



Biodiversity: the UK Overseas Territories

Compiled by
S. Oldfield

Edited by
D. Procter and L.V. Fleming

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Cover photographs

Front cover:

Top right: Southern rockhopper penguin *Eudyptes chrysocome chrysocome* (Richard White/JNCC). The world's largest concentrations of southern rockhopper penguin are found on the Falkland Islands.

Centre left: Down Rope, Pitcairn Island, South Pacific (Deborah Procter/JNCC). The introduced rat population of Pitcairn Island has successfully been eradicated in a programme funded by the UK Government.

Centre right: Male Anegada rock iguana *Cyclura pinguis* (Glen Gerber/FFI). The Anegada rock iguana has been the subject of a successful breeding and re-introduction programme funded by FCO and FFI in collaboration with the National Parks Trust of the British Virgin Islands.

Back cover:

Black-browed albatross *Diomedea melanophris* (Richard White/JNCC). Of the global breeding population of black-browed albatross, 80 % is found on the Falkland Islands and 10% on South Georgia.

Background image on front and back cover:

Shoal of fish (Charles Sheppard/Warwick University).

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1: Introduction

The Overseas Territories (OTs) of the United Kingdom have long been acknowledged as being rich in biodiversity (Anon. 1994; Oldfield 1987; Oldfield & Sheppard 1997; UKDTCF 1996). With the exception of the British Antarctic Territory and Gibraltar, they are all islands, small in size and isolated to varying degrees. These attributes, combined with their geographic location, has often resulted in a high degree of endemism (Table 1). Equally, the territories are often host to significant populations of breeding birds or marine turtles, and have rich terrestrial and marine ecosystems. Yet, many of these species and habitats are threatened. This report provides a profile of the biodiversity of the United Kingdom's Overseas Territories as a contribution to the development of plans for their conservation and sustainable use.

Background

In June 1992 representatives from the governments of over 150 countries met in Rio de Janeiro for the United Nations Conference on Environment and Development (UNCED), which subsequently became known as the 'Earth Summit'. Amongst many agreements that the world's governments adopted at that meeting was one called the Convention on Biological Diversity—or the Biodiversity Convention for short. This pledges them to conserve biodiversity, to use its components in a way that will ensure that they continue to be available in the future, and to share out the benefits of biodiversity fairly and equitably between all nations and all people. Including the United Kingdom as well as the European Union, 159 governments signed the convention in Rio and it came into force in December 1993. So far six of the UK Overseas Territories have also signed the Convention.

One outcome of the Biodiversity Convention was a requirement by signatories to produce their own national plans for the conservation of biodiversity. In the UK, this resulted in the

publication of Biodiversity the UK Action Plan (Anon. 1994). This document provided a summary of the state of UK biodiversity (including Crown Dependencies and Overseas Territories) and the actions being taken to conserve it. Most importantly, it contained in a final section a set of '59 steps' to be implemented by Government and its agencies. These steps encompassed a whole range of activities, from the need to continue with the programme of European site designations required by EU Directives, to the limitation of UK fishing activities, developing education and awareness programmes, and to action for Overseas Territories. Specifically, the final step (number 59) aimed to "Encourage individual Overseas Territories to develop strategies for biodiversity conservation including updating existing legislation and developing new legislation as appropriate". In the UK, under the guidance of a specially created steering group (Anon. 1995a), this process has resulted in the identification of priority species and habitats for which action plans have been produced, or which are in preparation. Volume 2 of the UK Steering Group report (Anon. 1995b) included a first tranche of 116 species action plans and 14 habitat action plans. Further plans (c.290 species and 24 habitats) are in preparation. A significant number of local biodiversity action plans, typically based on local authority boundaries, are also completed or underway. These plans, and the process that underpin them, provide a useful model that might be applied elsewhere (Scottish Biodiversity Group 1997).

The recently published white paper on the United Kingdom's Overseas Territories (Anon. 1999; FCO website: <http://www.fco.gov.uk>) identified an objective, common to the UK and the territories, of using the environment in a sustainable manner, to provide benefits to the residents of the territories whilst also conserving the natural heritage (Box 1). Within this objective, specific aims were identified (set out below) with

the intention that these aims should be achieved through the drafting and implementation of environmental charters agreed between the UK and the Overseas Territories. The aims were:

- to promote the sustainable use and management of the natural and physical environment of the Overseas Territories;
- to protect fragile ecosystems from further degradation, and to conserve biodiversity;
- to promote sustainable alternatives to scarce resources or species which are used for economic purposes;
- to enhance participation in, and implementation of, international agreements in Overseas Territories.

To achieve these aims adequate information on the state of biodiversity in the relevant territory, and on any trends that may be occurring, is necessary. This allows priorities to be established, gaps in information to be identified and further action determined. To assist this process, the Joint Nature

Conservation Committee (Box 2), in our role as adviser to Government, commissioned the following profiles of biodiversity in all of the UK's Overseas Territories from the World Conservation Monitoring Centre. These profiles aim to:

- summarise the salient features of biodiversity in each of the 15 Overseas Territories;
- provide a reference document of use to a broad constituency;
- stimulate further action to conserve biodiversity.

Much has already been achieved for the conservation of biodiversity in the territories and this has been assisted by governments and by NGOs, both in the UK and in the territories themselves. The UK Overseas Territories Conservation Forum (UKOTCF), for example, exists to promote a co-ordinated approach to conservation between NGO's and Governments of these geographically dispersed territories. We recognise, however, that this report is not, and should not, be seen as the final word on the biodiversity of the Overseas Territories. For example, we do not set the biodiversity of the

Table 1 Numbers of endemic taxa in the Overseas Territories (updated from Anon. 1994)

Overseas Territory	Location	Size (sq. km)	Plants	Terrestrial invertebrates	Reptiles & amphibians	Birds
Anguilla	Caribbean	91	1	0	8	0
Ascension	Atlantic	88	12	28	-	1
Bermuda*	W Atlantic	55	15	31	1	2
BAT	Antarctica	1.7 m	0	-	0	0
BIOT*	Indian Ocean	60	1	3	0	0
BVI	Caribbean	153	3	2	7	0
Cayman Isles	S Atlantic	259	24	>64	21	17
Falkland Islands	S Atlantic	12,173	15	70% (insects)	0	17
Gibraltar	Mediterranean	6	3	3	0	0
Montserrat	Caribbean	104	2	>6	2	1
Pitcairn Islands	S Pacific	43	24	170	0	4
St Helena	S Atlantic	122	50	c. 300	-	1
South Georgia	Sub-Antarctic	3,755	1	c. 55	-	2
S Sandwich Islands	Sub-Antarctic	310	0	-	-	0
Tristan da Cunha	S Atlantic	178	20	22	-	9
Turks & Caicos	Caribbean	500	9		7	0

* - also 3 species of endemic fish.

territories in the wider ecological context of the region in which they occur. Nevertheless, these profiles provide a summary of biodiversity in the Overseas Territories. Although other authors have suggested priorities for conservation (UKDTCF 1996), and have reviewed the application of measures to conserve biodiversity (Cross & Pienkowski 1998), it is not the role of these profiles to identify priorities or to suggest actions. That is for the Overseas Territories to determine themselves, in collaboration with the UK Government and other advisers. We hope that, individually, these profiles will be built upon and, indeed, superseded by the territories as they each develop their environmental charters.

Structure of the profiles

With the exception of the British Antarctic Territory and South Georgia and South Sandwich Islands, each Overseas Territory is profiled individually. However, because of their isolation and distinct features, separate accounts are given for St Helena, Tristan da Cunha and Ascension, even though, constitutionally, they form a single group of associated territories. The availability of information varies markedly between territories depending on the amount of research and study that has taken place. In the case of the British Antarctic Territory (BAT), South Georgia and South Sandwich Islands, there is a vast amount of published information that has arisen from the dedicated work of the British Antarctic Survey. In these cases, any attempt here to provide a profile of their biodiversity could only give the briefest of outlines and more comprehensive accounts are available elsewhere. However, for the sake of completeness, a summary account is provided of the international obligations and legislative provisions only relating to these territories.

The profiles provide a brief introduction to each territory, its population, location and physical and socio-economic features. Following the introduction, those Conventions and other international agreements relevant to nature conservation, to which the territory is a Party, in its own right or through the UK, are listed. The

following section looks at how these international obligations are implemented through legislation or other means. Additional sections look at the type, number, and extent of protected areas within the territory (IUCN 1992a, b, c, d) and at the habitats and species of major significance. An up-to-date summary of existing and candidate Ramsar sites for the Overseas Territories can be found in JNCC (1998). Measures to protect species are then addressed.

Where the risk of extinction for a species has been evaluated, its IUCN threat category is presented. Unless otherwise stated, these evaluations are derived from either the 1996 *Red list for animals* (IUCN 1996), the 1997 *Red list for plants* (Walter & Gillet 1998) or the *World list of threatened trees* (Oldfield et al. 1998). Whilst the 1996 and 1998 red lists use the revised IUCN threat criteria (IUCN 1994), the 1997 list for plants does not do so. Abbreviations for both old and new threat categories are, therefore, used in the text and are summarised below. If any assessment of threat is at regional or local, rather than global, level this is stated and the relevant reference given.

Standard abbreviations for threat categories are used as follows:

Table 2 IUCN threat categories

New (1994) categories	Old categories
EX – extinct	Ex – extinct
EW – extinct in the wild	E – endangered
CR – critically endangered	V – vulnerable
EN – endangered	R – rare
VU – vulnerable	I – indeterminate
LR – lower risk	
cd – conservation dependent	
nt – near threatened	
lc – least concern	
DD – data deficient	K – insufficiently known

Finally, each profile concludes with a list of key contacts for each territory, and a bibliography to enable the reader to follow up any subject areas of interest. Much information lies within unpublished reports, the so-called 'grey literature', and is not readily accessible. We do not claim that the bibliographies are fully comprehensive.

In the period between the completion of these profiles and their publication, much additional work may have been undertaken and, indeed, published. New threats to biodiversity may have arisen, progress may have been made with site designations and conservation programmes, or the taxonomy of putative endemic taxa may have been re-evaluated. Some mistakes may have been made in the profiles, though we made every effort to avoid this. It is also possible that we have overlooked published or unpublished studies. As it is our intention in future to maintain these profiles on the JNCC web page (<http://www.jncc.gov.uk>), we would be grateful to receive any comments, additions or corrections to these accounts.

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Box 1

The Foreign & Commonwealth Office (FCO) has recently re-organised the way it deals with OTs. The geographical desks for all OTs, except Gibraltar, have been brought together in the Overseas Territories Department (OTD). The Gibraltar desk remains in the Southern European Department. However, the lead department on some subjects in the OTs lies with functional departments: Environment, Science & Energy Department (ESED) leads on environmental issues, and Aviation & Maritime Department (AMD) leads on maritime and fisheries issues.

When the Foreign Secretary introduced the 17 March white paper on the Overseas Territories (Anon. 1999), he also announced that the FCO would make £1.5m available to support environmental work in the OTs over the next three years. This new funding is administered by ESED which is currently working on guidelines on how this will be used. In recent years about £150,000 p.a. has been provided for environmental projects in the OTs (Annex 1). ESED also co-ordinates work on multilateral environmental agreements (MEA) and the OTs.

Box 2

The Joint Nature Conservation Committee is a forum through which the three country nature conservation agencies – the Countryside Council for Wales (CCW), English Nature (EN) and Scottish Natural Heritage (SNH) – deliver their statutory responsibilities for Great Britain as a whole and internationally. These responsibilities, known as the special functions, contribute to sustaining and enriching biological diversity, enhancing geological features and sustaining natural systems. The special functions are principally:

- to advise ministers on the development of policies for, or affecting, nature conservation in Great Britain and internationally;
- to provide advice and knowledge to anyone on nature conservation issues affecting Great Britain and internationally;
- to establish common standards throughout Great Britain for the monitoring of nature conservation and for research into nature conservation and the analysis of results;
- to commission or support research which the Committee deems relevant to the special functions.

The work falls into two broad categories: core work, which covers all of the main advisory functions, and a series of projects which are of fixed duration.

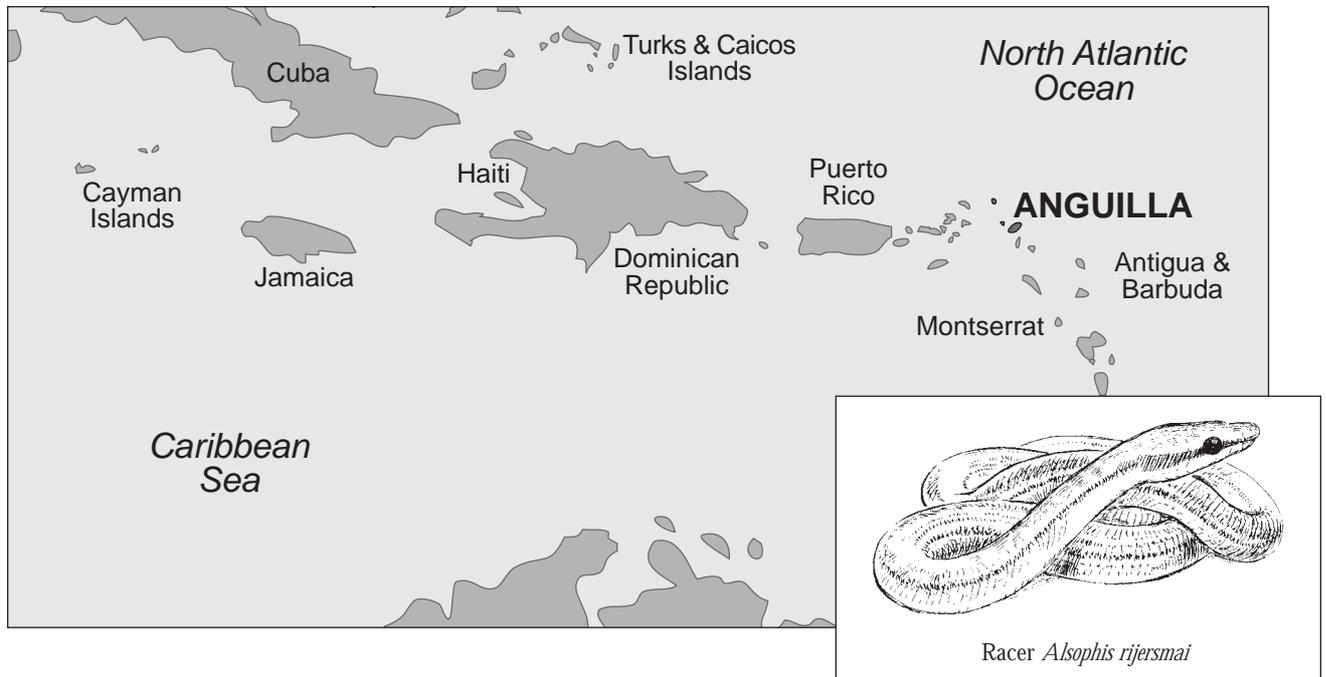
The work can be done through the Committee's own Support Unit, composed of staff assigned from the three country agencies, by one country agency leading on behalf of the others, or through a network of agency staff. Much of the work is contracted out.

The Special Functions are managed by a Joint Management Group, which includes the Managing Director, Projects Director and Business Manager of the Support Unit and country agency representatives.

GLOSSARY

ANT	Anguilla National Trust	IUCN	International Union for the Conservation of Nature and Natural Resources
BAMZ	Bermuda Aquarium, Museum and Zoo	IWRB	International Waterfowl and Wetlands Research Bureau (now called Wetlands International)
BBP	Bermuda Biodiversity Project	MNT	Montserrat National Trust
BIOT	British Indian Ocean Territory	MOD	Ministry of Defence
BVI	British Virgin Isles	NCC	Nature Conservancy Council
BZS	Bermuda Zoological Society	NERC	Natural Environment Research Council
CANARI	Caribbean Natural Areas Resources Institute	NGO	Non-Governmental Organisation
CARICOM	Caribbean Community	NOAA	National Oceanic and Atmospheric Administration
CBD	Convention on Biological Diversity	OECS	Organisation of Eastern Caribbean States
CCAMLR	The Convention on the Conservation of Antarctic Marine Living Resources	OT	Overseas Territory
CCAS	Convention for the Conservation of Antarctic Seals	RSPB	Royal Society for the Protection of Birds
CINT	Cayman Islands National Trust	SCAR	Scientific Committee for Antarctic Research
CITES	Convention on International Trade in Endangered Species	SEDS	Sustainable Environment and Development Strategy
DETR	Department of the Environment, Transport and the Regions	SPAW	Protocol Concerning Specially Protected Areas and Wildlife
DfID	Department for International Development	TCI	Turks and Caicos Islands
DOE	Department of Environment (Cayman)	UK	United Kingdom of Great Britain and Northern Ireland
ECNAMP	Eastern Caribbean Natural Area Management Program	UKOTCF	UK Overseas Territories Conservation Forum
EBA	Endemic Bird Area	UNCED	United Nations Conference on the Environment and Development
EIA	Environmental Impact Assessment	UNDP	United Nations Development Programme
EU	European Union	UNEP	United Nations Environment Programme
ESED	Environment, Science & Energy Department of the FCO	USVI	United States Virgin Isles
FCO	Foreign and Commonwealth Office	WCMC	World Conservation Monitoring Centre
FFI	Fauna and Flora International	WWF	World Wide Fund for Nature (still called World Wildlife Fund in some countries)
FIG	Falkland Islands Government		
GEF	Global Environment Facility		
GIS	Geographical Information Systems		
GONHS	Gibraltar Ornithological and Natural History Society		
ICBP	International Council for Bird Preservation		
ITE	Institute of Terrestrial Ecology		

2: Anguilla



Introduction

Anguilla is the most northerly of the Leeward Islands in the eastern Caribbean. It is a low coralline island with an area of 91 km² and a population of about 8,500. The main industries are tourism and fishing. The home fishing industry employs 20% of the population, and territorial waters are also fished by foreign trawlers (Richardson 1984). Tourism developed rapidly during the 1980s: at the beginning of the decade Anguilla had only a few thousand visitors annually, but by 1990 the figure had reached an estimated 70–80,000. Fishing and tourism both pose problems of damage to coral habitats by anchors and spearfishing. The development of tourism is increasingly important to the economy, but it also exerts pressure on natural resources. Together with house building, it is contributing to the current 'building boom' causing environmental problems.

International obligations relevant to nature conservation

Anguilla 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).
- International Convention on the Regulation of Whaling

Implementation

Ramsar: Anguilla's decision to join the UK's ratification of Ramsar in 1990 followed an independent review of policy and legislation on wetland protection of the island (Pritchard 1990). There are currently no designated Ramsar sites.

Protected areas

A system of marine protected areas for Anguilla has been developed over the past 20 years. In 1980 the Government requested the assistance of the Eastern Caribbean Natural Area Management Program (ECNAMP) in formulating a management plan for critical marine resources. A major recommendation of that study (Jackson 1981) was the creation of a system of marine parks to protect areas of high ecological value from human activity. The study also recommended the establishment of a multiple-use reserve covering an area of sea to the north of Anguilla.

- **Marine Parks Ordinance 1982.** This enabling legislation for the designation of marine protected areas was passed in 1982. It empowers the Governor "by Order or Regulations published in the Gazette" to "designate any portion of the marine areas of Anguilla as a marine park" and allows him to make regulations covering a wide range of measures.

In 1989 the Anguilla Government put forward a proposal for a comprehensive marine parks programme. The objectives were:

- to develop and implement an effective organisational approach for managing coastal resources;
- to provide site-specific information and technical guidelines for development and management of coastal resources;
- to establish marine parks at Shoal Bay, Sandy Island, Prickly Pear Cays (including Seal Island), Dog Island, Little Bay and Sombrero Island;
- to improve public awareness and understanding of coastal resources, as a means of providing a

base of popular support for protection and sustainable development of these resources; and

- to provide immediate attention to, and amelioration of, known problems of beach erosion and visitor-caused damage to critical marine habitats at proposed park sites and elsewhere.

Elements of the marine parks programme that have been carried out include: inventory and analysis of marine resources funded by the UK Government's British Development Division in the Caribbean (BDDC); provision of public information by the US National Parks Service and WWF-UK; and the establishment of marine parks funded by WWF-UK.

In 1993 five areas were designated as marine parks. These are Sandy Island; Prickly Pear Cays and Seal Island; Dog Island; Little Bay and Shoal Bay; and Island Harbour. A leaflet giving information on the Anguilla marine park mooring system and providing a map of the marine parks has been produced. Subsequently little development of the marine parks system has taken place (Christian, in litt. 1998). At present, responsibility for the marine parks lies with the Department of Fisheries and Marine Resources.

- **Access to Beaches Ordinance No. 2 1981:** defines the beach as "including land adjoining the foreshore of Anguilla and its islands and extending not more than 100 ft beyond the landward limit of the foreshore." Wilful damage to plants, shrubs and trees is prohibited. (Pritchard 1990).
- **The Beach Protection Ordinance No. 10 1988:** provides for the declaration of protected beaches from which the extraction of sand and gravel is forbidden. Seventeen such beaches have been designated.

In 1985 Fountain Cavern National Park was acquired using Government funds. Acquisition of the 1.9 ha site involved investigation by the Archaeological and Historical Society of an

extremely complex landowning pattern and negotiations with the owners (Pritchard 1990). A corporation has been established to take full responsibility for further development of the park. Other sites are being considered as national parks, including Big Spring and Road Point (Elvet Hughes *in litt.*).

Habitats of major significance

Anguilla is a low coralline island, formed from limestone and marls developed on old volcanic rocks. It shares a common submarine shelf with St Martin to the south. The coastline has sandy bays in the south and cliffs in the north. There are extensive reefs off the north coast and fringing reefs along most of the south coast. The 17 km-long reef along the south-east coast is considered to be one of the most important largely unbroken reefs in the eastern Caribbean (Putney 1982).

Coastal and sublittoral habitats of all islands and reefs of the Anguilla group have been surveyed and mapped as part of the Anguilla Marine Resources Inventory Project administered by the Government of Anguilla, funded by ODA (Blair Myers et al. 1995; Sheppard et al. 1995). Based on aerial photography, the detailed atlas is GIS-based, allowing for relatively straightforward updating when facilities in the territory permit. The production of large-format, paper atlases by themselves show the extent and location of all marine and intertidal habitats, the intention being to supply data on important areas during the process of development planning and permitting. Simultaneously, data were collected on terrestrial habitats near the coasts.

Anguilla has small areas of mangroves and about 15 saline ponds of considerable importance for resident and migratory waterfowl (Scott & Carbonnell 1986). A guide to Anguilla's wetlands has recently been produced by the Anguilla National Trust. The guide describes the major ponds, their bird life (with local and scientific names), the plant species around them and includes historical as well as ecological notes (Christian *in litt.* 1998).

Offshore islands hold significant breeding seabird colonies. Detailed ecological surveys of these islands and seabird counts are required (Pritchard 1990).

The vegetation of Anguilla consists of degraded evergreen woodland, with scattered areas of grassland, and low scrub. Areas classed as conservation areas in the National Land Use Plan of 1996 are the south-west peninsula, the north-east peninsula, two areas mid-way along the north-west coast, and Prickly Pear Cays. All vegetation is subject to uncontrolled grazing by livestock. The existing beaches at Prickly Pear provide important nesting habitats for a number of species of birds, and the hawksbill turtle *Eretmochelys imbricata*. The offshore cays are considered critical habitat because they have large rookeries of several bird species, such as the sooty tern *Sterna fuscata*, brown booby *Sula leucogaster*, blue-faced booby *Sula dactylatra*, and noddy tern *Anous stolidus* (Christian *in litt.* 1998).

Remnant natural areas are predominantly on the north coast, with the most extensive tract of thorn-scrub forest in an area between Little Bay and Shoal Bay. Along the coast are many vertical cliffs with sea caves and sink holes. Immediately inland from the cliffs are densely vegetated areas which provide the habitat for Anguilla's reptiles, including the threatened Lesser Antillean iguana *Iguana delicatissima*. Another relatively undisturbed site is the windward point of the island between Savannah Bay and Island Harbour where stunted, salt-spray tolerant vegetation occurs. A smaller area, Katouche Canyon (approximately 1.5 km long and 0.5 km wide), is probably one of the least disturbed areas in Anguilla and is currently free from goats, cats and dogs. The Katouche Canyon is an important site for reptiles and birds (Anon. 1993).

Species of major significance

Plants

There are approximately 500 species of plants recorded for Anguilla, 321 of which are indigenous. One plant species, *Rondeletia anguillensis* (Rubiaceae)

is endemic to the island. It occurs near Deep Waters at the east end of the island and in the vicinity of Little Bay, near Flat Cap Point (Howard & Kellogg 1987).

Reptiles and amphibians

The reptiles of Anguilla and offshore cays consist of 12 lizard species, one species of snake and one species of land tortoise. The endemic reptiles are:

a black ground lizard *Ameiva corvina*: endemic to Sombrero;

a black ground lizard *Ameiva corax*: endemic to Little Scrub Island.

The following species are endemic to the Anguilla Bank:

Leeward Island racer *Alsophis rijersmai* (EN): this snake occurs in Anguilla, Guadeloupe and the Netherlands Antilles. An assesment of the Anguilla population took place in spring 1998.

a ground lizard *Ameiva pleei*: this species is endemic to Anguilla, St Martin and St Barthelemy, where it occurs in dry scrub, mangrove edges and amongst limestone.

a tree lizard *Anolis gingivinus*: occurs on most islands and cays on the Anguilla Bank being ubiquitous amongst coastal scrub, rocks and trees.

a small gecko *Sphaerodactylus macrolepis parvus*: endemic to the Anguilla Bank; on Anguilla it is found only in moist areas, such as caves and canyons, it is most abundant in Katouche Canyon and Cavannagh Cave.

Two other reptiles, the gecko *Sphaerodactylus sputator* and Lesser Antillean iguana *Iguana delicatissima* (VU) are endemic to the northern Lesser Antilles. Of these, the iguana is threatened on the island as a result of tree felling and grazing by feral goats: only about 50 individuals remain.

During 1997 Fauna & Flora International worked with the Anguilla National Trust to assess the status of the Lesser Antillean iguana. Other than those listed above, there is a further threat to this species posed by the arrival of the green iguana *Iguana iguana* which floated to Anguilla on logs during Hurricane Louis in 1995. Several of the latter species have been captured and are being kept by a friend of the Trust to prevent or minimise the risk of interbreeding. Meanwhile a conservation plan is being developed for the Lesser Antillean iguana. Translocation to offshore cays and other conservation areas is being considered as well as captive breeding.

Anguilla is of regional importance for sea turtle nesting sites.

Green turtle *Chelonia mydas* (EN). Together with the hawksbill *Eretmochelys imbricata*, the green turtle is the most common species in Anguillan waters. Important nest sites for this turtle include Dog Island and the Prickly Pear Cays (Groombridge & Luxmoore 1989). Notable foraging sites are Shoal Bay, North Hill Village, Lower South Hill, Long Bay, Meads Bay, Scrub Island, Sandy Island, Sombrero Island, Dog Island, and between South Shoal Bay and Blowing Rock (Groombridge & Luxmoore 1989).

Hawksbill turtle *Eretmochelys imbricata* (CR). The hawksbill is the principal species nesting on Anguilla. Important nesting sites include Dog Island, the main island and on Prickly Pear Cays (Groombridge & Luxmoore 1989). Foraging hawksbills are present year round, especially in the extensive reef to the north of the island and the offshore cays (Groombridge & Luxmoore 1989).

Leatherback turtle *Dermochelys coriacea* (EN). Leatherback turtles are considered to be rare around Anguilla. Nesting has been recorded from the main island and Scrub Island (Meylan 1983); the current status of this population requires evaluation.

Loggerhead turtle *Caretta caretta* (EN). There is

little information about this species in Anguillan waters. Loggerhead turtles have been captured at Scilly Cay, near Island Harbour and are suspected to forage around Dog Island, Scrub Island and Sandy Island (Meylan 1983). There have been no reliable reports of nesting by loggerheads on Anguilla (Meylan 1983).

With the help of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), the Anguilla National Trust has taken the opportunity of a five-year moratorium on the harvesting of sea turtles, to develop public awareness and education about the four species which may be found in Anguillan waters. The focus has been on the hawksbill, which is Anguilla's predominant nesting species, and the green turtle which forages on Anguilla's reefs and surrounding waters. A second five-year moratorium is now being sought for scientific study of the turtles that will inform the Anguilla Sea Turtle Recovery Plan (STRAP). Each WIDECAST member country will have a STRAP based on the particular needs of their turtle populations. A WIDECAST workshop was held in Anguilla in late 1998, supported by WWF-UK.

Birds

Anguilla is important for seabirds in a regional context, and for waterfowl and migratory shorebirds. Wetland and bird research priorities are specified by Pritchard (1990).

Mammals

Five species of bats, Anguilla's only native terrestrial mammals, reside in the caves and sink holes of the island. Assessment of the bat populations by the Anguilla National Trust, working with Fauna and Flora International (FFI) is currently proposed. The bat species of Anguilla are:

Barbados long-tongued bat *Monophyllus plethodon* (LRnt)

A subspecies of the Jamaican fruit-eating bat *Artibeus jamaicensis jamaicensis*

A subspecies of the Antillean fruit-eating bat *Brachyphylla cavernarum cavernarum*

Mexican funnel-eared bat *Natalus stramineus*

Pallas' mastiff-bat *Molossus molossus*

Migrating humpback whales *Megaptera novaeangliae* (VU) and, occasionally, sperm whales *Physeter catodon* (VU) have been reported off the north-west and west coasts of Anguilla in March/April (Gricks 1994). The sei whale *Balaenoptera borealis* (EN) may occur sporadically in Anguillan waters, although this requires confirmation.

Species protection

- **The Wild Birds Protection Ordinance 1913:** this protects specified wild bird species and their nests and eggs. It establishes a closed season for specified 'game' birds. Protected and game species are listed only by their local names. Updating the Ordinance is desirable (Bradley, undated).
- **The Fisheries Protection Ordinance No. 4 1988:** this applies to territorial waters plus the contiguous 200 mile fisheries zone. It provides for the appointment of Fisheries Officers and gives them enforcement powers. The Ordinance regulates the taking and killing of certain marine species, and establishes close seasons for lobsters and turtles. It repeals the Turtles Ordinance No. 6 of 1984. Details of the policing of fisheries are set out in the Fisheries Protection Regulations No. 12 1988 and the Fisheries Protection (Amendment) Regulations No. 4 1990.

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 Roland Hodge, Elvet Hughes, Walcott Richardson
 – Government of Anguilla

Key names and addresses

Ministry of Tourism (Permanent Secretary),

Agriculture and Fisheries, The Valley, Anguilla

Anguilla Archaeological and Historical Society,
PO Box 252, The Valley, Anguilla. Tel: 497 4164;
fax: 497 4165; e-mail: spinmac@anguillanet.com

The Anguilla National Trust, PO Box 1234,
The Valley, Anguilla. Tel: 497 5297; fax: 497 5571;
e-mail: axanat@anguillanet.com;
web site: <http://www.web.ai/ant/>

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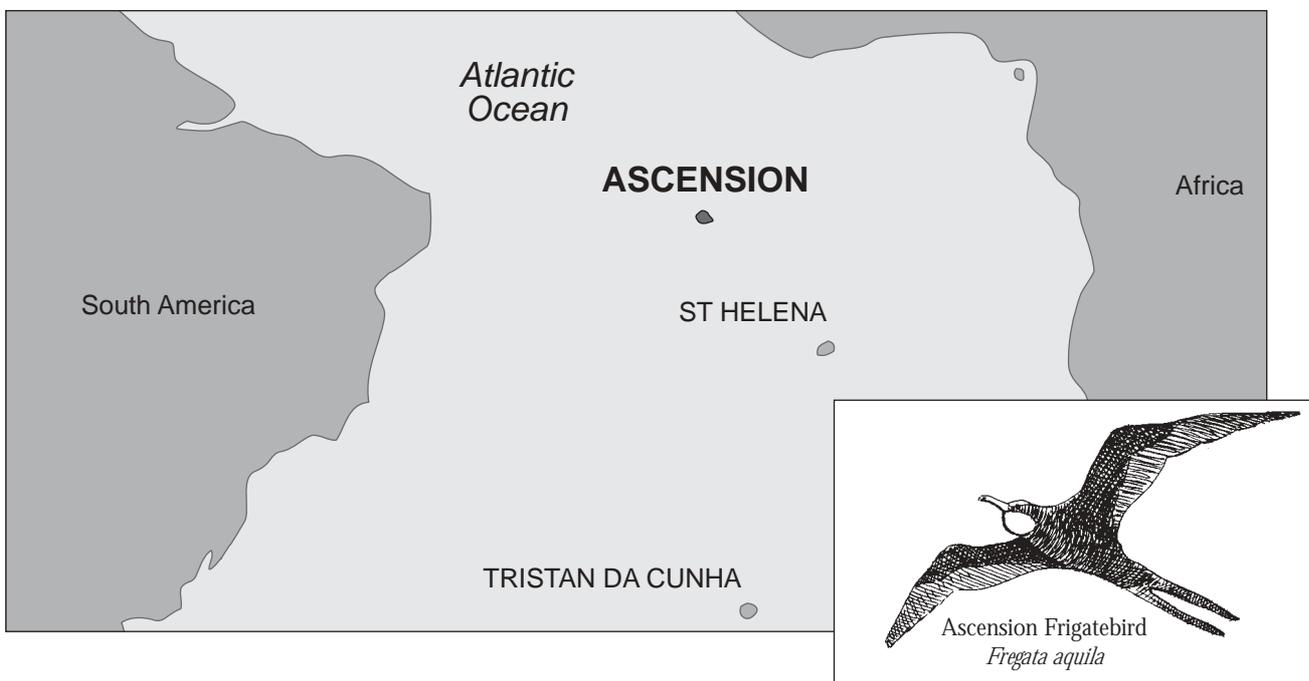
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3: Ascension



Introduction

Ascension is a volcanic island situated in the central equatorial Atlantic Ocean, midway between Brazil and Africa, at $7^{\circ} 57' S$, $14^{\circ} 22' W$. The land area of Ascension is 88 km². Ascension has no permanent human population. Contract workers from St Helena, the UK and the USA make up the resident population some of who have been on the island for 30 years or more. The island is an important communications centre. Whilst it is a Dependency of St Helena, it is a separate UK Overseas Territory.

International obligations relevant to nature conservation

- 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 on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on Biological Diversity (CBD)
- International Convention on the Regulation of Whaling
- Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa

Protected areas

- **Green Mountain (Natural Resources) Protection Ordinance No. 14 1955:** protects the forests and water supplies of Green Mountain.

Boatswainbird Island was designated as a Site of Special Scientific Interest in 1989.

By the Governor's Declaration of 25 September 1997, two nature reserves have been established at Mars Bay and Hummock Point respectively.

- **Ascension Land Ordinance, 1967:** Section 3 states that "All lands and all rights over the same in Ascension are hereby declared to be under the control and subject to the disposition of the Governor and no title to the occupation and use of any such lands shall be valid without the consent of the Governor." Under this section the Governor may withhold consent for the use of certain tracks or in order to protect nesting sea turtles. Consent may be withheld at all times or for short periods. No sand mining is permitted at any of the beaches. There is a code of procedure for visitors to the beaches during the turtle nesting season.

The World Conference of the International Council for Bird Preservation (ICBP), passed a resolution in 1990 recommending that the UK Government designate Ascension a "protected natural area", and prepare and implement a management plan to include the eradication of introduced animals as soon as possible. The UK Government funded the drafting of the island's conservation management plan. It also funded studies for the eradication of feral cats and rats and, together with NGOs, is seeking funds to implement the report's findings.

Habitats of major significance

The vegetation of Ascension has been substantially modified, mainly through effects resulting from introduced plant and animal species: over 300 species of plant have been introduced. The main ecological zones of Ascension are briefly described in Royal Botanic Gardens, Kew (1993).

The highest point of Ascension is the peak on Green Mountain Ridge at 860 m. The lower slopes of Green Mountain are covered by thick scrub of

introduced bushes and cacti *Opuntia* spp. A gently sloping plain lies to the north of Green Mountain.

Low altitude areas of Ascension are barren with occasional grass clumps and the endemic small shrub *Euphorbia origanoides* (Euphorbiaceae), although there is concern at the rapid encroachment by an exotic tree, the Mexican thorn *Prosopis juliflora*. The UK Government funded a biological control programme to limit the further spread of this tree.

Along the north, west and north-east coasts of the island there are 32 crescent-shaped sandy beaches. Ascension has deep inshore waters and no coral reefs.

Species of major significance

Biodiversity assessment

The terrestrial ecology of Ascension, with a checklist of the flora, is described by Duffey (1964). The status of endemic plants is described by Cronk (1980). The land fauna of Ascension is described by Ashmole and Ashmole (1997). Some 311 species of land animals (including a few now extinct) are known to have established themselves on the island. About 95 species are considered to be native, including two species of marine turtles, 12 seabird species and two extinct landbirds. At least 138 species were probably introduced and 78 are of doubtful status.

Plants

There are 25 native vascular plants of which six ferns and six flowering plants are endemic (Table 3.1).

While most of the endemic plant species are threatened with extinction, at present they survive mainly on exposed rock faces and walls in the highest altitude vegetation zones. These open habitats are associated with farm buildings and path construction around the peaks (Royal Botanic Gardens, Kew 1993).

Table 3.1 Endemic plant species

Family	Species	IUCN threat category
Asiantaceae	<i>Anogramma ascensionis</i>	Extinct or Endangered
Aspleniaceae	<i>Asplenium ascensionis</i>	Rare
Cyperaceae	<i>Cyperus appendiculatus</i>	Rare
Dryopteridaceae	<i>Dryopteris ascensionis</i>	Extinct or Endangered
Euphorbiaceae	<i>Euphorbia origanoides</i>	Rare
Gramineae	<i>Sporobolus caespitosus</i>	Endangered
Gramineae	<i>Sporobolus durus</i>	Extinct or Endangered
Grammitidaceae	<i>Xiphopteris ascensionensis</i>	Rare
Lycopodiaceae	<i>Lycopodium axillare</i>	Indeterminate
Marattiaceae	<i>Marrattia purpurascens</i>	Rare
Pteridaceae	<i>Pteris adscensionis</i>	Endangered
Rubiaceae	<i>Oldenlandia adscensionis</i>	Extinct

Source: Walter & Gillett (1998)

Invertebrates

There are about 29 endemic animals, including species in three new genera of terrestrial arthropods discovered in the past decade (Ashmole & Ashmole 1997); some of these are given in Table 3.2.

Amphibians and reptiles

There are no native species of terrestrial reptiles or amphibians. The green turtle *Chelonia mydas* breeds on the island, but there is no record that the other turtle regularly seen around Ascension's shores, the hawksbill *Eretmochelys imbricata*, breeds there. The island has one of the world's major breeding colonies for the endangered green turtle with around 2,000 nesting each year. An intensive 16-month study carried out during 1976-1978 means that the green turtle colony on Ascension was at that time the best-documented insular sea turtle population in the world (Mortimer & Carr 1984). There are 32 nesting beaches which can be grouped into four clusters: South West Bay, Long Beach, English Bay, and the North East Bay clusters. With Darwin Initiative financing, on 1 December 1998 a resident team from Swansea University began a two-year study of Ascension's green turtles, the first such comprehensive study since the early 1980s.

Birds

The main biodiversity interest of Ascension is the seabird breeding colonies, with up to a million birds consisting of four species of tern, three boobies, two tropicbirds, one storm petrel, and the globally threatened endemic Ascension frigatebird *Fregata aquila* (CR) which breeds only on Boatswainbird Island. Ascension, and its associated stacks, is regarded as one of the most important seabird breeding localities in the South Atlantic. Information on the status of resident bird species can be found in Nash *et al.* (1991).

There has been a recorded decline in numbers of the Ascension frigatebird since the huge colonies that occurred when breeding took place on Ascension itself. Up to 10,000 breeding adults were recorded in the late 1950s, declining to 5,000 birds visible in 1976 (Collar & Stuart 1985), and to 2,500 birds and 1,000 nests in 1988 (Blair 1989). It is, however, possible that recent counts reflect differences in counting efficiency (Ashmole, Ashmole & Simmons 1994).

Species protection

- **Wild Life (Protection) (Ascension) Ordinance Cap 129 1944:** under this Ordinance the

Table 3.2 Some endemic animal species

Family	Species	Comments
Crustacea	<i>Procaris ascensionis</i>	An endemic genus and species of shrimp, this species occurs in coastal rock pools
	<i>Typhlatya rogersi</i>	A shrimp which is confined to coastal rock pools
Pseudoscorpiones	<i>Allochernes ascensionis</i>	A very distinct cave adapted species discovered in 1990
	<i>Stenowitzius duffeyi</i>	
	<i>Garypus titenius</i>	
	<i>Apocheiridium sp. nov</i>	
Araneae	<i>Opopaea euphorbicola</i>	A new genus and therefore species discovered in 1990
	<i>Catonetria gen. and sp. nov</i>	
Coleoptera	<i>Neopactus ornatus</i>	

Source: Ashmole & Ashmole (1997)

Governor-in-Council may make regulations prohibiting or controlling the killing, capturing, or taking of any wildlife within the Dependency.

- **Wild Life (Protection) (Ascension) Regulations 1967:** all birds and eggs (except domestic fowls), turtles and eggs, are protected under this legislation, together with frogs, lizards, donkeys and goats which are all introduced. Donkeys are, in fact, damaging the native flora and control measures are needed. The Regulations license the killing, capture or take of any of the specified wildlife.
- **Endangered Species Control Ordinance 1976:** this Ordinance is the means by which Ascension implements CITES.

Ascension also has Ordinances relating to the export of fish, fish products and crayfish.

Ascension is a member of the South Atlantic Islands Plant Specialist Group; part of the IUCN Species Survival Commission.

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R.C. Huxley, Administrator, Ascension.

Key names and addresses

The Administrator, Ascension Island, South Atlantic Ocean. Tel: 247 6311; fax: 247 6152; e-mail: Administrator@Atlantis.co.ac; web site: www.ascension-island.gov.ac

Ascension Historical Society, Fort Hayes Museum, Georgetown, Ascension.

IUCN/SSC South Atlantic Plants Specialist Group c/o the Administrator.

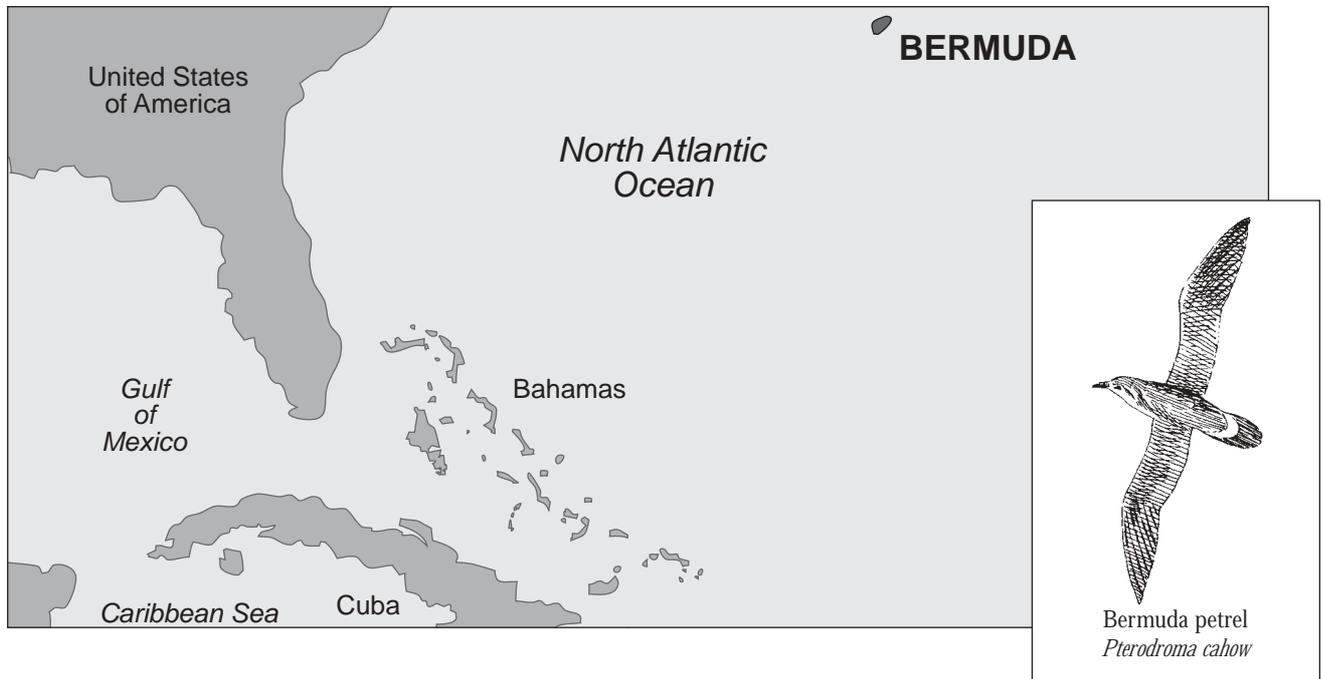
Ascension has a resident Administrator, who is responsible to the Governor of St Helena and who is assisted by the Island Management Group. The Administrator has local responsibility for conservation affairs.

The Ascension Historical Society at Fort Hayes Museum has an interest in Ascension's natural history and conservation. It advises the Administrator on all matters concerning both the natural and man-made environment.

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4: Bermuda



Introduction

Bermuda is situated in the western Atlantic Ocean (32°N, 64°W) approximately 917 km from the coast of North Carolina in the USA. Bermuda consists of around 150 coral limestone islands and islets extending along the edge of an extinct submarine volcano. The ten main islands are connected by bridges or causeways to form a chain about 35.4 km long. The total land area of Bermuda is 55 km². It has an estimated population of 61,000. Tourism and international business are the main sectors of the economy.

International obligations relevant to nature conservation

Bermuda 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 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: the implementation of the Ramsar Convention in Bermuda is considered in detail by Pritchard (1992). Nine sites are considered to meet the criteria for listing under the Ramsar Convention, and six sites have been put forward for formal designation in 1999.

CITES: this Convention is implemented through the Endangered Animals and Plants Act 1976 (as amended).

Protected areas

Bermuda has a comprehensive system for protection of remnant areas of natural habitat, with various legal measures in place.

- **The Bermuda National Parks Act 1986.** This is the enabling legislation for the designation of national parks and reserves, which may be areas of land or water. The Act also requires the preparation of a strategic plan for the management and development of the national parks system as a whole. The main purpose of protected areas declared under the legislation is informal recreation. There are two designations:

Class A Protected Areas— Nature Reserves: to be managed to protect special or fragile natural features and provide limited public access;

Class B Protected Areas—Parks: to be managed to encourage conservation and enjoyment of natural and historic features with the minimum of commercial activity.

Reserves further divide into Government reserves and private (or 'agreement') nature reserves. Private reserves enter the system by agreement and can be withdrawn by agreement. None of these has yet been gazetted, although it is the intention to do so with Audubon Society reserves. Each protected area is meant to have a management plan in place within five years of declaration, but plans have not yet been completed for all sites. Any activity undertaken within a protected area must be consistent with the purposes of the area and its management plan. Ministers can make regulations to ensure this, and can provide for permit arrangements. Infringement of the terms of a permit is an offence, and strict enforcement is provided for. Construction or alteration of roads, buildings, alteration of land and other activities requires written approval of the

Minister: proposals must be published and there is a period for public comment.

Currently, 12 nature reserves covering some 48 ha, and 63 parks ranging in size from 0.04 ha to 38 ha are listed under the Act. The nature reserves listed include a number of those already declared under statutory instruments arising from the Protection of Birds Act.

- **Protection of Birds Act 1975.** The first legislation to provide for nature reserves was the 1949 Protection of Birds Act, under which the first reserve was declared at Castle Harbour Islands following the rediscovery of the cahow in 1951. This Act was superseded by the Protection of Birds Act 1975, which similarly provided for reserves to be declared by the Minister on land appearing to be "especially suited for the feeding and nesting of protected birds, or otherwise important for their preservation." Reserves are declared only on Government-owned land, or with the consent of the private landowner(s). Enforceable restrictions in reserves relate to access control by permits or to designated access areas. A number of sites have been declared by Statutory Instrument under this Act: The Nature Reserves (Tern Nesting Areas) Order 1976; The Nature Reserves (Spittal Pond) Order 1979; The Nature Reserves (Castle Harbour) Order 1979; and The Nature Reserves (Evans Bay) Order 1981.
- **Tree Preservation Orders.** Section 27 of the Development and Planning Act 1974 provides for the making of Tree Preservation Orders that can be applied to individual trees, groups of trees or woodlands. Several are currently in force.
- **Coral Reef Reserve Act 1966.** This is the enabling legislation for the designation of coral reef reserve areas. Two coral reef areas, North Shore Coral Reef Preserve and South Shore Coral Reef Preserve, are protected under the Coral Reef Reserve Act.

- **Fisheries Act 1972.** This is the enabling legislation for the designation of exclusive fishing zones. Section 4 gives the Minister of the Environment authority to declare any area of the waters within the exclusive fishing zone to be a protected area, prohibiting or restricting the taking of fish (although this does not affect use of boats within designated areas).

In addition to the protected areas established under the above legislation, ten sites (c. 15 ha) are managed by the Bermuda Audubon Society, 15 sites (c. 40 ha) by the Bermuda National Trust, and there are two other private protected areas (25 ha) administered under the Walsingham Trust Act and the Heydon Trust Act. The Bermuda National Trust Act 1969 (amended 1970) is the legal means by which the Trust can purchase or receive land for management as nature reserves to be managed according to the Bermuda National Trust (Open Spaces and Property) Regulations. Nature reserves acquired and owned by the Bermuda National Trust are managed by the Gardens and Nature Reserves Committee, with the advice and assistance of the Government Conservation Division. Reserves owned by the Bermuda Audubon Society are managed by the Society's Executive Committee with advice from the Conservation Division. The Bermuda Audubon Society Act 1960 provides for the purchase and holding in trust of land managed as a nature reserve.

Planning legislation in Bermuda also has provisions giving precedence to the conservation of natural areas.

- **The Development and Planning Act 1974.** Legislation enacted in 1965 made provision for a Planning Department and for various categories of land zoning, including public and private open space. A 1983 amendment to the 1974 Development and Planning Act included an additional provision for "overlay zoning" of "Environmental Conservation Areas", within which the preservation of open space and the natural environment takes precedence over other planning considerations.

- **"Bermuda 2000": The Bermuda Plan 1992.** The Bermuda Plan 1992 was preceded by island-wide development plans prepared in 1968, 1974 and 1983. The 1983 development plan introduced a wide range of zonings and provisions designed to identify and protect areas of environmental importance. The Bermuda Plan 1992 is based on the concept of sustainable development. The plan identifies sufficient land to meet the community's development needs during the plan period and places greater emphasis on the conservation of open land and natural resources.

Three goals of the plan are to:

- conservate open space and promote a high quality environment;
- provide sufficient development potential to meet the community's needs; and
- encourage a more efficient use and development of land.

The 1992 plan maps identify for protection areas of open space, agricultural land, woodland, parkland, nature reserves, caves and groundwater resources. 'Nature reserves' are defined as "areas of special environmental significance and ecological, biological, geological or scientific value." They include mangrove swamps, marshlands, bird sanctuaries, cave and rock formations, islands and other wildlife habitats.

The section on nature reserves states: "There is an urgent need to safeguard those special places which sustain wildlife in Bermuda. Some of these places are already protected as nature reserves under the National Parks Act or under the stewardship of the Audubon Society or National Trust. Many areas do not enjoy such protection and it will fall on planning policy to ensure their continued existence." Nature reserves designated by the plan itself or run by the National Trust or Audubon Society are identified by a nature reserve zoning on the plan's maps.

Woodland reserves are defined as areas of mature trees and dense vegetation to be protected because of their ecological or amenity value. They may be important as natural habitats, buffer zones or windbreaks, or for their scenic value.

Habitats of major significance

Bermuda is densely populated and only small areas of natural habitat survive, for example at Paget and Devonshire marsh, and the upland hills of Castle Harbour and Walsingham. In total, the inland peat marshes cover about 48 ha and are sites of great botanical interest. Approximately 10% of the total land area of Bermuda is forest or woodland. Bermuda is the most northerly site of mangrove distribution in the world, and small, scattered areas of mangrove swamp amounted to a total of 16.7 ha in 1980.

Nine sites have been put forward to the UK authorities as proposed Ramsar sites. It is expected that the Bermuda Government will declare the following six areas in time for the 7th Conference of Ramsar Parties in May 1999:

Hungry Bay Mangrove Swamp
Lovers Lake
Paget Marsh
Pembroke Marsh East
Spittal Pond
Warwick Pond

The three other identified candidate sites are: Devonshire Marsh east and west basins, Trott's Pond and Mangrove lake, and Somerset Long Bay Pond.

The Bermudian coral reefs are of scientific importance, forming the most northerly coral reef system in the world. An extensive programme of marine environmental research is carried out by the Bermuda Biological Station for Research, and the Bermuda Aquarium, Natural History Museum and Zoo (BAMZ) and its supporting arm, the Bermuda Zoological Society (BZS).

Bermuda's limestone caves are of international

biological significance. They are described in various publications by Iliffe and co-authors (Iliffe 1979 *et seq.*). More than 150 caves are known. Over 100 of these, including many of Bermuda's largest and longest caves, are located in the 2 km² area of the Walsingham Tract, between Harrington Sound and Castle Harbour. Most of the island's more extensive dry caves, notably Admiral's, Sibley's and Jane's Caves, are located here.

The sea-level, brackish pools located in the interior of Bermuda's caves, as well as similar pools of collapse origin located outside caves, are classified as 'anchialine' habitats (i.e. subterranean, brackish water bodies with limited connection to the sea). A rich and diverse biota inhabits the submarine passageways and anchialine pools. Two of the most important caves in Bermuda are Church and Bitumen Caves, situated beneath Ship's Hill. Church Cave contains the largest underground lake in Bermuda. The saltwater lakes of these caves contain at least 11 species of endemic troglobitic invertebrates (Iliffe 1997).

Species of major significance

Biodiversity assessment

The biodiversity of Bermuda is relatively well known, with over 3,450 publications relating to the fauna and flora of the island. A recent assessment of biodiversity at a species level, indicates that Bermuda has at least 8,299 species of which 4,597 are marine and 3,702 are terrestrial (Sterrer 1998).

In February 1997 the BAMZ and BZS launched the Bermuda Biodiversity Project which aims to promote informed management of the island's natural resources. Through this ongoing project published and unpublished information on all species is being collated and entered into a database which is linked to the GIS database being developed by the Department of Planning. Information gaps are being addressed through fieldwork with particular emphasis on detailed mapping of fragile ecosystems. The data will be used directly by local planners, resource managers

and conservationists to provide a rational basis for conservation activities and sustainable resource use.

Plants

The flora of Bermuda is well studied although most of the published accounts were produced early in this century. There are 165 native vascular plant species, 15 of which are endemic. The conservation status of flowering plants and ferns has been studied and measures are being taken to propagate rare species in the Botanical Gardens and to enhance wild populations. Endemic flowering plants and ferns are as follows.

Non-woody plants

Adiantum bellum. a fern found in deep road cuttings and on rough stone boundary walls, it is quite widespread and apparently not threatened. This species may also occur in Guyana.

Carex bermudiana (R): rare sedge which is found in the Paget Marsh Nature and at five upland sites.

Bermuda snowberry *Chiococca bermudiana* (R): a sprawling bush or vine, it is generally found on hillsides and woody areas. It is uncommon but still widespread.

Bermuda cave fern *Ctenitis sloanei*. rare, it survives in Walsingham.

Diplazium laffanianum (EX): now extinct in the wild, this fern was formerly found in the caves of Paynter's Vale and Walsingham districts, and last found in Walsingham at the turn of the century. A few specimens survive in the Bermuda Botanical Gardens.

Bermuda spike rush *Eleocharis bermudiana* (EX): believed extinct, it formerly occurred in peat marshes of lowland valley areas.

A fleabane *Erigeron darrellianus*. fairly common and widespread throughout Bermuda in sandy or rocky coastal situations.

Goniopteris bermudiana (E): an endangered fern, it survives only in rocky holes and sinks in the Walsingham area.

Hypericum macrosepalum (Guttiferae): an endangered shrub that was once frequent on hillsides and marshes. Land development and competition from introduced plants have reduced the species to a few isolated localities.

A wild pepper *Peperomia septentrionalis* (R): a rare species of 'wild pepper', this succulent herb is mainly on pinnacle rock and in sink-holes of the Walsingham geological formation between Harrington Sound and Castle Harbour at the east end of Bermuda.

A vine *Phaseolus lignosus* (E): an endangered climbing vine, known only from one small hillside site.

Blue-eyed grass *Sisyrinchium bermudiana*. common and widespread in Bermuda it thrives in any open sunny site, mainly in coastal areas. It is not certain that this species is endemic: it may also occur naturally in south-west Ireland.

Trees

Bermuda olivewood *Elaeodendron laneanum* (VU): a rare evergreen tree which survives naturally on rocky hillsides in the Eastern End, Harrington Sound, Walsingham and Abbotts Cliff areas. Propagation as an ornamental tree has greatly increased its distribution parks and gardens since 1960.

Bermuda cedar *Juniperus bermudiana* (CR): over 95% of the trees of this valuable timber species have been lost through infestation by a scale insect accidentally introduced in the 1940s. Since then a scale resistant strain has evolved with the aid of biological controls. Although the population has recovered to 10% of its former abundance, competition from a host of introduced and invasive broad-leaved trees is preventing a full recovery.

Bermuda palm *Sabal bermudana* (EN): restricted to

small areas of natural vegetation, it is an ornamental species, well established in cultivation.

The bryophyte flora consists of 51 species with two endemic species of moss recorded. These are *Campylopus bermudiana* and *Trichostomum bermudianum*.

Invertebrates

The following information on insects is taken from Sterrer (1998). Records for Lepidoptera cover 183 species of which 50 resident species are identified as probably indigenous and 11 species and three subspecies are endemic. One of these, a geometrid moth *Semiothisa ochrifascia* is believed to be extinct. This species was dependent on the endemic Bermuda cedar *Juniperus bermudiana*. There are 228 recorded species of Coleoptera with no endemics (Hilburn and Gordon 1989) and 258 species of Diptera, including 17 endemic species (Woodley & Hilburn 1994). In total there are about 44 endemic insect species of which 16 are thought to have become extinct this century. These include a cicada *Tibicen bermudiana* and the Bermuda flightless grasshopper *Paroxya bermudensis*. Seven dragonflies and three damselflies are recorded for Bermuda (Wingate 1996).

The caves of Bermuda have a rich and diverse marine biota. More than 250 species of macro-marine invertebrates have been identified from the caves including 42 new species, 14 new genera, one new family (of Isopoda) and two new orders (of Peracarida and Copepoda). Sixty of these taxa are endemic. Twenty-five species of invertebrates are considered to be critically endangered (IUCN, 1996; Iliffe 1997).

A copepod *Antriscopia prehensilis* (CR): known only from five mature specimens collected in Roadside Cave (Walsingham Tract).

An isopod *Atlantasellus cavernicolus* (CR): a small, unpigmented, eyeless isopod known only from Walsingham Sink Cave (Walsingham Tract).

A shrimp *Barbouria cubensis* (CR): the Bermuda

population is known only from Tucker's Town, Chalk, and Admiral's Caves (Walsingham Tract). This cave-limited shrimp species is also known from Cuba, the Bahamas, Cayman Islands, Jamaica and Yucatan (Mexico).

An isopod *Bermudalana aruboides* (CR): known only from Church, Bitumen and Wonderland Caves (Walsingham Tract), Bermuda.

A mysid *Bermudamysis speluncola* (CR): a monotypic genus known from Green Bay Cave (Shelly Bay) and Castle Grotto, Cherry Pit, Palm, Walsingham, Leamington Caves and Grenadier Pool Bermudian caves.

An amphipod *Bogidiella (Antillogiella) bermudensis* (CR): blind and unpigmented, it is known from six specimens collected from Walsingham and Roadside Caves (Walsingham Tract).

An amphipod *Cocoharpinia iliffei* (CR): known only from Walsingham Cave (Walsingham Tract).

An isopod *Currassanthura bermudensis* (CR): known only from a single specimen washed from coarse sediments on the shore of Church Cave. The other two species of the genus occur in subterranean habitats in the Canary Islands and Curacao (Netherlands Antillies).

A copepod *Erebonectes nesioticus* (CR): known only from Christie's, Church, and Bitumen Caves (Walsingham Tract) and Devonshire Cave (Devonshire). The Bermuda Government is confident that strict environmental controls, monitoring and mitigation measures will protect the species from the threat posed by the resort housing development in the vicinity of Christie's, Church and Bitumen caves.

An amphipod *Idunella sketi* (CR): known only from Walsingham Cave (Walsingham Tract).

An amphipod *Ingolfiella longipes* (CR): known only from a single specimen collected in 1978 at Walsingham Sink Cave (Walsingham Tract),

Bermuda. Despite repeated collection efforts, no additional specimens have ever been collected.

A polychaete *Mesonerilla prospera* (CR): known only from Walsingham, Cripplegate, Deep Blue, Emerald Sink, Cherry Pit, Myrtle Bank, Church and Bitumen Caves (all in the Walsingham Tract).

A peracarid crustacean *Mictocaris halope* (CR): a blind and unpigmented troglobitic species of known only from Green Bay Cave (Shelly Bay) and Crystal, Roadside and Tucker's Town Caves (Walsingham Tract).

A copepod *Nanocopia minuta* (CR): known only from two specimens collected in Roadside Cave (Walsingham Tract).

A copepod *Paracyclopia naessi* (CR): known only from Chalk Cave (Devil's Hole); Christie's, Southdown and Tucker's Town Caves (Walsingham Tract); and Devonshire Cave (Devonshire). The monotypic genus *Paracyclopia* is the only representative of the calanoid family *Pseudocyclopiidae* in Bermuda. Previous records of this family included only specimens from a single genus inhabiting waters around the British Isles and Norway.

A tubificid *Phallogrilus macmasterae* (CR): a transparent tubificid known only three specimens collected from Prospero's Cave (Walsingham Tract), Bermuda.

A mysid *Platyops sterreri* (CR): known only from five specimens collected in Castle Grotto (Walsingham Tract) and Green Bay Cave (Shelly Bay).

A shrimp *Procaris chacei* (CR): known only from two specimens collected in Green Bay Cave (Shelly Bay), Bermuda.

An amphipod *Pseudoniphargus grandimanus* (CR): this troglobitic amphipod is common in the groundwater lenses of Bermuda, most frequently in the moderately saline sections, including the anchialine cave waters of Roadside, Wonderland, Church, Bitumen, Admiral's, Shop and Bat Caves

(all in the Walsingham Tract). Before its discovery in Bermuda, this genus had been known from inland groundwaters around the Mediterranean basin, in Atlantic drainage systems of Portugal and Spain, and in the Azores.

A shrimp *Somersiella sterreri* (CR): the Bermudan population is known from only two specimens collected from Tucker's Town Cave (Walsingham Tract) and Chalk Cave (Devil's Hole). The shrimp also inhabits caves in the Bahamas, Yucatan Peninsula (Mexico) and Cuba.

An ostracod *Spelaeoecia bermudensis* (CR): this species has been reported from Jane's, Bitumen, Christie's, Church, Crystal, Fern Sink, Green Bay, Roadside, Tucker's Town, Walsingham Sink, and Wonderland Caves (all in the Walsingham Tract).

A copepod *Speleoithona bermudensis* (CR): a minute diaphanous cyclopid known only from Walsingham, Bee Pit, Church and Bitumen Caves (Walsingham Tract).

A copepod *Speleophria bivexilla* (CR): known only from Roadside Cave (Walsingham Tract).

A copepod *Speleophria scottodicarloi* (CR): known only from a single specimen collected in Chalk Cave (Devil's Hole).

A shrimp *Typhlatya iliffei* (CR): known only from Tucker's Town and Bitumen Caves (Walsingham Tract), the closest relative of this shrimp is *T. rogersi* from Ascension.

Fish

The list of fish recorded for Bermuda consists of 430 species in 107 families. These are mostly inshore species recorded from depths above 200 m. Three endemic species of *Fundulus* are found in brackish ponds and marshes.

Reptiles

Bermuda has one indigenous terrestrial lizard

Eumeces longirostris, an endemic skink which is declining and now rare on the main islands. Healthy populations remain on a few smaller islets. The skink is the subject of an intensive study as part of the Bermuda Biodiversity Project (Davenport *et al.* 1997; Raine 1998).

Four sea turtle species forage in Bermuda waters. Foraging turtles are reported to be moderately abundant.

Loggerhead turtle *Caretta caretta* (EN). Breeding and foraging have been reported (UNEP/IUCN 1988). The last breeding attempt was in 1991.

Green turtle *Chelonia mydas* (EN): formerly nesting on Bermuda, green turtles became extinct as a nesting species by 1934 (Groombridge & Luxmoore 1989). An experiment to restore this species as a breeder was carried out between 1968 and 1978 by transportation, and hatching of egg clutches; 16,000 hatchlings were released on Bermuda beaches. Bermuda supports an abundant population of juvenile turtles which are the subject of a lengthy tag and recapture study through the BAMZ (Meylan *et al.* 1992).

Leatherback turtle *Dermodochelys coriacea* (EN): no nesting has been reported. They may be observed foraging around Bermuda (UNEP/IUCN 1988).

Hawksbill turtle *Eretmodochelys imbricata* (CR): no nesting has been reported. Low numbers of hawksbills are known to forage on the reefs of the Bermudan platform (Groombridge & Luxmoore 1989).

Birds

A checklist of the birds of Bermuda is provided by Wingate (1973) and Amos (1991) and includes over 350 species. Resident and breeding species are relatively few, with nine surviving indigenous species, one reintroduced, three recent colonisations and six introductions. The Bermuda petrel *Pterodroma cahow*, and the Bermuda white-eyed vireo *Vireo griseus bermudianus* are endemic to Bermuda.

Bermuda petrel *Pterodroma cahow* (EN). This species was once an abundant nesting seabird throughout Bermuda. The introduction of mammal predators before and during early European settlement (1560–1620) caused rapid extermination from the main and largest inhabited islands. It was lost to science for three and a half centuries until 18 pairs were found breeding on tiny rocky islets (total area 1 ha) in Castle Harbour during 1951. Since 1961, intensive management, including the creation of artificial burrows and the elimination of nest-site competition by the white-tailed tropicbird *Phaethon lepturus*, has resulted in an increase to 55 pairs (Wingate 1998) with 30 young fledged.

Bermuda white-eyed vireo *Vireo griseus bermudianus*. This species is known in Bermuda as the chick-of-the-village. Numbers declined as a result of the loss of Bermuda's extensive cedar forests (*Juniperus bermudiana*), although they continue to thrive in parks and larger remaining woodlands.

Marine mammals

Bermuda is an important area for migrating humpback whales *Megaptera novaeangliae* (VU). Sperm whales *Physeter catodon* (VU), blue whales *Balaenoptera musculus* and northern right whales *Eubalaena glacialis* (EN) may occasionally occur in Bermudan waters. Also known from Bermuda are Cuvier's beaked whale *Ziphius cavirostris*, short-finned pilot whale *Globicephala macrorhynchus* and minke whale *Balaenoptera acutorostrata*.

Species protection

- **Protection of Birds Act 1975:** 'Protected birds' include all non-captive-bred species, except four pest species (*viz.* American crow *Corvus brachyrhynchus*, house sparrow *Passer domesticus*, starling *Sturnus vulgaris* and kiskadee *Pitangus sulphuratus*) (see Protected areas above).
- **Tree Preservation Orders:** (see Protected areas above).

- **Protected Species Order 1978:** includes all corals, sea turtles, marine mammals and threatened species of molluscs and fish.

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Dr T.M. Iliffe, Department of Marine Biology, Texas A&M University, Texas USA.

Brian Rowlinson, Permanent Secretary, Ministry of Environment, Bermuda.

Key names and addresses

Ministry of the Environment, Government Administration Building, 30 Parliament Street, Hamilton HM 12, Bermuda. Tel: 441 297 7590; fax: 441 292 2349.

Department of Planning, Government Administration Building, 30 Parliament Street, Hamilton HM 12, Bermuda. Tel: 441 297 7752; fax: 441 295 4100; e-mail: bdaplan@ibl.bm.

Department of Agriculture and Fisheries (CITES Authority), PO Box HM 834, Hamilton HM CX, Bermuda. Tel: 441 236 4201; fax: 441 236 7582.

Conservation Unit, Parks Department, Ministry of Youth Development, Parks, Sports & Recreation, PO Box HM 834, Hamilton HM CX, Bermuda. Tel: 441 4201, fax: 441 236 3711.

Bermuda Aquarium, Museum and Zoo and the Bermuda Zoological Society, PO Box FL 145, Flatts FL BX, Bermuda. Tel: 441 293 2727; fax: 441 293 3176; web site: www.bamz.org

Bermuda National Trust, PO Box HM 61, Hamilton HM AX, Bermuda. Tel: 441 236 6483; fax: 441 236 0617.

Bermuda Audubon Society, PO Box 1328, Hamilton HM FX, Bermuda. Tel: 441 297 2623.

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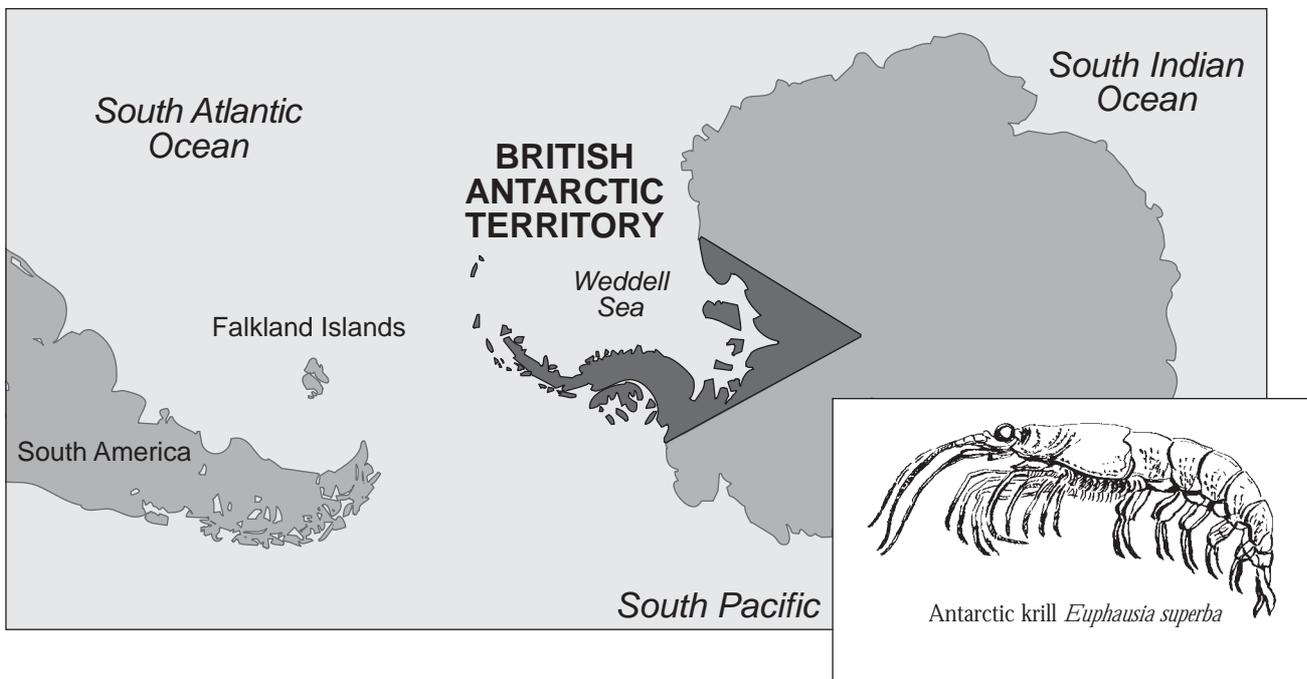
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5: British Antarctic Territory



Introduction

The British Antarctic Territory (BAT) lies between longitudes 20° and 80° W, south of latitude 60° S. It includes the South Orkney Islands, the South Shetland Islands, the mountainous Antarctic Peninsula (highest point Mount Jackson, 4,151 m, in Palmer Land) and all adjacent islands, and the land mass extending to the South Pole. BAT has a three nautical mile territorial limit. The land mass is largely ice-covered; the sea areas adjacent to Antarctica are seasonally frozen. The Territory has no permanent inhabitants; the population consists largely of visiting research workers. BAT is administered from London by the Head of the FCO's Overseas Territories Department (OTD) who is appointed Commissioner of the Territory. The Head of the Polar Research Section (OTD) acts as Administrator.

Only a summary of international obligations, legislative provisions relating to nature conservation, and key contacts are provided here. Comprehensive information on the biodiversity of this territory is researched by, and is available through, the British Antarctic Survey.

International obligations relevant to nature conservation

- The Antarctic Treaty
- The Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA)—not ratified
- The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR)
- Convention for the Conservation of Antarctic Seals (CCAS)
- The Protocol on Environmental Protection to the Antarctic Treaty

Implementation

The Antarctic Treaty: Legislation on the conservation of the Antarctic has been built up through the Agreed Measures for the Conservation of Antarctic Fauna and Flora of the

Antarctic Treaty, and subsequent measures, decisions and resolutions from Antarctic Treaty Consultative Meetings. The objectives of the Antarctic Treaty are to “ensure that Antarctica is used for peaceful purposes, for international co-operation in scientific research, and does not become the scene or object of international discord.” An important element of the Antarctic Treaty is given in Article IV—the sovereignty umbrella—which holds in abeyance any territorial claims within the Treaty area.

The following conventions, protocols and agreed measures have resulted from annual meetings of the Treaty Parties.

The Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA):

establishes objectives and institutions for the regulation of possible mineral resource activities. The Convention has not been ratified by the requisite number of Parties and is therefore not in force. CRAMRA has largely been superseded by the Protocol on Environmental Protection to the Antarctic Treaty of 1991 which provides for an indefinite prohibition on mineral activities.

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR):

provides a legal framework for the management of fisheries south of the Antarctic Convergence. The ecosystem approach taken by CCAMLR means that commercial fishing must take into account not only the impact on the target species, but also the impact on those species which are its predators and prey. This approach ensures that the implications of fisheries on the whole food chain are considered. Any harvesting and associated activities in the area south of 60°S are governed by the conservation principles laid down in Article II of the Convention.

The Convention for the Conservation of Antarctic Seals (CCAS):

the objective is to “promote and achieve the protection, scientific study and rational use of Antarctic seals, and to maintain a satisfactory balance within the ecological

system of the Antarctic.”

The Protocol on Environmental Protection to the Antarctic Treaty: Parties to the Protocol are committed to the comprehensive protection of the Antarctic environment and dependent and associated ecosystems. The Protocol also designates Antarctica as a natural reserve, devoted to peace and science. The Protocol has five annexes:

- Annex I Environmental Impact Assessment
- Annex II Conservation of Antarctic Fauna and Flora
- Annex III Waste Disposal and Waste Management
- Annex IV Prevention of Marine Pollution
- Annex V Area Protection and Management.

Annex V has yet to be approved by all Parties, and is therefore not in force, although its provisions are in de facto operation. The UK enacted domestic legislation to enforce the provisions of the Protocol through the Antarctic Act 1994 and Antarctic Regulations 1995.

In addition to the legal instruments and measures of the Antarctic Treaty System, activities in Antarctica are also subject to a variety of legal obligations that stem from treaties that are more broadly applicable, such as the International Convention for the Regulation of Whaling.

Protected areas

Specially Protected Areas (SPAs) have been designated under Article VIII of the Agreed Measures; special protection is given to preserve unique natural ecological systems or those of outstanding scientific interest.

Sites of Special Scientific Interest (SSSIs) provide protection for sites which are important for scientific research. Access and types of activity permitted are regulated according to management plans.

Further categories agreed, but not in force, include

Specially Reserved Areas (SRAs) and Multiple Use Planning Areas (MPAs). SRAs are designated for the protection of representative examples of areas of outstanding aesthetic, scenic and wilderness value. MPAs cover high-use areas where co-operative planning of human activities is necessary to minimise harmful environmental impacts.

When ratified, Annex V to the Protocol on Environmental Protection to the Antarctic Treaty, Area Protection and Management, will rationalise the protected area system by allowing for the designation of two categories of protected areas: Antarctic Specially Protected Areas and Antarctic Specially Managed Areas.

Six Sealing Zones and three Seal Reserves have been established under the Convention for the Conservation of Antarctic Seals. Two sites, Seal Islands and Cape Shirreff, have been designated as CCAMLR Eco-system Monitoring Programme (CEMP) sites under the CCAMLR Conservation Measure.

Species protection

- **The 1964 Agreed Measures for the Conservation of Antarctic Flora and Fauna** include prohibitions on the killing, wounding, capturing or molesting of any native mammal or native bird except in accordance with a permit; and regulations on the importation of non-indigenous species, parasites, and diseases. Permits may be issued only by persons authorised by a participating Government. Certain species can be designated 'Specially Protected Species'. The 1964 Agreed Measures though legally still in force, have been superseded by Annex II to the Environmental Protocol. (Further details are given in the section on international obligations.)
- **The 1972 Convention for the Conservation of Antarctic Seals:** this entered into force in 1978. The Convention contains comprehensive measures to regulate any taking of seals, including specifying permissible catch levels, protected species, and the opening and closure of sealing

seasons and zones, and it establishes three Seal Reserves. The Convention is subject to regular review and has been used as a conservation, rather than resource utilisation, instrument.

- **The 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR):** provides a legal framework for the management of fisheries south of the Antarctic Convergence. It established an Executive Commission and an Advisory Scientific Committee which meet annually at their headquarters in Hobart, Tasmania, Australia.

BAT also possesses a suite of its own up to date legislation, this includes Ordinances dealing with flora and fauna. Section 7 of the Antarctic Act prohibits entry into certain protected areas without a permit. Strict permitting provisions also relate to taking or harmful interference of wildlife.

Key names and addresses

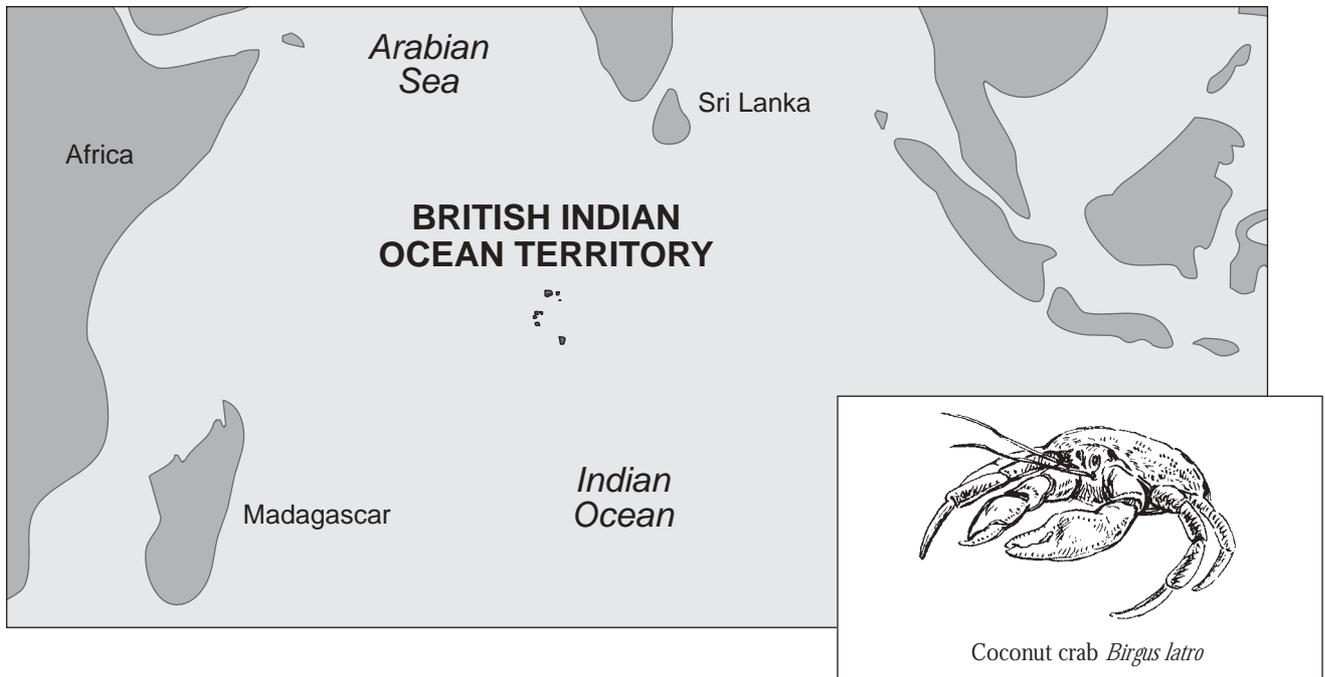
The Administrator, British Antarctic Territory,
Foreign and Commonwealth Office, King Charles
Street, London SW1A 2AH.

Polar Regions Section, Overseas Territories
Department, Foreign and Commonwealth Office,
King Charles Street, London SW1A 2AH.
Tel: 0171 270 1500.

British Antarctic Survey (The Director), High
Cross, Madingley Road, Cambridge CB3 0E.
Tel: 01223 321400; fax: 01223 32616;
web site: <http://www.nbs.ac.uk>.

A vast literature exists for the Antarctic as a whole and more specifically for the BAT. The British Antarctic Survey has a comprehensive reference facility to which access can be gained through their web site.

6: British Indian Ocean Territory



Introduction

The British Indian Ocean Territory (BIOT) covers 54,400 km² of ocean, including the reefs and islands of the Chagos Archipelago. The islands within the territory cover a total of around 60 km², and lie between 4 and 8°S and 70 and 75°E. The total area of near-surface coral reefs is some 4,000 km², which is approximately 1.5% of the total global area of reefs, a very major proportion of an important and increasingly threatened global heritage. The nearest neighbouring islands and reefs are those of the Maldives, with the southernmost atoll, Addu, being some 500 km to the north, separated by a channel some 2,200–3,300 m deep. The nearest continental land-area is that of Sri Lanka, which is over 1,500 km distant. To the west, the Seychelles lie over 1,800 km away, and the mainland coast of East Africa some 3,400 km distant. The Andaman and Nicobar Islands, the coast of Sumatra and Cocos Keeling Islands lie approximately 3,500 km to the east. The islands and reefs form the southernmost part of a long shallow ocean ridge, the Laccadives–Chagos Ridge, which runs almost

directly north–south. The Archipelago consists of a variety of reefs with their associated low-lying coralline islands. There are five atolls: Chagos Bank, Peros Banhos, Salomon, Egmont and Diego Garcia; and ten reefs and submerged shoals including Blenheim Reef, Speakers Bank, Pitt Bank and Centurian Bank.

BIOT was established by an Order in Council on 8 November 1965, having been a British territory since 1814, but formerly administered as a dependency of Mauritius. At present, land use is for military purposes only. There are licensed fisheries, notably for offshore tuna fishing, and a licensed reef fishery operated by Mauritian fishermen who visit the reefs for a few months each year (BIOT Administration 1997).

International obligations relevant to nature conservation

- Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)

- 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: the BIOT Administration has asked the UK to arrange to have the provisions of the Ramsar Convention extended to BIOT and will propose possible sites for listing under the Convention.

World Heritage: the World Heritage quality of the territory is recognised in the BIOT Conservation Policy Statement (October 1997) which specifies that BIOT will be treated in accordance with the requirements of the Convention subject only to defence requirements.

CITES: controls are implemented through the Green Turtles Protection Regulations 1968 and, more generally, through the Imports and Exports Control Ordinance 1984.

Protected areas

Because of its military status, the whole of the BIOT acts as a *de facto* protected area. Environmental policy of the US Navy (OPNAVINST 5090.1) applies to Diego Garcia.

BIOT legislation to designate protected areas is:

- **The Protection and Preservation of Wild Life Ordinance 1970 (Ordinance No. 1 of 1970):** provides for the protection and preservation of wildlife. Under this Ordinance the Commissioner may make regulations to declare any island or part thereof to be a 'Strict Nature Reserve' or 'Special Reserve'. A Strict Nature Reserve is defined as an area:

“set aside to permit the free interaction of natural ecological factors without any outside interference; throughout which any form of hunting or fishing, any undertaking connected with forestry, agriculture, any excavations, levelling of the ground or construction, any work involving the alteration of the soil or the character of the vegetation, any water pollution and, generally any act likely to harm or disturb the fauna or flora is forbidden; where it is forbidden to enter, traverse, camp or reside, and over which it is forbidden to fly at low altitude; and where it is forbidden knowingly to introduce non-indigenous wild life.”

A Special Reserve is defined as an area:

“in which any particular species of wild life requires protection and in which all other interests and activities shall, whenever possible, be subordinated to that end.”

At present no area has been designated as a Special Reserve, but the Strict Nature Reserves Regulations 1998, which were made on 18 September 1998 and came into operation on 1 November 1998, declared the following islands (including their international waters and the territorial sea appurtenant to them and also any reef of bank situated therein) to be Strict Nature Reserves: the Three Brothers and Resurgent Islands, Danger Island, Cow Island, Nelson Island and all islands in the Peros Banhos atoll to the east of a line drawn between the eastern most points of Moresby Island and Fouquet Island. Under these Regulations, it is now an offence for anyone to enter any of these Reserves, or to carry out various specified activities there, without the written permission of the BIOT Government.

- **The Diego Garcia Conservation (Restricted Area) Ordinance 1994 (Ordinance No. 6 of 1994).** Under this Ordinance, which came into force on 24 November 1997, a substantial part of Diego Garcia has been designated as a restricted area (i.e. an area into which entry otherwise than on official business is forbidden except as

expressly authorised by permit). The restricted area has been further divided into a Nature Reserve Area and a (more closely controlled) Strict Conservation Area. The latter includes the islets at the mouth of the Diego Garcia lagoon.

Habitats of major significance

Reefs

Both in their structure and in their isolation the reefs of the Chagos can be seen as very typical of many atolls around the world. Although distant from other reefs, their relation to reefs across the Indian Ocean of is considerable interest. They lie at the southernmost end of the Chagos Laccadive Ridge, a vast chain of atolls stretching over 2,500 km from the northernmost of the Lakshadweep (formerly Laccadive) islands in the north to Diego Garcia in the south, traversing the equator. There is clear evidence that biodiversity levels among corals increase to the south along this chain, with 64 hermatypic coral ('brain coral') genera recorded from the Chagos, only 38 from the northern Maldives; and only nine from Lakshadweep (Sheppard 1981a). It is also rich in reef fishes (Winterbottom & Anderson 1997).

Lying right in the centre of the Indian Ocean, it has also been speculated that the Chagos Archipelago may provide a crucial link between the coral reefs to the east and west. High levels of biodiversity are maintained across the Indian Ocean and the Chagos Archipelago is a crucial link in this (Veron 1995; Sheppard 1999).

Irrespective of their closest affinities, the fact that the Chagos reefs are among the most species-rich in the Laccadive–Maldivian–Chagos chain, and provide a link between west and central Indo-Pacific communities, is very interesting. Without the Chagos reefs the distance between west and central Indo-Pacific would effectively be over 5,000 km. While the faunal affinities of Chagos reefs would support the idea of some, restricted movement of species between both sides of the Indian Ocean and the Chagos, there has been no detailed analysis to date which might cast some light upon rates of flow of genetic material across the Indian Ocean, and

hence the importance of the Chagos Archipelago as a link between otherwise isolated communities.

Seagrass beds

These are not widespread, and the only known area of seagrasses of significant size lies on the eastern side of the lagoon at Diego Garcia. A number of fish species have been recorded in these seagrasses which have not yet been seen anywhere else in the Archipelago.

Terrestrial environment

On land many of the islands have undergone considerable changes since the first human settlements were established in the late 18th century. Originally heavily wooded the majority of the islands were cleared for coconut plantations, while the inhabitants also brought rats and other animals (donkeys, cats and chickens are still reported from some islands) which had considerable detrimental impacts on native flora and fauna (Bellamy 1979).

Vegetation of the main island has been substantially modified over the centuries. It consists of coconut groves (planted since the 1780s), woodland of *Casuarina* (Casuarinaceae), fan flower *Scaevola* (Goodeniaceae) scrub, marshland and relict broad-leaved woodland of fig *Ficus* (Moraceae), *Morinda* (Rubiaceae) and *Terminalia* (Combretaceae). The few islands that never had any inhabitants were generally very small and isolated. Small but important patches of hardwood forest remain on a number of these, including the Brothers (Great Chagos Bank) and also a few islands on northern Peros Banhos (see Fosberg & Bullock 1971; Davis *et al.* 1986). A feasibility study for restoring native vegetation was carried out during the 1978–1979 Joint Services Expedition (Baldwin 1975).

There is a small stand of the mangrove *Lumnitzera racemosa* on Eagle Island, with an associated peat bog: this may well be one of the most isolated mangrove communities in the world.

The smaller islands remain relatively undisturbed, and some still support isolated stands of original hardwood vegetation.

The ecology of Diego Garcia is documented by Stoddart and Taylor (1971).

Species of major significance

Biodiversity assessment

BIOT has received a relatively large amount of scientific attention. Three expeditions in the 1970s, (see for example, Sheppard 1979, 1980, 1981), developed a considerable body of data and a long list of publications on the islands and reefs of a mainly descriptive nature. These were largely funded by the UK Ministry of Defence. Another research visit in 1996 by nearly 20 island and reef scientists was designed specifically to provide information on the biological functioning of this remote coral area, and on its biogeographical importance, all with the primary intention of obtaining data on which to base conservation activity and to guide conservation policy in the future (Sheppard 1996). The Foreign and Commonwealth Office largely funded this work. A comprehensive volume *The ecology of the Chagos Archipelago* (Sheppard & Seaward 1999) was published in 1999.

Endemic species are not common in Chagos. Some have been recorded for BIOT including one marine alga (Rhyne 1971), one hermatypic coral (brain coral) *Ctenella chaguis* (Sheppard 1981a, b) and one gastropod (Taylor 1971). In addition to these described endemics, there are a number of other specimens which may, on further investigation, prove to be new to science, and it seems likely that further species inventory work and genetic analysis will identify other new endemics from the reefs of Chagos. A lack of endemic species in such a geographically isolated group reaffirms the important stepping stone role of this group of reefs.

Plants

A checklist of vascular plants of Diego Garcia is provided by Topp and Seaward (1999). About 280 flowering plants and ferns have been recorded in the Chagos Archipelago. There are no endemic

species. No species are of particular conservation concern at present.

The 1996 Chagos Expedition provided the first opportunity to study the terrestrial lower plant flora in detail. Records were made of nine mosses, seven liverworts, 52 lichen species, 21 fungi and one alga.

The marine algae of BIOT include 105 taxa reported for the Diego Garcia Atoll and 71 taxa for the northern banks and atolls (Basson & Joliffe 1997).

Invertebrates

Sheppard (1981) described the reefs of the Chagos Archipelago as being the most speciose reefs known for hermatypic corals in the Indian Ocean. The faunal affinities of the Chagos have, as might be predicted, close affinities to both the Indonesian high diversity fauna and the East African faunas, but they also show significant differences from both of these. Thus, for the corals there are a number of genera from Indonesia which are not found in the Chagos, but also four East African genera are absent (Sheppard 1981).

The brain coral *Ctenella chaguis* is the only extant representative of the family Meandrinidae in the Indo-Pacific, although this family was widespread in the Cretaceous (Veron 1995).

Over 384 species of mollusc are recorded for BIOT.

The coconut crab *Birgus latro* (DD) occurs on all the atolls and most of the islands of the Great Chagos Bank (Dinesen 1977; Sheppard 1979, 1984; Topp pers. comm.).

Insects

A checklist of insects is provided by Hutson (1981) and Barnett and Emms (1998a). The 1996 Chagos Expedition identified 95 insect species, which included 35 previously unrecorded species (Barnett & Emms 1996, 1999). A new moth species *Stictoptera hironisi* was discovered and a new endemic subspecies of the hawkmoth *Macroglossum*

corythus was recorded in good numbers (Barnett, Emms & Holloway in press). The two other endemic subspecies of butterfly *Jamonia villida* and *Hypolimnus bolina* were also recorded, the former in very good numbers (Barnett & Emms 1998b). Six species of damselfly and dragonfly were recorded, with two being new records for the Chagos (Barnett & Emms 1997a).

The expedition also discovered a sizeable colony of the sea strider *Halobates* sp. probably *flaviventris* in Turtle Cove, Diego Garcia. This is an unusual species in that it is a marine insect found on floating seaweed and on the surface of the sea itself, in tropical and sub-tropical seas (Barnett & Emms pers. comm.).

Fish

Three species of fish are endemic to BIOT: an anemone fish, *Amphiprion chagosensis*; a goby, *Trimmatom offuscus* and a worm fish, *Paragunellichthys fehlmani*. A fourth likely endemic, a razorfish *Xyrichtys* sp. has yet to be described (Winterbottom & Anderson 1997, Winterbottom pers. comm.).

The known fish fauna for the region, some 773 species (Winterbottom & Anderson 1997), is less than the estimated figures for the Maldives (Anderson & Buttress 1996) and the Seychelles (Polunin 1984). However, the search effort in the latter two countries has been far greater, and there are undoubtedly many more species remaining to be recorded in the Chagos waters. For fish there are closer affinities to East Africa than are found on the reefs in the central and northern Maldives. Some 7.3% of Chagos fish species are restricted to the Western Indian Ocean (Winterbottom & Anderson 1997). By comparison some 15% of the Seychelles fish fauna are restricted to this region (Polunin 1984).

Routine monitoring, fisheries research and resource evaluations have been undertaken on fish stocks through catch and effort logbook monitoring, and observer programmes since the current fisheries management regime in BIOT was introduced in 1991. The Marine Resources

Assessment Group (MRAG Ltd.) manages the fisheries on behalf of the BIOT Administration in the FCO. MRAG and the BIOT authorities have contributed a recent summary of this data outlining both management activities and an assessment of sustainability of fishing within the BIOT inshore fisheries (Mees, Pilling & Barry 1999).

Illegal fishing of sharks in BIOT waters is a problem. Vessels have been observed taking sharks in relatively high numbers from the northern atolls and the 1996 expedition recorded an 85% collapse of reef shark numbers from previous levels recorded in 1978. However, insufficient fishery data are available to enable a shark resource evaluation for Chagos. By-catches from licensed Mauritian inshore vessels may be considered small compared with recorded catches elsewhere in the Indian Ocean (Mees *et al.* 1999). A more significant impact on shark resources may be related to unlicensed fishing activities in the past, principally vessels from South Asia.

Reptiles and amphibians

The marine turtles include green turtle *Chelonia mydas* (EN) and hawksbill turtle *Eretmochelys imbricata* (CR), with about 300 females of each species nesting annually. The most important nesting sites for the hawksbill turtle are Peros Banos and Diego Garcia. Green turtles nest mainly in the Chagos Bank. The leatherback turtle *Dermochelys coriacea* (EN) is a vagrant in the area.

Birds

The total bird list consists of 91 species, with large breeding populations of 16 species (Bourne 1971; Feare 1984; Hutson 1975; Symens 1997; Sheppard & Topp 1999). Although BIOT has no endemic birds, there are internationally important seabird colonies, particularly on the rat-free islands. BIOT's seabird community includes thriving populations of species which are rapidly declining in other parts of the Indian Ocean, such as red-footed booby *Sula sula*, masked booby *S. dactylatra* and lesser noddy *Anous tenuirostris*.

Species protection

- **The Wild Life Protection Regulations 1984:** these Regulations set out prohibited acts with respect to flora and fauna. Under the Regulations most types of animals are protected. It is prohibited intentionally to destroy, damage, or take any birds nest that is being built or used, or any birds egg or turtles egg, and to disturb nesting or dependent young birds. It is also prohibited to take or be in possession of any animal, specified seashell or coral or any specified flora. No species have been specified under the legislation.
- **Fishery Limits Ordinance:** a 200-mile Fishery Management Conservation Zone was established as from 1 October 1991 and a fisheries regime covering all BIOT fishing waters was established on the same day by the Fisheries (Conservation and Management) Ordinance 1991. Commercial fishing within this zone is only allowed under licence. Tuna fishing is prohibited within 12 nautical miles of land. Inshore fishing for demersal species is only permitted from 1 April to 31 October, by hook and line, and not within lagoons. Effort controls are further implemented in both fisheries by limited licensing, based on the best scientific information and adopting the precautionary approach.

Hunting of green turtle *Chelonia mydas* has been completely banned since 1968 (Frazier 1981).

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Cdr John Topp, Friends of the Chagos.

Key names and addresses

Commissioner's Representative, NP 1002, BFPO 485, Diego Garcia, British Indian Ocean Territory.

Friends of the Chagos (Secretary), 29 Champion Hill, London SE5 8AL.

The territory is administered from the Foreign and Commonwealth Office in London by a Commissioner who is assisted by the representative, an officer-in-charge of the Royal Navy complement on the island of Diego Garcia, at the joint UK-US naval base. Enforcement of conservation measures, such as for the existing bird sanctuaries, is the responsibility of the senior UK representative stationed on the island in his role as Magistrate. The United States Navy Officer in command of the Facility on Diego Garcia has responsibility for the implementation of US naval policy on the environment at the base.

The Friends of the Chagos is a UK registered charity established in 1992 to promote conservation, scientific and historical research, as well as to advance education about the Chagos Archipelago. As a non-political association, it aims, for example by promoting scientific expeditions (most recently in 1996), to monitor the status of the marine and terrestrial environment. It provides a channel for bringing relevant environmental problems to the Government's attention, and establishes links with other groups concerned with reef ecology, particularly in the Indian Ocean. The Friends of Chagos also encourage research into the history of the Chagos Archipelago, and seek to educate and make available the results of its work to a wider audience.

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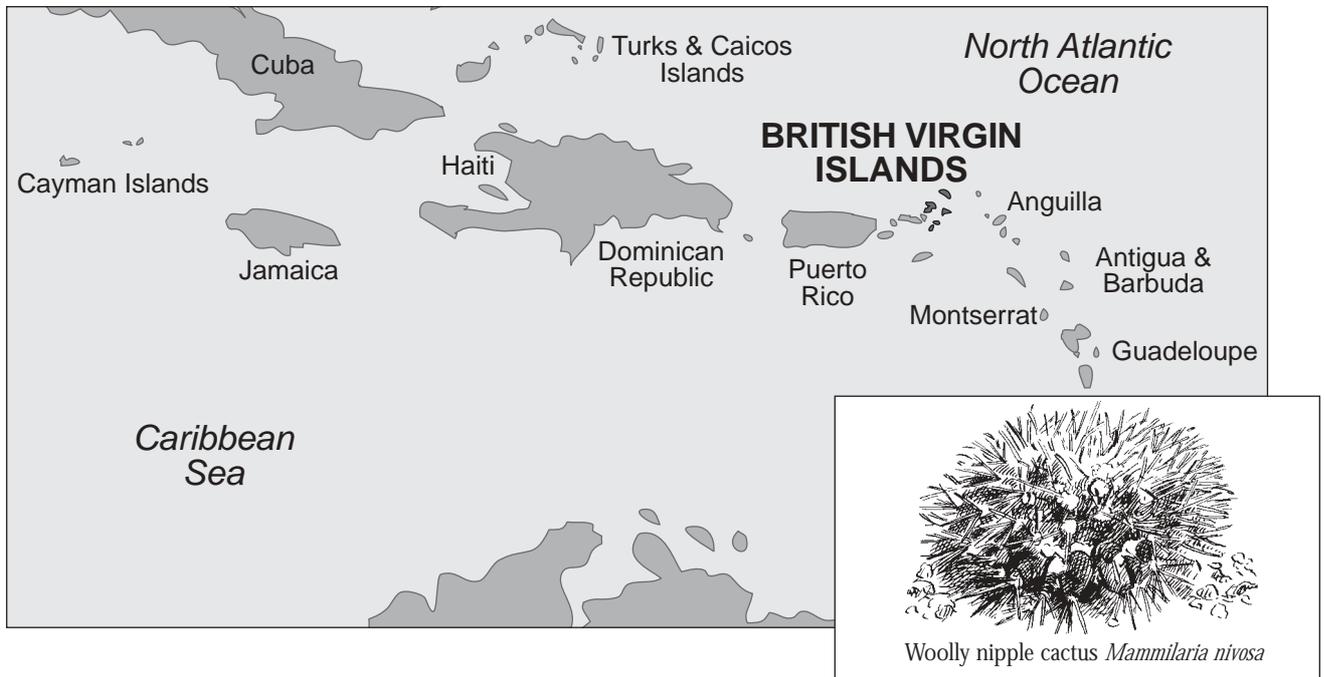
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7: British Virgin Islands



Introduction

The British Virgin Islands (BVI) form part of the Puerto Rican Bank in the eastern Caribbean Sea. There are approximately 40 islands in the group. Most of the islands were uplifted from submerged volcanos and are hilly with steep slopes. By contrast, Anegada is an emergent coral limestone platform. This island is flat with a maximum altitude of 8 m. The combined land area of the islands is 153 km². The largest islands are Tortola (54 km²), Virgin Gorda (21 km²), Anegada (38 km²) and Jost van Dyke (9 km²).

The population of BVI is 17,733 (1991). Over the past ten years there has been a 47% increase in population, mainly as a result of immigration. Tortola is the most developed island and has a population of over 13,500. The main economic activity is now tourism, which has expanded considerably in recent years. Yacht chartering is especially important. The offshore financial services sector is also significant. Development of the tourist industry has had an impact on natural

habitats, putting particular pressure on coastal wetlands and mangrove communities (Scott & Carbonell 1986). As the tourism industry is based on the marine environment, this was a significant factor leading to the development of protected areas in the islands.

A conservation policy was included in BVI's national report for UNCED and approved by its Executive Council (Anon. 1992). The stated policy is "to manage the human use of the biosphere so that it may yield the optimum sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations." Detailed objectives and goals are set out in this UNCED report.

International obligations relevant to nature conservation

British Virgin Islands 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 on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on Biological Diversity (CBD)
- International Convention on the Regulation of Whaling
- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention)— Protocol on Specially Protected Areas and Wildlife

Implementation

Ramsar: BVI joined the UK's ratification of Ramsar in February 1991. The largest wetland area in the British Virgin Islands is the saline lagoon complex at the west end of Anegada, comprising Flamingo Pond, Bones Bight Pond and Red Pond. This area is protected as the Flamingo Pond Bird Sanctuary. It is regionally important as a representative habitat, being one of the largest, relatively undisturbed saline lagoons in the Lesser Antilles, and it is internationally important because of the presence of endemic species and migratory birds. The island of Anegada as a whole is considered to be a priority area for the conservation of mangroves, salt ponds and coral reef habitats within the Lesser Antilles (Putney 1982). Horseshoe Reef, which lies to the south east of the island is one of

the most extensive and diverse reefs of the Caribbean and is protected under the 1990 Order under the Fisheries Ordinance. It is expected that the BVI Government will declare the Western Salt Ponds of Anegada as their first Ramsar site in time for the 7th Conference of Parties in May 1999.

The international conservation importance of Anegada and Horseshoe Reef has been widely recognised and a draft World Heritage nomination was prepared for the Nature Conservancy Council in 1988. Following consultation with the BVI Government it was decided not to proceed with the nomination. A draft information sheet on the Western Salt Ponds of Anegada, in standard Ramsar format, has been prepared by the Conservation and Fisheries Department (Hepburn *et al.* 1992).

Other wetland areas have been identified as potential Ramsar sites (Hepburn *et al.* 1992; Jarecki 1998)

CITES: BVI implements CITES by means of the Endangered Animals and Plants Ordinance 1976. Conservation and trade in the queen conch *Strombus gigas* is addressed through CITES and the Fisheries Act, 1997. Black coral *Antipatharia spp.* has been worked locally in the past but is now protected by BVI legislation and Appendix II of CITES which allows limited, but regulated, trade.

Protected areas

Protected areas in BVI are designated under various Ordinances and with varying degrees of protection.

- **The National Parks Ordinance No. 29 1961 as amended No. 3 1978:** established the National Parks Trust, and provided for the creation of protected areas in the form of national parks to be managed by the Trust.
- **The Marine Parks and Protected Areas Ordinance No. 8 1979:** provides for the creation of a range of categories of protected area, including multiple-use management area or

marine parks and protected area.

- **The Protection of Trees and Conservation of Soil Ordinance Cap. 86, 1954:** provides for protected forestry and water areas, and the Trust currently manages Sage Mountain Protected Forest created under this Act.
- **The Wild Birds Protection Ordinance Cap. 98 1959 as amended 1980:** authorises the Governor to declare protected areas specifically as bird sanctuaries. The provisions of this Ordinance also apply to birds in any marine park or protected area designated under the Marine Parks and Protected Areas Ordinance No. 8.

Other relevant legislation includes:

- **The Fisheries Ordinance No. 18 1979:** the Fisheries Ordinance authorises the Minister of Natural Resources to declare any water area within the exclusive fishing zone (200 miles) to be a protected area. All fishermen must obtain licences and fisheries officers are empowered to confiscate fishing equipment and impose fines. In May 1990 Horseshoe Reef was declared a protected area under the Fisheries Ordinance.
- **The Beach Protection Ordinance 1985.**
- **The Bird Sanctuary (Flamingo Pond, Anegada) Order 1977.**

Several laws deal with protected areas, and this was one of a number of reasons which led to the Government requesting technical assistance from the Organization of Eastern Caribbean States in strengthening and updating its existing environmental legislation. A report was subsequently prepared on the existing legislation (Lausche 1986). Since then two new pieces of environmental legislation have been drafted: a new Protected Areas and Wildlife Act 1987, and a Coastal Conservation and Management Act 1991. This comprehensive legislation is expected to make a major contribution to improving the territory's capacity for sound environmental planning and

management (BVINPT/ECNAMP 1988).

The Protection of Trees and Conservation of Soil Ordinance (Cap. 86) lacks regulations, but contains stronger provisions on offences, enforcement, and legal proceedings than does the National Parks Ordinance. While bye-laws or regulations may be enacted for the management of national parks and the control of public activities under either Act, Lausche (1986) describes the present lack of regulations as a major deficiency. Regulations were passed in 1991 prescribing permitted activities in marine parks and a schedule for fees.

Since 1980 the development of marine parks and protected areas has been the subject of collaboration between the Government and the Eastern Caribbean Natural Areas Management Programme. An initial survey resulted in eight marine areas being identified as warranting protection (Jackson 1981). Following endorsement of these areas by the Government, the project was extended into a second phase of research, planning and implementation. Two particular concerns were to integrate marine and terrestrial components of the protected area system, and to provide recreational areas for the local population. A parks and protected areas system plan for the British Virgin Islands, which identifies the goals, objectives and management requirements of the national parks and protected areas system, has been prepared (BVINPT/ECNAMP 1986).

At present, terrestrial parks cover about 2% of the land area. The 'system plan' sought to incorporate the existing parks into a larger system of comprehensive ecological units, in order to preserve the most important areas of the natural and cultural heritage. Twelve additional parks were proposed, but none of these has yet been declared. This is partly due to the approach adopted in BVI of preparing management plans and strengthening institutions in advance of park declaration (Cambers 1991).

Anegada has been identified as an internationally important wildlife site, with endemic and endangered plant and animal species and important wetland habitats. It has the largest reef complex in the Lesser Antilles, with Horseshoe Reef forming an extension of the fringing reef surrounding the island. Horseshoe Reef is now protected and managed for conservation; several proposals are being considered for the development of a terrestrial park for Anegada. The creation of a sanctuary for the BVI endemic and endangered Anegada rock iguana *Cyclura pinguis* within the proposed national park is currently being considered, and a management plan for the park is being prepared. The plan currently includes all central ponds plus the entire eastern end of the island, including the east-end ponds. The re-introduction of the endangered Caribbean flamingo *Phoenicopterus ruber ruber* has been a success. A total of 20 flamingoes were released on Anegada from the Bermuda Aquarium, Museum and Zoo in 1991. Later two died, but four young flamingos flew in and took up residence with the flock. In 1995, four pairs of the original introduced stock bred and raised four young. In 1997 ten pairs bred and raised eight young (Jarecki *in litt.* 1998).

Flamingo Pond Bird Sanctuary is an existing protected area at the west end of Anegada Island (18°44'N, 64°22'W). Established 1 September 1977, the sanctuary has an area of 449 ha and is Government owned.

Habitats of major significance

The British Virgin Islands comprise just over 40 islands, small cays and rocks, the marine area of the territory being well over five times the size of the land mass. Geologically, the islands belong to the Greater Antilles and, with the United States Virgin Islands, rise from the Puerto Rican shelf, here lying about 65 m below sea level. Most of the islands (with the exception of Anegada) were uplifted from submerged volcanoes and are formed from volcanic debris and metamorphosed sediments. The islands are dominated by steep-sloping hills. Historically BVI was a centre of sugar cane

production but now agricultural production is deterred by the limited water-holding capacity of the light soils, erratic rainfall patterns, and insufficient forest cover to retard steep slope erosion. The dominant natural vegetation is cactus scrub and dry woodland, although much of this has been modified.

The coastlines of BVI are generally rocky. Coral reefs surround many of the islands (UNEP/IUCN 1988; Walters 1984). North coasts of the islands are typically beaches, sometimes with mangrove ponds lying behind them. Fringing mangroves and mangrove lagoons dominate the more sheltered south coasts.

A survey of critical terrestrial and mangrove areas of BVI was carried out in 1981. In 1986 mangroves were designated a critical natural resource at a coastal zone management workshop. Following this, a Mangrove Management Programme was initiated with technical assistance from OECS-NRMU. Mangroves and associated wetlands have been mapped by the Conservation and Fisheries Department under this programme. Field work included noting wildlife species and disturbance at each site. Information was also compiled on land ownership and level of protection. Each site has been categorised in terms of ecological and socio-economic criteria and priorities set: critical, moderate and not critical for conservation (Blok-Meeuwig 1990). Monitoring of mangrove growth began in 1991 at four sites on Tortola with the collection of baseline data at Paraquita Bay and Lagoon, Hodge's Creek and Sea Cow's Bay (Overing 1991).

A habitat atlas of the coastal and marine areas has been prepared for the British Virgin Islands (Blair Myers *et al.* 1993) based on aerial photography, supported by the UK Government and administered through the Department of Conservation and Fisheries. The GIS-based atlas is designed to record information on the extent and location of the key resources for conservation and planning purposes. The coastal inventory shows coastal development, marinas, jetties, beaches,

dunes, mangroves, seagrass beds and coral reefs for the entire BVI.

Salt ponds of BVI are described by Jarecki (1991).

Species of major significance

Biodiversity assessment

Published information on the flora of the British Virgin Islands is generally included in accounts covering Puerto Rico and the Virgin Islands. An unpublished account of the flowering plants of BVI, prepared by J. Smith, which included an outline of the vegetation, descriptions of the endemic plants and summary of recorded species, is referred to in Davis *et al.* (1986). The conservation status of the fauna of BVI is described by Lazell (1980) and concentrates on butterfly, reptile, amphibian and bird species.

Plants

Endemic plants of BVI include the following:

Acacia anegadensis (Leguminosae): a dense, thorny evergreen acacia, endemic to Anegada, it is

known locally as 'pokemeboy' and is planted for shade.

Cynanchum anegadense (Asclepiadaceae): a 'swallow wort'.

Sida eggersii (Malvaceae): the only known large populations of this species are on Guana and Ginger but small populations are reported from Tortola, Great Thatch and Dead Chest. The species formerly occurred on Puerto Rico but has not been seen there since early this century (Kraus *in litt.* 1998).

Species endemic to BVI and US Virgin Islands include Egger's galactia *Galactia eggersii*, and cowage cherry *Malpighia woodburyana*. Both these species are potentially of conservation concern because of their restricted distribution and as such require monitoring (Kraus *in litt.* 1998).

Over 20 plant species are recorded as endemic to the Virgin Islands and Puerto Rico including the following plant species, some globally threatened, which are found in BVI (Center for Plant Conservation 1992).

Table 7.1 Total mangrove swamp areas; including associated habitats such as ponds and salinas

Island	No. of mangrove swamp systems	Mangrove swamp area (ha)
Beef Island	10	35.72
Anegada	9	439.39
Jost van Dyke	1	1.99
Tortola	29	101.18
Virgin Gorda	4	8.61
Total	53	586.89

Sources: Anon. 1992; Blok-Meeuwig 1990.

Cordia rupicola (Boraginaceae) (E): a shrub that is restricted to one population in the Guanica Forest in Puerto Rico, and may now be lost (Kraus *in litt.* 1998) and one population on Anegada, where grazing is the major threat.

Maytenus cymosa (Celastraceae) (EN): a tree species of Puerto Rico and the Virgin Islands, in BVI it is largely restricted to Gorda Peak which has the largest known population of this species where at least 100 plants persist (Oldfield, Lusty & MacKinven 1998). One specimen has been recorded along the coast at Savannah Bay. Part of the population at Gorda Peak may have been affected by a fire in June 1997 which burnt about 25% of the Park (Kraus *in litt.* 1998).

Sabal causiarum (Palmae): a palm species which is restricted to Puerto Rico and the Virgin islands. In BVI, 116 individuals have been reported on Guana Island, and 14 individuals on Anegada.

A further 12 plant species are restricted to Puerto Rico and the Virgin Islands, some are locally threatened. BVI has 15 species of cacti including *Opuntia repens*, which is endemic to Puerto Rico and the Virgin Islands and is not currently considered to be threatened in a regional context (Areces-Mallea 1997), the woolly nipple cactus *Mammillaria nivosa*, which is recorded as endangered in the Virgin Islands (Hunt 1992) but is not considered to be threatened in a regional context (Areces-Mallea 1997), and *Selenicereus urbanii* which is restricted to Guana within BVI (Kraus 1991).

The orchids of BVI are included in Ackerman (1995). Together with all species of cacti and orchids, lignum vitae *Guaiacum officinale* (EN) is also covered by the provisions of CITES. Lignum vitae is extremely rare in BVI (Kraus *in litt.* 1998).

Invertebrates

The following butterfly species are endemic to Anegada (Goodyear *in litt.* 1994):

A satyrine butterfly *Calisto anegadensis*. newly

described in 1991, this endemic butterfly occurs in the area proposed for Anegada National Park. A hesperiid butterfly *Copaodes eoa*. described in 1991, which also inhabits the proposed Park area.

Reptiles and amphibians

BVI has a range of animal species of regional and global conservation significance. The herpetofauna of BVI is particularly noteworthy. There are 24 taxa recorded, of which a quarter are endemic. The Anegada rock iguana *Cyclura pinguis* originally occurred on Puerto Rico and Saint Thomas, as well as Anegada. The range of this critically endangered species is now restricted to Anegada with a small relocated population on Guana Island.

Other endemic reptiles and amphibians include:

Anegada ground snake *Alsophis portoricensis subsp. anegadae*. occurs in Virgin Gorda Peak Forestry Park.

An anole *Anolis ernestwilliamsii*. restricted to Carrot Rock.

A frog *Eleutherodactylus schwartzi*. restricted to Virgin Gorda, now extinct on Tortola, St John (USVI).

Virgin gorda gecko *Sphaerodactylus parthenopion*. occurs on Tortola and Virgin Gorda.

Virgin gorda worm snake *Typlops richardi naugus*. occurs in Virgin Gorda Peak Forestry Park.

Anegada worm snake *Typlops richardi catapontus*. occurs within Flamingo Pond Bird Sanctuary.

Globally threatened non-endemic reptiles occurring in BVI are:

Roosevelt's giant anole *Anolis roosevelti* (CR): distribution: Puerto Rico, Virgin Islands (British), Virgin Islands (US).

Virgin Islands tree boa *Epicrates monensis granti* (EN): distribution: Puerto Rico, Virgin Islands

(British), Virgin Islands (US). This tree boa occurs within the Sage Mountain National Park, Tortola.

The population of marine turtles in the BVI is reported to have declined drastically over recent decades (Groombridge and Luxmoore 1989; Eckert, Overing & Lettsome 1992):

Green turtle *Chelonia mydas* (EN): nesting is reported from the following islands: Anegada, Beef Island, Cooper Island, Camanoe, Great Tobago, Great Thatch Island, Guana Island, Mosquito Island, Norman Island, Peter Island, Jost van Dyke, Prickly Pear, Sandy Spit, Sandy Cay, Tortola, Virgin Gorda, Necker Island and Scrub Island (Groombridge and Luxmoore 1989). Foraging turtles have been reported from Anegada, Tortola, Virgin Gorda, and Norman's Island in moderate numbers (Groombridge and Luxmoore 1989).

Hawksbill turtle *Eretmochelys imbricata* (CR): hawksbill nesting is reported to occur on the same islands as the green turtle (Groombridge and Luxmoore 1989). Foraging areas for this species include East End on Tortola, the north-east end of Virgin Gorda, and the east and west coasts of Anegada.

Leatherback turtle *Dermochelys coriacea* (EN): the nesting population has continued to decline into recent times, with less than ten females nesting annually in the late 1980s to early 1990s. Although rare, this species was still harvested in the traditional 'trunking' fishery during the early 1990s (Overing 1992).

Loggerhead turtle *Caretta caretta*, (EN): occasionally reported foraging around the BVI (Overing 1992).

Birds

Globally significant birds of BVI include:

Bahama pintail *Anas bahamensis*: nests at the salt pond on Guana and probably on other salt ponds in BVI.

Black-necked stilt *Himantopus mexicanus*: a breeding population occurs on Guana.

Bridled quail dove *Geotrygon mystacea* (LRnt): a rare species throughout the central Caribbean; the population on Guana is probably the densest known in this region.

White-crowned pigeon *Columba leucocephala*: Florida and West Indies.

Puerto Rican screech owl *Otus nudipes*: this species is confined to Puerto Rico, US Virgin Islands, BVI.

Mammals

Humpback whales *Megaptera novaeangliae* (VU) are reported to migrate off the British Virgin Islands (Gricks, 1994). Other species which may occasionally be encountered include sei whales *Balaenoptera borealis* (EN) and sperm whales *Physeter catodon* (VU).

Species protection

- **The Wild Birds Protection Ordinance, Cap 98 195:** this protects 24 species of birds and the eggs of all bird species. It also lists game species and specifies a closed season from 1 February to 15 July. The Ordinance is in need of revision. At present both the protected and game species are designated only by their local names and this leads to ambiguities. 'Wild duck' on the game list, for example, encompasses all nine duck species, including the globally threatened West Indian whistling duck *Dendrocygna arborea*, the ruddy duck *Oxyura jamaicensis*, and the masked duck *Oxyura dominica*.
- **Protection of Endangered Animals, Plants and Articles (Removal and Possession) Ordinance 1981:** this legislation seeks to prohibit the removal or possession, without a licence from the Minister, of black coral or any article principally derived therefrom. Provision is made for the addition of other species of plants, animals or articles requiring similar protection.

- **The Turtles Ordinance 1959 as amended:** the 1959 Ordinance was amended in 1986 to include the protection of leatherback turtles. The legislation now protects all species of sea turtles during a closed season from 1 April to 30 November. During this time it is unlawful to catch or take any turtle, to slaughter, sell or possess any turtle or turtle product, or to take the eggs of any turtle species.

Enforcement and surveillance of legislation relating to turtles has been a significant problem (Lima *in litt*).

- Fisheries Ordinance 1979: the Ordinance provides for the protection, regulation and control of products of the sea.
- The Marine Products (Prohibited Methods of Taking) Order 1989: prohibits the use of spearguns to harvest marine products within the 10 fathom line of Anegada, and prohibits the use of SCUBA gear to harvest any marine products within the Exclusive Fishing Zone.
- Protection of Trees and Conservation of Soil and Water Ordinance 1954: this seeks to maintain and preserve protected trees, to prevent deforestation of land on steep slopes and soil erosion in forestry areas, to maintain water supplies and to prevent siltation and pollution of water supplies.

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Lianna Jarecki, H. Lavity Stoutt Community College, BVI.
Dr Fred Kraus, Forestry and Wildlife Division, Hawaii Department of Land and Natural Resources, Honolulu, USA.

Key names and addresses

National Parks Trust, PO Box 860, Road Town, Tortola, British Virgin Islands. Tel: 1284 494 3904; fax: 1284 494 6383.

BVI Dive Operators Association, PO Box 108, Tortola, British Virgin Islands. Tel: 1284 495 5513; fax: 1284 495 5347.

Conservation and Fisheries Department, Road Town, Tortola, British Virgin Islands. Tel: 809 494 5651/2; fax: 809 494 4435.

Ministry of Natural Resources and Environment (CITES Authority), Road Town, Tortola, British Virgin Islands. Tel: 1 284 494 2147; fax: 1 284 494 4283.

Town and Country Planning Department, PO Box 834, Road Town, Tortola, British Virgin Islands. Tel: 809 494 3444\33; fax: 809 494 5794.

The Conservation and Fisheries Department of the Ministry of Natural Resources and Labour is responsible for biodiversity conservation in BVI. This Department has five main functions: environmental planning and application review; environmental monitoring; environmental education and awareness; legislation, surveillance and enforcement; and fisheries management.

The National Parks Trust, a statutory body established in 1961 under the portfolio of the Ministry of Natural Resources and Labour, is responsible for the development and management of all potential and designated areas, and for the Botanic Gardens. The Department of Conservation and Fisheries and the National Parks Trust work closely in areas such as environmental monitoring and resource management. The development of a single conservation agency has been proposed (Cambers 1991).

Other agencies involved in conservation include the BVI Dive Operators Association. Members of the Association have been involved, for example, in the management of Wreck of the Rhone Marine Park, providing surveillance, monitoring the wreck and reefs, and explaining park regulations to visitors. They have also installed and maintained moorings at the dive site with support and collaboration from the National Parks Trust and Government (Geoghegan *et al.* 1991).

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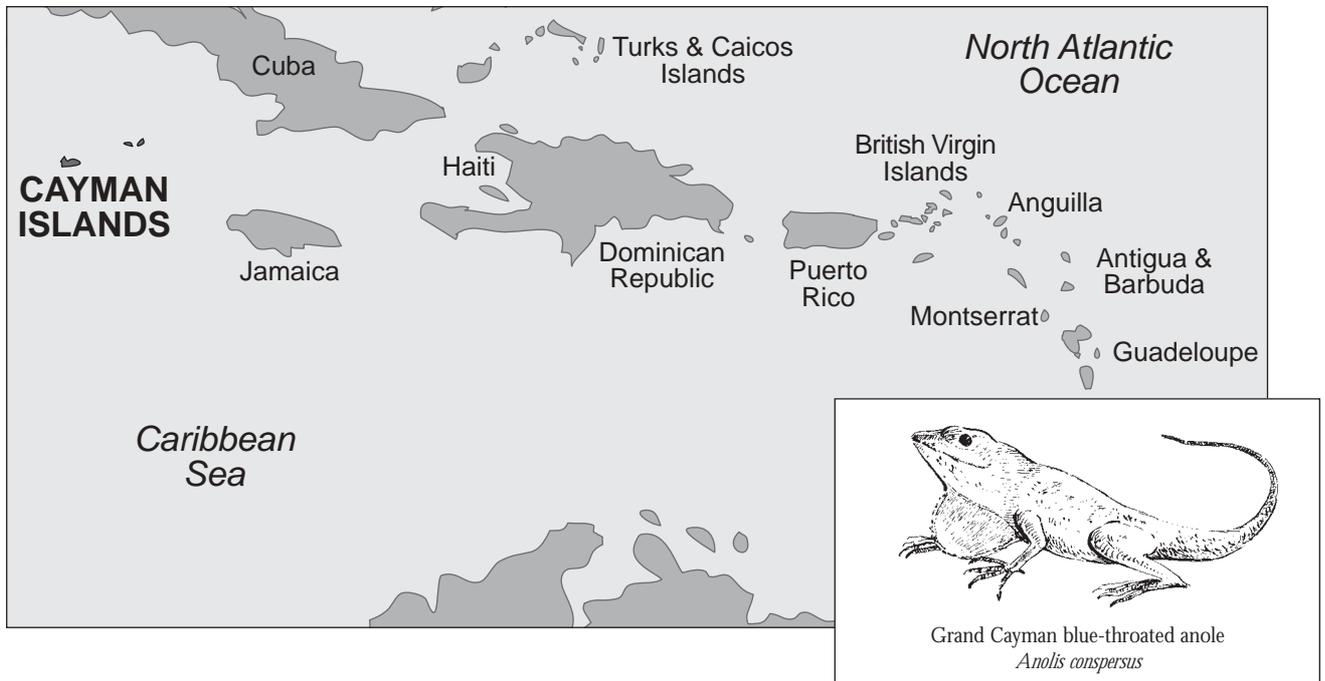
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8: The Cayman Islands



Introduction

The three Cayman Islands are situated at the western end of the Greater Antilles in the Caribbean. Their combined land area is 259 km². The largest of the islands is Grand Cayman with an area of 197 km². The population of the islands in 1990 was recorded as 25,355. The economy is based on tourism and the offshore finance industry. Most of the population of the Caymans lives on Grand Cayman where rapid development has transformed the island's environment. Development pressures on the island, and on Cayman Brac, continue to be the main threat to biodiversity. Little Cayman with a population of less than 100, has until recently remained relatively little disturbed. The number of buildings has, however, doubled in the past few years.

International obligations relevant to nature conservation

Cayman Islands are 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 on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on Biological Diversity (CBD)
- International Convention on the Regulation of Whaling
- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention)— Protocol on Specially Protected Areas and Wildlife

Implementation

Ramsar: Booby Pond and Rookery, Little Cayman was declared a Ramsar site in 1994. A second site, Little Sound on Grand Cayman, is under consideration for designation by the Government.

CITES: enabling legislation for CITES is the Endangered Species Protection and Propagation Law 1978. The legislation does not have a mechanism for incorporating updated appendices to CITES other than by specific amendment. A wide range of CITES species occurs in the Caymans including orchids, cacti, both endemic subspecies of the Cuban parrot *Amazona leucocephala*, marine turtles and ground iguana (*Cyclura*) species.

Protected areas

Legislation has been enacted in the Caymans to protect marine areas and sites important for the conservation of animal species. Approximately 5.5% of the land area is now protected. This includes 138 ha protected as animal sanctuaries and approximately 656 ha of National Trust properties.

- **Marine Conservation Law 1978:** this legislation allowed for the designation of restricted marine areas, for the purposes of research and development, and for marine parks.

- **Marine Conservation (Marine Parks) Regulations 1986:** enabling legislation for the designation of marine protected areas. Three categories of marine parks are specified with different restrictions applied to each. The categories are:

Environmental zone: in which prohibited activities include the removal of any form of marine life, the use of anchors, entry into the water and exceeding a speed of five knots.

Replenishment zone: where the removal of conch and lobster is prohibited and fishing methods restricted.

Marine park zone: in which marine life is protected and anchoring forbidden, except in certain circumstances.

The mangrove swamps bordering Little Sound, Grand Cayman are scheduled as an environmental zone. This includes part of Grand Cayman's central swamp.

- **Marine Conservation (Marine Parks) (Amendment) Regulations 1986:** designates marine protected areas on Cayman Brac and Little Cayman.
- **Animals Law No. 8 1976:** provides for the protection of iguanas and bird species (see below) and also allows for the designation of animal sanctuaries. Two such areas are designated on Grand Cayman: Meagre Bay Pond and Colliers Bay Pond. Under this law it is an offence to disturb any natural feature or any vegetable or animal life. Hunting is prohibited. The areas protected at Meagre Bay Pond and Colliers Bay Pond include a 100 m perimeter beyond the high water mark of the ponds.
- **Animal (Sanctuaries) Regulations 1980 (Cayman Brac):** Westerly Ponds, an area of swamp between the ponds, and Salt Water Pond in Cayman Brac West were designated as animal sanctuaries under this legislation. The protected

status of two of these sites was subsequently removed in 1988 by amended land registration.

- **Animal (Sanctuaries) Regulations 1982 (Little Cayman):** the pond and marshy area known as the Rookery, on Little Cayman, is designated an animal sanctuary.

Other relevant legislation includes:

- **National Trust for the Cayman Islands Law 1987:** the National Trust for the Cayman Islands was established by this law which specified the objectives of the Trust and enabled it to buy, lease, sell, hold or deal in property of any nature. The Trust maintains several areas of land for wildlife conservation. These include a 277 ha site in the north east of Grand Cayman, the Salina Nature Reserve, which incorporates about 125 ha of swamp. In December 1991 ownership of a 40 ha woodland site on Cayman Brac, important as a nesting area for the Cayman Brac parrot *Amazona leucocephala hesternae*, was transferred to the National Trust by the Nature Conservancy and is now titled Brac Parrot Reserve. The site will form the basis for a larger reserve on Cayman Brac.

In March 1992 the Council of the National Trust for the Cayman Islands re-examined the Trust's role and mission. It emerged with a primary commitment to establishing a system of reserves, designed scientifically to preserve as far as possible the biodiversity of the islands, and the integrity of their critical natural systems. A Scientific Advisory Council was established. On the recommendations of this group, the Trust has established as top priority the acquisition of a core reserve in an area of central Grand Cayman known as 'The Mountain'. Other priorities include the acquisition of reserve lands in the centre of Little Cayman and building on the existing core reserve on Cayman Brac (Burton 1992).

The Queen Elizabeth II Botanic Park was officially opened by the Queen in 1994. It covers

24 ha and is jointly owned by the Government and the National Trust. The park has been developed as a botanic garden, with woodlands preserved in their natural state.

Habitats of major significance

The three Cayman Islands are flat, low-lying limestone islands with extensive reef systems. The two dominant terrestrial ecosystems occurring naturally in the Cayman Islands are mangrove swamp formations, which occupy two thirds of Grand Cayman and a third of Little Cayman, and dry evergreen woodlands and thickets, which occupy the limestone and dolomite karst terrain above sea level. The vegetation of the Cayman Islands is described in Brunt & Davies (1994).

The dry woodlands of Grand Cayman and Cayman Brac have suffered a long history of disturbance for agriculture and timber extraction. The evergreen hardwoods that dominate this habitat are extremely slow growing and effects of logging in the early part of this century are still clearly visible. In central and eastern Grand Cayman and on Cayman Brac, the woodlands form a complex mosaic of secondary growth at various stages. Primary vegetation is restricted to the most inaccessible areas. Little Cayman is still dominated by primary vegetation (Burton 1992). The low elevation dry woodlands on all three islands of the Caymans are of regional importance for biodiversity conservation.

A survey of important wetland sites on the Cayman Islands was carried out as a contribution to the IUCN/IWRB Directory of Neotropical wetlands. The directory gives information on 15 wetland sites (Scott & Carbonell 1986).

Wetlands in the Caymans comprise primarily mangrove swamps which cover more than 50% of Grand Cayman and a significant area of Little Cayman. Cayman Brac, dominated by a major Tertiary Bluff Formation outcrop, has very limited mangrove areas (Brunt & Davies 1994). The extensive mangrove swamp of Grand Cayman is

the largest area of inland mangrove in the Caribbean; it is also unique within the region in terms of its geomorphology and vegetation zonation patterns. The integrity of the central mangrove swamp is considered crucial to a whole range of natural processes on Grand Cayman, including the rainfall pattern, the viability of North Sound, and retention of freshwater tables in surrounding agricultural land. The main threat to wetlands in the Caymans is the demand for land for development.

Other important wetland sites on Grand Cayman include: Malportas Pond (probably the most important of all the brackish ponds on Grand Cayman), and the Head of Barkers wetlands, both of which are very valuable for birds; South Sound Swamp and Half Way Pond; Buttonwood Swamp from Matilda Ponds to the swamp behind Bodden Town, Bowse Land Mangrove, Grapetree Pond and Betty Bay Pond. The mangrove swamps of Little Cayman, Tarpon Lake and Eastern Wetlands, are also of priority conservation importance (Hepburn *et al.* 1992).

In 1995–1996 a biological assessment of saline coastal ponds was carried out to provide information needed in management planning for the Ramsar site on Little Cayman and other protected ponds on the islands. The coral reefs and marine biology of the Caymans are described in the UNEP/IUCN Directory of coral reefs (UNEP/IUCN 1988).

Species of major significance

Biodiversity assessment

The species biodiversity of the Caymans has been relatively well documented. Comprehensive accounts of different species groups are given in Brunt and Davies (1994).

Extensive baseline studies of the oceanography and biology of the shallow marine environments of Grand Cayman have been carried out by the Cayman Island Government's Department of Environment (and its predecessors). Recent marine

research has focused on ecotourism and development impacts on coral reefs, and fishing impacts on Nassau grouper *Epinephelus striatus*, spiny lobster *Panulirus argus*, and queen conch *Strombus gigas*.

Co-ordination of biodiversity research is now effectively managed by the National Trust for the Cayman Islands, which maintains biological information and organises survey work. Since 1991 the Trust has been running a visiting scientists programme, which focuses partly on biodiversity assessments. Specialists from the UK, USA, Canada and Cuba have worked collaboratively with the Trust, resulting in establishment of a herbarium and insect collection in the country. Studies have focused on vascular plants, selected insect groups, the fauna of brackish and saline ponds, and the status of selected flagship species such as endemic parrots, ground iguanas and the large red-footed booby *Sula sula* nesting colony on Cayman (Burton *in litt.* 1997).

Plants

A comprehensive flora was published in 1984 and includes a floristic description of the different vegetation types (Proctor 1984). The plant collection assembled during preparation of the flora forms the basis for a herbarium maintained by the National Trust. Since publication of the flora, 53 additional species have been discovered in the Caymans. A recent assessment of the conservation status of wild plants of the Caymans shows that, out of the 24 endemic vascular plant taxa, eight are vulnerable or endangered and one is presumed extinct.

The flora of the Cayman Islands includes 20 species of orchids, five of which are endemic. Some species have been subject to collecting pressures. Eleven taxa of cacti are currently recorded from the Islands. An undescribed variety of *Epiphyllum phyllanthus* and new taxa of *Harrisia* and *Pilosocereus* occur in the Bluff area of Cayman Brac which is a priority site for the conservation of cacti and succulents in a regional context (Areces-Mallea 1997). All orchids and cacti of the Caymans

are included in Appendix II of CITES. Other CITES plant species occurring in the Caymans are the succulent *Euphorbia cassythoides* (Euphorbiaceae), currently not threatened in a regional context (Areces-Mallea 1997), cycads *Zamia integrifolia* and *Zamia sp. nov.* (Zamiaceae), and Caribbean mahogany *Swietenia mahogani*. The following trees and shrubs, endemic to the Caymans, have been assessed in *The world list of threatened trees* (Oldfield, Lusty & MacKinven 1998).

Chionanthus caymanensis var. *caymanensis* (Oleaceae; VU): confined to Cayman Brac and Little Cayman, the species occurs in dry evergreen woodland on dolomite karst. Populations are stable and there are extensive primary stands of the habitat remaining.

Chionanthus caymanensis var. *longipetala* (Oleaceae; EN): endemic to the Cayman Islands, occurring in dry evergreen woodland on dolomite karst, this variety is confined to Grand Cayman, where in the west the habitat has been 95% destroyed.

Cordia sebestena var. *caymanensis* (Boraginaceae; LRnt): endemic to the three islands of Cayman, occurring in all dry habitats on all three islands, the variety is widespread and well represented in protected areas. There is potential for hybridisation to occur with the type variety, which is being brought onto the islands for landscaping. Import restrictions and the growing interest in the propagation of native trees may help to avoid the problem.

Terrestrial invertebrates

Knowledge of Cayman Island terrestrial invertebrates is limited by the lack of research and collections. Some 133 species have been recorded; a third of these species are snails, which have been thoroughly studied, and another third spiders (Hounscome 1994). The world population of the globally threatened snail *Cerion nanus* (CR) is confined to a 300 m² area on the western end of Little Cayman where it can be found on one species of plant (Hounscome & Askew 1980). It is thought that there may be up to 30 endemic land snails

(Burton 1992). The first annelid specimens *Pontodrilus littoralis* were found in 1985 at Furtherland Farm in George Town and at the southern end of South Sound swamp where they were likely to have been introduced living in soil attached to imported garden plants and vegetables from the USA. As there are no native mammals, except bats, crabs often fill niches which would otherwise be filled by mammals, and are sometimes regarded as pests due to their scavenging nature. The large edible crab *Cardisoma guanhumis* is becoming gradually rarer on the Caymans due to increased road traffic and development. Because of its cultural importance some believe it worthy of protection; it performs a similar ecological function to rabbits, although it is more omnivorous (Davies 1994).

The varied insect fauna of the Cayman Islands comprises a small number of species. It is thought that there are over 30 endemic species, but they are not yet all described (Burton 1992). Knowledge of these species is inconsistent, some species being studied in depth and others neglected.

There are currently 48 taxa of butterfly known from the Cayman Islands, of which four subspecies are endemic; *Anaea echemus daneliana*, *Hemiargus ammon erembis*, *Brephidium exilis thompsoni* and *Papilio andraemon taylori* (Askew 1994).

Each island has an endemic cicada: *Diceroprocta cleavesi* of Grand Cayman, *Diceroprocta caymanensis* of Little Cayman, and *Diceroprocta ovata* of Cayman Brac.

Dragonflies are very abundant, and common species can be observed, as larvae, in brackish ponds and lagoons, while rarer species may inhabit smaller collections of rain water.

There are a great many invertebrate species that remain unidentified. Much more research is required before any definitive statements on environmental and geographical distributions of the invertebrate fauna of the Cayman Islands can be made.

Reptiles and amphibians

The herpetofauna of the Caymans is described by Seidal & Franz (1994). Twenty-one taxa of reptiles and amphibians are endemic. They include:

Grand Cayman blue-throated anole *Anolis conspersus*: an arboreal lizard endemic to, and widely distributed across, Grand Cayman. It occurs in brushy open areas, or mangroves and is rarely found in deep forest. There are two subspecies: *A. conspersus lewisi* inhabiting the east of the island and *A. conspersus conspersus* the western half.

An anole *Anolis maynardi*: a native arboreal lizard of Little Cayman, collections have most commonly been made from abandoned buildings and tree trunks near South Town.

Anolis sagrei luteosignifer: an endemic subspecies of this widespread Caribbean anole.

Ground iguana *Cyclura nubila*: there are three subspecies of this iguana, two of which are endemic to the Cayman Islands and are legally protected.

Cayman Islands ground iguana *C. nubila caymenensis* (EN): this subspecies occurs on Cayman Brac and Little Cayman; surveys have revealed that this subspecies has become seriously depleted on Cayman Brac, but is doing well on Little Cayman. There have been introductions to Grand Cayman. The preferred habitat of this lizard is sandy substrates with rocks nearby.

Cayman Islands ground iguana *C. nubila lewisi* (CR): this subspecies has become restricted to remote areas on the eastern side of Grand Cayman (Seidal & Franz 1994). Fossils in peat deposits and cave sediments suggest that it was once widespread across the island before colonisation by Europeans. Grant (1941) reported that it was doubted that more than a dozen individuals still existed. Since that initial

survey very few have been reported. The National Trust currently has a conservation programme for *Cyclura nubila lewisi*. The long-term possibility of establishing a population in the Salina Nature Reserve is being considered.

A lizard *Leiocephalus carinatus*: two subspecies of this xerophilic, diurnal lizard are:

L. carinatus granti: a native of Cayman Brac, possibly Little Cayman, it has been introduced to Swan Island (Schwartz & Thomas 1975); it apparently requires open beach with direct sunlight.

L. carinatus varius: this subspecies, native to Grand Cayman, was previously widespread on the surrounding coastal platform but many colonies are now feared eradicated as a result of beach front developments. Colonies observed in 1986–1987 were along isolated beach.

A gecko *Sphaerodactylus argivus*: a native species of the Cayman Islands which consists of three subspecies. The species is mesophilic to xerophilic:

S. argivus argivus: confined to the northern and southern coastal platforms of Cayman Brac (Seidal & Franz 1994).

S. argivus bartschi: found only on Little Cayman and Owen Island. Although likely to be widely distributed across the island it has largely been collected near the beach at South Town and Tarpon lake (Seidal & Franz 1994).

S. argivus lewisi: confined to Grand Cayman and is likely to be widely distributed, although the majority of collections have been made in the west (Seidal & Franz 1994).

A snake *Typhlops epactia*: an endemic mesophilic snake of Cayman Brac found only along the northern and southern coastal platforms.

A snake *Typhlops caymenensis*: a xerophilic snake

endemic to Grand Cayman, this species is found in dense *Coccoloba* and *Terminalia* woods, sandy beach scrub, under rocks and under termite infested wood (Schwartz & Henderson 1991).

Cayman islands dwarf boa *Trophidopsis caymenensi*: a native ground dwelling species of the Cayman Islands consisting of three subspecies. A xerophilic to mesophylic species with a wide range of habitats (Schwartz & Henderson 1991):

T. caymenensis caymenensi: restricted to central and eastern Grand Cayman.

T. caymenensis parkeri: restricted to Little Cayman.

T. caymenensis schwartz: restricted to Cayman Brac, reported only to occur on the northern and western coastal platforms.

A snake *Alsophis cantherigerus*: three subspecies of this diurnal snake are endemic to the Cayman Islands; they inhabit mangrove swamps, scrubby logwood areas, old fields, evergreen woods, brackish ponds (Seidal & Franz 1994):

A. cantherigerus caymanu: restricted to Grand Cayman where it is common and widespread.

A. cantherigerus fuscicauda: confined to the north and south coastal platforms, and the cross island road on the Bluff of Cayman Brac.

A. cantherigerus rutyi: restricted to Little Cayman, collections have been made from South Town and in the vicinity of the airport.

A 'water snake' *Tretanorhinus variabilis lewisi*: an endemic of Grand Cayman occurring along the rocky or muddy edges of freshwater and slightly brackish ponds, they are also often found in 'cow wells' (Seidal & Franz 1994).

The hawksbill turtle *Eretmochelys imbricata* (CR) and loggerhead turtle *Caretta caretta* (EN) occur only in limited numbers around the Caymans. A

small number of wild green turtles *Chelonia mydas* (EN) are found in the shallow sounds surrounding the islands, particularly the Little Sound area of North Sound and in Frank's Sound. Nesting has been observed along Barker's Beach, the northern portion of West Bay Beach, Beach Bay and at beaches on Little Cayman and Cayman Brac. Young green turtles feed on invertebrates associated with the roots of red mangrove *Rhizophora mangle*. The Cayman Island Farm Ltd. owned by the Cayman Islands Government commercially raises the green turtle. The farm annually produces 1,800 turtles for local consumption; in addition to this several thousands of turtles have been released from the farm as part of a re-establishment programme (Wood & Wood 1994).

Birds

A field guide to the 181 bird species of the Caymans was published by Bradley (1985) and an overview of the avifauna is provided by Bradley (1994). There are 21 families of breeding birds represented by 38 genera and 46 species in the Cayman islands, 17 subspecies of which are endemic (Bradley 1994). Grand Cayman thrush *Turdus ravidus*, the only endemic full species, is now extinct. Assessment and monitoring of bird populations and study of the life cycles of indigenous species is undertaken by the bird club, formed in 1990. Field work has shown that several migrants are more frequent than had previously been thought but that numbers of some resident species may be declining, probably because of habitat destruction. The status of the West Indian whistling duck *Dendrocygna arborea* (VU) on Grand Cayman is of particular concern. This species, confined to the Caribbean, is considered to be vulnerable as a result of wetland drainage and hunting pressure throughout its range (Collar et al. 1994). In the Caymans it has declined significantly over the past 50 years and became extinct in Cayman Brac by the late 1980s. The Grand Cayman and Little Cayman populations have been increasing in number since 1990 (Bradley 1994).

Notes on the endemic landbirds, based on Bradley (1994) are provided below. Thirteen of these endemic subspecies breed on Grand Cayman, nine of which occur exclusively. The close proximity of Little Cayman and Cayman Brac has meant that some endemic subspecies are shared by both islands.

A subspecies of the Caribbean dove *Leptotila jamaicensis collaris*. found only in the central and eastern parts of Grand Cayman where it breeds in dense thicket on exposed limestone.

Cuban parrot *Amazona leucocephala*. There are two subspecies of Cuban parrot occurring in the Cayman Islands:

Grand Cayman parrot *A. leucocephala subsp. Caymanensis*. an endemic of Grand Cayman where it is fairly common.

Cayman Brac parrot *A. leucocephala subsp. hesternae*. a rare endemic of Cayman Brac. The Cayman endemic parrots have received particular conservation attention as 'flagship species'.

Cayman woodpecker *Melanerpes superciliosus caymanensis*. a common endemic of Grand Cayman.

Cayman flicker *Colaptes auratus gundlachi*. a common endemic of Grand Cayman.

Cayman elaenia *Elaenia martinica caymanensis*. this endemic flycatcher is found in all habitats on all the Cayman Islands, although preference is given to arid woodland.

A subspecies of the loggerhead kingbird *Tyrannus caudifasciatus caymanensis*. a common species breeding in all major habitats on Grand Cayman, it also occurs on Cayman Brac.

Red-legged thrush *Turdus plumbeus coryi*. confined to Cayman Brac, it inhabits forest and mixed woodland, gardens and coastal woodland. This subspecies is fairly common in the breeding season, from March to September.

Cayman vireo *Vireo magister caymanensis*. a common but shy sub-species of the Yucatan vireo confined to mangrove, mixed woodland and limestone forest in Grand Cayman.

A subspecies of the thick-billed vireo *Vireo crassirostris alleni*. known from Cayman Brac and Grand Cayman, this species is common in dry bushland and woodland.

A subspecies of the vitelline warbler *Dendroica vitellina vitellina*. known only from Grand Cayman where it is common in arid mixed woodland, logwood and coastal woodland.

A subspecies of the vitelline warbler *Dendroica vitellina crawfordi*. known only from Little Cayman, where it inhabits low scrub woodland, and on Cayman Brac, bluff paths; this is the most common species of warbler on the islands.

A subspecies of the bananaquit *Coereba flaveola sharpei*. this endemic of the Cayman Islands is known from all three islands and is very common in all habitats.

A subspecies of the stripe-headed tanager *Spindalis zena salvini*. known only from Grand Cayman, this subspecies is fairly common in logwood, limestone forest and mixed woodland.

A subspecies of the Cuban bullfinch *Melopyrrha nigra taylori*. known only from Grand Cayman, this species is common in mature mangroves, woodland and forest.

A subspecies of the Greater Antillean grackle *Quiscalus niger caymanensis*. known only from Grand Cayman, this subspecies can be found in all habitats, especially mangroves.

A subspecies of the Greater Antillean grackle *Quiscalus niger bangsi*. known from Little Cayman and Cayman Brac, this subspecies can be found in all habitats, especially mangroves; it has been absent from Cayman Brac in recent years.

Mammals

The bats of the Caymans with notes from Morgan (1994) include:

A subspecies of Pallas' bat *Molossus molossus tropidorhynchus*: the most abundant bat of the Caymans, this subspecies commonly roosts in buildings.

Waterhouse's leaf-nosed bat *Macrotus waterhousii minor*: this subspecies is restricted to Cuba, Isle of Pines, the three Cayman Islands and the northern Bahamas. On the Caymans, it roosts in caves and abandoned buildings.

A subspecies of the Jamaican fruit-eating bat *Artibeus jamaicensis parvipes*: this sub species is found in Cuba, the southern Bahamas, Providenciales (TCI) and the three Cayman Islands. On the Caymans it is the second most abundant bat. It roosts primarily in small caves.

Cuban fruit-eating bat *Phyllops falcatus* (LRnt): this species is restricted to Cuba, Grand Cayman and Cayman Brac. The only Cayman Islands' record is a single skin of a male specimen, collected in 1938.

A subspecies of the Cuban fruit-eating bat *Brachyphylla nana nana* this subspecies is known from Cuba, Isle of Pines, Grand Cayman, Hispaniola and middle Caicos. It is cave dwelling but roosts have not yet been found on Grand Cayman. At the species level, the IUCN category is LRnt.

A subspecies of the buffy flower bat *Erophylla sezekorni syops*: an obligate cave dweller, this subspecies is restricted to Jamaica, Grand Cayman and Cayman Brac.

Big brown bat *Eptesicus fuscus*: a widespread species; the Grand Cayman specimens are the smallest representatives and are considered to form a new subspecies.

A subspecies of the Brazilian free-tailed bat *Tadarida brasiliensis muscula*: a widespread species

occurring on most of the Caribbean islands. One roost is known from the Cayman Islands. At the species level, the IUCN category is LRnt.

The only cetacean of global conservation concern recorded from the Cayman Islands is the sperm whale *Physeter catadon* (VU) (Morgan 1994). It is probable that other species occur in Cayman waters, and these may include sei whales *Balaenoptera borealis* (EN), blue whales *Balaenoptera musculus* (EN), fin whales *Balaenoptera physalus* (EN), and humpback whales *Megaptera novaeangliae* (VU) (Morgan 1994).

Species protection

- **The Marine Conservation Law 1978:** gives protection to certain marine species.
- **The Marine Conservation (Turtle Protection) Regulations 1978:** gives protection to marine turtles.
- **Animals Law No. 8 1976:** this protected iguanas and all non-domestic birds, except those listed as game birds, from hunting, collection and egg-taking.
- **Animals (Protection) Regulations 1989:** this legislation significantly amended the above. It reduced the list of game species to three—the white-winged dove, *Zenaida asiatica*, white-crowned pigeon *Columba leucocephala*, and the blue-winged teal *Anas discors*—and established a closed season from 1 February–31 July. The Regulations removed the two races of the Cuban parrot, Grand Cayman parrot and Cayman Brac parrot, from the game list.
- **Development and Planning Law 1978:** under Part III of this law, the central planning authority may make a tree preservation order for individual trees, tree groups or woodlands.

Acknowledgements

Gina Ebanks-Petri, Director, Department of Environment, Cayman Islands Government.

Key names and addresses

The Cayman Islands Government Office, 197 Knightsbridge, London SW7 1RB. Tel: 0171 491 7772; fax: 0171 491 7944.

Department of Environment, PO Box 486, George Town, Grand Cayman. Tel: 345 949 8469; fax: 345 949 4020.

The Chief Agriculture and Veterinary Officer (CITES Authority), Department of Agriculture, PO Box 459 GT, Lower Valley, Grand Cayman.

National Trust for the Cayman Islands, PO Box 31116 SMB, Grand Cayman. Tel: 345 949 0121; fax: 345 949 7494; e-mail: ntrust@candw.ky; web site: <http://www.caymans.com/trust.htm>.

Conservation agencies

In the Cayman Islands the Government agency with responsibility for conservation is the Ministry of Agriculture, Environment and Communications. This Ministry has an overview of all environmental matters and is responsible for international Conventions. The Department of Environment, a department of this Ministry, has responsibility for environmental monitoring, administration of marine parks and environmental issues relating to development. The Department of Environment is also responsible for the section of the Animals Law that refers to animal sanctuaries. The Department has three Enforcement Officers on Grand Cayman and one each on Cayman Brac and Little Cayman.

The responsibilities of the the Ministry of Agriculture, Environment and Communications include the Water Authority, Lands and Surveys. The Planning Department falls under the Ministry of Education, Aviation and Planning and is responsible for producing and updating Develop-

ment Plans, and for controlling the development process. Various other departments, authorities and boards have statutory conservation obligations.

The National Trust for the Cayman Islands, a statutory non-governmental organisation (NGO), was established in 1987 to preserve the historic, natural and maritime heritage of the islands. Its activities include the acquisition and management of land for conservation purposes, the management of species conservation projects and the provision of advice on conservation matters.

Enforcement of conservation legislation is the responsibility of the police and, in cases of marine issues, of the marine enforcement officers who are employed by the Natural Resources Unit and have full constabulary powers. At present there are two marine enforcement officers on Grand Cayman and one on Little Cayman and Cayman Brac. A number of volunteer fisheries officers also assist with the enforcement of marine conservation legislation.

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9: The Falkland Islands



Introduction

The Falkland Islands are situated in the South Atlantic. They cover an area of 12,173 km², with two main islands, East Falkland and West Falkland, and hundreds of smaller offshore islands and islets. There are 2,121 permanent residents (March 1991) with about the same number of temporary inhabitants. The traditional economic activity of the Falklands is sheep ranching for the production of wool. Since 1987 the chief source of income has been the sale of fishing licences to foreign squid and finfish fleets operating within a unilateral, offshore fisheries conservation zone.

The Falkland Islands Tourist Board was established in 1985. Tourism is directed at three main sectors: overseas wildlife and game fishing enthusiasts; cruise ships; and the local civilian and military communities. Cruise ship visits have increased from 11, carrying 1,587 visitors during the 1990–1991 summer season, to 55, carrying almost

20,000 visitors during the 1998–1999 season (Black *in litt.*).

The Falkland Islands are especially important in an international context for their bird and marine mammal populations. Threats to the wildlife of the Falklands have included the introduction of domestic livestock and other mammals, and the uncontrolled burning of native vegetation. Domesticated pigs, goats and cattle introduced in the 18th and 19th centuries to both main islands and a number of others have, together with the burning of maritime tussock grass communities in the early 1800s, resulted in the loss of important habitats. The introduction of sheep farming to the Falklands in the 1860s compounded this effect. Rats and mice found on the main islands and some offshore islands have greatly affected the bird populations.

International obligations relevant to nature conservation

- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)
- Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention)
- 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: various reports have been produced to identify sites suitable for designation as Ramsar sites in the Falklands (Standring 1982a; Hepburn et al. 1992; M. Smart & P. St Pierre *in litt.*). Four areas have been identified as candidate sites: Berthas Beach, Lake Sullivan/River Doyle, Pebble Island East and Sealion Island (JNCC 1998).

Protected areas

Legal protection for sites of conservation importance is provided by:

- **The Nature Reserves Ordinance of 1964:** this provides for the designation of nature reserves as follows:

Nature reserve: reserved for the purposes of protecting flora and fauna, and for providing opportunities for research on the biota, nature reserves may only be designated on Crown land. Entry into, and activities within, reserves are restricted, including the burning and cutting of vegetation and the hunting of animals.

- **The Wild Animals and Birds Protection**

Ordinance 1964: sanctuaries may be designated under this legislation, which also provides for more general protection of animals. Private land may, with the consent of the owner, be made a wild animal and bird sanctuary. The protected area designations are:

Animal and bird sanctuary: established for the protection of animals and birds, with specified exceptions. The introduction of animals is prohibited and there is provision for scientific research.

Private sanctuary: protected with the consent of the landowner, provisions are as above, although subject to the landowner's stipulations. Limited farming, tourism and research can occur.

There are currently 11 sanctuaries, three on Crown land and eight on private land. In addition there are 48 nature reserves, all of which are on off-shore islands: 20 on Crown land covering 1,692 ha; 14 on private land covering 3,400 ha; and 14 conservation reserves covering 768 ha (A. Brown *in litt.*).

Habitats of major significance

The Falklands consist of two main islands, East Falkland and West Falkland, together with over 420 associated islands and islets. They are composed of sedimentary rocks: the landscape is generally rugged and hilly, with the highest peaks being Mount Adam (700 m) on West Falkland and Mount Osborne (705 m) on East Falkland. East Falkland is divided into two large land blocks, connected by a narrow land bridge. The southern block is dominated by the Plain of Lafonia, an area of gentle relief. The coastline is deeply indented.

The climate of the islands is cool temperate oceanic, and supports a vegetation consisting of heath, grassland, bog and feldmark communities. On the main islands the vegetation has been severely degraded by burning and overgrazing. Most of the main islands are dominated by oceanic heath, with grass and small shrubs; bush and scrub

associations are found inland on well-drained slopes; bog communities are found on poorly drained areas; while feldmark vegetation occurs above 600 m, with cushion-forming vascular plants and associated mosses and lichens. Vegetation of the smaller ungrazed offshore islands is generally dominated by dense stands of tussock grass. There are no trees. Kelp beds are common around the coasts (Clark & Dingwall 1985; Oldfield 1987).

Species of major significance

Plants

The vascular plant flora consists of 169 taxa of which 15 taxa are endemic (Moore 1968, 1973; Broughton & McAdam 1999). Moore (1968, 1973) describes all known species and the main vegetation associations, but provides little information on species distributions. Inventory of lower plants is incomplete. The moss flora includes at least 168 species and subspecies of which 43 have not been recorded outside the Falklands (Greene 1983) and there are also 127 known liverworts including three endemics (Engel 1972). It is likely that further survey work and taxonomic research will uncover other endemic plant species within the Falkland Islands.

The endemic vascular plant species recorded to date are:

Falklands rock cress, *Arabis macloviana* (E);
 Felton's flower, *Calandrinia feltonii* (E);
 Barros sedge, *Carex barrosii*;
 Clubmoss cudweed, *Chevreulia lycopodioides*;
 Hairy daisy, *Erigeron incertus* (R);
 Falklands cudweed, *Gnaphalium affine*;
 Antarctic cudweed, *Gamochaeta antarctica*;
 Silver-leaved ranunculus, *Hamadryas argentea* (R);
 Falkland lilaeopsis, *Lilaeopsis macloviana*;
 Coastal nassauvia, *Nassauvia gaudichaudii*;
 snake plant, *Nassauvia serpens*;
 Falkland false plantain, *Nastanthus falklandicus* (R);
 Moore's plantain, *Plantago moorei*;
 Woolly Falkland ragwort, *Senecio littoralis*;

Smooth Falkland ragwort, *Senecio vaginatus*.

The sub-species *Sisyrinchium junceum filifolium* may be endemic to the Falkland Islands but its taxonomic status is uncertain.

Invertebrates

The invertebrate fauna of the Falkland Islands is relatively poorly known. An insect checklist was prepared for the Falklands by Robinson (1984) and references to invertebrate groups are scattered through the literature (e.g. Coleman 1982, Usher 1983, Worsfield 1991, Eason 1993, Bamber 1995, Stary & Block 1996). A high proportion (70%) of the insect species described from the Falkland Islands have not been recorded elsewhere in the world; further survey and taxonomic research in the region is needed to determine what proportion of these are true endemics (Fuller 1996).

Fish

Three species of freshwater fish have been recorded from the Islands, although only two—the native trout *Aplochiton zebra*, which also occurs in western Chile, and Falkland smelt *Galaxias maculatus* which is widely distributed in southern South America, Australia and New Zealand—have been recorded in recent times (McDowell 1971a, b). In the Falklands the native trout has been severely affected by the introduction of brown trout *Salmo trutta*, and is apparently now restricted to a few lakes.

Birds

The avifauna is well documented and the Atlas of breeding birds of the Falkland Islands, presenting the results of a survey based on a 10 km sq. grid, has recently been published (Woods & Woods 1997). One species is endemic, the Falkland steamer duck *Trachyeres brachydactyla*, and up to 16 subspecies or races may be endemic. Notes on these endemics, based on Woods & Woods (1997) are given below. The Falkland Islands are recognised as an Endemic Bird Area (EBA). Tierra del Fuego and the Falklands share another EBA as

the following species are present in both regions: tussacbird *Cinclodes antarcticus*, ruddy-headed goose *Chloephaga rubidiceps*, striated caracara *Phalacrocorax australis*, and the black-throated finch *Melanodera melanodera*. (ICBP 1992).

Endemic bird species and races

White-tufted grebe *Rollandia rolland rolland*: this race is endemic to the Falklands; further investigation is needed to establish whether it is an endemic species. White-tufted grebe is rare in the Falklands and numbers may have declined. Studies of the wetland habitats are needed to ensure its survival.

Common diving petrel *Pelecanoides (urinatrix) berard*: this race may be a full species but the intraspecific taxonomy of the species is not fully resolved. In the Falklands the common diving petrel is known from a few colonies but their distribution and size are uncertain. Investigation of islands with good tussac grass cover is needed. Predation by cats or rats is a potential threat.

Black-crowned night heron *Nycticorax nycticorax falklandicus*: this is apparently an endemic sedentary race which is widespread mainly around the coasts of the Falkland Islands. Beach pollution is a potential threat.

Upland goose *Chloephaga picta leucoptera*: widespread and abundant in the Falklands, this local race is not currently threatened. It has been viewed as a pest by sheep farmers and management issues are documented by Summers & McAdam (1993).

Kelp goose *Chloephaga hybrida malvinarum*: the Falkland race of this goose is not threatened, but is potentially vulnerable to coastal pollution as it is dependent on coastal green algae.

Falkland steamer duck *Tachyeres brachypterus*: this flightless endemic species is not currently threatened but is potentially vulnerable to pollution of coastal waters as it feeds on marine invertebrates.

Short-eared owl *Asio flammeus sanfordi*: the short-eared owl is one of the least common landbirds in the Falklands; this endemic race is found on some of the larger islands and on tussac islands where it usually breeds.

Tussacbird *Cinclodes antarcticus antarcticus*: formerly abundant around the coast, this subspecies has become rare in the Falklands where cats and rats are present. Commercial removal of kelp and coastal pollution are potential threats.

Dark-faced ground-tyrant *Muscisaxicola macloviana macloviana*: an endemic race found in a variety of habitats, it appears to co-exist with cats and rats and is not under any immediate threat.

Falkland pipit *Anthus correndera grayi*: inhabiting large areas of coarse white grass during the breeding season, feral cats and rats probably pose the greatest threat to its survival.

Falkland grass wren *Cistothorus platensis falklandicus*: an endemic race of the grass wren which seems to be widespread, but probably has a small total population as it requires a particular habitat type (wet or flooded lowland with adequate shelter).

Cobb's wren *Troglodytes aedon cobbi* (VU): this endemic wren is considered vulnerable as a result of the long-term destruction of tussac habitat, the impact of introduced mammals, and the small geographic range of its scattered population.

Falkland thrush *Turdus falcklandii falcklandii*: widespread in the Falklands, this species has adapted to a wide variety of habitats. It does not appear to be under any current threat.

Black-throated finch *Melanodora melanodora melanodora* (LRnt): there are currently no obvious threats to the black-throated finch in the Falklands.

Long-tailed meadowlark *Sturnella loyca falklandica*: this species is widespread in the Falklands and is not currently considered to be under threat.

The seabird populations of the Falklands are of international importance. The Falkland Islands have the world's largest concentration of southern rockhopper penguin *Eudyptes chrysocome chrysocome*, a quarter of the world population of gentoo penguin *Pygoscelis papua*, and a significant proportion of the world population of Magellanic penguin *Spheniscus magellanicus*, possibly up to 10% (Woods & Woods 1997). The king penguin *Aptenodytes patagonicus* is at the extremity of its global range in the Falklands, and its population is almost entirely concentrated at Volunteer Point. Information on the status of penguin populations in the Falklands is given by Bingham (1996).

The Falklands are the world's single most important breeding area for the black-browed albatross *Diomedea melanophris*, probably supporting 80% of the world population of some 682,000 pairs (Croxall et al 1984; M. Tasker *pers. comm.*). The Falkland breeding population of southern giant petrel *Macronectes giganteus* represents approximately 20% of the world population. The islands also hold a significant proportion of the world population of thin-billed prion *Pachyptila belcheri* (Woods & Woods 1997; Enticott & Tipling 1997). In response to recent oil exploration licences, studies are presently underway into the use by seabirds of the waters around the Falklands.

Other important bird species found in the Falkland Islands include the bulk of the world population of ruddy-headed goose *Chloephaga rubidiceps* (LRnt) and striated caracara *Phalacrocorax australis* (LRnt). A significant proportion of the world population of white-rumped sandpiper *Calidris fuscicollis* overwinter in the islands. The Hudsonian godwit *Limosa haemastica* (LRnt), the Feugian snipe *Gallinago stricklandii*, and the canary-winged finch *Melanodera melanodera* (LRnt) have also been recorded. The Falkland populations of the two-banded plover *Charadrius falklandicus* and the Magellanic snipe *Gallinago paraguayiae magellanica* may be distinct geographical races. The plover is not currently considered to be threatened; the snipe is fairly common and widespread in the Falklands but is apparently preyed upon by feral cats. The snipe has

been classed officially as a game bird but is not being hunted.

Mammals

Southern sea lion *Otaria flavescens*: studies of the Falkland Island population in the 1930s revealed 380,000 individuals, but this number has declined to 15,000 by the late 1980s. This decline may be due to an increase in fishing activity (Reijnders *et al.* 1993).

Southern elephant seal *Mirounga leonina*: seals breeding on the Falkland Islands form part of a distinct population which also breeds on the Valdes Peninsula on mainland South America (Reijnders *et al.* 1993).

South American fur seal *Arctocephalus australis*: two subspecies have been described – *Arctocephalus australis australis* for the Falkland population and *Arctocephalus australis gracilis* for the mainland population. The validity of these subspecies is disputed (Reijnders *et al.* 1993). In the Falkland Islands the species is now mainly found on Volunteer Rocks, Elephant Jason Island and New Island. The population of the Falkland Islands is about 5% of the world population.

Leopard seal *Hydrurga leptonyx*: this circumpolar species is occasionally present around the Falkland Islands (Clark & Dingwall 1985).

An assessment of whale numbers around the Falklands and South Georgia region has been made by the Sea Mammal Research Unit (A.R. Martin *in litt.*; M. Bingham *in litt.*). The following species are either abundant or regularly recorded in the region: sperm whale *Physeter catodon* (VU); killer whale *Orcinus orca* (LRcd); Peale's dolphin *Lagenorhynchus australis* (DD); dusky dolphin *L. obscurus* (DD) and Commerson's dolphin *Cephalorhynchus commersonii* (DD). A number of other species have been recorded but are scarce: southern right whale *Eubalaena australis* (LRcd); blue whale *Balaenoptera musculus* (EN); fin whale *Balaenoptera physalus* (EN); sei whales *Balaenoptera borealis* (EN); minke whale *Balaenoptera acutorostrata* (LRnt);

humpback whale *Megaptera novaeangliae* (VU); Cuvier's beaked whale *Ziphius cavirostris* (DD); southern bottlenosed whale *Hyperoodon planifrons* (L.Rcd); Hector's beaked whale *Mesoplodon hectori* (DD); Gray's beaked whale *M. grayi* (DD); straptoothed whale *M. layardii* (DD); southern right whale dolphin *Lissodelphis peronii* (DD) and spectacled porpoise *Australophocaena dioptrica* (DD).

Species protection

• The Wild Animals and Birds Protection

Ordinance 1964: this Ordinance makes it an offence to kill, injure, or take all species of wild animal or wild bird, excluding a number of species considered as pests. In addition to foxes *Dusicyon griseus*, rats *Rattus spp.*, mice *Mus musculus*, rabbits *Oryctolagus cuniculus* and, possibly, *Sylvilagus* sp. (Strange 1992), carachos *Caracara plancus* and turkey vultures *Cathartes aura*, these 'pests' include kelp gull *Larus dominicanus*, skua *Catharacta spp.*, house sparrow *Passer domesticus*, upland goose *Chloephaga picta leucoptera*, ruddy-headed goose *Chloephaga rubidiceps*, thin-billed prion *Pachyptila belcheri* and hare *Lepus europaeus* which are listed in Schedule I. A further five species of game birds which may be taken outside a summer close season are listed in Schedule II. Various exceptions to the general prohibitions are made for scientific studies and for instances of serious injury or damage to domestic animals, crops, fisheries or other property. The Ordinance also covers the taking of penguin and albatross eggs under licence for human consumption, but does not protect other species' eggs.

• Seal Fishery Ordinance 1921 and Seal Fishery (Amendment) Ordinance 1951:

these Ordinances were enacted to protect dwindling seal stocks, harvested for oil and skins, through the implementation of a licensing and reserve system. These industries have now ceased, although several seal reserves remain.

• The Whale Fishery Ordinance 1936 and Whale Fishery Amendment Ordinance 1964:

these have been superseded by the 1992 Sea

Mammals Protection Bill which protects all cetaceans and seals within 150 miles of the Falklands.

- **The Control of Kelp Ordinance 1970:** makes provision for the licensing of seaweed harvesting and export.

In 1986, a 150-mile Falkland Islands Interim Conservation and management Zone (FICZ) was established to regulate fishing activities; a number of countries are permitted to fish within the zone. In 1990 the Falkland Islands Outer Conservation Zone (FOCZ) was declared which extends beyond the FICZ to the north, east and south of the Falkland Islands to 200 miles, measured from coastal baselines. Further details are given in the 1996 Fisheries Statistics Report (Falkland Islands Government Fisheries Department 1997).

New conservation legislation is being drafted and is expected to be enacted at the end of 1999.

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Key names and addresses

The Executive Council, Government House, Stanley, Falkland Islands.

The Director, Chief Secretary's Office (CITES Authority), Port Stanley, Falkland Islands.

Falkland Conservation, PO Box 26, Stanley, Falkland Islands. Tel: 500 22247; fax: 500 22288; e-mail: conservation@horizon.co.flk.

Falkland Conservation (UK Secretary) 1 Princes Avenue, Finchley, London N3 2DA.

Tel & fax: 081 343 0831;

e-mail: info@falklands-nature.demon.co.uk;

web site: <http://www.falklands-nature.demon.co.uk>.

Conservation agencies

With the exception of the Director of Fisheries, who has responsibility for the conservation of offshore fish and squid stocks, there is no professional conservation officer within the Falkland Islands Government (FIG). Access to reserves and sanctuaries on Crown land is nominally under the control of the Director of Agriculture, in his capacity as Lands Officer. In addition, a local naturalist, Ian Strange, has acted as the FIG's Honorary Conservation Adviser over the past 20 years. Recommendations that a professional conservation officer or advisor should be appointed (e.g. Shackleton 1982; Standring 1982b; Dunnet 1983; Strange 1989) have not yet been implemented.

Falklands Conservation (formally Falkland Islands Foundation) is a charitable NGO, founded in 1979, which aims to promote the protection of the Islands' natural and historic heritage. With funding assistance from the FIG and outside agencies such as WWF-UK, Falklands Conservation runs ecological research, survey and monitoring projects, provides educational materials, manages a number of small offshore island reserves and provides advice to the FIG on conservation issues.

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10: Gibraltar



Introduction

Gibraltar lies at 36° 07' N 05° 20' W, at the southern extreme of the Iberian Peninsula. It has a total area of 6.5 km². The Rock of Gibraltar, formed of Jurassic limestone, rises in a sheer cliff on the eastern side, reaching 426 m. and slopes more gently to the west. It is joined to Spain by a low-lying sandy isthmus.

International obligations relevant to nature conservation

- Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention)
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)
- 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)
- Convention on Biological Diversity (CBD)
- International Convention on the Regulation of Whaling
- Agreement on the Conservation of Bats in Europe (an agreement under the Bonn Convention)
- Council Directive (79/409/EEC) on the Conservation of Wild Birds (Birds Directive)
- Council Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna (Habitats Directive)
- Council Regulation (338/97) on the Protection of Species of Wild Fauna and Flora by Regulating Trade Therein

Implementation

World Heritage Convention: there are moves to declare parts of Gibraltar a World Heritage Site.

CITES: the Convention is implemented through the Endangered Species Ordinance 1990 which was amended in 1993. Gibraltar has also implemented the relevant EU Regulation, and has further legislated to ensure inclusion of locally important species in the Control of Trade in Endangered Species Ordinance 1998.

Birds Directive: Article 4 of the Directive requires member states to designate important areas as special protection areas.

Habitats Directive: a report on the implementation of this Directive was recently prepared by the Gibraltar Ornithological and Natural History Society (GONHS 1994a). This identifies which species and which habitats listed under the Directive occur within Gibraltar.

Proposals to designate areas under both Directives, as part of the Natura 2000 series, is in hand.

In addition Gibraltar may become a biosphere reserve in combination with other areas in the Straits of Gibraltar, as an international effort.

Protected areas

- **The Nature Protection Ordinance 1991:** provides for the designation and preservation of protected areas. The Gibraltar Nature Conservancy Council was created by this Ordinance. It is charged with overall responsibility for nature protection (Part IV Section 20) and is empowered to enforce the Ordinance. This body has the authority to appoint wildlife wardens and honorary voluntary wardens. An area may be designated:

- Nature conservation area:
 - a) by reason of any of its flora, fauna, geological or physiographical features;
 - b) by reason of being the habitat of any wild bird, wild animal or plant specified by the Ordinance;
 - c) for the purpose of securing the survival in Gibraltar of species specified by the Ordinance;
 - d) for the purpose of complying with any international obligation;
 - e) for the provision of suitable research opportunities relating to the natural environment.
- Marine nature area:
 - a) for the purpose of conserving marine flora or fauna or geological or physiographical features of special interest in the area;
 - b) for the provision of suitable research opportunities relating to the natural environment;
 - c) for the purpose of complying with any international obligation.

Consultation on site designation is with the Gibraltar Nature Conservancy Council. No site designation can be made on Crown land without the consent of the Secretary of State. There are restrictions on activities within designated sites and species occurring there are fully protected.

Since the first designation of a part of the Upper Rock of Gibraltar as a nature reserve, the entire area of the Upper Rock is now a nature reserve. The area is managed by Sights Management Ltd. on behalf of the Government of Gibraltar; its responsibilities include control of the Barbary macaque *Macaca sylvanus* population. Visitors to the reserve are charged an entrance fee which also includes access to tourist sites of historical interest.

Much of the Upper Rock has been managed sympathetically with the interests of nature conservation in mind, prohibiting actions harmful to wildlife. As such, the Upper Rock was a *de facto* protected area, even before the Nature Protection Ordinance, not having been farmed, grazed, hunted, farmed, managed for forestry or built upon in any way for the last 30–50 years. A plant community of

unique characteristics has thus developed. This is now under threat as 'firebreaks' are no longer managed annually, and so the open areas important for the foraging of certain species, such as the Barbary partridge *Alectoris barbara*, are vegetating over.

Other important natural sites are on Ministry of Defence land, nine of which have been singled out as being of particular conservation value (GONHS 1990). In 1987 proposals were presented to the MOD for the fencing of Jacob's Ladder as a nature reserve, and it was subsequently incorporated into a conservation area (Cortes 1978). As of October 1991 discussions were underway between Government departments and the GONHS leading to the protection of a series of sites of importance. Proposed areas for nature conservation include: the Upper Rock—southern terraces and Windmill Hill Flats, Upper Rock—east slopes; Governor's Beach and Sea Caves, and also southern coastal areas of Europa Point Foreshore (GONHS 1990; Cortes *in litt*). The Government of Gibraltar is undertaking a study with a view to implementing a management plan for the caves of Gibraltar.

A marine reserve was declared with effect from 1 January 1996, covering all of Gibraltar's territorial waters. Capture of wildlife is prohibited, including fishing with nets and raking of the seabed, under the principle Ordinance (Nature Protection Ordinance 1991). Due to technical difficulties the full effect of the designating Regulation has not yet been brought to bear.

Crown Estate property and Ministry of Defence land continues to be under the jurisdiction of the British Army and the Royal Navy, although a proportion of Ministry of Defence (MOD) land is gradually being handed over to the care of the Government of Gibraltar. Expenditure in 1990 for nature and landscape conservation (including public gardens) amounted to approximately £0.3 million (Cortes *in litt*).

In the 1980s the Windmill Hill area on MOD land had been set up as the Windmill Hill Conservation Area, followed by the addition of

Jacob's Ladder in 1987. It is managed by the MOD Conservation Group, and has representatives from the Gibraltar Ornithological and Natural History Society (GONHS), the British Army and the Royal Navy. The aims of this body are to co-ordinate improvements to the natural environment of the above-mentioned areas (GONHS 1990).

Habitats of major significance

It is likely that the original vegetation of Gibraltar was woodland that has been destroyed over the centuries by tree felling and extensive goat grazing. Since the removal of goats early this century, maquis (mattoral) has become the dominant vegetation type. Cliff communities are also important. There are nearly 500 species of flowering plant, and the existing semi-natural vegetation is dominated by a maquis scrub of olive *Olea europea*, pistachio *Pistacia lentiscus*, *Osyris quadripartita* (Santalaceae) and the buckthorn *Rhamnus alaternus*. There are also areas of pseudo-steppe and garigue. A rich flora is found particularly on the inaccessible cliffs and ledges of the eastern slopes (for species lists and details see Gibraltar Environmental Group 1980).

Europa Point foreshore is the only limestone shoreline on the northern shore of the Strait of Gibraltar. Its characteristic plants therefore form a unique community totally different from the Spanish shore across the bay. It is an important site for the endemic Gibraltar sea lavender *Limonium emarginatum*, and other rare plants and land snails. The shoreline and its offshore reef are important for marine life.

The southern shoreline of Gibraltar, from the South Mole to Europa Point, forms an exposed rocky shore which is rich in littoral and sublittoral species. The south-western shore, along with the southern coast to the southern end of Sandy Bay (which includes Governor's Beach) is proposed as a marine nature reserve. Governor's Beach is a nesting site for the threatened western Mediterranean shag *Phalacrocorax aristotelis desmarestii*.

Relicts of seagrass meadows occur along the northern periphery of the Bay of Gibraltar, covering the area between the La Linea pier, around the airfield and again in the northern two-thirds of the harbour. Reclamation work in the harbour threatens the Bay's remaining seagrass meadows (Shaw 1993).

Species of major significance

Biodiversity assessment

Gibraltar's biodiversity has been recorded in considerable detail. Species lists for birds, reptiles, terrestrial molluscs and plants have been published and updated by GONHS, largely in its journal *Alectoris* (Cortes *et al.* 1980; Cortes 1983; Linares 1993; Menez 1993). The avifauna of Gibraltar and the Strait has been comprehensively reviewed by Finlayson (1992). Major review work on the botany of Gibraltar was presented at the First Conference on Research and Conservation of the Flora of Gibraltar and the Campo de Gibraltar in September 1993, and published in 1994 in *Almoraima* (e.g. Cortes 1994a, b; Linares 1996; Linares *et al.* 1996). Marine species lists have similarly been prepared (GONHS 1994b).

Plants

The flora of Gibraltar consists of about 600 plant species including several predominantly North African species which have their only European presence on Gibraltar. Examples include Gibraltar candytuft *Iberis gibraltatica* and Gibraltar mouse-ear *Cerastium gibraltarium* both of which occur on rocky outcrops. Gibraltar thyme *Thymus willdenowii* is very common locally on rocky outcrops and very rarely, if at all, found elsewhere.

The Gibraltar campion *Silene tomentosa* was thought to be extinct until its re-discovery in 1994 on rocky outcrops (three plants left in the wild). It is currently the subject of a propagation and re-introduction programme by the Gibraltar Botanic Gardens and the Royal Botanic Gardens, Kew. The campion was thought to be endemic to Gibraltar

until its recent discovery in north-west Africa (Valdés & Parra 1999). Other endemic plant species include:

Gibraltar sea lavender *Limonium emarginatum* (VU): an endemic species that occurs on cliffs and rocky shorelines.

Gibraltar restharrow *Ononis natrix ramosissima* (VU): an endemic subspecies found on rocky outcrops.

Gibraltar saxifrage *Saxifraga globulifera gibraltatica* (VU): an endemic sub-species found on rocky outcrops.

Invertebrates

A number of land snails and marine nudibranchs (sea slugs) are endemic (Garcia-Gomez 1983; GONHS 1994b).

Amphibian and Reptiles

Marine turtles

No marine turtle nesting occurs in Gibraltar. Loggerhead turtles *Caretta caretta* (EN) and green turtles *Chelonia mydas* (EN) occur in the surrounding waters; vagrant hawksbill turtles *Eretmochelys imbricata* (CR) and leatherback turtles *Dermochelys coriacea* (EN) occasionally enter the Mediterranean through the Strait of Gibraltar.

Birds

Over 300 bird species have been recorded on the Rock (GONHS 1990), although the majority of them are migrants or rare visitors. Some populations of these migrants utilise the Rock as a migratory stopover, but the importance of the Rock to each species or population is not known and under investigation (Finlayson 1992). Gibraltar is renowned for its spectacular spring and autumn passage of migrating raptors that take advantage of the narrow sea crossing between western Europe and north Africa. Up to 190,000 raptors of 15

species may pass over the rock in a single season with numbers dominated by honey buzzards *Pernis apivorus* and black kites *Milvus migrans*. The most important bird species resident on the Rock are western Mediterranean shag *Phalacrocorax aristotelis desmarestii* and Barbary partridge *Alectoris barbara*, Gibraltar is the only site on mainland Europe for this partridge species.

Important bird areas in Europe (Grimmett & Jones 1989), lists two sites in Gibraltar, one of 600 ha on the Rock of Gibraltar and the other as part of the Strait, including land and water under the jurisdiction of the United Kingdom, Spain and Morocco.

Mammals

Gibraltar is renowned for its Barbary macaques *Macaca sylvanus* (VU), a long-established introduction (Drucker 1978). The macaque population now exceeds the carrying capacity of the Upper Rock and will need to be managed.

Four species of bat are recorded from Gibraltar: greater mouse-eared bat *Myotis myotis*, Schreiber's bent-winged bat *Miniopterus schreiberi*, the pipistrelle *Pipistrellus pipistrellus* and the free-tailed bat *Tadarida teniotis*. All bats and their roost sites are protected under the Nature Protection Ordinance 1991.

The sei whale, *Balaenoptera borealis* (EN) is occasionally recorded and is a vagrant from the Atlantic. Fin whales *Balaenoptera physalus* (EN), humpback whales *Megaptera novaeangliae* (VU), northern right whales *Eubalaena glacialis* (EN) and sperm whales *Physeter catodon* (VU) occasionally pass through the Strait of Gibraltar. In addition there is a resident population of common dolphin *Delphinus delphis* and striped dolphin *Stenella coeruleoalba* (LRcd), both of which calve in Gibraltar Bay during summer. A number of other species have been recorded (Shaw 1998).

Species protection

- Nature Protection Ordinance 1991: under this Ordinance all wild birds are protected, together with their nests and eggs. A list of other protected animal species forms Schedule 1 of the Ordinance. Schedule 2 provides a list of plant species that are not offered protection by the Ordinance. All other wild plants are protected.

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Dr J. Cortes, GONHS and Dr C. Finlayson.

Key names and addresses

Collector of Customs (CITES Authority), Custom House, Waterport, Gibraltar.

The Gibraltar Botanical Gardens, The Alameda, Red Sands Road, PO Box 843, Gibraltar.
Tel: 72639; fax: 74022;
e-mail: wildlife_gib@compuserve.com.

The Gibraltar Museum, PO Box 939, Gibraltar. Tel: 74289; fax: 79158.

The Gibraltar Ornithological and Natural History Society (GONHS), Gibraltar Natural History Field Centre, Jew's Gate, Upper Rock, Gibraltar.
Tel: 72639; fax: 74022; e-mail: gonhs@gibnet.gi;
website: <http://gibnet.gi/~gonhs>

Ministry of the Environment, Main Office, City Hall, John Mackintosh Square, Gibraltar.
Tel 75483.

Environmental Health Section, Town Range, Gibraltar. Tel: 70620; fax: 74119.

Nature Conservancy Council and Environment and Heritage Council, c/o Ministry of the Environment.

Sights Management Ltd (managers of the Upper Rock Nature Reserve), Napier of Magdala Battery, Rosia Road, Gibraltar. Tel: 42400.

Conservation agencies

The Gibraltar Nature Conservancy Council advises the Governor on conservation matters relating specifically to the Nature Protection Ordinance 1991, and more generally in relation to wild species and the protection of areas of special interest.

The Gibraltar Ornithological and Natural History Society (GONHS) works closely with the Government of Gibraltar in promoting and implementing nature conservation. The GONHS has its origins in the Gibraltar Ornithological Society (GOS) founded in 1978. Amongst others, its aims are to safeguard all natural assets, to educate and to work for the improvement and implementation of wildlife and environmental protection. It now has 200 members and includes the former Gibraltar Environmental Group (GEG) which was formed in 1978 with express concerns for the conservation of the environment on the Rock (Gibraltar Environment Group 1980). The GONHS runs a field centre within the designated protected area, and there is an active museum based not far away in the main town of Gibraltar which maintains an extensive natural history collection (GONHS 1991). The field station, which was established in 1990–1991, is manned by volunteers, and runs on a budget of £2,000 per year (Cortes 1991). GONHS additionally runs Bruce's Farm Biological Station on Upper Rock. The Gibraltar Trust for Natural History and the Helping Hand Trust are charitable trusts allied to GONHS contracted by the Government of Gibraltar to advise and contribute towards the management of the Upper Rock Nature Reserve and the Marine Reserve respectively.

The newly formed Gibraltar Botanical Gardens at the Alameda intends to undertake extensive plant conservation and threatened plants propagation programmes (Cortes pers. comm.). Other interested bodies include the Gibraltar Heritage Trust with interests in preservation of the valuable cultural heritage.

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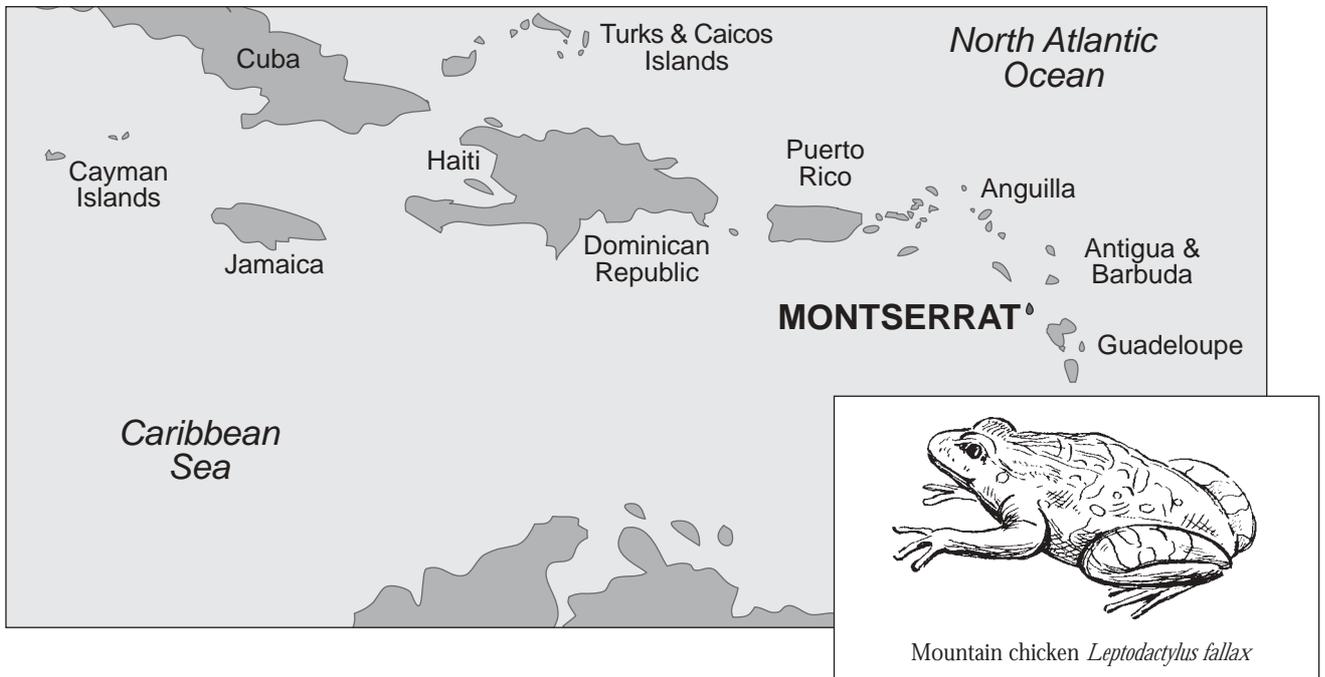
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11: Montserrat



Introduction

Montserrat is situated in the Leeward Islands of the eastern Caribbean, lying at 16° 45' N, 60° 15' W. The land area of the island is 104 km². It is a small volcanic island with three main hill ranges, two of which are forest-covered. Except for a relatively small area in Roaches Mountain, one of the formerly forested mountain ranges (Soufriere and South Soufriere Hills) now lacks vegetation: a result of the recent volcanic eruptions.

Montserrat has recently suffered a series of natural disasters which have profoundly disrupted the economy and ecology of the island. In 1985 the population of Montserrat was 11,852. Following the major devastation of Hurricane Hugo in 1989, the more recent impacts of Tropical Storm Iris, Hurricane Luis and Hurricane Marilyn, and the major volcanic activity in the southern part of the island, most people have left the island. Tourism and agriculture were the main sectors of the economy.

International obligations relevant to nature conservation

Montserrat 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 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: Montserrat has been included in the UK's ratification of Ramsar since 1976. One site, Fox's Bay Bird Sanctuary, was proposed for Ramsar listing in 1986 but was considered not to meet the criteria for listing at the time. However, a re-appraisal of information on the site suggested that the present Ramsar criteria are met (Hepburn et al. 1992).

Funding was provided by WWF-UK to the Montserrat National Trust for a project to carry out ecological restoration and management of the sanctuary before the recent hurricanes and volcanic activity. Work included an ecological assessment of the biotic community and water quality at the site, together with an assessment of the impact of Hurricane Hugo and damaging activities such as housing development around its perimeter.

The Fox's Bay site has been substantially affected by the volcanic eruptions and its current status is unclear.

CITES: the enabling legislation for CITES is the Endangered Animals and Plants Ordinance 1976.

Bonn: the enabling legislation for this treaty is the Convention of Migratory Species of Wild Animals Ordinance 1985.

Protected areas

- **Forestry, Wildlife, National Parks and Protected Areas Ordinance 1996:** this Ordinance contains provisions to establish an environmental board to oversee the management of forests, wildlife, national parks and protected areas, to prepare a national forestry plan, and to set up an environmental fund to finance management activities.
- **Forestry Ordinance Cap. 95 1956:** this Ordinance was repealed when the Forestry, Wildlife, National Parks and Protected Areas Ordinance 1996 was enacted. The Instruments

previously allowed under Cap. 95 are enacted under the new legislation. Cap. 95 makes provision for the Governor to appoint a forestry board that can declare any land to be protected forest and specify appropriate restrictions on its use. The board may also recommend the purchase of lands by the Crown to serve as forest reserve. Under the Ordinance, clearing of forest, cutting of timber or fuelwood and livestock grazing is illegal without the permission of the forestry board.

One official forest reserve has been declared—the Silver Hills Forest Reserve—under Forest Reserve Proclamation Cap 95 (Butler 1991). The present zoning plan allows for the declaration of forest reserves and protected forest in the Centre Hills. Mapping and declaration of conservation areas will begin during 1999. These areas will protect the island's watersheds, watercourse and other sensitive areas, proposed national parks and wildlife habitat. Administratively, forests above 500m are considered to be protected.

Fox's Bay Bird Sanctuary, owned by the Montserrat Company, is on lease to the Montserrat National Trust, and was a declared a protected wildlife area in 1979. A few other areas have also been set aside for conservation, land being vested with the National Trust or the tourism authorities.

In 1980 the Caribbean Conservation Association (CCA), through the Eastern Caribbean Natural Areas Management Programme (ECNAMP), assisted the Montserrat National Trust in preparing a proposal to establish a national park. Plans to create Montserrat National Park, that would include Soufriere Hills and Galway Estate (total 810 ha), have existed since 1982. Sites within the area of the proposed park are already maintained by the National Trust (Butler 1991). The topography of Soufriere Hills and Galway Estate has subsequently been completely modified by volcanic eruption.

Habitats of major significance

Montserrat is a small volcanic island with two main areas of highland reaching altitudes greater than 740 m. Much of the land surface is very rugged, with deep gorges, and the coastline is characterised by truncated spurs and hanging valleys. Rainfall is seasonal, and varies with altitude. On lands with rainfall of more than 1,750 mm per year, lower montane and montane rain forest, palm break and elfin woodland represent the climax vegetation. At lower altitudes the vegetation consists of a mosaic of cactus and dry scrub woodland, littoral vegetation, semi-evergreen forest and small areas of mangrove.

Nearly all Montserrat's original forest cover has been cleared for agriculture or timber exploitation. Before the recent disasters, secondary forest and scrub re-growth covered approximately 7,300 ha (71% of total land area). About 3,000 ha of this total comprised rain, cloud or moist forest.

The most important wetland site on Montserrat is the small area of mangrove protected as Fox's Bay Bird Sanctuary. The only other area of mangrove is at Carr's Bay. This was reported in 1993 as severely deteriorated as a result of siltation, lack of water flow from land, and excessive dumping of hurricane debris.

One other wetland, the Belham River Estuary, is described in Scott and Carbonell (1986). A further wetland site which merits closer investigation is Chance's Pond. This is a unique site formed in a depression at the summit of Chance's Mountain, which varies seasonally from being a pond to a marsh. Very little investigation of the site has been undertaken. In addition there are several ponds in the north of the island that are used by migratory waterfowl and other birds.

In general, terrestrial areas important for conservation have been identified but detailed ecological studies have not been carried out. *The Preliminary data atlas for Montserrat* (ECNAMP 1980) indicates 'important marine habitats' and seagrass beds, together with non-marine wetland sites.

Species of major significance

Biodiversity assessment

An unpublished checklist of the flora has been prepared for the island by R.A. Howard, but there has been no assessment of the conservation status of species. Two species of shrub are thought to be endemic: *Xylosma serratum* (Flacourtiaceae) and *Rondeletia buxifolia* (Rubiaceae).

Various assessments of the conservation status of birds, reptiles and amphibians of Montserrat have been carried out, for example by Faaborg and Arendt (1985) and Blankenship (1990). *The Montserrat Biodiversity Project of the Fauna and Flora Preservation Society* (FFPS) carried out in 1995, focused on an assessment of the mountain chicken *Leptodactylus fallax*.

Distributions, relative abundances, and habitat requirements were also investigated for ten other reptile and amphibian species. The endemic galliwasp lizard *Diploglossus montisserrati* was not found during this survey, but it has subsequently been caught and measured by local forestry staff (Gray *in litt.*). The Montserrat Biodiversity Project also collected information on bats which are the only native mammals on the island; eight of the ten species were recorded during the study. The project aimed to establish baseline population data and initiate conservation monitoring programmes. Project implementation was undertaken in conjunction with the Montserrat National Trust and the Government Forestry and Environment Divisions.

Amphibians and reptiles

Mountain chicken *Leptodactylus fallax*. This frog, which is restricted to Dominica and Montserrat, is hunted for food and therefore of considerable economic importance. In 1995, for the first time, juvenile mountain chickens were located and were found to be using 'nursery pools'. The volcanic emissions are thought to have severely damaged these pools. The mountain chicken primarily inhabits forested areas above 300 m.

The slippery back skink *Mabuya mabouya mabouya* is considered rare in Montserrat (Blankenship 1990).

Montserrat anole *Anolis lividus*: this endemic species is ubiquitous throughout Montserrat and is frequently abundant occurring in mangroves, amongst *Acacia* sp. and on walls (Schwartz & Henderson 1991).

Montserrat galliwasp *Diploglossus montisserrati* (CR) (Day in litt.): an endemic species of lizard, which was known only from one specimen collected in 1964, was re-found in September 1998 by local forestry staff.

Green turtle *Chelonia mydas* (EN): green turtles are resident around Montserrat and, together with hawksbill turtles *Eretmochelys imbricata*, are the most common species in Montserrat waters (Groombridge & Luxmoore 1989). Nesting possibly occurs at Yellow Hole, Bunkum Bay and Limekiln Bay; feeding areas include O'Garros, Bransby Point, Bunkum Bay and Trants Bay (Groombridge & Luxmoore 1989).

Hawksbill turtle *Eretmochelys imbricata* (CR): a species is relatively common year round in Montserrat waters, and reported nesting sites include Farm Bay, Yellow Hole, Rendezvous Bay, Little Bay, Carr's Bay, Bunkum Bay, Woodlands Bay, Limekiln Bay, Old Road Bay, Fox's Bay and Isles Bay (Groombridge & Luxmoore 1989). Foraging sites include O'Garros, Bransby Point, Rendezvous Bluff, Yellow Hole, and Trant's Bay (Groombridge & Luxmoore 1989).

Leatherback turtle *Dermochelys coriacea* (EN): rarely encountered around Montserrat. Nesting is also rare but has been recorded (Meylan 1983).

Loggerhead turtle *Caretta caretta* (EN): has been recorded off Montserrat but very rarely. Nesting has not been recorded. (Meylan 1983).

Birds

Montserrat oriole *Icterus dominicensis oberi* (LRnt): the IUCN conservation category for this species is in need of revision following the recent natural disasters on the island. A rapid survey undertaken recently recorded 100 pairs of the Montserrat oriole, representing half the previous population size. The forest habitats of this species have been devastated by acid rain, a consequence of the volcanic eruptions. An emergency action plan, prepared by RSPB, WWF and the Jersey Wildlife Preservation Trust, has been accepted by the Montserrat Government.

Mammals

Migrating humpback whales *Megaptera novaeangliae* (VU) and sperm whales *Physeter catodon* (VU) occasionally pass by the west coast (Gricks 1994). The sei whale *Balaenoptera borealis* (EN) may occur in Montserrat's waters, although this requires confirmation.

Four regionally endemic bat species occur in Montserrat. The tree bat *Ardops nichollsi montserratensis* is considered rare (Blankenship 1990).

Species protection

- **Forestry, Wildlife, National Parks and Protected Areas Ordinance 1996:** replaces the Wild Birds Protection (Amendment) Ordinance 1987.
- **Turtles Ordinance Cap. 112 1951:** this covers all marine turtle species. It provides for a closed season from 1 June to 30 September and specifies the minimum capture size as 9 kg.

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Key names and addresses

Forest and Environment Division, Ministry of Agriculture, Trade and Environment, PO Box 272, Brades, Montserrat, West Indies.

Montserrat National Trust (Coordinator, National Parks), Parliament Street, Plymouth, Montserrat, West Indies. Tel: 809 491 3086.

CITES Management Authority, Government House, Plymouth, Montserrat, West Indies.

Conservation agencies

The Forestry and Environment Division of the Ministry of Agriculture, Trade and Environment is responsible for forestry and wildlife, national parks and protected areas, as well as the protection and management of environmental and natural resources. In addition the National Forestry Action Plan exists to promote agro-forestry.

The Montserrat National Trust is a locally based statutory NGO dedicated to the conservation and protection of the environment, and the preservation of the island's natural and historic sites. It was established by the Montserrat National Trust Ordinance in 1970. A senior civil servant is nominated by the Governor to serve on the Trust Council and to liaise with Government. Links with Government are further strengthened by maintaining close working relationships with the various departments which deal with agriculture, fisheries, forestry, physical planning and tourism. The Trust is regularly called upon by both Government and international conservation agencies as an advisory body.

The Montserrat Government and the Montserrat National Trust are members of the Caribbean Conservation Association.

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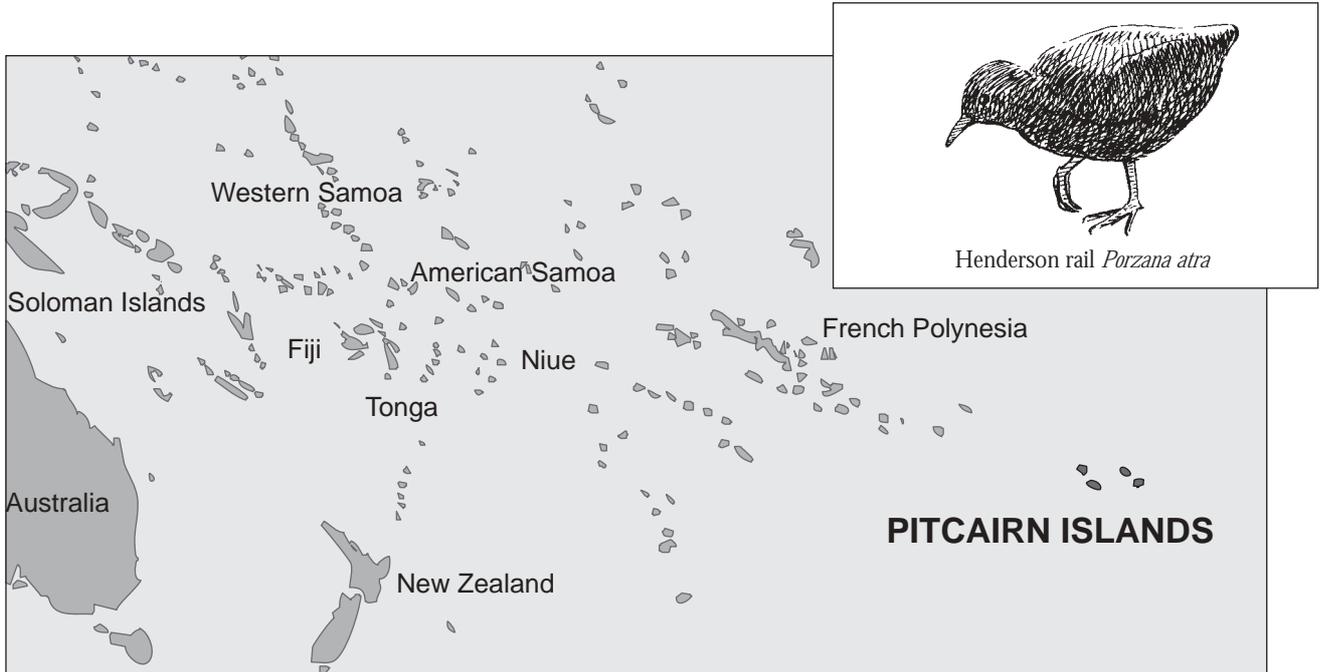
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12: The Pitcairn Islands



Introduction

The Pitcairn Islands comprise four islands located in the South Pacific Ocean, roughly equal distance (4,800 km) from the continental land masses of South America and Australasia, and close to the Tropic of Capricorn. Of the four islands, only Pitcairn, a small, volcanic island, is inhabited; the other three coral islands, Henderson, Oeno and Ducie are uninhabited. The total land area of the Pitcairn Islands is 43 km² (Pitcairn 7.5 km² and Henderson 37 km²).

The population of Pitcairn is approximately 60. The main employment of the small Pitcairn workforce is in local government and community service sectors. Supplementary income is provided by the sale of wood carvings or curios, mainly to cruise ship passengers and, to a limited extent, by mail order. The introduced hardwoods, miro and toa, which grow on Henderson are prized for carving. The UK Government has previously leased fishing rights within Pitcairn waters to Japanese fishery interests under a three-year licence

in the late 1980s. Pitcairners report frequent incidents of illegal commercial fishing by Korean, Taiwanese and other fishing vessels within the 200-mile exclusive economic zone (Hepburn 1992).

International obligations relevant to nature conservation

- 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 on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention for the Protection of the Natural Resources and Environment for the South Pacific Region

- International Convention on the Regulation of Whaling

Implementation

World Heritage Convention: Henderson Island was inscribed on the World Heritage List of Natural Sites in 1988.

Ramsar Convention: the UK Government is considering the possibility of listing Ducie Atoll as a Ramsar site under the Convention.

Protected areas

Henderson Island is a World Heritage site and a management plan for the island has been prepared to ensure the conservation of this unique raised coral atoll and its associated biodiversity.

Habitats of major significance

Pitcairn is a small, high island, reaching 333 m. There is one settlement, Adamstown, below which is the only sheltered landing on the island, Bounty Bay. There is much evidence of extensive Polynesian occupation on Pitcairn, where the local pitchstone was quarried and exported throughout Polynesia. However, this large population had disappeared by the time of the island's colonisation by the Bounty mutineers in 1790. Until relatively recently the small population of islanders lived a subsistence existence. As a result, much of the cultivatable land on the island has been used to grow a wide variety of crops. In addition, many non-food plants have been introduced to the island (e.g. Norfolk Island pine *Araucaria heterophylla* and rose-apple *Syzygium jambos*). The feral goat population has also seriously affected the local habitat. Much of the local woods, used for fuel, building and carving for export, have also been over-exploited. As a result, the island has been extensively changed by the islanders' occupation. There is one strip of native vegetation left on the island, and this runs along a ridge at the Highest Point. Here there are the remnants of 'cloud forest' with a small number (c. 30) of surviving tree ferns.

Henderson is the world's best remaining example of an elevated coral atoll ecosystem and is thought to be of outstanding value in this regard (Fosberg, Sachet & Stoddart 1983). This is particularly so because of the relatively low level of disturbance in comparison with other raised coral atolls. Henderson remains little disturbed, largely as a result of its remoteness, and its inhospitable nature. Unlike other oceanic islands, it has suffered relatively little human modification, and few exotic species occur.

Henderson Island is a raised coral island, uplifted by the lithospheric flexure caused by the crustal loading of the volcanic island of Pitcairn. The old lagoon floor of Henderson is now raised to an elevation of about 30 m. As a result of the elevation, the island plateau is protected from the periodic inundation of the sea during cyclones, which is a feature so typical of lower atolls. This has allowed the continued existence on the island of colonising species and, as a result, a diverse fauna and flora has developed with many endemic elements.

The surface of the island is, in large part, reef-rubble interspersed with areas of dissected limestone, surrounded by steep limestone cliffs undercut on all sides except to the north. There are three main beaches, to the north, north-west and north-east. Tidal range at spring tides is probably about 1 m, and tides are semi-diurnal. Freshwater is almost completely absent on Henderson, only occurring as drippings in caves, and as a spring below high tide level in the north (its flow and permanence is unknown). The geology of the island is summarised by Fosberg *et al.* (1983), who conclude that the limestones are of late Tertiary age. It is also suggested that much of the inland topography may be karst features.

There is a fringing reef at least 200 m wide to the north, north-west and north-east sides of the island, backed by a wide beach (St John and Philipson 1962). Reefs off the north and north-east beaches are seaward sloping reef platforms without reef crests, and are not typical fringing reefs. Coral

cover is about 5%, dominated by cauliflower coral *Pocillopora* with fire coral *Millepora* becoming dominant at depths greater than 7 m (Paulay 1989). Submassive acropora coral *Acropora* colonies are also present on the buttresses and solid substratum (Richmond in litt.). In total, 19 genera and 29 species of coral were collected in 1987 (Paulay 1989).

Henderson is characterised by difficult terrain and very dense vegetation. As a result of the porosity of the limestone, there has been little build-up of soil, so in the island interior the underlying fossil coral is bare. There are gross structures, such as old reef units and erosion features (coral pinnacles, reaching up to 5 m high), as well as the smaller fragments of individual coral colonies, fossil clams (often still in growth positions) and other gastropods. Fossil urchins have also been found in the interior. Growing on top of this terrain is a vegetation made up of some 63 native species including nine endemic taxa (Florence *et al.* 1995, Fosberg *et al.* 1983).

There is considerable evidence of an extensive period of Polynesian occupation on Henderson. The population may have reached as many as 100. The Polynesians are likely to have lived solely on the coastal fringes of the island, and the plants they cultivated became extinct after the Polynesians disappeared (Brooke *et al.* 1991). Henderson remains, perhaps, the only example of a Pacific Island where the present vegetation and fauna even resembles approximately its native condition.

Oeno and Ducie are remarkably undisturbed coral atolls. Oeno Atoll consists of a small central island surrounded by a lagoon. The lagoon is relatively shallow with scattered coral patch reefs separated by sand. Ducie Atoll is the most remote of the Pitcairn Islands. It is 469 km east of Pitcairn itself, and rarely visited by the islanders. An atoll about 1.6 km in diameter, it consists of four islands surrounding some 60% of the lagoon. The largest is Acadia, about 2.4 km miles long and up to 250 m wide, with a maximum elevation of about 3 m.

Species of major significance

Biodiversity assessment

A major independent multi-disciplinary expedition, based on Henderson Island from January 1991 to March 1992, gathered considerable information on the current and historical ecology of Henderson and on the other islands in the group. Results from the Sir Peter Scott Commemorative Expedition (Benton and Spencer 1995) provide a substantially improved basis for assessing the conservation value of the islands' biota. The introduced rat populations on Pitcairn and Henderson Islands have been the subject of a recent successful rat eradication project funded by the FCO.

Plants

Oeno and Ducie have relatively sparse vascular floras; only two vascular plant species are recorded from Ducie. Henderson and Pitcairn support richer floras with a high number of endemic and endangered species. Over half of the flora of Pitcairn is either threatened or likely to be so whilst less than 20% of the flora of Henderson is threatened (Waldren, Florence & Chepstow-Lusty 1995). Notes on some of the threatened and endemic species follow, a fuller account is given by Waldren *et al.* (1995).

Trees and shrubs

Abutilon pitcairnense (Malvaceae): probably extinct—a site known 20 years ago was searched without success, and is now invaded by *Lantana camara*. A shrub, endemic to Pitcairn.

Bidens hendersonensis hendersonensis (Compositae) (VU): a shrub or tree endemic to Henderson Island, it occurs with var. *subspathulata* in gaps in the plateau forest. The population of both varieties together is calculated to be about 40,000 individuals. Regeneration appears to be good although the species appears to be monocarpic.

Bidens hendersonensis oenoensis (Compositae) (CR): a

tree or shrub endemic to Oeno Island where it was known to occur under *Argusia argentea* trees. A botanical expedition in 1991 failed to find any living specimens despite thorough searches.

Bidens hendersonensis subspathulata (Compositae) (VU): a variety endemic to Henderson Island, it occurs with the type variety in open gaps in the plateau forest. The total combined number of individuals of the two varieties has been calculated to be about 40,000.

Bidens mathewsii (Compositae) (VU): locally frequent on the southern and western coasts, on cliffs and steep slopes, it may formerly have occurred in scrub and thickets above these slopes. A low spreading shrub, but may grow more erect in taller vegetation; endemic to Pitcairn.

Coprosma rapensis benifica (Rubiaceae) (CR): a small tree endemic to Pitcairn Island found in degraded areas of forest at moderate altitude. Only ten individuals of flowering size seen in 1997.

Geniostoma hendersonense (Loganiaceae): a shrub endemic to Henderson, occurring in shrubby vegetation in open sites, such as cliff sites and the central *Timonius* thicket area. Widespread and fairly common in suitable habitat with a population estimated to consist of approximately 120,000 individuals. No specific threats have been identified and no conservation measures are required.

Glochidion comitum (Euphorbiaceae) (EN): apparently endemic to Pitcairn Island, this species has only recently been described as distinct from *G. pitcairnense*. Widespread in disturbed scrub and open forest. Population probably 500–1,000 mature individuals.

Glochidion pitcairnense (Euphorbiaceae) (VU): a tree known only from Henderson and Pitcairn Islands and from Mangareva in the Gambier Islands (French Polynesia). On Henderson the species is relatively common, numbering about 20,000 individuals in plateau and beach forest. The

population is smaller, with less than 250 individuals, on Pitcairn and confined to remnant forest and scrub, where it is threatened with cutting and the spread of the invasive *Syzygium jambos*. No regeneration has been observed.

Hernandia stokesii (Hernandiaceae) (VU): recorded from Henderson Island, it is commonly found rooted in deep crevices within a restricted range in the north-west of the island. There are estimated to be 500 individuals here.

Homalium taypau (Flacourtiaceae) (VU): restricted to hillsides and valleys on Pitcairn Island the species is still common and forms the dominant component of the vegetation that remains. At least 2,000 individuals survive. The spread of invasive exotics such as *Syzygium jambos* and also the loss of habitat pose some threat.

Ixora fragrans (Rubiaceae): a shrub possibly endemic to Henderson, which is common in plateau forest with a population, calculated to be between 150,000 and 200,000 individuals. No threats to the species have been identified and no conservation measures are needed.

Myrsine hosakae (Myrsinaceae) (VU): one of the least common of the Henderson Island endemics. Up to 7,000 individuals may exist, scattered in the plateau forest. The species is dioecious and may be suffering from the heavy predation of fruits, often before they are ripe, by doves. *Ex situ* germination tests have failed so far as many seeds appear to lack embryos.

Myrsine aff. niauensis (Myrsinaceae): not found in 1997, only two collections known. Restricted to Pitcairn and apparently endemic. Probably extremely rare, less than 250 plants estimated to survive.

Nesoluma st. johnianum (Sapotaceae) (VU): a common tree endemic to Henderson Island and co-dominant in the plateau forest with *Xylosma suaveolens*, it also occurs in scrub vegetation and on cliff slopes. The total population is estimated

to number between 20,000 and 40,000 individuals and is under no threat at present.

Santalum insulare hendersonensis (Santalaceae) (VU): endemic to Henderson Island where in the plateau forests it is a semi-decumbent tree, becoming more shrubby and scarcer in cliff and more open communities. The total population size is calculated to be between 2,000 and 4,000 plants. The regeneration potential of the taxon is likely to be affected by poor fruiting performance. It is also partially parasitic which hampers the cultivation of the plant *ex situ*.

Sesbania coccinea atollensis (Leguminosae) (DD): this shrubby subspecies is endemic to the eastern Pacific and is very rare on Henderson. The population is probably considerably less than 50 individuals; no specific threats are known.

Xylosma suaveolens haroldii (Flacourtiaceae) (EN): a tree endemic to Henderson and Pitcairn Islands. On Henderson it is widespread in plateau forest and drier areas. The population on Pitcairn has declined through habitat loss and cutting. There are 250 mature individuals on Pitcairn Island which may have its own distinct subspecies, but this has yet to be determined. Very few individuals there are expected to survive. The total population on Henderson is estimated to be about 10,000 trees. Seeds are dispersed by the endemic fruit dove *Ptilinopus insularis* on Henderson but dispersal on Pitcairn Island is limited by the lack of frugivorous birds.

Non-woody plants

Angiopteris chauiodontia (Marattiaceae) (E): a large fern endemic to Pitcairn, inhabiting damp shady stream sides, growing on a rich loam. Extremely rare with only two populations known with a population size of probably less than 20. In need of immediate conservation measures. *Ex situ* cultivation and re-introduction are priorities and remaining sites must be closely guarded. Spore germination has proved a problem and the species is not known in cultivation.

Ctenitis cumingii (Dryopteridaceae) (E): a fern,

endemic to Pitcairn, requiring humid shady lanes on deep soils. Very rare, population thought to consist of less than 25 individuals. Threats include the spread of exotic species, maintenance work on trackways and damage to native vegetation.

Peperomia hendersonensis (Piperaceae) (V): a succulent, terrestrial or epilithic herb with decumbent branches, endemic to Henderson. Found to occur in shade in limestone crevices and on the forest floor. Widespread and common with a population of at least one million individuals and is therefore not threatened.

Peperomia pitcairnensis (Piperaceae) (V): a small herb, apparently endemic to Pitcairn, but the taxon is very poorly known. Thought to occur in rocky woodlands. Likely threats are removal of native vegetation and invasion of woodlands by exotics.

Invertebrates

Almost all the insects on Henderson are derived from the west, despite the islands easterly location, and most are likely to be indigenous. The orders showing the most diversity are *Lepidoptera* (c. 53 spp.), *Coleoptera* (c. 38 spp.), *Diptera* (c. 37 spp.), *Hymenoptera* (c. 21 spp.), *Homoptera* (c.14 spp.) and *Heteroptera* (4 spp.). The weevils, *Heteroptera* and *Homoptera* show considerable endemism and may be examples of intra-island radiation. Henderson sustains a much greater insect fauna than nearby Ducie Atoll (Benton 1995).

The biodiversity of the arthropods on Henderson is markedly small, which is perhaps due to the location of the island, topographic uniformity of the central plateau and its comparative youth. The mite fauna is rich (particularly in oribatids) and many are seemingly endemic. In addition, there are in the region of 26 species of spider and nine species of isopod, with three endemic to Henderson. Species belonging to *Diplopoda*, *Chilopoda*, *Amphipoda*, *Pseudoscorpions*, *Diplura*, *Protura* and *Collembola* are also represented (Benton & Lehtinen 1995).

The land snail fauna of the Oeno and Ducie atolls is poor and each atoll supports fewer than six species. The molluscan fauna of Henderson is more diverse, with at least 16 species belonging to seven families; in the region of eight are presumed to be endemic, at least at the level of subspecies. Pitcairn Island was found to support 26 species of land snail on a recent expedition. Seven of these species are thought to be prehistoric adventives and a further three are likely to be prehistoric introductions. The threats to the land snails on the Pitcairn Islands are the invasion of the exotic rose-apple (Benton & Spencer 1995) and predation by the Pacific rat which is presumed to have been responsible for the extinction of at least six species (Preece 1995a).

The marine molluscan fauna of the Pitcairn Islands comprises of 80 taxa recorded on Ducie and Pitcairn, 240 on Oena and 320 on Henderson. Significant faunal differences occur between the four islands in the group, which are related to the different character of each island. The molluscs of the Pitcairn Islands appear to be impoverished in comparison with those found on islands farther west. Most of the fauna is composed of widespread Indo-West Pacific species, with a few appearing to be endemic (Preece 1995b).

Fish

The fish of the Pitcairns show a low degree of endemism (Benton & Spencer 1995). Of the reef fishes, the family showing the greatest representation is the Labridae with 21 species (Irving *et al.* 1995).

Marine turtles

Both green turtles *Chelonia mydas* (EN) and hawksbill turtles *Eretmochelys imbricata* (CR) occur around the Pitcairn Islands. A small number of green turtle females (c. 10) nest on the east beach of Henderson Island (Brooke 1995a).

Birds

The Pitcairn Islands are categorised as a high priority Endemic Bird Area by ICBP. The endemic birds are described below based on Collar, Crosby & Stattersfield (1994). The islands also support large and internationally significant seabird populations. Ducie is perhaps the world's main breeding station of Murphy's petrel *Pterodroma ultima*, with over 200,000 breeding pairs; in addition, many other seabirds found in the locality breed here in large numbers (Rehder & Randall 1975; Brooke 1995b; Brooke 1995c).

Henderson rail *Porzana atra*: a flightless, omnivorous species which occurs in the plateau forest and surrounding scrub. The population likely to be at the carrying capacity for the island as most territories have more than two adults, the population is considered stable (Jones 1995).

Henderson lorikeet *Vini stephensi*: an omnivorous species restricted to forest on Henderson Island. In 1992 the population was estimated to be about 1,200 pairs (Graves 1992).

Henderson fruit-dove *Ptilinopus insularis*: confined to the interior forest of Henderson Island, it is a specialist frugivore. The population numbers 3,500–4,000 (Graves 1992; Brooke & Jones 1995).

Pitcairn reed-warbler *Acrocephalus vaughani*: endemic to the Pitcairn Islands and Rimatara in the Tubuai Islands, French Polynesia, occurring as three races: *taiti*, *vaughani* and *rimatarae* on Henderson, Pitcairn and Rimatara. On Henderson (where the population was estimated to be c. 10,800 in 1987) it is found throughout the forest, foraging in all substrates and at all levels; on Pitcairn it is rarely found at ground level, perhaps because of the presence of cats and humans (Pratt *et al.* 1987; Graves 1992).

Mammals

There is little information available about the marine mammals of the Pitcairn Islands. It is

probable that cetacean species occasionally occur in the surrounding waters, and further investigation is required to identify the species present.

Species protection

- **The Fisheries Zone Ordinance:** this provides the legislative basis for fisheries management.
- **Local Government Regulations 1971 (Part IV):** this covers animals and wildlife. Section C deals specifically with wildlife and is concerned primarily with species protection. The legislation generally prohibits the killing or taking eggs of wild birds or, subject to the authority of the Wild Bird Protection Committee, controls the extent to which certain prescribed species may be exploited. An amendment in 1982 adds species which are protected (three whales, three seabirds and two turtles) and sets conditions under which they may be captured, killed or harassed, and extends protection to migratory species as a means of implementing the Bonn Convention within the Pitcairn Islands. The amendment extends the remit of the committee to be responsible for implementation of this Convention.

Acknowledgements

Steve Waldren & Naomi Kingston, Trinity College Botanic Garden, Dublin; Michael de L. Brooke, University of Cambridge.

Key names and addresses

Office of the Governor of the Pitcairn Islands, The British Consulate-General, Private Bag, Auckland, New Zealand. Fax: 64 9 3031836).

The Island Magistrate, Pitcairn Island, South Pacific Ocean, via New Zealand.

Pitcairn Working Group of the UK Dependent Territories Conservation Forum, c/o Dr M. de L Brooke Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK

Conservation agencies

Administrative responsibility for conservation regulations is borne by the Office of the Governor of the Pitcairn Islands, based in New Zealand. Access to the islands requires a licence issued by the Governor in consultation with the Island Council.

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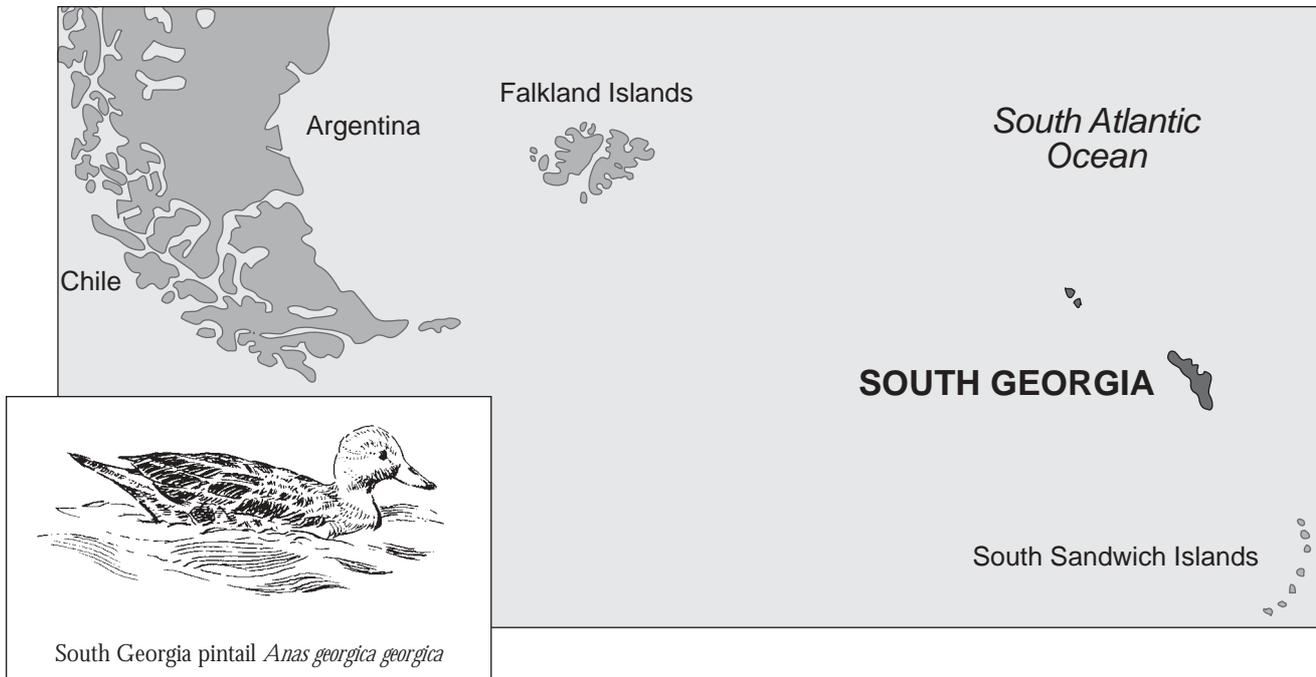
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13: South Georgia



South Georgia pintail *Anas georgica georgica*

Introduction

South Georgia is an isolated sub-Antarctic island lying between $53^{\circ} 56'$ and $54^{\circ} 55'$ S, and $34^{\circ} 45'$ and $38^{\circ} 15'$ W. It is about 1,400 km from the Falkland Islands and 1,550 km from the nearest point on the Antarctic continent. In addition to the main island, there are smaller islands, islets and rocks. Clerke Rocks to the south east and Shag Rocks to the north west are included in the territory. South Georgia is the second largest of the sub-Antarctic islands. Its total land area is 3,755 km².

South Georgia is very mountainous, rising to over 2,934 m. The backbone of South Georgia is formed by two mountain ranges, Allardyce and Salveson. Of these ranges 13 peaks rise above 2,000 m, the highest being Mount Paget at 2,934m. The south east of the island is higher than the north west, with much steeper, almost vertical slopes. Ice fields and glaciers surround these mountains. Ice and permanent snow cover over 50% of the island.

South Georgia has no permanent population. The British Antarctic Survey (BAS) maintains a base on Bird Island, and there is a garrison at King Edward Point. At the beginning of 2001 the garrison will be withdrawn, and the UK's presence in the territory will be replaced by the British Antarctic Survey. Fishing operations occur in the vicinity of South Georgia. Currently, this interest is focused on toothfish *Dissostichus eleginoides* replacing an earlier interest in pelagic harvesting of krill. Tourism has developed in recent years. South Georgia is part of the South Georgia and South Sandwich Islands Dependency. The dependency is administered by a Civil Commissioner based in the Falkland Islands (who is concurrently the Governor of the Falkland Islands).

Only a summary of international obligations, legislative provisions relating to nature conservation, and key contacts are provided here. Comprehensive information on the biodiversity of this territory is researched by, and is available through, the British Antarctic Survey.

International obligations relevant to nature conservation

- 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 on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on Biological Diversity (CBD)
- International Convention on the Regulation of Whaling
- Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)

Implementation

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR): provides a legal framework for the management of fisheries south of the Antarctic Convergence. Because of the ecosystem approach taken by CCAMLR, commercial fishing must take into account not only of the impact on the target species, but also on those which are its predators and prey. This approach ensures that the implications of fisheries on the whole food chain are considered. Any harvesting and associated activities in the area south the Antarctic Convergence are governed by the conservation principles laid down in Article II of the Convention.

Protected areas

- **Falkland Islands Dependencies Conservation Ordinance 1975:** conservation and protection of the flora and fauna is regulated by this Ordinance. Under it, sites may be designated as Specially Protected Areas, protected in order to preserve their ecological systems, and Sites of Special Scientific Interest. Cooper Island is listed as a Specially Protected Area in Schedule A. Bird Island and Annenkov Islands are listed as Sites of Special Scientific Interest in Schedule B. Entry into these areas is by permit only.

Any additional area may be designated as a Specially Protected Area if it is:

- a representative example of a major land, freshwater, or coastal marine ecological system;
- an area with a unique complex of species;
- an area which is the type locality or only known habitat of any native plant or invertebrate species;
- an area which should be kept inviolate so that in future it may be used for purposes of comparison with localities that have been disturbed by man.

Two areas, King Edward Point and Bay of Isles, are designated *Areas of Special Tourist Interest* and are open for tourism and recreation. All other parts of South Georgia are closed to access other than by permit.

New legislation may stem from the South Georgia Management Plan being prepared by the British Antarctic Survey for the administration of the South Georgia and South Sandwich Islands Dependency (BAS in prep.).

A 200 nautical mile Maritime Zone was declared around South Georgia and the South Sandwich Islands in 1993 which makes provision for, amongst other things, the management and conservation of fisheries, mineral resources and control of whaling activities.

Species protection

Falkland Islands Dependencies Conservation Ordinance 1975: under this Ordinance, it is an offence to kill, wound, capture, molest or export any native mammal or native bird; or collect or destroy any native plant, except under permit.

Key names and addresses

Assistant Commissioner and Director of Fisheries,
Government of South Georgia and South Sandwich
Islands, Government House, Stanley, Falkland
Islands. Tel: 27433; fax 27434;
e-mail: gov.house@horizon.co.fk

British Antarctic Survey (The Director), High
Cross, Madingley Rd, Cambridge CB3 0ET. Tel:
01223 321400; fax: 01223 32616;
web site: <http://www.nbs.ac.uk>.

Conservation agencies

South Georgia is administered by the Com-
missioner of South Georgia and South Sandwich
Islands who is also the Governor of the Falkland
Islands. Local administration of conservation
regulations is delegated to the resident Marine
Officer, Magistrate (Garrison Commander) and to
the Director of the British Antarctic Survey.

14: South Sandwich Islands



Introduction

The South Sandwich Islands lie 470 km south-east of South Georgia and 1300 km from the Antarctic Continent, between 56° 18' and 59° 28' S, and 26° 14' and 28° 11' W. The group consists of 12 volcanic islands. The larger islands are largely ice-covered whereas the smaller ones are virtually ice-free. The total land area of the South Sandwich Islands is 310 km². The islands are uninhabited. The South Sandwich Islands are part of the South Georgia and South Sandwich Islands dependency. The Dependency is administered by a Civil Commissioner based in the Falkland Islands (who is concurrently the Governor of the Falkland Islands).

The islands form the only volcanic arc in the Antarctic region and are bounded by a deep sea trench, up to 8,265 m deep, on its eastern side. The west side is bound by the Scotia Sea. The islands range in length from 1–28 km and from 190–1,370 m in altitude. The larger islands, Bristol, Cook, Montagu, Saunders, Thule and Visikoi, are mainly

covered by ice; the smaller islands are almost ice-free in summer. Virtually all the islands show signs of recent volcanic activity, several have active fumaroles, and recent eruptions have occurred

Only a summary of international obligations, legislative provisions relating to nature conservation, and key contacts are provided here. Comprehensive information on the biodiversity of this territory is researched by, and is available, through the British Antarctic Survey.

International obligations relevant to nature conservation

- 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 on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on Biological Diversity (CBD)
- International Convention on the Regulation of Whaling
- Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)
- Convention for the Conservation of Antarctic Seals (CCAS)

Protected Areas

- **Falklands Islands Dependencies Conservation Ordinance 1975:** governs the conservation and protection of flora and fauna. Under this Ordinance, sites may be designated as Specially Protected Areas, protected in order to preserve their ecological systems, and Sites of Special Scientific Interest. Entry into these areas is by permit only. No sites have been designated in these categories as yet. Areas may also be designated Areas of Special Tourist Interest which are open for tourism and recreation, but no such areas have been declared as yet. New legislation may stem from the South Georgia Management Plan being prepared by the British Antarctic Survey for the administration of the South Georgia and South Sandwich Islands Dependency (BAS in prep.).

A 200 nautical mile Maritime Zone was declared around South Georgia and the South Sandwich Islands in 1993 which makes provision for, amongst other things, the management and conservation of fisheries, mineral resources and control of whaling activities. A substantial area of the Maritime Zone to the south of the South Sandwich Islands extends south of 60° S and therefore into the Antarctic Treaty Area. Under

the SGSSI 1993 Fisheries Ordinance, regulation of fishing activities does not extend to this part of the Maritime Zone.

Species protection

- **Falkland Islands Dependencies Conservation Ordinance 1975:** in accordance with this Ordinance, it is an offence to kill, wound, capture, molest or export any native mammal or native bird; or collect or destroy any native plant, except under permit.

Key names and addresses

Assistant Commissioner and Director of Fisheries,
Government of South Georgia and South Sandwich
Islands, Government House, Stanley, Falkland
Islands. Tel: 27433; fax 27434;
e-mail: gov.house@horizon.co.fk.

British Antarctic Survey (The Director), High
Cross, Madingley Road, Cambridge CB3 0ET. Tel:
01223 221400; fax: 01223 362616;
web site: <http://www.nbs.ac.uk>.

Conservation agencies

Under the South Georgia and South Sandwich Islands Order 1985, the islands are administered by the Governor of the Falklands in his capacity as Commissioner of South Georgia and the South Sandwich Islands. Local administration of conservation regulations is also delegated to the Director of BAS.

15: St Helena



Introduction

St Helena is a tropical island situated in the South Atlantic Ocean. It lies some 1,960 km from the nearest point on the south-west coast of Africa and 2,900 km east of South America. The island is volcanic, representing the deeply eroded summit of a composite volcano. It is approximately 16 km long and 10 km at its widest point. A high central ridge dominates the topography, and the highest point, Diana's Peak, lies on this ridge rising to 823 m above sea level. The land area of St Helena is 122 km². St Helena has two other Overseas Territories as dependencies: Ascension and Tristan da Cunha. St Helena, Ascension and Tristan da Cunha together form a single group of associated territories referred to as St Helena and its Dependencies.

The population of St Helena was 4,913 in 1998. Agriculture, livestock rearing and fishing are the island's main economic activities. The island is principally maintained by financial aid from the UK. Tourism is limited due to the isolation of St Helena.

The few visitors to the island include passengers from RMS St Helena. In addition, several cruise ships each year bring a few hundred visitors and between 100 and 150 yachts call at St Helena annually.

In 1993 a three-volume report on the sustainable environment and development strategy (SEDS) for St Helena was published (Royal Botanic Gardens Kew 1993). This study, commissioned by the UK Government at the request of the St Helena Government, represents one of the world's first programmes to begin integrating environmental and conservation issues under the goals of sustainable development. The SEDS strategy is supported by an integrated series of action plans and programmes. Information on St Helena's environment, compiled as part of the study and published in volume 2 of the report, forms the basis for this biodiversity profile. In December 1997 an Advisory Committee on the Environment was formed with responsibility for the full development of SEDS on the Island.

International obligations relevant to nature conservation

- 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 on Biological Diversity (CBD)
- 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

World Heritage Convention: in 1987 a proposal was put forward to inscribe the 11 ha of Diana's Peak and High Peak (St Helena) on the World Heritage list, but it failed to meet the criteria and was rejected on technicalities; the area was considered too small and the local protection status uncertain.

CITES: Regulations are in place under Customs legislation to enforce CITES requirements.

St Helena has also been proposed under the UNESCO Man and the Biosphere Programme for inscription as a biosphere reserve (Drucker *et al.* 1991).

Protected areas

- **The Forestry (Amendment) Ordinance 1985 (Forestry Ordinance No. 9, amended No. 2, 1985):** is the current legislation for protected areas together with Statutory Rules and Orders

No. 15, amended in No. 15 of 1978, and Legal Notice No. 3, 1981. New legislation for protected areas is expected in 2000 (Francis *in litt.*). The Forestry Ordinance 1985 empowered the Forestry Advisory Committee and subsequently its successor, the Agricultural and Natural Resources Committee, to declare three categories of protected area as follows:

- National forest: defined as any designated area of Crown land. Under Section 17(1), except with the written permission of the forestry officer, no person shall in any national forest:
 - cut, dig, burn or carry away any soil;
 - cut, gather, burn or carry away any forest produce;
 - permit any stock to enter or remain therein;
 - bring or make any fire therein.
- Dedicated forest: any area of privately owned land under the control of the forestry officer. Under Section 17(1), i–iv above also apply.
- Protected private forest: under Section 17(1), i–iv above also apply

Under the 1985 amendment in Section 15A(3) a report by the Agricultural and Forestry Officer on the environmental consequences of the loss of such forest must be made in the event of attempts to revoke or alter land in one of the three categories.

The first site, Diana's National Forest, was constituted under Section 8(1) (a) of the Forestry Ordinance No. 9 of 1954, No. 25 of 1955 and No. 6 of 1957. It is mixed St Helena Government property and Crown land. Diana's Peak National Park currently covers an area of 81 ha.

In 1990 protected areas were zoned into 1,000 ha of total productive forest for timber and fuel, and 200 ha as conservation forest areas. Conservation areas included areas of well-established natural woodland and areas of 'productive' woodland, established and maintained to prevent erosion and soil degradation. The sizes of individually gazetted forest sites are: Diana's

Peak Forest Reserve (1.3 ha), Hardings and Casons Forest Reserve (24.6 ha), High Peak Forest Reserve (4.9 ha) and Horse Ridge Nature Reserve (7.1 ha). At present, as little as 6% of St Helena is protected as forest (Wilson & Lomas 1991). Under the Endangered Plants Propagation Programme (see Biodiversity assesment section below) areas of endemic vegetation are designated as endemic forest reserves to distinguish them from areas of new planting of endemic trees and production forest

The Crown Wastes are Crown property and are therefore protected from private development, and are covered by an Ordinance against grazing animals of all kinds.

There are many areas that harbour examples of the unique and threatened flora, fauna, habitats, geology and heritage of the island. Most of these are protected under the existing Forestry Ordinance and are currently being reviewed as part of the National System Plan of Protected Areas. Despite the significant importance of the biological wealth in St Helena, the island has so far failed in its attempts to receive international recognition for this through inclusion on the World Heritage List.

A National System Plan of Protected Areas is currently being developed according to IUCN guidelines. However the completion of the Protected Area Plan, and consequent changes in protected area legislation, is not timetabled until 2000. The Strategic Land Use Plan for St Helena is currently being revised. Following the publication and final approval of the revised Strategic Land Use Plan, it will be known as the Land Use and Development Control Plan; together with the Land Planning and Development Control Ordinance 1998, it will guide future land-use development on the island. All protected areas, including the built environment identified in the National Plan System, will be included in the Land Development Control Plan.

There is a 200 mile exclusive fishing zone (EFZ) around St Helena.

Habitats of major significance

The habitat types of St Helena are discussed by Cronk (1989). There are at least 27 main terrestrial habitat types of which only about five are dominated by endemic or indigenous species. Most of the original vegetation of St Helena has been destroyed. Over 60% of the island is now covered by eroded areas of rock or scrub of prickly pear, aloe and other exotic species. Semi-natural forest covers less than 1% of the country in isolated remnants of the central mountain ridge. These remnants are of immense botanical, zoological and biogeographical interest, consisting of St Helena's endemic plants in their natural associations (Cronk 1990; Drucker *et al.* 1991; Royal Botanic Garden Kew 1993).

Current vegetation types have been identified as follows: tree-fern thicket; pasture, flax plantation, woodland and cultivations of mid-altitude areas partly covered by *Chrysanthemoides* (Asteraceae) – *Diospyros* (Ebenaceae) scrub, gumwood *Commidendrum robustum*, and pasture; cactus *Opuntia* scrub; *Lantana* (Verbenaceae) scrub dominated by invasive *Lantana sp.*; 'creeper' waste areas covered by mats of carpetweed *Carpobrotus sp.*; and semi-desert, which has very little vegetation but forms the eroding, barren Crown Wastes which were formerly covered with scrubwood *Commidendrum rugosum* (Cronk 1986c). Semi-desert areas have regenerating populations of the indigenous *Suaeda fruticosa* and endemic annuals St Helena salad plant *Hypertelis acida*, bone-seed *Ostespermum sancatae-helena* and babies' toes *Hydrodea cryptantha*.

Small mountain streams are the only inland waters found on St Helena. Patches of seasonal swamp, associated with the water courses, are scattered throughout the island's wet, central peak district, and also in some of the larger valleys of the arid peripheral areas.

Little is known about the coastal and marine habitats or ecosystems of St Helena; even the dominant communities re not fully known. The coastal and marine zone is broadly divided into four

sub-divisions: the deep ocean with an average depth of 4,000 m; sea-mounts; the inshore water on the narrow and shallow island shelf; and the coastline itself dropping to the low-water mark. The island shelf has three major types of habitat. Close inshore at the bases of cliffs, there is rock with a coating of seaweed and molluscs, usually dropping off steeply and often pitted with crevices and caves. The rocky drop-offs end either in fairly flat, sandy areas or areas of rubble and algal cobbles. The steep rock faces and numerous caves harbour schools of fish, corals, sea-fans, spiny lobster and occasional moray eels. In general there is much greater biomass in the marine zone than on land with greatest concentrations in the inshore waters (Royal Botanic Gardens Kew 1993).

Species of major significance

Biodiversity assessment

There is a continuous chronology of globally important scientific research, from Holly in 1676 to the earliest recorded plant species conservation measures in 1718 and some of the first global environmental concerns in 1722, to the work of Joseph Banks, Buchell, and Hooker in the 19th century. Darwin undertook work on the island in 1832–1836 and research has been undertaken subsequently, including seven major expeditions since the 1960s and the recent SEDS assessment.

Examples of recent work include the combined activities in plant conservation of the WWF-UK, Royal Botanical Gardens, Kew and the Agriculture and Nature Resources Department of St Helena in the Endemic Plants Propagation Programme (EPPP). This was established to protect threatened plant species and their habitats and, over the last few years, has been co-ordinated by the Agriculture and Forestry Officer (Benjamin *et al.*, 1986; Cronk 1980, 1986 a,b,c). Research on the conservation biology of the St Helena ebony and St Helena redwood was carried out in 1994–1995 (Rowe 1995) and there are currently various studies of the rarest endemic plant species funded by WWF-UK.

The SEDS initiative set out the research requirements to support an integrated biodiversity programme. The Advisory Committee for the Environment is actively seeking support for biodiversity assessments of lichens, lower plants and invertebrates (Rowe *in litt.* 1998). A checklist of the recorded fauna is given in Royal Botanic Gardens Kew (1993).

Plants

The native flora consists of about 60 species of flowering plants and ferns, 50 of which are endemic (in ten plant genera). The endemics are of great biogeographical interest, notably the giant woody members of the Compositae known as ‘cabbage trees’. Of the endemic species, six are now extinct, and 40 are threatened with extinction on a global scale. St Helena boxwood *Melissia begoniifolia* (Solanaceae), which had not been recorded for over 100 years, has been recently re-discovered and attempts are now being made to propagate the one remaining plant from seed (Royal Botanic Gardens Edinburgh, *in litt.*). Hybridisation, genetic and reproductive problems associated with rarity keep St Helena’s endemics close to the brink of extinction.

The conservation status of the following tree species are listed in the world list of threatened trees (Oldfield *et al.* 1998).

Acalypha rubrinervis (Euphorbiaceae) (EX): formerly a rare shrub or small tree of thickets on the central ridge above 600 m, it became extinct in 1870.

Commidendrum robustum ssp. gummiferum (Compositae) (EX): although it is doubtful whether any pure material of this gumwood subspecies still exists, its characters are frequently seen in hybrid populations at Peak Dale. The taxon was at one time distributed on the central ridge between 400 and 700 m. There is also a tree of questionable identity found in Deep Valley. The genus consists of five species, all endemic to St Helena.

St Helena gumwood *Commidendrum robustum subsp. robustum*, (EN): gumwood woodland covered over 60% of St Helena in the 16th century. Extensive cutting of trees for their fine timber in the following centuries led to their reduction to a few small stands. Only two viable populations now remain in Peak Dale and Deep Valley, accounting for less than 2,500 trees. Recent evidence indicates sheep grazing and competition with introduced plants may be a problem. Biological control appears to have helped rid infestations of the homopteran pest, *Orthezia insignis*. The genus consists of five species, all endemic to St Helena.

Bastard gumwood *Commidendrum rotundifolium* (Compositae) (EW): formerly one of the common gumwoods occurring in dry areas, by the end of the 18th century stands were reduced to a few isolated localities and the species was considered extinct at the end of the 19th century. A tree was rediscovered on an inaccessible cliff at the southern edge of Horse Pasture in 1982 but, by 1986, it had blown down in a gale. Nineteen trees, seedlings of the tree which blew down, were planted at Pounceys in the mid-1980s. Attempts to root cuttings have failed and seed from these trees have so far failed to germinate.

Scrubwood *Commidendrum rugosum* (Compositae) (VU): low domed shrub of the Crown wastes. At one time it became entirely confined to cliff localities. Since the extirpation of goats, population numbers are believed to be expanding. The total population consists of several thousand individuals. Sub-populations are very small and restricted geographically, making them vulnerable to stochastic events. They vary from approximately 1,000 in places such as South West Cliffs to scattered individuals on the approach to the Barn. The species is able to tolerate severe drought and saline conditions. There is evidence that hybridisation is occurring.

False gumwood *Commidendrum spurium* (Compositae) (CR): a small tree, known from just 12 individuals in the wild: one at Coles Rock, one old plant with three young ones at Mount Vesey,

and one fenced individual on a ridge between Cason's Gate and Oaklands. The species has been brought into cultivation. In the past, trees were recorded as growing on the tops of the highest mountains. The wood was chiefly used as a source of fuel.

She cabbage *Lachanodes arborea* (Compositae) (CR): once a common tree, occurring on the central ridge between 600 and 800 m, the species was thought to be extinct until 1976, when three old trees and some seedlings were discovered in pastureland above Osborne's Cottage. Seedlings have since been raised and planted out. It is a short-lived tree, which takes considerable effort to conserve in cultivation. The genus is monotypic.

Black cabbage tree *Melanodendron integrifolium* (Compositae) (VU): the most abundant of the endemic cabbage trees. A total of probably more than 1,000 individuals occur in various localities on the central ridge, principally Diana's Peak, Actaeon, Cabbage Tree Road, near Sandy Bay, High Peak and the Depot. Populations are healthy, appearing to regenerate well, although under competitive pressure from invading introduced species. The genus is monotypic.

St Helena olive *Nesiota elliptica* (Rhamnaceae) (EW): a small tree, once known from localised populations on the highest parts of the eastern central ridge; it became noticeably rare in the 19th century, when the population was recorded to consist of only 12 to 15 trees on the northern side of Diana's Peak. A single tree was discovered on a precipitous cliff near Diana's Peak but died in 1994. Of the many attempts to propagate cuttings from the tree, most have failed. One cutting grew to a tree of 2 m in Scotland but died in 1997. Now surviving are two seedlings at Pounceys, one seedling re-introduced to the Peaks, and one seedling in the nursery. The species was known to be pollinated by an endemic syrphid fly which also visits other endemic trees. The genus is monotypic.

'Dogwood' *Nesohedyotis arborea* (Rubiaceae) (EN): one of the commoner endemic trees of St Helena with 132 adult trees growing in damp tree-fern thickets on the central ridge. The 24 subpopulations are small and clumped because of human land-use patterns. The species is dioecious, although males can set seed occasionally, and a small part of the population is currently reproductively isolated. It is pollinated by an endemic syrphid fly, which is also known to visit other endemic trees. The genus is monotypic.

Whitewood *Petrobium arboreum* (Compositae) (EN): the smallest of the cabbage trees, it is confined to damp areas of relict tree-fern thicket or cabbage-tree woodland on the upper slopes of the central ridge above 600 m, principally at Cuckhold's Point, below Diana's Peak, Actaeon, above Grapevine Gut, Cabbage Tree Road. A total of approximately 150 plants exist. The genus is monotypic.

Phyllica polifolia (Rhamnaceae) (CR): occurring now only as a low straggling bush, the last tree-form specimen died recently at Blue Hill. Populations have been reduced to dry locations on cliffs, e.g. High Hill (27 plants), Lot (60 plants), Man's Head (15–20 plants) and one plant between Distant Cottage and Asses Ears. Although there may be up to 100 plants, they are fragmented in occurrence and vulnerable to competition from introduced plants.

He cabbage *Pladaroxylon leucadendron* (Compositae) (CR): a small spreading tree, which is found in a number of localities between 720 and 800 m on the central ridge, particularly at High Peak, from Mount Actaeon to Cuckhold's Point, also at Cabbage Tree Road and Diana's Peak. The total population size is probably less than 50 individuals. Regeneration has been successful where invasive plants, such as New Zealand flax, have been cleared. The genus is monotypic.

Trochetiopsis ebenus (Sterculiaceae) (CR): at one time this species of ebony occurred as a small tree,

distributed commonly in dry places between 200 m and 500 m, especially in northern and western parts of the island. The populations declined sharply in the 18th century, principally because of goat grazing, to what was thought to have been extinction. In 1980, two low shrubs were discovered on a cliff near the Asses Ears. Cuttings from the plants have rooted and almost 4,000 propagated specimens have been planted out around the island. The genus is made up of just three species endemic to St Helena, two of which are extinct in the wild.

St Helena redwood *Trochetiopsis erythroxylo*n (Sterculiaceae) (EW): the species was once common around the central ridge, but population declines were rapid as early settlers overexploited the tree for its red timber and bark, and introduced goats reduced any chance of regeneration. The last wild tree occurred in Peak Gut in the 1950s and is the ultimate source of the few existing individuals in cultivation. Inbreeding depression and a depauperate gene pool are manifest in the poor growth and high mortality of cultivated specimens. The hybrid between cultivated forms of this species and *T. ebenus*, by contrast, is extremely vigorous and may provide the only chance of survival for this part of the gene pool.

St Helena ebony *Trochetiopsis melanoxylo*n, (EX): a dwarf ebony, the identity of which has been confused with *T. ebenus* for the past 170 years. It probably occurred as a small shrub in arid areas of the north under the rain shadow of the central ridge. The last sighting of it was recorded in 1771.

The conservation status of other endemic vascular plants is recorded by Royal Botanic Garden Kew (1993).

The bryophytes of St Helena include 23 moss species, with 12 endemics, and 20 liverwort species with 11 endemics. The bryophytes are concentrated mainly in the remnant areas of endemic-rich vegetation, but they are also found in humid areas or valley bottoms dominated by exotic

species. The recorded lichen flora consists of 52 species of which 16 are endemic. The fungi have not been recently studied. Records mainly include widespread and introduced species. A list of over 60 marine algae of St Helena is provided by Lawson *et al.* (1993). One species of red algae *Predaea feldmannii* is reported to be endemic. In general the lower plants are poorly known.

Invertebrates

Around 300 endemic invertebrates have been described. Of the 256 beetles recorded on the island, 61.3% are endemic. Notes on critically endangered endemic invertebrate species are given below, based on Seal *et al.* (1993) unless stated otherwise. A total of 55 Coleoptera spp., two species of Diptera, one species of Mollusca, and one of Crustacea were evaluated for conservation status by Seal *et al.* (1993).

St Helena dragonfly *Sympetrum dilatatum* (EX): this species has not been seen with certainty since 1963 and is considered to be extinct in the 1996 IUCN red list of threatened animals (IUCN 1996).

Giant earwig *Labidura herculeana* (CR): the world's largest earwig; last collected in the Plain areas in 1965–1967, no individuals have subsequently been seen despite searches in 1988 and 1993 (IUCN 1996).

Giant ground beetle *Aplothorax burchelli*: last collected in the Plain areas in 1967, no individuals have subsequently been seen despite searches in 1988 and 1993.

Pseudophilochthus grayanus (CR): an endemic groundbeetle, this species is confined to Diana's Peak.

Pseudophilochthus dicksoniae (CR): an endemic groundbeetle, this species is confined to Diana's Peak.

Pseudophilochthus sublimatus (CR/EX): a species of endemic groundbeetle, it was recorded from the High Central Ridge in an area which has subsequently eroded.

Pseudophilochthus trechoides (CR): a species of endemic groundbeetle restricted to forest on the High Central Ridge.

Pseudophilochthus gemmulipennis (CR): an endemic groundbeetle, this species is confined to Diana's Peak.

Pseudophilochthus evanescens (CR): a species of endemic groundbeetle, restricted to forest in the Cabbage Tree Road area of the High Central Ridge.

Apteromimus platyderoides (CR): a species of endemic groundbeetle, recorded from forest of the High Central Ridge.

Apteromimus wollastoni (CR): a species of endemic groundbeetle, recorded from forest in the Cabbage Tree Road area of the High Central Ridge, living in rotten dead tree stems.

Endosmatium megalops (CR): a species of endemic groundbeetle, recorded from Actaeon and Diana's Peak.

Succinea sanctaehelena bensoniana (CR): the arid form of the endemic blushing snail, it occurs on Horse Point and Prosperous Bay Plain. The estimated population in 1993 was 600 individuals. The species as a whole is globally threatened.

Nesiotes barbatus (EX?): an endemic weevil of bastard gumwood forest last collected in 1880.

Nesiotes fimbriatus (EX?): an endemic weevil of gumwood forest.

Nesiotes brevisculus (EX/CR): an endemic weevil of Cabbage Tree forest, recorded from Diana's Peak, *High Peak and West Lodge*.

Acanthinomerus wollastoni (CR): an endemic weevil of Cabbage Tree forest.

The marine invertebrate fauna of St Helena has been subject to considerable study, with particular attention to molluscs, echinoderms and crustaceans. Of the 26 echinoderm species recorded on the St Helena shelf, two are endemic to St Helena, and four species together with three subspecies are found only at St Helena and Ascension. Eleven species of starfish have been recorded on the shelf including three endemics: *Astropecten sanctaehelenae*, *Astropecten variegatus* and *Narcissia trigonarea helenae*. *Tethyaster magnificus* is known only from St Helena and Ascension. Five species of brittle-star are recorded from the St Helena shelf and ten species of sea urchin. *Euclidaris clavata* is restricted to St Helena, Ascension and St Paul's Rocks. The sea urchins *Tretocidaris spinosa*, *Echinometra lucunter polypora* and *Pseudoboletia maculata atlantica* are known only from Ascension and St Helena (Royal Botanic Garden Kew 1993).

Fish

The fishes of St Helena have been reviewed by Edwards and Glass (1987) and the fisheries have been subject to a recent study (Edwards 1990). Currently 138 species of fish are known from the waters around St Helena. Endemic species of marine fish are St Helena dragonet *Callionymus sanctaehelenae*, the skulpin *Physiuculus helenensis*, deep-water jack *Pontinus nigropunctatus*, silver eel *Ariosoma mellissii*, Melliss's scorpion fish *Scorpaena mellissii*, deepwater greenfish *Holanthias fronticinctus*, bastard five finger *Chromis sanctaehelenae*, cavalley pilot *Stegastes sanctaehelenae*, greenfish *Thalassoma sanctaehelenae*, and Springer's blenny *Scartella springeri*. A further 16 species are recorded only from St Helena and Ascension (Royal Botanic Garden Kew 1993).

St Helena dragonet is considered to be critically endangered in the IUCN red list. It is only found at Sugar Loaf Hill and was described in 1983 from one specimen collected in the 1930s. The skulpin, a deepwater species, is also considered to be critically

endangered, deepwater jack is considered to be vulnerable (IUCN 1996).

Reptiles

Hawksbill turtle *Eretmochelys imbricata*, (EN) and green turtle *Chelonia mydas*, (CR) occur around the island but are rarely observed.

Birds

The endemic St Helena plover *Charadrius sanctaehelenae* occurs only in the northern, flatter parts of the interior of the island, where in the mid-1980s several hundred pairs were thought to survive (Collar & Stuart 1985). Intensive study during 1988–1989 showed that some 450 birds were then present, at highest densities in relatively dry, flat pastures. These studies also showed that apart from possible (but undocumented) predation by, or competition from, some introduced species, the only threat would appear to lie in potential land-use changes (McCulloch 1991, 1992). Censuses in 1991, 1992 and 1993 have suggested a steady decline from c. 375 (1991) to c. 315 (1993), with numbers on Deadwood Plain, a key area, halved since the late 1980s (Collar, Crosby & Stattersfield 1994).

Mammals

The coastal waters of St Helena support large numbers of bridled dolphin *Stenella attenuata*, smaller numbers of bottlenose dolphin *Tursops truncata*, and occasional visits by spinner dolphin *Stenella longirostris*. The humpback whale *Megaptera novaeangliae* migrates annually to the island from the southern Atlantic.

Species protection

- **The Forestry and Indigenous Trees and Plants Preservation Rules 1959:** details plants to be protected wherever they grow on the island, and annexed amendments include all major endemic species.

- **The Endangered Endemic and Indigenous Species Protection Ordinance 1996 and the Endangered Endemic and Indigenous Species Protection Order 1996:** replace the Wildlife (Protection) Ordinance 1984.
- **The Birds Protection Ordinance 1996:** has replaced the Game and Wild Birds (Protection) Ordinance 1950 and its subsequent amendments.

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Dr Rebecca Cairns-Wicks, Agriculture and Forestry Department, St Helena.

Key names and addresses

Department of Agriculture and Natural Resources, Scotland, St Helena Island, South Atlantic Ocean. Tel: 290 4724; fax: 290 4603; tlx: 4202 govt hl.

St Helena Heritage Society, Broadway House, Jamestown, St Helena Island, South Atlantic Ocean.

St Helena Nature Conservation Group, c/o Dr Rebecca Cairns-Wicks, PO Box 48, St Helena Island, South Atlantic Ocean. Tel: 290 4419; fax: 290 4978.

South Atlantic Working Group of the UK Dependent Territories Conservation Forum, c/o Mike Maunder, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB.

Chair IUCN/SSC South Atlantic Plants Specialist Group, Dr Rebecca Cairns-Wicks, PO Box 48, St Helena Island, South Atlantic Ocean. Tel: 290 4419; fax: 290 4978.

Conservation agencies

In St Helena conservation matters come under the

administration of the Agricultural and Natural Resources Committee of the Legislative Council, which oversees agricultural, forestry and fisheries activities.

The Director of the Department of Agriculture and Natural Resources (previously the Department of Agriculture and Forestry) heads four divisions; the Agricultural, Research, Administrative, and Forestry Divisions. Conservation and management of forest reserves is largely the responsibility of the Forestry Division.

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16: The Tristan da Cunha Islands



Introduction

The Tristan da Cunha Islands consist of four islands. Three are grouped together, namely Tristan da Cunha (9,600 ha), Inaccessible (1,300 ha) and Nightingale (400 ha, including offshore islets Middle and Stoltenhoff), which lie in the South Atlantic about 2,800 km from South Africa and some 3,200 km from the nearest point of South America. The fourth, Gough Island (6,500 ha), lies about 350 km south-south-east of Tristan da Cunha. The total land area of the islands is 178 km². The resident population of the Tristan da Cunha Islands is around 300, all resident on Tristan da Cunha, plus six non-permanent residents on Gough Island. The inshore lobster fishing concession provides the main source of revenue. Tristan da Cunha is a UK Overseas Territory and constitutionally it is also a dependency of St Helena. St Helena, Tristan da Cunha and Ascension together form a single group of associated territories referred to as St Helena and its Dependencies.

International obligations relevant to nature conservation

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

Implementation

World Heritage: Gough Island became a World Heritage Site in December 1995. A comprehensive management plan (Cooper & Ryan 1994) for Gough Island, prepared on behalf of the Tristan Government and funded by the Foreign and Commonwealth Office and the World Wide Fund for Nature came into effect in October 1993.

Protected areas

- **The Tristan da Cunha Conservation Ordinance 1976 (as amended):** This Ordinance applies to all the islands and islets in the group and the territorial waters. It makes provision for the designation of protected areas, as well as placing general restrictions on certain activities throughout the islands. Gough Island and Inaccessible Island have been listed by the Tristan da Cunha Council as Wildlife Reserves. In total some 44% of the land area of the Tristan da Cunha Islands is considered protected.

Designations under the Ordinance include:

Wildlife Reserve: activities prohibited include killing, capture, or molestation of native birds and mammals; interference with native vegetation; introduction of non-native fauna and flora; construction of buildings, roads, and structures without a permit.

Sanctuary: activities prohibited include wilful killing, capture or molestation of any native bird or native mammal.

One sanctuary, a rockhopper penguin *Eudyptes chrysocome* colony at Jews Point, has so far been created on Tristan da Cunha Island.

- **The Tristan da Cunha Fisheries Limits Ordinance of 1968 as amended by Ordinance No.3 of 1977:** this Ordinance specifically protects an area of 200 nautical miles around the Tristan Islands (Ryan & Cooper 1991). Fishing within this area is allowed only by permit.

Habitats of major significance

The volcanic island of Tristan da Cunha consists of a conical central peak rising to 2060 m above sea level. A shallow crater lake occurs at the summit. The island has a discontinuous ring of lowlands, the most important of which are Settlement Plain in the north-west, Sandy Point at the east, and Stony Hill and Cave Point in the south. The coastline has steep cliffs fringed by narrow boulder beaches and rocky headlands.

The native vegetation of Tristan is zoned altitudinally and topographically into five vegetation types. The lower areas were originally covered by tussock grass *Spartina arundinacea*, or thickets of island tree *Phyllica arborea* growing amongst a mass of ferns. Most of this lowland vegetation has been cleared by livestock grazing. Relatively undisturbed fern bush remains on the Base above Sandy Point, in the southern half of the island and in most of the gulches (Wace & Holdgate 1976). Between 600 and 750 m, the dwarf tree fern *Blechnum palmiforme* is dominant and, from 750–900 m, the tree ferns are replaced by low herbaceous vegetation which has been modified by grazing. Above this zone extensive mats of the crowberry *Empetrum rubrum* and the moss *Rhacomitrium lanuginosum* occur. Above 1,500 m the vegetation becomes very sparse.

Nightingale has two hill masses, the highest point in the east reaching about 400 m. The vegetation of Nightingale Island consists primarily of tussock grass *Spartina spp.*, with small groves of island tree *Phyllica arborea* in some of the inland gullies. There are patches of swampy vegetation and open water in the centre of the island. The vegetation has been little modified. Middle and Stoltenhoff Islands have similar tussock grass vegetation.

Inaccessible Island is thought to represent a fragment of a massive volcanic cone whose summit lay to the west of the present island. The highest point of the island rises to about 600 m above the western cliffs. Vegetation consists mainly of tussock grass on the coast and up to the steep sea

cliffs to the edge of the plateau (200–500 m). Fern bush with island tree thickets covers most of the wet peaty plateau and there are a few areas of crowberry *Empetrum* and mossy deergrass *Scirpus sp.* heaths at the highest altitudes to the west of the plateau (Roux *et al.* 1992).

Gough Island is the eroded summit of a Tertiary volcanic mass separated from the volcanic formations of the Tristan group. The island is mountainous, with steep cliffs forming much of the coastline and an undulating plateau rising to 910 m above sea level. The eastern side of the island is dissected by a series of deep, steep-sided valleys known as glens, which are separated by narrow, serrated ridges. The western side of the island consists of rounded slopes, extending from the central plateau to western sea cliffs. The southern part of the island has the only land below 200 m. Boulder beaches are found beneath the cliffs, and there are numerous offshore islets, stacks and rocks. The largest stacks support vascular plants and breeding birds.

Vegetation on Gough exhibits marked changes with altitude in relation to climatic differences (Wace 1961). Tussock grassland, dominated by *Spartina arundinacea* and tussock grass *Parodiocloa flabellata*, is restricted to areas where salt spray is regular, and can be found on offshore stacks, sea cliffs and adjacent slopes. Tussock grassland extends 300 m up seaward facing slopes on the exposed western side of the island, and to approximately 100 m on the more sheltered eastern side. Extending above the tussock grassland to approximately 500 m is fern bush. Fern bush is dominated by bat's wing fern *Histiopteris incisa*, characterised by the hard fern *Blechnum palmiforme*, and is more extensive on the eastern side of the island and in southern downland areas. This vegetation type reaches heights of approximately 1 m, occasionally interrupted by the island tree. From the upper limits of fern bush communities, wet heath becomes the dominant vegetation type, up to 800m altitude. This is a diverse vegetation type, characterised by fern species, sedges, grasses, angiosperms and mosses. Wet heath is dominated by *B. palmiforme*, *Empetrum rubrum*, grasses and sedges.

Above 600 m, peat bogs are widespread. These sodden bogs reach depths of up to 5m in deep valleys and are dominated by *Sphagnum mosses*. Fuegian arrow-grass *Tetroncium magellanicum* and *Scirpus spp.* are the only abundant vascular plants found in bogs, although bog margins show a wider diversity, including various grasses. From 600 m, feldmark and montane rock communities are found. These consist of an assemblage of cushion-forming or crevice plants, found on exposed areas such as ridges.

In the report on Ramsar implementation in the UK Dependent Territories, seven wetland sites which may be of international importance are identified (Hepburn *et al.* 1992). These are:

Sphagnum bogs, Gough Island
Skua Bog, Inaccessible Island
Ringeye Valley, Inaccessible Island
The Ponds, Nightingale Island
Soggy Plain, Tristan da Cunha
The Ponds up the East'Ard, Tristan da Cunha
Jenny's Watron, Tristan da Cunha

Species of major significance

The components of the flora and fauna of the islands of the Tristan da Cunha group are essentially similar to one another although some sub-Antarctic plants occur on Gough Island. The islands have significant numbers of endemic species and are particularly noteworthy for their endemic plants and landbirds.

Biodiversity assessment

A bibliography of scientific research at the Tristan da Cunha islands is provided by Watkins *et al.* (1984).

A Norwegian scientific expedition spent six months, during 1937–1938 investigating the geology and biology of the Tristan da Cunha Islands. The first detailed biological research on Gough Island was undertaken by members of the 1955 Gough Island Scientific Survey. Following the Royal Society expedition in 1962 and conservation

survey in 1968, research at Gough has been mainly by staff of the Percy FitzPatrick Institute of African Ornithology, University of Cape Town, South Africa, as part of the South African National Antarctic Research Programme (SANARP). Thirteen expeditions to Gough have been undertaken by the FitzPatrick Institute between 1979 and 1990. Most of the work on the island has been ornithological, but recently research activities have broadened to cover other aspects of the biota with special attention paid to conservation aspects (Cooper & Ryan 1992b).

Although Inaccessible is the second largest island of the Tristan group, it remained, until recently, the least well known. The Denstone Expedition to Inaccessible Island took place from October 1982 to February 1983. The island was previously largely unexplored and unmapped from ashore with only six short visits by scientists having taken place (Fraser *et al.* 1983). Following the Denstone Expedition, research, mainly by scientists from the FitzPatrick Institute, has made been made possible by the Expedition's provision of a field hut. The landbirds, seabirds, vegetation and invertebrates have all been studied in the past ten years. It is now considered that Nightingale Island needs a similar level of study.

Plants

The native flora of Tristan comprises about 40 species of flowering plant and 30 pteridophytes, with less on Nightingale and Inaccessible (Clark & Dingwall, 1985; Wace & Holdgate, 1976; R.Headland, *pers. comm.*, 1992; Roux *et al.* 1992). A number of endemic plants are considered to be rare but few, if any, of the taxa are immediately threatened (Davis *et al.* 1986).

The plant species endemic to Tristan da Cunha are:

- Acaena stangii* (Rosaceae): endemic to Gough, Inaccessible, Tristan da Cunha
- Agrostis carmichaelii*: a bent-grass restricted to Inaccessible and Tristan da Cunha

- Agrostis holdgateana* (I): a bent-grass restricted to Inaccessible and Tristan da Cunha
- Agrostis magellanica ssp. laeviuscula*: an endemic subspecies of bent-grass.
- Agrostis media*: a bent-grass found on Gough, Inaccessible and Tristan da Cunha
- Agrostis wacei* (I): a bent-grass restricted to Inaccessible and Tristan da Cunha
- Asplenium alvarezenae*: a fern found on Gough, Inaccessible and Tristan da Cunha
- Atriplex plebeja*: a rare saltbush found on Nightingale and Tristan da Cunha
- Calamagrostis deschampsiiiformis* (I): a small-reed found on Gough, Inaccessible and Tristan da Cunha
- Carex thourarsii var. recurvata*: a sedge found on Gough, Inaccessible and Tristan da Cunha
- Deschampsia christophersenii* (I): a hair-grass species restricted to Inaccessible and Tristan da Cunha
- Deschampsia mejlandii* (I): a hair-grass species restricted to Inaccessible and Tristan da Cunha
- Deschampsia ribusta* (I): a hair-grass restricted to Tristan da Cunha.
- Elaphoglossum campylolepium*: a fern restricted to Inaccessible and Tristan da Cunha
- Elaphoglossum obtusatum*: a fern restricted to Inaccessible and Tristan da Cunha
- Glyceria insularis* (I): a sweet-grass species found on Gough, Inaccessible and Tristan da Cunha
- Lycopodium diaphanum*: a clubmoss found on Gough, Inaccessible and Tristan da Cunha
- Nertera assurgens* (R): a rare bead plant restricted to Inaccessible and Tristan da Cunha
- Nertera holmboei* (R): a rare bead plant restricted to Inaccessible and Nightingale.
- Polypogon mollis* (I): a grass species restricted to Inaccessible and Tristan da Cunha

Forty species of algae have been recorded (Chamberlain *et al.* 1985), of which two species are endemic to Gough.

Invertebrates

Terrestrial invertebrates have been poorly studied, although c. 100 free-living species have been recorded. An additional 24 parasitic

invertebrate species have also been recorded from vertebrate hosts on the island. At least eight free-living invertebrate species are endemic to Gough, and an additional 14 species are restricted to Gough and the Tristan group of isles (Holdgate 1965). Only eight species of freshwater invertebrate are known (Holdgate 1965).

Most littoral species found at Gough are widespread on other Southern Ocean islands, and 79 invertebrate species have been recorded (Chamberlain *et al.* 1985). The absence of limpets and bivalves in the littoral and subtidal zones is noted. Sea urchins *Arbacia dufresnii* are abundant in the marine area, as are whelks *Argobuccinum* sp., chitons, starfishes, sea anemones, bryozoans, barnacles, slipper limpets, nudibranchs and sponges. Twenty coastal fish species have been recorded (Andrew *et al.* 1994) and other important marine species include Tristan rock lobster *Jasus tristani* (from close inshore to 400 m depth around Gough), and octopus. Both are economically exploited by fishermen under close regulation.

Birds

The avifauna of Tristan da Cunha are relatively well studied. The endemic landbirds are all considered to be rare with the exception of the Tristan thrush *Nesocichla eremita*, and are included in the *Threatened birds of Africa and related islands* (Collar & Stuart 1985), and *Birds to watch 2*: (Collar *et al.* 1994). The Tristan Islands and Gough are considered as two separate Endemic Bird Areas (EBA) by BirdLife International (Stattersfield *et al.* 1998).

The endemic land birds are:

Inaccessible rail *Atlantisia rogersi* (VU): the smallest flightless bird in the world, it is confined to Inaccessible. An estimated 8,400 birds live at high density (probably at carrying capacity) amidst the dense grassy vegetation of the island. There is a permanent risk that the island will be colonised by mammalian predators, particularly rats (Collar & Stuart 1985; Fraser 1989; Fraser *et al.* 1992).

Gough moorhen *Gallinula comeri* (VU): is found in tussock grassland and fern bush vegetation areas, and estimates of population size vary from 300–500 pairs (Richardson 1984) to 2,000–3,000 pairs (Watkins & Furness 1986).

Tristan thrush *Nesocichla eremita* (LRnt): has different subspecies recognised on the three main islands of the Tristan group. Habitats of the species are boulder beaches, tussock grassland, fern-bush and tree thickets (Fraser *et al.* 1994).

Gough bunting (or Gough finch) *Rowettia goughensis* (VU): is endemic to Gough Island where its 200 pairs are considered to be permanently at risk from the introduction of mammalian predators (Collar & Stuart 1985). The habitats of this species are wet heath, mires and feldmark.

Tristan bunting *Nesospiza acunhae* (VU): occurs widely on Inaccessible and Nightingale and also on Middle and Stoltenhoff islands. Populations, although totalling several thousands, remain at risk from the introduction of mammalian predators. Formerly, the Tristan bunting also occurred on Tristan itself (Collar & Stuart 1985). Analysis of work done in 1983 indicates some 5,000 birds (nominata *acunhae*) on Inaccessible, divided into two (upland and lowland) forms (Fraser & Briggs 1992; Ryan *et al.* 1994). Numbers of the race *questi* on Nightingale are unknown, but assumed to be smaller (see Collar & Stuart 1985).

Grosbeak bunting *Nesospiza wilkinsi* (VU) is restricted to *Phylica* woodland on Inaccessible and Nightingale Islands. The total population is in the low hundreds. The main threat is considered to be the introduction of mammalian predators (also seed predators) and the loss of its habitat (Collar & Stuart 1985). Analysis of work done in 1983 indicates some 500 birds (race *dunnei*) on Inaccessible, fewer (nominata *wilkinsi*) on Nightingale (Fraser & Briggs 1992).

Gough Island has been described as a strong

contender for the title “most important seabird colony in the world” (Bourne 1981), with 54 bird species recorded in total, of which 22 species breed on the island and 20 species are seabirds. About 48% of the world’s population of northern rockhopper penguin *Eudyptes chrysocome moseleyi* breed at Gough. Atlantic petrel *Pterodroma incerta* (VU) is endemic to Gough and the Tristan group of islands. Gough is also a major breeding site of the great shearwater *Puffinus gravis*, with up to three million pairs breeding on the island. The main southern ocean breeding sites of little shearwater *Puffinus assimilis* are Tristan da Cunha and Gough Island, with breeding pairs numbering several million (Richardson 1984). Tristan albatross *Diomedea dabbenena* is endemic and virtually restricted to Gough, with up to 2,000 breeding pairs (J.Cooper *in litt.* 1993). This represents about 4,000 mature individuals and 6,500 birds in total. The Atlantic yellow-nosed albatross *Thalassarche melanophrys* is also restricted to the islands, occurring in the main archipelago and on Gough Island, with an estimated global population of 36,800 pairs. The majority of the world population (15,600 pairs) of sooty albatross *Phoebastria fusca* (LRnt) occurs on Tristan and Gough Island. The only survivors in the Tristan group of the southern giant petrel *Macronectes giganteus* also breed on Gough, with a few hundred pairs recorded (J. Cooper *in litt.* 1998).

Tristan da Cunha Island has 15 breeding bird species. Inaccessible has 20 breeding birds including the Inaccessible rail and endemic subspecies of three other landbirds. It is the only breeding site for the spectacled petrel *Procellaria conspicillata* and an important site for the great shearwater. A few pairs of Tristan albatross *Diomedea dabbeana* breed on Inaccessible, the northernmost breeding station for this taxon. Nightingale has 16 breeding birds, including endemic subspecies of three landbirds. Nightingale has the largest breeding population of great shearwaters and significant numbers of northern rockhopper penguins.

Marine mammals

Two species of seal are native. They have been exploited in the past but are now protected, and are increasing in numbers once more (Wace & Holdgate 1976; Clark & Dingwall 1985; Bester 1990). They are:

Subantarctic fur seal *Arctocephalus tropicalis*. The Tristan de Cunha population, one of three distinct groups, is estimated at 200,000 accounting for approximately 65% of the world population (Reijnders *et al.* 1993). On Gough, breeding occurs at beaches all round the island. Subantarctic fur seals also breed on Nightingale and Inaccessible.

Southern elephant seal *Mirounga leonina*. within the Antarctic Treaty area (south of 60°S) this species is protected by the Convention for the Conservation of Antarctic Seals. The small population of the Tristan da Cunha Islands is one of five possible distinct groups. About 100 individuals of this species breed on Gough’s sheltered east coast (Bester 1990).

The southern right whale *Eubalaena glacialis australis* (LRcd) and dusky dolphin *Lagenorhynchus obscurus* (DD) occur offshore.

Species protection

• The Tristan da Cunha Conservation

Ordinance 1976: this Ordinance gives protection to native plants on Inaccessible and Gough. Such plants cannot be picked, cut down, uprooted or destroyed by non-residents of Tristan, without a permit. The Ordinance protects listed birds and mammals on the main island of Tristan da Cunha, and specifies under a second schedule those species which can be taken. On the other islands, all native birds and mammals are protected from capture, molestation and killing by non-residents of Tristan, except under permit. The taking of seals for commercial purposes by the concessionaire is also controlled under the Ordinance.

Amendments in 1984 and 1986 have modified the list of protected bird species under the Ordinance. Breeding birds on Tristan that remain unprotected are the sub-Antarctic skua *Catharacta antarctica*, the introduced Gough moorhen *Gallinula comeri*, the great shearwater and the sooty shearwater *Puffinus griseus*. The two shearwaters have since been confirmed as breeding on Tristan and may be included by amendment to the Ordinance. Species remaining legally unprotected on Nightingale are rockhopper penguins and great shearwaters, which are permitted to be taken by Tristan islanders under the terms of the Ordinance (Cooper & Ryan 1992a). Exploitation of all wildlife on Gough is forbidden under the Ordinance.

- **Tristan da Cunha Fisheries Limits Ordinance 1968 as amended:** defines the fishery limits of Tristan da Cunha and makes provision for the regulation of fishing within those limits.

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Mark Tasker, JNCC.

Key names and addresses

South Atlantic and Antarctic Department, Foreign and Commonwealth Office, King Charles St., London SW1A 2AH. Tel: 0171 270 3000.

The Administrator, Edinburgh, Tristan da Cunha. Tel: 874 144 5434; fax: 874 144 5413.

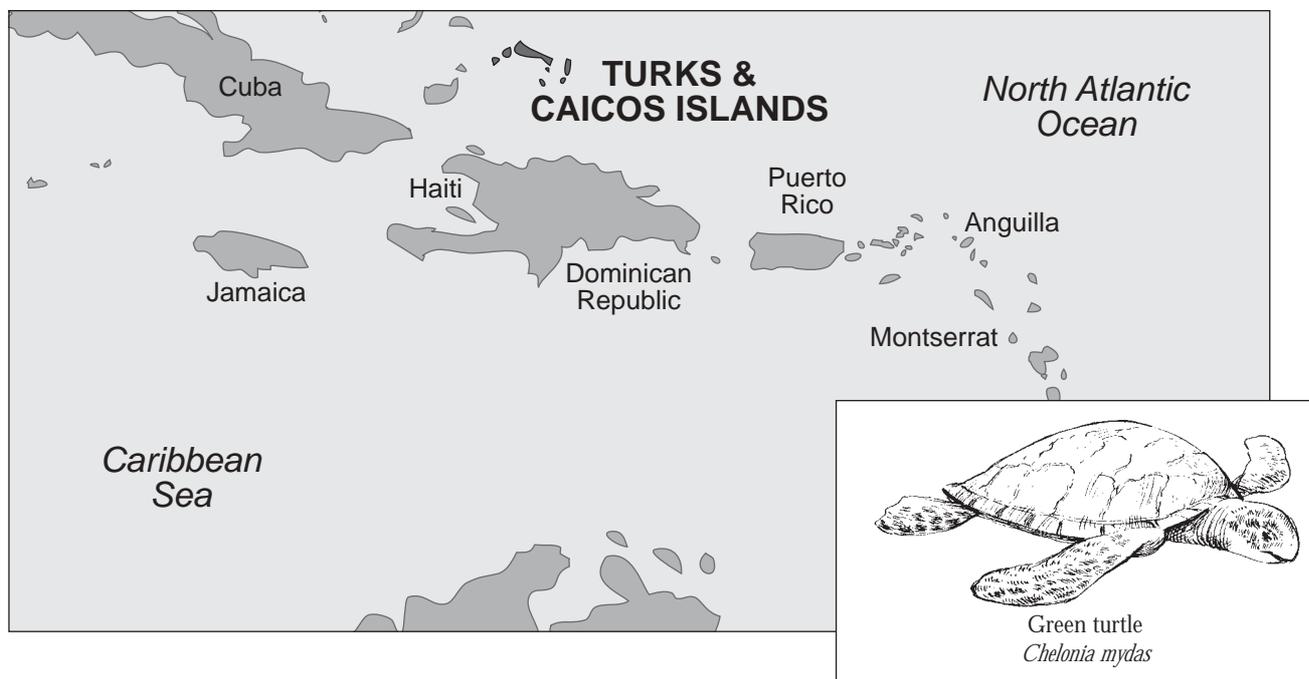
Dr Peter Ryan (Secretary of the Gough Island Wildlife Reserve Advisory Committee) Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7701, South Africa. Tel: 2721 650 2966; fax: 2721 650 3295; e-mail pryan@bottzoo.uct.ac.za.

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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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Dr Ed Green, WCMC; Dr John L. Hammerton,
Department of Agriculture, Bahamas

Key names and addresses

Director of Planning Department, South Base,
Grand Turk, Turks & Caicos Islands. Tel: 649-946-
2200; fax: 649-946-2448.

Christopher Hall (Acting Director) or Michelle
Fulford (Acting Chief Scientific Officer).
Department of Environment and Coastal
Resources, Ministry of Natural Resources, South
Base, Grand Turk, Turks & Caicos Islands.
Tel: 649 946 2970/2855/; fax: 649 946 1895;
e-mail: DECR@tcivav.tci.

Ethlyn Gibbs-Williams, Director, The National
Trust of the Turks and Caicos Islands,
Providenciales, Turks & Caicos Islands. Tel/fax:
649 941 5170.

Andrew Gude, Field Director, School for Field
Studies, South Caicos, Turks & Caicos Islands.

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Annex 1: Overseas Territories: Recent environmental projects with support from the UK Government (NB Italics = project still in progress)

ANGUILLA	* Lesser Antillean Iguana Conservation	£15,910	97/98
	+ <i>Anguilla Fisheries: Long-line Pilot Project</i>	£670,000	97/98
	D <i>Biodiversity Conservation and Protected Areas</i>	£83,000	99/01
BERMUDA	* Bermuda linkage to Convention on Biodiversity	£20,000	97/98
BAT	* <i>Resource Pack on Antarctica for Secondary Schools</i>	£23,228	98/99
BIOT	* <i>Turtle genetics research in Diego Garcia</i>	£25,000	98/99
BVI	* Anegada Rock Iguana	£28,940	98/99
	D <i>Integrating BVI National Parks, education & community development</i>	£116,000	98/00
CAYMAN Is	* Assess Caymans Wild Turtle Stocks	£8,650	97/98
	* Regional CITES Workshop in Grand Cayman June 98	£30,000	98/99
	* Falklands Ramsar Project	£12,050	97/98
FALKLAND Is	* <i>Falklands plant survey</i>	£17,300	98/99
	D <i>Falklands status and distribution of flora</i>	£33,000	99/01
	* Gibraltar – Rare Plant Propagation	£7,000	97/98
GIBRALTAR			
MONTSERRAT	* Biodiversity Project (moved to Caymans after eruptions)		pre-97
PITCAIRN Is	* <i>Pitcairn Reafforestation project</i>	£9,775	98/99
	+ <i>Rat eradication on Pitcairn</i>	£140,000	Sept 97/99
	* Land parcel for Diana's Peak National Park	£8,000	97/98
ST HELENA	* <i>Environmental Education in St Helena</i>	£7,400	98/99
	D <i>Ecology and conservation of Wirebird</i>	£89,000	98/00
	* Control Mexican Mesquite Tree <i>Prosopis juliflora</i>	£460	97/98
*ASCENSION	* Attempts at Rat and Cat eradication on Ascension	£29,923	97/98
	* Environment management plan for Ascension	£5,000	97/98
	D <i>Green Turtle status/eco-tourism plan</i>	£127,000	98/00
*TRISTAN	* <i>Research hut on Inaccessible Island (Tristan)</i>	£9,500	98/99
	D <i>Gough Island invertebrate diversity, endemism and threats from introduced species</i>	£127,000	99/02
SGSSI			
TCI	* TCI National Trust capacity building	£10,000	97/98
	* Underwater Dive and Snorkel Trails in TCI	£7,795	97/98
	* <i>Environmental Education in TCI</i>	£28,188	98/99
	+ <i>TCI Coastal Resources Management Project</i>	£985,000	Aug 98/01
	D Biodiversity Management around Ramsar site	£125,000	99/02
GENERAL (earlier)	D Support for NGOs in UK Overseas Territories (Round 1) D Rare Plants Training (Kew) for OTs and others (Round 3)		

Funding since May 1997 for 30 projects = £2,788,119 breakdown:

*= FCO Environment Command Programme Budget (CPB, FCO) £293,303 (21 projects, av £13,970)

D= Darwin Initiative of DETR £689,000 (7 projects, av £98,500)

+ = support from DfID £1,795,000 (3 projects, av £598,300)

Annex 2: Numbers of RDB species in each territory

These tables are compiled from the three IUCN red data books. Not all territories have been tabulated in each case as the summary data are not available.

Plants (other than trees)

	Ex	EX/E	E	V	R	I	Total no. threatened	No. species	% threatened
Bermuda	3		5		5		10	167	6
British Indian Ocean Territory						1	0	101	0
British Virgin Islands			4	3	6	1	13		
Cayman Islands		1	6	2	2	2	11	539	2
Falkland Islands			2		4		6	165	4
Gibraltar				3	1		4		
Montserrat			1		1		2	671	0.3
Pitcairn Islands			2	11		1	13	76	17
St Helena	11	3	22	2	27	14	54	165	33
Turks and Caicos					2		2	448	0.4

Source: Walter & Gillet 1998

Animals

	EX	EW	CR	EN	VU	LR cd	LR nt	DD	Total no. threatened
Bermuda			26	1	1			1	28
British Indian Ocean Territory			1	1		2		2	2
British Virgin Islands			3	3	4		1		10
Cayman Islands	4		1	1	2		5		4
Falkland Islands	1				1		6	4	1
Gibraltar					4	1	1	1	4
Montserrat			2	4			7		6
Pitcairn Islands						1			0
South Georgia					1				1
St Helena	24		4	2	13		3		19
Turks and Caicos			2	3	2		2		7

Source: IUCN, 1996

Trees

	EX	EW	CR	EN	VU	LR cd	LR nt	DD	Total no. threatened
Anguilla				2	1				3
Bermuda			1	1	2				4
British Indian Ocean Territory					2				2
British Virgin Islands			1	3					4
Cayman Islands				2	2		1		4
Montserrat				2	3				5
Pitcairn Islands			3	2	8				13
St Helena	3	3	5	3	2				10
Turks and Caicos				2				1	2

Source: Oldfield *et al.* 1998