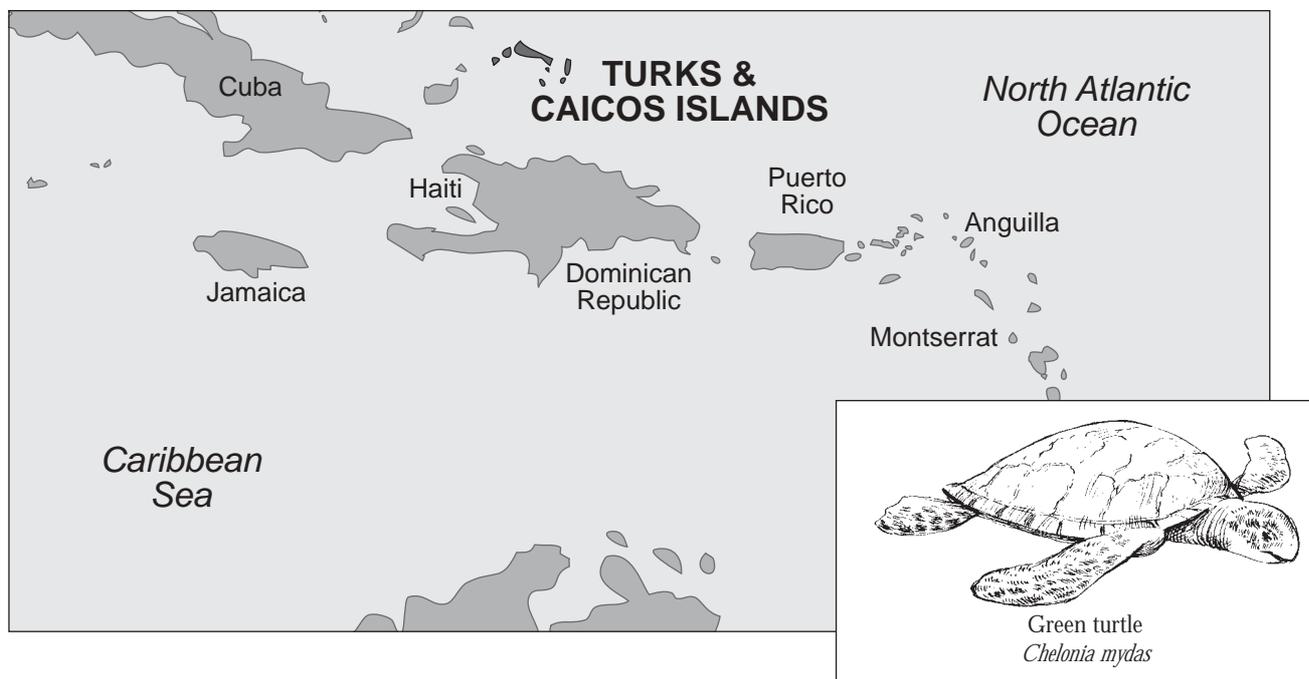


17: Turks and Caicos



Introduction

The Turks and Caicos are a group of islands lying at the south-eastern extremity of the Bahamas Archipelago. The islands are limestone with outlying coral reefs and with cliffs present on some windward coasts. The Turks and Caicos Islands (TCI) are low lying with no land over 75 m and over half the land area consists of wetlands. There are over 40 islands in the group of which only six main islands and two small ones are inhabited. The total land area of the Turks and Caicos Islands is 500 km². The population of the islands is estimated at around 12,000 (1990 estimate) There has been a large influx of Haitian immigrants since 1990.

Tourism is the main economic activity in the Turks and Caicos, and the off-shore finance industry is also important. Fishing is the third most economically important industry, but in socio-economic terms it is far more important than off-shore finance, being the major employment sector on South Caicos. The two main species supporting the fishery industry are the spiny lobster *Panulirus*

argus, and the queen conch *Strombus gigas*. Most is exported to the USA; for example each year an average of 185,000 kg of conch meat was exported between 1989–1994, representing 20–35% of US total conch imports, more than any other Caribbean nation except Jamaica.

International obligations relevant to nature conservation

- The Turks and Caicos is included in the UK's ratification of the following international agreements:
- Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)
- Convention for the Protection and Development

of the Marine Environment of the Wider Caribbean Region (Cartagena Convention) Protocol on Specially Protected Areas and Wildlife.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- International Convention on the Regulation of Whaling

Implementation

Ramsar: preliminary identification of sites for Ramsar designation took place in 1986 and was followed by detailed survey in 1987 (Clark & Norton 1987). The report of this survey describes the different types of wetlands found in the Turks and Caicos and provides site descriptions. One Ramsar site is identified, comprising representative areas of different wetland types, and recommendations are given for the conservation of other wetlands on the islands. On the basis of the survey report, the designation of a Ramsar site encompassing parts of North, Middle and East Caicos, was announced in June 1990. Vine Point and Ocean Hole Nature Reserves lie within the Ramsar site. The entire Ramsar site is protected as a nature reserve under the 1992 legislation.

Most of the extensive Ramsar site has been considered to be inaccessible and, until recently, development pressures seemed unlikely. However, a major development is proposed nearby for East Caicos Port, with a cruise ship terminal and resorts. An environmental appraisal of a proposed aragonite mining operation on West Caicos was carried out in 1985 (Mitchell *et al.* 1985). This pointed out that such an operation would lead to direct destruction of coral reefs, and indirect effects of turbid water and sedimentation.

The UK Dependent Territories Ramsar Study

carried out in 1992, listed 29 wetland sites where further research is needed to assess their conservation importance (Hepburn *et al.* 1992).

Development is proceeding apace in the TCI despite national laws and international conventions. Perhaps most worryingly a massive condominium development is planned on East Caicos, immediately adjacent to the Ramsar site. East Caicos is also to be linked to South Caicos (the nearest airport) by a causeway, but impact on the endemic iguana is considered to be minimal.

CITES: the export of queen conch (live, shells or meat), whether wild-taken or ranched, is limited by quotas notified to the CITES secretariat and other CITES Parties.

Protected areas

- **The National Parks Ordinance 1992:** provides the legal framework for protected areas in the Turks and Caicos. Four categories are specified:

National Park: activities permitted within protected areas are governed by the Ordinance. An area designated as a national park shall be open to members of the public for recreational use such as camping, fishing and sailing. Developments, such as the erection of buildings, construction of roads and marinas, must be licensed by the Governor. The criteria which the Ordinance sets down for an acceptable development include the requirement that the proposal will "facilitate the enjoyment by the public of the natural setting of the area".

Nature Reserve: certain activities are also allowed within nature reserves. The need to sustain a "proper balance in the natural ecology of the area determines permissible activities in a nature reserve". The Ordinance lists agriculture, arboriculture, pisciculture, sport and recreation as permissible activities. The only buildings and developments permitted are those required for one of the permitted uses and, before a development can be undertaken, a licence has to be granted by the Governor.

Sanctuary: the primary purpose of a sanctuary is to protect the natural ecology, or any particular form of living organism (including any marine life) in the area, and to avoid disturbance by human beings. Entry into a sanctuary is not permitted, except in accordance with any regulations made in respect of the sanctuary. No development is permitted.

Area of Historic Interest: areas of historical interest may be included within one of the previous categories, in which case it will be subject to the same restrictions as that area. Where the area does not coincide with one of the above, the public may have access, subject to conditions set down by appropriate regulations. No development is permitted without a licence granted by the Governor.

The decision to gazette a protected area is the responsibility of the Executive Council, which is advised by the National Conservation Committee. In July 1987 the National Parks Committee presented a list of 33 recommended sites to the Executive. The National Parks Order of 4 March 1988 designated five national parks, one nature reserve, two sanctuaries, and two areas of historical interest. All 33 recommended sites are now protected under the 1992 Ordinance.

Preparation of an overall plan is proposed which takes account of the need to achieve broad support for the system from the local community; to develop indigenous management capability; and to draw up a sound financial strategy to pay for the management system. A major coastal resources management project is proposed with funding from the UK Government. This will establish the infrastructure for the national parks system with staff and a national parks centre.

Public awareness of the protected area system also needs to be increased. Noticeboards are urgently needed, because the protected areas are not identified on the ground and consequently few people are aware of their whereabouts and purpose (Wood, 1996). Priority sites for information boards

include the Ramsar site, South Creek National Park and Boiling Hole National Park.

Habitats of major significance

The Turks and Caicos Islands consist of two archipelagos. The islands are distributed across these two limestone platforms whose margins are defined by a "drop-off" which plunges steeply into water of abyssal depth. The Caicos Bank is the larger platform and covers approximately 8,000 km². Water depth ranges from a few centimetres along the inland coasts of the Caicos Islands to 20–30 m at the top of the drop-off, and clarity is typically good. A wide range of habitats occurs across the Caicos Bank. The margins are dominated by coral, algae and gorgonian communities growing on hard substrate, while the middle of the bank is typically covered by sparse sea-grass, calcareous green algae and bare oolitic sand. Mangroves grow in fringes along the inland margins of the Caicos Islands, and there are substantial areas of hypersaline mud dominated by halophytic succulents of the genus *Salicornia*. Marine and coastal areas of South Caicos have recently been mapped in a Department for International Development project (Green *et al.* in press; Mumby *et al.* 1997, Mumby *et al.* in press a-d)

Reefs

Generally the reefs in the Turks and Caicos Isles show little signs of being adversely affected by human activity at present. The reefs of the TCI are typical of the Bahamas with a deep fore-reef dominated by gorgonians and boulder coral *Montastrea annualaris* (although hard coral cover rarely exceeds 25%). Green algae are abundant on the fore reef, especially *Laurencia spp.*, *Microdictyon marinum* and *Lobophora variegata*. The main existing impact on the fore-reef comes from intense diving especially on the north-west point of Providenciales, West Caicos and western drop-off on Grand Turk. Massive construction on East Caicos and South Caicos with direct destruction of reef habitat, and increased sedimentation loads, threaten reefs there in the immediate future. The habitat classification below (Table 1) was conducted

by Mumby *et al.* (in press a-d) in July and August 1995.

Large patch reefs (50–250 m in diameter) occur in the shallow, sheltered waters of the Turks and Caicos Banks, with boulder coral *Montastrea annularis*, jewelled coral *Porites porites* and acropora coral *Acropora cervicornis* being the dominant species. These patch reefs are the main habitat for spiny lobster and are therefore the site of intense fishing during the lobster season. Adverse effects of this fishery are relatively limited, although the use of bleach to startle the lobsters from their holes is commonplace.

Vast areas of the Caicos Bank are covered by bare sand, fleshy and calcareous algae, and sea-grass. These habitats are crucially important as nursery grounds for conch and lobster but, because of the size of the areas in question (thousands of square kilometers) and the remoteness of much from the centres of population, they are not under much threat.

Mangrove

In the eastern Caribbean the steep shorelines of the high islands, the limited freshwater run-off of the low dry islands, and the exposure of a large portion of the shoreline to intense wave action imposes severe limits on the development of mangroves. These typically occur in small stands at protected river mouths or in narrow fringes along the most sheltered coasts. As a result most of the mangrove forests in this region are small. Nevertheless they occur in areas where they are particularly important for water quality control, shoreline stabilisation and as aquatic nurseries.

The mangroves of the TCI are typical of the region. Three species of mangrove, *Rhizophora mangle*, *Laguncularia racemosa* and *Avicennia germinans* grow with *Conocarpus erectus* (Combretaceae) in mixed stands along the inland margin of the islands fringing the Caicos Bank. The habitat classification below (Table 2) was derived from field work conducted by Green *et al.* (in press) in 1995 and 1996.

Table 1 Coral reef habitats (Mumby *et al.* in press)

Living and dead stands of *Acropora palmata*
Microdictyon marinum (77%), *Sargassum spp.* (4%), medium soft coral density (5 m²) and rubble (10%)
 Bare substratum (40%), low soft coral density (3 m²), *Microdictyon marinum* (30%), *Lobophora variegata* (12%)
 Bare substratum (80%), medium soft coral density (5 m²)
 Bare substratum (60%), high soft coral density (8 m²), *Lobophora variegata* (14%), high live coral cover (18%)
 of which ~ 9% is *Montastrea spp.*
Lobophora variegata (76%) and branching red/brown algae (9%)
 Sand and occasional branching red algae (<6%)
Amphiroa spp. (40%), sand (30%), encrusting sponge (17%), sparse *Thalassia testudinum* and calcareous green algae
Thalassia testudinum of low standing crop (5 gm²) and *Batophora spp.* (33%)
Thalassia testudinum of low standing crop (5 gm²) and sand
 Medium-dense colonies of calcareous algae - principally *Halimeda spp.* (25 m²) *Thalassia testudinum* of medium
 standing crop (~80 gm²)
 Dense colonies of calcareous algae – principally *Penicillus spp.* (55 m²) and *Halimeda spp.* (100 m²)
Thalassia testudinum of medium standing crop (~80 gm²)
Thalassia testudinum and *Syringodium filiforme* of 5-80 gm² standing crop
Thalassia testudinum and *Syringodium filiforme* of 80-280 gm² standing crop

Table 2 Mangrove habitats on Turks & Caicos

Habitat category description	N	Species Composition %				Tree Height (m) mean (range)	Tree Density (m ⁻²) mean ² (range)
		Rhz	Avn	Lag	Con		
<i>Conocarpus erectus</i>	6	0	0	0	100	2.4 (1.8–4.5)	0.6 (0.5–1.0)
<i>Avicennia germinans</i>	11	0	100	0	0	2.6 (0.8–6.0)	0.6 (0.2–1.0)
Short, high density, <i>Rhizophora mangle</i>	10	100	0	0	0	1.1 (0.5–2.0)	8.0 (6.0–10.0)
Tall, low density, <i>Rhizophora mangle</i>	25	100	0	0	0	3.7 (2.0–7.0)	0.3 (0.2–0.5)
Short mixed mangrove, high density	10	62	38	0	0	1.7 (0.8–2.5)	8.1 (5.0–15.0)
Tall mixed mangrove, low density	14	56	43	0	1	3.5 (2.0–5.0)	0.6 (0.2–1.2)
<i>Laguncularia</i> dominated mangrove	2	35	5	45	0	3.8 (3.5–4.0)	2.2 (0.5–4.0)

Terrestrial habitats

The Turks and Caicos are low lying, less than 75 m in altitude, and support a range of vegetation types. The Caicos Islands are relatively fertile, and support an understorey of scrub bush and cacti below a canopy of low trees. The Turk Islands have an unproductive, fine, sandy dune topsoil which supports a sparse vegetation of sedge and cacti. Scrub-type forest has been estimated to cover some 90% of the total land area. Predominant tree species of the forest/scrub biome of the Turks and Caicos include *Pithecellobium quadalupense* (Leguminosae), *Conocarpus erectus* (Combretaceae), *Bursera simaruba* (Burseraceae), a species of lignum-vitae *Guaiacum sanctum* (Zygophyllaceae) (EN), Caribbean mahogany *Swietenia mahagoni* (Meliaceae) (EN), *Manilkara zapota* (Sapotaceae) and Caribbean pine *Pinus caribaea* (Pinaceae). Pine forests are particularly noteworthy on North Caicos which has the highest rainfall of all the islands.

The dry shrubwoods of coastal areas and rocky plains, with species such as the prickly pears, *Opuntia millspaughii*, *O. bahamana* and *O. lucayana*, have been identified as regional priorities for the conservation of cacti and succulents (Areces-Mallea 1997). Matured forest stands are rare in many places because of the high demands for fuelwood and for charcoal production (CDB 1983).

Species of major significance

Plants

The flora of the Turks and Caicos is covered by Correll & Correll (1996). Nine species are endemic. In addition over 40 plant species endemic to the Bahama Archipelago occur in the Turks and Caicos. Endemic plant species include:

An orchid *Encyclia caicensis*: epiphytic, and found in coppices and on rocky scrublands.

Argythamnia argentea. a shrub in the Euphorbiaceae, which occurs in dry sandy pockets on rocky hillsides and in scrublands.

Turk Island prickly pear *Opuntia x lucayana*. a natural hybrid which grows in scrublands, open flats and rocky slopes.

A sea lavender *Limonium bahamense*. a succulent which is considered to be potentially endangered by Areces-Mallea (1997). This species occurs on saline flats and open saline brushlands.

An asclepiad *Cynanchum stiptatum*. apparently restricted to North Caicos. It grows on cut-over areas and disturbed soils.

Borreria brittonii (Rubiaceae): a shrub which grows on loose rocky soils, dunes and open grassy areas.

B. capillaris (Rubiaceae): a succulent species which grows on thin soils and crevices of rock flats in open coppices.

The following tree and shrub species, all scarce and local in Turks and Caicos and restricted regionally in their distribution, were evaluated against IUCN red list criteria but are not considered to be globally threatened.

Caesalpinia reticulata (Leguminosae) (Turks and Caicos, Bahamas): a shrub or small tree of coastal and hilly coppices. This species is reportedly uncommon.

Euphorbia gymnonata (Euphorbiaceae) (Turks and Caicos, Bahamas): a succulent tree of scrublands and open coppices.

Hibiscus brittonianus (Malvaceae) (Turks and Caicos, Bahamas): a shrub of rocky scrublands and coppices.

Mimosa bahamensis (Leguminosae) (Turks and Caicos, Bahamas): a shrub or small tree of scrublands and thickets.

Pavonia bahamensis (Malvaceae) (Turks and Caicos, Bahamas): found in rocky coastal thickets., this species is not common but is probably not threatened.

Pinus caribaea var. *bahamensis* (Turks and Caicos, Bahamas): this sub-species of Caribbean pine is protected in the Bahamas, where only small pockets of old growth pine remain.

Tabebuia bahamensis (Bignoniaceae) (Turks and Caicos, Bahamas, Cuba): scrublands, pinelands and coppices, it occurs in all the Bahamas and Turks and Caicos islands, and is generally not threatened.

Thouinia discolor (Turks and Caicos, Bahamas): found in coppices, pineland, scrublands, this species occurs in the Bahamas and Turks and Caicos Islands and is probably not threatened.

Ziziphus taylori (Rhamnaceae) (Turks and Caicos, Bahamas): found in rocky coppices and scrublands; a favoured food of iguanas in the Caicos Islands. This species is considered uncommon.

Invertebrates

Information on terrestrial invertebrates appears to be limited. There has been a number of published studies on coral reef invertebrates.

Reptiles and amphibians

The following species of herpetofauna are endemic to TCI: the geckos *Aristelliger hechti*, *Sphaerodactylus caicosensis*, *S. underwoodi*, Turk island boa *Epicrates chrysogaster chrysogaster*, Ambergris Cay dwarf boa *Tropidophis greenwayi* (Iverson 1987); the iguana *Leiocephalus psammodromus* and the Turks and Caicos ground iguana *Cyclura carinata carinata* (CR). A survey of the Turks and Caicos ground iguana undertaken in 1995 found over 50,000 individuals. However, on nearly every island in the TCI where domestic animals occur (cats, dogs, livestock), no iguanas are present. Big Ambergris Cay is the

largest island refuge for the endemic iguanas, supporting more than 50% of the total estimated population.

Marine turtles are common, nesting on many of the cays (UNEP/IUCN 1988). They include:

Green turtle *Chelonia mydas* (EN): nesting green turtles are considered to be moderately abundant though there may be a continuing decline in the nesting population (Groombridge & Luxmoore 1989). Foraging sites include Big Ambergris Cay, Little Ambergris Cay, Fish Cay, Bottle Creek, Highas Cay, Grand Turk, Gibbs Cay, Cotton Cay, East Cay, Salt Cay, Grand Caicos, North Caicos and Ocean Hole (Groombridge & Luxmoore 1989).

Hawksbill turtle *Eretmochelys imbricata* (CR): the nesting population is considered to be moderately abundant but decreasing (Groombridge & Luxmoore 1989). Hawksbill turtles are the most abundant turtle species nesting on the Caicos Islands (Groombridge & Luxmoore 1989). Feeding areas include Big Ambergris Cay, Little Ambergris Cay, Fish Cay, Highas Cay, Grand Turk, Gibbs Cay, Cotton Cay, East Cay, Salt Cay, Grand Caicos and North Caicos (Groombridge & Luxmoore 1989).

Loggerhead turtle *Caretta caretta* (EN): nests on the Turks and Caicos Islands in regionally important numbers (Ehrhart 1989).

Birds

A checklist of bird species with comments on their status is provided by Sanderson (1982), and a revised checklist has recently been produced by Bradley (1995). Species accounts of wetland birds are given by Clark and Norton (1987). Two species are listed as vulnerable by Collar, Crosby and Stattersfield (1994), namely the non-breeding Kirtland's warbler *Dendroica kirtlandi* (VU) and the breeding West Indian whistling duck *Dendrocygna arborea* (VU).

Mammals

During November and December migrating humpback whales *Megaptera novaeangliae* (VU) move through the deep Turks Island Passage on their way south to the Muchoir Bank (in the TCI) and Silver Bank (near the Dominican Republic) breeding grounds (Gricks 1994). Sperm whales *Physeter catodon* (VU) and sei whales *Balaenoptera borealis* (EN) may occasionally occur in Turks and Caicos waters, although this requires confirmation. There have also been several sightings of manatees *Trichechus spp.* in TCI waters though they are not resident there.

Species protection

Legislation protecting bird species has recently been revised but there is, as yet, no legal protection for threatened reptile or plant species, except within protected areas where all species are protected. Further species legislation will be required for implementation of the *Protocol for Specially protected Areas for Wildlife* (SPAW). Lack of enforcement is a major problem for species legislation.

- **Wild Birds Protection Ordinance 1990:** this protects all bird species from hunting, collection or egg taking, with the exception of the migrant blue-winged teal *Anas discors*. Under the 1990 legislation, protection was extended to the rare Cuban crow *Corvus nassicus*, and the West Indian whistling duck *Dendrocygna arborea* (VU). The brown pelican *Pelecanus occidentalis*, the greater flamingo *Phoenicopterus ruber* and the roseate tern *Sterna dougallii* were accorded specially protected status with penalties up to \$5,000 for conviction.
- **Fisheries Protection Ordinance 1941:** under this Ordinance Regulations can be made to protect marine species.

Fisheries Protection Regulations 1976: legal protection for sea turtles is provided by this legislation. A minimum size for take is specified, eggs are totally protected as are turtles on beaches.

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Bibliography

Anon. 1985. *Operation Raleigh Magnificent Frigatebird Survey*. London, Operation Raleigh. Unpublished report.

Anon. 1990. *Turks and Caicos Islands strategic review. Final Report*. Mokoro.

Areces-Mallea, A.E. 1997. The Caribbean islands. In: *The IUCN / SSC action plan for cacti and succulents*, ed. by S.F. Oldfield, 14 + 211. Gland & Cambridge, IUCN.

Auffenberg, W. 1983. Feeding strategy of the Caicos ground iguana. In: *Iguanas of the world: their behaviour, ecology and conservation*, ed. by G.M. Burghardt & A. Rand, 84-116. Park Ridge, New Jersey, Noyes Publishers.

Auth, D. 1980. *The thermal biology of the Turks and Caicos rock iguana*. Florida, University of Florida.

Bradley, P.B. [Undated]. *Bird conservation in United Kingdom Dependent Territories in the West Indies*. Unpublished manuscript.

Bradley, P.B. 1995. *Birds of the Turks and Caicos Islands—the official checklist*. Turks and Caicos Islands, National Trust of the Turks and Caicos Islands.

Brown J. 1983. The activities of PRIDE—Turks and Caicos Islands. *Caribbean Conservation News*, 7: 20-22.

Brownell, W.N., & Stevely, J.M. 1981. The biology, fisheries and management of the queen conch *Strombus gigas*. *Marine Fisheries Review*, 43(7): 1-12.

Butler, P. 1997. *An iguana's tale. Promoting conservation education and sustainable resource development in the Turks and Caicos Islands*. Philadelphia, Rare Center for Tropical Conservation.

Carr, A., Meylan, A., Mortimer, J., Bjorndal, K., & Carr, T. 1982. *Surveys of sea turtle populations and habitats in the western Atlantic. USA, National Oceanic and Atmospheric Administration*. (NOAA Technical Memorandum NMFS-SEFC-91.)

CDB 1983. *Regional forestry sector, country study report, Turks and Caicos Islands*. Barbados, Caribbean Development Bank.

Clark, N.V. & Norton, R.L. 1987. *The Turks and Caicos Islands, a Ramsar site proposal*. Final report to the Turks and Caicos Islands Government, WWF-UK, DoE and ODA. 39 pp.

Clark, C.D., Ripley, H.T., Green, E.P., Edwards, A.J., & Mumby, P.J. 1997. Mapping and measurement of tropical coastal environments with hyperspectral and high spatial resolution data. *International Journal of Remote Sensing*, 20: 237-242.

Collar, N.J., Crosby, M.J., & Stattersfield, A.J. 1994. *Birds to watch 2: the world list of threatened birds*. Cambridge, BirdLife International.

Correll, D.S. & Correll, H.B. 1996. *Flora of the Bahama Archipelago*. New York, Lubrecht & Cramer.

Doran, E.B. 1958. The Caicos conch trade. *Geographical Review* 48: 388-401.

Edwards Hill, J. 1985. *Operation Raleigh—bats from the Bahamas, January–February 1985*. London, Operation Raleigh. (Unpublished report.)

Ehrhart, M. 1989. Status report of the loggerhead turtle. In: *Proceedings of the Second Western Atlantic Turtle Symposium*, ed. by L. Ogren, 122-144. USA, National Oceanic and Atmospheric Administration. (NOAA Technical Memorandum NMFS-SEFC-226.)

Garland, J.L. 1994. *Final report on Project 90727, Turks and Caicos National Parks*. (Unpublished report.)

Gerber, G.P. 1995. *Population status of the Turks and Caicos Rock Iguana*. Report to the National Trust of the Turks and Caicos Islands. Tennessee, University of Tennessee

Green, E.P., Mumby, P.J., Edwards, A.J. & Clark, C.D. 1996. A review of remote sensing for tropical coastal management. *Coastal Management*, 24: 1-40.

Green, E.P., Mumby, P.J., Ellis, A. C., Edwards, A.J. &

Clark, C.D. 1997a. Estimating leaf area index of mangroves from satellite data. *Aquatic Botany*, 58: 11–19.

Green, E.P., Mumby, P.J., Ellis, A.C., Edwards, A.J. & Clark, C.D. In press. The assessment of mangrove areas using high resolution multispectral airborne imagery (CASI). *Journal of Coastal Research*.

Gricks, N. 1994. *Whale-watching in the West Indies: a guide to cetaceans and sites of the region*. Washington DC, Island Resources Foundation.

Groombridge, B. & Luxmoore, R. 1989. *The green turtle and hawksbill (Reptilia: Cheloniidae) world status, exploitation and trade*. Lausanne, CITES.

Hepburn, I., Oldfield, S., & Thompson, K. 1992. *UK Dependent Territories Ramsar study: Stage 1*. Unpublished report.

Institute of Development Studies. 1981. *Turks and Caicos development plan*. Sussex and London, Sussex University and the Overseas Development Agency.

IUCN. 1992. *Protected areas of the world: review of National systems. Volume 4, Nearctic and Neotropical*. Cambridge and Gland, IUCN.

Iverson, J.B. 1978. The impact of feral cats and dogs on the populations of the West Indian Rock Iguana *Cyclura carinata*. *Biological Conservation*, 14: 63–73.

Iverson, J.B. 1987. *Notes of the natural history of the Caicos Islands dwarf boa, Tropicophis greenwayi*. *Caribbean Journal Science*, 22: 191–198.

Kucharski, K.M. 1980. *The spiny lobster fishery in the Turks and Caicos Islands: a status report and recent landings*. Fort Lauderdale, South Florida Institute of Marine Sciences.

Kucharski K.M. 1981. *The Turks and Caicos Islands spiny lobster fishery: an update*. Fort Lauderdale, South Florida Institute of Marine Sciences. (Unpublished manuscript.)

Lightbourne, E.S. 1991. Development of a marine park in a developing country to implement pre-impact maintenance for coral reef management. In: *Proceedings of the Regional Symposium Public and Private Cooperation in National Park Development*, ed. by G. Cambers. Tortola, British Virgin Islands National Parks Trust.

Mitchell, A.J.B., Dawson Shepherd, A.R., & Wakeling, H.L. 1985. *Environmental appraisal of a proposed aragonite mining operation and other proposed activities at West Caicos Island*. Unpublished report to the Government of the Turks and Caicos Islands, British West Indies.

Mitchell, B.A., & Barborak, J.R. 1991. Developing coastal park systems in the tropics: planning in the Turks and Caicos Islands. *Coastal Management*, 19: 113–134.

Mulliken, T.A. 1996. The status of the queen conch fishery in the Caribbean. *Traffic Bulletin*, 16: 17–28.

Mumby P.J., Green E.P., Clark C.D., & Edwards A.J. 1997. Coral reef habitat mapping: how much detail can remote sensing provide? *Marine Biology*, 130: 193–202.

Mumby P.J., Edwards A.J., Green E.P., Anderson C.W., Ellis A.C., & Clark C.D. In press a. A visual assessment technique for estimating seagrass standing crop on a calibrated ordinal scale. *Aquatic Conservation*.

Mumby P.J., Green E.P., Clark C.D., & Edwards A.J. In Press b. Digital analysis of multispectral airborne imagery of coral reefs. *Coral Reefs*.

Mumby P.J., Green E.P., Clark C.D., & Edwards A.J. In press c. Benefits of water column correction and contextual editing for mapping coral reefs. *International Journal of Remote Sensing*.

Mumby P.J., Green E.P., Clark C.D., & Edwards A.J. In press d. Measurement of seagrass standing crop using satellite and digital airborne remote sensing. *Marine Ecology Progress Series*.

Nardi, G.C. 1982. *An analysis of the queen conch fishery of the Turks and Caicos Islands, with a review of a new, multi-purpose dock receipt*. MSc Thesis. Stony Brook, New York, State University of New York.

Nicholls, J.T. 1921. A list of Turks Islands fishes, with a description of a new flatfish. *Bulletin American Museum Natural History*, 44: 21–24.

Norton, R., & Clark, N. 1992. Notes of the rock iguana of the Caicos Islands. *Florida Field Naturalist*, 20: 45–46.

Operation Raleigh. 1986a. *Report on the Turks and Caicos expedition. Report on the distribution of habitats and species of the north coast of Providenciales and Leeward Cays (Part 1)*. York, University of York.

Operation Raleigh. 1986b. *Report on the Turks and Caicos expedition. Management of the north coast of providenciales and Leeward Cays resources and recommendations for protected areas (Part 2)*. York, University of York.

Operation Raleigh. 1987a. *Report on the Turks and Caicos expedition. Management of the marine and coastal resources of the island of Grand Turk and recommendations for protected areas (Part 4)*. York, University of York.

Operation Raleigh. 1987b. *Report on the Turks and Caicos expedition. Report on the Distribution of coastal and marine habitats and species on the island of Grand Turk*. York, University of York.

Orr, K., & Halaby, J. 1984. *The natural world of the Turks and Caicos Islands*. Rockville, McCollum Press.

Ray, C., & Sprunt, T. 1971. *Parks and conservation in The Turks and Caicos Islands. A report on the ecology of the Turks and Caicos with particular emphasis upon the impact of development upon the natural environment*. TCI, Turks and Caicos Islands Government.

Sanderson, J. 1982. Birds of the Turks and Caicos Islands. *Turks and Caicos Current, November/December 1982*.

Scott, D.A., & Carbonell, M. 1986. *A directory of Neotropical wetlands*. IUCN, Cambridge and IWRB, Slimbridge.

Smith, G. 1992. Return of *Cyclura carinata* to Pine Cay, Turks and Caicos Islands. *Herpetological Review, 23*: 21–23.

Spotte, S., Bubucis, P.M., & Adams, G. 1992. Diurnal occupancy of crevices and overhangs by fishes on the Caicos Bank, Turks & Caicos Islands, British West Indies. *Bulletin Marine Science, 5*: 66–82.

Sprunt, A. 1984. The status and conservation of seabirds of the Bahama Islands. In: *Status and conservation of the world's seabirds*, ed. by J.P. Croxall, P.G.H. Evans & R.W. Schreiber. Cambridge, International Council for Bird Preservation. (ICBP Technical Publication No. 2.)

Sullivan, K.M., Chiappone, M., & Lott, C. 1994. Abundance patterns of stony corals on platform margin reefs of the Caicos Bank. *Bahamas Journal of Science, 1*: 2–12.

Turks and Caicos Islands Government. 1992a. *Maps of the national parks, nature reserves, sanctuaries and areas of historical interest as listed in the National Parks Order 1992*.

Tortola, Department of Environment, Heritage and Parks, Ministry of Natural Resources.

Turks and Caicos Islands Government. 1992b. *The National Parks (Protection and use of National Parks, Nature Reserves, Sanctuaries and Areas of Historical Interest) Regulations 1992*. Tortola, Turks and Caicos Islands Government.

UNEP/IUCN. 1988. *Coral reefs of the world. Volume 1: Atlantic and Eastern Pacific. UNEP regional seas directories and bibliographies*. Gland and Cambridge, IUCN and Nairobi, UK/UNEP.

Wanless, H.R., & Dravis, J.J. 1989. *Carbonate environments and sequences of the Caicos platform: field trip guidebook T374*. Washington DC, American Geophysical Union.

Wood, K.M. 1996. *Ecology of the Turks and Caicos Islands. A guide for teachers at the primary school level*. Florida, Florida International University.