

# TRINIDAD AND TOBAGO

## INTRODUCTION

by Carol James, Nadra Nathai-Gyan and Geddes Hislop

Trinidad and Tobago are the most southerly of the Caribbean chain of islands, with Trinidad lying only 12 km from the mainland of South America near the Orinoco Delta, and Tobago 34 km northeast of Trinidad. The twin island nation comprises an area of 5,123km<sup>2</sup>, with Trinidad accounting for 4,828km<sup>2</sup>. Both islands lie between 10° and 12°-north, and between 60° and 62° west. Trinidad is relatively flat except for three mountain ranges which cross it from east to west; the mountains in the Northern Range are the highest, and attain a maximum elevation of 940m. Numerous rivers drain these upland areas and traverse alluvial plains lying between the ranges. Most end in coastal swamps, marshes or lagoons. In contrast to that of Trinidad, the topography of Tobago is rugged, with a mountain ridge running in a northeast-southwest direction for nearly two-thirds of the length of the island, and rising to 576m. There is a small area of coastal plain in the southwest which contains the only wetland habitat of any significance on the island. There are several small offshore islands, particularly off northwest Trinidad and to the northeast of Tobago.

The climate is humid tropical, with uniformly high temperatures and an annual rainfall in excess of 2,000 mm. There are two main seasons; a long rainy season from late May to December interrupted by a short dry season in late September and October, and a long dry season from January to May. The islands lie on the very edge of the hurricane zone, and rarely experience hurricane or storm force winds.

The total population of Trinidad and Tobago is estimated to be 1,149,300, with 1,106,300 in Trinidad and 43,000 in Tobago. Sixty per cent of this population live in settlements classified as urban, and forecasts indicate that this proportion will increase substantially. More than 90% of Trinidad's population reside and work in the west coastal area and this factor, coupled with the siting of large industrial complexes, manufacturing concerns and large scale agricultural developments, has subjected the area to tremendous pressures.

Land use practices vary with quality of soil, topography and areas of mineral deposits. Economically significant deposits of oil and natural gas exist in the southern lowlands, the Gulf of Paria and off the east coast; and there is a natural asphalt lagoon of 45 ha at La Brea in the south. Approximately 3,000km<sup>2</sup> remain under forest or other natural vegetation; tree crops account for 860km<sup>2</sup>, and agriculture, principally the production of sugar cane, and livestock rearing account for a further 830km<sup>2</sup>. The manufacturing sector is dominated by oil and sugar refining, and much of the activity related to these is located in west-central and southwest Trinidad.

The most important wetland areas are mangrove swamps, fresh to brackish coastal lagoons, and swamps and swamp forest in the flood plains of the larger rivers and low-lying coastal areas. The Draft National Physical Development Plan of 1978 classified these areas as unsuitable for cultivation and recommended that they be left under indigenous forest cover. The swamps and swamp forests comprise approximately 16,000 ha in Trinidad and 58 ha in Tobago. Reservoirs of significance for waterfowl are located at Navet in the Central Range, at Caroni-Arena in the Northern Range, and at the Pointe-a-Pierre Oil Refinery.

The two most important wetlands for waterfowl are the Caroni and Nariva Swamps. Between them they contain representatives of all the wetland plant communities and waterfowl species found in Trinidad and Tobago. In addition, both swamps are important nursery grounds for marine fisheries, and the Caroni Swamp is particularly important for wildlife related tourism.

## Institutional Base for Wetland Conservation and Research

### Governmental organizations

*Forestry Division, Ministry of Agriculture, Lands and Food Production.* The Forestry Division is primarily responsible for the protection and management of Forest Reserves, several of which include important wetland areas. However, with the recent acquisition of

a small staff of trained biologists, the Forestry Division has begun to conduct faunal research.

*Institute of Marine Affairs.* This is an independent research organization set up by the government in 1976 with the assistance of UNDP. Its major role is to conduct research on the marine environment and watershed areas which affect this.

*Fisheries Division.* This division conducts research on the biology, ecology and exploitation of fishes in all the major wetlands and in the coastal zone of the Gulf of Paria.

*Zoological Society of Trinidad and Tobago.* This society, set up by an Act of Parliament, is dedicated to the study of the indigenous fauna and is responsible for the Emperior Valley Zoo in Port-of-Spain, which has attracted some 150,000 paying visitors annually since 1982.

*Chaguaramas Development Authority.* The authority, established by an Act of Parliament, is responsible for management of the entire northwest peninsular of Trinidad. A Park Planner is responsible for research on flora and fauna in the area and for advising the local authorities on conservation matters.

#### Non-governmental organizations

*The University of the West Indies.* The Zoology Department and the Department of Biological Sciences have undertaken a number of wetland research projects at Nariva and Caroni Swamps since the late 1960s.

*Trinidad Field Naturalist Club.* This is the oldest conservation organization in Trinidad dating back to 1891 and with a current membership of 400 persons. Although the predominant role of the Club has always been the education of its members, important issues dealing with the misuse of natural resources or with development proposals which conflict with the principle of wise utilization of resources have, from time to time, been brought successfully to the attention of resource planners.

*Pointe-a-Pierre Wildfowl Trust.* This private non-profit organization, set up in 1966, manages a wildlife sanctuary and small collection of captive birds, mainly waterfowl, at Pointe-a-Pierre, and conducts studies on indigenous species. Conservation education is given high priority, and the Trust has made considerable progress in increasing the awareness of the general public, particularly school children, to wildlife conservation issues in Trinidad and Tobago.

*Asa Wright Nature Centre.* This private organization manages a nature reserve in the Arima Valley of the Northern Range. Although no extensive wetland habitat exists in the nature reserve, refuge and feeding are provided for many wetland species normally resident at Caroni Swamp, 5-10 km to the south.

*Trinidad Naturalist Magazine.* This is a private commercial enterprise which recognized the need to educate the public on natural history and conservation issues, and since its inception in the mid 1970s has published a number of important articles on wetland flora and fauna.

#### Progress in Wetland Conservation and Research

Several laws of the country affect, either directly or indirectly, the status and protection of wetland habitat and its wildlife. Those of major importance include the Forest Act which provides for the proper management and control of Forest Reserves; the Conservation of Wildlife Act which provides for the declaration of wildlife sanctuaries, protected animals, hunting seasons and a system for the issuance of licenses and permits; and the Marine Areas (Preservation and Enhancement) Act which provides for the protection of flora and fauna in restricted areas. Other legislation covers the exploitation of fishes, crustaceans and sea turtles; the control of oil pollution; the prevention of pollution of fresh waters; and the regulation of irrigation and reclamation schemes. Trinidad became a signatory to the Convention on International Trade in Endangered Species (CITES) in April 1984.

Thirteen Wildlife Sanctuaries exist in Trinidad and Tobago, and two of these are within the major wetlands areas of Caroni and Nariva. In addition, 37 Forest Reserves have been demarcated. The fauna in Wildlife Sanctuaries receive total protection all year round, but in Forest Reserves animals may be hunted during the six months open season. Under a proposed "System of National Parks and other protected areas" prepared by the Forestry Division in conjunction with the Organization of American States, recommendations were made to set aside 61 areas in Trinidad and Tobago for nature conservation and preservation. Management and

development plans were prepared for several areas including Caroni Swamp. The Government agreed in principle to the overall system, but no legislation has as yet been enacted. Thus plans to develop Caroni and Nariva Swamps as National Parks, and Fishing Pond, Icacos Basin and Godineau Swamp as Nature Conservation Reserves, have not been implemented.

Over the years, various studies by international consultants on land use of wetlands have been commissioned, but as far as is known, no concrete plans for development have been initiated. The Draft National Physical Development Plan (1978) recognizes the existence of ecologically sensitive areas such as swamps and recommends careful planning for proposed developments.

A considerable amount of research has been conducted on the nation's wetland ecosystems. Some of the principal studies have included the following:

- a) A detailed study of the biological associations, hydrology, resource exploitation and potential land use of Nariva Swamp; by the University of the West Indies (Bacon *et al*, 1979).
- b) Ecological studies and floral investigations at Caroni Swamp; by Bacon (1970) and Ramcharan (1980) respectively.
- c) A socio-economic study of the wetland resources of Caroni Swamp; by Ramdial (1980).
- d) A study of the ecological impact of a project to divert the Couva River on the mangrove swamps and fishery in Carli Bay; by the Institute of Marine Affairs (Mutunhu, 1984).
- e) Research on the wetlands of Trinidad with special reference to the energetics of mangroves and inventory of the fauna; by the Institute of Marine Affairs (Ramcharan *et al*, 1983).
- f) Censuses of *Eudocimus ruber* populations; by the Forestry Division in collaboration with the World Working Group on Storks, Ibises and Spoonbills.

#### **Major Threats to Wetlands and Waterfowl**

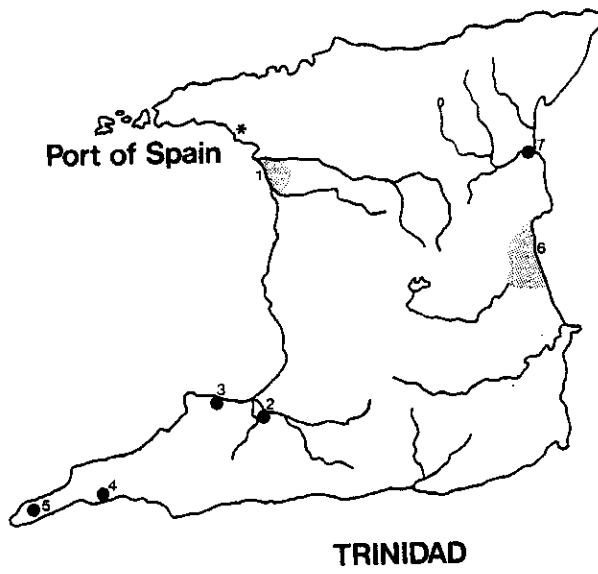
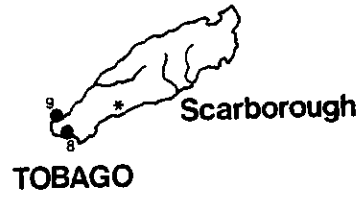
Wetlands in Trinidad and Tobago are under threat from an expanding human population. Pressure for space, pressure for industrial, agricultural and housing developments, and the resulting pollution from such activities are the major threats to all coastal wetlands. Urban and suburban sprawl are particularly severe on the west coast, and have already accounted for the loss of wetlands at Westmoorings, Cocorite, Sealots and Laventille.

Land reclamation for rice cultivation has occurred on the landward side of many coastal wetlands, but in recent years the incursion of salt water at Caroni, Rousillac and South Oropuche has resulted in the abandonment of some areas previously cultivated. Caroni remains under threat because of schemes to dredge channels in the swamp in an attempt to control severe flooding in nearby low-lying agricultural and residential areas. The dredging would seriously affect the hydrology of the swamp, and would offer only a temporary solution to the flooding since the causal factors have not been corrected. These are related to the siltation of water courses resulting from deforestation of hillsides and extensive quarrying activities in the Caroni watershed.

Proposals by private businesses to develop salt water shrimp farming at Nariva and fish ponds at Nariva and Caroni have been received by the Ministry of Agriculture, Lands and Food Production. Advice was sought from the FAO, but their consultant's findings have not as yet been made available. The Forestry Division has registered strong reservations against the total transformation of intact wetland habitat for agricultural development or aquaculture, and has suggested as an alternative the use of degraded habitats such as mangrove swamps close to industrial or residential areas, or abandoned quarry sites.

Inland reservoirs still offer potentially good habitat for most waterfowl because these areas are protected from activities which will reduce the availability or acceptability of water for human consumption.

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## WETLANDS

Site descriptions based on a report prepared by Carol James, Nadra Nathai-Gyan and Geddes Hislop of the Forestry Division (James *et al.*, 1984), and data sheets provided by Eugene K. Ramcharan of the Institute of Marine Affairs.

### Caroni Swamp (1)

**Location:** 10°35'N, 61°28'W; 3.5 km southeast of Port of Spain, Trinidad.

**Area:** 5,611 ha (formerly 14,000-15,000 ha including flood plain).

**Altitude:** 0-10m.

**Province and type:** 8.4.1; 03, 07, 08, 09 & 16.

**Site description:** An estuarine and coastal mangrove system with large brackish to saline lagoons, extensive mangrove swamps, and seasonally inundated brackish marshes and grassland on its landward fringes. The maximum depth of the channels is 9-11m, the level fluctuating with the tides. Seasonal marshes flood to a depth of 1m during the rainy season (June to November). There is an extensive network of ditches throughout the swamp; relicts of drainage projects attempted on several occasions since the early 1930s, but subsequently abandoned. Large areas of the adjacent fresh to brackish marshes have however been reclaimed for agriculture.

**Principal vegetation:** Mangrove swamps with *Rhizophora mangle*, *Avicennia germinans* and *Laguncularia racemosa* in that order of abundance; marshes with species of *Eleocharis*, *Cyperus*, *Typha*, *Acrostichum*, *Eichhornia*, *Pistia* and *Lemna*.

**Land tenure:** Mainly state owned; with 3,197 ha in a Forest Reserve, 1,540 ha in State Lands, and 874 ha privately owned.

**Protection:** Largely within a State Forest Reserve, patrolled daily by Forestry Wardens. 197.6 ha in the north of the swamp have been made into a Bird Sanctuary. A Wildlife Sanctuary of 7,900 ha created in 1936 was decommissioned in 1982. Hunting is prohibited throughout the area during the general close season (1 April to 31 October).

**Land use:** Intensive fishing and the harvesting of crabs and oysters; hunting from November to March; nature tourism; and agriculture, industrial development, highway construction and dumping of rubbish in peripheral areas.

**Waterfowl:** A very important area for a variety of waterfowl, and particularly the Scarlet Ibis *Eudocimus ruber*, which formerly nested in large numbers. Unfortunately, because of considerable hunting pressure and disturbance from tourists, the birds have not bred since the 1970s, and numbers feeding and roosting in the swamp have declined to a few thousands (2,450 in early 1984). Other common species include *Pelecanus occidentalis*, *Phalacrocorax olivaceus*, *Bubulcus ibis*, *Butorides striatus*, *Egretta caerulea*, *E. tricolor*, *E. alba*, *Dendrocygna autumnalis*, *Rallus longirostris*, *Gallinula chloropus* and *Larus atricilla*. *Anas discors*, *Ardea herodias* and a variety of Nearctic shorebirds are common on migration and in winter; and *Ajaia ajaja* is a regular non-breeding visitor.

**Other fauna:** About 140 species of birds have been recorded in the area, and the endemic subspecies of the Straight-billed Woodcreeper *Xiphorhynchus picus altirostris* is apparently confined to the swamp. The Osprey *Pandion haliaetus* is a common winter visitor. The mammalian fauna includes the Silky Anteater *Cyclopes didactylus didactylus* and Crab-eating Raccoon *Procyon cancrivorus cancrivorus*; reptiles include *Caiman crocodilus*. The wetland supports a thriving fishery, both offshore and in the swamp. Fishes include *Megalops atlanticus* and species of *Mycteroperca*, *Mugil*, *Lutjanus*, *Caranx*, *Anchoa* and *Hycengraulis*. The crab *Ucides cordatus* is still harvested commercially, but the oyster *Crassostrea rhizophorae*, which was formerly abundant, has been depleted through improper harvesting. Other crab species include *Aratus pisonii* and *Uca* spp.

**Threats:** The swamp is seriously threatened by a number of factors. There is a serious pollution problem from run-off of fertilizers and pesticides, industrial waste and domestic sewage; peripheral areas are being reclaimed for housing, industrial development, road construction and rubbish tips; there is excessive disturbance from tourists visiting the Sanctuary, excessive hunting during the open season, and a considerable amount of illegal hunting in the close season and in the Bird Sanctuary; the shellfish populations are being overexploited; and there is marine pollution along the coastal fringe.

**Research and conservation:** The Caroni Swamp has been the focus of a number of activities concerning research, education, recreation and agriculture. In addition to its importance for wildlife, the swamp is of great value as a fish spawning ground, and attracts thousands of tourists each year. A proposal has been made to give National Park status to the entire area, and a management plan has been drawn up, but no action has as yet been taken. The swamp has been nominated as a potential Ramsar Site in anticipation of the Government ratifying that Convention.

**References:** Bacon (1970, 1971 & 1975); Ramdial (1975 & 1980); Forestry Division & OAS (1979); Thelen & Faizool (1980); IUCN (1982); Lambert (1983); French & Ramcharan (1984).

**Source:** Carol James, Nadra Nathai-Gyan, Geddes Hislop and Eugene K. Ramcharan.

**Criteria for inclusion:** 123.

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### South Oropuche Swamp (2)

**Location:** 10°12'N, 61°32'W; 8 km southwest of San Fernando, between Freeman Bay and Mosquito Creek, Trinidad.

**Area:** 5,642 ha.

**Altitude:** 1-5m.

**Province and type:** 8.4.1; 02, 07, 08, 13 & 17.

**Site description:** An estuarine system with a shallow brackish lagoon, up to 1.5m deep, behind a sand bar, tidal mangrove swamps, and fresh to brackish marshes on the landward fringe. A large part of the marshes has been converted into rice paddies. The water level in the marshes fluctuates by 1m, reaching its maximum between June and November.

**Principal vegetation:** Mangrove swamps with *Avicennia germinans*, *Laguncularia racemosa* and *Rhizophora mangle*; and marshes with species of *Eleocharis* and *Ipomoea*.

**Land tenure:** State owned, with large areas leased to rice growers.

**Protection:** 92 ha are within a Forest Reserve which is patrolled by Game Wardens on a weekly basis. The remainder is unprotected.

**Land use:** Agriculture, principally rice growing; petroleum exploration; hunting of waterfowl; and fishing.

**Waterfowl:** An important breeding area for waterfowl, with five mixed colonies of Ardeidae including 500 pairs of *Egretta thula* and 1,000 pairs of *E. alba*. There are also important breeding populations of *Dendrocygna bicolor* and *D. autumnalis*. *Eudocimus ruber* occurs in small numbers as a non-breeding visitor.

**Other fauna:** *Pandion haliaetus* occurs in winter, and there is a small population of *Caiman crocodilus*. The wetland is used extensively as a nursery and feeding ground for many species of commercially important fishes, and offshore there is an extensive bank which is the focus of a thriving fishing industry. Crabs include *Cardisoma guanhumi* and *Uca* spp.

**Threats:** The many threats to the swamp include pollution from agrochemicals and an oil pipeline which runs through the area; increased sedimentation; reclamation for agriculture; squatting by illegal settlers; the dumping of rubbish; coastal erosion; and fires in the dry season.

**Research and conservation:** Proposals for the conservation of the area have been drawn up by the Institute of Marine Affairs.

**References:** French & Ramcharan (1984); Ramcharan (1984); Ramcharan *et al* (1983).

**Source:** Carol James, Nadra Nathai-Gyan, Geddes Hislop and Eugene K. Ramcharan.

**Criteria for inclusion:** 2c & 3a.

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### Roussillac Swamp (3)

**Location:** 10°14'N, 61°36'W; 7 km northeast of Point Fortin, Trinidad.

**Area:** 496 ha.

**Altitude:** 0-25m.

**Province and type:** 8.4.1; 05, 07 & 08.

**Site description:** A permanent brackish tidal lagoon separated from the sea by a sand bar, and with extensive mangrove swamps. Fluctuations in water level are relatively slight.

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**Principal vegetation:** Mangrove swamps with *Avicennia germinans*, *Laguncularia racemosa* *Rhizophora mangle* and *Nymphaea ampla*.

**Land tenure:** Mainly state owned, with 34 ha in private lands.

**Protection:** Largely included in a Forest Reserve of 443 ha in which hunting is prohibited, but active protection is limited.

**Land use:** Agriculture; grazing of livestock; hunting; fishing; and the harvesting of crabs.

**Waterfowl:** Poorly known. Species recorded include *Jacana jacana* and *Porphyryula martinica*.

**Other fauna:** The crab *Ucides cordatus* and the catfish *Hoplosternum littorale* form the basis of a local fishery.

**Threats:** General disturbance from human activities; squatting by illegal settlers; and oil pollution.

**Research and conservation:** A proposal has been made for the proper management of the area by the Institute of Marine Affairs.

**References:** Ramcharan *et al* (1983).

**Source:** Carol James, Nadra Nathai-Gyan and Geddes Hislop.

**Criteria for inclusion:** 2c & 3a.

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**Los Blanquizales Swamp (4)**

**Location:** 10°05'N, 61°47'W; 18.5 km WSW of Point Fortin, Trinidad.

**Area:** 1,085 ha.

**Altitude:** 0m.

**Province and type:** 8.4.1; 06, 07 & 08.

**Site description:** A permanent brackish tidal lagoon, up to 2m deep, with intertidal mudflats, mangrove swamps and brackish marshes.

**Principal vegetation:** Mangrove swamps; marshes with *Eleocharis intersticta*, *E. mutata*, *Acrostichum aureum*, *Montrichardia arborescens* and *Heliconia psittacorum*. Agricultural land and forests on the landward side.

**Land tenure:** State owned.

**Protection:** Protected under the State Lands Act, but the regulations are not properly enforced.

**Land use:** Agriculture; illegal settlement; and hunting.

**Waterfowl:** Poorly known. Species recorded include *Phalacrocorax olivaceus*, *Butorides striatus*, *Egretta alba*, *Dendrocygna bicolor*, *Aramus guaraina* and *Jacana jacana*.

**Other fauna:** The parrots *Ara manilata* and *Amazona amazonica* occur in the area. Crabs include *Aratus pisonii* and *Uca* spp.

**Threats:** General disturbance from human activities; squatting by illegal settlers; agricultural practices causing changes in the hydrology of the area; and pollution from agrochemicals.

**Research and conservation:** Proper management plans should be developed for the area, and illegal squatting and agricultural encroachment prevented.

**References:** Ramcharan *et al* (1983).

**Source:** Carol James, Nadra Nathai-Gyan and Geddes Hislop.

**Criteria for inclusion:** 3a.

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**Icacos Basin (5)**

**Location:** 10°04'N, 61°54'W; 30.5 km WSW of Point Fortin, Trinidad.

**Area:** 330 ha.

**Altitude:** 0m.

**Province and type:** 8.4.1; 07 & 08.

**Site description:** A complex of permanent brackish lagoons, up to 2.5m deep, mangrove swamps and brackish marshes, with relatively stable water levels.

**Principal vegetation:** Mangrove swamps with *Avicennia germinans*, *Laguncularia racemosa* and *Rhizophora mangle*; marshes with *Eleocharis* sp, *Acrostichum aureum*, *Paspalum fasciculatum* and *Heliconia psittacorum*.

**Land tenure:** State owned.

**Protection:** Protected under the State Lands Act, and patrolled by Game Wardens.

**Land use:** A small amount of agriculture, and some grazing of livestock.

**Waterfowl:** Poorly known. Species recorded include *Phalacrocorax olivaceus*, *Butorides striatus*, *Egretta caerulea*, *E. tricolor*, *E. thula*, *E. alba*, *Dendrocygna bicolor* and *Vanellus chilensis*.

**Other fauna:** *Caiman crocodilus* occurs.

**Threats:** There is a small amount of coastal erosion in the area, and overgrazing by domestic livestock.

**Research and conservation:** Management proposals have been made by the Institute of Marine Affairs. The area has good potential for studies on plant succession.

**References:** Ramcharan *et al* (1983).

**Source:** Carol James, Nadra Nathai-Gyan and Geddes Hislop.

**Criteria for inclusion:** 3a.

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### Nariva Swamp (6)

**Location:** 10°23'N, 61°04'W; 16 km SSE of Sangre Grande, on the east coast of Trinidad.

**Area:** 6,234 ha.

**Altitude:** 0-10m.

**Province and type:** 8.4.1; 07, 08, 09, 13, 16 & 18.

**Site description:** A permanent brackish lagoon with extensive mangrove swamps, separated from the sea by two parallel sand bars, and a large area of fresh to brackish swamps, swamp forest and seasonally flooded marshes. The level of the lagoon is influenced by the tides by way of river channels and possibly subsurface seepage; salinities range from 4-25 p.p.t. The area includes the largest freshwater herbaceous swamp in Trinidad. The seasonal marshes flood to a depth of 1m between June and November, leaving islands of higher ground with humid tropical forest.

**Principal vegetation:** Beach scrub with *Coccoloba* sp; mangrove swamps with *Rhizophora mangle* and *Avicennia germinans*; permanent herbaceous swamps with *Montrichardia arborescens* and *Cyperus giganteus*; marshes with *Eleocharis mutata*, *Cyperus giganteus*, *C. odoratus* and *Phragmites* sp; swamp forest with *Pterocarpus officinalis*, *Carapa* sp and *Bactris* sp; and islands of humid tropical forest with *Roystonea oleracea*, *Mauritia setigera* and *Euterpe oleracea*.

**Land tenure:** Almost entirely state owned, with 6.1 ha under private ownership.

**Protection:** 1,554 ha of forested high ground jutting out into the swamp are protected in the Bush Bush Game Sanctuary, established in 1968, and 40 ha are included within the Ortoire Nariva Windbelt Forest Reserve. The remainder of the area and thus almost all of the wetland habitat is unprotected.

**Land use:** Agriculture, grazing of livestock, forestry, hunting, fishing, bird trapping for the pet trade, and recreation.

**Waterfowl:** An important area for a variety of waterfowl including *Anhinga anhinga*, several Ardeidae, *Dendrocygna autumnalis*, *Aramus guarauna* and *Jacana jacana*.

**Other fauna:** Over 170 species of birds have been recorded in the swamp. The Blue and Yellow Macaw *Ara ararauna* formerly occurred, but now appears to have been exterminated as a result of excessive trapping for the pet trade. *Ara manilata* is still fairly numerous. Mammals include the manatee *Trichechus manatus*, *Cebus albifrons* and *Alouatta seniculus*; and reptiles include *Caiman crocodilus* and *Eunectes murinus*. The wetland supports a large population of the catfish *Hoplosternum littorale*, which forms the basis of a thriving fishery. Crabs include *Cardisoma guanhumi*, *Ucides cordatus* and *Aratus pisonii*, and the freshwater conch *Pomacea urcens* occurs.

**Threats:** Many threats have been identified including illegal squatting; the reclamation of land for agriculture and clandestine cultivation of cannabis; illegal grazing of domestic livestock in the Game Sanctuary; exploitation of the forests for timber; overfishing; illegal hunting including the use of gun-traps; and excessive trapping of birds for the pet trade.

**Research and conservation:** Because of the uniqueness of the physical conditions, the wetland supports a diverse fauna and flora with many species which are found nowhere else in Trinidad. The swamp has significant potential for research, education and recreation, and some studies have already been made on the biological resources. It has been proposed that the entire area be made into a Wildlife Sanctuary or National Park, and that it be designated a Ramsar Site when the Government ratifies that Convention.

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**References:** Bacon *et al* 1979; Ramcharan (1980 & 1984); Thelen & Faizool (1980; IUCN (1982); Lambert (1983); French & Ramcharan (1984).

**Source:** Carol James, Nadra Nathai-Gyan, Geddes Hislop and Eugene K. Ramcharan.

**Criteria for inclusion:** 123.

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**North Oropuche Swamp (Fishing Pond) (7)**

**Location:** 10°37'N, 61°03'W; 10 km east of Sangre Grande, Trinidad.

**Area:** 1,220 ha.

**Altitude:** 0m.

**Province and type:** 8.4.1; 02, 07, 08, 09, 16 & 17.

**Site description:** The estuary of the River Oropuche and a seasonal shallow brackish lagoon, up to 50 cm deep, with mangrove swamps, bordered inland by seasonally inundated grassland and areas of rice cultivation. The lagoon and surrounding marshes dry out completely during the dry season.

**Principal vegetation:** Mangrove swamps with *Avicennia germinans* and *Rhizophora mangle*; seasonal marshes with *Eleocharis mutata* and *Acrostichum aureum*.

**Land tenure:** Mainly state owned, with 322 ha in private lands.

**Protection:** 900 ha are included in the Manzanilla Windbelt Forest Reserve (939 ha); the remainder is unprotected.

**Land use:** Agriculture, cattle ranching, fishing and the harvesting of crabs.

**Waterfowl:** Poorly known; species recorded include *Tigrisoma lineatum*, *Egretta caerulea*, *E. tricolor*, *E. thula* and *Jacana jacana*.

**Other fauna:** The manatee *Trichechus manatus* occurs in the river, and *Eunectes murinus* has been recorded. Fishes include *Hoplosternum littorale*, *Rivulus hartii* and *Polycentrus schomburgkii*; and crabs include *Aratus pisonii*, *Cardisoma guanhumi* and *Uca* sp.

**Threats:** The principal threat is the reclamation of land for agriculture.

**Research and conservation:** Some research has been conducted in the area by the Forestry Division. The wetland should be declared a Wildlife Sanctuary, at least for the duration of the close season (April to October).

**Source:** Carol James, Nadra Nathai-Gyan and Geddes Hislop.

**Criteria for inclusion:** 2a & 3a.

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**Kilgwyn Swamp (8)**

**Location:** 11°09'N, 60°48'W; 9 km WSW of Scarborough, near the southwestern tip of Tobago.

**Area:** 12 ha.

**Altitude:** 0m.

**Province and type:** 8.17.4; 07 & 08.

**Site description:** A permanent brackish lagoon with fringing mangrove swamps, separated from the sea by a sand bar.

**Principal vegetation:** Mangrove swamps with *Rhizophora mangle* and *Laguncularia racemosa*; and halophytic grasses. Coconut plantations inland.

**Land tenure:** Privately owned.

**Protection:** No legal protection, but hunting is prohibited and access restricted by the owners.

**Land use:** Grazing of livestock; dumping of rubbish; fishing; and harvesting of crabs.

**Waterfowl:** An important area for *Anas bahamensis*, with a breeding population of about 30 birds. Other species present include *Nyctanassa violacea*, *Butorides striatus* and *Egretta caerulea*.

**Other fauna:** The crabs *Cardisoma guanhumi*, *Aratus pisonii* and *Uca* sp.

**Threats:** Human disturbance; overgrazing by domestic livestock; and infilling with rubbish.

**Research and conservation:** One of the few wetlands on Tobago, and the only significant land-locked lagoon. The rubbish tip should be relocated, and the area given better protection.

**References:** Thelen & Faizool (1980).

**Source:** Carol James, Nadra Nathai-Gyan and Geddes Hislop.

**Criteria for inclusion:** 2b & 3a.

**Buccoo Reef and Bon Accord Lagoon (9)**

**Location:** 11°10'N, 60°51'W; 12 km WSW of Scarborough, at the southwestern tip of Tobago.

**Area:** 650 ha.

**Altitude:** 0-2m.

**Province and type:** 8.17.4; 01, 05, 07 & 08.

**Site description:** Buccoo Reef is an arc of reef enclosing a sand-bottomed bay, 2m deep, with a single channel connecting to the open sea, and with some fringing mangroves. Bon Accord Lagoon (34 ha) lies at the east end of the reef, between Sheerbird Point and Pigeon Point, and is partly land-locked by a sand bar. There are extensive mangrove swamps along its eastern and southern shores.

**Principal vegetation:** Mangrove swamps of *Rhizophora mangle* with some *Laguncularia racemosa* on the landward fringes; extensive beds of *Thalassia* sp in the bay. Coconut plantations inland.

**Land tenure:** Buccoo Reef is state owned; Bon Accord Lagoon is privately owned.

**Protection:** The reef and surrounding waters were designated as a restricted area in 1966, and have been protected as a strict nature reserve. Bon Accord Lagoon is not legally protected, but the owners prohibit hunting and restrict access.

**Land use:** Tourism, particularly visits to the reef in glass-bottomed boats; fishing; harvesting of crabs; and livestock grazing.

**Waterfowl:** Species recorded in the area include *Pelecanus occidentalis*, *Nycticorax nycticorax*, *Nyctanassa violacea*, *Butorides striatus*, *Egretta caerulea*, *E. thula* and *Gallinula chloropus*. All have small and vulnerable populations on Tobago.

**Other fauna:** There is a rich and varied marine fauna associated with the reef, and there are very well developed stands of living coral. The fauna of Bon Accord Lagoon includes the crabs *Cardisoma guanhumi*, *Aratus pisonii* and *Uca* sp, and the tree oyster *Isognomon alatus*.

**Threats:** Plans to build a tourist hotel and marina were abandoned because of potential ecological damage to the mangrove ecosystem, but the threat of reclamation for hotel development persists. Bon Accord Lagoon suffers from excessive disturbance from recreation activities, and overgrazing by domestic livestock.

**Research and conservation:** The area is particularly important for marine life, and presents an ideal opportunity for studies of the relationships between offshore coral reef and mangrove ecosystems. A number of studies have been carried out on the structure of the reefs, sedimentation and water movements, and the value of the mangrove forest in protecting the coastline from hurricane damage is now appreciated. A reduction in the level of grazing along the shores of Bon Accord Lagoon has been proposed.

**References:** Wood (1964); Goreau (1967); Thelen & Faizool (1980); IUCN (1982).

**Source:** Carol James, Nadra Nathai-Gyan and Geddes Hislop.

**Criteria for inclusion:** 2b & 3a.