMP is to improve the practice of biodiversity conservation by developing and promoting common standards and an auditing mechanism for the process of conservation and measuring conservation impact. Each organization within CMP has biodiversity conservation as its primary goal, has a focus on field-based conservation actions, and is working to develop better approaches to project design, management, and assessment. The CMP members have come together to work on issues related to impact assessment and accountability because they believe that, collectively, they have a greater chance of making significant progress on designing and implementing effective monitoring and evaluation (M&E) systems.

How was CMP Established?

CMP has roots both in the conservation and donor communities. During the July 2002 annual meeting of the Society for Conservation Biology, members of the USAID-funded Global Conservation Program – in particular WWF-US, WCS and TNC – called together conservation practitioners who shared similar questions and concerns about how we monitor and measure conservation success. Many individual organization efforts also led directly to the establishment of CMP. In particular, M&E and auditing efforts in TNC, WWF, WCS, CI, and FOS all contributed to increased awareness among conservation organizations that these issues could best be tackled together.

What does CMP do?

By participating in CMP, member organizations seek to capitalize on their individual and collective experience to avoid duplication of effort, bypass tried but failed approaches, and quickly identify and adopt best practices. We believe that CMP will serve as a dynamic and active catalyst for promoting innovation in monitoring and evaluation in conservation. CMP will not be a passive network of institutions that occasionally meets to discuss relevant issues. Instead, CMP has developed a work plan to identify and resolve the conservation community's most intractable M&E problems. More specifically, CMP will develop a set of mutually acceptable standards for designing, implementing, assessing, and auditing conservation projects.

To fulfill its mission CMP will:

- Create a lexicon of approaches to conservation planning, adaptive management, and measuring effectiveness.
- Validate a set of project cycle or adaptive management standards for the effective practice of conservation;
- Develop recommendations for effectively reporting the impact of conservation interventions;
- Develop and validate the process for conducting conservation audits;
- Conduct a set of pilot audits of CMP conservation projects and activities; and
- Communicate regularly with the broader conservation practitioner and donor communities to share what it has learned

Key Products to Date

Rosetta Stone

For conservation practitioners to work together efficiently, they need to communicate effectively. Many conservation organizations have developed their own systems for planning, managing, and monitoring projects. In the process, they have also evolved their own language to describe these key concepts. Unfortunately, these various dialects have made it a challenge for practitioners to communicate both within and across institutions and disciplines, even though the concepts and processes may be similar. The CMP Rosetta Stone presents side-by-side the various project management systems used by the conservation organizations in the Conservation Measures Partnership.

Open Standards

Making the most of the extensive, trial-and-error experience gained by conservation organizations while designing, implementing and appraising their conservation projects, we have developed a set of project cycle or adaptive management open standards that are reflected in the work of all of our organizations and are, we believe, fundamental to conducting good conservation. These standards are less a recipe that must be followed exactly than a framework and guidance for conservation action. Our goal in developing these open standards is to bring together common concepts, approaches, and terminology in conservation project design, management, and monitoring in order to help practitioners improve the practice of conservation. In particular, these standards are meant to provide the principles, tasks, and guidance necessary for the successful implementation of conservation projects

Reference

Further information on the CMP is available from www.conservationmeasures.org

MAIZE AND BIODIVERSITY: THE EFFECTS OF TRANSGENIC MAIZE IN MEXICO

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Keywords: Maize; indigenous use, traditional farming, gene flow, diversity of land races

This text stems from a report that was prepared by the CEC Secretariat pursuant to Article 13 of the North American Agreement on Environmental Cooperation (NAAEC). The recommendations it includes are those of the Advisory Group and are not intended to reflect the views of the CEC Council or the governments of Canada, Mexico or the United States.

Introduction

In April 2002, the CEC was petitioned by 21 indigenous communities of Oaxaca and three Mexican environmental groups, Greenpeace México, the Mexican Center for Environmental Law (*Centro Mexicano de Derecho Ambiental*—Cemda), and the Union of Mexican Environmental Groups—eventually supported by more than 90 letters from organizations and institutions throughout the three NAFTA countries, urging an analysis of the impacts of transgenic introgression into landraces of maize in Mexico. This issue was considered of great potential environmental importance, given that Mexico is a centre of origin and diversity for maize and that maize is so intrinsically linked to Mexican culture, especially that of Mexican indigenous groups.

The questions of social, cultural, economic, and trade impacts of technological and other changes in agriculture are also subjects of dynamic debates. These questions assume particular importance in Mexico, where maize was domesticated from teosinte and where it remains genetically highly diverse. Recognizing these difficulties, the CEC created a 16-member Advisory Group to represent stakeholders from academia, industry, NGOs, and community and indigenous groups and guide the development of the report.

The report analyzes the likely effects of current and future uses of transgenic maize, as compared to non-transgenic maize production, upon: the genetic diversity of landraces and wild relatives of maize, agricultural and natural biodiversity, human health, and social values and cultural identity.

In considering the effects of transgenic maize cultivation, the Advisory Group aimed to identify and assess both the risks and benefits to interested and affected parties and to maize biodiversity in Mexico. Various of the 10 chapters of the background volume to the report examine issues related to gene flow, both direct and indirect, from transgenic varieties of maize to Mexican landraces and their wild relatives, and the conservation of maize biodiversity near its centre of origin. They also deal with the context and background on wild and cultivated maize in Mexico, present a framework for judging potential benefits and risks, on understanding benefits and risks, help our understanding of the biology of maize and community values to improve communication and participation, and discuss managing potential risks and enhancing potential benefits. Other chapters cover the potential effects of transgenic maize on biodiversity, genetic diversity, agriculture, society and culture, and human health. Time and resources were not available to complete an economic analysis of transgenic maize in Mexico. Issues related to the distribution of risks and benefits among affected parties are also considered.

The sections comprising key findings and recommendations are organized according to themes: 1) transgenic maize and gene flow, 2) impacts on biodiversity, 3) impacts on health, and 4) sociocultural impacts in Mexico. The biodiversity findings and recommendations are presented here.

Context of GM maize in Mexico

High levels of poverty, dependence upon agriculture by large populations for income and food security, and a significant indigenous population distinguishes rural Mexico from that of Canada and the United States. There is a "rural crisis" in Mexico of poverty, migration, and dislocation as the Mexican economy moves from a rural and agricultural base toward an urban majority and an economy based in manufacturing and services. In the regions of maize landrace cultivation, there is recent cultural memory and political history among the indigenous peoples of perceived inequity and injustice at the hands of Mexicans of Spanish origin, Americans, and powerful elites. The issue of transgenic maize impact on landraces has become entwined with historical issues and grievances affecting rural Mexicans that are not directly associated with either improved maize or traditional landraces. Similarly, those who advocate greater use of genetic engineering and unrestricted trade may have vested interests in aspects of scientific and technical development, trade, political influence, or industrial agriculture in Canada, Mexico and the United States.

All of the above issues have become intertwined in the debate over the impacts of the presence of transgenes in Mexican landraces. Care needs to be taken by decision makers to recognize the impact of broader issues upon the views and interests of proponents and opponents of transgenic maize in Mexico.

Biodiversity

1. The diversity of maize in Mexico is maintained primarily by local and indigenous farming communities. This system allows the conservation of the maize genetic resources that constitute the basis of food and agricultural production. In the last six or seven decades, institutions in Mexico such as the *Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuaries* (the National Institute for Research in Forestry, Farming and Animal Husbandry—INIFAP), the *Centro Internacional de Mejoramiento de Maíz y Trigo* (International Maize and Wheat Improvement Center—Cimmyt), the institutions of higher education, and some foreign sources, especially the United States, have contributed to this genetic diversity through the generation of a number of novel varieties of maize.
2. The landraces of maize in Mexico have been produced dynamically and are changing continuously as a result of human and natural selection. They are not static or discrete entities, but the term "landrace" refers to the different regional strains of maize in Mexico.
3. With specific reference to maize in Mexico, there are three areas of biodiversity that have special interest:
    a. The genetic diversity of maize and the species of teosinte, all of the members of the genus *Zea*.
    b. The diverse assemblages of plants and animals that regularly occur in the fields where maize is cultivated.
    c. The biodiversity of neighbouring natural communities and ecosystems.
4. All three of these areas pose important concerns and yield the following conclusions:
    a. There is no evidence to suggest that the patterns of inheritance of transgenes in Mexican maize or teosintes differ from their behaviour in other organisms, or from the behaviour of genes and genetic elements, in general.
    b. Neither negative nor positive effects of transgenic maize on the plants and animals occurring with them in Mexican maize fields, or milpas, have been reported, however, specific studies have still to be conducted.
    c. The biological characteristics of maize and the teosintes are such that they appear very unlikely to spread into neighbouring communities, whether they are transgenic or not. However, the effects of GM maize on target and non-target insects moving between maize fields in Mexico and adjacent natural communities are unknown.
    d. Agriculture, however practiced, reduces the overall level of biodiversity from its pristine condition. It is an open question whether productive, concentrated agriculture affects biodiversity more than dispersed, less intensive and less productive systems.

5. Scientific investigations and analyses over the past 25 years have shown that the process of transferring a gene from one organism to another does not pose any intrinsic threat over the short or long term, either to health, biodiversity or the environment. It is, therefore, the characteristics of any organism and strain that should be examined in determining the risks or benefits of that organism or strain, regardless of whether the new genes are transgenes or not.

Recommendations

The following unanimous recommendations to the CEC Council are informed not only by the preceding key findings but also by the background volume, comments received throughout the process, including at a symposium held in March 2004, and the best professional judgment of the interdisciplinary, multi-stakeholder advisory group that was tasked to formulate these recommendations.

1. The changing genetic nature of maize and teosinte populations in Mexico should be monitored on an ongoing basis, both for existing genes, transgenic or not, and new genes that become established in the future. The monitoring system should provide information to the public in a timely manner.
2. The genetic diversity of Mexican races of maize and teosinte should be conserved both in nature and in agriculture, and in ex situ cultivation and seed banks. Mexican, international, and private sector funding should be made available for this exceedingly important effort.
3. Human capacity building in Mexico should be supported for specialists in all aspects of maize study and improvement, from molecular genetics to ecology, including the economics and social sciences involved.
4. Many aspects of the cultivation and improvement of maize in Mexico need further study, with special attention being given to the role and needs of campesinos, which have largely been neglected.
5. The direct and indirect effects of the cultivation of genetically modified maize on the assemblages of plants and animals, many of them useful, which occur with the maize in milpas and other Mexican agricultural systems, and on biodiversity in the neighbouring natural communities, need urgently to be examined and evaluated.
6. The further development of maize cultivation in Mexico needs to take into account the needs and the potential benefits and risks for campesinos, small-scale producers, and large-scale commercial agriculture.
7. Farmers of all sorts should be involved in the development of new agricultural practices from the start of the process.

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For further information on the historical and contemporary context, full list of authors, as well as the discussion papers and background volumes assembled in the course of this study please consult the CEC's web site, at: <http://www.cec.org/maize/index.cfm?varlan=english>.

PAN-EUROPEAN BIOLOGICAL AND LANDSCAPE DIVERSITY: THE 2010 TARGET

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Keywords: Pan-European, biodiversity, regional, targets, 2010 target

Introduction

In 1995, the *Environment for Europe* Ministerial Conference[11] adopted the Pan-European Biological and Landscape Diversity Strategy (PEBLDS). The PEBLDS is primarily a forum for governments, inter-governmental organizations, non-governmental organizations, the private sector and other relevant stakeholders to promote, coordinate and implement national and regional actions to conserve and sustainably use biodiversity in the Pan-European region. PEBLDS partners have carried out a number of catalytic activities on all geographical levels following the adoption of the PEBLDS. Activities include the development of a Pan-European system of protected areas and ecological networks, a regional monitoring framework, stakeholder activities in the agriculture and forest sectors, biennial preparatory conferences for the meetings of the Conference of the Parties to the Convention on Biological Diversity[12] and many more.

However, despite all these efforts by countries, the European Union, international governmental and non-governmental organizations and other stakeholders, Europe's biodiversity still is declining at a rapid rate. Although some successes were obtained by safeguarding biodiversity in nature areas and landscapes, biodiversity is still at risk in and around these nature areas. In Europe, all major sectors have some effect on biodiversity and the agriculture and forestry sectors seem to have the highest impact in most countries (European Environment Agency, 2003). Farmland birds have dramatically declined over the last decades, as well as waders, even – and especially - in European countries with the highest nature conservation budgets. The European Environment Agency (2003) warns that nearly half of Europe's breeds of domestic animals are at risk of extinction and that important ecosystems continue to be at risk including forests, wetlands, species-rich agricultural habitats, several dry and arid areas and some marine areas in the pan European region. Central and Eastern Europe contains Europe's richest natural capital, including its last great wilderness areas and rich cultural landscapes, but all may be at risk from damaging agricultural, transport and infrastructure development policies (WWF International, 2004)

Achieving the Pan-European target to halt the loss of biodiversity by 2010

In order to maintain and wisely use biodiversity in Europe, new approaches have to be explored and new partnerships have to be developed. In May 2003, the Ministers at the Fifth *Environment for Europe* Ministerial Conference (Kyiv, Ukraine) took a historic decision and agreed to halt the loss of biological diversity by the year 2010. Europe agreed to 9 so called "Kyiv" key sub targets in seven areas: forests, agriculture, ecological networks, invasive alien species, biodiversity financing, biodiversity indicators and monitoring, and public awareness and participation. Never before has the entire pan-European region agreed to such a far-reaching target, and never before have such concrete and focused targets been set in a joint effort of all European countries, including the European Union, which had already agreed in 2001 to halt the loss of biodiversity in the European Union.

[11] The Environment for Europe process is a Pan-European ministerial process that sets long-term environmental priorities at the pan-European level.

[12] The Convention on Biological Diversity, ratified by most of the world's governments, sets out commitments for maintaining the world's ecological underpinnings as we go about the business of economic development. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

Within the framework of the PEBLDS, action plans have been developed to facilitate the achievement of these targets, while benefiting from a new initiative - *Countdown 2010* - an independent communications and technical support instrument to profile the importance of the global 2010 target in the pan-European context and to monitor the progress of implementation of these targets. The action plans propose a number of catalytic activities that highlight and address elements of the key targets that best can and should be undertaken under the direct umbrella of the PEBLDS, through concerted actions, regional cooperation and capacity-building, with the involvement of governments, non-governmental organizations, relevant stakeholders, and economic sectors.

Working towards the achievement of the 2010 target in Europe and the Kyiv biodiversity targets is not something that can be delayed. Many habitats and species will be irreversibly lost if Europe does not succeed in achieving these targets. But there is more. European landscapes are undergoing a silent but dramatic transformation due to changes in agriculture and urbanization, and extension of the transport infrastructure network. Climate change is already having noticeable effects and may result in habitats and species moving north, at a relatively rapid pace. Globalization forces result in equalizing effects on various landscapes and regional cultures. On the other hand, the demands of European citizens on rural and urban areas are growing, and there is a growing emphasis on non-food related services and requirements, such as health care, nature and landscape, recreation, identity, environment and animal welfare. It becomes more and more clear that biodiversity, nature and landscapes are important economic assets for sustainable development in Europe. Economic functions such as agriculture, tourism and water management depend to a high extent on biodiversity and landscape management, and directly and indirectly biodiversity, nature and landscape values contribute substantially to the gross national products of many European countries.

Available mechanisms to achieve the targets

There are various international fora and instruments that exist to help European countries to reach each of the targets. The European Community has made important progress in the implementation of the European Community Biodiversity Strategy and its Action Plans, of the EU Birds and Habitats Directives, including the establishment of the Natura 2000 Network and of biodiversity actions under the Sixth Environmental Action Programme and Sustainable Development Strategy. The European Union's Message from the Malahide Stakeholders' Conference (April 2004) – contains recommendations for priority objectives and targets to achieve the 2010 goal in the EU. The objectives of several of the pan-European Kyiv targets, therefore, will only be achieved through activities in the action plans carried out in collaboration and synergy with the European Community, particularly those involving the agricultural sector, monitoring, and ecological networks. Maximum synergies will be promoted between the Pan-European 2010 Biodiversity Implementation Plan and the EU's Biodiversity 2010 Implementation Plan (in preparation).

A great number of stakeholders exist whose activities have an impact on biological diversity, yet they have not been given the opportunity to play their part in the conservation and sustainable use of biological diversity in the Pan-European region. The involvement of all stakeholders from all relevant sectors, including economic and production sectors, is vital to collectively address the root causes of biodiversity loss in the Pan-European region. It is also of critical importance that the entire Pan-European community as well as other relevant stakeholders embrace and support, both financially and politically, the activities contained in the action plans to ensure follow up of the commitments made at the regional and global levels.

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INDIA: PATHFINDERS TO AN EXQUISITE EQUILIBRIUM

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Keywords: National Biological Diversity Act, conservation, ABS Regimes, traditional knowledge, sustainable use

Introduction

Being one of the earliest signatories to the CBD, India has always recognized the value of her biological resources and her responsibility to preserve the natural biodiversity for future generations of human beings as well as the flora and fauna, in keeping with the preamble to the CBD which recognizes "the dependence of traditional lifestyles on biological resources".

India is rich in biological diversity and associated traditional and contemporary knowledge system relating thereto. In an attempt to conserve our rich biodiversity, protect traditional knowledge as well as comply with the commitments made at the time of signing the CBD, India had taken the novel step of enacting the Biological Diversity Act in the year 2002. This Act legally establishes the tenets of conservation, sustainable utilization and equitable sharing of the benefits arising out of utilization of genetic resources thus giving effect to the said CBD.

The Biological Diversity Act, 2002

India had started the process of formulating a legislation on biodiversity conservation right in 1994, when we became a Party to the Convention. Detailed discussions, extensive consultations and participation of eminent experts, NGOs, different departments of Central Government and State Governments and other stakeholders, led to the formulation of the present Act. Salient features of the biodiversity legislation are as follows:

- The Act primarily addresses the issue concerning access to genetic resources and associated knowledge by individuals, institutions or companies, and equitable sharing of benefit arising out of the use of these resources and knowledge to the country and the people.
- Provides for setting up of a three-tier structure at national, state and local levels.
- All foreign nationals/organizations require prior approval of National Biodiversity Authority (NBA) for obtaining biological resources and/or associated knowledge for any use. Indian individuals/entities require approval of NBA for transferring results of research with respect to any biological resource to foreign nationals/organizations. NBA will impose terms and conditions so as to secure equitable sharing of benefits.
- The legislation provides for setting up of biodiversity funds at central, state and local levels. Benefits will be given directly to individuals or group of individuals only in cases where biological resources or knowledge are accessed directly from them.

ABS Regimes

ABS regimes recognize the sovereign rights of the State. By exercising such rights it is intended that the country would be better able to capture the benefits from industrial use of their biogenetic resources while conserving and sustainably utilizing biodiversity. In the light of the principles enshrined in the Convention the Indian Biological Diversity Act, 2002 (BDA) attempts to further the resolve of the international community by putting in place an effective and operational access and benefit sharing mechanism for rewarding the local people for their efforts in conserving biological resources and creating and preserving traditional knowledge.

In India traditional knowledge has been preserved through 'shruti' (teachings) and 'smriti' (learning and remembering). That is, through the word of the teacher, which is not documented but heard and then remembered, converted into a statutory right neither in favour of the teacher nor his disciple. Although this form of right is enshrined in the common law principles, and is recognized through jurisprudence in India, at times it is even converted into a statute for a more predictable rights regime.

It is the protection of such knowledge that has initiated the process of access and benefit sharing arrangements, so as to ensure that such TK is not exploited and is also beneficial for the good of all men. It obliges Parties to provide access to others, but only on mutually agreed terms (hence there has to be a negotiation of the terms of access), subject to prior informed access (hence Parties have the right to prevent bio-piracy). Also, ensure fair and equitable sharing of benefits arising out of research as well commercialization of the resources.

Efforts have been made for public/private partnerships to ensure benefit sharing. Despite their criticism on account of inadequacy of the rewards to the innovators, it is a path worth pursuing so that some critical mass of opinion on what should be an equitable reward emerges.

Kani Tribe Case

One of the most widely reported instances of access and benefit sharing partnerships in India involved the Kani tribe, who traditionally possess the knowledge of the anti-fatigue properties of a wild plant Trichopus zeylanicus, and the Tropical Botanic Garden and Research Institute (TBGRI), Kerala. TBGRI developed the drug "Jeevani" after a chance access to the knowledge from the tribesmen in 1987, and licensed it to Arya Vaidya pharmacy in 1995, for reported Rupees one million for a period of 7 years and a royalty of 2% on ex-factory price. TBGRI opened a trust in 1997 in the name of Kerala Kani Samudaya Kshema Trust wherein the stakeholder shares of 50% of the license fees as well as royalty are used for the social upliftment of the Kanis.

Modern methods of working with traditional knowledge and use of plants for the same has led to the conservation of this plant species as well as its associates.

The social responsibility of TBGRI and the access and benefit sharing mechanism has resulted in a win-win situation. Related issues of forest conservation and sustainable utilization of biological resources are other aspects of this partnership.

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INDEX BY AUTHOR

INDEX BY KEYWORDS

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Issue 1: Assessment and Management of Alien Species that Threaten Ecosystems, Habitats and Species

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Issue 10: Interlinkages between Biological Diversity and Climate Change

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