

Conservation of biological diversity in the Dominican Republic

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*The Dominican Republic on the island of Hispaniola has the highest degree of biological diversity in the Caribbean. The country's wildlife service (Departamento de Vida Silvestre) carried out investigations at ecosystem and - for the vertebrate fauna - at species level in order to identify gaps in the representation of ecosystems within the nation's protected area system. As a result of this exercise 15 new areas have been proposed for protected status. The information presented here is a summary of the report *La Diversidad Biológica de la República Dominicana*, published by SEA/Departamento de Vida Silvestre in December 1990.*

Introduction

The Dominican Republic occupies the eastern two-thirds of Hispaniola, which, with an area of 78,000 sq km, is the second largest island of the Greater Antilles. Hispaniola is approximately 660 km long and 270 km wide at its broadest point. It is surrounded by six islands and a series of smaller islets and keys.

Four major mountain ranges aligned approximately east-west divide the island into regions Hartshorn et al., 1981). The Cordillera Central in the interior reaches 3087 m (Pico Duarte) at its highest point and large areas of the island are above 1000 m. The Hispaniolan climate is mainly influenced by humid north-east trade winds causing high levels of precipitation (more than 2000 mm per year) in the north-eastern part of the Dominican Republic, while the north-western and southern lowland areas are very dry (less than 700 mm of rain a year).

Between the southern mountain ranges of Sierra de Neiba and Sierra de Bahoruco lies a deep valley, which was once a marine channel dividing Hispaniola into a northern and a smaller southern island. A relic of this channel is left as Lago Enriquillo, a large saltwater lake 40 m below sea level.

Biological diversity

Flora

When Columbus arrived in Hispaniola 500 years ago, the island was almost entirely covered by tropical forests. Today almost 90 per cent of these forests have vanished due to human activities (Figure 1).

The great variety of geological features and climatic conditions is reflected in a broad range of different types of vegetation. Along the coasts are found beach and dune vegetation, plant societies of rocky shores, and extensive mangrove forests in sheltered bays. Halophyte plants are found in the salty basin of Lago Enriquillo.

The drier lowland zones of the north-east and the south are dominated by semi-deciduous forests. The south-eastern Caribbean coastal plain (all the land east of Santo Domingo) receives higher precipitation (up to 1400 mm a year), but the underlying porous limestone does not store sufficient water to support humid forest and semi-deciduous forest predominates.

Transition forests (dry to humid) dominated by mahogany *Swietenia mahagoni* and *Coccoloba diversifolia*, are found in areas with precipitation (1000-1800 mm a year). They have been reported in the east of the country and at elevations between 400m and 900 m in the Sierra de Neiba and northern slopes of Cordillera Central (Santana et.al. 1990). Evergreen forests used to be found in many humid areas, but today only remnants are left in the mountain ranges. Broadleaf humid forests of the lower elevations still exist in parts of the northern and central mountain chains and there are five areas of considerable size. Cloud forests of medium and high elevations (up to 2000 m) remain in isolated parts of the mountains. Three major cloud forest types have been distinguished: the manaclar, dominated by the palm *Prestoea montana*, in elevations between 600 and 1250 m; the Ebano forests, dominated by *Magnolia spp.*, between 950 and 2100 m; and the high cloud forest with *Didymopanax tremulus* above 1600 m.

Riparian forests are influenced more by the abundance of river mist in the morning and high ground-water level than by macroclimatic Pine Forest conditions. In the Dominican Republic four kinds of riparian forests can be distinguished: two along rivers in humid lowland zones; one along permanent rivers in arid regions; and one in mountain areas.

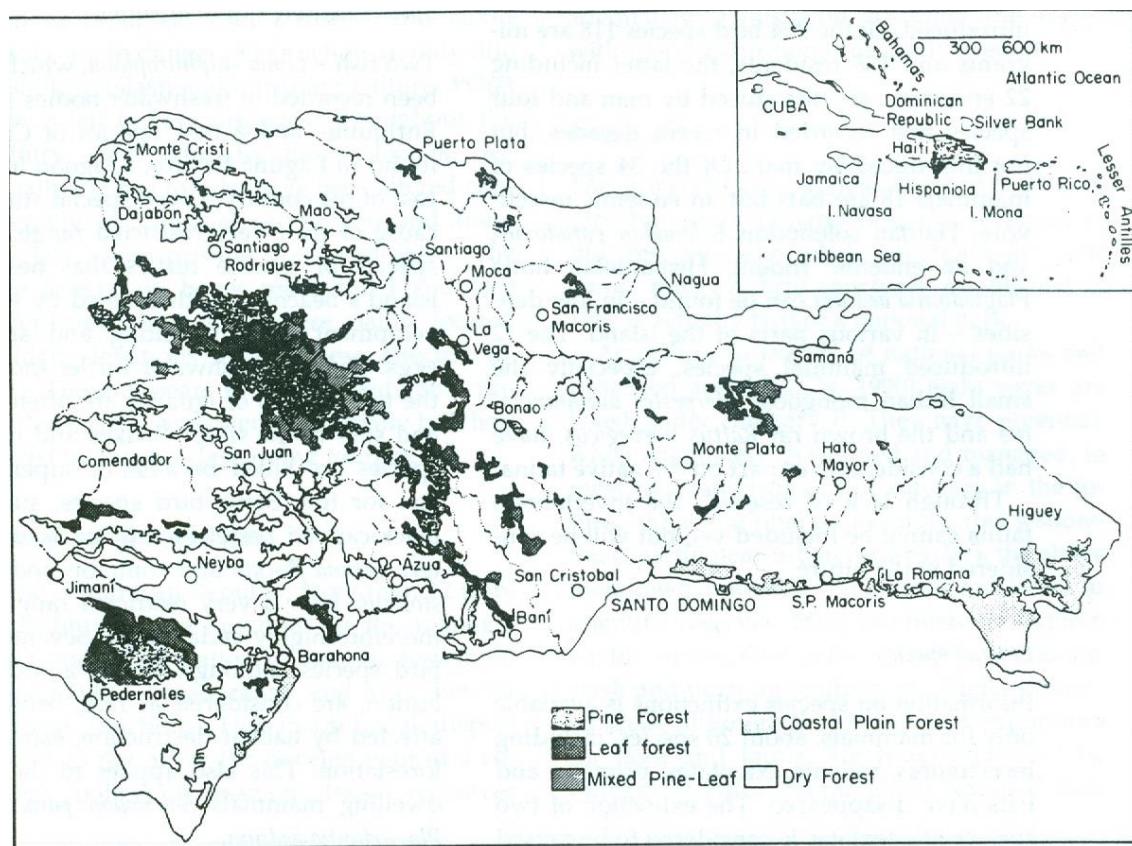


Figure 1. Natural forest ecosystems in the Dominican Republic, located on 1984 aerial photographs

Fauna

Due to its varying physiography Hispaniola offers many different types of habitats, resulting in a high level of species richness. In the freshwater rivers, lakes and lagoons 70 species of fish have been recorded, among them 22 endemic species. The other 48 species have been introduced for commercial reasons or are marine species that commonly use fluvial habitats. Sixty species of amphibians have been recorded, all belonging to the order Anura.

The great majority (43 species) are of the genus *Eleutherodactylus*. The two species *Rana catesbeiana* and *Bufo marinus*, have been introduced. Of the 141 reptile species, 117 are endemic, while two lizard species have been introduced.

Of the 254 bird species 118 are migrants and 138 residents, the latter including 22 endemics, six introduced by man and four species first recorded in recent decades, but not introduced by man. Of the 34 species of mammals 18 are bats but an endemic insectivore, Haitian solenodon *Solenodon paradoxus*, and an endemic rodent, Hispaniolan hutia *Plagiodontia aedium* can be found - in low densities - in various parts of the island. The 12 introduced mammal species, especially the small Indian mongoose *Herpestes auropunctatus* and the brown rat *Rattus noroegicus*, have had a considerable impact on the native fauna. Through lack of research the invertebrate fauna cannot be included yet, but will be considered in the future.

Extinct species Information on species extinctions is available only for mammals: about 20 species, including insectivores, rodents, edentates, primates and bats have disappeared. The extinction of two species of edentates is considered to be caused by subsistence hunting by pre-Columbian people (Olson, 1978). Other mammals, such as *Nesophontes* spp., possibly survived until the beginning of the present century (Woods et al., 1985). The wood stork *Mycteria americana*, the colubrid snake *Alsophis melanichnus* and the insectivore *Solenodon marcanoi* have not been recorded or several decades and may be extinct in the Dominican Republic. However, currently available data does not allow us to estimate the number of animal or plant species that have been lost due to human activities.

Threatened species

Among fish, reptiles, birds and mammals, 89 species and subspecies are considered as threatened: 15 are endangered; 37 vulnerable; 13 rare; and 24 are of indeterminate status. We consider that 39 threatened species need special attention: two fishes, 13 reptiles, 21 birds and two mammals. Of these, the 13 reptiles and one bird, *Pardirallus maculatus* do not occur in any of the Dominican Republic's protected areas.

Species needing special attention

Two fish - *Limia sulphurophila*, which has only been recorded in freshwater bodies near Lago Enriquillo and a new species of *Cyprinodon*, found in Laguna Bavaro, a lagoon in the very east of the country - need special attention because of their very restricted range. The four species of marine turtles that nest on the island's beaches are threatened by tourist development, illegal hunting and stealing of eggs. The two freshwater turtles (jicotéas) and the two species of iguanas are often captured and sold in the street. Snakes and many bird species are killed because of superstition or just for fun. Some bird species, such as the black-capped petrel *Pterodroma hasitata*, sooty tern *Sterna fuscata* and common noddy *Anous stolidus* have a very restricted range and are therefore highly endangered. Seventeen other bird species, although having a wider distribution, are considered as rare, being heavily affected by habitat destruction, especially deforestation. This also applies to the ground-dwelling mammals *Solenodon paradoxus* and *Plagiodontia aedium*.

Habitats

A comparison of amphibian species-richness in different habitats reveals that the highest species numbers are to be found at high elevations, apparently depending little on the type of vegetation. Reptiles prefer open habitats and are generally more frequent in areas altered by agriculture. Among the vertebrates, birds appear to be most affected by human impacts, because two-thirds of the total

number of species is found exclusively in natural ecosystems and one-quarter of the total live only in forest ecosystems.

The current situation of biodiversity conservation

Human impacts

The evaluation of the actual status of each ecosystem revealed that the evergreen forests, such as broadleaf (rain-) forests and cloud forests, are in danger of extinction, mainly due to shifting (slash-and-burn) agriculture. What little is left is very dispersed throughout the country. The semi-deciduous forests, especially the dry forests, have been altered considerably by charcoal production and there are only a few pristine dry forest areas. The pine forests are better represented and face fewer threats because they are mainly located at high elevations and are less affected by fires. There appears to be a considerable impact on coastal ecosystems, especially beaches, caused by rapidly developing tourism.

Institutional infrastructure

In the Dominican Republic more than 12 public institutions are involved in the management and conservation of natural resources. They have a broad range and very heterogeneous functions. This institutional dispersion does not allow the development of a coherent policy to manage these resources adequately. Legislation to unite the forces within one institution is urgently needed.

Protected areas

The protected area system comprises 22 conservation units: 12 national parks, seven scientific reserves, one whale sanctuary and one scenic route. A bird sanctuary established in 1987 is actually part of a national park.

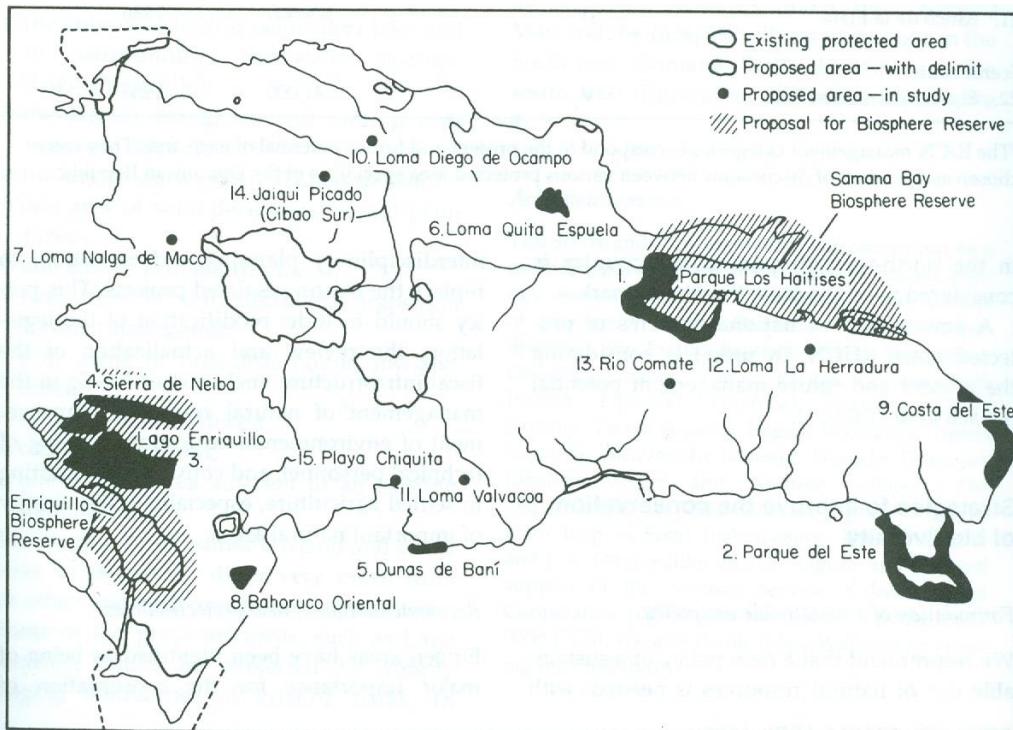


Figure 2. Proposed new protected areas in the Dominican Republic

Table 1. Protected areas in the Dominican Republic (June 1992)

National designation	IUCN category*	Area (ha)	Year established
National parks			
1. Parque del Este	II	42,000	1975
2. Isla Cabritos	II	2,400	1974
3. Jaragua	II	137,400	1983
4. Armando Bermúdez	II	76,600	1956
5. José del Carmen Ramírez	II	73,783	1958
6. Los Haitises	II	20,800	1976
7. Monte Cristi	II	53,000	1983
8. Sierra de Bahoruco	II	80,000	1983
9. Parque Submarino La Caleta	V	1,010	1986
10. Cabo Frances Viejo	V	125	1974
11. Litoral Norte (Puerto Plata)	None	75	1971
12. Litoral Sur (Santo Domingo)	None	1,075	1968
Scientific reserves			
13. Ebano Verde	IV	2,310	1989
14. Laguna del Rincón	IV	4,780	1983
15. Lagunas Redonda y Limón	IV	10,100	1983
16. Valle Nuevo	IV	40,900	1983
17. Loma Quita Espuela	IV	7,250	1992
18. Villa Elisa (Dr Orlando Franco)	I	15	1976
19. Loma Isabel de Torres	V	2,200	1983
Bird sanctuary			
20. Cayos Siete Hermanos	Part of Monte Cristi National Park		
Humpback Whale Sanctuary			
21. Banco de la Plata	IV	374,800	1986
Scenic route			
22. El Aceitillar-Cabo Rojo	V	41,000	1986

*The IUCN management categories correspond to the present and future potential of each area. They were chosen as the result of discussions between various protected area specialists of the Dominican Republic.

According to the list of national parks and protected areas (IUCN, 1990) eight parks are listed under category 11. They have potential, when adequately developed and managed, to meet the standards of this category in the future. Three 'national parks' along rocky shorelines, partly near urban centres, lack the above mentioned potential. Five areas are listed as scientific reserves. Most are intensely exploited for commercial fishery, livestock grazing, slash-and-burn agriculture, etc. Some protected areas, although they have great importance for flora and fauna, are heavily affected by human activities. Monte Cristi National Park such as in the north-western part of the country is considered to be the most threatened park. A new review of national systems of protected areas (IUCN, in prep.) is considering the present and future management potential of each area (Table 1).

Strategies to improve the conservation of biodiversity

Formulation of a sustainable use policy

We recommend that a new policy of a sustainable use of natural resources is needed, with interdisciplinary planning and execution, to replace the existing isolated projects. This policy should include: modification of the legislation; the review and actualization of the fiscal infrastructure; inclusion of NGOs in the management of natural resources; improvement of environmental education; training of technical personnel; and conversion of shifting to settled agriculture, especially in the vicinity of important natural areas.

Recommendation of new protected areas

Fifteen areas have been identified as being of major importance for the conservation of biological diversity and these are recommended for inclusion in the national system of protected areas (Figure 2, Table 2). Within these 15 areas the following ecosystems are represented:

- the country's largest (saltwater) lake and its surrounding freshwater swamps (Lago Enriquillo):
- the largest mangrove and swamp area near Samaná Bay
- the largest dune system (Dunas de Baní)
- one area of semi-deciduous coastal plain forest
- one area of primary dry forest
- two areas of semi-deciduous transition forests (mahogany)
- four areas of broadleaf humid lowland forest
- six areas of cloud forest
- one riparian forest
- one marine area adjacent to an existing national park

The fragments of humid lowland and cloud forests, in particular, differ very much from each other, and each one deserves protection.

Some of the proposed areas, such as Lago Enriquillo, could be protected by simply changing boundaries of existing parks. In some cases we have included proposals for boundaries of new areas, although mostly our limited knowledge does not allow us to do so. We also suggest the declaration of two areas as Biosphere Reserves under the UNESCO Man and the Biosphere Programme, one in the north-east (Samaná Bay), the other in the south-west (Enriquillo) of the country (Figure 2).

Table 2. Proposed new protected areas in Dominican Republic

	Proposed new protected areas*	IUCN Category	Area (ha)
1	Los Haitises (amplification)	II	55 000
2	Parque del Este (amplification)	II	55 000
3	Lago Enriquillo (amplification)	II	45 000
4	Sierra de Neiba	II	30 000
5	Dunas de Baní	V	1 500
6	Loma Quita Espuela (recently protected as a scientific reserve)	IV	7 250
7	Loma Nalga de Maco	IV	8 500
8	Bahoruco Oriental	IV	7 000
9	Costa del Este		
10	Loma Diego de Ocampo		
11	Loma Valvaca		
12	Loma La Herradura		
13	Río Comate		
14	Cibao Sur (Jaiqui Picado)		
15	Playa Chiquita de Azua		

*1--6: areas studied before December 1990; 7-9: areas studied in 1991; 10-15: areas currently being studied

IUCN-Category: Management Category proposed for the area

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References

Hartshorn, G., Antonini, G., DuBois, R., Harcharik, D., Heckadou, S., Newton, H., Quesada, C., Shores, J. and Staples, G. 1981. La República Dominicana; Perfil ambiental del país, un estudio de campo. Mclean, Virginia 22102, USA.

IUCN 1990. United Nations List of National Parks and Protected Areas. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN (in prep). Protected Areas of the World: A Review of National Systems, Vol. 4. IUCN, Gland, Switzerland and Cambridge, UK.

Olson, S.L. 1978. A paleontological perspective of West Indian birds and mammals. In Zoogeography of the Caribbean. The 1975 Leidy Medal Symposium. (ed. F. B. cun. pp. 99-117. Acad. Nat. Sci. Philadelphia.

Santana, B., Dominici G. and Schaub, T. 1990. Informe sobre Investigaciones botanicas, zoologicas y socio-economicas en la Sierra de Neiba. SEA-Vida Silvestre, Santo Domingo, RD.

SEA/DVS. 1990. La Diversidad Biologica en la República Dominicana. Reporte preparado por el Departamento de Vida Silvestre para el DED y el WWF-US. Secretaría de Agricultura, SURENA, DVS, Santo Domingo, RD.

Woods, c.A., Ottenwalder J.A. and Oliver W.L.R. 1985. Lost mammals of the Greater Antilles. Dodo, [ourn. Jersey Wildl. Preserv. Trust, 22, 23--42.

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