

umbrella group known as Council of Presidents of the Environment (COPE), which facilitates collaboration amongst its members.

Table 5 - Some of the key NGOs and CBOs and Private Sector agencies involved in biodiversity conservation in T&T.

NGOs	CBOs	Private Sector and Special Interest Groups
<ul style="list-style-type: none"> • Asa Wright Nature Centre • Caribbean Forest Conservation Association • Caribbean Association of Researchers & Herbal Practitioners (CARAPA) • CARINET • Centre for Rescue of Endangered Species of T&T (CRESTT) • Citizens for Conservation • Eastern Hunters' Association • Environment Tobago • Fishermen and Friends of the Sea • Friends of the Botanical Gardens • Horticultural Society of T&T • Hunters' Association • Ornithological Society • Pointe-a-Pierre Wildfowl Trust • T&T Biological Society • T&T Field Naturalists' Club • T&T Game Fishing Association • T&T Horticultural Society • T&T Orchid Society • Tobago Fisherfolk • UWI Biological Society • Zoological Society of T&T 	<ul style="list-style-type: none"> • Grande Riviere Environmental Awareness Trust (GREAT) • Fishing Pond Environment and Community Group • Nature Seekers Incorporated (NSI) • Santa Rosa Community • Southeast Ecotours • Toco Foundation 	<ul style="list-style-type: none"> • Guardian Life Wildlife Trust • AMOCO • Royal Bank Young Leaders Project

NGOs and CBOs are engaged in biodiversity conservation through initiatives in research, species and ecosystem management and education. The T&T Field Naturalists' Club has a long tradition of scientific research on the biota of T&T, and has contributed significantly to the knowledge base. Several organizations have contributed knowledge regarding their specific interest floral or faunal group, for example orchids, game fish, horticultural species, and birds. The Zoological Society of T&T and the Pointe-a-Pierre Wildfowl Trust conducts ex-situ species management. Species protection within its habitat is conducted by the Fishing Pond Environment and Community Group, GREAT, Nature Seekers Inc. and the Toco Foundation. Ecosystem management is conducted by the Asa Wright Nature Centre on their forested lands in the Arima and Aripo Valleys.



Table rock, Galeota point.

The Private Sector is emerging as a critical stakeholder in biodiversity conservation in the country. Initiatives such as the Royal Bank Young Leaders project, and the Guardian Life Wildlife Trust have been heightening awareness among various sectors of the society. During this project, the industrial sector have shown great interest in upgrading their skills and practices to lessen impacts on the environment.

The private sector has long provided examples of the contribution to management and conservation in the country. The emphasis on

ecotourism for Trinidad and Tobago has encouraged the expansion and organization of tour operators in the country, and recognition of business opportunities based on ecosystem biodiversity. A number of these organizations have been recognized through local and international awards for their work, e.g. Wildways, Asa Wright Nature Centre.

COLLABORATION

Inter-agency collaboration

Inter-agency collaboration has been used as a key tactic to make up for inadequacies in legislation and lack of human and material resources.

Marine fisheries management will be used to illustrate the importance of inter-agency collaboration. Marine fisheries management is complicated by multi-sectoral use of the coastal zone as well as impacts from inland sources which are felt by fisheries. Apart from activities within the fishing industry that are directly responsible for the current unsustainable exploitation of these resources, several activities taking place in the coastal zone, as well as inland (which reach the coast via draining watercourses), impact directly upon coastal and marine ecosystems and thus on marine fisheries.

The primary categories of concern are wetland and other habitat destruction, pollution (oil from natural seepage and the petroleum industry, domestic solid and liquid wastes, shipping bilge and ballast water, agro-chemicals, industrial wastes especially heavy metals and other toxic substances). Tourism-related activities also threaten fisheries, inflict damage to coral reefs and habitats through hotel and other development.

An integrated multi-sectoral approach is needed for coastal and fisheries management, both within T&T as well as regionally. The committee appointed to review the status of fisheries recommended that a monitoring and advisory committee be established with representatives of various stakeholders (UWI, IMA, Fisheries Division, CARDI, THA, Coast Guard, CFRAMP, fishing industry, fishing community and organizations). Provisions are made for this in the new draft fisheries legislation.

Collaboration and participatory management

Collaboration between Government and environmental NGOs for biodiversity conservation has had a mixed history. However, it is an increasingly important aspect of resource management that should be cultivated and institutionalized. There are some formalized standing committees on which broad stakeholder interests are represented. These include the Fisheries Advisory Committee and the Wildlife Conservation Committee (WLCC).

Some extremely successful collaborations include that between the Wildlife Section and the San Juan Rotary Club for manatee protection in the Nariva Swamp. The Rotary Club has developed a project proposal establishing a Manatee Conservation Trust, with representatives from all stakeholders including Government as well as NGOs. Another example is between the Forestry Department of the THA and Environment



Hillside development in Carenage contributes to the siltation and plumes after each heavy shower of rain.



Spider web network.

Tobago, a dynamic and well-respected environmental non-governmental group in Tobago.



Pulling seine, Castara.

Opportunities for productive collaboration with private individuals and organizations must also be explored. Watershed management is one of the primary focus areas for the Forestry Department of the THA, as much of the watershed lands are privately owned. To meet this challenge the Forestry Department is attempting to collaborate with private landowners for watershed management. The THA Forestry Department also collaborates closely with the Wildlife Farmers Association in Tobago and provides support, technical advice and extension services.

The most notable example of a community participation model in T&T is the beach monitoring and management of the leatherback turtle programme started by the Wildlife Section in 1990. The success of these community-based turtle protection projects has attracted international attention. State agencies in T&T have increasingly recognized the potential of community participation and co-management for biodiversity conservation, although the challenges to implementation are considerable.

Other possible avenues for community participation and co-management was a project for conservation tourism in Tobago planned by the Environment Department and the Technical Support Unit of the Division of Tourism, Planning and Development. This study was due to commence in 1998, with objectives to:

- Identify and quantify the island's natural resources.
- Solicit the views of Tobago communities on key issues related to environmental management, in the context of conservation tourism, as related to the sustainability of the tourism industry.
- Identify opportunities to secure the future economic well being of the people through effectively managing human interactions with and impacts on the environment.

This was to include surveying Tobago communities to gather opinions relevant to the second objective. This appeared to be an excellent initiative, which should be pursued.



NBSAP stakeholder discussion on the Tourism sector.

Corporate Collaboration

Corporate citizens have also participated in biodiversity conservation efforts in T&T. The Royal Bank has a long tradition of supporting environmental education initiatives, including through its Young Leaders Programme. The Guardian Life Wildlife Fund has supported several conservation projects, including those of Nature Seekers Inc. for protection of leatherback turtles. The First Citizens Bank recently formed Citizens in Action to Restore the Environment (CARE).

The general feeling by the public about the corporate involvement, is that there is much more that can be done by this sector, in terms of supporting existing initiatives with their organizational resources and by financial commitment.

Collaborations with regional and international organizations

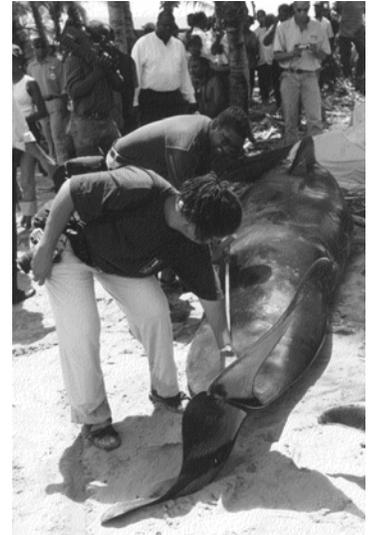
Several of the state agencies, NGOs and CBOs responsible for biodiversity management and conservation in T&T have productive official and informal links with a wide variety of regional and international organizations involved in biodiversity conservation. Public institutions generally link with official funding and technical institutions, while the NGOs and CBOs tend to link with similar groups internationally. Both the Ministry of Agriculture, Land and Marine Resources and the University of the West Indies (UWI) maintain technical links with universities and institutions abroad.

For example, international organizations with which the Wildlife Section cooperates include the World Conservation Union (IUCN), the Ramsar Secretariat, the Wider Caribbean Sea Turtle Conservation Network (WIDECAS), the Royal Society for the Protection of Birds (RSPB), the Hubbs Sea World Research Institute, the Center for the Rescue of Endangered Wildlife (CREW) and the CITES Secretariat. The Fisheries Division is collaborating closely on regional initiatives for conservation of marine fisheries resources, including the CFRAMP project.

However, there needs to be closer collaboration between the Ministries that manage biodiversity and the research institutions that could potentially provide them with relevant information to increase their management capability. These institutions need to work out priorities for sectors of biodiversity conservation, and assist each other in achieving their aims.

This is not an exhaustive listing of programmes, contributions or initiatives by state, private sector, NGOs or CBOs. It does however illustrate productive initiatives in participatory management and the increasing concern for biodiversity and environmental matters by all sectors of the society. They provide an impetus for management agencies and organizations, to explore different methods and partnerships to address these biodiversity issues. However, many strengths of collaborative systems have not been institutionalised and therefore are not supported by policy, legislation or common practice. The many initiatives do provide varying degrees of successes and case studies upon which to improve and continue building local capacity to manage and sustain our biodiversity resources.

There is considerable interest amongst all sectors of civil society to meet the challenges of participatory planning and management. There are opportunities for positive impact on management of biodiversity in the country which should be tapped more comprehensively and consistently if we are to make any impact on conservation of these natural resources.



The largest pod in living memory of beached Pilot Whales occurred on Manzanilla Beach 1999. Numbering 25 whales, the occasion created the largest outpouring of interest and concern from the public, private sector and government agencies, all coordinating in an attempt to save the whales.



Forested walk at Lizard Springs, a proposed scientific protected area.



5. The value of biodiversity in T&T

The all encompassing values of biodiversity are introduced.

An approach to the contribution biodiversity makes to Trinidad and Tobago.

Economic and social data on the value of biodiversity to T&T is found to be severely lacking.

The daily lives of thousands of people, are both directly and indirectly dependent on biodiversity.

INTRODUCTION

As the basis of life and the fundamental underpinning of all economic activity, biodiversity is the essence of all human value systems; economic, spiritual, social, cultural, educational and environmental. One of the strongest arguments for conserving biodiversity, is, however, its utilitarian value to humans.

It becomes necessary to try to give an indication of the contribution biodiversity makes to the national economy, if its management and sustainable use is to be afforded a national priority.

The value of our Biodiversity Resources to Trinidad and Tobago

It is impossible to produce an accurate assessment of the value of biodiversity for Trinidad and Tobago, and the contribution these resources make to the national economy, for a number of reasons:

1. **The paucity of information and data on user groups.** Non-wood forest product users are absent from official figures. For those who utilize products for medicinal uses, herbs, handicraft and informal construction, charcoal etc., no data exists.
2. **Information collected on users is scattered, sporadic, and inconsistent,** and therefore does not reflect the contribution a particular resource makes to the economy, or even individually to the users. An example of this is the handicraft sector. Persons who utilize non-wood forest products apply for a permit of \$1.00 for one month, to extract a particular species, for handicraft. No data exists, on how much is actually collected by an operator, what the resource is used for, what value may be added to it, or the levels of income of the permit holders, technologies utilized etc.
3. **No economic information or levels of use are available for the non-consumptive user-groups.** The growing activities associated with tourism are examples here. Tour guides and tourism operators are increasingly using the attractions of the country's biological resources, contributing to their values through non-consumptive use. As a growing industry, eco-tourism and nature based tourism are significant to this country's tourism drive. It should become the norm to disaggregate the contribution that species and ecosystems make to ecotourism, to capitalize economically and support conservation efforts. The 1994 Tourism Master Plan suggested that ecotourism

It is estimated that the average harvest of timber, fisheries and game, is valued at over \$150 million annually.



Handicraft using the calabash and hats made from the nests of the yellow-tail or crested oropendula.

only accounted for 1.4% of GDP of T&T, noting that it is a rapidly growing industry.

4. **High levels of illegal activities**, for obvious reasons, cannot be reflected in official figures. It is commonly thought that for certain resources, non-registered users and illegal users, actually exceed the number of legitimate users. Commercial hunters, for example, who hunt year round on both public and private lands, are thought to exceed the bona fide hunters who apply for permits annually, and who submit hunting returns.

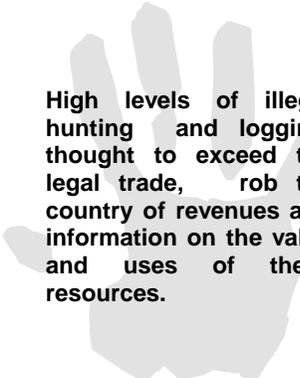
Where do we start trying to estimate the value of biodiversity resources to T&T? It will not be an accurate reflection of the true value of trade of the nations biodiversity to reflect only registered users of these natural resources due to the perceived high levels of illegal use. Yet, extrapolations for illegal user groups would be highly speculative, as they are regarded to be significant, both at the subsistence and commercial levels.

Exploited Species

Many species in T&T form the basis of important commercial or artisanal industries. Most of these are managed by state agencies and data has been collected on exploitation. Information is given here on hunting of game, marine fisheries, timber and other forest resources.

Game

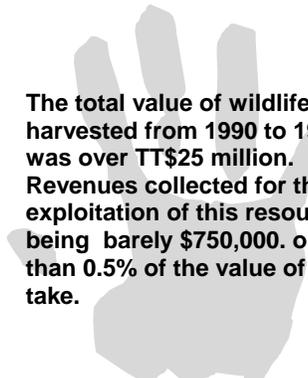
One of the most urgent problems facing wildlife in T&T is over-exploitation of the most favoured game species. Hunting game is popular in T&T and is done for sport, subsistence and commercial sale. Game is sold in the markets in T&T as a relatively high priced meat and is considered a delicacy. The Wildlife Section and Forestry Department (THA) have collected data, since 1990 on the exploitation of game in T&T. This data is submitted by hunters on mandatory data forms. Table 6 summarizes these findings. In Tobago, there was very low compliance by hunters with the requirement to submit Mandatory Data Forms until 1996.



High levels of illegal hunting and logging, thought to exceed the legal trade, rob the country of revenues and information on the value and uses of these resources.



Seedpod of crappo. *Carrapa guianensis*. Oil is extracted from the seeds and used medicinally for massaging the body and joints.



The total value of wildlife harvested from 1990 to 1995 was over TT\$25 million. Revenues collected for the exploitation of this resource being barely \$750,000. or less than 0.5% of the value of the take.

Table 6 Hunters, number of permits sold, revenue collected and estimated value of the game caught annually for 1990-1995 for Trinidad. (Source: Wildlife Section, Forestry Division MALMR.)

Season	Total # of permits sold	Total # of Hunters	Revenue collected for sale of permits TT\$	Total estimated value of game TT\$
1990-91	7,206	1,995	144,120	5,507,076
1991-92	7,385	5,406	147,700	5,588,375
1992-93	6,835	4,863	136,700	3,774,612
1993-94	7,726	5,940	154,520	5,592,309
1994-95	7,313	6,271	146,260	4,680,221
TOTALS	36,465	24,475	729,300	25,142,593

Table 7 Hunting permits sold and revenue collected for 1996-1997 for Tobago. (Source : Leotaud 1998 from Raw data of the THA)

Season	Total number of permits	Revenue collected TT\$	Total estimated value of game TT\$
1996-97	68	1,360	11,628
1997-98	54	1,080	8,142
TOTALS	122	2,440	19,770

Marine Fisheries

Table 8 Marine fishery ecosystems and some species exploited

Fishery Ecosystem	Species exploited
Coastal demersal soft bottom	Shrimp
Coastal demersal rocky or coralline bottom	Snappers, groupers, grunts, lobsters
Coastal Pelagic	Flying fish, carite, sharks, cavali
Deepwater demersal	Snappers, groupers, grunts
Oceanic highly migratory	Snappers, groupers, shrimp

The 1994 draft policy for marine fisheries in T&T (Fisheries Division, 1994) estimates an annual production of landings at approximately 14,000 tonnes, with 80% of this coming from trawling and gill-netting. This is worth an estimated TT\$ 100 million annually, representing 13% of agricultural contribution to Gross Domestic Product (GDP). However, the total contribution of the fisheries sector to GDP, is less than 1%, including all ancillary activities. The policy further notes that marine fisheries are very important to social welfare and stability in T&T, especially in rural areas, and estimates that there are 8,000 fishermen with up to 50,000 dependents. A 1997 Ministry of Agriculture, Land and Marine Resources document states that the fisheries sector employs over 13,000 persons.

In his doctoral thesis of 1974, Dr. Bal Ramdial estimated that an acre of Caroni Swamp was worth \$4,000. This was an accumulated estimated amount from fishermen, oyster collectors, tourism and other informal activities.

Table 9 Fish landings and value of the artisanal fishery 1994

Species	Landings (tonnes)	Value TT\$ X 1000
Carite	1,372	13,526
Shrimp	946	15,026
Croaker	915	3,942
Kingfish	496	6,005
Shark	488	2,799
Snapper	467	7,097
Cavali	328	2,578
Sea trout	262	1,798
Totals	5,274	52,771

Outdated royalty rates are responsible for low income levels for lumber that do not reflect the market prices. Recent practices of auctioning plantation coupes by the Forestry Division has seen a dramatic increase in income.

Timber and other forest products

Approximately half of T&T is covered with forests, with 77% of this on State Lands. This skewed distribution puts the state in control of most of the forest resources, a mammoth task of managing, given the limited resources available. There seem to be great inconsistencies with the data available concerning the existing forest area.

The 1993 CARICOM/TFAP report asserts that the most important forest product is lumber. In T&T there are 63 registered sawmills, which employ more than 400 people and contribute 0.2% of the GDP. There has been a considerable drop in the value of timber extracted from natural forests. From 1955-1980 an estimated volume of 85,000 cubic metres was harvested annually, which dropped to 43,730 cubic metres annually from 1984-1989 (CARICOM/TFAP, 1993). This was due to less timber being harvested from private lands as cocoa estates were abandoned, as well as the marked reduction in the volume of Mora harvested

Wanton and illegal logging on both state and private lands is common and widespread.

Table 10 - Forest yields and revenues for Trinidad 1980-1997.

Forest type	Total volume harvested Cubic metres	Total Revenue collected TT\$
Natural Forest	619,023	8,336,392
Teak & pine plantations	163,655	18,975,754
Totals	782,678	27,312,146

Community quote:

“Loggers don’t care and they know there is no enforcement, they are steps ahead of the authorities all the time”

Active registered licensees (loggers) have reduced from 1600 in the 1980’s to about 400 today.

This may indicate the availability of the resource is more difficult to access through legal means, and/or that the resources are not being managed sustainably and are experiencing scarcities.



The common sight of blue crabs *Cardisoma guanhumi* for sale on the highway.

“Crab catching when the crabs are ‘running’ is a serious problem. This is when they are going to lay their eggs. They get whitish, and only after they lay they get back their bluish colour.”

People in Mayaro regard them as unhealthy in this whitish state. They are often not aware of when crabs are running, until the influx of outsiders catching them by the bagful signals the start of the season.

Employment levels directly related to the harvesting of biodiversity.

The number of families actually supported by the breadwinners, and their levels of income, has not been the subject of any investigation. Including the speculative illegal trade and income, it must be realized that a substantial portion of the population gains and/or supplements its living from the direct consumption of non-cultivated biodiversity resources.

Direct consumption of biological resources makes a significant contribution to both the formal and informal economies, and the incomes and diet of thousands of people in the country.

Table 11 Number of persons estimated involved in the primary exploitation of biodiversity

Sector	Estimated numbers of users of Biodiversity Resources
FORESTRY & Forestry related jobs	Over 10,000 people*,
FISHERIES	13,000 (over 50,000 dependents)
FAUNA	7,000 Registered Hunters, 22,300 secondarily involved

* Ramnarine 1997

Tourism

Non-consumptive uses are also growing, eg. tourism, recreation, and there is a huge potential for revenue generation and employment in these areas. Indeed tourism is being touted as our new growth industry for T&T and is the fastest growing industry in the world today. For T&T to compete in this industry, sound conservation policies and management must support our natural resources.

There is no way of establishing the full contribution of biodiversity to the tourism thrust in T&T, or even the employment figures that are directly related to ecotourism, but there are a few groups that have been well documented in this area. The Buccoo Reef tour operators, The Asa Wright Nature Centre, CBO's such as the Tourism Action Committees (TAC's), Nature Seekers Incorporated of Matura etc. There are also an increasing number of independent tour operators, who charge fees for hiking and visits to natural areas, bird-watching, camping etc.

A limited number of case studies on the economic values of ecosystems, and the sustainable use of their resources have been done from time to time, but efforts remain fragmented. Of particular note have been the valuing of the resources of the Caroni Swamp (Ramdial 1976), the EIA on the Nariva Swamp and economic assessment of its biotic resources (1998), the Economic value of Wildmeat in Trinidad and Tobago (Asibey 1982), Economic Assessment of Buccoo Reef (Simmons 1996). Information from these studies provide us with some hard data that can be used to make better economic and conservation choices. More



The Guanapo Gorge in the Aripo Valley.

importantly they can be used to design financial instruments that support sustainable use of these resources. Studies like these could also help us to evaluate our present policies, plans and programmes in terms of their effectiveness for long term sustainability, in light of rising economic costs of management and remediation.

Future considerations

A 1996 study prioritizing ecosystems that could form the basis for a system of protected areas in the country, recommended a number of areas for such conservation. Of significance was the fact that the best representative natural areas were to be found on state lands. In other words, private lands have largely been converted from their natural vegetation to other uses. What this signals for biodiversity conservation, is that the state will be increasingly pressured to both protect and exploit these biotic resources, to fuel economic growth, due to the impoverishment of private lands. It is crucial that financial instruments to encourage sustainable use, restoration and remediation of private lands be developed to deflect pressures on state lands and to encourage sustainable uses of these resources on private. Stewardship schemes and other incentives could be utilised as well as a more liberal taxation regime to promote sound management.

The cost of continued inaction of biodiversity conservation and sound environmental planning and practices, will continue to burden central government, as costs for disaster remediation, restoration and clean-up operations increase annually. There is a dire need to break this cycle, through the use of sound economic arguments, fueled by relevant studies, that illustrate the significant financial and social contribution biodiversity makes to the formal and informal economy of T&T. What is needed is an array of financial and other inducements, designed to meet our peculiar circumstances, and which supports planning policies that encourage sustainable use.

The perception among NBSAP participants, is that government policies and pricing structures contribute to the over-exploitation of our biological resources. It was also widely recognized that the information necessary to strengthen the case for sound financial instruments could not be made at this time due to lack of information. Allowing market forces only to dictate the value of biological resources may not be appropriate, as those who use these resources on a subsistence level may be unable to pay for access. A combination of market forces and financial instruments could produce a balance that is more reflective of the value of the resources, encourage their sustainable use, and initiate a greening of the national accounting systems.



It is crucial that financial instruments to encourage sustainable use, restoration and remediation of private lands be developed to deflect pressures on state lands and to encourage sustainable uses of these resources on private lands in the long term.



Heavily exploited in the southern forests during WW1 and WW2, the heartwood and root of the Fustic tree *Chlorophora tinctoria*, yielded khaki dye for the war effort.



6. Threats To Biodiversity

The underlying or ultimate causes of biodiversity loss, or the larger story of why we are losing our biodiversity in T&T, is discussed.

The finer issues of the interactions of these root causes, and how they actually appear (proximate causes) or affect these living resources.

INTRODUCTION

The root causes associated with biodiversity loss in the country include :

- population density and growth
- resource consumption patterns
- use of damaging technologies
- inadequate waste disposal
- environmental ethics and attitudes
- issues associated with planning philosophies
- information availability
- institutional capacities

These underlying problems show themselves in a number of ways. Perhaps among the most important are the evil quartet:

- habitat destruction
- over-exploitation of species and ecosystems
- introduction of exotic species
- cascading effects

Many of these issues emerged in the specific reports prepared by the six sector specialists who assisted in the development of this NBSAP (Garraway 1999, Joseph 1999, Harris 1999, Nelson 1999, Ramnarine 1999, Spence 1999). These reports provide a detailed examination of biodiversity in six sectors of human activity in the country, and provide the basis for much of what follows.

ULTIMATE THREATS PRECIPITATING THE BIODIVERSITY CASCADE.

Population Density and Growth:

With a population density approaching 236 persons per square kilometer, Trinidad and Tobago has a population density, which is among the highest in the Western Hemisphere (World Resources Institute 1998). It is this high population density which may ultimately pose natural resource managers the greatest challenge in sustainably managing the biodiversity of these islands, as the intensity of competition between conservation of natural landscapes and other land use activities for housing, agriculture, industry, recreation and employment opportunities for its citizens is heightened.

In its population policy document, the Population Council of Trinidad and Tobago (1997) agrees that the increasing population of the country can be expected to accelerate the rate of environmental degradation. It suggests that a target stable population for the country should be set at



Christmas fern,
Lycopodium spp commonly
used during this season in
floral arrangements

Community concern

The river Lobster, locally
called 'Mackie' fetches
\$15-20/lb. It has been
severely over-harvested,
and is rare now in some
rivers in the north east.

1.5 million, and that the fertility rate should be reduced to 2.1 children per woman (replacement level) by 2010.

Currently, it is unclear how close the country is to either of these goals, but even if the Population Council's target is realized, the estimated population density for the country would stand at approximately 293 persons per square kilometer, an increase of 22 percent from current population levels. Should these conditions be realized, this would still require a tremendous improvement in the management of biodiversity resources, and rationalization of land use in the areas of the country which have already been converted to human-dominated landscapes.

With the prosperity of the country strongly tied to the petrochemical and related down-stream activities, and the historic abuse of native habitats by the unemployed during periods of economic recession, the increase in population can be expected to intensify the potential for negative impacts on biodiversity.

Resource Consumption:

Patterns of resource consumption significantly impact the biodiversity of the country, when this consumption is done in a manner that is unsustainable.

Examples of such patterns of resource abuse include the over-harvesting of freshwater and marine aquatic species, over-hunting of wildlife, and unsustainable levels of timber exploitation. Symptomatic of these abuses is the reduction in wildlife populations, decrease in forest cover, and depletion of many fishery stocks in the country. Such patterns of resource uses have been widely described in all of the sector specialist reports.

Additionally, exploitation of non-renewable non-living resources has also had a significant impact on the biodiversity of these islands. Thus, the largely unregulated exploitation of mineral resources has been responsible for the degradation of much of the Valencia Wildlife Sanctuary (once the country's largest wildlife sanctuary), leaving this area with little vegetative cover and, in many areas, with exposed mineral soils.

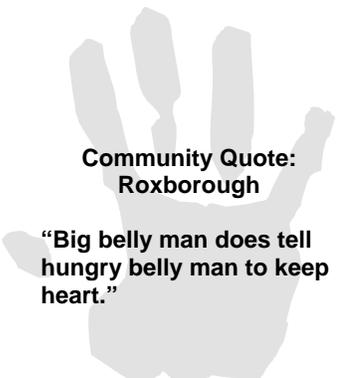
Such abuses of the biological endowment of the country appear to follow a pattern typical of Hardin's (1968) "Tragedy of the Commons." Here, the over-exploitation of public resources for individual gain appears to be the norm in resource management in these islands. This situation appears to be related to several synergistic factors including the subsidy of resource exploitation by the government, a lack of adequate valuation of goods and services associated with biodiversity, and a public that is largely indifferent to biodiversity and other environmental concerns.

Long-term implications for the country, due to this "frontier" style approach to resource consumption, could include the loss of several species of commercially and recreationally exploited plants and animals, as well as long-term cascading effects through the various aquatic and terrestrial ecosystems. Mismanagement of these resources will also

Community quote

"The most devastating act of quarrying is happening from Valencia to Toco Road. Go and see what National Quarries have done there. They are clear stripping pines and quarrying again. The Government is the biggest offender in terms of quarrying."

The result of the Government subsidizing individual exploitation of the common natural resources, is the high cost of remediation and clean up from the public purse.



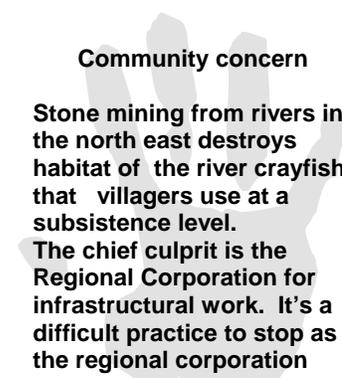
**Community Quote:
Roxborough**

“Big belly man does tell hungry belly man to keep heart.”

mean a loss of traditional livelihoods associated with these resources, as well as reducing the resource options available to Trinidadians and Tobagonians (and other associated intergenerational equity issues) and the resulting environmental problems such as flooding and siltation, pollution and degradation.

This is a serious situation that the country can ill afford, given the significant numbers of people who directly and indirectly benefit from the use of these resources, and the level of economic contribution that biodiversity makes to the society. The destruction of biodiversity resources has contributed to increasing levels of poverty in all developing countries.

Damaging technologies:



Community concern

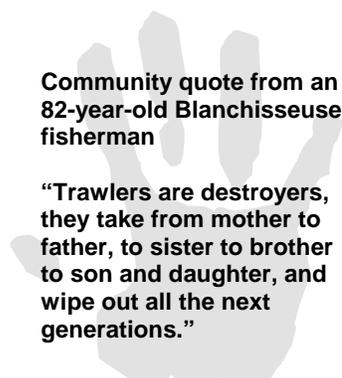
Stone mining from rivers in the north east destroys habitat of the river crayfish that villagers use at a subsistence level.

The chief culprit is the Regional Corporation for infrastructural work. It's a difficult practice to stop as the regional corporation employs people from the area.

The use of inappropriate technologies, either to directly extract biological resources, or indirectly, through secondary impacts of other economic activities (e.g. pollution), can have tremendous consequences for the biological diversity of the country.

These range from use of fishing gear which produces significant by-catch waste and threatens marine turtles; timber harvesting/processing techniques which wastes much of the raw materials; to inappropriate use of pesticides in agriculture leading to contamination of water-courses and loss of aquatic species, as well as pollution of ground water.

Many of the damaging technologies, which are being used in the country, are not directly used to extract biological resources, but are being used in other parts of the economy, and inadvertently have huge negative impacts on biodiversity. One such example is the quarrying industry and its impacts on water quality in eastern Trinidad, as well as its heavy impacts on the native forest ecosystems due to lack of use of appropriate deep extraction techniques and re-vegetation of exploited sites.



Community quote from an 82-year-old Blanchisseuse fisherman

“Trawlers are destroyers, they take from mother to father, to sister to brother to son and daughter, and wipe out all the next generations.”

These are but a few examples of the types of damaging technologies described by the sector specialist reports (Garraway 1999, Joseph 1999, Harris 1999, Nelson 1999, Ramnarine 1999, Spence 1999). However, the key point is that these abuses of the country's biodiversity are significant and are having a cumulative effect. As these sector specialists point out, the use of inappropriate technologies is due to several factors including, a lack of public sensitivity to biodiversity, a lack of adequate valuation of biological resources, inadequate legislation to manage the technologies used in the various sectors of the economy, and inadequate law enforcement.

Environmental Attitudes and Ethics to Biodiversity Conservation

Conserving Trinidad and Tobago's biodiversity is contingent on the presence of a population whose attitude to the country's living resources is sympathetic, and who are motivated to act in an "ethical" manner when

deciding the fate of these natural assets. This is a fundamental requirement for the long-term success of any programme that attempts to address the loss of biodiversity in the country.

One study that attempted to define the current state of the public's attitudes and ethics, with respect to biodiversity, suggested that the populace is largely indifferent to the biological resources of the country. Although smaller surveys of the nation's school children, however, suggest that this group is more sensitive to conservation issues. It is clear that the attitude of nationals of Trinidad and Tobago cannot generally be defined as sympathetic. However, there is a rapidly growing awareness among certain groups and communities, and many of them have been stakeholders in this NBSAP process. In addition, environmental problems, often a result of biodiversity destruction and degradation have become more commonplace in communities throughout Trinidad and Tobago and are being viewed with concern by these communities.



Bamboo joint crab trap.

As we attempt to place biodiversity conservation in the context of sustainable development, it is appropriate to examine where we are in the evolution of an ecological ethic and our general attitudes towards nature. This is by no means an easy proposition, as the lack of information and very cosmopolitan nature of the populace, with its varying religious, economic and sociological context, make this a challenging issue.

Kellert (1980) developed a useful list of eleven or so categories of human attitudes towards nature and in this context, biodiversity. These ranged from those attitudes that were highly antagonistic towards nature to those which were extremely sympathetic to wild things. Based on the little published data and experience gained from the various consultative processes during the NBSAP, it appears that the utilitarian and dominionistic categories defined by Kellert (1980) reflect the views of the population to non-human life in the country.

The dominionistic view of nature suggests that man's ethical right is to be master of nature and to control and manipulate the biotic world to suit his needs. The utilitarian view suggests that nature is only worthy of ethical consideration in the context of the use that we can put these resources to. Neither of these attitudinal types provides a basis on which to cultivate a public view that is sympathetic to biological diversity. However, if we are to come up with approaches to biodiversity conservation, which are acceptable to the "man in the street," then it is critical to consider the ethics and attitudes that these approaches need to build on.

Personal experience and attitudes:

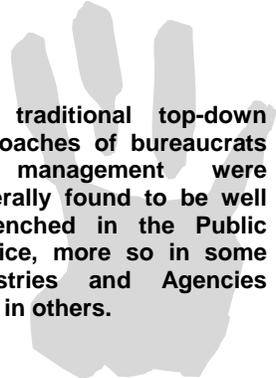
Most attitudes to nature are often the products of personal experiences and other information acquired about nature, which have been integrated with some underlying value system. In the case of Trinidad and Tobago, these underlying value systems are, in part, based on the religious teachings, which a given group identifies with, as well as other social constructs.

Princes Town

"If people could only understand that it is their own money that they are throwing away by destroying the environment."

Community quote

"Would like to see a Tobago that is well treed, with citizens taking pride in their environment. A return to old values like planting a tree to make your coffin. We need to regain the connection between us and the life around us."



The traditional top-down approaches of bureaucrats to management were generally found to be well entrenched in the Public Service, more so in some Ministries and Agencies than in others.

Attitudes towards conservation are taught in primary school, but rarely practiced in reality. The adults give inappropriate examples in everyday life, providing little reinforcement to the attitudes learnt in school.

The challenge here is to transform public indifference to biodiversity into some form of ecological sensitivity. Some sociologists suggest that it is very difficult to change the attitudes of the public about a subject (e.g. biodiversity), once that attitude is developed through personal experiences with the subject. Nonetheless, it seems imperative that an attempt be made to promote positive attitudes and ethical responses of nationals to biodiversity conservation.

The “Tragedy of the Commons”

During the public consultations for the NBSAP, several participants suggested that the abuse of the country’s biological resources were due to a combination of attitudinal issues. These included a perception that these biological resources were limitless, or that they are largely self-regulating and could not be overexploited by humans. Yet, on closer questioning, users of these resources freely admitted that they have witnessed the gradual decline in sizes and quantities of all the resources they traditionally exploit. This is a clear indication that the users of biodiversity in the country are observing declines in the abundance of these resources. Their reluctance to admit to these trends relate to their access to these resources, and the changes that may occur if these patterns are confirmed, including:

- Efforts to curtail the ‘free’ access to resources
- Increased restrictions, fines and regulations
- Increased economic costs of access to the resources, and decreasing returns
- Changes in harvesting practices

Other attitudinal patterns towards the resource seem to suggest that many people regarded resources managed by the State as “State Resources” rather than public resources. This seems reflected in the nonchalance often seen when instances of resource abuse are described, or in the acceptance of the “Tragedy of the Commons” scenario being played out with respect to the use of these public resources as being inevitable.

Top-down approaches:

In addition to these general attitude patterns, there are some specific ones which have a tremendous impact on the fate of biodiversity in the country. The attitude of natural resource managers is significant in this context.

A primary example is the case of the policy-making process, where the manager’s role in the policy process is regarded as being dominant to that of the resource users or other stakeholders. This attitude was reflected in access to information, which was not always readily available



Enjoying nature's forested diversity, Trinity Hills.

or accessible to a national planning exercise such as this one, and the comprehensiveness and consistency of that information.

Redefining the human-nature relationship

The country, recognizing that conservation of its biological resources is integral to its development, must recognize that the attitudes of nationals to these resources is a key factor in their conservation. While many remain uninterested, the enthusiastic response of the public to the NBSAP process clearly illustrates that some sectors of the public are, extremely concerned about the fate of these biodiversity resources, and are committed to assisting efforts to address these issues. Their willingness to contribute at all levels reinforces the importance of participatory approaches that the NBSAP has advocated.

As we attempt to redefine this human-nature relationship, public education and awareness programmes will play a key role in the cultivation of public attitudes, which are sympathetic to biodiversity. The participatory nature of the process, brought to the fore the dire need for people to have access to environmental and biodiversity information. Although public consciousness on these issues are being heightened due to a number of initiatives and greater access to global information, the local information base on which to develop education and awareness materials is underdeveloped. This lack of foresight and planning with environmental and biodiversity considerations in mind is reflected in official policies, plans and programmes at all levels of public macro-economic planning.

It was not surprising therefore, that education and awareness surfaced as the top priority for the country to address biodiversity management and conservation at all levels of the society, that the political commitment to biodiversity and environmental issues was brought into question, and that concerns of participation and collaboration emerged as a continuous underlying theme of the strategic approaches recommended.

Planning Philosophies

The public consultation process of the NBSAP identified the approach to planning for development as one of the major contributors to degradation of the country's heritage, and a critical weakness in management of biodiversity in Trinidad and Tobago.

Biodiversity management requires a holistic ecosystem approach, which takes into consideration integration of activities, when developing plans for sustainable development, and not the isolated planning efforts that are still too common within and between Ministries. The case for such a holistic view is even more important when one considers the small size of both islands, the high population density, fragility of the native ecosystems and the limited human and financial resources available to the country.



**Child-sized Wahoo
Acanthocybium solandri in
Charlotteville**

Community quote

“Communities need to be the nucleus of the drive Working with people is a meticulous and time consuming process, requiring many resources, both human and financial. Agencies of the state need to work together to address the needs of communities to make headway in this area.”



The rarely seen flower of the insect-eating sundew, *Drosera capillaris*, from the Aripo Savannas. The area is threatened by squatting, fires and quarrying.

It is also apparent that many of the existing plans for development in the various sectors of the country at best pay lip service to conservation of biodiversity, and at worst, do not identify it as a consideration at all. This is a tremendous challenge to biodiversity conservation, as the siting of inappropriate developments (e.g. roads, hotel development housing and agriculture etc.) which can have irreversible impacts on the biodiversity of the country, is all too common.

A key component of the policy and planning process is the role of the public and the resource managers in development of plans and policies. The roles of each player in the policy process needs to be more clearly defined and understood by the public, if planning and policy are to be made more sensitive to the country's needs. Participation in planning processes became an underlying theme of many of the strategies and actions.

Information issues

Basic information on the status of any species of plant or animal, their rates of exploitation and reproduction is non-existent. Data is often not collected consistently, and may be unusable by other agencies for planning, leaving managers and other stakeholders at a loss for management information. It becomes impossible for the resource management agencies to determine what levels of exploitation of biodiversity are sustainable.

It is clear that what little information exists on the status of biodiversity in the country, tends to be hoarded within institutions, often with sister institutions not knowing what data resides in each other's libraries and files. The sharing and access to information therefore becomes an issue.

Such a situation is problematic as it gives rise to unnecessary duplication of effort, when agencies design individual research efforts to acquire data, which already resides with other institutions. Additionally, the capability of the NGO and CBO community, as well as the public in general, to take part in policy formulation and management of the country's biodiversity, is predicated on the accessibility of these data. The development of an informed public, willing and able to participate in management of the country's biological heritage, can only take place if information on the status of the country's wild resources is placed in the public domain.

Community quote

"Studies are one way of getting information from the people and communities, that will not be used to benefit us."

Institutional commitment and capacities:

Much of the legal responsibility for the conservation of biodiversity in Trinidad and Tobago resides with the government agencies such as the Ministry of Agriculture, Land and Marine Resources, the Environmental Management Authority, and the Tobago House of Assembly. That being the case, the ability of these agencies to actually manage these biological resources, is pertinent.

Throughout the consultation process, it was clear that many of the existing government agencies lack the financial, personnel or in some cases, the legal and policy instruments to actively manage biodiversity. Sustainable management of the country's biological heritage cannot be expected to arise spontaneously, but can only be achieved as the result of a concerted programme to actively manage these resources.

That such management agencies are currently under-funded and understaffed, has been perceived by the public as a lack of government commitment to conservation of these resources. It was also clearly the view of the communities that these very Government Ministries were insensitive to their needs, and did not respond to community efforts to assist in the protection of their resources.

Similarly, with the shift towards greater involvement of NGOs and CBOs in managing these biological resources, it is imperative that these groups be afforded more opportunities for training and collaboration in natural resources management.

PROXIMATE THREATS TO BIODIVERSITY IN TRINIDAD AND TOBAGO

“The Evil Quartet”

Used by Conservation biologists to describe the ways in which the loss of biological diversity occurs, the “Evil Quartet” of over-exploitation, habitat fragmentation, cascading effects and introduced species, illustrates the negative impacts on the ecosystems of the country.

In the Trinidad and Tobago context, the least significant of these (thus far) is the introduction of exotic species. For many small island states, exotic species (e.g. rats, cats, snakes) have caused tremendous losses of biological diversity. In Trinidad and Tobago there are currently no species that have become extirpated due to the introduction of exotic species. This is due in part to the high species diversity of these islands, which limits the opportunity for invasion by exotic species. That the country has been fortunate thus far is no indication that exotics are not a threat. The recent outbreak of pink mealy bug has suggested that potentially disastrous introductions are possible.

The members of the “Evil Quartet” are treated separately below, as they all play a significant role in the challenges to biodiversity conservation facing Trinidad and Tobago.

Over-exploitation/overkill.

The over-harvesting of specific animal and plant species, represents one of the most significant threats to biological diversity on these islands. Here, hunting of wildlife for meat as well as for the pet trade, and the exploitation of selected species of trees for lumber from our forests has led to significant decline in certain species. Some marine species also

Mayaro Community Quote

“There is no coke block in Trinidad that the police are not aware of. We are putting blame all over the place, because no one is targeting the authority that is supposed to be carrying out specific functions. I could tell you plenty people who logging and walking around with the Foresters stamp ! People need to do what they getting paid to do, with the seriousness they supposed to do it with.”

Toco Community Quote

“ The Government is dumb deaf and blind to the plight of fishermen. They must open their ears to hear them, open their eyes to see what is happening, and open their mouths to speak with them.”



Teta from the Lopinot River. Overexploitation of river fish is a common problem.



Wild hog or quenk, *Tayassu tajacu* originally roamed in large bands of 40-60 individuals. Such large groups are no longer observed.

Community quote

“The community wants to play a bigger role in the management of their resources. There needs to be people from the communities who can respond on the spur of the moment. The Environmental Police are too far away in Port of Spain.”

Siparia Community Concern

We are concerned that many of the issues associated with biodiversity loss is being perpetrated by State companies, and there was no effective way to ensure these agencies reduce their impacts on pollution and destroying the forest.

suffer the same fate. This exploitation involves all social strata of the population.

Although some information is available on the legal extraction of wildlife and lumber, illegal poaching of these resources is estimated to be considerably higher than the legal trade. While the total picture on our levels of biodiversity resource use in the country is highly speculative, significant trends of over-exploitation are unmistakable.

Indeed, studies based on the reported take by legal hunters, New Directions in Fisheries Policy for the 1990's, and the closing of several Forest Reserve ranges, all point to highly unsustainable levels of harvesting of many of our commercial species. This information is corroborated by the users of the resources.

The over-exploitation of biodiversity in Trinidad and Tobago has been documented by several authors (Joseph 1999, Kenny et al. 1997, Leotaud 1998, Nelson 1999, Ramnarine 1999). The most obvious impacts are reflected in the decline in several game species (Nelson 1999); loss of non-wood forest plant species, suspected changes in forest composition and loss of forest cover (Joseph 1999); and over-harvesting of marine fisheries in areas like the Gulf of Paria (Ramnarine 1999). Unlike many components of biodiversity, it should be easy to assign a monetary value to those species that are traditionally exploited, and hence justify their management. Indeed, with game, fisheries timber harvests valued at approximately TT\$150 million annually, the contribution of these biodiversity resources to the national economy is significant. However, like most biological resources in the country, the value of these exploited species remains under estimated, and their exploitation subsidized.

Habitat conversion and fragmentation:

The loss of habitats is another significant challenge to the maintenance of the diversity of these islands.

The process of conversion of some proportion of the country's landscape from a natural one to a human dominated landscape, is inevitable, as human populations expand and social conditions change. Nonetheless, the maintenance of the country's biological heritage hinges on finding a compromise between human needs for housing, agriculture and industrial development, and the need to maintain natural ecological processes and the components of biodiversity.

Although 44.8 percent forest cover is often reported for the country (TFAP 1992), there is serious concern among agency personnel and the NGO community, that these numbers do not accurately reflect the quality of natural vegetative cover nor the level of habitat fragmentation. Given the country's small size (Trinidad is 4284 km² and Tobago 300km²), the small, fragmented distribution of remaining natural areas (Joseph 1999, Kenny et al. 1997, Leotaud 1998, Nelson 1999, and FAO 1997) estimates

of 31 percent native forest cover, and forest loss of approximately 1 percent each year, it is imperative that there is no net loss of remaining natural areas. The challenge then is to achieve a zero percent loss of native vegetative cover, while providing the opportunity for sustainable development in other sectors of human development in the country.

Interviews with the resource managers in Trinidad have indicated that they consider squatting the primary cause of habitat loss on the island.

While one anticipates qualitative changes, based on observations of the activities of squatters, the use of fires and the subsequent conversion of the natural vegetation to seasonal crops, represent significant loss in the biological diversity of the sites affected. In addition to the loss of such habitats for terrestrial fauna, it is apparent that many of these squatters are also involved in subsistence hunting in the remaining nearby forests. At a landscape scale, it appears that such squatting is associated with increased access to forest sites through development of new roads, trails or utility corridors. This exacerbates the impacts of habitat fragmentation.

It also is apparent that much of the forested lands converted to squatting are wasted, as the peasant farmers actually only utilize a small proportion of the land which they fire each year. Once converted to a predominantly grass cover, these burnt areas show very little signs of recovery, as the annual fires continually set back the successional processes at these sites. Squatting has become a significant threat at many of the Forest Reserves currently managed by the Forestry Division. Some of these sites include the Southern Watershed Reserve, Central Range Reserve and Valencia, to name a few.

Thus, the loss of natural habitats through squatting for agriculture and housing, and the attendant use of fire to remove the native vegetation for such practices, represent some of the most significant challenges to maintaining the terrestrial biodiversity of the country.

Cascading Effects

Cascading effects are the ripple effects, which human activities cause in ecological systems, and these can include processes such as biomagnification, or the concentrating of heavy metals and toxic organic compounds in living tissues. Such effects have been reported for Scarlet Ibises and may be responsible for elevated mutation rates in mangroves within the Caroni Swamp.

Given the country's heavy investment in the petrochemical sector, as well as various industries that utilize/produce toxic chemicals (e.g. polychlorinated biphenyls) in product development, there is a significant risk of contamination of tropical systems with these toxic chemicals. However that risk remains unquantified. Of similar concern is the widespread use of pesticides by the agricultural sub-sector. There has long been speculation that the widespread use of these toxic chemicals has contributed to loss e many of the native finches. However there is little quantitative evidence to support this supposition.



Patches of guinea grass also known as *lastro* , now a common occurrence on the hills of the Western Northern Range. *Lastro* is the result of annual fires.



Industrial Environment Sector Specialist Michael Harris discusses report with Tyrone Kalpee of TRINMAR.

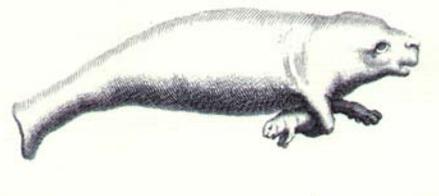


River mouth Matura Beach.

“Development should not affect the natural scenic beauty of the island. Develop, but keep it beautiful.” - Tobago

In Trinidad and Tobago the environment is.....oysters eaten around the Savannah, swallowed in a peppery tomato sauce by the light of a flambeau, and followed by a cool coconut water. Yet, with the occasional dismay when shellfish sales are banned because of faecal contamination discovered by the Health authorities.

Our Native Land
Joy Rudder 1991



Manatee and young from 17th Century woodcut. The only locally known pod of the West Indian Manatee *Trichechus manatus* exists in the Nariva Swamp.

Another area of concern, with regard to ripple ecosystem changes, are the impacts of forest management practices on the terrestrial biodiversity of the country. Discussion with forest management professionals in both islands reveal concern that there have been significant changes in the forest composition of the island since Beard's (1944, 1946) studies. Such concerns are well founded as managers of the forest resources observe what can only be described as an attack on both state and private lands for preferred lumber species. If such changes have occurred it is probable that the impacts on the invertebrate biological diversity of the island would also be significant.

With regard to specific ripple effects in the terrestrial fauna community, again there is very little hard data on the possible changes that may be taking place in the composition and relative abundance of most species. However, recent work by Nelson (1996) suggests that such changes in the mammal community may be occurring in Trinidad due to over-hunting.

Pollution and other forms of ecosystem stress **The chemical challenge**

The impact of pollution and other associated forms of ecosystem stress, including chemical loading of rivers and near-shore ecosystems, can have an accumulative impact on biodiversity. With the number of new chemicals being developed annually topping 1000, many of which find their way into agriculture and industry, the potential threats to biodiversity can be significant.

These chemicals are often persistent, (i.e. remain unchanged in nature for a long time), are highly toxic and many are accumulated in the tissues of living organisms, and become concentrated in higher organisms. Some of these chemicals include poly-chlorinated biphenyls, dioxin, benzene, carbamates and organo-phosphate pesticides. Additionally, high concentrations of naturally occurring heavy metals such as lead and mercury can have similar effects on living organisms.

Challenges posed by exotics

Managing exotic species remains a significant challenge to biodiversity conservation, and is especially so on islands as their communities tend to lack certain types of species (e.g. large carnivores), and tend to have more fragile ecosystems

These exotic species include our domesticated animals, pests like rats and mice, organisms we use for biological control and ornamental plants to name a few. In Trinidad and Tobago some of the exotics which are readily identifiable include species such as teak, pine, the mongoose and a handful of African grass species which now dominate fire-burnt areas of the western Northern Range.

Although these exotic species may seem comparatively benign, experience from other islands has suggested that the introduction of exotic species can have devastating impacts on the native species. This

has been the case in islands such as Guam, the Chatham Islands, and Hawaii where exotic species have played a significant role in the extinction of many endemic species. These extinctions often happen due to predation by the introduced species, their competition with native species or the introduction of new diseases with these exotics.

Trinidad and Tobago has been fortunate to have not lost any of its native species through exotic species. However as habitat fragmentation increases the opportunity for colonization by exotics, colonizing species may take advantage of weakened ecological systems and decimate native life forms.

Genetically Modified Organisms (GMO's)

However, the more recent danger comes from genetically modified organisms (GMO's), and the potential effect of their introduction into natural systems. These organisms might have the potential for becoming weeds or alternatively increasing the aggressiveness of an already existing weeds to the detriment of other plants.

For example, a plant that has been modified for tolerance to high levels of herbicide might be able to hybridize with a near relative which is a weed, thereby passing on the gene to the weed. Such an accidentally modified plant would compete with an advantage with other plants, leading to their elimination and thereby reducing the genetic diversity.

Genetic Decay

Managing wild genes

The genetic variation found in living things is a key component of biodiversity. This diversity is nature's biochemical library, providing organisms with the flexibility they need to respond to environmental change. This genetic variation includes variability within individuals, between individuals and between populations of individuals.

When animal and plant populations become small, there is a high probability that they will lose much of their genetic variability through processes such as inbreeding and genetic drift. This then makes them very susceptible to extinction.

The loss of genetic variation in plant and animal species will be an extremely important consideration for managing biodiversity in Trinidad and Tobago, as the islands can be expected to have species, which may be susceptible to these genetic problems. This is the case as many species on the island (larger mammals and birds e.g. Pawi and southern anteater) may be close to the "50-500" population threshold, at which genetic problems become a factor in their survival.

Due to the isolated nature of plant and animal populations on both islands and the continuing fragmentation of the native habitats, one can expect the genetic dynamics of animals and plants to become more complicated and to display meta-population dynamics (Meffe and Carol 1997). This

Trinidad and Tobago still imports the "Dirty Dozen" pesticides that have been banned in developing countries due to their persistent toxic effects on the environment and on human health.



The entrance to the Cumaca cave, habitat of the vulnerable Oilbird *Steatornis caripensis*. Poaching and disturbance affects these night-flying birds.

means that populations of animals and plants behave as though they are composed of several loosely connected smaller populations, rather than a single unit. In practical terms, this means that these species are more susceptible to extinction.

Additionally, genetic management becomes more complicated in Trinidad and Tobago, compared to continental countries, due to the fact that the country is composed of two islands. Specifically, these islands represent a living experiment in evolution, being separated from the South American continent relatively recently. These factors affect the rate at which the islands are colonized by new species, and the rate at which new species arise through isolation.

This situation makes management decisions about such issues as species reintroduction and augmentation of wild populations with individuals from other countries especially complicated. Ultimately, the country's responsibility is to ensure that development takes place in a way that ensures that the genetic wealth of the country is not diminished and that there is continuation of nature's evolutionary experiment.



Iguana iguana



7. The Strategies and Actions

The consultative process of the NBSAP endorsed the major findings of the sector specialists, who investigated the status of biodiversity from various aspects of national life. These consultations provided some solutions, which are articulated in the strategies and actions, and display the depth of understanding that the public and stakeholders possess of these problems.

The process of discussions and workshops, involved prioritizing these concerns, so that one could focus on the best path for management of Trinidad and Tobago's biodiversity at this point in her development.

It was not surprising, that education and awareness surfaced as the top priority for the country to address biodiversity management and conservation, at all levels of the society, and that the political commitment to biodiversity and environmental issues was brought into question. Concerns of participation and collaboration by civil society and interest groups emerged as a persistent underlying theme of the strategic approaches.

The following strategic approaches and actions have been identified by the participatory process as key in transforming public attitudes to biodiversity, its value to the society, and increasing our information base to enhance our capacity to manage and conserve these vital resources.

This section is the core of the NBSAP project and process. It is arranged in sections that discuss the priority issues identified by stakeholders of the process.