



UNITED NATIONS ENVIRONMENT PROGRAMME

*Marine and coastal conservation in
the East African region: National Reports*

UNEP Regional Seas Reports and Studies No. 50

Prepared in co-operation with



IUCN

PREFACE

The Regional Seas Programme was initiated by UNEP in 1974. Since then the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources and has requested the development of regional action plans.

The Regional Seas Programme at present includes eleven regions ^{1/} and has over 120 coastal States participating in it. It is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation and encompassing a comprehensive approach to controlling environmental problems through the management of marine and coastal areas. Each regional action plan is formulated according to the needs of the region as perceived by the Governments concerned. It is designed to link assessment of the quality of the marine environment and the causes of its deterioration with activities for the management and development of the marine and coastal environment. The action plans promote the parallel development of regional legal agreements and of action-oriented programme activities ^{2/}.

Decision 8/13(C) of the eighth session of the Governing Council of UNEP called for the development of an action plan for the protection and management of the marine and coastal environment of the East African region. As a first activity in the region, UNEP organized in October and November 1981 a joint UNEP/UN/UNIDO FAO/UNESCO/WHO/IMCO/IUCN exploratory mission which visited the region.

The findings of the mission were used to prepare the following six sectoral reports:

- UN/UNESCO/UNEP: Marine and coastal area development in the East African region. UNEP Regional Seas Reports and Studies No. 6. UNEP, 1982;
- UNIDO/UNEP: Industrial sources of marine and coastal pollution in the East African region. UNEP Regional Seas Reports and Studies No. 7. UNEP, 1982;
- FAO/UNEP: Marine pollution in the East African region. UNEP Regional Seas Reports and Studies No. 8. UNEP, 1982;
- WHO/UNEP: Public health problems in the coastal zone of the East African region. UNEP Regional Seas Reports and Studies No. 9. UNEP, 1982;
- IMO/UNEP: Oil pollution control in the East African region. UNEP Regional Seas Reports and Studies No. 10. UNEP, 1982; and
- IUCN/UNEP: Conservation of coastal and marine ecosystems and living resources of the East African region. UNEP Regional Seas Reports and Studies No. 11. UNEP 1982.

^{1/} Mediterranean Region, Kuwait Action Plan Region, West and Central African Region, Wider Caribbean Region, East Asian Seas Region, South-East Pacific Region, South Pacific Region, Red Sea and Gulf of Aden Region, East African Region, South-West Atlantic Region and South Asian Region.

^{2/} UNEP: Achievements and planned development of UNEP's Regional Seas Programme and comparable programmes sponsored by other bodies. UNEP Regional Seas Reports and Studies No. 1. UNEP, 1982.

The six sectoral reports prepared on the basis of the mission's findings were used by the UNEP secretariat in preparing a summary overview entitled:

- UNEP: Environmental problems of the East African region. UNEP Regional Seas Reports and Studies No. 12. UNEP, 1982.

The overview and the six sectoral reports were submitted to the UNEP Workshop on the Protection and Development of the Marine and Coastal Environment of the East African Region (Mahé, Seychelles, 27-30 September 1982) attended by experts designated by the Governments of the East African region.

The Workshop:

- reviewed the environmental problems of the region;
- endorsed a draft action plan for the protection and development of the marine and coastal environment of the East African region;
- defined a priority programme of activities to be developed within the framework of the draft action plan; and
- recommended that the draft action plan, together with a draft regional convention for the protection and management of the marine and coastal environment of the East African region and protocols concerning (a) co-operation in combating pollution in cases of emergency, and (b) specially protected areas and endangered species, be submitted to a conference of plenipotentiaries of the Governments of the region with a view to their adoption.

In consultation with the Governments of the East African region the further development of the action plan was focused on activities directly related to preparations for the conference of plenipotentiaries and to other regional activities which received a first priority rating in the programme recommended by the Mahé workshop ^{3/}. This included the preparation of a series of country reports by experts from the region on:

- national legislation;
- national resources and conservation; and
- socio-economic activities that may have an impact on the marine and coastal environment.

^{3/} Report of the Workshop on the protection and development of the marine and coastal environment of the East African region, Mahé, 27-30 September 1982, (UNEP/WG/77/4).

The national reports were synthesized in regional reports 4/ 5/ 6/ which were prepared with a view to assisting the Governments of the East African region in their negotiations on the regional convention and its protocols. In addition, a technical training Workshop on the control of pollution from ships in the East African region was convened jointly by the International Maritime Organization (IMO) and UNEP in November 1983.

The present document is a compiled volume of the national reports dealing with the East African region. Similar volumes covering legal aspects and socio-economic activities in the East African region have been compiled 7/ 8/ 9/. The seven national studies were written by the following experts: L.A. ChongSeng (Seychelles), H. Gruchet (France), I. Jehangeer (Mauritius), D. Kinyanjui (Kenya), A.A.B. Noman (Comoros), A. Razafimbelo and P. Randrianarijaona (Madagascar) and M. Salah (Somalia). No expert was designated by Mozambique, and the expert from the United Republic of Tanzania did not submit a report, hence no reports for these two countries is contained in this volume. The national reports are reproduced in the original language in which they have been prepared and submitted.

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- 4/ FAO/UNEP: Legal aspects of protecting and managing the marine and coastal environment of the East African region. UNEP Regional Seas Reports and Studies No. 38. UNEP, 1983.
- 5/ IUCN/UNEP: Marine and coastal conservation in the East African region. UNEP Regional Seas Reports and Studies No. 39. UNEP, 1984.
- 6/ UNEP: Socio-economic activities that may have an impact on the marine and coastal environment of the East African region. UNEP Regional Seas Reports and Studies No. 41. UNEP, 1984.
- 7/ FAO/UNEP: Legal aspects of protecting and managing the marine and coastal environment of the East African region: National reports. UNEP Regional Seas Reports and Studies No. 49. UNEP, 1984.
- 8/ IUCN/UNEP: Marine and coastal conservation in the East African region: National reports. Regional Seas Reports and Studies No. 50. UNEP, 1984.
- 9/ UNEP: Socio-economic activities that may have an impact on the marine and coastal environment of the East African region: National reports. UNEP Regional Seas Reports and Studies No. 51. UNEP, 1984.

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SEYCHELLES NATIONAL REPORT : by L. Chongseng

BASIC DATA ON SEYCHELLES

Land area:	444 km ²
Area of territorial sea:	1,374,000 km ²
Population:	64,410 (mid-1982 figures)
Population density:	1,45.1 inhabitants per km ²
Rate of population growth:	2.0 per cent per year (average of the natural rate of growth for 1978-1982) 0.0 per cent if migration figures are taken into account
Population earning living from agriculture:	17 per cent*
Population earning living from fishing:	4 per cent*
Per capita gross national product:	US\$ 2,327 for 1981
Literacy rate:	35.6 per cent
Major sources of foreign exchange:	
Tourism :	285 million rroupes (1 US\$ = 7.5 SR)
Transfer grants :	68 " "
Re-exports :	67 " " (mostly petroleum)
Official loans :	42 " " (products)
Exports :	32 " "
	Main exports are copra, frozen fish and cinnamon

(*) 1977 census

REVIEW OF NATIONAL MANAGEMENT POLICIES TO PROTECTED AREAS
AND ENDANGERED SPECIES

Legislation

International legislation:

Seychelles has become party to the following legal instruments:

- a) World Heritage Convention (3 December, 1979);
- b) Convention on International Trade in Endangered Species (CITES, 5 September 1977).

National legislation:

- a) Protected area legislation:

As stated by Wilson, 1980, "The National Parks and Nature Conservancy Act is the basis of the network of national parks and reserves in the Seychelles. It provides for the creation of a National Parks and Nature Conservancy Commission (this has now been strengthened and renamed, The Seychelles National Environment Commission), to be the managing authority for areas designated as Strict Nature Reserves, Special Reserves, National Parks and Areas of Outstanding Natural Beauty and confers the necessary powers to the Commission to undertake this task."

The act also defines a national park as: "An area set aside for the propagation, protection and preservation of wildlife as the preservation of places of objects of aesthetic, geological, prehistoric, historical, archeological or other scientific interest for the benefit, advantage and enjoyment of the general public and includes in the case of a marine national park, an area of shore, sea or seabed together with coral reef and other marine features so set aside".

Each separate reserve also has its own regulations, e.g. The St. Anne Marine National Park Regulations which clearly states the do's and the don'ts. It also gives details of fines and imprisonment terms for offenders.

- b) Species conservation legislation

There have been attempts to protect two main types of species:

- Those species that are migratory and therefore widespread throughout the Republic, e.g. marine turtles and sooty terns. This legislation tends to go into details about the size, sex, open and close season of the species it is trying to conserve. In effect an attempt at policing was tried. The newer legislation now tries to attack the market rather than carrying out actual policing. The latest laws on seashells and hawksbill turtles make it illegal to sell them. By destroying the market the pressures on the species are removed very effectively.
- Those species that only occur in very specialized habitats like cocos-de-mer, paradise flycatchers, black parrots etc.. In these cases the habitat as a whole is given some protection as well as making it illegal to kill or take the actual species itself.

The Seychelles consist of over a hundred islands with over 95 per cent of the population living on Mahé, Praslin and La Digue. This means that these are the only areas with a police force and not much enforcement of species legislation is carried out.

c) Legislation dealing with land-use planning

There is comprehensive legislation controlling all developments within Seychelles, the most important being the Town and Country Planning Act (Cap 160). Anybody wishing to carry out any development has to submit an outline and detailed planning applications which are circulated to various ministries and departments such as Agriculture, Water, Electricity, Conservation, Health, etc. for comments. These comments and planning applications are then processed by a Town and Country Planning Authority.

According to the 1975 Structure Plan the following land-use zoning categories exist: conservation areas, protected beaches, coastal areas of special control, airport special planning areas, existing major hotels, industrial areas, major residential estates, agricultural rural zones, settlement growth areas, district service centres, greater Victoria planning areas, east coast road proposals. At the moment various committees are identifying land for agricultural uses, and others are trying to produce a land use map for Mahé.

d) Legislation dealing with coastal zone management

Not very comprehensive. Each development project is judged on its own merit. Certain beaches on Mahé, Praslin and La Digue have been designated as "protected beaches". All contiguous development - the type and character of which would be strictly controlled - would, in normal circumstances, require to be set back at least 40 feet from the high water mark.

Legislation exists to control the removal of sand and gravel from beaches, rivers and plateaux, to stop the cutting of beach front vegetation, to stop the felling of roadside trees etc.. Strict control over the type of development uses to be permitted, including hotel projects is also exercised.

e) Legislation dealing with fisheries

Traditionally concerned with types of gear, mesh sizes, etc.. Certain bays were administered as fishing reserves where no net fishing was allowed. Various size limits, open and close season, berried or non-berried females, were applied especially for crabs and lobsters. Fishing with a light at night was only allowed under licence. No dynamiting was allowed and since 1968 spear fishing has also been illegal.

The new legislation is more concerned about foreign fishing vessels in the Exclusive Economic Zone and territorial waters. Seychelles waters are patrolled and legitimate fishing vessels are charged licence fees. There are also numerous laws dealing with marine turtles, which have been chopped and changed so often that a lot of confusion has resulted. At the moment a World Wildlife Fund expert is carrying out a two-year survey and it is to be hoped that new legislation will be adopted based on scientific facts.

Provisions for planning

National Development Plan

A five-year National Development Plan is published every year and is normally presented by the President who also writes the foreword. It is produced by economists from the Ministry of Planning who liaise with other government ministries and parastatal organizations. Intensive consultations are also carried out by the Government and the people. The purpose of the plan is to set out, for all to see,

the policies and programmes which Government considers should be adopted with the aim of creating a more prosperous and equitable society. The plan is flexible and is continually reviewed so as to take into account changes both internal and external. Each year one particular theme is chosen, be it boosting food production, education, medical care etc.

National planning board (or similar body)

The local equivalent is the Town and Country Planning Authority. Members are appointed by the Minister for National Development and are chosen from the various technical services as well as leading lay citizens. The Principal Secretary in the Ministry of National Development and the Chief Planning Officer have the posts of chairman and secretary. According to its constitution a quorum for a meeting is five members. Meetings are held every six weeks when the various planning applications are processed. The Town and Country Planning Authority's decision can however be overruled by the Minister for National Development.

National Conservation Strategy (NCS)

Originally the White paper on the Conservation Policy of the Seychelles played a similar role. Although still the official policy it is outdated. It was printed in 1971 and was too ambitious and needs to be revised. In 1982 the Seychelles National Environment Commission did most of the groundwork in an attempt to draw up the National Conservation Strategy. Six sub-commissions on topics like pollution, legislation, education, national parks, etc. were set up and asked to write reports. These reports have been collated and used to draw up the terms of reference for a consultant to come and draft the NCS. A formal request for assistance has been made to IUCN.

Regional (sub-national) plans

None as such exist. However the policy of the Government has been to decentralize certain sectors like schooling, health clinics, children's creches, social centres and a vast building phase is almost complete now. Recently a detailed plan for the development of the Beau Vallon area on Mahé (an area renowned for its large hotels and spectacular beach) was produced and exhibited. It is intended that it will serve as a model for other districts.

Since Seychelles consists of over 100 islands, it is being administered as three basic groups. Mahé, the inner islands of Praslin, La Digue, and Silhouette, and the outer island groups of Aldabra, Farquar and Amirantes. Infrastructures like water, electricity and roads are being introduced on a regional basis.

Coastal zone plans

Again, coastal zone plans as such do not exist. The zone that has suffered a great deal is the east coast of Mahé, an area which had large expanses of mangrove swamps. However most of the early settlers established themselves on this coast and destroyed the mangroves through land reclamation schemes and building coastal roads using corals as the main building material.

More recently there have been the sites for gigantic reclamation projects such as Pointe La Rue airport and the new port harbour. Other projects being planned are the massive east coast road project, an international marina, and a fishing harbour. Along the coastal zone there are to be found the Les Mammelles industrial zone and various housing estates, farms and research stations.

Protected area systems plan

The document of closest relevance existing is the Seychelles Government White paper (1971) "Conservation Policy in the Seychelles". In its introduction it states:

"The Government's policy statement on tourism development in Seychelles emphasized the overriding need to protect the natural beauty of the islands and their natural environment, which are our greatest assets. It was envisaged that one of the most important ways of achieving this should be through the designation of National Parks and other reserves and through the protection of areas where characteristic wildlife could be conserved in its natural surroundings, for the enjoyment of the public. The purpose of the White paper is to set out in more detail how the Government intends to give effect to this aspect of its policy".

Because of such an approach, less attractive habitats like mudflats, marshes and mangrove swamps have been neglected. In particular, the marine areas have been chosen more from an aesthetic angle than as being thriving areas of good coral reefs, etc. The plan was a very ambitious one and should be revised to take into account the new economic situation.

Management plans for protected areas

All the protected areas have had management plans drawn up. Aldabra was taken care of by the Royal Society, Aride by the Royal Society for Nature Conservation (RSNC) and Cousin by the International Council for Bird Preservation (ICBP). All the others like Morne Seychellois National Park, Praslin National Park (including the Vallée de Mai), St. Anne Marine National Park, Curieuse Marine National Park, Port Launay and Baie Ternaie Marine National Parks have all had plans formulated by Roger Wilson who came to Seychelles in 1980 as conservation legislation adviser and then stayed for another two years as the conservation adviser. The plans have all been approved by the Council of Ministers but in the case of Praslin, Morne Seychellois, Port Launay and Baie Ternaie have not yet been implemented due to lack of personnel, funds and equipment.

Zoning plans for protected areas

Especially for places like Morne Seychellois, Praslin and Curieuse where it is envisaged that tourism, agriculture, commercial forestry and conservation are all accepted activities going on in the National Parks, a system of zoning had to be adopted. There are zones where only scientists accompanied by park rangers are allowed and others where unaccompanied tourists are admitted, etc. In the conservation areas there is further refining, e.g. in the St. Anne Marine National Parks certain areas are zoned as viewing areas only. In these areas the dropping of anchors and fishing are strictly prohibited. However, one glaring omission from the marine parks has been the lack of a buffer zone between the controlled fishing and non-fishing areas.

Institutional linkages of species and habitat conservation

Ministry of Environment

The equivalent is the newly created Ministry of National Development. It contains the former Ministry of Agriculture, the Physical Planning Division, the Lands Division, the Survey Division, the Environmental Division and the Fisheries Division. Clearly this is the Ministry to decide whether a freshwater marsh shall be drained and used for intensive vegetable production, whether indigenous forests

shall be replaced with exotic species like pines, eucalyptus and mahogany, whether healthy coral reefs shall not be destroyed for lime production or from siltation caused by large-scale dredging, etc. The Forestry and Conservation Division, the main executive for the conservation policy, falls within this Ministry.

Ministry of Agriculture (or similiar institution)

This has now been absorbed by the new Ministry of National Development. This department is advocating very modern techniques involving a lot of variety trials and intensive production using artificial fertilizers and pesticides. They have tried to mechanize as much as possible, which means that they tended to develop all the flat areas with the result that a lot of mangroves and freshwater marshes have been drained and reclaimed for vegetable and root crop production.

This tendency towards monoculture and the use of pesticides could lead to serious disease problems in the future. On the other hand, by using such efficient methods the more destructive methods like slash burning on steep hillsides can be avoided. The department has been responsible for the introduction of a number of exotic species which have turned out to be invasive. The classic case is the introduction of the African barn owl as a biological control for rats, but which instead almost wiped out the white native owls.

Department of Forestry

When it started in the early 1940s its main role was soil conservation. This has now shifted to timber production and there are ambitious plans to make Seychelles both self-sufficient and an exporter of fine timber. After some trials with *Callophyllum*, *Tabebuilla* and various other *Meliaceae* it decided that the Mahogany *Swietenia macrophylla* was the best and fastest-growing species and launched into a reforestation project whereby every year 200 acres of mahogany was planted both on Mahé and Praslin. This virtual monoculture of an exotic species is now being questioned and there seems to be a move to plant indigenous trees.

A major disadvantage of mahogany is that it does not tolerate competition. This means that before it can be planted the planing area must be clear felled. The Forestry Department has the best personnel for the propagation and re-planting of rare endemic species. In recent years they have exploited a lot of *Cinnamomum zeylicum* and *Albizia falcataria* which are probably the most invasive exotic species. Unless an eradication programme is launched fairly soon, the indigenous species still growing will be just a memory. Due to the fact that the department was run by expatriate officers there is at present a dearth of qualified forestry officers who are only now in the process of being trained.

Department of Fisheries

The Department has been concentrating on investigations into the size of tuna stocks. A lot of the studies carried out have been more to do with testing of new fishing gear and techniques than monitoring fish abundance in general and they had the capacity to carry out monitoring programmes. Certain species like crabs and lobsters have become very rare because of ineffective law enforcements.

About the only aspect of species and habitat conservation the Department is concerned about is to administer certain Mahé bays as fishing reserves. Little concern has been shown for cockle beds, sea-grass beds, mangroves, coral reefs, turtles, marine shells, etc. By a change of attitude the Department could play a vital role in their conservation since it has not the personnel and equipment to carry out research.

Ministry of Tourism

Through the use of areas like St. Anne Marine National Park, Vallée de Mai and La Digue Veuve Reserve the Ministry tends to justify its existence on economic grounds. If it were not for tourism it would be virtually impossible to keep housing development out of national parks. Places like Vallée de Mai, Cousin island, Aride island rely a lot on revenue generated by tourism. By holding courses for tourist guides at the hotel training school the Ministry plays a vital role in ensuring that visitors respect Seychelles rules and regulations. It also acts as a source of information through its various bureaux to inform visitors on what the islands have to offer. It has also contributed to funds for setting up road signs and developing footpaths. It has given Seychelles a good deal of publicity and drawn particular attention to the unique flora and fauna.

Ministry of Planning or Development

The new Ministry of Planning and External Relations is the local equivalent. It is the Ministry that submits a project for funding from the various aid donors. The Minister, Planning and External Relations, is also the chairman of the Seychelles National Environment Commission, (SNEC) and his Principal Secretary for Planning is also a member of the SNEC. This means that development projects are public knowledge right from their inception and open to comment whereas previously projects were only heard about when they were already on the ground and it was too late to do anything about them. This Ministry has also played a prominent role in the international arena on such varied topics as whaling, the Regional Seas Programme, CITES, the Indian Ocean Alliance, Aldabra, etc.

Protected area management

The following categories are represented by the protected area system of Seychelles:

I.	Strict Nature Reserve	3 Units
II.	National Park	4 Units
III.	National Monument	None as yet but over 20 sites have been proposed to the Council of Ministers
IV.	Game Reserve	2 Units
V.	Cultural Landscape	None
VI.	Resource Reserve	8 Units
VII.	Anthropological Reserve	None
VIII.	Multiple-Use Reserve	2 Units
IX.	Biosphere Reserve	None
X.	World Heritage Site	1 Unit plus another just proposed

Category I

Aldabra:	Mr. David Thomas The Secretary Seychelles Island Foundation c/o State House, Mahé Seychelles
Cousin Island: Local:	Mr. Robbie Bresson Warden, Cousin Island via Praslin Seychelles
Overseas:	The International Council for Bird Preservation British Section c/o - R. D. Chancellor British Museum (Natural History) Cromwell Road London SW7 5BD Tel: 01-589-6323 Telegrams: ICBP, Nathismus, Southkens, London
Aride Island:	Mr. Chris Lomer Secretary Aride Island Local Management Committee
Local:	c/o - Grand Anse Research Station Ministry of National Environment Seychelles
Overseas:	Mr. C. Cadbury (Royal Society for Nature Conservancy) RSNC. c/o - Beaconwood Rednal Birmingham B45 9XP UK

Category II

St. Anne Marine National Park	)	Mr. L. Chongseng
Port Launay Marine National Park	)	Conservation Officer
Baie Ternaie Marine National Park	)	Independence House
Curieuse Marine National Park	)	Ministry of National Development

Category IV

Vallée de Mai Nature Reserve Address: same as Category II

La Digue Veuve Reserve Address: same as Category II

Category VI

Ile Sèche)	
Ile aux Fous)	
Boudeuse)	
Etoile	)	Address: same as above
Lamperiaire)	
Les Mamelles)	
Cousine)	
Vache Marine)	

Category VIII

Morne Seychellois National Park) Address: same as above
Praslin National Park)

Policies

The Forestry and Conservation Division is responsible for the creation and management of all protected areas in Seychelles apart from Aldabra, Cousin and Aride which are special cases. Its policies are those stated in the "Conservation Policy in the Seychelles" a White paper which sets out current government policy on matters affecting conservation in the Seychelles. It was published in 1971 and still remains the official policy.

In the White paper it is stated that the intention over the long term is to observe the following principles:

- Examples of natural habitats must be preserved for the people of Seychelles and for the world at large, in order to make it possible to study individual species and to retain biological systems where natural processes can be studied and put to beneficial use of man.
- Extensively distributed natural resources should be protected and developed to ensure that they remain a source of food, materials or revenue.
- Appropriate areas should be protected and developed for public recreation and enjoyment, both for the people of Seychelles and for tourists.

The Seychelles Island Foundation (SIF) has the more specific objective of managing Aldabra Atoll as a Strict Nature Reserve. It has a series of committees namely: Appeals Committee - for fund raising, Scientific Advisory Committee, Management Committee and a board of trustees. Different countries and organizations

have been invited to belong to the various committees, the main ones being The Royal Society, The French Research Organization ORSTOM (Office de la recherche scientifique et technique d'outre-mer), the Smithsonian Institute, the World Wildlife Fund and The Royal Society for Nature Conservation (RSNC). The aim is to make Aldabra financially secure by setting up a trust fund. It is intended that revenue will be generated mostly through the use of the research facilities by scientists and limited, carefully controlled, tourism.

Aldabra was accepted as a World Heritage Site at the end of 1982. This means that the prospect for the training of much needed personnel and equipment is now good. The policy is one of minimal interference, which has been the key to Aldabra's importance in the recent past.

International Council for Bird Preservation (ICBP)

Cousin was acquired and managed as a nature reserve to fulfil the following objectives:

- (i) To preserve and, if practicable, to increase the populations of the following bird species in order of priority:
 - Seychelles brush warbler,
 - Seychelles fody,
 - Seychelles turtle dove;
- (ii) To protect and conserve all the wildlife of the island, including the coral reefs and marine life around the island;
- (iii) To allow the vegetation to revert as nearly as possible to its natural state;
- (iv) To use the island judiciously for research which would:
 - help to achieve objectives (i), (ii), (iii), and
 - to increase the total fund of knowledge, especially of birds;
- (v) To make optimum use of the island for the education of Seychellois;
- (vi) The island shall be open to visitors. Such visits will be carefully controlled in the interests of the bird life, and visitors shall pay a landing fee. The landing on Cousin is sometimes hazardous and it shall be at the discretion of the Scientific Administrator or the island manager to withhold landing facilities without notice;
- (vii) A management plan shall be prepared, with a five-year term, to be revised not later than the end of the fourth year;
- (viii) The capital and recurrent costs of management shall be borne by ICBP;
- (ix) Revenue from the island shall be credited to the account of ICBP;
- (x) A local committee shall be appointed to advise on the management of the island.

Royal Society for Nature Conservation (RSNC)

This organization has more or less the same policies as ICBP. However, as an added activity Aride Island is looked upon as a suitable site where threatened bird species can be re-introduced. Already two attempts has been made to re-introduce the Seychelles magpie robin from Frigate island. It is the home of the greatest concentration of seabirds (11 species) in the entire region and boasts the world's largest colonies of both the lesser noddy and roseate terns. On its 150 acres are also found several species of bird and plant to be seen nowhere else in the Seychelles; notably the red-tailed tropic bird and the spectacular Gardenia annaea (Wright's gardenia). A particularly brilliant variety of the ultramarine surgeon-fish and fine groves of stag-horn coral are features of the reef.

Monitoring and evaluation

A lot of monitoring work has been carried out on Aldabra, Cousin and Aride islands. Basically on Aldabra:

- The climate is being very closely monitored as it forms part of the World Weatherwatch system.
- Some transects are regularly checked as part of a long-term study on giant tortoises.
- Following a massive outbreak of the coccid Icerya seychellarum which affected the vegetation, a monitoring programme is being carried out to give early warning of any further outbreaks.
- The vegetation as a whole is being monitored.
- Tortoise utilization (removal) is also being monitored.

Previous research at Aldabra has been carried out according to the following scheme of priorities:

- Completion of base-line studies:
 - (i) topographic survey;
 - (ii) geological survey;
 - (iii) establishment of meteorological station;
 - (iv) completion of survey of flora.
- Research on the giant tortoise:
 - (i) distribution;
 - (ii) demography;
 - (iii) energetics.
- Studies of endemic land birds, especially the rail and the fody.
- Studies of the insect fauna.
- Opportunistic studies, depending on individual proposals from prospective visiting scientists; this category includes marine studies. As from 1981 the order of priority chosen was:
 - (i) tortoise studies;
 - (ii) green turtles;
 - (iii) the lagoon.

a) Cousin Island

The gradual reversion of the vegetation from maintained coconut plantation to growth of native species is being closely monitored, especially its effects on the populations of birds. A lot of effort has also been devoted to the breeding population of hawksbill turtles.

It is felt that the sea-birds, by far the group with the largest biomass, have been ignored in the past and some effort to evaluate their importance should be made. The various bird populations have been closely monitored, especially the Seychelles brush warbler population.

The change in vegetation since the decision to let the island revert to its original vegetation has also been monitored. The hawksbill turtle population which breeds on Cousin is reputed to be the highest in the Indian Ocean. A lot of effort has been put into the tagging of laying females and studies are carried out to find hatching successes.

b) Aride Island

The remarkable regrowth of the *Pisonia* is being closely monitored especially since some people believe that a lot of birds are killed by the *Pisonia*'s sticky seeds/fruits. Since the cropping of sooty terns' eggs has stopped, estimates of the different bird population have been made at regular intervals to evaluate any changes. A close watch is also kept on the one or two pairs of red-tail tropic birds that breed on Aride.

c) Others

With regard to the other protected areas very little monitoring and evaluation have been carried out mostly because of lack of trained personnel but the following efforts have been made:

- An evaluation of the distribution and numbers of crown of thorn starfish that are removed in the St. Anne Marine National Park.
- The breeding population of hawksbill turtles are being tagged both on Curieuse and St. Anne.
- Attempts have been made to monitor fish catches taken by licensed park residents on St. Anne.
- Some basic photographic surveys of coral reefs have been attempted.
- Proposals have been made for the establishment of permanent sample plots to study the effects of invasive exotic species on the slow-growing indigenous ones.

The writer proposes that an evaluation of the role the remaining areas of mangrove play should be made and that if and when the east coast road scheme is carried out, there should be some monitoring to evaluate the effects of the inevitable siltation that will occur in St. Anne Marine National Park.

Recommendations

Basically a lot more should be done especially with regard to the invasion of indigenous vegetation by exotic species and the effects of dredging on coral reefs.

The distribution and abundance of key species like the Scops Owl, the Seychelles white-eye and the Seychelles kestrel should also be monitored.

Research

Apart from well studied and well documented areas like Aldabra, Cousin and Aride, a research policy for protected areas as such does not exist. The various protected areas were declared after studies, evaluations and recommendations were made by people like Horne 1894, Vesey - Fitzgerald 1940, Jeffrey 1962 and, more recently Procter 1970. These areas were chosen because they were still relatively rich in endemics and there was a chance that incompatible development could be kept out.

Because of lack of personnel and local funding, great reliance has to be placed on researchers from outside coming to the islands to do research on a subject of their choice. The fact that a lot of them went away without ever sending back copies of any reports as publications that resulted ended in the Government setting up a National Research and Development Council in 1982. This council examines and approves all research applications in the Seychelles.

So far a lot of good work has been done especially on vertebrate species like the Seychelles fruit-bats, paradise flycatcher, kestrel and magpie robins. A few researchers have also done good work on the reptiles and amphibians and one botanist is busy studying the flora. In areas where essential basic data are lacking due to the absence of proper management, there has been a tendency to send projects to organizations like WWF for funding.

Certain Universities like Aberdeen, Oxford, Cambridge and Bristol have links with Seychelles. Aberdeen, in particular, has sent students here to do their doctorates. The resulting theses have proved invaluable.

On the local scene the highest academic training available was Advanced Level pre-university training. Some quite good work has been done on various bird counts and hunts for rare plants. Since the beginning of 1982 a Polytechnique has been opened and should prove a valuable institution for the execution of research.

The National Research and Development Council has started to give small grants to people wishing to carry out research. So far it has tended to finance studies on pests, energy and medicinal plants. A good idea would be for it to encourage more research on protected areas.

The Fisheries Division has tended to spend all its efforts on the efficiency of fishing gear and investigating the size of the tuna stock rather than carrying out research on mangroves, coral reefs, etc. within the protected areas. The Forestry Division has also tended to spend more effort on exotic species like mahogany, Tabebuilla, Sandoricum and Pterocarpus, instead of indigenous species like Mimusops, Northea, Dillenia, Vateria, etc. Attempts at propagation of endangered species like Medusagyne, Vateria and Toxocarpus have not been carried out systematically. To improve this situation we must both train the personnel and create posts for full-time research officers.

Enforcement procedures

Most of the protected areas are manned by Senior Park Rangers, Park Wardens, Park Rangers Grades I and II, Assistant Park Rangers and labourers. From Park Ranger Grade II upwards they are all sworn Special Police Constables with powers of arrest.

When an area is declared a protected area, publicity is given through the mass media and the various regulations are published through the Official Government Gazette. Then a phase of giving warnings and explanations to "unknowing" offenders is entered upon. After a month or so any offenders are prosecuted. This approach works well in most cases. However problems remain with some persistent poachers who are prone to violence. In these cases special police branches like the Marine Police, the Police Mobile Unit and even the CID might be called in. Places like Curieuse, Cousin and Aride have direct radio telephone links with their nearest police station so that their assistance can be requested speedily.

Improvements can be realized by having trained personnel on a higher salary. This would mean more motivated staff. There should also be at least double the number of existing park rangers. It has also been suggested that persistent offenders should be absorbed within the Park system by employing them, and also to use the mass media much more to make the public more aware of Park regulations.

Personnel and Training

Table 1: Manpower requirements for protected areas

Functions (Roles)	Current staff	Staff requirements	Staff requirements in 1987	
			Expected	Ideal
Management (Manager)	1	1	1	3
Protection/Resource Management (Ranger)	9	14	11	17
Ecology (Ecologist)		3		1
Interpretation (Interpreter)				1
Administration/Accounting (Administrative Officer)				1
Maintenance (Maintenance Specialist)		1		1
Sociology (Sociologist)				1
Economics (Economist)				1
Natural Science (Scientist)				1
Law, Resource Policy (Law and Policy Specialist)		1		1
Land Tenure/Acquisition (Tenure/Acquisition Specialist)				1
Public Relations (Public Relations Specialist)				1
Planning (planner)				1
Landscape Architecture/Engineering (Architect/Engineer)				1
Art/Exhibit Technique (Artist/Exhibit Designers)		2		1
TOTAL:	10	22	12	33

Level of Personnel (in per cent)

Current

Expected in 5 years

a. Professional (e.g. Chief Park Warden, Planners, etc)	13.33	a. Professional:	15.78
b. Middle level (e.g. Park Warden, Senior Scout or Guard)	53.33	b. Middle level:	57.89
c. Lower level (e.g. Scout, Guard, Guide)	33.33	c. Lower level:	26.31

Training

a) University

None locally. All students have to be sent overseas, traditionally to the UK and France. Now there is a much wider choice ranging from Australia to Cuba. However, apart from two people following a Forestry course in Cyprus nobody is being trained. The main problem is the identification of the right candidate as well as funding. There is intense competition amongst university-material school-leavers of whom, so far, most have gone into medicine, engineering and teaching.

b) Middle-level

Up to now the only possibilities have been in in-service training. Recently the Government adopted a 'training for trainers' policy. However one big problem is that it is being operated with a minimum number of staff. This means that when somebody is sick, on annual leave or even attending training courses, a lot of hardship and difficulties are experienced.

In the past, the Mweka Wildlife Training College in Tanzania, and Lincoln College, New Zealand, had been identified as possible training establishments. Again the old problems of suitably qualified candidates and funding have meant that, to date, nobody has been sent to these establishments.

Also in the past an American Peace Corps volunteer was recruited to train the St. Anne Marine Park Rangers. Unfortunately the experiment did not succeed and was not repeated.

The current thinking is that may be a regional training centre should be set up under the auspices of a United Nations Body. Another idea being discussed is the possibility of recruiting an expert to come and design and carry out an in-service training programme.

c) Range-level

In the past school-leavers were recruited who were then sent for three weeks to the Praslin Police Training School where they were given some training in the various Seychelles Laws and how to make an arrest. This practice has been stopped on the grounds that their new programmes are no longer suitable. There has been an offer to run a specially designed course for park rangers but for a minimum of six participants. To date this offer has not been taken up.

Courses in first aid are given once a year by the Red Cross Society, boat handling is learnt at the Sail Training Scheme, scuba diving at the local branch of the British Sub-Aqua Club (BSAC). All these courses have been attended with mixed results. One important factor is that once staff get some training they are lost to organizations who can pay them a higher salary.

d) Labourer

Labourers tend to receive on-the-job training in footpath maintenance, identification and elimination of invasive exotic species. They are also an essential part of the fire-fighting and re-afforestation teams.

Recommendations: to raise the staff levels and salaries; to provide full-time training officers; and to arrange study tours in the region.

Means for bringing benefits of nature protection to people

(i) Hiring of local people to work in protected areas

Relatively few people have been hired to work in protected areas. The main sources of employment have been as forestry workers, labourers who clean and maintain the network of footpaths, ticket vendors, bird wardens and the various grades of rangers and wardens. There is a general principle absorbing all the fishermen who would be deprived of traditional fishing grounds. However, this has not been policy.

(ii) Resource exploitation

In some of the forestry plantations, especially those next to large housing estates, written permits are issued to people who are authorized to come and collect fodder for their livestock. They are not allowed to bring their animals into the plantations but they may cut and take away grass. This in fact helps with the cleaning of the plantations. Most of the forestry workers tend to take bundles of firewood home but this practice is on the wane because more and more people are buying kerosene stoves.

In some areas of the St. Anne Marine National Park the park residents are licensed to fish with traditional means for their own consumption. This means that each family is entitled to a basket trap and a handline fishing permit which are renewed every year. From 1977 to 1982 a total of 20 fishermen living on Mahé were licensed to fish with two basket traps each from July to the end of September, the reasons being that the St. Anne Marine Park used to be their traditional fishing ground and they had tiny boats which made it impossible for them to go fishing outside the Park during the rough weather of the south-east monsoon. This practice has been stopped because of abuses.

The exploitation of a variety of produce ranging from bamboo, palm leaves, bread-fruit, jack-fruit and guava is also allowed in the various national parks. Most of these tend to be exotic species.

For a long time the exploitation of cinnamon has been the main source of employment. This very aggressive species has invaded most of the secondary forest areas and even some of the indigenous forest. Cinnamon is selectively coppiced every four to seven years and in these times of recession it is becoming more and more important.

(iii) Participation of local people on protected area management boards

The Seychelles National Environment Commission, the umbrella organization charged with the management of national parks and nature reserves has a majority of local Seychellois members. The Seychelles Island Foundation, the Cousin island local management committee and the Aride island local management committee all have local members. Since the country is so small and not very many people are interested in the environment, the stage has been reached where the same individuals serve on the various committees. A move is afoot to improve co-ordination and avoid duplication of efforts.

(iv) Compensation from Government for crops or livestock damage

Curieuse Island is being used for the establishment of a large breeding population of the giant tortoise *Testudo gigantea*. The tortoises are free to roam everywhere. The immediate result was that people found it impossible to grow vegetables in their gardens. This problem has been solved by the Government having deep trenches dug all around the gardens. Some soiling of streams has meant that reservoirs have had to be built.

In 1977, all firearms were collected. One of the unexpected results has been a major increase in the population of the large endemic Seychelles fruit-bats. They are now venturing openly in people's fruit-trees and causing damage. So far nothing has been done except that it is being recommended that the roosting trees, which tend to be in Protected areas, should not be touched. With the Government launching into large fruit-farm establishments a conflict is foreseen.

(v) Special education, health or other government programmes for people living around protected areas

None exist. However, every week a health programme is broadcast on the radio. The target is the nation as a whole. A few programmes aimed mostly at the primary schools, National Youth Service and Polytechnic students are also broadcast every now and then. Three of the National Youth Service camps are situated within and around the Marine National Parks. Various nature trails and projects have been set up to make the students aware of their surroundings.

(vi) Watershed protection benefits

One of the major reasons for the establishment of the Morne Seychellois and Praslin National Parks is because they are the major water catchment areas. This benefit is not evident to the average member of the public and therefore not appreciated. Very rugged granitic islands such as some of the Seychelles tend to have a rainy season but also a period of drought, sometimes of up to three months. It is very important that the vegetation cover in the higher regions is maintained.

(vii) Sharing in profits from tourism

Tourism is by far the largest revenue earner. Most of the tourist establishments have to pay turnover tax. The Government has spent a lot of money on education, health, public transport, housing and sport. The recent world recession and subsequent fall in numbers of tourists has brought home clearly how much the economy relies on tourism.

Other benefits include the setting up of essential infrastructures like electricity, a treated water supply, good roads and the actual building and staffing of hotels which provide employment. These infrastructures are also enjoyed by the local people.

(viii) Provision of fishing rights

As already explained, these rights are now only given to people who actually reside within the protected areas. In St. Anne the intention was to phase out these fishing rights by allowing the fishermen who had traditionally fished there a permit to do so - but once these particular fishermen died the fishing permits would not automatically pass on to their children. This procedure has not been followed.

(ix) A network of maintained footpaths and picnic sites

With the Morne Seychellois National Park there are a series of trails leading up to most of the mountain tops. These are maintained and signposted by the Forestry and Conservation Division and very popular with local people who enjoy hiking. Some viewing lay-bys and viewing lodges and toilet facilities have also been built to allow people the chance of admiring the spectacular scenery safely and comfortably. The St. Anne Marine National Park, being so close to the most built-up area, Victoria, is also a favourite picnic site with local people. There are also restaurants that do a good trade with visitors undertaking trips in glass-bottom boats.

Table 2: Inventory of ecosystems of Seychelles

Notes: I = area unknown
n.r = not relevant

Number	Type	Total area (ha)	Protected area (ha)	Percentage
Terrestrial habitats				
1.1.1.1	Lowland rain forest	1,500	450	30%
1.1.1.2	Montane/sub-montane rain forest	2,000	600	30%
1.1.1.4	Cloud forest	750	550	73%
1.1.1.5	Riverine forest	n.r		
1.1.1.6	Swamp and bog forest	n.r		
1.1.2.1	Lowland seasonal forest	n.r		
1.1.3.1	Lowland semi-deciduous forest	n.r		
1.1.4	Subtropical rainforest	n.r		
1.2.1	Drought-deciduous tropical lowland forest	n.r		
2.1.1.1	Broad-leaved evergreen tropical woodland	n.r		
2.1.1.3	Broad-leaved sub-desert woodland	n.r		
2.2.1	Tropical drought deciduous lowland woodlands	1,500	1,500	100%
2.2.7	Thorn woodland	n.r		
3.1.1.1	Bamboo scrub	n.r		
3.1.1.2	Palm-fern scrub	n.r		
3.1.1.3	Tropical broad-leaved scrub	n.r		
3.1.1.5	Evergreen desert scrub	n.r		
3.1.2	Evergreen needle-leaved scrub	n.r		
3.1.3	Succulent scrub	n.r		
3.2.2.1	Drought-deciduous tropical scrub	10,000	10,000	100%
3.2.4	Deciduous desert scrub	n.r		
4.1.2	Desert evergreen dwarf scrub	n.r		
4.1.3	Succulent dwarf scrub	n.r		
4.2.1	Drought-deciduous dwarf scrub	n.r		
4.2.4	Desert deciduous dwarf scrub	n.r		
5.1.1.1	Tall-grass woodland savanna	n.r		
5.1.1.2	Tall-grass tree Savanna	n.r		
5.1.1.3	Tall-grass shrub savanna	n.r		
5.1.1.4	Tropical tall-grassland	n.r		
5.1.1.5	Flood savanna	n.r		
5.1.2.1	Short-grass tree savanna	n.r		
5.1.2.2	Short-grass shrub savanna	400	400	100%
5.1.2.3	Tropical short-grassland	n.r		
5.2.4	Sub-desert grassland	n.r		
5.4.4	Episodical desert forbland	n.r		
5.5.1	Freshwater marsh	I		<2%
5.5.3	Alkaline marsh	n.r		
5.6.1	Floating meadows	n.r		
5.6.2	Reed swamps	n.r		
6.1	Rock desert	n.r		
6.2	Sand desert	n.r		

Marine habitats

1.1.5	Mangrove forest	I		60%
5.5.2	Salt marsh	n.r		
5.6.3	Submerged aquatics (sea-grass beds)	I		<5%
5.6.4	Floating aquatics (algal beds)	n.r		
	Mudflats	I		0%
	Sandflats	I		
	Back reef lagoons	I		
	Rocky islands (sea-bird rookeries)	I		75%

Coral reefs

	Barrier reefs	n.r		
	Bank barrier reefs	n.r		
	Fringing reefs	I	I	<10%
	Atolls	16,300	15,129.6	92%
	Patch reefs	I		
	Knolls	n.r		
	Other reef structures			

The open seas 1,000,000 km²

List of coastal habitats

Notes: I = area unknown
n.r. = not relevant

	Total area (ha)	Protected area	% protected
A. Coastal environments			
Beach (sand, gravel, pebble)	I		
Rocky shore	I		
Cliffed shore	I		
Barrier island	n.r.		
Bay	I		
Estuary	n.r.		
Lagoon	I		
Other			
B. Coast-associated and intertidal habitats			
Algal	n.r.		
Sea-grass	I		
Intertidal sand/mud flat	I		
Mangrove forest	I		
Maritime forest-woodland (dune forest)	n.r.		
Coastal swamp forest	n.r.		
Coastal shrubland	n.r.		
Coastal grassland	n.r.		
Salina (saline marshes)	n.r.		
Palm forest	n.r.		
C. Living reefs			
Coral atoll	I		
Barrier coral reef	n.r.		
Bank-barrier coral reef	n.r.		
Patch reef	I		
Fringing coral reef	I		
Coral faro	n.r.		
Coral knoll	n.r.		
Other reef structures (oyster, sabellariid, sipunculid, bryozoan and algal reef)			
D. Offshore (subtidal) environments			
Island	I		
Limestone (or other rocky) fringing reef	n.r.		
Continental shelf/soft bottom)	I)		
Continental shelf/hard bottom)	I)	42,950 km2	0%
Continental slope	I		
Submarine canyon	n.r.		
Drowned coral reef/guyot	n.r.		

	Total area (ha)	Protected area	% protected
Submarine ridge	I		
Submarine plateau	I		
Shoal	n.r		
Alluvial bar	n.r		
Other			
E. Pelagic ecosystems			
Inshore circulation cells/eddies	n.r		
Offshore eddies/gyres	n.r		
Upwellings/downwellings	I		
Current convergence/divergence	n.r		
F. Man-made environments			
Spoil dump, reef	2		0%
Mariculture site	n.r		
Harbour/marina/other	3		0%
G. Special interest areas			
Sea-bird nesting/roosting site	I		
Turtle nesting/feeding area	I		
Dugong feeding/shelter area	n.r		
Fish spawning/nursery/feeding area	I		
Shrimp spawning/nursery/feeding area	I		
Other commercial/endangered species critical habitat			

INVENTORY OF EXISTING PROTECTED AREAS

NAME: St. Anne Marine National Park
MANAGEMENT CATEGORY: II (National Park)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Designated as a Marine National Park in 1973 under the National Parks and Nature Conservancy Act 1971. Protective regulations under this act have been enforced since 1975. The commencement notice appeared in 1975.

DATE ESTABLISHED: 1973 as St. Anne Marine National Park

GEOGRAPHICAL LOCATION: A series of six granitic islands about 5 km due east of Victoria, capital of Seychelles. All the surrounding reefs and seas between them form part of the park.

ALTITUDE: From 30m to 250m (the top of St. Anne)

AREA: 1,423 ha

LAND TENURE: The sea forms part of the Seychelles exclusive economic zone. The islands St. Anne, Round, Long are Government-owned. The islands of Moyenne, Cerf and Cachée are privately owned.

PHYSICAL FEATURES: A chain of six small granitic islands most of them quite rugged. The St. Anne channel is the deepest part. There are extensive marine grass beds between Round Island and Cerf. There are sandy patches providing habitats for molluscs, starfishes, burrowing shrimps and gobies.

A great variety of coral reefs can be seen within the park, ranging from dead reefs to live stands of pure Acropora sp. Quite a lot of the corals are dead from unknown causes.

VEGETATION: Amongst some of the dead reefs are fairly extensive beds of Sargasso weeds. The turtle grass Thalassia sp. is to be found between Round Island and Cerf. All the algae associated with the various types of coral polyps are of course present. With regard to the islands they are all covered with secondary vegetation, coconuts Cocos nucifera being by far the most common. On the NE side of St. Anne there is a very steep and rocky area which still has fine stands of the native palm Phoenicophorium borsigianum, and various Pandanus species.

NOTEWORTHY FAUNA: Some of the finest marine life can be seen off the northerly side of Moyenne where some 150 species of fish have been identified including clownfishes Amphiprion fuscocaudatus, Moorish idols (Zanclus cornutus), blue surgeon-fish (Acanthurus leucosternon) and a wide variety of butterfly fishes (family Chaetodontidae). Small rays are particularly abundant within the park. It is probably the main breeding site for hawksbill turtles Eretmochyles inbucaria within the granitic Seychelles. Octopuses, sea urchins, sea-cucumbers, starfishes, even the dreaded Acanthaster planci, are to be found in varying numbers. Amongst the common birds seen in the park are the little green heron Butarides striatus, greenshanks Tringa nebularia, turastone Arenaria interpres, grey plover Charadrius squatarola and whimbrel Namenius phaeopus.

ZONING: There are seven areas of delicate shallow water coral reefs which were to be administered as viewing areas only. No dropping of anchors and fishing were allowed. However they have not been easy to demarcate although most of the glass bottom boat operators (the main park users) know these areas well.

DISTURBANCE OR DEFICIENCIES: In the past, shell collecting had caused some damage to the corals. A lot of the reefs are dead from unknown reasons and some siltation resulted from dredging for the construction of Seychelles International Airport on Mahé. The main problem is persistent poaching by two or three families from the Les Mamelles area of Mahé. The rangers tend to be young and have not been formally trained. Due to the strong SE monsoon the park boundary bouys have to be renewed every year which can be quite a major exercise.

SCIENTIFIC RESEARCH: An American has done some studies on the growth rate of sea-urchins. The Fisheries Division was monitoring the fish catches from the licensed fishermen. Since 1981 a programme of tagging hawksbill turtles and counting tracks has been in progress.

SPECIAL SCIENTIFIC FACILITIES: None. There used to be accommodation facilities and a wet lab. These have been lost.

PRINCIPAL REFERENCE MATERIAL:

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Lionnet, G. (1972) The Seychelles. David and Charles, Newton Abbot, UK: 200 pp.

Robertson, I.J.B. (1972) Seychelles Marine National Parks. IUCN/WWF report No. 726, Morges.

Smith, J.L.B. (1969) The Fishes of Seychelles. The J. L. B. Smith Institute of Ichthyology. 223 pp.

Taylor, J.D. (1968) Coral reef and associated invertebrate communities (mainly molluscan) around Mahé, Seychelles. Phil. Trans. R. Soc. (B) 254:129-206.

Salm, R. V. (1967) A Guide to Snorkelling and Diving in Seychelles. Octavian Books, London: 60 pp.

STAFF: 2 park rangers grade 1, and 2 park rangers grade II. There used to be two labourers but these have been transferred to the National Youth Service Village.

BUDGET: Falls within the budget of the Conservation section which has a total budget of 600,000 SR per annum. On average about 150,000 SR are collected as entrance fees to the Park every year.

LOCAL PARK OR RESERVE ADMINISTRATION: Conservation Officer, c/o Ministry of National Development, Independence House, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: 26.5.83

NAME: La Digue Veuve Reserve
MANAGEMENT CATEGORY: IV (Managed Veuve Reserve)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Declared a nature reserve under the National Parks and Nature Conservancy Act, 1971 and 1982. The draft regulations drawn up in 1979 are being enforced.

DATE ESTABLISHED: 1982

GEOGRAPHICAL LOCATION: On the western plateau of La Digue. Its central part has the co-ordinates 4°20'30"S and 55°50'E.

ALTITUDE: 0 - 20m

AREA: 8.3 ha

LAND TENURE: The property belongs to Mrs. Rene Payet of La Digue. She has leased the property to Mr. C. Cadbury of the RSNC who has agreed to let the Forestry and Conservation Division of the Ministry of National Development manage it.

PHYSICAL FEATURES: A plateau covered by mature woodland of Badamier Terminalia catappa and Takamaka Callophyllum inophyllum trees. The north-western corner is part of a large freshwater marsh. It is bordered on two sides by a dirt public road.

VEGETATION: The dominant vegetation are mature and juvenile trees of Callophyllum inophyllum and Terminalia catappa. There are also some old coconut trees - Cocos nucifera and large Casuarina equisetifolia which tend to fall down in the high winds causing considerable gaps in the closed canopy.

NOTEWORTHY FAUNA: It is the home of 7-9 pairs of rare Seychelles black paradise flycatchers, Terpsiphone corvina. Other birds to be found include the Seychelles bulbul and the barred ground dove.

The reserve is also a good site for the Seychelles pond turtle and caecilians. The latter are abundant in the humus layer.

ZONING: Apart from the fact that visitors are asked to keep to the paths and that some care was given to the siting of the paths there is no zoning.

DISTURBANCE OR DEFICIENCIES: The land still belongs to Mrs. R. Payet. It should be purchased by the Seychelles Govt. There are still two families living within the reserve. Following high winds which brought some very large Casuarina trees crashing down they are requesting that the trees within the vicinity of their houses be felled. This would cause too many gaps within the tree canopies. A better solution would be to find homes for the families elsewhere and pull down the houses. The marsh in the NW corner forms part of a larger marsh system. This means that the reserve is vulnerable to both marsh drainage and uses of pesticide. The freshwater marsh forms an essential part of the habitat required by the paradise flycatcher.

SCIENTIFIC RESEARCH: Dr. J. Watson has done some work on the distribution and ecology of the paradise flycatcher.

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL:

- Watson, J. (1977) The Seychelles paradise flycatcher. (Terpsiphone corvina) ICBP Progress report 2.
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- Watson, J. (1981) The Seychelles black paradise flycatcher (Terpsiphone corvina) on La Digue. World Wildlife Fund Project 1590: Endangered land birds, Seychelles, final report - unpublished.
- Beamish, Sir T. (1972) The paradise flycatcher, Seychelles Biol. Conserv.4:311-313.
- Penny, M. (1968) The endemic birds of the Seychelles, Otyx 9: 267-275.
- Fayon, M. (1971) The plight of the paradise flycatcher, Seychelles Soc: 7:8-11.
- Loustau-Lalanne, P. (1962) Land birds of the granitic islands of the Seychelles. Seychelles Soc. Occ. Publ. 1, Govt. Printer, Seychelles.

NAME: Cousin Island Special Reserve
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Designated as a Special Reserve under the National Parks and Nature Conservancy Act, 1971, in 1975. The Cousin Island Special Reserve Regulations (S.I. No.93 of 1979) were gazetted in 1979. The marine turtles are further protected under the Turtle Act which lists Cousin as a protected breeding site, i.e. no turtles to be caught, killed etc. less than 1,000 metres from the high water mark.

DATE ESTABLISHED: 1975 as Cousin Island Special reserve. However it has been administered as a Bird Sanctuary since 1968.

GEOGRAPHICAL LOCATION: A small granitic island due west of Praslin island. An area comprising the whole of Cousin island whose centre lies in latitude 4°19'45" and longitude 55°39'50" together with the surrounding sea extending for a distance of 400 metres from the high water mark.

ALTITUDE: Sea level to 58m

AREA: 28 ha

LAND TENURE: International Council for Bird Preservation, British Section.

PHYSICAL FEATURES: About 80 per cent of the island is a plateau that had been established as a coconut plantation. The NW north and especially the NE sides are surrounded by fine white sandy beaches.

The other 20 per cent consists of a rocky hill with mostly indigenous vegetation. There is also a fringing reef all around the island which on average extends 200 metres from the high water mark.

VEGETATION: The plateau area is an abandoned coconut Cocos nucifera plantation. Among the plants now doing well are Carica papaya, Scalvola taccada, Bois chauve-souris and various Ficus sp. Along the beaches are some huge Casuarina equisetifolia trees.

On the hill there are more indigenous species such as Euphorbia pyrifolia, Paudanus multispicatus, Guettarda speciosa, Ficus mantarum and Ficus avi-avis.

NOTEWORTHY FAUNA: Cousin was acquired mainly because it was the home of 3 rare endemic land birds, namely the Seychelles brush warbler, weaver and turtle dove.

By far the largest biomass is represented by large sea-bird colonies. It probably has the largest Seychelles colony of the white fairy tern Gygis alba. There are shearwaters (Audubon and wedge-tailed), tropic birds (white-tailed) and bridled terns breeding amongst the rocks on the hill. In the plateau there are mainly the lesser noddy and common noddy terns that are nesting. There is an abundance of the skinks Mabuya wrightin and Mabuya seychellensis. The brown "loose skin" geckos Aelusony seychellensis are also fairly common. Cousin is acknowledged as having the largest population of breeding hawksbill turtles.

ZONING: There are certain very dense colonies where visitors are not allowed. Apart from this the island is too small for proper zoning.

DISTURBANCE OR DEFICIENCIES: Its past history as a well maintained coconut plantation means that it is only now that the native vegetation is making a comeback. Quite a lot of exotic species like papaya, castor oil, cotton etc. have been introduced in the past. A patch of Pangoon creeper has turned out to be a constant nuisance, growing again vigorously despite repeated hackings and applications of weed-killers. In an effort to encourage the native vegetation to come back, all coconuts that fall down are collected and shipped to Praslin. Recently the very low prices being offered for the nuts has made it difficult to continue this activity.

Occasional visits following the introduction of the African barn owl have to be watched. These owls are killed because they prey the fairy terns. Some of the Praslin fishermen have persisted in poaching hawksbill turtles.

SCIENTIFIC RESEARCH: A fairly intensive research effort covering most of the flora and fauna has been carried out by the successive Scientific Administrators and the work continues. Special attention has been given to the ecology, behaviour and population size of the brush warbler. Various ringing programmes have been carried out. Another long-term study has been the tagging of female hawksbill turtles. The hawksbill turtle population has probably been the subject of more studies than any other in the world.

SPECIAL SCIENTIFIC FACILITIES: A fully equipped research station was built thanks to a generous foreign donation. However it is very much under-utilized probably due to lack of publicity. Two or three visiting scientists can be accommodated.

PRINCIPAL REFERENCE MATERIAL:

Percy, R. (1970) Cousin Island Nature Reserve in the Seychelles, Indian Ocean. Biol. Conserv. 2:225-226 (bought by ICBP in 1968; an account of its possibilities, with recommendations).

Newton, E. (1867) On the land birds of the Seychelles Archipelago. Ibis (2)3:335-60.

Oustalet, M.E. (1978) Etude sur la faune ornithologique des files Seychelles. Bull. Soc. Philomath. Paris (7) 2:161-206.

Vessey - Fitzgerald, L.D.E.F. (1940) The birds of the Seychelles. I: The endemic birds. Ibis (14) 4:480-9.

Loustau-Lalanne, P.L. (1962) Land birds of the granitic islands of the Seychelles. Occ. Publs. Seychelles Soc. 1. 32 pp.

STAFF: 1 expatriate scientific administrator plus 5 Seychellois workers.

BUDGET:

1981: Local - Income	Rs.	115,110.85
Expenditure (deficit)	Rs.	161,133.44
London - Income	Pounds	5,497.07
Expenditure	Pounds	4,632.02

LOCAL PARK OR RESERVE ADMINISTRATION: Mr. Guy Lionnet, Chairman Cousin Island Local Management Committee, c/o Plaisance, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

NAME: Aride Island Special Reserve
MANAGEMENT CATEGORY: 1 (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Declared a Nature Reserve under the National Parks and Nature Conservancy Act, 1971. Under the Turtle Protection Act, listed as protected breeding site. Therefore turtle cannot be hunted up to 1,000 metres from high water mark (HWM). Move to declare an area up to 300 metres around as Marine Park.

DATE ESTABLISHED: Aride was purchased in 1973 by Christopher Cadbury for the Society for the Promotion of Nature Reserves (SPNR). A management plan has been enforced since 1975.

GEOGRAPHICAL LOCATION: Aride is the northernmost granitic island of the Seychelles group, and lies in latitude 4°8'S and longitude 55°40'E, some 9 km NNE of Praslin.

AREA: 70 ha

LAND TENURE: RSNC (Royal Society for Nature Conservation), UK.

PHYSICAL FEATURES: 90 per cent is rugged hill rising to 134m, whilst the remainder is a flat coastal plain (plateau) not more than four metres above high tide level. The fairly exposed fringing coral reefs around the island are intended to be accorded further protection up to 200m from HWM.

VEGETATION: The vegetation of Aride is largely free from exotic plant species and is the most natural of any of the small islands. Since the coppicing of *Pisonia grandis* stopped in 1975 it has grown quickly to become the dominant species. Other important species feature the various *Bicus* species, Bois due lait, *Euphosbia pycnophylla* and liane-sans-famille. However the species for which Aride is renowned and where alone it is found is Wright's gardenia (*Rothmania annaea*). It also has a few examples of other tree species like *Tatsia bijuga*, *Hernandia ovigera*, *Marinda citrifolia*, *Barringtonia asiatica*, *Tournefortia argentea*, *Hibiscus tiliaceus*. There is also a fine stand of cultivated banana *Musa* sp. and a freshwater swamp dominated by coco yams.

NOTEWORTHY FAUNA: Aride is free of rats, cats and dogs. It is the home of more than a million (pairs) of sea-birds. There are 11 species. It boasts the world's largest colonies of both the lesser noddy (*Anous stolidus*) and roseate terns. It is the only place in granitic Seychelles where the red-tailed tropic bird is still breeding.

Among the other birds to be seen are: fairy tern, two species of noddy, the bridled tern, Madagascar cardinal (weaver) and barred ground dove, white-tailed tropic bird, wedge-tailed and audubon shearwaters and frigate-birds (both lesser and greater). It also still has a sole surviving male magpie robin (*Copsychus seychellarum*) the survivor of two attempts to establish a second breeding population from Frigate island. Its marsh and plateau also are the best sites for observing the endemic moorhen (*Gallinula chloropus seychellarum*).

Aride is also noted for a particularly brilliant variety of the ultramarine surgeon-fish and fine groves of staghorn corals. A small number of hawksbill turtles also breed on its lone beach.

ZONING: Basically divided by the hills where no agriculture is carried out. A network of footpaths is maintained. Certain areas like the frigate-bird colony and red-tailed tropic birds nests are out of bounds.

DISTURBANCE OR DEFICIENCIES: Lack of trained and motivated staff. Two plant species, the wild pineapple and the cactus (Opuntia sp) are encroaching on the sooty tern colonies. Landing is very dangerous from June to October.

SCIENTIFIC RESEARCH: There have been studies carried out on the vegetation and the sea-bird colonies. No monitoring is going on. Steven Warmer has done a brief survey of the reefs.

SPECIAL SCIENTIFIC FACILITIES: Since it contains 11 species of sea-birds it offers good research opportunities.

PRINCIPAL REFERENCE MATERIAL:

Baker, B.H. (1963) Geology and mineral resources of the Seychelles archipelago. Mem. geol. Surv. Kenya. No. 3, pp. 1-40.

Baker, J.G. (1877) Flora of Mauritius and the Seychelles. London.

Piggott, C.J. (1968) A soil survey of Seychelles. Tolworth, Ministry of Overseas Development; Directorate of Overseas Survey; Land Resources Division.

Fayon, Mielal (1978) Geography of Seychelles, 3rd Edition.

Procter, J. (1974) The endemic flowering plants of the Seychelles: An annotated list. Candollea 29: 345-387.

Loustaun-Lalanne, P.L. (1963) Sea and shore birds of the Seychelles.

High, J. The natural history of the Seychelles: Seychelles Nature handbook.

Procter, J. and Feare C. (1972) Preliminary report on a visit to Aride island Seychelles, 28 Feb to 3rd March 1972 (Mimeographed).

Betts F.N. (1940) The birds of the Seychelles. II: The sea-birds, more particularly those of Aride Island. Society for the Promotion of Nature Conservation (1978): Aride Island Nature Reserve, Seychelles Management Plan.

STAFF: 1 Manager, 6 labourers, 1 boatman, 1 tourist guide.

BUDGET:

1982: Income	67,800 SR
Expenditure	191,465 SR

LOCAL PARK OR RESERVE ADMINISTRATION: The Chairman, Aride Island Local Management Committee, c/o Mr. G. Lionnet, Ministry of Education Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

NAME: Curieuse Marine National Park
MANAGEMENT CATEGORY: VIII (Multiple-Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Declared a Marine National Park in 1979 under the National Parks and Nature Conservancy Act, 1971. Protective regulations under this act have been drafted and will be introduced when designation is complete.

DATE ESTABLISHED: 15 May, 1976

GEOGRAPHIC LOCATION: Consists of Curieuse island and its surrounding waters including the entire channel between the island and Anse Boudin on Praslin. The central co-ordinates are 4°5'S, 55°43'E. Sea level to 100 metres and covering 283 ha of sea area.

AREA: 13.7 km² (sea area = 283 ha)

LAND TENURE: Government ownership.

PHYSICAL FEATURES: A rugged granitic island of which some areas have been badly burnt and extensive anti-erosion work in the form of contour drains, and Casuarina plantations are visible. Also good stands of cocos-de-mer and capucin. The sea part of the park ranges from about a 30m drop to shallow water reefs which are exposed at low tide.

VEGETATION: The island is famous as being one of two islands where the coco-de-mer Lodoicea maldivica grows naturally. It is also the main site for the endemic vine Toxocarpus schimperianus. Some of the finest specimens of the Northea seychellarum are to be found at the back of Baie La Raie. In a small walled-up bay a diverse patch of mangrove swamp is developing, including Rhizophora mucronata, Humnitzera sp., Sonneratia sp., and Xylocarpus sp. A new species of Bois Banane Gastonia sp. has been discovered since 1982.

NOTEWORTHY FAUNA: It has some of the more common land-bird species: like the sunbird Nectarinia dussumieri, the bulbul Hypsipetes crassirostris crassirostris and some fairy terns Gygis alba. It also has an introduced population of 300 giant tortoises Testudo gigantea from Aldabra. These tortoises are breeding well and are at large. About 20-40 female hawksbill turtles use the beaches on Curieuse during the breeding season. The marine section is well known for its good coral growth especially around Ile St. Pierre, well known for its tubular coral colonies, and Anse Petit Cour on the Praslin side. Most noticeable are colonies of blue-tipped Asropora, mauve or brown staghorn and pink Pocillopora. Many large angel-fishes and groupers lurk with the soldier fishes around caves in the pitted bases of larger boulder corals. In summary, the fish life is remarkably rich, varied and unafraid. Curieuse also used to be famous for its abundant molluscs, octopuses and lobsters. Only now are crabs making a comeback within the mangrove. The land-crab Cardisoma is abundant on the coastal strip.

ZONING: Divided into three main zones:

(a) Conservation: By far the most extensive including the badly burnt hillsides which are being restored;

(b) Agricultural: including commercial forest. The fertile land near the former leper colony has been earmarked for a fruit farm and piggery.

(c) Tourism: there is a proposal to turn the old doctors house into an information centre and to have some chalet-style hotel development.

DISTURBANCE OR DEFICIENCIES: It is probable that in their search for boat-building material the Government will want to exploit the fine stands of takamaka Callophyllum inophyllum. Various politicians have come up with plans to drain the marshes and introduce extensive vegetable production. This means that the most suitable site for starting a second colony of Seychelles paradise flycatchers will be lost. Some of the families living on the Praslin side are persistent poachers of hawksbill turtles.

SCIENTIFIC RESEARCH: The giant tortoise Testudo gigantea population that was introduced is being closely monitored as well as its impact on the vegetation. A tagging programme for female hawksbill turtles during the breeding season was launched three years ago. Some preliminary terrestrial plant surveys have also been carried out.

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL:

Frazier, J. (1974) Sea turtles in Seychelles. Biol. Conserv. 6: 71-73.

Government of Seychelles (1971) Conservation policy in the Seychelles. Government Printer, Mahé, Seychelles, 10 pp.

Procter, J. (1970) Conservation in the Seychelles. Government Printer, Mahé, Seychelles: 35 pp.

Salm, R. V. (1977) A guide to snorkelling and diving in Seychelles. Octavian Books. London 60 pp.

Salm, R. V. (1978) Conservation of marine resources in Seychelles - Report on current status and future management. IUCN/WWF report, Morges.

STAFF: 1 senior park ranger, 1 park ranger grade II, 8 labourers.

BUDGET: Curieuse forms part of the Park system administered by the Conservation Division which has a total annual budget of 600,000 SR (1 US\$ = 7 SR).

LOCAL PARK OR RESERVE ADMINISTRATION: Conservation officer, c/o Ministry of National Development, Independence House, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: 12.6.83

NAME: Baie Ternay National Park
MANAGEMENT CATEGORY: II (National Park)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Designated as a National Park in 1979 under the National Parks and Nature Conservancy Act, 1971. A draft management plan exists but to date has not been enforced.

DATE ESTABLISHED: 1979 as Baie Ternay National Park

GEOGRAPHICAL LOCATION: A sheltered bay on the extreme western tip of Mahé.

AREA: 80 ha

LAND TENURE: Republic of Seychelles.

PHYSICAL FEATURES: A shallow lagoon approximately 800 metres wide separates the reef from the shore. A continuous fringing reef borders the shallow lagoon at the head of the bay. Grooved and cut by numerous surge channels this section of reef offers refuge to a host of large and small reef fishes.

ZONING: None

DISTURBANCE OR DEFICIENCIES: To date, lack of trained personnel, equipment and houses has meant that there is no enforcement of park regulations. In the past some poaching of corals, shells and hawksbill turtles occurred. Since early 1983 the second and largest National Youth Service Village has been sited next to the Baie. This means that effectively the Baie is closed to the general public. The treated sewage (three oxidation ponds) ends up within the enclosed Baie. Some of the existing mangrove swamp had been reclaimed in the past.

SCIENTIFIC RESEARCH: Was the site for a general survey by a group from Galway University, Ireland.

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL:

Government of Seychelles, (1971) Conservation policy in the Seychelles. Government Printer, Mahé, Seychelles. 10 pp.

Lionnet, G. (1972) The Seychelles. David and Charles, Newton Abbot, UK: 200 pp.

Procter, J. (1970) Conservation in the Seychelles. Octavian Books, London 60 pp.

Salm, R.V. (1978) Conservation of Marine Resources in Seychelles.
IUCN/WWF report, Morges.

STAFF: None

BUDGET: None

LOCAL PARK OR RESERVE ADMINISTRATION: Conservation Officer, c/o Ministry of National Development, Independence House, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: 20.6.83

NAME: Port Launay National Park
MANAGEMENT CATEGORY: II (National Park)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Designated as a Nature Reserve in 1979 under the National Parks and Nature Conservancy Act, 1971. A draft management plan has been drawn up but to date has not been enforced.

DATE ESTABLISHED: 1979 as Port Launay National Park

GEOGRAPHICAL LOCATION: An enclosed cove on the north-west coast of Mahé. The co-ordinates for the central region are 4°39'S and 55°23'30"E.

ALTITUDE: Ranges from sea level to 25m

AREA: 158 ha

LAND TENURE: Republic of Seychelles.

PHYSICAL FEATURES: A beautiful sheltered cove with a central sandy bottom. There is a reef fringing the rocky shores at either end of the beach. The two fringing reefs are of the boulder type, characteristic of areas of calm sea and erratic temperature and salinity. The back-reef zones are shallow and covered by the stalked seaweed *Turbinaria*. Reef development is not extensive and living corals are few. One of the best beaches in Seychelles is to be found in the SE corner.

ZONING: None

DISTURBANCE OR DEFICIENCIES: Since the establishment of the first National Youth Service camp at Port Launay the area has been closed to the general public. Some fishing with handline and traps and even some seine netting (mostly mackerel) are carried out by the NYS staff and students.

SCIENTIFIC RESEARCH: None

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL:

Salm, R.V. (1977) A Guide to Snorkelling and Diving in Seychelles. Octavian Books, London: 60 pp.

Salm, R.V. (1978) Conservation of marine resources in Seychelles. IUCN/WWF report, Morges.

Wilson, R. (1980). Baie Ternay National Park, Port Launay National Park and the La Plaine International Swamp - a draft management plan - (mimeographed).

STAFF: None

BUDGET: None

LOCAL PARK OR RESERVE ADMINISTRATION: Conservation Officer, Ministry of National Development, Independence House, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: 20.5.83

NAME: Morne Seychellois National Park
MANAGEMENT CATEGORY: VIII (Multiple-Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Designated as a National Park in 1979 under the National Parks and Nature Conservancy Act 1971. A draft Management plan drawn up in 1979 has yet to be implemented. The birds are offered further protection under the Wild Animals and Birds Protection Ordinance; No. 37, 1961.

DATE ESTABLISHED: Designated in 1979 as Morne Seychellois National Park.

GEOGRAPHICAL LOCATION: Covers most of the west and central massif of Mahé. The co-ordinates of the central region of the Park are 4°38'S and 55°26'E.

ALTITUDE: From sea level to 905m

AREA: 3,045 ha

LAND TENURE: The park is primarily under Government ownership although the entire north-west section is private land and there is a complex ownership pattern along the Forêt Noire road, particularly in the Sans Souci, L'Exil area.

PHYSICAL FEATURES: A very rugged part of the largest granitic non-volcanic oceanic island. Supports a variety of habitats with a relatively rich biota for an oceanic island, and a high degree of endemism. The area contains the best montane moss forest on Mahé and a number of key sites rich in endemic species. In some cases the communities formed by the native species are still extant as relics although invasion by exotic species is general and very few areas have escaped being cut back in the past. All the endemic plants found on Mahé are present within the park. At least one species, Balsamine (Impatiens thomassetii), is limited to one known locality only. All the endemic birds on Mahé are to be found and it is assumed that other taxa are fully represented.

VEGETATION: Although largely invaded by exotics especially Albizia falcataria, Cinnamomum zeylanicum, it still contains some relic communities of Randia sericea, Nepenthes pervillei, Northea seychellarum etc.

The largest known groups of two of the four species listed in the IUCN Plant Red Data book as being endangered, Bois de Fer (Vateria seychellarum) and Bois méduse (Medusagyne oppositifolia), are found within the area. Toxocarpus schimperianus, another IUCN Red Data book species, has also recently been discovered on two sites. The rare palm Rocheria melanochaetes is well represented in the park.

NOTEWORTHY FAUNA: Has several large roosts of endemic fruit-bats Pteropus seychellensis. The greater part of the known populations of two endangered birds limited to Mahé, the bare-legged scops owl (Otus insularis) and the Seychelles White-eye (Zosterops modestus) are found within the park boundaries. Of the 15 other species of terrestrial birds 9 of them are to be found in large numbers especially the blue pigeon Alectroenas pulcherrima, the bulbul Hypsipetes crassirostus, the swiftlets Collocalia franciea and the Seychelles sunbird. A fair number of the white-tailed tropic bird Phaethon cepturus still breed on the mountain tops. Most of the Seychelles reptiles, namely, the Seychelles house snakes Boadon geometricus, Seychelles wolf snake Lycognoteus, Seychelles blind snakes Ramphotyphlops braminus, the Chamalles tigris, Phesuma astriata, P. longisulae, are present. All the species of caecilians are to be found including the very rare Prastinia cooperii (in fact only re-discovered in June 1983).

ZONING: Certain areas are administered as Strict Nature Reserves where only scientists accompanied by forest rangers are allowed. Since 1983 even the traditional cinnamon pickers have been instructed to stay clear of these areas. Other severely degraded areas are being reafforested mostly with Meliaceae like Sandoricum ratiatum and Swietenia macrophylla. A small area is under tea plantation.

TOURISM: Development consists primarily of provision of viewing points, refreshment facilities, paths, interpretive facilities and literature.

DISTURBANCE OR DEFICIENCIES: Past exploitation of timber and forest fires have done irreparable damage. Since 1950 the re-afforestation work has resulted in the vegetation cover once again being established. Exotic species like Albizzia, Cinnamon, Ochrosia, Psidium and lantana are encroaching on a large scale.

There has been felling of trees for the passing of a 33 kV line. There are also private houses within the park. Sometimes army exercises are carried out there.

Some good work on the systematics and ecology of the reptiles and amphibians has been done. Some surveys on the distribution of rare endemic plants have been carried out. The various fruit-bat colonies have been estimated. Some preliminary work has been done on the Seychelles white eye and the scops owl. One Aberdeen University student has done his doctorate on the Seychelles kestrel.

SPECIAL SCIENTIFIC FACILITIES: Only a small nursery run by the forestry division at Sans Soucis.

PRINCIPAL REFERENCE MATERIAL:

Wilson, J. R. (1980) The Morne Seychellois National Park. A preliminary management plan. (Mimeographed).

Bailey, D. (1971) List of the flowering plants and ferns of Seychelles with their vernacular names. 3rd edition, Seychelles.

Baker, J. G. (1877) Flora of Mauritius and the Seychelles. London.

Fayon, M. (1978). Geography of Seychelles, 3rd edition.

Gadow, H. and Stanley Gardiner, J. Aves, with some notes on the distribution of the land birds of the Seychelles. Trans. Linn. Soc. Lond. Zool. 2-12: 103-110.

Nussbaum, R. A. (in press) Amphibians of the Seychelles. USA.

Nussbaum, R. A. (in press) Snakes of the Seychelles. USA.

Summerhayes, V.S. (1983) An enumeration of the Angiosperms of the Seychelles archipelago. Trans. Linn. Soc. Lond. (Zool.) 19: 261-299.

Vessey-Fitzgerald, D. (1940) On the vegetation of the Seychelles. J.Ecol:28:465-483.

Watson, J. (1981) Population, ecology, food and conservation of the Seychelles kestrel (Falco area) on Mahé. Ph.D. thesis, University of Aberdeen.

STAFF: Up to the present moment the Conservation Division has had no full time staff working there. However, when visiting scientists, maintenance of footpaths etc. have warranted it, rangers have been temporarily transferred from St. Anne to assist. It

has also been possible to call on the Forestry Division staff for assistance especially from Sans Soucis and Le Niolle Stations. These two stations have about 3 senior forest rangers and labourers.

BUDGET: Since 1973, when project was completed; falls within budget of Conservation section which has a total budget of 600,000 SR.

LOCAL PARK OR RESERVE ADMINISTRATION: Forestry and Conservation Division, c/o Ministry of National Development, P.O.Box 54, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: 25.6.83

NAME: Praslin National Park
MANAGEMENT CATEGORY: VIII (Multiple-Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Designated as a National Park in 1979 under the National Parks and Nature Conservancy Act, 1971. Protective regulations under this act have been drafted and have been enforced since 1979.

DATE ESTABLISHED: 15 May 1979, as Praslin National Park

GEOGRAPHICAL LOCATION: Lies within the central highlands of Praslin island, the second most populated of the Seychelles islands. The co-ordinates for the central region are 4°20'S and 55°44'E.

ALTITUDE: 20 - 360m

AREA: 337.6 ha

LAND TENURE: 329.4 ha are Government-owned, comprising the Vallée de Mai, Midlands estate, Fond Boffay estate, and the northern slopes of Fond Azore. An enclave of privately owned land, 8.2 ha in area, lying to the south of the entrance to the Vallée de Mai and which had been partially planted with tea, has reverted back to Government ownership since 1981.

PHYSICAL FEATURES: Contains some of the best wooded land (including palm forest) on Praslin. The area is quite rugged and is the main catchment area of Praslin. The area is primarily managed for forestry although the famous Vallée de Mai has been under some form of conservation management since 1883. The trans-island tarmac road from Grand Anse to Baie St. Anne bisects the whole park into northern and southern sections. Some areas are suffering from severe sheet erosion and are gullying.

VEGETATION: As well as including the vegetation of the famous Vallée de Mai it also includes fine areas of untouched mixed forests dominated by Dillenia ferruginea, Ludia mauritiana, Intsia bijuga, Eugenia wrightii, Erythroxyum seychellarum, and Sideroxyllum ferrugineum.

On the degraded slopes are to be found Calophyllum inophyllum, Gymbopogon sp., Lophoschoenus hornier, Chroysobalanus icaco and thick areas of Dicranopteris ferns.

NOTEWORTHY FAUNA: Again as well as having the fauna found within the Vallée de Mai, it has a lot of roosting trees for the fruit-bat Pteropus seychellensis (Praslin pop. c. 2,000) and other pairs of the Seychelles sub-species of the black (lesser vasa) parrot (Coracopsis nigra barklyi).

ZONING:

- (a) There is a conservation zone devoted entirely to wildlife protection, research and recreation, thus being analogous to a special reserve;
- (b) Soil conservation zones areas suffering from severe sheet erosion;
- (c) Residential zone: mostly at Fond Boffay Forestry station for forestry workers;
- (d) The road side strip: includes lush tall mixed woodland, retained as a screen;
- (e) The forestry zone: comprises all the remainder of the park including land which has been or is scheduled for planting with commercial timber species.

DISTURBANCE OR DEFICIENCIES: Some trees introduced for timber, especially Albizzia falcataria, Cinnamomum zeylanicum and Alstonia sp., are tending to invade the conservation zones. The Praslin people have a history of setting fires to vegetation and part of the park is suffering from sheet erosion. The existing system of fire-breaks is inadequate and not maintained.

SCIENTIFIC RESEARCH: Some work has been done on the black parrots, geckos and the fruit-bats. Preliminary surveys have been made of the palms and screw-pines.

SPECIAL SCIENTIFIC FACILITIES: None

STAFF: One park ranger grade 1 and three assistant park rangers/ticket vendors. There are also two labourers who sweep the paths daily.

BUDGET: It falls within the budget of the Conservation section which has a total budget of 600,000 SR per annum. Each year about 200,000 SR is collected from visitors who each pay 10 SR to visit the Vallée. Also about 500,000 SR are raised from the sale of cocos-de-mer.

LOCAL PARK OR RESERVE ADMINISTRATION: Conservation Officer, c/o Ministry of National Development, Independence House, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: 15.5.83

NAME: Vallée de Mai Nature Reserve
MANAGEMENT CATEGORY: IV (Managed Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 4.16.12 (Seychelles and Amirantes Islands)

LEGAL PROTECTION: Declared a Nature Reserve under the Wild Birds Protection (Nature Reserves) Regulation S.I. 27/1696 (18 April 1966). Also further protected under the National Parks and Nature Conservancy Act (Cap 159) S.I. No. 57 of 1979, Praslin National Park (Designation) Order of 1979, and the Coco-de-mer management decree, 1978. Managed by the Forestry and Conservation Division. Policies are decided by the Seychelles National Environment Commission.

DATE ESTABLISHED: 18 April 1966

GEOGRAPHICAL LOCATION: Within Praslin National Park on Praslin Island; 4°19'S, 55°44'E.

ALTITUDE: 200 - 300m

AREA: 18 ha

LAND TENURE: Government ownership.

PHYSICAL FEATURES: A valley in the heart of Praslin National Park, untouched until the 1930s and still retaining palm forest in a near natural state.

VEGETATION: Palm forest including the endemic coco-de-mer Lodoicea maldivica. All six endemic Seychelles palms are found either in or around the Vallée de Mai. A further 28 endemic species of plants have been recorded, including the vine Toxocarpus schimperianus, which was once thought extinct, and then believed to exist only on Curieuse island. Takamaka Callophyllum inophyllum and calice du pape Tabebuia pallida have been planted.

NOTEWORTHY FAUNA: Birds include the endemic black parrot Coracopsis nigra barklyi, the noisy bulbul Hypsipetes crassirostris, blue pigeon Alectroenas pulcherrima, sunbird Nectarinia dussumieri and cave-nesting swiftlet Collocalia francica. Among reptiles are the endemic chameleon Chamaeleo tigris, the Seychelles house-snake Boaedon geometricus, green geckos Phelsuma sunbergi and P. astriata, bronze gecko Aluronyx sechellensis, skink Mabuya sechellensis, Seychelles wolf-snake Lycognathophis sechellensis and the blind snake Ramphotyphlops braminus. In the deep beds of moist humus are found caecilians, six species related to frogs but that look more like large worms, and are rarely found even by scientists. The stream contains freshwater crabs Dekenia allaudi, the big freshwater prawn Macrobrachium lar, shrimps Caridina sp. and the only endemic species of freshwater fish, the gourgeon Pachypanchax playfairi. Two endemic snails also found are the brown snail Stylodonta unidentata and the blackfish snail Pachnodus arnatus.

ZONING: None

DISTURBANCE OR DEFICIENCIES: Past exploitation of timber and planting of exotics such as coffee, patchouli Pogostemon cablin, Albizia falcataria, Cinnamomum zeylanicum, Psidium cattleianum and Philodendron sp. Attempts to remove dead vegetation have led to erosion, so the litter remains, causing a real fire hazard. Collection of coco-de-mer nuts should be controlled so that a certain proportion are allowed to germinate.

SCIENTIFIC RESEARCH: Some work has been done by individuals on parrots and palm geckos.

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL:

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Summerhayes, V.S. (1983) An enumeration of the angiosperms of the Seychelles Archipelago. Trans. Linn. Soc. Lond. (Zool) 19: 261-299.

Vesey-Fitzgerald, D. (1940) On the vegetation of the Seychelles. J. Ecol. 28: 465-483.

Wilson, Roger, (1979) The Praslin National Park Management Plan.

STAFF: One park ranger grade 1 and three ticket vendors.

LOCAL PARK OR RESERVE ADMINISTRATION: Forestry and Conservation Division, c/o
Ministry of National Development, P.O.Box 53, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: December 1982

NAME: Aldabra Atoll
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.24.13 (Comoro Islands and Aldabra)

LEGAL PROTECTION: Designated as a Special Reserve under the National Parks and Nature Conservancy Act, 1971. Protective regulations under this act have been drafted and will be introduced when designation is complete. In 1967 the Royal Society acquired the lease; in 1980 it was succeeded by the Seychelles Islands Foundation, a charitable trust established under the Seychelles Islands Foundation Decree, 1979. The Foundation is governed by a Board of Trustees with international representation and the Atoll is managed by four subcommittees (Management, Scientific Advisory, Finance, and Appeal) set up under the Foundation.

DATE ESTABLISHED: 1976 as Aldabra SNR

GEOGRAPHICAL LOCATION: An atoll north of the Mozambique Channel, 420km north-west of Madagascar and 640km east of the East African mainland; 9°25'S, 46°25'E.

ALTITUDE: Rarely over 3m above sea level

AREA: 35,000 ha

LAND TENURE: The Seychelles Island Foundation, on lease from the Government of Seychelles.

PHYSICAL FEATURES: A classic coral atoll which has risen above the sea. It consists of four main islands of coral limestone, separated by narrow passes and enclosing a large shallow lagoon. The lagoon contains many smaller islands and the entire atoll is surrounded by an outer reef. Geomorphological processes have produced a varied topography, generally rugged, which supports a variety of habitats with a relatively rich biota for an oceanic island, and a high degree of endemism. Marine habitats range from coral reefs to mangrove mudflats and have almost completely escaped interference, human impact having been minimal. The climate is semi-arid with a pronounced wet season from November to April.

VEGETATION: The terrestrial flora is exceptionally rich for a small coral island, with 273 species of flowering plant and fern. Nineteen of these species are endemic, including *Peponium sublitorale* which is only known on the south island. A further 22 species are shared only with the neighbouring islands. Many of these plants are considered to be threatened. They include mangroves.

NOTEWORTHY FAUNA: Most outstanding is the largest world population of giant tortoise *Geochelone gigantea* (152,000), which attains a density of 1,700 per sq km, and is self-sustaining. The green turtle *Chelonia mydas* breeds here, approximately 1,000 females laying annually. Of the 13 species of terrestrial birds, one is the last representative of the western Indian Ocean flightless birds, the Aldabran rail *Dryolimnas cuvieri aldabranus* (about 5,000 individuals); two are full Aldabran forms, the Aldabran warbler *Nesillas aldabranus* and the Aldabran drongo *Dicrurus aldabranus*; and the remainder are marked subspecies. In addition, the colonies of red-footed boobies and frigate birds are the largest in the western Indian Ocean.

DISTURBANCE OR DEFICIENCIES: Past exploitation of mangroves, turtles, fish and tortoises appears to have done no irreparable damage and the populations have all recovered. Rats, cats and goats have been introduced and have become established, together with a number of exotic plants.

SCIENTIFIC RESEARCH: An intensive research effort covering the whole atoll has been in operation since 1967.

SPECIAL SCIENTIFIC FACILITIES: A fully-equipped research station was established by the Royal Society in 1971, and is maintained by the Foundation. The Seychelles Government maintains a meteorological station. There is accommodation for 15 visiting scientists and a network of field camps for their use.

PRINCIPAL REFERENCE MATERIAL: Two main sources for bibliography are Phil. Trans. R. Soc. Lond. B. Volume 260, 1971, and Phil. Trans. R. Soc. Lond. B. Volume 286, 1979. The Seychelles Islands Foundation/Royal Society prepared 'A management plan for Aldabra'. Also, Stoddart, D. R. Settlement, development and conservation of Aldabra, Phil. Trans. R. Soc. Lond. B. 260: 611-628.

STAFF: 10-12 resident Foundation employees.

BUDGET: 100,000 US\$ per annum

LOCAL PARK OR RESERVE ADMINISTRATION: The Chairman, Seychelles Islands Foundation, c/o Department of Agriculture and Land Use, P.O.Box 54, Mahé, Seychelles.

NAME OF CNPPA CO-ORDINATOR: L.A. ChongSeng

DATE: 25.11.81

INVENTORY OF THREATENED OR ENDANGERED SPECIES

Threatened animals of Seychelles

<u>Threskiornis aethiopica abbotti</u>	Aldabra sacred ibis	
<u>Falco araea</u>	Seychelles kestrel	
<u>Falco newtoni aldabranus</u>	Aldabra kestrel	R
<u>Dryolimnas cuvieri aldabranus</u>	Aldabra white-throated rail	R
<u>Streptopelia picturata rostrata</u>	Seychelles turtle dove	E
<u>Coracopsis nigra barklyi</u>	Seychelles black parrot	R
<u>Otus insularis</u>	Seychelles scops owl	R
<u>Copsychus sechellarum</u>	Seychelles magpie robin	E
<u>Bebrornis sechellensis</u>	Seychelles brush warbler	
<u>Nesillas aldabranus</u>	Aldabra brush warbler	I
<u>Terpsiphone corvina</u>	Seychelles paradise flycatcher	R
<u>Zosterops modesta</u>	Seychelles white-eye	E
<u>Foudia sechellarum</u>	Seychelles fody	R
<u>Dicrurus aldabranus</u>	Aldabra drongo	
<u>Geochelone gigantea</u>	Aldabra giant tortoise	R
<u>Nesomantis thomasseti</u>	Thomasset's Seychelles frog	I
<u>Sooglossus sechellensis</u>	Seychelles frog	I
<u>Sooglossus gardineri</u>	Gardiner's Seychelles frog	I
<u>Praslinia cooperi</u>		
<u>Grandisonia brevis</u>		
<u>Grandisonia diminutiva</u>		
<u>Grandisonia larvata</u>		
<u>Grandisonia sechellensis</u>		
<u>Phelsuma spp.</u>	Day geckos	

Indian Ocean

<u>Balaenoptera physalus</u>	Fin whale, fin-back, common rorqual	V
<u>Megaptera novaeangliae</u>	Humpback whale	E
<u>Balaenoptera musculus</u>	Blue whale, sulphur-bottom whale	E
<u>Caretta caretta</u>	Loggerhead turtle	E
<u>Chelonia mydas</u>	Green turtle	E
<u>Dermochelys coriacea</u>	Leatherback	E
<u>Eretmochelys imbricata</u>	Hawksbill turtle	E
Families: <u>Antipathidae</u>	Black coral	I
<u>Leiopathidae</u>		
<u>Charonia tritonis</u>	Triton's trumpet (giant triton)	I
<u>Tridacna squamosa</u>	Scaly or fluted clam	V
<u>Tridacna maxima</u>	Small giant clam	V
<u>Turbo marmoratus</u>	Mother-of-pearl	
<u>Pinctada spp.</u>	Mother-of-pearl	
(any other molluscs in ornamental trade, or used as food)		
<u>Palinurus spp.</u>	Spiny lobsters	
<u>Birgus latro</u>	Coconut crab (robber crab)	V

Table 3(a): Status and protection of threatened species in Seychelles

Note: U = unknown

Species	Population	Pop. in pro- tected areas	% protected
Mammalia			
<u>Pteropus seychellensis</u>	5,000-10,000	500-1,000	10%
<u>Coleura seychellensis</u>	U	U	U
Aves (Granitic islands)			
<u>Otus insularis</u>	60-100 pairs	50-85 pairs	85%
<u>Zosterops modesta</u>	< 100	40-50	50%
<u>Acrocephalus seychellensis</u>	250-300	250-300	100%
<u>Terpsiphone corvina</u>	70-90	10-15	15%
<u>Coracopsis nigra barklyi</u>	50-60	8-10	30%
<u>Foudia sechellarum</u>	1,000-2,000	500-1,000	50%
<u>Streptopelia picturata rostrata</u>	U	U	U
<u>Falco araea</u>	300-450	100	30%
<u>Copsychus sechellarum</u>	25-30	12	40%
<u>Alectroenas pulcherrima</u>	1,000-2,000	250-500	25%
<u>Gallinula chloropus sechellerum</u>	200-600	16-50	8%
<u>Butorides stiatatus degens</u> (Aldabra)	200-600	10-40	5%
<u>Dryolimnas cuvieri aldabranus</u>	7,000-9,000	7,000-9,000	100%
<u>Nesillas aldabranus</u>	5-11	5-11	100%
<u>Threskiornis aethiopica abbotti</u>	200-300	200-300	100%
<u>Falco newtoni aldabranus</u>	80-100	80-100	100%
<u>Dicrurus aldabranus</u>	U	all	100%
<u>Streptopelia picturata coppingeri</u>	U	all	100%
<u>Caprimulqus madagascariensis</u>			
<u>aldabranis</u>	U	all	100%
<u>Hypsipetes madagascariensis</u>			
<u>rostratus</u>	U	all	100%
<u>Foudia eminentissima aldabrana</u>	U	all	100%
<u>Centropus toulou insularis</u>	U	all	100%
Sea-birds			
<u>Phaethou rubricauda</u>	U		90%
<u>Sula dactylatsa melanops</u>	U		0%
<u>Sterna dougalic arideansis</u>	U		100%
Reptilia			
(Marine)			
<u>Chelonia nydas</u>	9,000-12,000	6,000	50-60%
<u>Eretmochelys imbricata</u>	5,000-10,000	400	8%
<u>Caretta caretta</u>	U	Probably no breeding sites	
<u>Dermochelys coriacea</u>	U		
(Terrestrial)			
<u>Testudo giganteae</u>	150,000	140,000	99%
	200,000	199,000	

<u>Boaedon geometricus</u>	U	60%
<u>Lycognathopsis seychellensis</u>	U	25-30%
<u>Chameleo tigris</u>		
<u>Aeluronyx seychellensis</u>	U	75%
<u>Mabuya wrightii</u>	U	75%
<u>Phelsuma sunbergi</u>	U	35%
<u>P. astriata</u>	U	15%
<u>P. longisulae</u>	U	15%

Amphibia

<u>Megalixalus seychellensis</u>)		
<u>Sooglossus seychellensis</u>)		
<u>S. gardineri</u>)	U	50%
<u>S. thomasseti</u>)		
<u>Praslinia cooperi</u>)		
<u>Grandisonia brevis</u>)		
<u>Grandisonia diminutiva</u>)		
<u>Grandisonia larvata</u>)		
<u>Grandisonia seychellensis</u>)	U	
<u>Nesomentio thomasseti</u>)		
<u>Grandisovia atternans</u>)		
<u>Hypogeophis rostratus</u>)		

Crustacea

<u>Birgus latro</u>	U	90%
<u>Macrobracium lar</u>	U	10%
<u>Caridina spp.</u>		25%
<u>Detenia allandi</u>		75%
<u>Cardisoma sp.</u>	U	25%

Mollusca

<u>Stylodonta unidentata</u>	U	50%
<u>Stylodonta studeriana</u>	U	100%

Table 3(b): Status and protection of threatened species in Seychelles forests

Species	Population	Pop. in protected areas	% protected
Vegetation:			
<u>Lodoicea maldivica</u>	6,000-7,000	4,000	57-66%
<u>Vateria seychellana</u>	50	50	100%
<u>Toxocarpus schimperianus</u>	50-80	35-50	70%
<u>Medusagyne oppositifolia</u>	40-50	42	84%
<u>Carissa seychellensis</u>	50-100	None	0%
<u>Angreacum maheense</u>	5-10	5-10	100%
<u>Drypetes riseleyi</u>	40-60	40-60	100%
<u>Loranthus seychellensis</u>	U	U	U
<u>Gastonia seychellarum</u>	50-100	40-90	90%
<u>Vernonia seychellensis</u>	U	U	U
<u>Mimusops seychellarium</u>	200-400	100-200	50%
<u>Impatiens gardonii</u>	U	U	U
<u>Impatiens thomassetti</u>	U	U	U

All the other species on the list are fairly widespread throughout the Morne Seychellois and Praslin National Parks. On average, over 75 per cent of the populations are protected.

Table 4: Critical habitats for the endangered species of Seychelles

Note: U = unknown

Endangered species	Critical habitats	% protected
BIRDS		
<u>Pteropus seychellensis</u>	Woodlands of Mahé, Praslin and Silhouette. Roosting trees probably a limiting factor especially on Praslin.	10%
<u>Coleura seychellensis</u>	Dark caverns on Mahé, Praslin and Silhouette	5%
<u>Threskiornis aethiopica abbott</u>		
<u>Falco newtoni aldabranus</u>		
<u>Dryolimnas cuvieri aldabranus</u>	Aldabra atoll	100%
<u>Nesillas aldabranus</u>		
<u>Dicrurus aldabranus</u>		
<u>Geochelone gigantea</u>		
<u>Falco araea</u>	Wooded highlands of Mahé	15-20%
<u>Otus insularis</u>		
<u>Zosterops modesta</u>		
<u>Bebrornis sechellensis</u>	Cousin island and possibly Cousine island	99%
<u>Coracopsis nigra barklyi</u>	Praslin island especially the Vallée de Mai and Fond Ferdinand	8.4%
<u>Copsyclus seychellarum</u>	Frigate island - Islands must be cat and rat free	0%
<u>Terpsiphone corvina</u>	Mature woodlands and freshwater marshes on La Digue	2%
<u>Foudia seychellarum</u>	Islands of Cousin, Cousine and Frigate	35%
<u>Streptopelia picturata rostrata</u>	Freshwater marshes of Mahé, Praslin, La Digue, Cousin and Aride	2%
<u>Gallinula chloropus meridionalis</u>		
<u>Butorides striatus</u>	Mangroves and fresh water of granitic Seychelles	1%
<u>Ixobrychus sinensis</u>	Mountain forest of Mahé	10-15%
<u>Alectroenas pulcherima</u>	Praslin, Silhouette and Frigate	
<u>Sula dactylatra melanops</u>	Cosmoledo (main breeding site) Boudeuse, Etoile and Desnoeouf	1%
<u>Sterna dougalii arideensis</u>	Aride island, Les Mamelles and Récif. Undisturbed sea-bird rookeries.	85%
REPTILES		
<u>Chelonia mydas</u>	Aldabra, Cosmoledo, Astove, Assumption etc. The safe breeding beaches are the critical factor.	50%
<u>Eretmochyles imbricaria</u>	Cousin, Curieuse, St. Anne and the Amirantes, Farquar and Aldabra group. Again safe	5-10%

	limiting factor.	
<u>Caretta caretta</u>	I Amirantes and Farquar group	U
<u>Dermochelys coriacea</u>	Sea between Mahé and Silhouette	U
<u>Boaedon geometricus</u>	Forest of Mahé, Praslin and	15-20%
<u>Lycognathophis seychellensis</u>	La Digue	
<u>Ramphotyphlops braminus</u>		
<u>Phelsuma sunbergii</u>	Praslin, La Digue and Curieuse vegetation	10-20%
<u>Phelsuma astriata</u>	Vegetation of Mahé, Praslin,	10-20%
<u>Phelsuma longisulal</u>	La Digue and Silhouette	
<u>Ailuronyx seychellensis</u>	Praslin, Aride and Cousin	30%
<u>Chaemeleo tigris</u>	Mahé, Praslin, Silhouette	5-10%
AMPHIBIANS	Limited to the larger higher islands with abundant rainfall and moist forest	U
<u>Grandisonia brevis</u>	Mahé	U
<u>Grandisonia diminutiva</u>	Praslin	U
<u>Praslinia cooperi</u>	Mahé, Praslin	U
<u>Grandisonia lavata</u>	Mahé, Silhouette, Praslin, La Digue	U
<u>Grandisonia seychellensis</u>	Mahé, Silhouette, Praslin	U
<u>Nesomantis thomasseti</u>	Mahé, Silhouette	U
<u>Sooglossus gardineri</u>	Mahé, Silhouette	U
<u>Sooglossus sechellensis</u>	Mahé, Silhouette	U
<u>Megalixalus seychellensis</u>	Mahé, Silhouette, Praslin, La Digue	U
<u>Grandisonia atternans</u>	Mahé, Silhouette, Praslin, La Digue, Frigate.	U
<u>Hypogeophis rostratus</u>	Mahé, St. Anne, Cerf, Silhouette, Praslin, Curieuse, La Digue and Frigate.	U
<u>Rana mascariensis</u>	Mahé, Silhouette, Praslin, La Digue and Frigate	U
<u>Palinurus spp.</u>		
<u>Birgus latro</u>	Aldabra, Cosmoledo and Farquar	60%
<u>Iridacna squamosa</u>	unknown	U
<u>Iridacna maxima</u>		U
PLANTS		
<u>Lodoicea maldivica</u>	The island of Praslin - especi- ally Vallée de Mai and Fond Ferdinand and Curieuse island	55%
<u>Medusagyne oppositifolia</u>	Bernica and Mt Sebert slopes on Mahé	100%
<u>Vateria seychellarum</u>	Anse Boisleau, Dans Jamalac Casse Dent, Mt Brulée and Boid de Fer River on Mahé	50%
<u>Toxocarpus schimperianus</u>	Mt Sebert and Casse Dent on Mahé. Valée de Mai and Anse Petit Cour on Praslin and the island of Curieuse	75%
<u>Carissa seychellensis</u>	Silhouette island	0%
<u>Wright's gardenia</u>	Aride island	100%
<u>Pandanus balfourri</u>	Coast of Mahé especially the Pointe au Sel region	U
<u>Loranthus seychellensis</u>	Mountains of Mahé	U

BEETLES, SCORPIONS, etc.

Teneprionid beetle)		
Polposipus herculeanus	)	Frigate Island	0%
soldier 1848)		
Scorpion)		
<u>Isometrus maculatus</u>)		
<u>Whip scorpions</u>)		
<u>Pedipalps spp.</u>)		
Mite	)	Pitchers of the <u>Nepenthes</u>	50%
<u>Crecitzera</u>	)	<u>pervillei</u> plants	
<u>Uranotaenia repenthes</u>)		

TURTLES

Pond turtle		Swamps on Mahé, Praslin	0%
<u>Pelusius subrigrer</u>		and especially La Digue	
Green turtles		Breeding beaches:	20%
<u>Chelonia mydas</u>		Mostly Aldabra, Farquar,	
		Cosmoledo, Astove, etc.	
<u>Birgus latro</u>		Cosmoledo, Farquar and Aldabra	
		Area free from human predation	

FISH

(a) Freshwater

<u>Pachyponchax playfairi</u>		Rivers of Mahé, Praslin and Silhouette	<2%
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(b) Marine

<u>Pseudupeneus seychellensis</u>			U
<u>Chronus cinctus</u>			U
<u>Pomacentrus luteobrunneus</u>			U
<u>Pristotis judithae</u>			U
<u>Chalyxodytes chameleontoculis</u>			U
<u>Paraannellicuthys seychellensis</u>		live in sand	U
<u>Ctenogobius crocineus</u>		shallow warm seas	U
<u>Ctenogobius nocturnus</u>		shallow warm seas	U
<u>Gobiodon alboineatus</u>		shallow warm seas	U
<u>Gobiodon rivulatus</u>		shallow warm seas	U
<u>Seychellea hectari</u>		shallow warm seas	U
<u>Stigmatogobius versicolor</u>		Mahé tidal stream	U
<u>Eviotops infulatus</u>		Mahé, Aldabra	U
<u>Stanulus seychellensis</u>		U	U
<u>Pogonoscorpius seychellensis</u>		U	U
<u>Minous longimanus</u>		U	U
<u>Platycephalus cooperi</u>		U	U
<u>Aspasmodes brigghi</u>		U	U
<u>Anarchias seychellensis</u>		U	U
<u>Collionymus Spiniceps</u>		U	U
<u>Collionymus delicatulus</u>		U	U
<u>Champsodon seychellensis</u>		U	U
<u>Xenanthias gardineri</u>		U	U
<u>Holocentrus seychellensis</u>		U	U
<u>Engyprosopon sechellensis</u>		U	U

<u>Symphurus seychellensis</u>	U	U
<u>Syngnathus alternans</u>	U	U
<u>Callionymus spiniceps</u>	U	U
<u>Callionymus delicatulus</u>	U	U
<u>Apolemichthys armitagei</u>	U	U
<u>Lepidaplois aldabrensis</u>	U	U

PROPOSALS FOR NEW PROTECTED AREAS

This is a first approximation of the habitats and species which need further protection through the establishment of the various categories of protected areas.

Habitats

Coral reefs
Mangrove swamps (Mahé)
Freshwater marshes
Frigate island: main habitat for the magpie robin, Seychelles fody, turtle dove, blue pigeon, beetles, and scorpions
Silhouette Island
La Digue

Species

Carissa seychellensis
Loranthus seychellensis
Copsuchus seychellensis
Green backed beron
Chinese little bittern
Seychelles pond turtle
Spiney lobster
Mangrove crab, Scylla spp.

List of proposed protected areas

New protected areas proposed in the Government of Seychelles, 1971, "Conservation Policy in the Seychelles", a White paper based on a report by John Procter:

- (a) La Digue National Park: will cover the north-east coastal area from Anse Severe southwards to Anse Caiman. IUCN Category: IV (Managed Nature Reserve);
- (b) Silhouette island: a large part of Silhouette island will make an ideal National Park, particularly with regard to the island's natural beauty and due to the fact that it has the longest surviving area of indigenous forest in the Seychelles. IUCN Category: (Resource Reserve);
- (c) Cousine island: intended to be run as a single unit with the ICBP - managed neighbouring Cousin. Aimed for special reserve status. IUCN Category: IV (Managed Nature Reserve);
- (d) Desnoeuvs island: this island harbours the regions largest colony of sooty terns; *Sterna fuscata*. It is intended that a third of the island will be managed as a Strict Nature Reserve. IUCN Category: I (Strict Nature Reserve);
- (e) Ile aux vaches) To be declared special reserves for the purpose of
(f) African Banks) protecting their bird life;
(g) Récif island) IUCN Category: IV (Managed Nature Reserve);
(h) L'Ilot (frigate))
(i) Félicité: For its bird life and endemic flora) To be declared
(j) Frigate island: For its land bird community and other) special reserve
animal life) IUCN Category:
(k) Cosmoledo: Bird life and marine turtles) VIII Multiple -
Use Reserve.

The following two areas have been approved by the Seychelles National Environment Commission and the proposal only needs to go to the Council of Ministers and public representatives before becoming official.

- (l) The reefs around Aride Island (from high water mark (HWM) to a distance of 300 metres) are to be declared a Marine National Park. IUCN Category: II (National Park).
- (m) Albatross rocks/Cocos island: Large rocks surrounded by spectacular reefs: to be declared a Marine National Park. IUCN Category: II (National Park).

The following areas within the Morne Seychellois National Park are being proposed for Strict Nature Reserve Status specially to protect unique, rare endemic plant communities.

- (n) Bernica)
- (o) Mt Sebert)
- (p) Mt Jasmine)
- (q) Casse Dent)
- (r) Congo rouge) IUCN Category I: (Strict Nature
- (s) Trois Frères to Morne Seychellois Ridge) Reserve)
- (t) Police Bay freshwater marsh)
- (u) La Plaine mangrove swamp)
- (v) La Digue - Freshwater marsh)

Most of these areas are of greater value as Reserves than as development opportunities.

Silhouette, Cosmoledo, Desneouf are already being administered by the Island Development Corporation (IDC).

Bird island, Cousine and Frigate belong to private owners who are willing to co-operate.

All the others are government property which would presumably be given to the Conservation Section to manage.

Procedures for establishing new protected areas (clearly laid down in a Regulation of 1971)

- A map is drawn up on the instructions of the Commission showing the location and boundaries of the area in question. A notice is placed in the gazette stating that the Commission intends to submit an order for the approval of the Minister of Agriculture designating the area a national park.
- The notice is published in the gazette for three consecutive weeks and representation from the public is invited. Free access is given to the map.
- The Commission considers representations from the public and submits an Order of Designation to the Minister with copies of all representations received.
- After ministerial approval the Order is published in the gazette.

Annex I

Endemic Data of Seychelles
(Updated by F. Friedman & L. Chongseng - 14 May, 1983)

PTERIDOPHYTA	
<u>Cyatheaceae</u>	
<u>Cyathea sechellarum</u> Mett	V
ANGIOSPERMAE	
<u>Anacardiaceae</u>	
<u>Camptosperma sechellarum</u> Marchand	V
APOCYNACEAE	
<u>Carissa sechellensis</u> Baker ^{1/}	E
ARACEAE	
<u>Protarum sechellarum</u> Engl.	V
ARALIACEAE	
<u>Gastonia sechellarum</u> (Baker) Harms	E
<u>Geopanax procumbens</u> Hemsley	E
<u>Indokingia crassa</u> Hemsley	V
ASCLEPIADACEAE	
<u>Toxocarpus schimperianus</u> Hemsley	V
BALSAMINACEAE	
<u>Impatiens gordonii</u> Horne ex Baker	I
<u>Impatiens thomassetii</u> Hook f.	I
BEGONIACEAE	
<u>Begonia sechellensis</u> Hemsley	V
BIGNONIACEAE	
<u>Colea sechellarum</u> Seemann	R
COMPOSITAE	
<u>Gynura sechellensis</u> (Baker) Hemsley	R
<u>Vernonia sechellensis</u> Baker	I
CYPERACEAE	
<u>Lophoschoenus hornei</u> (C.B.Clarke) Stapf	R
<u>Thoracostachyum angustifolium</u> C.B. Clarke	V
<u>Thoracostachyum floribundum</u> (Ness)	R
C. B. Clarke	
DILLENIAEAE	
<u>Dillenia ferruginea</u> (Baillon) Gilg	R
DIPTEROCARPACEAE	
<u>Vateria sechellarum</u> Dyer	E
EBENACEAE	
<u>Maba sechellarum</u> Hiern	R
ERYTHROXYLACEAE	
<u>Erythroxyton sechellarum</u> O. Schulz	R

1/ Now only found on silhouette island. The island has recently been acquired by the Government. There is a move to keep all development below the 200m contour. The wood was poached heavily in the old days. There are probably less than 100 individuals left. One small plant is doing very well in the Botanical gardens on Mahé.

EUPHORBIACEAE		
	<u>Drypetes riseleyi</u> (Hemsley) Airy Shaw	E
	<u>Excoecaria benthamiana</u> Hemsley	V
FLACOURTIACEAE		
	<u>Aphloia seychellensis</u> Hemsley	R
GRAMINEAE		
	<u>Garnotia sechellensis</u> C.E. Hubb & Summerh.	V
HYPOXIDACEAE		
	<u>Curculigo rhizophylla</u> (Baker) T. Durand & Schinz	V
	<u>Curculigo seychellensis</u> Bojer	R
	<u>Curculigo</u> sp.	V
LABIATAE		
	<u>Achyrospermum sechellarum</u> Baker	E
	<u>Coleus subfrutectosus</u> Summerh.	E
LORANTHACEAE		
	<u>Loranthus sechellensis</u> Baker	I
MEDUSAGYNACEAE		
	<u>Medusagyne oppositifolia</u> Baker	E
MELASTOMATACEAE		
	<u>Memecylon eleagni</u> Blume	R
MORACEAE		
	<u>Ficus bojeri</u> Baker	V
MYRSINACEAE		
	<u>Rapanea sechellarum</u> Mez	V
MYRTACEAE		
	<u>Eugenia wrightii</u> Baker	R
NEPENTHACEAE		
	<u>Nepenthes pervillei</u> Blume	V
OLACACEAE		
	<u>Grisollea thomassetii</u> Hemsley	E
ORCHIDACEAE		
	<u>Agrostophyllum occidentale</u> Schltr.	V
	<u>Angraecum maheense</u> Schltr.	E
	<u>Bulbophyllum intertextum</u> Lindley	V
	<u>Hederorkis seychellensis</u> Bosser	V
	<u>Malaxis sechellarum</u> (Kraenzlin) Summerh.	V
	<u>Oeceoclades sechellarum</u> (Summerh.) Garay & Taylor	E
	<u>Platylepis sechellarum</u> S. Moore ex Baker	V
	<u>Vanilla phalaenopsis</u> Reichenb. f.	R
PALMAE		
	<u>Deckenia nobilis</u> H.A. Wendl. ex Seemann	V
	<u>Lodoicea maldivica</u> (J. Gmelin) Pers.	V
	<u>Nephrosperma vanhoutteanum</u> (Wendl. ex Van Houtte) Balf. f.	R
	<u>Phoenicophorium borsigianum</u> (K. Koch) Stuntz	V
	<u>Roscheria melanochaetes</u> (H. A. Wendl.) H.A. Wendl.	V
	<u>Verschaffeltia splendida</u> H. A. Wendl.	V
PANDANACEAE		
	<u>Pandanus balfourii</u> Martelli	V
	<u>Pandanus hornei</u> Balf. f.	V
	<u>Pandanus multispicatus</u> Balf. f.	R
	<u>Pandanus sechellarum</u> Balf. f.	R
PITTOSPORACEAE		
	<u>Pittosporum wrightii</u> Hemsley	V

RUBIACEAE

<u>Canthium carinatum</u> (Baker) Summerh.	V
<u>Canthium sechellense</u> Summerh.	E
<u>Craterispermum microdon</u> Baker	V
<u>Ixora pudica</u> Baker	V
<u>Psychotria dupontiae</u> Hemsley	V
<u>Psychotria pervillei</u> Baker	V
<u>Psychotria sechellarum</u> (Baker) Summerh.	E
<u>Randia sericea</u> (Baker) Hemsley	V
<u>Rothmannia annae</u> (E. Wright) Keay	V
<u>Tarenna sechellensis</u> (Baker) Summerh.	V
<u>Timonius sechellensis</u> Summerh.	V

SAPINDACEAE

<u>Allophylus sechellensis</u> Summerh.	R
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SAPOTACEAE

<u>Mimusops sechellarum</u> (Oliver) Hemsley	V
<u>Northea hornei</u> (Hartog) Pierre	R

SIMAROUBACEAE

<u>Soulamea terminalioides</u> Baker	V
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TRIUTIDACEAE

<u>Seychellaria thomassetii</u> Hemsley	V
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Annex II

FOUR THREATENED TREES OF THE SEYCHELLES

(Data sheets supplied by the Threatened Plants Committee (TPC) of IUCN, 1978)

Lodoicea Maldivica (J. F. Gmelin) Pers. Coco de Mer, Double Coconut, PALMAE

STATUS: Vulnerable. "This famous palm is protected both by law and by sentiment but the demand for nuts by tourists and others constitutes a threat to the species" (6). Recently, however, further measures have been taken to reduce over-exploitation of the nuts (see below). The species had declined mainly because of severe exploitation, but also because of fire, competition from introduced trees and shrubs, and to some extent clearing for cultivation. The trees in the Vallée de Mai, Fond Ferdinand and on Curieuse Island are protected.

DISTRIBUTION: Seychelles. It is local and scattered on Praslin ('Isle of Palms', about 10 x 3-5 km) with dense stands in only two localities, but was formerly abundant and locally dominant; it is also on Curieuse Island (about 3 x 1 km) but extinct on the small Round Island.

HABITAT AND ECOLOGY: Hill slopes and valleys from near sea-level to c. 300m, presumably forming pure stands in the past. Vesey-FitzGerald points out in (1) that possibly the species could not survive if reduced to scattered individuals since other species can invade once the dense palm canopy is lost. A major factor may be pollination - the mechanism is not understood.

CONSERVATION MEASURES TAKEN: To reduce poaching, the Government has recently become the sole distributor of the nuts, buying all of them and re-selling at a fixed price. Only nuts with a Government-issued tag may be exported. The most famous locality, the Vallée de Mai, is a reserve under the Wild Birds Protection (Nature Reserves) Regulations 1966.

CONSERVATION MEASURES PROPOSED: Praslin National Park declared by the Government in 1979.

BIOLOGY AND POTENTIAL VALUE: In the past many fables arose about the origin of the giant nuts. Their distinctive shape and immense size (they are the largest seeds in the plant kingdom) made them much-prized symbols of virility and suggested a supernatural origin until the tree itself was discovered in 1973.

As with most palms, the trees have many local uses. The 'cabbage' of young developing leaves was used in the past as a vegetable, the old leaves used for roofing, etc., the trunks for building materials and the young nuts for their edible, fleshy, white endosperm. The immature leaves (before they unfold) were used for making hats, vessels, baskets, brooms and even for filling pillows (3). *Lodoicea* is of great interest to studies of plant geography and taxonomy for the most unusual size of its flowers and fruits. *L. maldivica* is the only species in the genus.

CULTIVATION: It is in cultivation on Mahé, Silhouette, Félicité, La Digue and Frigate Islands, as well as in numerous botanic gardens. It is said to be easy to grow from seed, but germination has proved difficult in some cases. In the Seychelles the nuts (after they fall) are dehusked, stored for about six months and then sown by laying them on moist soil. The Department of Agriculture sells germinated nuts at a reduced price to interested growers.

DESCRIPTION: Palm with a bare slender columnar trunk only c. 30cm across, but up to 30m high, with a crown of 12-20 pale yellow-green leaves, each 4-6m wide on stalks 2-4(-10)m and folded like a fan when young later opening into a broadly ovate blade with sub-pendulous folds or segments 4-10cm broad. Male and female flowers appearing after 14-30 years and on different trees; male spikes spreading, pendulous, more or less cylindrical, 1-2m long and 6-10cm across; female spikes stout, 1-2m long, covered with large red-brown scales and bulging where the 5-13 large flowers are each inserted. Fruits more or less ovoid, somewhat flattened, 40-50cm long, with a fibrous husk 1-2cm thick covering the distinctive, black, usually 2-lobed nut which resembles two coconuts joined as Siamese twins, weighs 10-22 kg and remains on the tree for 5-8 years (1).

For illustrations see (1), (2), (3) and (4).

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Toxocarpus schimperianus Hemsley, ASCLEPIADACEAE

STATUS: Endangered, due to destruction of the habitat.

DISTRIBUTION: Seychelles. It occurs on Curieuse Island (about 3x1km), at c. 50-150m. It has been found in two localities on Mahé, namely Mt. Sebert and Casse Dent. Also, last year it was discovered in two localities on Praslin, namely, at the back of Anse Petit Cour and Vallée de Mai. There are at least 72 flowering plants endemic to the Seychelles (not including Aldabra), and nearly all are believed to be threatened (4). These are mostly plants of the forest, which have been severely affected by fire and over-exploitation, resulting in soil erosion, a decrease in soil fertility and intensification of the adverse effects of drought (2).

HABITAT AND ECOLOGY: On Curieuse, fire and erosion over many years have destroyed much of the vegetation, and only a few small pockets and a belt near the coast remain. The eastern peninsula was burnt in 1967 and, despite a rainfall of 250cm per year, is now partly desert. The Toxocarpus occurs in small patches in the surviving remnants of forest, though it was formerly in forest clearings and in open communities. In one place it was found scrambling over Pandanus multispicatus Balf. f., surrounded by red badlands (with a reclamation scheme in progress). The Casse Dent stand is in a very rich (in endemic species - at least 45) fairly thick humid forest.

Recently, however, lock and spill drains have been constructed in the burnt areas to reduce erosion and re-afforestation is being carried out.

CONSERVATION MEASURES TAKEN: Curieuse Island is government land and is being managed by the Forestry and Conservation Division. Access to the public is restricted. The Casse Dent and Mt. Sébert are proposed strict Nature Reserves. Some re-germination in the Botanical Garden is being being tried.

CONSERVATION MEASURES PROPOSED: The island is being considered for National Park status and has already been surveyed. The species should also be brought into cultivation.

BIOLOGY AND POTENTIAL VALUE: In common with other species of the Asclepiadaceae it may contain pharmacologically active substances, but this requires investigation.

DESCRIPTION: Slender liane with twining stems bearing opposite pairs of narrowly lanceolate, leathery leaves 10-15cm long with reddish midribs, and in the axils, small panicles 2-5cm long of diminutive flowers, each only opening partially, 2-4mm across; calyx c. 2mm long (the lower half narrowly tubular); corolla white to pale rose, with elliptic lobes c. 2mm long. Fruits each of two slender diverging follicles 6-9cm long, spindle-shaped and tapering to a point, containing numerous flattened seeds 8-10mm long, each with a tuft of silky hairs 20-25mm long.

For an illustration see (1).

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Medusagyne oppositifolia Baker Bois méduse, MEDUSAGYNACEAE

STATUS: Endangered. After its discovery in 1903 it was not seen again until 1970, when it was rediscovered in a different locality; about 40 individuals are now known in this site. During 1974 a single individual was also rediscovered in the locus classicus. During 1980 four other individuals were found at the locus classicus. Both sites are in the Morne Seychellois National Park (1979).

Note: The main site is earmarked as the site for a dam in 1990.

DISTRIBUTION: Seychelles; confined to Mahé. There are at least 72 flowering plants endemic to the Seychelles (not including Aldabra) and nearly all are believed to be threatened (6). They are mostly plants of the forest, which have been severely affected by fire and over-exploitation resulting in erosion, decrease of soil fertility and intensification of the adverse effects of drought. Large areas are covered by cinnamon coppice, the second most important crop on the islands and now the most abundant flowering plant.

HABITAT AND ECOLOGY: Rocky inaccessible places at 220m, growing in deep clefts between granite masses. The associates are listed in (6). The altitude at the locus classicus is c. 300-450m.

CONSERVATION MEASURES TAKEN: Seeds have been sent to France, UK and Mauritius for propagation. Attempts are also being made in the Botanical Garden Victoria.

CONSERVATION MEASURES PROPOSED: The two sites are in areas proposed for Strict Nature Reserves, both of which, as mentioned above, lie within the Morne Seychellois National Park. This area has been surveyed, but not yet gazetted. It is recommended that these conservation areas be declared. As opportunity permits, cultivated material of the species should be distributed among botanic gardens to help ensure its survival.

BIOLOGY AND POTENTIAL VALUE: It is of great interest in taxonomic botany and in studies of plant geography as a species so distinct it is accorded a family of its own. The fruits, described below, are particularly interesting. It is possibly related to the Theaceae, but its true position in the plant kingdom is uncertain.

CULTIVATION: It can be grown with some difficulty from seed; a single small specimen is being grown in the Sans Soucis Forestry Station in the Seychelles. It seems that wild seedlings rarely or never survive (6).

DESCRIPTION: Shrub or small tree up to 10m high with a dense umbrella-shaped crown of shining, leathery, elliptic leaves 4-9cm long, in opposite pairs and red when senescent. Flowers in loose, slightly nodding panicles c. 3-5cm long, scarcely exceeding the leaves; each flower with 5 small sepals, 5 spreading or recurved, white or pink-flushed petals 5 mm long and a ring of short stamens surrounding an ovary which is crowned by about 20-25 short, spreading styles with swollen stigmas. Capsule barrel-shaped, 7mm long, with persistent styles at the top and stamens at the bottom, longitudinally grooved and dividing into 20-25 segments spreading out from the top, resembling a small Medusa-like parasol, each segment to release two small winged seeds.

For illustrations see (2),(4) and (6).

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Vaceria seychellarum Dyer, Bois de fer, DIPTEROCARPACEAE

STATUS: Endangered. It is now known in about 5 localities (4) but the population is critically low. One estimate is of about 50 trees. It has been felled extensively for its fine timber and for fire-wood with the result that it was becoming scarce towards the end of the last century (1), and is now virtually extinct over most of its range. It occupied a zone cleared for cultivation of cinnamon and other crops. All the present localities are within the Morne Seychellois National Park.

DISTRIBUTION: Seychelles. It is endemic to Mahé and was formerly one of the dominants in the forest at the foot of the hills, ranging up to c. 400m and possibly extending down to about 100m in the now extinct lowland forest.

There are at least 72 flowering plants endemic to the Seychelles (not including Aldabra) and nearly all are believed to be threatened (4). They are mostly plants of the forest, which has been severely affected by fire and over-exploitation resulting in erosion, decrease of soil fertility and intensification of the adverse effects of drought. Large areas are covered by cinnamon coppice, the second most important crop on the islands and now the most abundant flowering plant.

HABITAT AND ECOLOGY: Rain-forest on soils derived from granite. One group of the remaining trees is near what is probably the upper altitudinal limit of the species' former range; the surrounding vegetation is now secondary forest, regularly cut for cinnamon, which inhibits the formation of a forest canopy. Most of the surviving specimens appear to have regenerated from cut stumps but a few have only one stem. There are a few seedlings but no young trees. Numerous associates are listed in (4).

CONSERVATION MEASURES TAKEN: Morne Seychellois was declared a National Park in 1979.

CONSERVATION MEASURES PROPOSED: As mentioned above, all of the known population is within the Morne Seychellois National Park. This area has been surveyed, but not yet gazetted. It is recommended that this important conservation area be declared. Also, the species should be propagated and grown in botanic gardens and tropical research institutes. Work is needed to determine the optimum conditions for establishing the tree, e.g. degree of shade, tolerance of competition and viability of the seed.

BIOLOGY AND POTENTIAL VALUE: The timber is of good quality, comparable to that of the Dipterocarps of Malaya, and the species is thus a valuable part of the gene pool which should be available for breeding. (Dipterocarps are the dominant tall timber trees of primary lowland rain-forest in south-east Asia and a major source of timber.) When cut the bark of this species gives off a very fragrant resin which was once used as an incense (5) and is potentially valuable in the perfume industry. As an outlying member of the family, the species is of some importance in studies of plant geography and taxonomy.

CULTIVATION: The Forestry Department in the Seychelles has been gathering seeds and germinating them with success. Some have been replanted in the wild. The species is also in cultivation at Aberdeen University, Scotland. Although it can be grown readily from seed, young trees often die after a promising start. Those that survive appear to be very slow-growing.

DESCRIPTION: Tree 25-30m high and c. 2m in diameter at the base, with large leathery elliptic leaves 12-25cm long, pointed at the tip. Flowers c. 1.5cm across, in small racemes in the leaf axils, with 5 ovate blunt-tipped sepals, 5 spreading,

slightly concave, obovate, yellow to white petals c. 7mm long and a tight central boss of numerous short stamens. Fruits spherical, 3-4 across, each containing a single seed with 2 large fleshy cotyledons.

For illustrations see (4) and (5).

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The TPC is most grateful to Mr. J. Procter and to the Conservation Officer, Ministry of Agriculture and Land Use, Republic of the Seychelles, for help in procuring the information in annex II.

RAPPORT NATIONAL FRANCAIS (LA REUNION) : par H. Gruchet

DONNEES DE BASE

Superficie:	2 512 km ²
Terres arables:	51 842 km ² - 20,58 pour-cent des terres
Superficie de la mer territoriale:*	318 300 km ²
Population:	515 814
Densité:	205 habitants au km ²
Taux de croissance démographique:	+ 0,95 pour-cent par an
Population vivant de l'agriculture:	12,72 pour-cent
Population vivant de la pêche:	0,39 pour-cent
Produit national brut par habitant:	US\$ 2 364
Taux d'alphabétisation:	63 pour-cent

EXAMEN DES POLITIQUES NATIONALES DE GESTION RELATIVES
AUX AIRES PROTEGEES ET AUX ESPECES EN DANGER

Législation

Législation internationale:

La Réunion est partie aux instruments normatifs suivants:

- le Patrimoine mondial;
- le Commerce international des espèces menacées CITES (avec réserves);
- les espèces migratrices, Bonn (signataire);
- Genève 1958 (958-31) (signataire);
- Londres 1933 (933-83) (signataire);

Législation nationale: (aires protégées)

a) Forêt

Il existe trois réserves biologiques intégrales:

- une de 3,5 ha, canton du Grand Matarum, dans le Cirque de Cilaos;
- une de 4,25 ha, canton de Piton bleu, dans le Cirque de Cilaos.

*N.B. Tromelin 280 000 km², Mayotte 73 600 km², Juan de Nova 61 050 km², Europa
127 300 km², Bassas da India 123 700 km², Glorieuses 48 350 km²

Ces deux réserves sont manifestement trop petites et doivent être incluses dans un projet de réserves beaucoup plus vastes de 500 ha environ.

- La troisième de 68,39 ha concerne une forêt de basse altitude à Mare Longue dans la commune de St. Philippe.

Ces trois réserves sont insuffisantes en nombre et en étendue pour pouvoir assurer la pérennité des espèces botaniques et zoologiques. Etant donné la grande diversité des habitats un projet de créer 12 réserves supplémentaires est à l'étude.

b) La mer

Il existe des réserves de pêche tendant essentiellement à limiter la pêche sous-marine dans:

- tous les lagons;
- la partie extérieure des lagons jusqu'à 1 km au large dans une zone comprise entre le Cap la Houssaye et la pointe de l'Etang-Salé. Cette zone est divisée en trois; à tour de rôle une partie est mise en réserve pour trois ans.

Législation nationale: (conservation des espèces)

a) Animales

Terrestres

Oiseaux: Tous les oiseaux indigènes sont protégés sauf le merle Hypsipetes borbonica. Il sera prochainement retiré de la liste des gibiers. La législation est suffisante mais elle est mal appliquée, par manque de personnel de surveillance. En effet, bien que ce soit interdit, on continue à capturer des petits oiseaux à la glu, fabriquée avec le latex des fruits du "petit natte" Labourdonnaisia calophylloides et du "grand natte" Mimusops maxima.

Papillons: Deux espèces sont protégées: Papilio phorbanta et Salamis augustina. Des démarches sont entreprises pour interdire la récolte de Antanartia hippomene.

Reptiles: Les deux Phelsuma, P. borbonica et P. ornata inexpectata sont protégés par la Convention de Washington.

Marines

Les menaces pesaient sur deux groupes:

- les coraux à cause de la fabrication de la chaux;
- les coquillages à cause des collectionneurs.

Des arrêtés préfectoraux interdisent maintenant la récolte de ces animaux marins. Mais la législation est mal appliquée faute de moyens de surveillance.

b) Végétales

Les espèces particulièrement menacées sont:

- les orchidées: la culture de ces plantes ornementales est à la mode. Les

fleurs, mais les acheteurs, trompés, ne le savent pas. La récolte des orchidées sauvages est interdite;

- les palmistes Acanthophoenix crinata sont coupés pour la récolte des bourgeons terminaux qui sont comestibles. Il est interdit de vendre des palmistes sans une autorisation du Service Forestier. Là aussi la surveillance est insuffisante;
- certains arbres rares, notamment en zone sèche, disparaissent à cause des tisanneurs qui en prélèvent l'écorce.

Liens institutionnels entre la conservation des espèces et celle des habitats:

- Secrétaire d'Etat chargé de l'Environnement et du Cadre de vie;
- Direction de la Protection de la Nature;
- Service de la Chasse et de la faune sauvage;
- Service de la pêche et de l'hydrobiologie;

- Ministère de l'Agriculture;
- Secrétaire d'Etat chargé de la Forêt;
- Office National de la Forêt;

- Secrétaire d'Etat chargé de la mer;
- Administration des Affaires Maritimes;
- Police des Eaux.

Gestion des aires protégées (reposant sur le document de l'UICN sur les catégories, objectifs et critères pour les aires protégées)

Les catégories suivantes sont représentées dans le réseau d'aires protégées de La Réunion:

Réserve naturelle stricte	- 3 (Forestières) + 12 en instance
Monument national	- 0 (1 en instance: le volcan)
Réserve de gibier	- 5 (5 terrestre + 1 marine)
Paysage culturel	- 3 (7 à l'étude)
Réserve de ressources	- 1 réserve marine tournante

Nom et adresse des organes de gestion des aires protégées

Les trois réserves naturelles situées dans le domaine forestier sont gérées par le Directeur Régional de l'Office National des Forêts, Colline de la Providence, 97400 St. Denis. La réserve marine tournante est gérée par l'Administration des Affaires Maritimes, 11, rue de la Compagnie, 97400 St. Denis. Les sites classés (paysage culturel) sont gérés par le Service Départemental de l'Architecture, 97 rue Juliette Dodu, 97400 St. Denis. Il n'existe aucun personnel chargé uniquement de la bonne marche de ces aires protégées.

Les aires protégées n'ont pas de personnel propre mais il existe à la Réunion des possibilités pour la formation de ce personnel si l'administration décide de les recruter. Il existe notamment une université.

Personne ne travaille dans les réserves qui ont été établies dans des zones où n'existait aucune activité humaine. La circulation des piétons dans les sentiers est libre.

INVENTAIRE DES ECOSYSTEMES DE LA REUNION

Type	Superficie totale (km ²)	Surface protégée (km ²)

Recifs coralliens		
Récifs frangeants	12 km ²	pas de surface protégée (uniquement réserve de chasse sous-marine)
La haute mer		
Plate forme sous-marine: (limite bathymétrique 200m)	500 km ²	

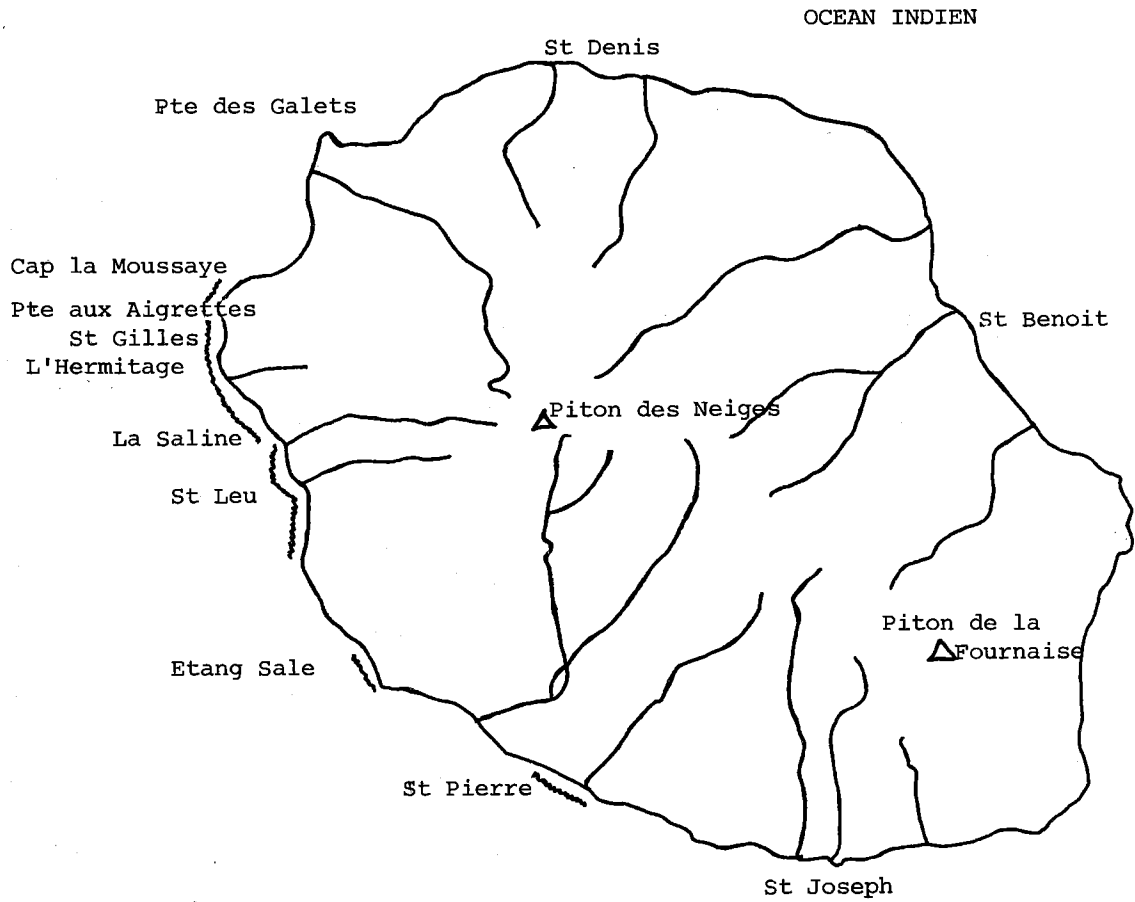
Les pièces suivantes ont été jointes au rapport mais le manque d'espaces nous a empêchés de les reproduire.

1. Averous: Esquisse Géomorphologique des atterages de l'île de La Réunion.
2. Direction départementale de l'Agriculture: Carte forestière du département de La Réunion.
3. Direction départementale de l'Agriculture: Carte agricole du département de La Réunion.
4. Institut des aménagements régionaux et de l'environnement: Programme de coopération scientifique et technique pour la conservation et la valorisation des ressources écologiques des îles des Comores, des Mascareignes et des Seychelles. Extrait du rapport du Séminaire sur les ressources aquatiques 1981.
5. Ferlin, et Ledoux: Project de conservation et de valorisation des ressources écologiques des îles des Comores, des Mascareignes et des Seychelles. Extrait du rapport sur l'inventaire de la macrofaune des eaux douces et lagunaires.
6. Affaires maritimes Hennequin: La pêche maritime à la Réunion, 1979.
7. J. Bosser: Project de constitution de reserves biologiques dans le domaine forestier de la Réunion (plus les sites et les annexes sites - Loi du 2.55.30 - 1930).
8. Arrêté no 3890/DAGR.2 du 11 october 1982.
9. Arrêté no 3892/DAGR.1.
10. Décret no 81-854 du 28 août 1981 portant création de la réserve naturelle de Saint-Philippe-Mère-Longue (Réunion).
11. Directive sur la protection et l'aménagement du littoral.
12. Fiche de présentation d'une reserve biologique domaniale.


13. Règlement permanent sur la police de la chasse dans le département de la Réunion.
14. Arrêté modificatif à l'arrêté réglementaire permanent sur la police de la chasse dans le département de la Réunion.
15. Arrêté de clôture de la chasse dans le Département de la Réunion pour la campagne 1983.
16. Arrêté no 431 1/2 du 15 mai 1959 portant réglementation permanente de la pêche fluviale.
17. Ordonnance locale sur la police de la pêche du 5 juin 1819.
18. Circulaire du 26 août 1980 relative à l'utilisation des terrains domaniaux du littoral dans les départements d'outre-mer plus annexe.
19. Arrêté no 4938/SGAE/DP.1 portant modification de l'arrêté préfectoral no 217/SGAE/DP.1 en date du 20 Janvier 1977 organisant le contrôle sanitaire des produits de la pêche maritime à l'importation et à la vente au détail.
20. Arrêté no 217/SGAE/DP.1 du 20 Janvier 1977 portant modification de l'arrêté préfectoral no 1948/SGAE/3 en date du 28 juin 1973 organisant le contrôle sanitaire des produits de la pêche maritime à l'importation et à la vente au détail.
21. Arrêté no 4319/DAGR/2 modifiant l'arrêté no 2862/DAGR/2 du 21 juillet 1976 réglementant l'exercice de la pêche maritime côtière dans les eaux du département de la Réunion.
22. Loi no 76-655 du 16 juillet 1976 relative à la zone économique au large des côtes du territoire de la République.
23. Arrêté no 1905/DAG.R/2 du 25 mai 1976 portant institution de réserves dans les eaux maritimes du département de la Réunion.
24. Arrêté no 1948 SGAE/3 du 28 juin 1973 organisant le contrôle sanitaire des produits de la pêche maritimes à l'importation et à la vente au détail.
25. Arrêté no 11/DAG.2/du 3 janvier 1975 réglementant la circulation dans les eaux et rades de la Réunion.
26. Arrêté no 1904/DAG.R/2 du 25 mai 1976 portant réglementation de la pêche sous-marine dans les eaux maritimes du littoral du département de la Réunion.
27. Arrêté no I 486/DAG/I portant interdiction de la pêche au corail dans les lagons de la Réunion.
28. Arrêté no 1110 P.C. du 5 décembre 1949 portant règlement pour l'extraction sur le rivage de la mer, des sables, pierres et autres matières non considérées comme amendements marins.
29. Arrêté no 2862/DAG.R/2 réglementant l'exercice de la pêche maritime côtière dans les eaux du département de la Réunion.
30. Loi no 71-1060 du 24 décembre 1971 relative à la délimitation des eaux territoriales françaises.

31. Arrêté no 0263/DAGR/2 du 28 janvier 1983 portant modification de l'arrêté no 2862/DAGR/2 du 21 juillet 1976 réglementant l'exercice de la pêche maritime cotière dans les eaux du département de la Réunion.
32. Arrêté no 801/AM réglementant le mouillage des navires et embarcations en certains points du littoral du Département de la Réunion.
33. Comité Economique et Sociale région Réunion 1982 - L'environnement à L'île de la Réunion.
34. Etats régionaux de l'environnement - Livre blanc de l'environnement - Réunion.

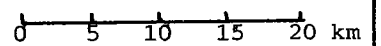
CARTE DE LA REUNION



Legende

 Recifs 12 km²

Echelle



NATIONAL REPORT FOR MAURITIUS : by M.I. Jehangeer

BASIC DATA ON MAURITIUS

Land area:	1,865 km ²
Arable land:	1,026 km ² , 55 per cent of land area
Area of territorial sea:	Not available
Population:	949,686 (1972 census)
Population density:	509 inhabitants per km ²
Rate of population growth:	1.26 per cent per year
Population earning living from agriculture:	52,338*
Population earning living from fishing:	4,152
Per capita gross national product:	US\$ 659
Literacy rate:	About 75 per cent
Major sources of foreign exchange:	Tourism, industrial commodities, agricultural produce (sugar, tea), fisheries produce (canned tuna, red fish and prawns)

* This figure is an estimate for 1972 only (Source: Biannual Digest of Statistics, Vol. 17, no. 1982). More reliable figures should be obtainable after the next census.

REVIEW OF NATIONAL MANAGEMENT POLICIES RELATED TO PROTECTED
AREAS AND ENDANGERED SPECIES

Legislation

International legislation:

Mauritius has become party to the following legal instruments:

- Convention on International Trade in Endangered Species (CITES);
- African Convention on Conservation of Nature;
- Indian Ocean Sanctuary, 1979.

National legislation:

a) Protected area legislation

The main regulation dealing with protected areas is the Ancient Monuments Act which has provisions for enabling the creation of protected areas such as parks or reserves, etc. At least eight regulations contain provisions for protection and management of specific areas (aquatic or terrestrial), one dating from 1863.

(i) Ancient Monuments Act (1944)

The object of this Act is to set up a Board under the name of Ancient Monuments and Nature Reserves in Mauritius to advise the Government on all matters connected with the acquisition, guardianship, ownership and maintenance of monuments and reserves, and the protection and preservation of the fauna and flora of the island. An Ancient Monument or Natural Reserve can be in private ownership and can include inhabited dwellings and other buildings. The procedure for declaring a privately owned site as an Ancient Monument or a National Reserve is for the Governor-General (on the advice of the Board) to serve a notice to the owner. A list of ancient monuments and national reserves is published annually in the Government Gazette. Government Notice 263/44 deals with the constitution of the Board.

(ii) Forest and Mountain and River Reserves Act (1971)

This Act regulates the management of forest, mountain and river reserves as defined therein. The salient sections of the Act govern the following: destruction of trees and removal of wood, trees and brushwood, planting in reserves, removal or deposit of materials from and in reserves. The inference of the regulation is that land should be covered with vegetation or a crop approved by the Conservator of Forests and this is irrespective of the fact that reserves may be private land.

(iii) Wood and Forest Act (1881)

This Act regulates the management of woods and forests. It contains provisions against the destruction of trees by negligence or fire. Two sections deal with the control and destruction of undesirable Cuscuta creeper on any land including reserves or crown land.

(iv) Botanical Gardens Ordinance Ca. 222 of 1884

The Ordinance empowers the Minister of Agriculture and Natural Resources to make regulations relating to the use of the Botanical Gardens at Pamplémousses and Curepipe. Infringement of these regulations is punishable by a fine of Rs. 200 or a term of imprisonment not exceeding three months. The regulations are contained in GN

(v) Pas Géométriques Act (1895)

The Act defines Pas Géométriques, the reserved lands along the sea-coast forming part of the 'domaine public', as inalienable and imprescriptible and as having a breadth not less than 81 m and 21 cm from the line of the sea-shore which is reached by high water at spring tide. Also, sea-water ponds, salt-water marshes, lakes, bogs and basins situated wholly or partly upon the Pas Géométriques, the islets adjacent to the shore which can be reached at low tides on foot, the creeks and mouths of rivers are deemed annexes of Pas Géométriques and shall form part of the 'domaine public'.

Other provisions of the Act deal with the conditions for granting leases of Pas Géométriques by private contract or public auction, including those granted under a Cyclone Housing Scheme, or for camping sites (which are used either in the public interest, for recreation by registered clubs or for bona fide religious, charitable or educational purposes). Section 23 prevent dumping on Pas Géométriques.

(vi) Rivers and Canals Act (1863)

The aims of this Act are to preserve the water of rivers and canals against excessive uses for irrigation and industrial purposes, to ensure a normal flow of watercourses and to protect them against pollution. In this connection, section 87(1) is noteworthy. It stipulates that "subject to subsection (2) any person who throws or causes to be thrown, or sends or allows to flow into a river or into a canal, pipe or other conduit discharging into a river or canal, any scum, residue, refuse washings or other dirty waters or other liquid that may tend to pollute the water of such river or canal shall commit an offence and shall on conviction be liable to a fine not exceeding 1,000 rupees."

(vii) The Maritime Zone Act (1977)

With this Act Mauritius basically claims sovereignty over territorial waters, Exclusive Economic Zone (EEZ) and the continental shelf. The rights claimed over these areas include, inter alia: sovereign rights for the exploration, exploitation, conservation and management of all resources and the exclusive jurisdiction to preserve and protect the marine environment and to prevent and control marine pollution. Further, the Prime Minister is empowered to make appropriate regulations to carry out the provisions of the Act.

(viii) Fisheries Act (1980)

This Act makes provisions for the control of fishing in waters under national jurisdiction and for the management and preservation of fish stocks. Special zones under this Act are the reserved areas, designated by the Minister of Agriculture and Natural Resources, who may prescribe where fishing with a large or gill net is prohibited. Further, section 19(b) stipulates that no person shall beat the surface of the water in a reserved area for the purpose of catching or luring any fish away from the reserve area. The water area (marine environment) within the fishing limits (EEZ) is protected under section 21 against the use of destructive methods of fishing (explosives) and under section 913 from disposal of pollutants. Government Notice No. 18 of 1983 defines the boundary of the Reserves.

(ix) Continental Shelf Act (1970)

This Act lays the basis for the regulation of the use of the continental shelf as well as the management of mineral and other natural or non-living resources of the seabed, subsoil and living organisms belonging to the sedentary species on the

shelf. The Minister is empowered to make appropriate regulations governing, inter alia, the prohibition and restriction of any exploitation of the continental shelf likely to cause unjustifiable interference with navigation, fishing or conservation of living resources of the sea, or activities likely to interfere with national defence or security, or with oceanographic and other scientific research.

(x) Pesticides Control Act 1970

This Act makes provision for the establishment of a Pesticides Control Board to regulate the control, manufacture, use, storage, packing, sale and import of pesticides and to provide for matters connected therewith and incidental thereto. Of relevance to the environment is section 27 which stipulates that containers which held pesticides be thoroughly washed or destroyed, that empty containers when washed, or disposed of, do not contaminate water-ways and ponds and that contaminated water does not find its way to water-ways and ponds.

(xi) Removal of Sand Act 1973

This Act amends and consolidates the law relating to the removal and transport of sand and trade in sand. Of particular relevance to protected areas is section 8 which prohibits any person from removing or causing to be removed any sand other than from a sandy quarry or lagoon to a sand landing place. Further, section 7(1) prohibits any person from removing and transporting sand, or causing sand to be removed and transported, unless he is in possession of a permit. Control over transport is achieved by requiring that the permit specifying quantities and purposes be in the possession of the person in charge of the vehicle. He is also required to give relevant information to an authorized officer if the latter has reason to suspect an unlawful transaction. The protection of the beach and shores is thus adequately assured.

(b) Species conservation legislation

(i) The Wildlife Bill (No. XV of 1983)

The object of this Bill is to make better provisions for the protection of wildlife and game. It amends and consolidates the law relating to game, camarons and shrimps, and to the protection of birds (in Rodrigues as well). The most important sections in the Act pertain to the following: protected wildlife, birds, hunting devices, hunting of game, introduction of animals, camaron and shrimp fishing licences, search and entry, and regulations.

It is forbidden to hunt, rear, sell or export any protected wildlife, destroy the eggs or nests of any wild birds as specified in the second schedule, or to kill or destroy any bird as laid down in the third. The capture of certain categories of birds for rearing purposes, however, is permitted. For other categories, a close season for capture is imposed.

Hunting of game is regulated through a licensing system. A minimum length for sale and a close season between October and March are imposed on the catch and sale of berried female freshwater prawns (camaron). Fishing with explosives, poisonous substances or artificial lights is prohibited. A size limit of 8.5 cm for camaron is specified.

(ii) Beneficial Insects Protection Ordinance 1931 (Cap 3 Statutes Vol.1)

This ordinance protects beneficial insects and provides for regulations with respect to their capture, removal, possession, sale or destruction, killing, injuring or molesting and also enables officers of the Ministry of Agriculture and

(iii) Plants Act 1976

This Act consolidates laws relating to plants and plant diseases. It also implements the International Plant Protection Convention 1951 and makes better provisions for the protection of plant life.

(iv) Fisheries Act 1980

This Act makes provisions for the control of fishing within the limits of waters under national jurisdiction and for the management and preservation of fish stocks. Three provisions in the Act relate to species conservation:

- Section 9(1) prohibits possession of any undersized fish, crab, 'Carlet' or spiny lobster in the barred state;
- Section 4(1). No person, except with the approval of the Permanent Secretary, is permitted to import into or export from Mauritius any live fish or any coral or shell, whether live or dead;
- Section 6(2). Fishing any turtle or marine mammal within the fishing limits of Mauritius without the approval of the Permanent Secretary is forbidden.

It is proposed that a new provision be added under Section 6 to prohibit collection of shells except as prescribed by regulations under this Act.

(c) Legislation dealing with land use planning

One of the major land use planning legislations is the Town and Country Planning Act which also establishes a Town and Country Planning Board for the implementation of its provisions. There are many legislations which deal with land use of the island but only the most important are considered in the sections below.

(i) Town and Country Planning Act (1954)

This Act makes provisions for the "orderly and progressive development of lands, towns and other areas whether urban or rural." It establishes a Town and Country Planning Board to carry out the functions outlined below under "National Planning Board".

When the Board is of the opinion that an outline scheme should be prepared for a particular area, it makes representations to that effect to the Governor-General who may, after consultations with the local authority concerned, declare the area a planning area. Once the area has been declared a planning area, the Board must prepare an outline scheme for it. The main matters to be provided for in the outline schemes are set forth in the First Schedule of the Act. A Planning Committee may be appointed by the Governor-General on the recommendation of the Board and after consultation with the local authority. The Board is required to work in consultation with the Planning Committee which will be required to provide information on the planning needs of its area.

An outline scheme is declared to be in force after public notification and representations are over and approval of the Governor-General is obtained. For any declared planning area, a development permit is required from the local authority (District Council or Urban Authority) for development of any land. The Board may, however, direct the local authority to cancel a permit if intended development is likely to contravene a scheme under preparation. Detailed schemes (as compared to outline schemes) may be prepared by the Local Planning Committee (or private developers) for part of an area for which an outline scheme is already in force and

Since 1974, all parts of the island of Mauritius have been declared Planning Areas. (A development permit is therefore required for every development). Approved outline schemes are in force for three areas, Port Louis, Curepipe and Vacoas-Phoenix municipal council areas. Outline schemes for the remaining five rural areas are being prepared.

(ii) Building Ordinance

In general, the Building Ordinance deals only with the broad powers available to building authorities and with the administrative and legal aspects of building control and the detailed standards to be observed. No person may begin construction of a building without both a building permit and a development permit (see above).

(iii) District Ordinance (Cap 250, 1975)

This Ordinance describes the boundaries of the nine geographical districts and states that the boundaries are plotted on a plan deposited in the Registry of the Supreme Court and in the Ministry of Housing, Lands, and Town and Country Planning. The Minister may, by order, declare that a sugar estate or other cultivated property is to be regarded as falling wholly within one or another district whenever it is crossed by a boundary line or lines of two or more districts.

(iv) Local Government Act (1962)

This Act deals with the constitution, functions and procedural aspects of municipal (urban authority) councils, district councils and village councils. Section 14 lists the powers of urban authorities and includes, among others, lighting, maintenance of roads, care of drains, bridges, lakes, rivulets and streams; also, construction of housing estates, control of shops, etc. Similarly, sections 26 and 31 lay down the powers of district councils and village councils respectively.

Section 58 empowers local authorities to appoint committees and to delegate to such committees "any function exercisable by local authority except the power to levy a rate or to borrow money". Local authorities may acquire land by agreement but only urban authorities may purchase land compulsorily in any other ordinance for the purpose of its function under the local Government. Certain regulations may be made by local authorities for the more efficient discharge of their functions (several regulations have so far been made).

The control and management of all public beaches situated within areas subject to the provisions of the Town and Country Planning Act are vested in the urban authorities and district councils which may make regulations regarding the use of these beaches. Such regulations may involve payment of fees for the use of any facilities or amenities provided.

It is unlawful for any person to plant sugar-cane on land, within the boundaries of a town, which was not planted with sugar-cane on the date this Act came into effect.

(v) The Crown Lands Act (Cap 224, 1874)

The Minister may make regulations for the management of crown lands, e.g. removal of sand or dumping for which a maximum fee of Rs. 1,000 is prescribed. Crown lands are imprescribable and include defence lands and the Pas Géométriques as defined in the Forests and Mountain and River Reserves Act. Other provisions deal with leases, sales, exchanges, etc. of crown lands.

(d) Legislation dealing with coastal zone management

There is at present no legislation governing coastal zone management only. Coastal zone management is subject to varied land use legislations mentioned earlier.

(e) Legislation dealing with fisheries

Aspects of the Fisheries Act have already been described. It is primarily intended to modernize and consolidate the law in relation to fisheries. The salient features of the Act as described in paragraph 2 of the explanatory memorandum are:

- to regulate and control all fisheries within the limit of Mauritius;
- to subject to a licensing system all forms and types of fishing;
- to improve the system for the distribution of fish by providing that all fish caught be landed at landing stations;
- to ban all underwater fishing except in a few specific cases with the approval of the Minister;
- to cause all fishing boats to be registered;
- to control resulting pollutants and to prevent their entry into the marine environment; and
- to set up a Fishery Advisory Board.

Provisions for planning

National development plan

The realisation in the 1960s that a series of local plans formulated separately did not add up to a coherent national policy led the Government to seek technical assistance for the preparation of a physical national plan for development of the island as a whole. Its objective is to set out the framework and criteria for national land use. This is described below.

(i) The National Physical Development Plan

A preliminary National Physical Development Plan (NPDP) submitted by the Mission d'Aménagement du Territoire à l'Ile Maurice in 1977 has been accepted in principle by the Government to form the basis for making and evaluating development decisions. The NPDP consists of a long-term and a medium-term plan. The long-term plan, consisting of several well-defined proposals, was based on the following objectives:

- the accommodation of a population of 1.6 million by the year 2032;
- the preservation of land with good agricultural potential;
- planned industrial development; and
- protection of the natural environment.

Basically, the plan proposes a hierarchy of settlements consisting of a conurbation with major and minor growth poles. The medium-term plan aims at specific proposals to enable a proper phasing of the plan implementation.

The plan has not been fully implemented and several studies have been carried out to determine its feasibility. According to one of the studies the major obstacles appear to be: (i) lack of co-ordination among various public institutions dealing with the formulation of a comprehensive land use policy and with development planning and control; and (ii) the proliferation of acts and subsidiary legislations dealing with land use planning and control and their administration by different authorities.

National Planning Board

(i) Town and Country Planning Board

The Town and Country Planning Board established under the Town and Country Planning Act 1954 has the following main functions:

- declaration of planning areas;
- preparation and/or modification of outline schemes for declared planning areas;
- approval of detailed schemes prepared by local authorities; and
- hearing of appeals (against local authority decisions).

In declared planning areas, a development permit is required for all development pertaining to:

- division of land;
- construction of buildings (residential, commercial, industrial, etc.);
- change in the use of an existing building or land area;
- sand quarries.

However, development permits are issued by the local authorities i.e., the Municipalities and District Commissions, which are required to verify that the proposed development does not contravene an outline scheme already in force or under preparation.

Although the Board is legally responsible for the preparation of outline schemes, there is still an agreement that the Planning Division of the Ministry of Housing, Lands and the Environment will provide this service to the National Planning Board because of a lack of planners on the Board.

National Conservation Strategy

At present there is no National Environment Act in existence which can state explicit national conservation strategies. Nevertheless, the principle of conservation has been incorporated in the National Physical Development Plan and the Board has to take into consideration uniform sets of criteria when establishing outline schemes for areas under the responsibility of urban authorities and district councils.

Regional (Sub-National) Plans

The Town and Country Planning Act makes provisions for the preparation of outline schemes mentioned earlier for different regions of Mauritius. The island has eight planning zones, each falling under the responsibility of one of the eight agencies (five urban authorities and three district councils). Outline schemes for the purpose of planning are in principle provided and/or approved by the Town and Country Planning Board. Several such outline schemes for specific regions of Mauritius are under preparation or revision at the Planning Division of the Ministry of Housing, Lands and the Environment, which for the time being executes such planning work for the Board.

Coastal Zone Plans

There is no legislation to provide for comprehensive planning with respect to coastal zones. These are subject to the various land use legislations and to such outline schemes as may be in force in the different regions. Outline schemes prepared by the Town and Country Planning Board also include several sets of criteria for particular types of development including hotel development on the water front. These do not differ much for the different areas under the urban authorities and district councils. Also, section 173 of the Local Government Ordinance 1962 empowers an urban authority or a district council to make regulations regarding the use of public beaches.

Protected Area Systems Plan

The Plan is not yet provided for in any planning procedures for protected areas.

Management Plans for protected areas

The management of protected areas does not yet involve the use of elaborate plans. Provisions of relevant Acts governing the protected areas are merely enforced by the various agencies concerned. Management measures are usually implemented to achieve both the short- and long-term effects in the protection of the areas. A few examples of management measures are:

- uprooting exotics in priority areas to protect rare plant species;
- rearing of rare plants by collecting seeds, cultivation, etc.;
- protection, through fencing, of rare plants in the wild.

Zoning plans for protected areas (This is not yet practised in Mauritius)

Institutional linkages of species and habitat conservation

Ministry of Agriculture

The Ministry of Agriculture, Fisheries and Natural Resources incorporates three important sections which have among their functions the protection and conservation of habitats and/or species. These are: (a) Forest Department or Services, primarily concerned with terrestrial habitat and species; (b) Fisheries Division, concerned with fisheries and marine environment; and (c) Land Use Division, concerned with optimizing limited land resources. As such, this Ministry plays a key role in the conservation of habitats, species and resources. The extent of involvement of the first two sections are outlined below:

(a) Department of Forestry

The functions of this department in relation to the conservation of habitats and species are as follows:

- protection and management of tree cover (plant communities) on areas of land for the maintenance of the climate and physical conditions of the island (including soil conservation);
- protection of indigenous or endemic plant and animal species either in nature reserves or by transplanting to protected areas for propagation;
- management and protection of forests and river reserves, regulation and control of wildlife (its exploitation), and control of fishing (camaron and shrimp) in rivers and canals.

(b) Fisheries Division

The main functions of the fisheries division are:

- management of fishery resources within the limit of the EEZ and where Mauritius has the fishing rights. The basic objective is to obtain sustainable yields and optimum social and economic benefits from the resource;
- to carry out related research on fish stocks, marine environment, hydrographic conditions etc. needed to achieve the above-mentioned aims and to help formulate appropriate management measures for the protection of fisheries resources and the marine environment;
- to enforce regulations in relation to fisheries and the environment. These include regulations of fishing seasons, together with management control over endangered and rare marine species.

Ministry of Tourism

This Ministry is presently not involved with the conservation of habitat and species. Its main task is limited to the development of the tourist industry and to encourage a maximum amount of foreign exchange.

Other

There are many other institutions in Mauritius which are directly or indirectly linked to habitat and species conservations. The most important are mentioned below.

Ministry of Housing, Lands and the Environment

This Ministry plays an important role in co-ordinating efforts to bring about pollution control. It now incorporates the Environment Division which has the following aims and objectives:

- to draw the attention of the Government, public and private bodies to the value of the environment, to point out the specific problems that lead to air and water pollution, and damage to land, sea, plant and animal life;
- to prepare environmental legislation and to advise on the apparatus for the enforcement of such legislation;
- to educate the public to preserve and improve the environment;
- to conduct continuous monitoring and assessment of the environment and undertake related research.

The Central Water Authority

This body is solely responsible, according to the Central Water Authority Act 1971, for the supply of water for domestic, commercial and industrial purposes throughout Mauritius. Among the many other duties of the CWA, those related to habitat conservation are:

- to study and formulate policy in relation to control and use of water resources both for the disposal of sewage and industrial waste and the abatement and prevention of water pollution;

- to prepare plans for the conservation, utilization, control and development of water resources.

Port Authority - The Mauritius Marine Authority

The Mauritius Marine Authority, established under the Ports Act of 1974, fosters the development and ensures the efficient operation of ports and of a mercantile marine. Section 4(c) of the Act provides that one of the objectives of the Authority shall be -

"In ports and in the territorial sea of Mauritius adjacent to a port, to take such action as it thinks fit for the regulation of fishing and navigation and for dredging and removing wrecks, obstructions and pollution".

Ministry of Works

Among other duties, one of its responsibilities is the treatment and disposal of sewage in the lagoon (including the engineering aspect of sewerage work) with minimum harmful effects. This aspect is not yet taken over by the Central Water Authority (see above).

Ministry of Health

This Ministry is mainly concerned with human health hazards arising from pollution problems, either terrestrial or aquatic. Some of the concerns of this Ministry are the types of species consumed by human beings and the level of toxic substances found in them and in their environment or habitat.

Mauritius Institute of Education

The Institute has played a fundamental role in developing a curriculum emphasising education in the Mauritian context. The principle of conservation of the environment and species has been included in some of the basic texts designed for schools.

The Mauritius Institute

The Mauritius Institute has played a leading role in taxonomic and ecological research on the flora and fauna of Mauritius. Work still continues along this line and the Institute has a valuable collection of specimens and reference materials.

Mauritius Sugar Industry Research Institute

This is one of the most important Institutes in the island, having played a vital role in the development of sugar technology and agriculture in general. It has an excellent herbarium facility and has greatly contributed to the identification and classification of Mauritian flora.

Conservation societies

There are many such volunteer groups on the island. An example is the Mauritius Underwater Group which, with the collaboration of other societies and the Ministry of Agriculture, has initiated a project for sinking old ships, lorries and tyres to serve as artificial reefs in selected areas in order to encourage the re-population of the lagoon.

Protected area management (based on IUCN paper on categories, objectives and criteria for protected areas)

Category I: Strict Nature Reserve (8 units)

Ile Ronde
Ilot Gabriel
Ile Plate
Coin de Mire
Ilot Marianne
Ilot Aigrette
Ile Cocos
Ile aux Sables

Category VIII: Multiple Use Reserve (6 units)

Port Louis)	
Rivière du Rempart - Poudre d'Ore)	
Flacq	)	Fishing Reserves as defined
Trou d'Eau Douce	)	in Government Notice No. 18
Grand Port - Mahébourg	)	of 1983 (see section 4)
Black River)	

Category I: Department of Forestry

Curepipe - Mauritius

Category VIII: Fisheries Division

Registrar-General's Building, 3rd level, Port Louis, Mauritius
Policies
Forestry Department

Management policies of the Department of Forestry aim at:

- (a) effecting the preservation of a tree cover for the benefit of present and future inhabitants of Mauritius in land areas as are required for the maintenance and improvement of the climatic and physical conditions of the country; safeguarding water supplies and soil fertility and preventing damage to rivers and agricultural land by flooding and erosion;
- (b) effecting the permanent preservation of forests in such land areas as are required for the supply, at reasonable rates, of all forms of forest produce needed for agricultural, domestic and industrial purposes;
- (c) managing the forest estates with an aim to obtaining highest revenues compatible with sustained yield, in so far as this is consistent with (a) and (b);
- (d) effecting the fullest possible utilization of forest products subject to the requirements of their management, and encouraging the most economic utilization of both imported and local timber;
- (e) carrying out such experimental work as may be required to implement the forest policy;

- (f) educating and training Mauritian personnel about the standards required to fill posts of all grades within the Forestry Service; fostering, by means of propaganda, an understanding among the people of Mauritius of the value of forests both for them and future generations, and encouraging and assisting the owners of private forests, woodlands and plantations to manage such crops in a sound manner;
- (g) co-operating with other land interests to achieve optimal use, allocation and conservation of land, soil and water, to prevent erosion, and to accept the principle that security of tenure and long-term planning are essential for the successful management of the forest estate.

Management of the Fisheries Division are:

- (a) to develop, protect and conserve fishery resources within the Exclusive Economic Zone and where Mauritius has fishing rights;
- (b) to manage fishery stocks with the aim of achieving the optimum sustainable biological yields and socio-economic benefits; and to formulate and enforce laws and regulations for the conservation and management of our fishery resources;
- (c) to advise on all matters pertaining to the fishing industry in Mauritius and the outer islands;
- (d) to protect and preserve the marine environment (from pollution and other harmful effects) so as to ensure long-term production and benefit to present and future generations;
- (e) to carry out necessary research for providing the scientific basis to support the activities described above.

Monitoring and evaluation

Fisheries Division

Since 1977 Mauritius had been implementing a Frame Survey Programme designed to collect statistics on catch and effort from the lagoon and the six reserves. The 64 landing stations around the coast are now divided into 5 strata on a region-wide basis. Seven stations are randomly selected from these strata each week. Fishery statistics are collected at each station for six hours (6 a.m to noon and noon to 6 p.m.) alternatively on consecutive days for one week. At the end of the month the collected data are processed and analysed. An estimate for the year can thus be compiled.

A special statistical unit has been set up within the Research Branch of the Fisheries Division for the above-mentioned task. This comprises seven field enumerators and two technical officers. Landing stations to be covered are chosen from random number tables, and enumerators are assigned to a landing station by the statistical office.

Data are recorded on proformas designed for this purpose and include details of the catch of broad groups of species in the lagoons. These are processed at the Fisheries Research Centre and results provide an adequate picture of the state of stock (relative abundance in relation to effort deployed in the lagoon for gear such as basket trap, line and seine). Appropriate regulations, taking into account socio-economic factors, may use the feedback from these analyses. The lagoon and Reserves are also subjected to constant observation by fisheries assistants who submit reports regularly. Several cases of fish mortalities in lagoons and barachois are investigated as and when they occur.

Recommendations

1. In addition to the statistics on catch and effort, detailed length composition data must be collected on commercially important species in order to provide information on the dynamics of specified fish stocks.
2. There should be a proper zoning system within the reserve where no fishing or collecting of any sort will be allowed. These areas should be located near the reef and should be areas for which no adequate protective measures exist.
3. Alternately, one or two zones in the lagoon fishing reserves should be promoted to the status of marine parks where baseline studies can be carried out.
4. Baseline studies on communities in lagoons or other marine habitats must be started, so that the effects of pollution can be adequately assessed when they occur.

Forestry services

Occasionally, Round Island and Gunner's Quoin are visited and observations carefully noted. Similarly, observations are recorded regularly about the different species in sectors of Perrier or Macchabée or Bel Ombre Nature Reserves.

Recommendations

1. It may be worth while to carry out a complete ecological study of the vegetation of Macchabée and Bel Ombre Nature Reserves.
2. There appears to be a lack of adequate information on the distribution of some plant communities in the Ile aux Aigrettes Nature Reserve and other islets, especially concerning the influence of exotics on the indigenous or endemic flora.
3. Further observation should be undertaken of indigenous and endemic plants and provisions should be made for their protection.

Environment Division of the Ministry of Housing, Lands and the Environment

Several studies have been carried out on the effects of sugar mill effluents and other industrial wastes on river and lagoon environments. This aspect has been adequately dealt with in the National Report on Socio-Economic Studies.

Research policy

Fisheries

Fisheries research is the responsibility of the Research Branch of the Fisheries Division of the Ministry of Agriculture. The main problem encountered here is the near over-exploitation of fishery resources of the lagoons. Until now, lagoons have been the only source of fresh fish for the local market. The basic policy of research, therefore, is to recommend appropriate measures. This policy encompasses reserve areas of the lagoon. In the meantime, stock assessment research is given priority over other activities. Aquaculture is viewed as a means to supplement production from the lagoon. Research also aims at replenishing the lagoon by developing breeding programmes intended for future use. High priority is placed on research into the most effective ways of protecting and ensuring the continued productivity of the marine environment.

Forestry

Some of the research is oriented towards the protection of rare and endangered species. Further research into the breeding in captivity of many endangered bird species is also being undertaken. Similarly, several rare plants are being propagated for their eventual transfer to the wild after conditioning. The medicinal value of some of the plants is also being studied.

Environment (Ministry of Housing and Lands)

The nature of research carried out by this division is mostly socio-economic but a certain amount of monitoring and analysis is being carried out in collaboration with other ministries which have laboratory facilities. Its role in the co-ordination of this type of research cannot be overestimated.

Recommendations

1. The University has not been greatly involved with research of an environmental nature except when called upon to undertake complicated analysis. It must now play a more prominent role in the environmental research work that has a bearing on conservation.
2. Maximum co-ordination of research efforts should be an aim in order to carry out more meaningful research.

Enforcement procedures

With regard to the Reserves, the only two institutions that have enforcement powers are the Fisheries Division and the Forestry Services.

Fisheries

There is a Protection Branch within the Fisheries Division with a staff of 146. Of this number 107 are actively engaged in patrolling the lagoon from 13 sub-offices along the coast. This is carried out on a 24-hour basis with the staff working in shifts. Part of the staff is also engaged in a mobile unit provided with radio links to main or sub-offices. This is a group of protection officers who travel by vehicle along the coast to survey the lagoon with binoculars etc. and, should the need arise, take to the sea. Surveillance of the Reserves is particularly vigilant, for these are the areas where most of the illegal fishing occurs.

Forestry

Surveillance is carried out by regular patrols of 25 forest officers. The problem here is lack of communication and transport. It is not possible to enforce regulations on distant islets like the Round Island and Gunner's Quoin.

Recommendations

1. The patrolling system of nature reserves, especially those under the Forestry Service, must be made more effective. This is both difficult and costly.
2. Fisheries and Forestry Services should come to an agreement about sharing facilities in order to make frequent visits to islets reserves possible.
3. More funds should be made available for capital expenditure on equipment.

Table 1(a): Manpower requirements for protected areas

Forest Services

Functions (Roles)	Current Staff	Current Requirements	Staff Requirements in 1987	
			Expected	Ideal
Management (Manager)	1	-	-	1
Protection/Resource Management (Ranger)	25*	-	15	40
Ecology (Ecologist)	1	-	-	1
Interpretation (Interpreter)	-	-	-	-
Administration/Accounting (Administrative Officer)	-	-	-	-
Maintenance (Maintenance Specialist)	-	-	-	-
Sociology (Sociologist)	-	-	-	-
Economics (Economist)	-	-	-	-
Natural Science (Scientist)	1	-	-	1
Law Resource Policy (Law and Policy Specialist)	-	-	-	-
Land Tenure/Acquisition (Tenure/Acquisition Specialist)	-	-	-	-
Public Relations (Public Relations Specialist)	-	-	-	-
Planning (Planner)	-	-	-	-
Landscape Architecture/Engineering (Architect/Engineer)	-	-	-	-
Art/Exhibit Technique (Artist/Exhibit Designers)	-	-	-	-
TOTAL	28	-	15	43

Level of current staff

Expected level of staff in five years

Professional (e.g., Chief Park Warden, Planners etc.)	10%	Professional	7%
Middle level (e.g., Park Warden, Senior Scout or Guard)	20%	Middle level	25%
Lower level (e.g., Scout, Guard, Guide)	70%	Lower level	68%

* = Part time

Table 1(b): Manpower requirements for protected areas (Lagoon protection)

Fisheries Division (N.B: No marine parks in operation)

Functions (Roles)	Current Staff	Current Requirements	Staff Requirements in 1987 Expected	Ideal
Management (Manager)	2+	2	2	2
Protection/Resource Management (Ranger)	145	200	200	200
Ecology (Ecologist)	-	1	1	2
Interpretation (Interpreter)	-	-	-	-
Administration/Accounting (Administrative Officer)	2*	2	2	2
Maintenance (Maintenance Specialist)	-	-	-	-
Sociology (Sociologist)	-	-	-	-
Economics (Economist)	-	-	-	-
Natural Science (Scientist)	2*	4	4	6
Law, Resource Policy (Law and Policy Specialist)	-	-	-	-
Land Tenure/Acquisition Tenure/Acquisition Specialist)	-	-	-	-
Public Relations (Public Relations Specialist)	-	-	-	-
Planning (Planner)	-	-	-	-
Landscape Architecture/Engineering (Architect/Engineer)	-	-	-	-
Art/Exhibit Technique (Artist/Exhibit Designers)	-	-	-	-
TOTAL	151	209	209	212

Level of current staff		Expected level of staff in five years	
Professional	1.3%	Professional	0.96%
Middle level	2.6%	Middle level	3.35%
Lower level	96.0%	Lower level	95.7 %

+ = 1 part time

* = Part time

Training

University

The University of Mauritius, at present, offers degree courses in agriculture, sugar technology, administration and other related diploma courses. A new course (in agriculture, fisheries and natural resources) will be available as from this year. The curriculum includes subjects on ecology and environment, but with the exception of agriculture, these may be insignificant with respect to the courses being taught.

At present, scientists and other professionals required for specific work in connection with protected areas are trained abroad. Short courses are sponsored by various international agencies or organizations for persons working in specific fields such as environment and protected areas.

Middle level

Adequate facilities offering on-the-job training in specific fields exist at this level. However, if a Marine Park were to be implemented, training facilities would have to be sought abroad.

Ranger-level

Basic Ranger-level training can be obtained at the departmental level.

Labour

Training for this category is usually done on the job.

Means of bringing benefits of nature protection to people

Hiring of local people to work in protected areas

People assigned to this type of work are already employed in the public or private sector irrespective of whether they live near the protected areas or not.

Resource exploitation (grazing, firewood, hunting) in buffer zones (or within protected areas)

It is an offense, within protected areas, to remove or destroy trees. However, the Forest and River Reserves Act makes provisions for some measure of exploitation of resources. Any planting or replanting on reserves situated on private land can be only of fruit trees or vegetation approved by the Conservator. Any planting that is detrimental to agriculture may, after notice is given to the property owner, be subjected to replanting. Increased use of privately-owned mountain reserves for deer ranching will be allowed.

Exploitation of timber and fruit trees from crown land (21,180 m³ sold in 1978) is carried out by the Forest Department. A few thousand Christmas trees, hundreds of guava handles and thousands of small bamboos, together with other minor produce, are sold annually. Proceeds from these sales go to general revenues.

A substantial portion of Pas Géométriques in the south of the island is leased for grazing to adjacent estates, and other areas have been granted long-term leases for grazing and tree planting. Shooting leases are also provided for hunting on crown land. These are distributed by the Shooting and Fishing Lease Ordinance of 1966.

Participation of local people on protected area management boards

The Ancient Monuments Board already mentioned provides a means for local people or other interested conservation-oriented groups to participate in the selection and management of protected areas. Government Notice 855 of 1983 specifies Board membership which includes, besides representatives of the most important government departments and the private sector, one or two persons with outstanding experience in environmental conservation.

Other boards, where local people might be represented include, for instance, the Fisheries Board, established under the Fisheries Act, groups of representatives from various Ministries, private sector groups, and other interested bodies, such as fishermen or industries. Their intention is to advise the Minister on all matters of general policy related to fisheries. This mechanism, though seldom used, ensures that sufficient consideration will be given to relevant socio-economic factors in the formulation and implementation of management measures for any protected areas.

The Man and Biosphere Advisory Committee also allows participation of interested local persons concerned with protected areas. This Committee, though no longer active, was set up under the aegis of the Board of Agriculture, Natural Resources and Environment which was promulgated under Act No. 2 of 1977 to advise the Minister on all matters of general policy relating to agriculture, forestry, the utilization and preservation of natural resources and the environment.

Compensation from Government for crop or livestock damage

No such scheme is in effect on the reserves.

Special education, health or other government programmes for people living near protected areas

There are several television and radio programmes designed to educate the public and such groups as planters, etc.

Watershed protection benefits

The island abounds with rivers which flow from the high central plateau to the sea. The protected river reserves on each side of the rivers, canals, etc. serve as a means of water conservation, thus benefitting agriculture and the environment in general. Again, the 'jouissance of rivers' by proprietors whose land is traversed by a river or stream, and the right of use of canals, rivers or spring water are all governed and regulated by the Rivers and Canals Act of 1863 (section 212.1f).

Sharing tourism profits

The nature reserves are visited by large numbers of tourists, which benefits the country's economy in general. A number of people work as guides for tourists visiting the nature reserves, botanical gardens, etc. Direct economic benefits are derived from this industry.

Provision of fishing rights

Under the Rivers and Canals Act of 1863, all rivers and streams are public property. However, section 8 of the wildlife Act 1983 permits any person who owns land bordered or crossed by a natural watercourse, or his agent, or any person authorized by him in writing, to fish for camaron or shrimp under conditions specified thereunder. Again, fishing rights are provided under the Shooting and

Fishing Leases Ordinance of 1966. Section 3(1) allows the Minister to provide leases giving the right to shoot and hunt game, and to fish on crown lands, and for these lands to be put up for public auction. Such a lease is granted for a period not exceeding 14 years.

Other

Cyclone relief

According to section 23(A) of the Forest and Mountain and River Reserves Act of 1971, the Governor-General "may where he thinks advisable to alleviate the distress caused by any cyclone, issue an order authorizing the Conservator of Forests to Grant permission for the removal of fallen or broken trees from such crown lands as specified in the order, which are not under lease, to persons whose houses or premises have been destroyed or damaged by such cyclones for the purpose of rebuilding or repairing their houses or premises during such periods as he thinks expedient, and subject to such conditions as to the persons to whom the order shall apply or otherwise as may be contained in the order".

Recommendations for providing enhanced benefits to local people

In Mauritius, where fuel prices are constantly rising, the demand for firewood is increasing steadily, especially where it can be picked up easily. Thus it appears that the destruction of mountain and river reserves near large population centres is now a problem. There is a greater need for forest patrols near population centres. Replanting should be carried out speedily where destruction has been predominant. In all of these management policies, however, the needs of the populace must be taken into consideration. Although firewood is presently sold to such government departments as prisons and the Ministry of Works, etc., it would be appropriate to sell firewood at concessional prices in population centres bordering on the reserves. Efforts should also be made to set up educational programmes in villages near reserves, with a view to educating people about the dangers of deforestation.

Recreation within forest reserve settings may provide added benefits to locals. Access could be improved by erecting kiosks to display posters and sell brochures delineating the benefits and means of conservation, thus improving the general education of nature reserves.

INVENTORY OF ECOSYSTEMS

Table 2: Inventory of ecosystems of Mauritius ((+) = occurs; (-) = does not occur)

Habitat type	Occurrence	Total area (km ²)	Protected area (km)	% Area protected
A. Coastal environments				
Beach (sand, gravel, cobble) Mauritius	+	5 km ²	Total by Pas Geometric Act & Sand Removal Act	Total
Rocky shore	+	0.5 km ²)	Total under Pas Geometric	Total
Cliffed shore	+	negligible)		Total
Barrier island	-	-	-	-
Bay	+	13.6 km	Total as far as lagoon	Total
Estuary	+	132 km ²	Total under River & Canal Ordinance	Total
Lagoon Mauritius	+	243	507 Total under Fisheries Act	Total
(figures 1,2,3)				
Rodrigues	+	240		
Agalega	+	24		
B. Coast - associated and intertidal habitats				
Algal beds (floating aquatics)	+	NA	Nil	Unprotected
Sea-grass beds (submerged aquatics)	+	NA	Nil	Unprotected
Intertidal sand/mud flat	+	NA	Nil	Unprotected
Mangrove forest* (figure 4)	+		Nil	Unprotected
Maritime forest, woodland (dune forest)	-			
Coastal swamp forest	-			
Coastal shrub land	-			
Coastal grassland	-			
Salina (saline marshes)	+	NA	Total protection under Pas Géométrique which includes all salt marshes	
Palm forest	-			
C. Living reef				
Coral atoll	-			
Barrier coral reef (figure 5)	+	Small area on south east of Mauritius	Not protected (except as concerns export of corals)	
Bank barrier coral reef	-			

Patch reef	+	NA	present through- out lagoon	Unprotected (except in re- serve against seining)
Fringing coral reef				
Mauritius		300	Not protected	
Rodrigues		200	(except as	
St Brandon		80	concerns exports	
Agalega		500	of corals)	
Coral faro	-			
Coral knoll	-			
Other reef structures, oysters, etc.	-			

D. Offshore subtidal environment

Island (Rodrigues and Islets off Rodrigues, Mauritius islets, St Brandon and Agalega	+	118 km2 (annex I)	6.2 km2	11.6% (Does not include Rodrigues island)
Limestone or other rocky fringing reef	-			
Continental shelf/ soft bottom	+	81,584	Total under Continental Shelf Act and Fisheries Act	
Continental shelf/ hard bottom	+			
Continental slope	+	NA	Nil	Nil
Submarine canyon	-			
Drowned coral reef Guyot	-			
Abyssal plain	+	NA	Nil	Nil
Ocean Trench	-			
Sea mount	+	NA	Nil	Nil
Submarine ridge	+	NA	Nil	Nil
Submarine plateau	+	NA	Nil	Nil
Shoal (St Brandon Shoal, figure 6)	+	NA	Total under Fisheries Act	
Alluvial bar	-			
Other	-			

E. Pelagic ecosystem

Inshore circulation cell/eddies	-			
Offshore eddies/gyres	-			
Upwellings/down- wellings	-			
Current convergence/ divergence	-			

F. Man-made environments

Spoil dump, reef	+	Negligible		
Mariculture site (annex III)	+	3 km2	Total under Fisheries Act	
Harbour/marine	+		Total under Ports Act	
Other: Mooring site	+			

Grand Baie
Le Morne

Conclusion

Coastal and coast-associated habitats for which no protective measures exist are: coral reefs, algal beds, intertidal sand/mud flats and mangrove stands. Similarly, there are no provisions for protecting any of the following offshore subtidal habitats found in Mauritian waters: continental slope, abyssal plain, sea mount submarine ridges and plateau. The St Brandon shoal appears to be sufficiently protected under the Fisheries Act through gear regulation. However, with the exception of the mangrove, which has visibly decreased over the years, the other habitats mentioned above are relatively safe from any threat, either because they do not have exploitable resources or because of they provide inherent obstacles to exploitation.

The need for more land area for population settlements and the increase in agricultural and industrial activities may make themselves felt on the coastal habitats in shore and nearshore areas. Saline marshes, found in small areas in the northern and eastern parts of the island, may be a case in point. Although protected under the Pas Géométrique Act, these marshes may be filled for settlement purposes at some future date. Therefore, it is important that a representative area be declared a reserve to safeguard against the total disappearance of this type of habitat.

The most threatened habitats are the lagoon, coral reef and the mangrove stand which have been exploited through the years. The numerous regulations now in force to control fishing activities testify to the fragility of the lagoon and reef environment in Mauritius. The habitats in need of additional protection are discussed in annex I.

INVENTORY OF EXISTING PROTECTED AREAS

The following are the existing protected areas in Mauritius:

(a) Islets

Round Island
Flat Island
Ilot Marianne
Ile aux Aigrettes
Ilot Gabriel
Ilot Sables
Ile aux Cocos
Coin de Mire

(b) Marine Areas

Rivière du Rempart-Poudre d'Or Fishing Reserve
Flacq Fishing Reserve
Black River Fishing Reserve
Grand Port-Mahébourg Fishing Reserve
Port Louis Fishing Reserve
Trou d'Eau Douce Fishing Reserve

MAURITIUS

NAME: Macchabée-Bel Ombre Nature Reserve
MANAGEMENT CATEGORY: IV & IX (Managed Nature Reserve & Biosphere Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Protected by law under the Ancient Monuments Ordinance Cap 282 of 1944.

DATE ESTABLISHED: 1951; accepted in October 1977 as a Biosphere reserve.

GEOGRAPHICAL LOCATION: In Mauritius, this reserve is composed of Petrin, Ste. Marie and Cocotte, Bel Ombre, Macchabée and Mare Longue, Petites Gorges, Florin, Desgranges, Les Mares, Mesliers and Black River Gorges, all of which are small, adjacent nature reserves. 20°25'S, 57°26'E.

ALTITUDE: 50-650 m

AREA: 3,611 ha

LAND TENURE: Government property

PHYSICAL FEATURES: Physiographically, the area comprises of a plateau in the north, the deep Black River Gorges in the middle sector, and towards the south, a gentle southerly slope. The soil is variable: at Petrin and Plaine Champagne it is either ground water laterite with lateritic concretion, or low humic clays. At Macchabée/Mare Longue, the soil is humic ferruginous latosols, whereas at Bel Ombre it is a brown forest soil.

HABITAT/VEGETATION: At Petrin, the variation in vegetation which leads to climax forest is quite evident. Marshy spots are characterized by Lycopodium, Sphagnum and Cyperus; and dry areas are characterized by Philippia/Phyllica and heath. Some of the rare plants found in this area are Astelia hemichrysis, Angraecum spp., Blechnum attenuatum, Trochetia spp., etc.

In the Macchabée/Mare Longue area, upland evergreen climax forest is mainly composed of Myrtaceae and Rubiaceae, with trees from the Sapotaceae family, of which about 20-25 per cent are endemic. The rare species of plants are Sideroxylon grandiflorum, Ocotea cupularis, Phajus spp., Jumella fragrans, Jambourissa sieberii, Cordyline mauritiana, Bakerella hoyifolia and Clematis mauritiana.

In Petites Gorges, Florin, Desgranges, Les Mares, Mesliers and Black River Gorges about 900 ha are covered with a high evergreen forest of large trees, badly invaded by exotics. The remainder is composed partly of a low, native scrub, marshy and a heath vegetation. These are mixed with the exotic, aggressive Psidium cattleianum and Rubus alcaefolius. There are various rare endemic plants, including some Pandanus and Trochetia.

At Ste. Marie and Cocotte successive cyclones have given rise to badly degraded mossy forest, which harbours several species of orchids, ferns, and mosses.

In Bel Ombre, mid-altitude forest is composed mainly of Labourdonnaisia glauca, Mimusops petiolaris and various Diospyros spp.

NOTEWORTHY FAUNA: All the rare endemic birds of Mauritius are found in this reserve - Nesoenas mayeri, Foudia rubra, Coquus typicus, Tchitrea bourbonnensis, Psittacula echo, Zosterops curvirostris curvirostris, Falco punctatus, Microscelis borbonica olivacea, Malacirops borbonicus mauritianus.

ZONING: None, apart from the partitioning into numerous smaller reserves.

DISTURBANCES OR DEFICIENCIES: The reserve is leased for the shooting of deer. Tourism also has a certain impact on the area. The forest is badly invaded with exotics like Psidium cattleianum, Rubus alcaëfolius and Ligustrum walkeri.

SCIENTIFIC RESEARCH: Research in the area dates from the 1930s. With some historical documentation, future research could investigate the total ecological effects of exotic plant establishment.

SPECIAL SCIENTIFIC FACILITIES: Herbarium facilities are available.

PRINCIPAL REFERENCE MATERIAL:

Owadally, A.W. (1969) International biological programme check sheets on the nature reserves of Mauritius. Prepared for the International Council of Scientific Unions of the Nature Conservancy, London.

Owadally, A.W. (1973) Les forêts naturelles de l'Ile Maurice. Info-Nature, Bulletin de Liaison de la S.R.E.P.N. Numéro spécial "La Forêt", p. 88-94.

Staub, F. (1973) Oiseaux de l'Ile Maurice et de Rodrigues. The Mauritius Printing Company, Mauritius.

Staub, F. (1976) Birds of the Mascarenes and St Brandon. Organisation normale des entreprises Ltee, Labama House, Mauritius.

Vaughan, R.E. & P.O. Wiehe (1937-1947) Studies of the vegetation of Mauritius. Jour. Ecol. 25, 28, 29, 34.

STAFF: 10 forest officers

BUDGET: Approximately US\$ 500 (1982)

LOCAL ADMINISTRATION: Conservator of Forests, Ministry of Agriculture and Natural Resources and the Environment, Forestry Service, Curepipe, Mauritius.

NAME OF CNPPA CO-ORDINATOR: A. W. Owadally

DATE: 21 January 1983

MAURITIUS

NAME: Round island
MANAGEMENT CATEGORY: IV (Managed Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Ordinance Cap 282 of 1944.

DATE ESTABLISHED: 1957

GEOGRAPHICAL LOCATION: About 24 km north-east of Cap Malheureux, the northernmost point of Mauritius; 19°51'S, 57°47'E.

ALTITUDE: Sea-level to 300 m

AREA: 159 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: Part of a volcanic cone, of which a kidney-shaped section remains above water. Most of the island is composed of volcanic tuff, weathered into curious, horizontally ridged pillars and deep gullies. Blocks of basalt and deposits of coral detritus occur at various levels.

HABITAT/VEGETATION: Greatly reduced by rabbits and goats (introduced about 1840). Thus, of the indigenous palms Hyoporbe lagenicaulis and Dictyosperma album var. conjugatum, only one specimen survives. Scattered Latania loddigesii and the screw pine Pandanus vandermeerschii sometimes form small clumps; in a few places there is a moderately dense ground cover of grasses, herbs and widespread ruderal species.

NOTEWORTHY FAUNA: The island still provides a breeding place for four species of seabirds: the wedge-tailed shearwater Puffinus pacificus; the Trinidad petrel Pterodroma arminjoniana (elsewhere known to breed only on the Trindade/Martin Vaz islands off the south-east coast of Brazil); the red-tailed tropic bird Phaethon rubricauda; and the white-tailed tropic bird P. lepturus. The island is also visited by migrant waders such as the turnstone Arenaria interpres; several species of tern feed near the shores. Reptile species constitute the most notable element of the fauna with no less than four species included in the Red Data Book - the Serpent Island gecko Cyrtodactylus serpensinsula (endangered), the Round Island day gecko Phelsuma guentheri (rare), the Round Island or Telfair's skink Leiolopisma telfairii (rare), the Round Island boa Bolyeria multicaarinata and the keel-scaled boa Casserea dussumieri (endangered). In addition, another gecko, Phelsuma ornata and two more skinks, Gongylomorphus bojerii bojerii and Ablepharus boutonii, are present in larger numbers.

ZONING: None

DISTURBANCES OR DEFICIENCIES: Due to physical conditions, protecting the island is a difficult problem. A certain amount of poaching, mainly of petrel and tropic-bird chicks, and disturbances still occur. There has been some success in eliminating goats and reducing the number of rabbits found on the island, but extermination of the latter is still a priority. The solution to these problems depends on funding.

TOURISM: Due to the difficulty of effecting a landing except during the months of September to mid-December, visitors to the island have been few; no water or shelter is available and the heat may be considerable. Occasionally, landing or evacuation by helicopter is organized; this is expensive and a helicopter is not always available. Nevertheless, there is a potential for tourism once adequate development funds are raised.

SCIENTIFIC RESEARCH: Studies of the fauna and flora by scientists.

SPECIAL SCIENTIFIC FACILITIES: Herbarium facilities are available on Mauritius.

PRINCIPAL REFERENCE MATERIAL:

Bullock, D. and North, S. (1975) Report of the Edinburgh University Expedition to Round Island.

Johnston, H.H. (1894) Report on the flora of Round Island, Mauritius. Trans. Bot. Soc. Edinb. 20: 237-264.

Staub, F. (1973) Oiseaux de l'Ile Maurice et de Rodrigues.

Vaughan, R.E. & P.O. Wiehe (1937-1947) Studies of the vegetation of Mauritius.

Vinson, J. (1964) Sur la disparition progressive de la flore et de la faune de l'Ile Ronde. Proc. R. Soc. Arts & Sci. Mauritius 2(3): 247-261.

STAFF: The island is visited as often as possible by Forest Service officers.

BUDGET: Virtually nil

LOCAL ADMINISTRATION: Enquiries to: Conservator of Forests, Forestry Service Headquarters, Curepipe, Mauritius.

NAME OF CNPPA CO-ORDINATOR: A. W. Owadally

DATE: 21 January 1983

NAME: Flat Island
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.15.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Ordinance Cap 282 of 1944.

DATE ESTABLISHED: 15.7.72

GEOGRAPHICAL LOCATION: About 11 km NNE of Cap Malheureux, the northernmost point of Mauritius: 19°53'S; 57°39'E.

ALTITUDE: Sea-level to 116 m

AREA: 253 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: The islet is nearly circular in outline, about a mile in diameter and consists of two main parts, a rocky hill 116 m high on its southern extremity and a plateau of volcanic rock beneath, stretching northward over more than half of the island. The eastern and western parts are formed of sand-ridges, some of which rise 9 m above MSL. They stretch northward from the base of the hill and degrade into a mass of loose coral and volcanic blocks. Landward, below the hill, the rising ground is formed of a thin stratum of volcanic sand and soil.

HABITAT/VEGETATION: Coastal stand flora is represented along part of the sandy eastern coast. The native flora has been almost completely destroyed by man, periodic fires and establishment of exotic tree plantations. Extensive grass and shrub savannah are present on the eastern slopes of the islet. The spinose shrub Lantana camara is widespread. Only a few Pandanus vandermerschii trees persist in a pocket of basaltic foreshore on the southern side of the islet (near Palisade Bay). A few Latania and Pandanus trees are still found inland sprouting from the fissures in the rocks.

NOTEWORTHY FAUNA: Skinks, Gongylomorphus bojerii bojerii observed on coral block and open ground sparsely covered by Cassytha, Cylophora and Graminae. Lizard Phelsuma vinsoni vinsoni often seen on rocks near the sea. Apart from a few passing migratory sea-birds, practically no bird species nests on the islet.

ZONING: None

DISTURBANCES OR DEFICIENCIES: Presence of cats (introduced by man) which fend for themselves on the islet. Rats in plentiful number. Periodic fires often cause enormous damage to vegetation. Priority should be given to elimination of both cats and rats.

SCIENTIFIC RESEARCH: Individual studies on flora and fauna.

SPECIAL SCIENTIFIC FACILITIES: None, although quarters are available. A lighthouse tops the hill of the islet. Herbarium and other laboratory facilities present in Mauritius.

PRINCIPAL REFERENCE MATERIAL:

Ayres, P.H.B. (1860) On the geology of Flat and Gabriel Islands. Trans. R. Soc. Arts & Sci., Mauritius. New series Vol. 1, part II. pp. 220-232.

Hornes, J. (1887) Notes on flora of Flat Island. Trans. Roy. Soc. Arts & Sci., Mauritius. New series vol. XIX pp. 116-115 (Annex G).

STAFF: Visited as often as possible by Forest and Fisheries Service officers.

BUDGET: None

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe, Mauritius.

NAME: Ilot Marianne
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.15.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Act.

DATE ESTABLISHED: 4.12.72

GEOGRAPHICAL LOCATION: 7.4 km to the east of Vieux Grand Port in the south-east of Mauritius 20°22.6'S; 57°47'E.

ALTITUDE: Sea level to 1-2 m

AREA: 2 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: The islet is typically calcarenitic with eroded coastline.

HABITAT/VEGETATION: Low sparse stand flora on eroded calcarenite substrate with native halophilous herbs. Typical of salt spray zone near reef; may be partially submerged during cyclonic weather.

NOTEWORTHY FAUNA: There is no nesting bird population, though migratory birds such as shearwater and fouquet are present. The skink Gongylomorphus bojerii bojerii is a noteworthy inhabitant of the islet. The surrounding water contains, among other organisms, numerous species of molluscs which have been subjected to intensive exploitation.

DISTURBANCE OR DEFICIENCIES: The islet, which is close to the reef, has rich marine fauna. Consequently, it has long been a favorite site for shell collection. In addition, its distance from the main coast precludes efficient control on activities of collectors.

SCIENTIFIC RESEARCH: Occasional surveys of flora by scientists.

SPECIAL SCIENTIFIC FACILITIES: None on the islet. Herbarium available in Mauritius.

PRINCIPAL REFERENCE MATERIAL:

Johnson, H.H. (1894) Report on Flora of Ile aux Aigrettes. Trans. Bot. Soc. Edinb. pp. 317-331.

Vinson J. & J.M. Vinson (1969) The Saurian fauna of the Mascarene Island. A revision of the fauna. Bull. Mau. Inst. 6(4): 203-320.

BUDGET: Virtually nil

STAFF: Periodic visit by Forest and Fishery Department staff.

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe, Mauritius.

NAME: Ile aux Aigrettes
MANAGEMENT CATEGORY: I. Strict Nature Reserve
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Ordinance Cap 282 of 1944.

DATE ESTABLISHED: 30.11.65

GEOGRAPHICAL LOCATION: About 1 km east of Pte. d'Esny in Mahébourg, 20°25.2'S, 57°43.7'E.

ALTITUDE: Sea-level to 4-5 m

AREA: 35 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: Calcarenite (coralline dune rock) with jagged eroded coastline.

HABITAT/VEGETATION: Typical strand salt spray zone shrub with Suriana, Pemphis and Scaerola well represented. Inland flora comprises endemic coastal trees and shrub which have now mostly disappeared from the coastal belt due to human settlements in the past. The native indigenous trees represented by Diospyros egrettarum, Larena coriacea (Rutidea coricea, Bois de rat) Gastonia eutipongia (Bois boeuf), Draeaena concinna, the orchid Listrostachys polystachys are noteworthy and require protection.

NOTEWORTHY FAUNA: The name Ile aux Aigrettes was probably derived from the reef heron "Egrettes". The islet serves as a site for large numbers of migratory sea birds. The reptilian fauna is represented mainly by Phelsuma ornata.

ZONING: None

DISTURBANCE OR DEFICIENCIES: Rats are plentiful. The easy accessibility of the islet, together with the fact that no watchman is posted there, has led to the virtual decimation of most indigenous trees. No natural freshwater source.

SCIENTIFIC RESEARCH: Occasionally visited by the staff of Forestry and Fisheries Departments.

SPECIAL SCIENTIFIC FACILITIES: None on the island

PRINCIPAL REFERENCE MATERIAL:

Johnson, H.H. (1894) Report on flora of Ile aux Aigrettes. Trans. Bot. Soc. Edinb. pp. 317-331.

Staub, F. (1973) Oiseaux de l'Ile Maurice et de Rodrigues.

Vaughan, R.E. & P.O. Wiehe (1937-1947) Studies of the vegetation of Mauritius.

STAFF: Visited as often as possible by Forest and Fisheries Service officers.

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe.

NAME: Ilot Gabriel
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Act.

DATE ESTABLISHED: 4.12.72

GEOGRAPHICAL LOCATION: 12 km to NNE of Cap Malheureux; 19°53.3'S, 57°40.2'E.

ALTITUDE: Sea-level to 27.5 m

AREA: 42 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: Central portion of volcanic mound which rises to about 90 ft is broken into ridges and boulders and covered with a thin layer of volcanic earth. This is bounded by low sand banks except at a point in the south-east where the beach is composed of long spurs of volcanic rock which project into the sea. Towards the central portion, the shore sand intermixes with coral blocks and volcanic detritus, forming a narrow belt to the central portion of volcanic rock.

HABITAT/VEGETATION: This islet is afforested with shrubby vegetation of Psiadia trinervia (Baume de l'Ile Plate), renowned for its medicinal value. The coastal shrubs Suriana, Scaevola and Tournefortia are also present.

NOTEWORTHY FAUNA: The presence of the reptile species Gongylomorphus bojerii bojerii and Phelsuma ornata is noteworthy. The islet does not appear to be an important nesting site for sea-birds, although Newton (1956) reported that white-tailed and red-tailed tropic birds breed in the terrain.

ZONING: None

DISTURBANCES OR DEFICIENCIES: Rabbits and rats have become numerous on the islet.

SCIENTIFIC RESEARCH: Several individual surveys of vegetation are carried out from time to time.

SPECIAL SCIENTIFIC FACILITIES: None on the islet, but facilities exist on the island of Mauritius.

PRINCIPAL REFERENCES:

Ayres, P.H.B. (1860) On the ecology of Flat and Gabriel Islands. Trans. R. Soc. Arts & Sci. Mauritius. New series 1(2): 220-232.

Hornes, J. (1887) Notes on flora of Flat Island. Trans. R. Soc. Arts & Sci., Mauritius. New series 1 (19): 116-151.

Newton, R. (1956). Bird islands of Mauritius. Ibis 98:296-302.

STAFF: Islet visited as often as possible by Forest and Fisheries Service officers.

BUDGET: None

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe, Mauritius.

NAME: Ilot Sable
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Act.

DATE ESTABLISHED: 30.5.81

GEOGRAPHICAL LOCATION: 3.7 km NW from Pointe La Fouche in the west of Rodrigues; 19°42'S; 63°18'E.

ALTITUDE: Sea-level to about 2 m

AREA: 7.75 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: Essentially sand cay in character with coarse granular sand and other debris from marine organisms. Extensive sand flats merge with the west coast.

HABITAT/VEGETATION: Mostly cultivation of Casuarina. Flora consists of scarcer representatives of both exotic and native species than that of Ile Cocos. This includes Stachytarpheta jamaicensis, Desmanthus virgatus and Archyranthis aspera. A few isolated plants such as the native Pisonia grandis are found inland. Thespesia populnea is scantily represented on higher ground.

NOTEWORTHY FAUNA: As with Ile Cocos, but to a lesser extent, large colonies of noddies Anous stolidus pileatus, the lesser noddy Anous temirostris temirostris and the fairy tern Gygis alba are present. Casuarina trees are the favourite nesting sites for these birds.

ZONING: None

DISTURBANCES OR DEFICIENCIES: Birds' eggs on the islet are extremely vulnerable. Indiscriminate collection by visitors has caused considerable disturbance and damage to bird life. Recently, through GN 157 of 182, everyone intending to visit the islet must seek prior authorization from the Resident Commissioner.

SCIENTIFIC RESEARCH: Island vegetation recently surveyed by J. Gueho (1980).

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL:

Gueho, J. (1977) Guide des principales plantes indigènes de l'Ile Rodrigues. Rev. Agric. Sucrière Ile Maurice. 56(1): 6-23.

Gueho, J. (1980) A Survey of vegetation of the lagoon islets of Rodrigues. Rev. Agric. Sucrière Ile Maurice. 59(1).

Staub, F. (1973) Birds of Rodrigues Island. Proc. R. Soc. Arts & Sci., Mauritius. 4(1):17-59.

Staub, F. (1977) L'avifaune de Rodrigues. Rev. Agric. Sucrière Ile Maurice 56(1):24-26.

Vinson, J. (1965) Quelques remarques sur l'Ile Rodrigues et sur sa faune terrestre. Proc. R. Soc. Arts & Sci., Mauritius. 2:263-277.

STAFF: Visited as often as possible by Forest and Fisheries Service officers from the main island of Rodrigues.

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe, Mauritius.

NAME: Ile Cocos
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Act.

DATE ESTABLISHED: 30.5.81

GEOGRAPHICAL LOCATION: 3.7 km off the west coast of Rodrigues, 19°43'S, 63°17.7'E.

ALTITUDE: Sea-level to 4 m

AREA: 14.40 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: Essentially sand cay in character with coarse granular sand and other marine organism debris accumulated by sea currents and tides in shallow lagoon waters. The more protected shores merge into intensive sand flats which are largely exposed at low tide. Due to erosion the calcarenite islet displays a jagged coastline and scoriaceous or pitted inland areas.

HABITAT/VEGETATION: Mixed plantation of Filao, Casuarina equisetifolia and coconut trees. Large expanses of grassy swards contain local weed societies of Stachytarpheta jamaicensis, Desmanthus virgatus and Achyranthes aspera. Dense Pisonia grandis thicket along part of the western littoral as well as inland; isolated clumps of the same species are sharply delimited from the cultivated tree plantation. A fairly extensive inland salt marsh supports a lush vegetation of Sesuvium ayresii with patches of Bacopa monnieri.

NOTEWORTHY FAUNA: Large colonies of noddies Anous stolidus pileatus, the lesser noddy Anous tenuirostris tenuirostris and the fairy tern Gygis alba are present. The colony of both species of noddies is very large, between 4 and 7 thousand birds, and the favourite nesting sites are the Casuarina trees and Pisonia thickets.

The terns lay eggs directly on bits of corals or on horizontal branches and the hatchlings are reared in very precarious situations. Both noddies lay one egg at a time in nests made of algae on branches of Casuarina.

ZONING: None

DISTURBANCES OR DEFICIENCIES: The eggs of birds are extremely vulnerable. Indiscriminate collection by visitors has caused considerable damage to bird life.

SCIENTIFIC RESEARCH: Island vegetation recently surveyed by J. Gueho (1980).

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL:

Gueho, J. (1977) Guide des principales plantes indigenes de l'Ile Rodrigues. Rev. Agric. Sucri. Ile Maurice 56(1):6-23.

Gueho, J. (1980) A survey of vegetation of the lagoon islets of Rodrigues. Rev. Agric. Sucri. Ile Maurice 59(1).

Staub, F. (1973) Birds of Rodrigues Island.

Staub, F. (1977) L'avifaune de Rodrigues.

Vinson, J. (1965) Quelques remarques sur l'île Rodrigues et sur sa faune terrestre.

STAFF: Visited as often as possible by Forest and Fisheries Service officers from the main island of Rodrigues. One watchman posted on the islet.

BUDGET: Virtually nil

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe, Mauritius.

NAME: Coin de Mire
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Total. Protected by law under the Ancient Monuments Ordinance Cap 282 of 1944.

DATE ESTABLISHED: 14.1.70

GEOGRAPHICAL LOCATION: About 4.16 km north of Cap Malheureux 19°56.5'S, 57°37'E.

ALTITUDE: Sea-level to 158 m

AREA: 76 ha

LAND TENURE: Public ownership

PHYSICAL FEATURES: Mass of volcanic rocks, apparently destitute of any secondary formation; the surrounding sea is so rough as to preclude reef formation. The single mass forms a wedge-shaped cliff with spurious stratification dipping on the one side towards Mauritius and on the other towards Flat Island. The top of the cliff is flat with a layer of volcanic soil.

HABITAT/VEGETATION: Thicket of Santalum album established over a large area on the top of the wedge-shaped cliff. Presence of extensive colonies of endemic liliaceneous aloe-like plant, Lomatophyllum tormentorii (a special feature of this islet and Round Island) as well as a few Dracaena concinna together with the native shrubs, Scutia myrtina and Eugenia lucida. The islet is invaded by exotic weed species.

NOTEWORTHY FAUNA: This island is a breeding place for large populations of the white-tailed tropic bird Phaeton lepturus, the red-tailed tropic bird P. rubricauda rubricauda and the wedge-tailed shearwater Puffinis pacificus chlororynchus. It may harbour a special variety of Cystodaelytus. Phelsuma vinsoni vinsoni also present.

ZONING: None

DISTURBANCE OR DEFICIENCIES: Rats present. No natural freshwater source.

SCIENTIFIC RESEARCH: Islet recently surveyed by Bullock and North of Edinburgh University. Report still forthcoming.

SPECIAL SCIENTIFIC FACILITIES: None on islet. Herbarium facilities are available on Mauritius.

PRINCIPAL REFERENCE MATERIAL:

Ayres, P.H.B. (1860) On the geology of Flat and Gabriel Islands. Trans. R. Soc. Arts & Sci., Mauritius. New series 1(2): pp 220-232.

STAFF: Periodic visits by Forest and Fisheries Department staff.

BUDGET: None

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe.

NAME: Rivière du Rempart - Poudre d'Or Fishing Reserve
MANAGEMENT CATEGORY: VIII (Multiple Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Fisheries Act 1980

GEOGRAPHICAL LOCATION: North-East coast of Mauritius

ALTITUDE: Sea-level

AREA: 35 km²

LAND TENURE: Public ownership

PHYSICAL FEATURES: That part of the sea between the sea-coast at high water mark and a line drawn from Pointe Grand Courant to the nearest shore of Ile d'Ambre and along the shore of that island to Pointe Dejeuner. From there along a prolonged line to the southern side of Passe St Geran, and further along the reef to Pointe Roches Noires. It encloses two barachois (fish ponds).

IMPORTANT HABITATS: Lagoon environment, sandy and rocky bottoms, coral reefs, inter-tidal zone covered by small stretches of sandy beaches, rocky shores predominating in the area; mangroves are found interspersed in rocky shores, in some areas mangroves form denser stands.

NOTEWORTHY FAUNA: Area particularly rich in mullets; fishes (see appendix), crabs, oysters and shrimps. Chanos chanos present.

DISTURBANCES OR DEFICIENCIES: Illegal fishing.

SCIENTIFIC RESEARCH: Fish stock assessment (not restricted to the reserve).

SPECIAL SCIENTIFIC FACILITIES: None but 'barachois' and oyster farms present.

PRINCIPAL REFERENCE MATERIAL: Fisheries Act 1980. Regulations G.N. No. 18 of 1983.

STAFF: 3 fisheries assistants posted in a nearby fisheries post.

BUDGET: No specific budget allocated but recurring expenditures and wages met from budget allocated to both Fisheries Research and Protection Service.

LOCAL PARK OR RESERVE ADMINISTRATION: Protection Service, Fisheries Division.

DATE: 7 July 1983

NAME: Flacq Fishing Reserve
MANAGEMENT CATEGORY: VIII (Multiple Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Fisheries Act 1980

GEOGRAPHICAL LOCATION: Eastern coast of Mauritius

ALTITUDE: Sea-level

AREA: 6 km²

LAND TENURE: Public ownership

PHYSICAL FEATURES: Includes that part of the sea between the sea-coast at high mark and a line drawn from a place called Pointe La Brise at Poste Lafayette to Pointe de Flacq. Encloses a 'barachois'.

IMPORTANT HABITATS: Lagoon environment with sandy and rocky bottom and coral reefs. Includes small rocky outcrops covered by mangrove trees, inter-tidal zone covered by sandy beaches, mangrove stands and water lilies.

NOTEWORTHY FAUNA: Excellent nursery grounds for Chanos chanos (Mare aux Lubines); shrimps and crabs present. Also fishes (see appendix).

DISTURBANCES OR DEFICIENCIES: Hotel development, boating activities, illegal fishing.

SCIENTIFIC RESEARCH: Fish stock assessment (not restricted to the reserve only).

SPECIAL SCIENTIFIC FACILITIES: None

PRINCIPAL REFERENCE MATERIAL: Fisheries Act 1980. Regulations G.N. No. 18 of 1983.

STAFF: 3 fisheries assistant posted in an adjacent fisheries post.

BUDGET: None.

LOCAL PARK OR RESERVE ADMINISTRATION: Protection Service; Fisheries Division.

DATE: 7 July 1983

NAME: Black River Fishing Reserve
MANAGEMENT CATEGORY: VIII (Multiple Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Fisheries Act 1980

GEOGRAPHICAL LOCATION: West coast of Mauritius (figure 1)

ALTITUDE: Sea-level

AREA: 9 km²

LAND TENURE: Public ownership

PHYSICAL FEATURES: The part of the sea between the sea-coast at high water mark and

- i) the sinuosities of the reefs from the place called Petit Vacoas where the reefs meet the coast to Pointe Lascars on the northern part of Black River Pass;
- ii) a straight line from the said Pointe Lascars to Grand Pointe on the southern point of the pass, both Black River and Case Noyale being included in the reserves;
- iii) straight line drawn from the said Grand Pointe to the southern extremity of of Pointe des Requins.

IMPORTANT HABITATS: Lagoon environment, coral patches and reefs, sandy areas. Internal zone covered by sandy beaches, rocky shores and mangrove stands.

NOTEWORTHY FAUNA: Fishes (see appendix), corals, crabs, oysters and shrimps.

SCIENTIFIC RESEARCH: Fisheries Research Centre situated a few kilometers to the north.

PRINCIPAL REFERENCE MATERIAL: Fisheries Act 1980. Regulations G.N. No. 18 of 1983.

STAFF: 3 fisheries assistants posted in an adjacent fisheries post.

BUDGET: None

LOCAL PARK OR RESERVE ADMINISTRATION: Protection Service; Fisheries Division.

DATE: 7 July 1983

NAME: Grand port - Mahébourg Fishing Reserve
MANAGEMENT CATEGORY: VIII (Multiple Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Fisheries Act 1980

GEOGRAPHICAL LOCATION: South-east coast of Mauritius

ALTITUDE: Sea-level

AREA: 22 km²

LAND TENURE: Public ownership

PHYSICAL FEATURES: That part of the sea-coast at high water mark and a straight line drawn from a stone bearing the letters "R.L." behind the Roman Catholic church at Old Grand Port to the extreme eastern point of Ile aux Aigrettes, the reefs and along the sinuosities of the reefs until Ilot at le Broudou. Encloses three islets: Ilot Chat, Ilot Rat and Mouchoir Rouge, and is bordered by Ile aux Aigrettes and Ilot Brocus at Le Bouchon Barachois. Encloses estuaries of two major rivers: Rivière La Chaux and Rivière des Créoles. Includes a small portion of a barrier reef.

IMPORTANT HABITATS: Lagoon environment; coral patches and reefs; sandy areas; rocky bottom; inter-tidal zone covered by sandy beaches, rocky shores; patches of mangroves and ferns in some areas with dense stands of mangroves in others; mangrove stands normally harbour areas of mud flats in upper limits of the inter-tidal zone; in some areas, inter-tidal zone occupied by cliffed shores and eroded eolianite deposits.

NOTEWORTHY FAUNA: Fishes (see appendix), corals, crabs, oysters and shrimps. Chanos chanos present.

DISTURBANCES OR DEFICIENCIES: During heavy rains and cyclones, siltation of lagoon.

SCIENTIFIC RESEARCH: Fish stock assessment (not restricted to the reserve).

SPECIAL SCIENTIFIC FACILITIES: Mahébourg Fish Farm about 83 ha including laboratory and aquaria facilities.

PRINCIPAL REFERENCE MATERIAL: Fisheries Act 1980. Regulations G.N. No. 18 of 1983.

STAFF: 3 fisheries assistants posted in an adjacent fisheries post.

BUDGET: None

LOCAL PARK OR RESERVE ADMINISTRATION: Protection Service; Fisheries Division.

DATE: 7 July 1983

NAME: Port Louis Fishing Reserve
MANAGEMENT CATEGORY: VIII (Multiple Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Fisheries Act 1980

GEOGRAPHICAL LOCATION: North-west coast of Mauritius

ALTITUDE: Sea-level

AREA: 5 km²

LAND TENURE: Public ownership

PHYSICAL FEATURES: That part of the sea between the sea-coast at high water mark and a line drawn from Martello Tower at Pointe aux Sables to a point due west on the reefs, a place called "Pointe Tortue" along a straight line to the most westerly point at Fort George. Encloses harbour of Port Louis.

IMPORTANT HABITATS: Includes an estuary at the entry of the Grand River North West and River St Louis. Lagoon substrate muddy to sandy, with coral patches of mostly dead communities. A deep channel leads to the main harbour of the island from a wide pass in the reef which also consists mostly of dead communities. Sea-grass communities extensive on the southern part, with some eutrophication of weeds at the entry of sewage outfalls. The area is particularly rich in siganids and parrot fishes.

NOTEWORTHY FAUNA: Lagoon fishes, particularly siganids and other marine organisms.

DISTURBANCES OR DEFICIENCIES: Effluents from two sewage outfalls. Solid waste dumping area around northern point, presence of harbour.

SCIENTIFIC RESEARCH: Fish stock assessment (not restricted to reserve)

SPECIAL SCIENTIFIC FACILITIES: Fisheries Research Centre situated 10 km to the south.

PRINCIPAL REFERENCE MATERIAL: Fisheries Act 1980. Regulations G.N. No. 18 of 1983.

STAFF: 3 fisheries assistants posted in an adjacent fisheries post.

BUDGET: None

LOCAL PARK OR RESERVE ADMINISTRATION: Protection Service; Fisheries Division.

DATE: 7 July 1983

NAME: Trou d'Eau Douce Fishing Reserve
MANAGEMENT CATEGORY: VIII (Multiple Use Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: Fisheries Act 1980

GEOGRAPHICAL LOCATION: East coast of Mauritius

ALTITUDE: Sea-level

AREA: 7 km²

LAND TENURE: Public ownership

PHYSICAL FEATURES: That part of the sea between the sea-coast at high water mark and a line drawn from the old lime-kiln at Le Morne to the extreme western point of Ile aux Rats, then along the inner shore of the Ile aux Cerfs to Pointe Petit Vacoas, to the extreme point of Ilot Lièvre and to Pointe Saint Lain, commonly known as Pointe Cassis.

IMPORTANT HABITATS: Varied coral communities. Extensive mangrove areas in the intertidal zones and around many small islets of the Ile aux Cerfs region. Rich in sea-grass communities. Brackish water in most of the shallow area including the estuaries at the Grand River South East. Provides habitats to communities of oysters which settle, in particular, on mangrove roots. Nursery ground rich in mullet species.

DISTURBANCES OR DEFICIENCIES: Large amount of silt deposit in the reserve during heavy rain. Pollutants from a sugar mill carried, via Deep River Beau Champ, to part of the reserve which abounds with juvenile mullet.

SPECIAL SCIENTIFIC FACILITIES: None

INVENTORY OF THREATENED OR ENDANGERED COASTAL AND MARINE SPECIES

Table 4: List of threatened/endangered/rare/over-exploited coastal and marine species and those of other interest
(Status and protection of threatened species in Mauritius)

Species	Population	Population in protected area	% protected	Remarks
<u>MAMMALS: CETACEANS</u>				
<u>Balaenoptera physalus</u> Fin whale (L. 1758)		Data scarce about movement of the species in Mauritian waters		
<u>Balaenoptera musculus</u> Blue whale	"	"	"	
<u>Megaloptera noveangliae</u> Humpback whale	"	"	"	
<u>Physeter macrocephalus</u> Sperm whale		Report of one stranded at Ile aux Roches on the south-east reef 1834. (Desjardin J. 1834)		
<u>Mesoplodon densirostris</u> Beaked whale		Washed ashore at Trou aux Biches on west coast of Mauritius in Aug. 69. (Dupont J. de R. de Saint Antoine, 1970)		
<u>Globicephala indica</u> Pilot whale		Washed ashore at Grand Gaube, east coast of Mauritius on December 1977		

BIRDS

<p><u>Phaeton rubicauda</u> <u>rubicauda</u>(Boddaert) Red-tailed tropic bird</p>	<p>Fairly abundant in Mauritius and islets. Few in Rodrigues</p>	<p>Last estimate 200-300 active nests. Consti- tutes the greater pro- portion of the popula- tion. Is fast decreasing</p>	<p>Total protection two fold. i) Nature Reserve ii) Wild-life Bill 1983</p>
<p><u>Phaeton lepturus</u> <u>lepturus</u> Paille en queue White-tailed tropic bird</p>	<p>Fairly abundant in Mauritius & Islets. Few in Rodrigues</p>	<p>Constitutes the greater proportion of total population. Is fast decreasing</p>	<p>Total protection under Nature Reserve & under Wild-life Bill 1983</p>
<p><u>Pterodroma arminjoniana</u> <u>arminjonica</u> Trinidad petrel</p>	<p>Small numbers (rare)</p>	<p>All on Round Island</p>	<p>Total protection under Nature Reserve & under Wild-life Bill 1983</p>
<p><u>Sula dactylatra</u> <u>melanops</u> Masked or blue faced booby</p>	<p>20 prs. on Serpent Island. Some 200 prs. on Ile du Nord (St Brandon)</p>	<p>Ile du Nord protected by the Fishing Company's regulation</p>	<p>Threat appears to be loss of substrate</p>
<p><u>Sterna fuscata</u> <u>(Linnaeus)</u> Sooty tern</p>	<p>Large population on Albatros islets</p>	<p>No specific protected area</p>	<p>2/3 of total area of 101 ha covered with brown/ white carpet of the ground nesting bird; eggs form a source of protein for the inhabitants; need control over collection</p>
<p><u>Gygis alba</u> (Sparr) Fairy tern</p>	<p>Large population on St Brandon islets; Ile Cocos (400) Ile aux Sables (100)</p>	<p>Those on the Cocos and Ile aux Sables</p>	<p>Population on Ile Cocos (Rodrigues) protected</p>
<p><u>Sterna dougallii</u> <u>(Montagu)</u> Roscate tern</p>	<p>Population on petit Raphael Ile aux Tortues Ile Longue St Brandon</p>	<p>No specific protected area</p>	<p>Predation by sharks is intense on young that tak to sea</p>

Fregata minor
Frigate bird

Fregata ariel
Fr. aiei (Mathews)
Lesser frigate

No specific protected area for these birds

Need protection against fishermen's poaching; (lesser frigate outnumber the greater variety by a 25:1 ratio)

Anous stolidus
Pileatus Noddy

Abundant Mauritius
Serpent Island and St Brandon fairly abundant in Rodrigues

Population on serpent island to be protected under Nature Reserve

Anous termirostris
Terrarostris
Lesser noddy

Abundant Mauritius (Serpent Is.) Rodrigues
St Brandon

Population on Serpent island to be protected under Nature Reserve

Foudia flavicans
Rodrigues fody

Extremely rare 20-30 prs. in Rodrigues

No specific protected area but protected by law

Endemic bird being bred in captivity in Black River Aviary

Bebronnis
radericana
Rodrigues warbler

Extremely rare

Protected by law

Endemic bird on verge of extinction; deforestation & destruction of indigenous vegetation = threats

BIRDS DEPENDING ON ESTUARIES OR LAGOON AND COASTAL MARSHES

Butorides striatus
javanicus Gasse

No estimates

No specific protected area

Formerly resident in all Mascarene islands, now only on some rarely visited islets in Rodrigues lagoon and Mauritius; uses small mangrove islets growing in fish ponds or 'barachois'; nests made of sticks, hold 2-3 eggs

<u>Gallinea chloropus</u> <u>pyrrhorhoa</u> The Moorhen, La poule d'eau	Abundant	No specific protected area	Abounds in all marshy places of Mauritius
<u>MARINE TURTLES</u>			
<u>Caretta caretta</u> Logger-head turtle	Rare; no estimates	Total protection by law (Fisheries Act 1980)	Probably not resident on island or islets; pass through
<u>Erethmocheelys</u> <u>imbricata</u> Hawks bill turtle (Hughes 1976)	Rare; no estimates	Total protection by law (Fisheries Act 1980)	Once common throughout St Brandon & Mauritius Rodrigues & Ile Coco; sandy beaches used for nesting; now rare
<u>Dermocheelys</u> <u>coriacea</u> Leather back (Vaughan 1940)	No information; not seen any more	Total protection by law (Fisheries Act 1980)	Records of their standing in Mauritius; now not seen
<u>Chelonia mydas</u> Green turtle (Thomson 1981)	Rare in Mauritius. St Brandon is an important nesting site for a small population	Total protection by law (Fisheries Act 1980)	Rare in Mauritius; one case of nesting reported in 1981

Note: St Brandon islets are important nesting sites for turtles. These islets are leased to a private fishing company which exploits both guano and fishery resources of the area.

REPTILES

<u>Casserea dussumeri</u> Round Island keel scaled boa	75 - Probably an over- estimate	Total protection	Rare; lack of suitable cover for daytime re- treat and reproduction poses a threat
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	Very few	Very few; Round Island	Total protection	Possibly threatened with extinction owing to continued soil erosion
<u>Bolyeria multicarinata</u> Round Island boa				
<u>Cyrtodactylus serpensisinsula</u> Serpent Island gecko	4,000 - 5,000	4,000 - 5,000 Round Island Serpent Island (rare)		Restricted to Round and Serpent Island; rare on latter. Loss of substrate on Round Island is serious threat
<u>Phelsuma quentheri</u> Round Island Day gecko	300	300 Round Island	Total protection	Population falls after cyclones; threatened by soil erosion as well
<u>Leiolopisma telfairii</u> Round Island skink	4,000 - 5,000 (1978) Round Island	4,000 - 5,000	Total protection	Population has decreased in past 8 years; young seldom seen
<u>MOLLUSCA</u>				
<u>Charonia tritonis</u> Triton's trumpet or giant triton	Not known	-	Not protected except with regard to export	Rare; no quantitative estimate of population has been made
<u>Iridacna maxima</u> Giant clam (Bénitiers)	Not known but reported to be quite common; large specimens somewhat rare		"	Nearly pandemic in Indo-Pacific area, E. Africa, S.E. Polynesia; collected for food in Mauritius; (size range: 6-15 in.; max. weight found 2 kg)

Note: Most species of genera, Conus, Cyprea Oliva are threatened because of great demand for collection.

<u>Iridacna squamosa</u> Giant clam fluted clam Petit bennitier	Not known; has always been rare in Mauritius	Not protected except with regard to export	Live in shallow 1 ft to deep water
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<u>Donex faba</u> Tec-tec	Known to have declined drastically	"	Collected intensively in shallow waters for soups-very popular in Mauritius
<u>Lambis violaceae</u>	Known to be rare	"	Endemic to St Brandon
<u>Cyprea cripellum</u>	Known to be rare	"	
<u>Tecelus niloticus</u> Commercial tronchus	Not found in Mauritius		
<u>Turbo marmoratus</u> Green snail	"		
<u>Pinctada</u> spp. Pearl oyster	Known to be rare	Not protected except that export is regulated	Used as food; the shell for making jewels
<u>Lambis violacea</u> Violet spider shell	Believed to be rare	Not protected. Only export is regulated	
<u>Cyprea cribellum</u> Porcelaine de bois	Very rare	"	
<u>Cyprea broderpii</u>	"	"	
<u>Harpa costata</u> (<u>Harpa imperialis</u>) Double harpe	"	"	Endemic to Mauritius
<u>Cyprea mauritiana</u> Porcelaine bossu	Is diminishing very fast	"	Large shell; collected extensively for sale to tourists on the beach
<u>Cassis rufa</u> Tache rouge	Becoming rare	"	Big attractive shell used for making lamp shades

Note: Most Conus and Oliva spp. are also threatened by excessive collection.

<u>Lambis truncata</u> cinq doigts	Becoming rare	No specific protected area exists	Not protected except by regulation of exports	Large & attractive; big specimens used for making lamp shades; in Mauritius very small specimens are collected intensively
<u>Cypraea tigris</u>	Becoming rare	"	"	As for <u>C. Mauriciana</u>
<u>CRUSTACEANS</u>				
<u>Birgus latro</u>	None in Mauritius	Reported to occur on St Brandon islets. Opinions divided on this issue		
<u>Ocypode ceratophthalmus</u> White beach crab	No estimate available	-	Not protected	Indication that population is rapidly declining (source: Baissac, J.B. personal communication)
<u>Potamon bouvieri</u> (freshwater crab)	Extremely rare	-	"	
<u>Macrobrachium</u> <u>lat</u>	Known to be rare	Very small	Protected by law in canals, rivers & estuaries	
<u>Macrobrachium</u> <u>australe</u>	"	"	"	
<u>Penaeus monodon</u>	Over-exploited now rare			Some measure of protection through prohibition of fishing with artificial light; Fisheries Act 1980
<u>Metapenaeus</u> <u>monoceros</u>	"			

CORALS: BLACK CORALS

<u>Antipathidae</u>	Not known	-	No specific protected area	Particular concentration at Flic en Flac on external slope of reef as from 30 metres
<u>Sticopethis lutkeni</u>	Not known	-	"	Until now, not used for jewellery in Mauritius
<u>BLUE CORALS</u>				
<u>Heliopora cocrulea</u>	Not known	-	"	Appears to be found in shallow waters in Flat Island lagoon
<u>GOLDEN CORAL</u>				
<u>Tubastraea aurea</u> (Quoy & Gaimard)	Not known; uncommon	-	"	Communities found at Trou aux Biches & Ile Plate lagoon

FISHERIES THREATENED BY HABITAT DESTRUCTION

<u>Agonostromus telfairi</u> (freshwater mullet)	No estimates but extremely rare	-	Once plentiful in rivers & estuaries, now seldom seen or reported	Virtually nil	The species is catadromous
<u>Agonostromus dodulooides</u>	"	-	Has been reported to occur only once or twice	"	"
<u>Macrobrachium lar</u>	"	-	See also under crustaceans	"	Pollution of rivers, canals & estuaries; intense during part these species
<u>Macrobrachium australe</u>	"	-	"	"	"

COMMERCIAL SPECIES WHICH ARE OVER-EXPLOITED OR WHOSE HABITATS ARE IN NEED OF PROTECTION

ESTUARY-LINKED SPECIES

<u>Mugil cephalus</u>	Still quite large; may be decreasing	Protected through size regulation; close season for canard net in reserve areas	No population estimate made; mullet represents about 3% of total landing from lagoon of which <u>M. cephalus</u> represents about 10-15%
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<u>Chanos chanos</u>	No estimates; becoming exceedingly rare	No specific regulation for this fish so far. But protected in reserve areas
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CORAL REEF-LINKED SPECIES

<u>Siganus</u> spp.	Quite large	Most numerous of the commercial fishes
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CORAL REEF-LINKED SPECIES (Rare aquarium species exploited for export. B. Condé & L.P. Jauffret, 1978)

<u>Zebrasoma gemmatum</u> Valencienne 1835 (= <u>Acanthurus gemmatus</u>) <u>urus</u>	Very rare	Control through permit for export	Reach length of 4 in.; one of the rarest Acanthuridae
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<u>Chaetodon mitratus</u> (Gunter 1861)	Extremely rare	"	<u>Chaetodontidae</u> ; observed on steep of coral reef at more than 15 m; may occur at 50-80 m.
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<u>Amphiprion</u> <u>chrysogaster</u> (= <u>A. Fusciventer</u> 1831) (= <u>A. Mauritiensis</u> Schultz 1953)	Not known	Population heavily exploited together with the anemones	<u>Pomacentridae</u> ; an ane- mone fishe, endemic to Mauritius; recognized by its golden-yellow bell & thoracic fin; parents lay eggs under anemone. Young take refuge inside ane- mone. After 2-3 months, leave anemone with a 99% predation toll
<u>Anampses</u> <u>twisti</u> (Bleaker, 1856)	Rare	"	Wide distribution in Indo Pacific area but the Mauritian representative does not have dark stripe at base of pectoral fin
<u>Macropharyngodon</u> <u>bipartitus</u> (Smith, 1917) (= <u>M. varialvus</u>)	Rare	"	The species shows trans- formation phases in col- our; at first thought to be 2 different species
<u>Lepidaplois</u> <u>anthroides</u> Bennett (sub <u>Crenilabrus</u>) (= <u>Cossyphus</u> <u>bicolor</u> Sauvage, 1891)	Rare	"	<u>C. bicolor</u> is indigenous to Mauritius; distributed on east coast up to Indo- Mauritian archipelago. Habitat between 40-50 m deep among black corals (<u>Antipathathis</u>) where they look for food
<u>Rhinopias</u> <u>frondosa</u> Günter, 1891 (sub <u>scorpaena</u>)	Extremely rare	"	Distribution Indo-Paci- fic. Habitats vary from bare rocks, corals, to weed beds. Found at vary- ing depths up to 30 m.

Extremely rare

Rhinopias

eschmeyerii

(Conde, 1977 b.)

"

Probably same as R. frondosa. Changes colour according to habitats, algae or corals

FISH EXPLOITED AND SOLD TO TOURISTS AS CURIOS

Hypocampus

(Sea horses)

Not known

For export - control through permit; locally no control

Syngnathidae family.

Large number of preserved specimens caught locally sold to tourists

Diodon sp

Quite common in lagoon and banks

For export as aquarium fish - control through permit; locally no control

Diodontidae: (Porcupine fishes), D. holocanthus, D. hystrix; used for making lamp shades

COASTAL PLANT SPECIES

Diospyros

egrettarum

Few remnants outside protected area

400 - 500 (Ile aux Aigrettes)

Partially protected

Endemic; decimation continues in the Nature Reserve

Listrostachys

polystachys

(= Deniella

polystachya)

Some in orchid collection

50 - 60 (Ile aux Aigrettes)

"

Grown in orchid collection; population in wild rapidly diminishing (Ile aux Aigrettes)

Gastonia

cutispongia

Few left at low alt.

30 - 40 (Ile aux Aigrettes)

"

Diminishing; vulnerable

Sideroxylon

bontoniolum D.C.

Scarce; few left on low land coastal forest

Ile aux Aigrettes

"

Endemic, endangered

Pisonia grandis

Greatly reduced

500 - 600 (Rodrigues)

Partially on Nature Reserve

Indigenous (rare & confined to Rodrigues)

<u>Zanthoxylum paniculatum</u>	5 (Anse Quito)	Same population in un- declared protected area	Partial protection	Endemic (Rodrigues) and endangered
<u>Antirrhoea frangulacea</u>	Few (Pointe Corail)	"	"	"
<u>Nesogenus decembens</u>	Very few (P. Corail)	"	"	Endemic (Rodrigues)
<u>Hyporbe lagenicculus</u>	Cultivated in Mauritius	10 - 12 (Round Island)	Total protection	Endemic (wild population endangered)
<u>Diosperma album Var conjugatum</u>	Few cultivated in Mauritius	Round Island	"	Endemic (R.1) endangered in the wild
<u>Pandanus vandermerschii</u>	"	200 (RI), 15 (G. Quoin) 1 (Ile aux Aigrettes) 2-3 (Ile Plate)	"	Endemic v. important in Ecol. of R.1.
<u>Latania loddigesii</u>	Few cultivated on main island; prominent species on Round Island	Prominent species on Round Island	"	Endemic; rabbit and pos- sibly shearwaters pose threat to this species

Table 5: Critical habitats for the endangered species of Mauritius

Endangered sp.	Critical Habitat	% Protected	R e m a r k s
<u>NESTING SEA BIRDS</u>			
<u>Phaeton*</u> <u>rubicauda</u> <u>rubicauda</u> (Red-tailed tropic bird)	Nesting site under long grasses or pro- tected cavities on high grounds on Round Island, Serpent Island and Gunner's Quoin.	Total by law	In practice, it is diffi- cult to enforce regula- tions. There is consider- able predation by local fishermen. Erosion repre- sents another threat to the nesting site
<u>Phaeton*</u> <u>lepturus</u> <u>lepturus</u> (White-tailed Tropic bird)	Nesting site: rock hole at the foot of a tree or tree hole on Round Island, Serpent Island and Gunner's Quoin.	"	Threatened mainly by poaching
<u>Pterodroma*</u> <u>arminioniana</u> <u>arminioniana</u> (Round Island Trinidad gadfly petrel)	Nesting site: Crevices or beneath some over- hanging rock on Round Island	"	Threatened by poaching and possible infertility; also by erosion
<u>Sula dactylatra*</u> <u>dactylatra</u> (Blue faced booby, masked booby)	Serpent Island, Ile du Nord (St Brandon)	"	Poaching is a big threat
<u>Sterna Fuscata</u> <u>C.</u> (Sooty tern, yeye)	St Brandon; nesting on ground		Excessive threat; egg col- lecting which provides a source of protein; col- lection of eggs must be regulated
<u>Gygis alba</u>	Nesting grounds on Cocos island, Ile aux Sable and St Brandon islets	Population on Ile aux Cocos	Collection on St Brandon Islet must be regulated

(*) The company exploiting the Islets of St Brandon Shoal established North Island in the late 1960s as a Turtle Reserve. It further enforces a ban on taking marine turtle eggs at any time of the year. The company must be advised to declare Pearl Island and Frigate Island as Turtle Reserves.

Note: Despite the ban on the taking of birds' eggs and young, a considerable number of eggs are still removed and the sooty tern and frigate bird young, in particular, are killed for eating purposes. Masked booby on North Island is also captured.

<u>Fondia flavicans</u> Rodrigues fody	Dense vegetation near stream beds of 2 green valleys of Solitude & Cascade Pigeon (Rod.)	Total protection	Part of Cascade Pigeon & Solitude Valley must be declared Nature Reserves. Reafforestation with endemic species must be effected
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<u>Bebrornis rodericana</u> Rodrigues warbler	Dense vegetation of indigenous plants on Rodrigues	"	
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MARINE MAMMALS

Fin whale, <u>Balaenoptera physalus</u> L. (1758)	Data scarce about movement of the species in Mauritian waters	-	Mauritius Signatory to Indian Ocean Sanctuary, 1979
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Blue whale, <u>Balaenoptera musculus</u>	"	"	"
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Humpback whale, <u>Megaptera novaeangliae</u>	"	"	"
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Sperm whale <u>Physeter macrocephalus</u>	"	"	"
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Beaked whale <u>Mesoplodon densirostris</u>	"	"	"
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FISH

<u>Agnostromus telfairii</u>	Estuaries and lower reaches of river		
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<u>Agonostromus dobuloides</u>	"		
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CRUSTACEANS

<u>Birgus latro</u> (coconut crab robber crab)	Probably Islets of St Brandon. No confirmation	Nil	
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<u>Ocypode ceratophthalmus</u> White beach crab	Upper reaches of sandy beaches in Mauritius; easily picked up by beachgoers	"	
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MARINE TURTLES

<u>Caretta</u> <u>caretta</u>	Sandy beach for nesting; probably does not have any in the Mauritian zone	Total protection	
<u>Eretmochelys</u> <u>imbricata</u> (Hawk Bill Turtle)	Sandy beaches of Islet on St Brandon Shoal constitute important nesting sites	Total protection by law	
<u>Dermochelys</u> <u>coriacea</u> (Leather-back)	Sandy beaches	"	
<u>Chelonia mydas</u> (Green Turtle)	Sandy beaches of Islets in the St Brandon Shoal constitute important nesting sites; isolated & rare cases of nesting on beach of Mauritius	"	Management of turtle resources & law enforcement are left to care of fishing company exploiting St Brandon islets; undesirable from point of view of conservation

REPTILES

<u>Casserea</u> <u>dussumeiri</u> Round Island (Keel-scaled boa)	Round Island; in fairly well circumscribed belt of fan palm with plant cover for daytime retreat & reproductive activities	Total	Soil erosion affects species both directly and indirectly
<u>Boliveria mul-</u> <u>ticarinea</u> (Round Island boa)	Round Island; good soil cover for burrowing	"	Soil erosion direct threat
<u>Cryptodactylus</u> <u>serpensinsula</u> Serpent Island gecko	Round Island, Serpent Island; good ground cover is critical, for species is basically ground dwelling; soil mixed with plant detritus preferred for laying eggs	"	Soil erosion serious threat
<u>Phelsuma</u> <u>quentheri</u> (Round Island day gecko)	Fan-palms (Latania) of Round Island; gecko spends most of its time feeding, courting, mating (egg laying) on fronds	"	Fan palm seriously threatened by erosion
<u>Leiopisma</u> <u>telfairii</u> (Round Island skink)	Terrestrial & arboreal habitat preferred	"	Erosion also threatens this specie

MOLLUSCA

<u>Charonia tritonis</u> (Triton's trumpet or giant triton)	Not known; associated with passes of the reef	Nil	
<u>Tridacna maxima</u> (Giant clam petit Bénitiers)	Coral boulders in which it excavates shallow depressions and remains attached by a stout byssus	"	
<u>Tridacna squamosa</u> (Giant clam petit Bénitiers)	Coral rubbles where it lives attached by weak mucus-covered byssal strand; may be found in shallow waters	"	
<u>Donax faba</u> Tec-tec	Sandy bottom in intertidal region, below surface at about 1 cm.	"	Intensive collection for food as well as for bait
<u>Pinctada</u> spp. (Pearl oyster)			
<u>Lambis violaceae</u>	Unknown; probably found in sand and algae bottom at depths of 20-70 ft	"	Endemic to St Brandon
<u>Cypraea cripellum</u>	Unknown; normal habitat is shallow water inside reef	"	
<u>Cypraea esantropia</u>	Unknown; probably found at 5-15 m, on outer slope of reef under coral blocks	"	
<u>Cypraea broderpii</u>	Unknown; probably found around 50m depth among rock crevices	"	
<u>Harpa costata</u>	Unknown; probably found in shallow water with sandy bottom	"	Endemic to Mauritius
<u>Cypraea mauriciana</u>	Unknown; probably found in shallow water, with sandy to rocky bottom	"	
<u>Cassis rufa</u>	Unknown; probably in lagoon on sandy bottom at 10-15 ft	"	

<u>Lambis</u> <u>truncata</u>	Unknown; probably in lagoon at 10-15 ft	"
<u>Cyprea tigris</u>	Unknown; probably in shallow lagoon	"

BIRDS

NAME: Phaeton rubricauda rubricauda
VERNACULAR NAME: Red-tailed tropic bird - Paille en Queue à brins rouges
ORDER: Pelecaniformes
FAMILY: Phaethontidae

DESCRIPTION: This bird is generally white, with a pink sheen. A patch is located in front of the eye and a small streak behind. The shafts of the primaries and tail features, except at the ends, and the broad shaft stripes to the inner secondaries are black. The elongated and pointed middle tail feathers have black shafts and red webs. The iris is black; the bill red, the legs yellow becoming black on the webs and toes. The length of the bird, including the long tail feathers, is about 33 in., tail about 4 in., the long central feathers 19 in., the wing 13 in., the tarsus 1.25 in.

DISTRIBUTION: Found throughout the warmer regions of the Indian and Pacific Oceans. Breeds on Round Island, Serpent Island, Gunner's Quoin.

POPULATION: Gill et al., in October/November 1970 estimated the population to be about 100 pairs. In July/August 1975, Bullock and S. North estimated that there were 200-300 active nests. At present, no figure can be given, yet it is safe to say that the population is decreasing.

HABITAT AND ECOLOGY: It nests on the ground, under long grasses or in some cavity or protected place. One light violet brown egg, measuring 7.0 x 5.8 cm, with darker purplish and green-brown markings is laid at a time. Both male and female sit on the egg. Feeds on marine animals (squids and flying fish). An adult has also been observed feeding its mate while the latter remained on the egg. Some of the population breeds during the winter months from April to September.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: This subspecies is peculiar to the Indian Ocean, Round Island being its main breeding place. It is a beautiful bird and an attraction for tourists; this tropic bird is the emblem of the Mauritian airline; also used as food.

THREATS TO SURVIVAL: Effects of cyclones and considerable predation by local fishermen in the summer months when landing on Round Island is relatively easy.

CONSERVATION MEASURES PROPOSED: 1. Strict control should be exercised with the posting of resident wardens on these islands. 2. Heavier penalties should be inflicted on those who contravene the law. 3. Installation of radio transmitters between the islets and the mainland for rapid communication.

CONSERVATION MEASURES TAKEN: Round Island, Serpent Island and Gunner's Quoin declared as Nature Reserves.

REFERENCES:

Bullock, D. & S. North (1975) Report of the Edinburgh University expedition to Round Island. Mauritius July/August 1975.

Guérin, R., Faune ornithologique ancienne et actuelle des îles. Mascareignes, Seychelles, Comores et des île avoisinantes.

NAME: Phaeton lepturus lepturus
VERNACULAR NAME: White-tailed tropic bird - Paille en Queue à brins blancs
ORDER: Pelecaniformes
FAMILY: Phaethontidae

DESCRIPTION: Apart from some black colouring on the wings and at the base of the wings, the bird is brilliant white, almost silver, with a butter yellow bill. It has a white tail with black shafts. The juveniles are covered with broken black bars and appear speckled. This bird is smaller than the red-tailed tropic bird.

DISTRIBUTION: Range: extends into the Pacific and the Indian Oceans. Nests on Round Island, Gunner's Quoin, Serpent Island and the mainland of Mauritius in holes found in cliffs near the sea, and in deep, well-wooded ravines as far inland as the escarpment of the central plateau.

POPULATION: Decreasing rapidly.

HABITAT AND ECOLOGY: Breeds throughout the year; makes nest in a rock or tree hole, or at the foot of a tree. Lays one egg whose colour ranges from spotted white to a rich brown. The egg measures 5.4 x 3.8 cm. Both male and female sit on the egg. The young is a downy white fledgling with speckled black and white plumage. It spends three months in the nest after hatching. Feeds on marine animals (squid and fish).

SCIENTIFIC INTEREST AND POTENTIAL VALUE: This subspecies is peculiar to the Indian Ocean and Round Island is its main breeding place. It is a beautiful bird and an attraction for tourists; this bird is the emblem of the Mauritian airline; also used as food.

THREATS TO SURVIVAL: Considerable predation by local fishermen in the summer months when landing on Round Island is relatively easy and effects of cyclones.

CONSERVATION MEASURES PROPOSED: 1. Strict control over these islands should be exercised with resident wardens. 2. Heavier penalties should be inflicted on those who contravene the law.

CONSERVATION MEASURES TAKEN: Round Island, Serpent Island and Gunner's Quoin declared as Nature Reserves.

REFERENCES:

Guérin, R., Faune ornithologique ancienne et actuelle des île Mascareignes,, Seychelles, Comores et des îles avoisinantes.

Beamish, T., Birds of Seychelles.

Staub, F. (1976) Birds of the Mascarenes and St Brandon.

NAME: Pterodroma arminjoniana arminjoniana
VERNACULAR NAME: Trinidad Gadfly Petrel
ORDER: Procellariiformes
FAMILY: Puffinidae

DESCRIPTION: A dichromatic petrel, with both black and light brown phases, the two being connected by intermediates exhibiting a wide range of grey and dusky plumage and having dark quill shafts in all phases.

Adults: Light phase (sexes alike): the dorsal colour of the bird is ashy black, the feathers of the back are mottled with white bases, the scapulars and wing coverts are blackish, washed with slate grey, quills and secondaries dusky black and ashy brown for the greater part of the inner web, and mottled with black vermiculations towards the end of the outer web.

The throat of the bird is white, slightly mottled with dull ashy bars. The remainder of the under surface of body is white except for a broad collar of ashy brown across the foreneck, continued down the sides of the upper breast and body; a few bars of brown below the prepectoral collar; on the flanks a few darkish shaft streaks, causing a streaked appearance; the underpart iris brown, bill black, tarsi and base of toes flesh-coloured, remainder of webs black.

Adults: Dark phase: general colour varies between greyish brown and dark brownish black, mottled white areas found particularly on the throat and to a lesser degree legs and feet black. The length of adult birds about 38 cm.

DISTRIBUTION: Round Island, Trinidade off of Brazil.

POPULATION: Very rare.

HABITAT AND ECOLOGY: Lays one large, white spotted egg 6.60 x 4.67 cm in a crevice or beneath some overhanging rock; no nest. Both male and female sit on the egg. The young leaves nest after a two and a half month period. Feeds on marine animals.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Has a very restricted distribution and is known to nest in only one other part of the world besides Round Island, namely, Trinidade off Brazil. It would be interesting to study the genetic differences between these two isolated populations. Both are indigenous.

THREATS TO SURVIVAL: Effects of cyclones; plundering by local fishermen; decrease in fertility - eggs have been found to be contaminated by DDT, and disease (genetic weaknesses).

CONSERVATION MEASURES TAKEN: Round Island has been declared a Nature Reserve, but at present no control is being exercised over the island.

REFERENCES:

Staub, F. (1976) Birds of the Mascarenes and St Brandon.

Michel, C., Notes on the birds of Mauritius.

Murphy, R.C., Oceanic birds of South America. pp. 708-711.

NAME: Sula dactylatra melanops (Heuglin)
VERNACULAR NAME: Blue faced Booby - Fou Bête (Masked Booby)
ORDER: Pelecaniformes
FAMILY: Sulidae

DESCRIPTION: The adult male has white plumage except for the tail and wing primaries which are brownish black. The base of the mandibles and the throat are without feathers and the skin is black or slate-coloured. The iris is yellow, greenish yellow or reddish. The bill is horn-coloured, greyish green or yellowish green. The base of the bill is bright orange in the males and pink or light red in the females. The feet are greyish green, greyish brown or yellowish green, but never red in the male, and lead colour in the females. The female is similar to the male in size and skin colour. The average length of the bird is 35 in. The chick is a large ball of snowy fluff. The head, neck and the back of the juvenile is brownish grey. The under parts of the young bird are white. At first, the iris is brown, later pale green. Feet are lavender blue.

DISTRIBUTION: Serpent Island, Ile du Nord, St Brandon, Tromelin Island.

POPULATION: About 40 specimens in Serpent Island, but a larger colony exists on the Ile du Nord, St Brandon (about 200 breeding pairs). Approximately 10 ft spacing is required between breeding pairs which limits the population size.

HABITAT AND ECOLOGY: Breeding season begins in early July with the paring of the birds. The female usually lays one sometimes two eggs without a nest. The first-born chick obeys the Cain reflex and destroys the younger bird. The large chalky eggs measure 6.3 x 4.5 cm. The chicks are at first fluffy white and later turn to brown fledging their white adult plumage. Feeds on marine animals.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: An indigenous bird.

THREATS TO SURVIVAL: Because of human interference on the islets of St Brandon the species is now restricted to Ile du Nord where such threats are minimal.

CONSERVATION MEASURES PROPOSED: Serpent Island to be declared a Nature Reserve.

CONSERVATION MEASURES TAKEN: Ile du Nord, the only islet where the bird apparently remains undisturbed, is protected by the regulation of the fishing company exploiting the St Brandon Islands. Human interference is mitigated due to the difficulty of approach to the island.

REFERENCES:

Guérin, R., Faune ornithologique ancienne et actuelle des îles Mascareignes, Seychelles, Comores, et des îles avoisinantes.

Staub, F. (1976) Birds of the Mascarenes and St Brandon.

NAME: Foudia flavicans (A Newton)
VERNACULAR NAME: Rodrigues Fody - Zoiseau Zaune
ORDER: Passeriformes
FAMILY: Ploceidae

DESCRIPTION: Male has a deep yellow chest and belly, which turns to grey near the tail underparts; back is greenish brown. Tail feathers are ashy brown bordered with a yellow edge. A red orange hue on the forehead extends to the lore and chin; eyes have a thin black ring. The bill is black, the legs are light brownish in colour.

Female is drab with greenish brown back, the wing feathers are dark brown with a narrow yellow olive-hued edge. The parotid region is brownish, the chin and the underpart of the body is light yellow, the flanks light brownish. The bill and the feet are greyish brown. The male in winter plumage resembles the female, except for the orange in the face now turned yellowish. The first yellow tones begin to make their appearance at the beginning of August, and at the end of October these birds are arrayed in their nuptial plumage. The length of the bird is about 12 cm.

DISTRIBUTION: Endemic to Rodrigues Island.

POPULATION: Only about 20-30 pairs of this fody were estimated by Cheke in 1976 to survive in Rodrigues.

HABITAT AND ECOLOGY: The yellow-headed fody of Rodrigues is restricted to relatively dense vegetation, particularly near streambeds of Solitude and Cascade Pigeon valleys. Feeds mostly on insects and spiders. It forages on the ground level to heights of over nine metres and extracts small insects from crevices or the undersides of leaves and branches. The Rodrigues fody frequently hangs upside down as it extracts or captures food. The bird's nest is globose with a side opening, built of grasses and palm fibres and lined with feathers and cotton. It is placed at about three metres from the ground at the top of a branch or shrub. The three eggs of the clutch are of pale blue colour and measure 1.9 x 1.4 cm.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Endemic to Rodrigues Island.

THREATS TO SURVIVAL: 1. Destruction of indigenous vegetation. 2. Reduction and modification of the forest habitat by man and the domesticated animals such as pigs, goats and sheep. 3. Competition with exotic birds such as the Foudia Madagascariensis for food and territory. 4. Effect of cyclones.

CONSERVATION MEASURES PROPOSED: 1. Declaration of Solitude and Cascade Pigeon as Nature Reserves. 2. Reafforestation with endemic species.

CONSERVATION MEASURES TAKEN: Captive breeding is being carried out; in 1979 there were nine Rodrigues fodies in the Black River Aviaries which remained in excellent health but showed little sign of breeding. The bird is protected by law.

REFERENCES:

Frank, B. Gill. (1967) Birds of Rodrigues Island (Indian Ocean). Ibis, Vol 109.

Guérin, R., Faune ornithologique ancienne et actuelle des îles Mascareignes, Seychelles, Comores et des Iles avoisinantes.

Staub, F. (1976) Birds of the Mascarenes and St Brandon.

NAME: Bebrornis rodericana (Newton)
VERNACULAR NAME: Rodrigues Brush Warbler - Zoiseau long bec
ORDER: Passeriformes
FAMILY: Sylviidae

DESCRIPTION: The adult male generally has a greenish brown back. Towards the tail, the lore is pale yellow, this colour extending towards the upper part of the eye, but without forming a brow. The chin and cheeks are pale yellow and the belly from the chin is yellowish; the sides of the neck, breast and tail feathers are greyish green. The bill is long, thin and horn-coloured. Feet are light brown.

The total length of the male adult is about 6 in. The female is smaller than the male. The difference in the plumage colour is not great; it varies between dark olive green to light green or greyish brown. The yellow varies in certain individuals.

DISTRIBUTION: Endemic to Rodrigues and has been observed only at the Cascade Pigeon.

POPULATION: Extremely rare, may be on the verge of extinction.

HABITAT AND ECOLOGY: The Rodrigues brush warbler is a forest dweller; the nest is neat and strong, constructed of a variety of materials, mostly plant fibres and blades of grass. The lining is made up of soft feathers and the nest is suspended on a three or four-pronged branch. The clutch consists of three eggs, dull white, with grey and reddish brown markings, measuring 0.7 x 0.5 cm. The incubation period lasts 19 days and is shared by the parents. The Brush warbler is mostly insectivorous, working bark and leaves diligently. It continues to feed the young for some time after the latter have left the nest.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Endemic to Rodrigues Island. Distribution restricted.

THREATS TO SURVIVAL: 1. Deforestation. 2. Reduction in its territory due to destruction of indigenous vegetation by man and domesticated animals such as pigs, goats and sheep. 3. Competition for food with introduced species. 4. Effects of cyclones.

CONSERVATION MEASURES PROPOSED: 1. Proclamation of Cascade Pigeon as a Nature Reserve. 2. Entry of domestic animals in the reserve strictly forbidden. 3. Reafforestation of Cascade Pigeon with endemic plants.

CONSERVATION MEASURES TAKEN: The bird is protected by law.

REFERENCES:

Frank, B. Gill. (1967) Birds of Rodrigues Island.

Guérin, R., Faune ornithologique ancienne et actuelle des îles Mascareignes, Seychelles, Comores et des îles avoisinantes.

Staub, F. (1976) Birds of the Mascarenes and St Brandon.

REPTILES

NAME: Casserea dussumeiri
VERNACULAR NAME: Round Island Keel-scaled Boa
PHYLUM: Chordata
ORDER: Serpentes
CLASS: Reptilia
FAMILY: Bolyerinae

DESCRIPTION: Has a well-shaped neck and can attain a length of up to one metre. Immature specimens can be readily distinguished from adults not only by size but also by colouring; young snakes are orange-red with yellow underside. The adults are purplish-brown with cream undersides blotched with a pink and black tinge.

DISTRIBUTION: Round Island, Indian Ocean.

POPULATION: Rare. Nine specimens observed during period 1966-1975. Latest estimate is about 75.

HABITAT AND ECOLOGY: Round Island. Found mostly in the palm savannah forest on the western slopes of Round Island, though a few have been seen in the south. Lives mostly in the axil of Latania leaves but can also be found on the ground in search of prey (consisting mostly of lizards) or resting under dry Latania leaves during the day.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: All dorsal vertebrates bear hypophyses on interior face as compared to those of other boas which have hypophyses only on the anterior dorsal vertebrate. This reptile could represent an ancient group originating from the Dolichosaurians, which represented an intermediate group between snakes and lizards.

THREAT TO SURVIVAL: Loss of substrate on Round Island (erosion). Lack of sufficient cover during the day.

CONSERVATION MEASURES PROPOSED: Total elimination of rabbit population by poisoning. Steps to control erosion on Round Island.

CONSERVATION MEASURES TAKEN: Round Island declared strict Nature Reserve. Elimination of goats.

REFERENCES:

Vinson, J. & J.M. Vinson (1969) The Saurian fauna of the Mascarene Island.

Vinson, J.M. (1975) Notes on the reptiles of Round Island. Bull. Mau. Inst. 8(1): 49-67.

Vinson, J.M. (1949) Ile Ronde et l'Ile aux Serpents. Proc. R. Soc. Arts & Sci., Mauritius. 1(1): 32-52.

NAME: Cyrtodactylus serpensinsula (Loveridge) 1951
VERNACULAR NAME: Gesco
PHYLUM: Chordata
ORDER: Lacertilia
CLASS: Reptilia
FAMILY: Gekkonidae

DESCRIPTION: Digits not dilated, all clawed, nasal bones fused, head moderately large; forehead flat to slightly concave, more or less gently sloping toward snout. Rostral depressed above with median crease, nostril located between rostral, 1st supralabial and three nasals, of which the uppermost is the largest; one internasal; supralabials 8-10 (9.0;10). Pupil vertical with lobed margins, ear opening vertical to slightly oblique, subtriangular (pear-shaped to semi-circular) with apex of triangle pointing upwards, anterior margin of ear-opening is straight-edged and slopes backwards making an angle of about 45°.

DISTRIBUTION: Endemic to Mauritius, Indian Ocean.

POPULATION: Previously thought to be rare and threatened with extinction but it is now clear that its apparent rarity was due to its nocturnal habits. Actual population estimated to be between 4,000 to 5,000 on Round Island.

HABITAT AND ECOLOGY: Restricted to two islets, Round Island and Serpent Island. Apparently rare on Serpent Island. Nocturnal, ground dwelling; seen motionless on steep rocky slopes a few feet from the ground on flat expanses where food (insects) is abundant but predation hazard greater. Single egg is laid at a time (not attached to substrate) on powdery soil inter-mixed with plant debris, most often under protective layer of decaying fronds, old inflorescences etc., of Latania. Several eggs laid by the same female (on Round Island no collective nesting is resorted to, but eggs laid in haphazard manner) during breeding season which appears to be restricted to the summer months. Insects constitute the major food item.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Species is preyed upon by the two rare boas, Casserea dussumeiri and Bolyeria multicarinata and the skink Lieiolopisma telfairii. Gongylomorphus bojerii bojerii may also prey on the eggs or the young of these reptiles.

THREAT TO SURVIVAL: Loss of substrate on Round Island where eggs are laid constitutes a serious threat.

CONSERVATION MEASURES PROPOSED: 1. Total elimination of rabbit population by poisoning. 2. Declaring Serpent Island a Nature Reserve. 3. Take measures to control soil erosion.

CONSERVATION MEASURES TAKEN: 1. Round Island declared as Nature Reserve. 2. Elimination of goats on the island.

REFERENCES:

Vinson, J. & J.M. Vinson (1969) The Saurian fauna of the Mascarene Island.

Vinson, J.M. (1975) Notes on the reptiles of Round Island.

Vinson, J.M. (1949) Ile Ronde et l'Ile aux Serpents.

NAME: Leiolopisma telfairii (Desjardin) 1831
VERNACULAR NAME: Round Island Skink
PHYLUM: Chordata
ORDER: Lacertilia
CLASS: Reptilia
FAMILY: Scincidae

DESCRIPTION: Skink is a smooth-scaled lizard. The body is protected by bony plates underlying the scales, and the space between the temporal arch and the skull is roofed over by dermal bones. Limbs are present, the digits provided with claws.

DISTRIBUTION: Round Island, Mauritius.

POPULATION: Though common on R.I., the species is not numerous and the population appears to have decreased during the past eight years. Estimate is around 4,000 - 5,000.

HABITAT AND ECOLOGY: Diurnal in habit, terrestrial, occasionally observed climbing trees. Appears to be very tame and readily accepts food presented at arm's length. Basically feeds on insects and fruit (Latania, Pandanus, Mascarenha, Revaughanii).

THREATS TO SURVIVAL: Soil erosion on the island and effects of cyclones contribute to decrease in habitat and food.

CONSERVATION MEASURES PROPOSED: 1. Total elimination of rabbit population.
2. Measures to curb erosion (reservoirs, dams etc.).

CONSERVATION MEASURES TAKEN: 1. Elimination of goats. 2. Island declared as Nature Reserve. 3. Reduction of rabbit population.

REFERENCES:

- Vinson, J. & J.M. Vinson (1969) The Saurian fauna of the Mascarene Island.
Vinson, J.M. (1975) Notes on the reptiles of Round Island.
Vinson, J.M. (1949) Ile Ronde et l'Ile aux Serpents.

NAME: Bolyeria multicarinata (Boie), 1827
VERNACULAR NAME: Round Island Boa
PHYLUM: Chordata
ORDER: Serpentes
CLASS: Reptilia
FAMILY: Boidae

DESCRIPTION: This snake has no neck and can grow to be 1 m long. The adult Bolyeria is dark, sandy brown with irregular black markings on the upper surface. Underneath, it is entirely pink with black and olive markings. The diversion of the maxilla facilitates erection of the anterior maxilla when striking. The shape of the snout and the occipital articulation of Bolyeria suggest that it is adapted to shovelling its way through sand or litter. The strongly keeled trunk scales and long tail (about 100 scales), however, are quite unexpected in a burrowing species.

DISTRIBUTION: Endemic to Round Island, Indian Ocean.

POPULATION: Rare; between 1966 and 1975, during a total of 495 man hours of exploration, it was seen only nine times.

HABITAT AND ECOLOGY: Restricted to Round Island. It is suggested that Bolyeria is semi-fossorial, burrowing through loose soil and leaf litter, a mode of life which would presumably be abetted by its small head and absence of neck. Cyrtodaetylus serpensinsula constitute an important food item of this boa.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: All dorsal vertebrates bear hypophyses on interior face as compared to those of other boas which have hypophyses only on the anterior dorsal vertebrate. This reptile together with Casserea dussumeiri could represent an ancient group originating from the Dolichosaurian, which represented an intermediate group between snakes and lizards.

THREAT TO SURVIVAL: Owing to continued soil erosion, its presence on Round Island is very much threatened; may already be extinct.

CONSERVATION MEASURES PROPOSED: 1. Elimination of rabbit population by poisoning. 2. Control of soil erosion. 3. If a small population of this snake is found, may have to be brought into captivity for breeding.

CONSERVATION MEASURES TAKEN: 1. Round Island declared Nature Reserve. 2. Goats have been eliminated. 3. Rabbit population reduced.

REFERENCES:

Vinson, J. & J.M. Vinson (1969) The Saurian fauna of the Mascarene Island.

Vinson, J.M. (1975) Notes on the reptiles of Round Island.

Vinson, J.M. (1949) Ile Ronde et L'Ile aux Serpents.

FISH

NAME: Agonostromus telfairii(Bennett)
VERNACULAR NAME: Chitte
PHYLUM: Chordata
CLASS: Osteichthyes
ORDER: Mugiloides
FAMILY: Mugilidae

DESCRIPTION: Villiform teeth in the jaw, on the vomer and pterygoid bones, more in the palatines. The height of the body is one fifth of the total length; the length of the head nearly one sixth. Front part of upper lip is rather thick and does not protrude; snout is as long as the orbit. The anterior dorsal commences somewhat nearer to the snout than to the base of the caudal; upper part is dark-coloured, with a silvery band along the side.

DISTRIBUTION: Mauritius and Comoros Islands.

POPULATION: Suspected to be extremely low; has declined drastically over the years.

HABITAT AND ECOLOGY: The species is catadromous, adult phase being spent in rivers and estuaries. Once plentiful in large rivers such as the Grande Rivière Nord Ouest and Grande Rivière Sud Est.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Represents one of the few indigenous catadromous fish species of Mauritius.

THREAT TO SURVIVAL: Pollution of rivers and estuaries combined with explosive fishing and toxic substances.

CONSERVATION MEASURES PROPOSED: None; may be appropriate at this stage to initiate studies on its biology and to attempt artificial breeding.

CONSERVATION MEASURES TAKEN: None in connection with the species. Rivers and Canals Act 1863 aims at preventing pollution of water courses. Wild Life Bill 1983 prohibits use of explosives and toxic substances for fishing.

REFERENCES:

Gunter, (1861) Catalogues of Acanthoterigian fishes. Vol. III

CRUSTACEANS

NAME: Macrobrachium australe (Guérin)
VERNACULAR NAME: Camaron Betangue
CLASS: Crustacea
ORDER: Decapoda
FAMILY: Palaemonidae
SUB-FAMILY: Palaemoninae

DESCRIPTION: Chelae shorter than the body. Cutting edges of the fingers provided with 7-9 small teeth in the proximal part. Legs have greenish tinge. Fingers with two green bands, one of which very broad and situated in the basal part of the finger, the other narrow and separated from the broad band by a small uncoloured ring.

DISTRIBUTION: Known throughout the Indo-West Pacific region from the Seychelles and Madagascar to the Malay archipelago and Oceania as far as Marquesas.

HABITAT AND ECOLOGY: In Mauritius found in all rivers having access directly or indirectly to the sea and among freshwater weeds. Detritus feeder.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: No worthwhile scientific interest. Contribute in minor way to the local diet.

CONSERVATION MEASURES PROPOSED: Protection of estuaries.

CONSERVATION MEASURES TAKEN: Wild Life Act 1983 restricts fishing of Camaron in canals and rivers.

REFERENCES:

Holthuis, (1947) Sub-family Palaemoninae. The Palaemonidae collected by the Siboga and Snellius expeditions with remarks on other species. 1. Decapoda of Siboga Expedition. Part 10. Siboga Exped. Mon., 39(a): 1-100.

NAME: Metapenaeus monoceros (Fabricius)
VERNACULAR NAME: Crevette de Sable
CLASS: Crustacea
ORDER: Decapoda
FAMILY: Panaeidae
SUB-FAMILY: Penaeinae

DESCRIPTION: Body irregularly pubescent. Light tan or pink to brown; pleopods, uropods and antennae red; peduncles and tips of uropods purple; reschia and mera of periopods striped orange and cream.

DISTRIBUTION: Common in New South Wales (Australia), Indonesia and the Philippine Islands to Southern Japan and Indian seas.

HABITAT AND ECOLOGY: Sandy bottom of lagoon; burrowing habit; found up to 10 m.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Highly prized food in Mauritius.

CONSERVATION MEASURES PROPOSED: Protection of estuaries.

CONSERVATION MEASURES TAKEN: Use of shrimp net requires authorization from the Permanent Secretary, Ministry of Agriculture & Fisheries. Fishing for shrimp with artificial light requires permit.

REFERENCES:

Dall, W. (1956) A revision of the Australian species of Penaeinae (Crustacea, Decapoda:Panaeidae). Australian Jour. Mar. & Freshwater Res., Vol 8. pp. 136-231.

NAME: Macrobrachium lar (Fabricius, 1798)
VERNACULAR NAME: Camaron local
CLASS: Crustacea
ORDER: Decapoda
FAMILY: Palaemonidae
SUB-FAMILY: Palaemoninae

DESCRIPTION: Chela rather well developed with scattered red spots in males. Fingers dark violet with one or more white bands.

DISTRIBUTION: Most common Palaemoninae of the Indo-West Pacific region, known from East Africa to the Riukin Islands and the Marquesas.

HABITAT AND ECOLOGY: In Mauritius, found in rivers and rivulets with access to the sea; live in burrows under stones or among freshwater weeds. Detritus feeder.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Unlike Macrobrachium rosenbergii, mass recovery of larvae has not been successful so far. Further research needed. Highly prized and in great demand on the market.

CONSERVATION MEASURES PROPOSED: Protection of estuaries and larval rearing at hatchery level.

CONSERVATION MEASURES TAKEN: Protected through Rivers and Canals Act 1863 and Wild Life Act 1983.

REFERENCES:

Holthuis, L. B. (1939). Zoological results of the Dutch New Guinea expedition. No. 3. Decapoda, Macrura, with a revision of the New Guinea Parustacidae.

NAME: Penaeus monodon (Fabricius 1798)
VERNACULAR NAME: Crevette de mer
ORDER: Decapoda
CLASS: Crustaceae
FAMILY: Penaeidae
SUB-FAMILY: Penaeinae

DESCRIPTION: Carapace and abdomen transversely banded. Body colour ranging from light brown to blue. Rostrum teeth: 7-8/2-3, exceeding tip of antennular peduncle. Antennular flagella unequal and longer than peduncle. Telson unarmed.

DISTRIBUTION: Known in the Indo-Pacific region; common commercial prawn of Calcutta.

HABITAT AND ECOLOGY: In Mauritius, found in estuaries in the south-eastern regions; lives in brackish water. Migrates to the sea for spawning; larvae developed in full sea-water.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Can live in full sea-water; also adapted to live in freshwater. Highly prized food; has become very rare. Artificial rearing to be attempted.

CONSERVATION MEASURES PROPOSED: Protection of estuaries; artificial propagation.

CONSERVATION MEASURES TAKEN: Use of shrimp net requires authorisation from the Permanent Secretary, Ministry of Agriculture & Fisheries. Fishing for shrimp with artificial light requires permit.

REFERENCES:

Dall, W. (1956) A revision of the Australian species of Penaeinae (Crustacea, Decapoda: Penaeidae).

NAME: Ocypode ceratophthalmus (Pallas)
VERNACULAR NAME: Crabe cambresis, beach crab
PHYLUM: Arthropoda
ORDER: Decapoda
CLASS: Crustacea
FAMILY: Ocypodidae

DESCRIPTION: Carapace sometimes widest across the epibranchial area, sometimes across the antero-lateral angles, which are acute and slightly turned outwards. Eye-stalks produced in a long-style form process beyond cornea, usually longer in the male than in the female but variable in both sexes, short in half-grown specimens, and quite underdeveloped in juveniles. Upper orbital margin oblique, a line joining the outer orbital angles being well behind base of front; lower orbital margin with an indistinct notch in middle, no notch at outer orbital margin.

Lower margin of 4th joints of chelipeds and legs, both borders of hand and upper border of finger of chelipeds serrate; a single strong tooth on inner margin of 4th joint of chelipeds (often with smaller accessory teeth); palm of larger chela sparsely granulate, except near lower border, stridulating organ beginning above with a few rounded granules, followed by several widely spaced striae, and then more numerous close-set striae, the number of spaced and close-set striae variable, 14-20 and 15-20 respectively; part of the ridge occupied by hairy striae in front, polished ridge on 3rd joint well-developed, occupying at least half length of joint on larger cheliped, stronger on small cheliped. 6th joint of 2nd and 3rd leg furry; dactyls as in *Cordinamus* usually with strong fringe of hairs on anterior lateral margin; 5th segment of abdomen slightly broader than long. Length up to 40 mm; breadth 45 mm; milky or greyish white.

DISTRIBUTION: Mauritius, east coast of Africa to Red sea, and Indo-Pacific region.

POPULATION: Unknown; evidence that the population has been drastically reduced.

HABITAT AND ECOLOGY: Intertidal zone, sandy beaches with fine sand in which it burrows when disturbed; probably an omnivore. Easy to catch.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Due to the ease with which the crab can be collected and its pleasant taste, it has become quite a popular food.

THREAT TO SURVIVAL: Constant collection pressures have been responsible for a huge reduction in the population which now consists mostly of small crabs.

CONSERVATION MEASURES PROPOSED: It may be appropriate at this stage to regulate exploitation of this species by imposing limits on the size of the crab caught by implementing a close season or completely banning collection on certain beaches.

CONSERVATION MEASURES TAKEN: None.

REFERENCES:

Balkema, A.A. (1969) A guide to marine life on South African shores. University of Cape Town.

Day, J.H. (1969) Marine life on South African shores. University of Cape Town.

MOLLUSCS

NAME: Lambis violacea
VERNACULAR NAME: Violet spider shell
PHYLUM: Mollusca
ORDER: Pterocerea
CLASS: Gastropoda
FAMILY: Strombidae

DESCRIPTION: Shell 73 to 114 mm in length with 10-11 blade-like short labial digitations and a moderately long, slightly twisted, siphonal digitation. About 9 whorls; nuclear whorls not observed; post-nuclear whorls slightly concave, and sharply carinate just above the suture. Shoulder carination bears numerous evenly-sized nodules which are crossed by 4-5 small, but distinct spiral cords. Shoulder of body whorl with a row of 5-6 paired knobs, the last one being the highest. Below these, and in the centre of the body whorl, are 3 strong beaded cords. Remainder of whorls have numerous, smoothish, smaller spiral cords. Outer lip has 9-11 digitations whose under surfaces are smooth, enamel-white and somewhat concave. First digitation obscures the apex of the shell and is bifurcate, the prong to the left being shorter and broader. The 8 or 9 digitations become progressively smaller towards the anterior end. "Stromboid notch" deep and v-shaped. Below it, the base of the outer lip bears 3 or 4 very small digitations. Siphonal canal is twisted but descends almost straight down. Aperture deep inside, somewhat quadrate and violet or lavender, except for a white depression near the top. Outer wall of aperture has about 80 fine, strongly-raised white, spiral lirae; the outer edge has large, weak, yellowish spots. Parietal wall weakly and evenly lirate, its lower section strongly swollen, smooth and tan or purplish cream. Outer shell whitish with few isolated, small, squarish light-brown spots. Periostracum unknown; operculum chitinous, elongate, light brown and with smoothish edge. Radula unknown.

DISTRIBUTION: Endemic to St Brandon Islets, Indian Ocean.

POPULATION: Unknown; believed to be very rare.

HABITAT AND ECOLOGY: St Brandon Island. Probably lives in sand and algae bottoms at a depth of 20-70 ft; diet appears to be restricted to red algae.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: One of the rarest and most attractive Lambis.

THREATS TO SURVIVAL: The species is highly valued on the shell market. A shell can fetch a collector Rs. 150. It is thought that collection has been rather intensive and has resulted in the species becoming rare.

CONSERVATION MEASURES PROPOSED: For the Government to introduce a new provision to prohibit collection of shells except as prescribed by regulation.

CONSERVATION MEASURES TAKEN: There is a general provision in the Fisheries Act 1980 which prohibits import and export of shells except with the permission of the Permanent Secretary.

REFERENCES:

Albot, R.T. (1961) The Genus Lambis in the Indo-Pacific. Indo-Pacific mollusca. 1(3): 147-174.

NAME: Harpa costata (Linne, 1758) (= Harpa imperialis)
VERNACULAR NAME: Harpe double or double harpus
PHYLUM: Mollusca
ORDER: Neogastropoda
CLASS: Gastropoda
FAMILY: Harpidae

SUMMARY: The harp shells have long been favourites with collectors, but Harpa costata (Linne, 1758) is one of the most distinctive species, characterized by its broad shape and the large number of crowded ribs of varying shades for which it is known as the double harpe.

DESCRIPTION: Shell 70-100 mm (2.3/4-4 in.) in length, broadly subquadrate, solid, last whorl very large. Spire conical, protoconch elevated-conical, flesh pink. On the body whorl the ribs are crowded, 30-40 or more in number, depending on the size of the shell. External colouring of shell pale, flesh colour with bands of varying darker shades and some white. Easily distinguished from Harpa ventricosa and H. major by the fact that it has almost twice as many finer ribs.

DISTRIBUTION: Although A. Rehder mentioned the island range of the western Indian Ocean, including Mauritius, Rodrigues and north-eastern Madagascar, there is no record of Harpa costata being collected anywhere but in Mauritius. Until now, the species is endemic to Mauritius.

POPULATION: Harpa costata has always been a rare species compared to its counterpart Harpa major and H. ventricosa which are quite common. Today, only about 10 specimens can be collected over a period of a year.

HABITAT AND ECOLOGY: Found in moderately shallow water inside the Mahébourg lagoon, Le Morne and the northern area of Trou aux Biches; lives on sand and is known to be a very quick burrower by means of its large and stony foot. Feeds on small crabs living in the sand.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Because of its extreme beauty and rarity the shell is being sold from US\$ 50-200 depending on its size and perfection. It has always been highly prized by collectors; collection made difficult due to its quick burrowing ability.

REFERENCES:

Ceyrolle J.L. & V. Chakowa (1984) Les Porcelaines de l'Ile Maurice. (in press)

NAME: Cyprea esantropia (Dulas 1833)
PHYLUM: Mollusca
ORDER: Mesogastropoda
CLASS: Gastropoda
FAMILY: Cyrraeidae

SUMMARY: This species was discovered in Mauritius. Several authors have mistakenly reported it as Cyprea cribellum.

DESCRIPTION: Esantropia is globular and oval in shape and measures 10-20 mm. Resembles C. cribellum but is usually larger and shell is heavier. The dorsum is brown with cream spots.

DISTRIBUTION: According to Burgess, esantropia cowrie is endemic to Mauritius. It is now known to exist in Réunion Island; recently it was reported by B. Salvat and C. Rivers (1975) from Polynesia.

POPULATION: Unknown; cowrie is not common in Mauritius.

HABITAT AND ECOLOGY: C. esantropia lives at depths of 5-15 m on the outer slope near the reefs, under coral blocks. During building works in Port Louis harbour, numerous semi-fossiled specimens were discovered.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Due to its rarity the market value is about US\$ 20; only a few specimens can be collected yearly.

THREATS TO SURVIVAL: It is much sought after; is not left by collectors if found. Main collecting grounds are Baie du Tombeau, Pointe aux Sables, Trou aux Biches, Albion and Mahébourg.

CONSERVATION MEASURES PROPOSED: Government will be introducing a new provision to prohibit collection and sale of shells except as prescribed by regulation.

CONSERVATION MEASURES TAKEN: There is a provision in the Fisheries Act 1980 which prohibits import into or export from Mauritius of any live or dead shell except with permission from the Permanent Secretary.

REFERENCES:

Ceyrolle J.L. & V. Chakowa (1984) Les Porcelaines de l'Ile Maurice. (in press)

NAME: Cyprea broderpii (Sowerby 1932), Rare
PHYLUM: Mollusca
ORDER: Mesogastropoda
CLASS: Gastropoda
FAMILY: Cypraeidae

SUMMARY: This cowrie is one of the most beautiful found in Mauritian waters. It was first discovered in 1973 by a fisherman who caught it in a fish trap at a depth of 20 m, in a pass between Black River and Ile aux Bénitiers. Since then, a few more specimens have been found, but not more than 10 in perfect condition.

DESCRIPTION: Cyprea broderpii is oval and measures 70-100 mm in length; dorsum is covered with network of red-orange reticulations which surround bluish-grey or pink areas; dorsal line is usually distinct and pinkish-grey; extremities and sides are pale pink, with a few white blotches on the latter. The base is white and convex, the aperture narrow, wider towards the anterior. Teeth and interstices are white.

DISTRIBUTION: Broderpii cowrie is now found in Réunion Island, Madagascar, Mozambique and Somalia.

POPULATION: Unknown, but there may be only a few in number.

HABITAT AND ECOLOGY: It is a deep water shell probably found at 50 m depths among rock crevices. Places of intensive collection are Flic en Flac and Trou aux Biches.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Extremely rare and beautiful shell. Collected only by a limited number of scuba divers who are able to sell their catch at a very high price; market value is about US\$ 1,000 for a perfect specimen.

CONSERVATION MEASURES PROPOSED: Government is to introduce a new provision in the Fisheries Act 1980 to prohibit collection and sale of shells except as prescribed by regulation.

CONSERVATION MEASURES TAKEN: There is a provision in the Act which prohibits import into or export from Mauritius of any live or dead shell except with the permission of the Permanent Secretary.

REFERENCES:

Ceyrolle J.L. & V. Chakowa (1984) Les Porcelaines de l'Ile Maurice. (in press)

NAME: Cyprea cribellum (Gaskoin) 1849, Rare
VERNACULAR NAME: Porcelaine à Bois
PHYLUM: Mollusca
ORDER: Mesogastropoda
CLASS: Gastropoda
FAMILY: Cypraeidae

SUMMARY: This tiny little cowrie forms part of the beautiful cypraeidae family. It is much sought after by serious collectors.

DESCRIPTION: C. cribellum is cylindrical in shape, elongated, and measures 10 to 20 mm in length. Its dorsum is brown or light brown, studded with numerous round or hexagonal lacunae, white or grey in colour, and separated from one another by a thin brown seam; three darker transversal bands are also visible on the dorsum. The base is white and convex, inner lip is flat and slightly yellow, outer lip inflected in the middle; aperture is narrow with white teeth, labials more prominent than the columellar ones; external edge prominently angular and covered with tiny brown dots which extend as far as the white extremities; there is no dorsal line.

DISTRIBUTION: C. Cribellum is limited to Mauritius and Réunion.

POPULATION: This cowrie is not common in Mauritius. The main collecting grounds are Baie du Tombeau, Trou aux Biches, Black River and Pointe d'Esny in Mahébourg.

HABITAT AND ECOLOGY: Shallow water, inner side of reef.

SCIENTIFIC INTEREST AND POTENTIAL VALUE: Because it is small, it is difficult to see on the reef; brings a good price to fishermen with market value US\$ 10-20 each.

THREATS TO SURVIVAL: Search for this species is intense in spite of its rarity.

CONSERVATION MEASURES PROPOSED: The Government is to introduce a new provision prohibiting the collection and sale of shells except as prescribed by regulation.

CONSERVATION MEASURES TAKEN: There is a provision in the Fisheries Act 1980 which prohibits import into or export from Mauritius of any live or dead shell except with permission of the Permanent Secretary.

REFERENCES:

Ceyrolle, J.L. & V. Chakowa (1984) Les Porcelaines de l'Ile Maurice. (in press)

PLANTS

NAME: Pandanus vandermeerschii Balf. f.
VERNACULAR NAME: Screw pine or 'Vacoa'
FAMILY: Pandanaceae

STATUS: About 200 mature trees on Round Island (58 per cent of population senescent); 10-15 on Gunner's Quoin, one on Ile aux Aigrettes, 2-3 on Ile Plate.

DESCRIPTION: Low tree, 6-8 m high, usually growing in clumps and sometimes forming small thickets; main stem 20-25 cm in diam. Freely branched, the ultimate branches often descending and terminated by drooping, spiralling tufts of leaves. Bark pinkish grey, sparsely armed with wart-like spires. Stilt roots 6-7 cm diameter, arising from base of trunk. Leaves 50-75 cm long, 4-5 cm broad, bluish-green, tapering gradually from the base, marginal spires orange-red. Female head, trigono-globose or depressed at the apex 14-16 cm in diam. 250-450 drupes, peduncle pendulous 30-40 cm long. Drupes up to 3 cm long, 1-1.5 cm broad; 1-4 locular carpels usually uniseriate, rarely scattered, free in the upper half, the exposed portion of drupe steeply conical or fusiform, deep green, with a red band at the base, joined portion truncate, pale yellow when ripe. Summit of drupe deeply cleft between the oblique stigmas which are less than 2 mm broad. Male flower unknown.

DISTRIBUTION: Endemic to Mauritius, Indian Ocean.

HABITAT: Round Island, Ile Plate, Ile aux Aigrettes, Gunner's Quoin and some coastal sites on mainland. Erosion of substrate and accidental fires are threats.

BIOLOGY AND POTENTIAL VALUE: Important habitat for the arboreal geckos of Round Island. Provide shade which is useful for water and top soil conservation on island.

CONSERVATION MEASURES PROPOSED: Improvement of habitat with respect to substrate.

CONSERVATION MEASURES TAKEN: Cultivation of a few trees in gardens on the mainland (Pamplemousses Botanical Gardens).

REFERENCES:

Bullock, D. & S. North (1975) Report of the Edinburgh University expedition to Round Island.

Vaughan, R.E. & P.O. Wiehe (1953) The genus Pandanus in the Mascarene Island. J. Linn. Soc. Botany, Vol. IV (356).

Vinson, J. (1964) Sur la disparition progressive de la flore et de la faune de l'Ile Ronde.

NAME: Hyoporbe lagenicaulis (L.H. Bailey, H.E. Moore)
VERNACULAR NAME: Palmiste bouteille, palmiste gargoulette, bottle palm
FAMILY: Palmae

STATUS: Very rare in the wild, 10-12 individuals on Round Island.

DESCRIPTION: Palm 60 ft high, with a bottle-shaped stem 15-24 in. in diameter near the base, slightly diminishing upwards to the base of the leaf-sheaths where it is abruptly constricted. Leaf-sheath cylindrical; petiole 12-18 in. long, somewhat trigonous, grooved on the face; pinnae in 40-60 pairs lanceo, acuminate, 18 in. long, 2 in. broad; the central and one lateral vein on each side prominent on the upper surface and several secondary veins also prominent beneath, which are clothed towards the base with subridged adpressed lanceolate scales. Spadix with clustered branches; peduncle 1 ft long. Rudimentary pistil of male flower elongated, grooved. Fruit elliptic-oblong. Seed elliptical, 5/12 to 7/12 in. long with branches of the raphe diverging a little above the hilum and the embryo either subapical or medial. Area speciosa. Description H. amaricaulis = H. lagenicaulis in Baker, (1977).

DISTRIBUTION: Endemic to Mauritius, Indian Ocean.

HABITAT AND ECOLOGY: Part of the coastal savannah of Round Island. Erosion and grazing by rabbits are detrimental to the regeneration of the species.

BIOLOGY AND POTENTIAL VALUE: Important in the ecology of arboreal lizards on the island; provides source of nectar for insects which are part of the diet of various species of endemic lizards.

CONSERVATION MEASURES PROPOSED: It is thought that porous concrete wall enclosures (4 ft x 10 ft) around palm trees would prevent erosion and interference by birds (shearwaters) and rabbits.

CONSERVATION MEASURES TAKEN: Cultivated in Mauritius (Pamplemousses) and overseas.

REFERENCES:

Baker, F.M.S. (1977) Flora of Mauritius and the Seychelles. L. Reeve & Co. Ltd., Ashford, Kent.

Vinson, J. (1964) Sur la disparition progressive de la flore et de la faune de l'Ile Ronde.

Vaughan, R.E. & P.O. Wiehe (1937-1947) Studies of the vegetation of Mauritius.

NAME: Gastonia cutispongia Lam
VERNACULAR NAME: Bois boeuf, Bois d'Eponge
FAMILY: Araliaceae

STATUS: Vulnerable, 30-40 trees at Ile aux Aigrettes; very few left on mainland at lower altitudes. Indigenous to Mauritius.

DESCRIPTION: A stocky heterophyllous tree 12-15 ft tall, with dense crown. Leaves compound about 1 ft long, leaflets coriaceous, oblong, about 5-6 in. long. Inflorescences paniculate, reaching 1 ft in length, flowers umbellate, creamy, stamens and petals 10-12 in number.

DISTRIBUTION: Mauritius, Indian Ocean.

HABITAT AND ECOLOGY: Ile aux Aigrettes; coastal area in Mauritius.

BIOLOGY AND POTENTIAL VALUE: Native salt-resistant species of characteristic appearance; valuable, fast growing shade tree.

REFERENCES:

Baker, F.M.S. (1877) Flora of Mauritius and the Seychelles.

NAME: Diospyros eggettatum I.B.K. Richardson
VERNACULAR NAME: Bois d'Ebene
FAMILY: Ebanaceae

STATUS: 200-400 on Ile aux Aigrettes; remnant of coastal forest of Mauritius.

DESCRIPTION: A low tree, 5-6 m tall, trunk grey, very often covered by lichens. Leaves broadly oval (6-10 x 4-6 cm), coriaceous, cordate at the base, petiole short and thick; about 0.5-1 cm long. Flowers male or female. The male in glomerules of 3-8, calyx cup-shaped to cylindrical, 5-7 lobed silky, corolla 10-12 mm in diameter, tubular, about 6 mm long; 5-6 lobed, stamens 30-45, biseriate. Female similar to male but with subspherical calyx, staminodes c. 20 in number, fruit 3-4 cm in diam., calyx cupuliform, seeds c. 10 in number.

DISTRIBUTION: Endemic to Mauritius, Indian Ocean.

HABITAT AND ECOLOGY: Ile aux Aigrettes. No sign of regeneration; fruits and seeds apparently eaten by rats.

BIOLOGY AND POTENTIAL VALUE: A native salt-resistant tree; coastal distribution.

CONSERVATION MEASURES PROPOSED: Control of rat population by raticides. Protection against degradation by human interference (illegal collection of timber or firewood). Further measures are under consideration.

CONSERVATION MEASURES TAKEN: Ile aux Aigrettes protected as Nature Reserve since 30 November 1965.

REFERENCES:

Richardson, I.B.K. (1981) Flore des Mascareignes. Family 117, Ebanaceae. Govt. Print., Port Louis, Mauritius.

NAME: Latania loddigesii Martius
VERNACULAR NAME: Latin palm, fan palm
FAMILY: Palmae

STATUS: Dominant species on Round Island; scattered trees 4-6 m high, interspersed in groves with young stands.

DESCRIPTION: Palm 50 ft high. Petiole 3-4.5 ft long, tomentose; entire margins in mature tree, spiny in young plant, blade 3-5 ft long, very flaucous; primary veins slightly tomentose and tinged with red, especially in young plants; segment 2 ft long, under 3 in. broad, unequally acuminate; the edges spiny in young plants. Male spadix 5 ft long, with 8-12 branches, spikes 8-10 in. long, 3/8-7/12 in. broad, forming in clusters of 3-9 from the end of the branches on a level with the mouth of the spathe. Perianth 3/8 in. long, segments not fringed; 16-20 or more stamens. Rudimentary pistil of 3-5 grooved filaments, nearly as long as the stamens. Female spadix 3.5-4 ft long with 5-6 branches, each bearing 1 or 2 spikes. Drupe obovoid or puriform trigonous, 2.5 in. long, 1-3/4 in. broad, pyrenes elongate - obovoid, faintly mucronate at apex, 1.3/4-2.1/4 in. long, 3/4-5/6 in. broad, with a central ridge along the convex; furnished with a central crest, usually for only part of its length. Seed with dark brown testa.

DISTRIBUTION: Endemic to Mauritius, Indian Ocean.

HABITAT AND ECOLOGY: Dominant species throughout Round Island. Also found on Flat Island, Gunner's Quoin and Ile d'Ambre in very small numbers. Threats to this species are rabbits and possibly shearwaters. Presence of healthy regeneration in rocky gullies in contrast to absence of such regeneration over large areas with deep soil where shearwater nests are found. Probably part of the original coastal savannah on the mainland; almost disappeared due to human settlement.

BIOLOGY AND POTENTIAL VALUE: Of considerable importance to the Round Island ecosystem. Its trunk and crowns are almost the only remaining habitats for the two arboreal Phelsuma geckos and possibly the snake Casserea, which has also been reported to be arboreal (Temple, 1974). Its dead stump, debris and trunks form a great portion of the stored organic matter vital for further plant establishment and retard soil erosion.

CONSERVATION MEASURES PROPOSED: Propagation of the plants in porous concrete walled enclosures of 4 ft x 10 ft (as was proposed for other palm species on Round Island).

CONSERVATION MEASURES TAKEN: Elimination of goats; recent attempts to reduce rabbit populations. Cultivation in Botanical Gardens and some private gardens in Mauritius and overseas.

REFERENCES:

Baker, F.M.S. (1877) The Flora of Mauritius and the Seychelles.

NAME: Pisonia grandis R. Br
VERNACULAR NAME: Mapou
FAMILY: Nyctaginaceae

STATUS: Indigenous to Rodrigues where it is very restricted in distribution.

DESCRIPTION: Low tree about 6 m tall with thick trunk and branches. Leaves oval to narrowly oval, 12-13 x 7-16 cm, membranous, pointed at apex. Flowers small in dense panicle. Fruits (anthocarps) pubescent, glandular, adherent to bird feathers.

DISTRIBUTION: Islands in tropical region of Indo-Pacific.

HABITAT AND ECOLOGY: Coastal sand dunes at Ile Cocos; rarer at Ile aux Sables.

BIOLOGY AND POTENTIAL VALUE: Grows in thicket formations along coast and forms a favourite site for roosting of noddies. Regeneration known to be closely associated with deposits of phosphatic guano.

CONSERVATION MEASURES PROPOSED: Propagation suggested.

CONSERVATION MEASURES TAKEN: Ile Cocos and Ile aux Sables protected as Nature Reserves.

REFERENCES:

Gueho, J. (1980) A survey of vegetation of the lagoon islets of Rodrigues. Rev. Agric. Sucri. Ile Maurice, 59(1).

Staub, F. (1973) Birds of Rodrigues Island.

NAME: Sideroxylon boutonianum D.C.
VERNACULAR NAME: Bois de Fer
FAMILY: Sapotaceae

STATUS: Scarce.

DISTRIBUTION: Endemic to Mauritius, Indian Ocean.

DESCRIPTION: Tree about 10-15 m tall, brownish bark. Leaves broad, elliptic to oval (7-11 x 6 cm) rounded at apex, glabrous thin, coriaceous, light green. Flowers fascicled or solitary, borne on short pedicels; bare on portion of the branchlets below the leaves, corolla 4-5 mm long, 4-5 lobed. Fruit globular, about 1.2 cm in diam., containing a single seed about 1.0 cm broad, embryo transversal.

HABITAT AND ECOLOGY: Found in lowland coastal forest of Mauritius; one mature tree left at Ile aux Aigrettes.

BIOLOGY AND POTENTIAL VALUE: A hard wood, salt-resistant tree of low regeneration rate. Fruits probably destroyed by rats at Ile aux Aigrettes.

CONSERVATION MEASURES PROPOSED: Propagation and replanting at Ile aux Aigrettes.

CONSERVATION MEASURES TAKEN: Ile aux Aigrettes protected as Nature Reserve.

REFERENCES:

Friedmann, F. (1981) Flore des Mascareignes. Family 116, Sapotaceae. Govt. Print., Port Louis, Mauritius.

NAME: Lomatophyllum tormentorii Marais
FAMILY: Liliaceae

STATUS: 500 (Round Island); 2,000 (Gunner's Quoin).

DISTRIBUTION: Endemic to Mauritius, Indian Ocean.

DESCRIPTION: Accumbent to very short-stemmed, succulent aloe-like plant, leaves about 60 x 15 cm, rigid, shallowly channelled, pale-green to bluish-green in colour, margins horny, pale-coloured, toothed. Inflorescence, panicle up to 120 cm long, bearing bunches of pendant, tubular, pinkish flowers, greenish towards the lip. Fruits: a globular berry 2-2.3 cm in diameter containing several dark grey seeds.

HABITAT AND ECOLOGY: Round Island, Gunner's Quoin.

BIOLOGY AND POTENTIAL VALUE: Suspected of having medicinal value. A special feature is that pollination requires the presence of gecko lizards which feed on nectar.

CONSERVATION MEASURES TAKEN: Round Island and Gunner's Quoin (Coin de Mire) declared Nature Reserves.

REFERENCES:

Marais, W. (1978) Flore des Mascareignes. Family 183, Liliaceae. Govt. Print., Port Louis, Mauritius.

Bullock, D. & S. North (1975) Report of the Edinburgh University expedition to Round Island.

NAME: Listrostachys polystachys Rchb. f
FAMILY: Orchidaceae

STATUS: 50 - 60 at Ile aux Aigrettes.

DESCRIPTION: Stem stout terete, 3-6 in. high, here and there giving off wiry, leaf-opposed, aerial roots; leaves subimbricate, oblong, obliquely emarginate, 1-2 in. long, .5 in. (or more) broad. Racemes erect, leaf-opposed, laxly flowered, 6 in. (or more) in length, with several close, scattered sheathing scales; bracts rotundate, loose, pedicel and ovary 1/3 in. long. Sepals linear-lanceolate, acuminate, 3/4 in. long. Petals a little shorter, linear. Labellum about the same length as petals, ovate-rotundate, 3-lobed; lateral lobes crenulate, convolute around the column below; mid-lobed narrow-linear, entire, 1/4 in. long; spur tapering, nearly 1/6 in. in length. Glandicels linear; rostellum of two fleshy, obtuse lobes directed upwards and forwards.

DISTRIBUTION: Mauritius, Indian Ocean.

HABITAT AND ECOLOGY: Indigenous to Mauritius. Grows as epiphyte on Diospyros egrettarum. Interference by man and rats are threats. The species is only found in the wild at Ile aux Aigrettes.

BIOLOGY AND POTENTIAL VALUE: Epiphytic ornamental with white flowers; of touristic interest.

CONSERVATION MEASURES PROPOSED: Propagation in coastal park; control of rats. Further measures needed.

CONSERVATION MEASURES TAKEN: Ile aux Aigrettes protected as Nature Reserve since 30 November 1965. A few specimens cultivated by orchid collectors in Mauritius (Oeniella polystachya).

REFERENCES:

Baker, F.M.S. (1877) The flora of Mauritius and the Seychelles.

NAME: Nesogenes decumbens Balf.f.

STATUS: Endemic to Rodrigues; very rare in Plaine Corail.

DESCRIPTION: A diffuse perennial herb, branched at the crown of the root, with trailing or little-branched downy, slender, wiry stems, 1-2 ft long. Leaves short-petioled membranous, lanceolate or rhomboid, acute, small entire or sparsely toothed, base cuneate, the upper reduced. Flowers 3-4 in umbels in the axis of the leaves all down the stems, on short downy pedicels. Calyx 1/6 in. long; teeth lanceolate-cuspidate, as long as the tube. Corolla twice as long as the calyx, gradually widening from the base to the top of the tube.

DISTRIBUTION: Rodrigues, Indian Ocean.

HABITAT AND ECOLOGY: Occurs on calcarenite of coastal belt.

BIOLOGY AND POTENTIAL VALUE: Population greatly reduced due to degradation of habitat.

CONSERVATION MEASURES PROPOSED: Inclusion of area where plant last located in Nature Reserve, Plaine Corail.

CONSERVATION MEASURES TAKEN: Specimens under constant observation in undeclared protected areas.

REFERENCES:

Baker, F.M.S. (1977) Flora of Mauritius and the Seychelles.

Tirvengadam, D.D. (1980) On the possible extinction of Randia heterophylla from Rodrigues Island. Bull. Inst. Mauritius 9(1): 3-4.

NAME: Zanthoxylum paniculatum Balf. f.
VERNACULAR NAME: Bois Pasner, Bambara
FAMILY: Rutaceae

STATUS: Endemic to Rodrigues; very rare. Probably five trees at Anse Quitar.

DESCRIPTION: A spinose tree with compound leaves; leaflets elliptic to oblong 14 x 8 mm, 7 - 9 pairs subsessile. Acute to rounded at the tip, unequal at the base, margin entire. Fruit subspherical 7-9 x 6-7 mm verrucose, seeds ovoid, shiny black.

DISTRIBUTION: Rodrigues, Indian Ocean.

HABITAT AND ECOLOGY: Coastal belt on calcarenite soil beside river ravine.

BIOLOGY AND POTENTIAL VALUE: No natural regeneration observed so far.

CONSERVATION MEASURES PROPOSED: Probable inclusion of Anse Quitar in a proposed Nature Reserve and propagation of the species.

CONSERVATION MEASURES TAKEN: Constant observation in undeclared protected area.

REFERENCES:

Coode, M.J.E. (1979) Flore des Mascareignes. Family 65, Rutaceae. Govt. Print., Port Louis, Mauritius.

NAME: Antirrhoea fraxulacea D.C.
FAMILY: Rubiaceae

STATUS: Very rare; only a few specimens left near Pointe Corail airport.

DESCRIPTION: A much-branched shrub 4-6 ft high, with slender branchlets. Leaves opposite, crowded towards end of branchlets, petioled, oblanceolate - oblong, 2-3 in. long, subcoriaceous, glabrous, acute, cuneate at the base; stipules small lanceolate, deciduous, peduncles slender, glabrous, .5-1 in. long, the flowers not crowded and branchlets slightly silky. Calyx 1/24 in. long, silky, teeth 4, deltoid. Corolla nearly glabrous, yellowish, 1/8-1/6 in. long. Ovary 3-celled. Drupe globose, the size of a small pea, containing 3 pyrene.

DISTRIBUTION: Endemic to Rodrigues, Mauritius, Indian Ocean.

HABITAT AND ECOLOGY: Coastal belt of Rodrigues Island.

BIOLOGY AND POTENTIAL VALUE: Virtually no natural regeneration. Extensive damage by goats (Tirvengadam).

CONSERVATION MEASURES PROPOSED: Propagation.

CONSERVATION MEASURES TAKEN: Species under constant observation in undeclared protected area.

REFERENCES:

Baker, F.M.S. (1977) Flora of Mauritius and the Seychelles.

Tirvengadam, D.D. (1980) On the possible extinction of Randia heterophylla from Rodrigues Island.

NAME: Dictyosperma album var. conjugatum, Moore & Gueho
VERNACULAR NAME: Hurricane palm, Palmiste blanc.
FAMILY: Palmae

STATUS: Endangered; found to be exceedingly rare on Round Island already by 1975. At present, only two mature individuals left. No seedlings found and no flowering has been observed in recent years.

DESCRIPTION: A palm about 5 m tall, generally short and stout. Leaf sheaths whitish or brownish-tomentose; petiole usually tomentose on one or both surfaces; pinnae connected distally by persistent veins, with green mid-rib and 1-2 prominent intermediate veins on each side, ramenta prominent and tomentose on mid-rib towards base beneath. Staminate buds red to maroon or blackish, about 8 mm long.

DISTRIBUTION: Mauritius, Indian Ocean.

HABITAT AND ECOLOGY: Endemic palm of Round Island; formed a considerable proportion of the trees on the slopes in the past. It is imperative that the wild genetic stock be preserved. Specific threats to this species are the ploughing effects of fouquets (shearwaters), rabbit grazing and soil erosion.

BIOLOGY AND POTENTIAL VALUE: Important in the ecology of Round Island arboreal lizards. Provides source of nectar to insects which form part of diet of various endemic lizards.

CONSERVATION MEASURES PROPOSED: It is thought that porous concrete wall enclosures (4 ft x 10 ft) around the palm tree would prevent erosion, exclude rabbit and fouquets interference and allow accumulation of humus. May greatly help regeneration of the palm.

CONSERVATION MEASURES TAKEN: Species cultivated in Pamplémousses Botanical Gardens and elsewhere.

REFERENCES:

- Bullock, D. & S. North (1975) Report of the Edinburgh University expedition to Round Island.
- Johnston, H.H. (1894) Report on the Flora of Round Island. Mauritius Printing Co., Port Louis, Mauritius.
- Moore, H.E. & J. Gueho (1980) Acanthophoenix and Dictyosperma (Palmae) in the Mascarene Islands. Gentes Herbarium, 12(1): 1-16.
- Vaughan, R.E. & P.O. Wiehe (1937-1947) Studies of the vegetation of Mauritius.
- Vinson, J. (1964) Sur la disparition progressive de la flore et de la faune de l'Ile Ronde.

CONCLUSIONS

Birds

With the exception of the noddy, lesser noddy and fairy tern which are plentiful on Serpent Island and St Brandon, all the species mentioned appear to be poorly protected. In spite of the fact that Round Island was declared a Nature Reserve and legislation has been revised to increase protection of bird species, there is a lack of enforcement mechanisms for the protection of these birds and other animals against poaching by fishermen. It is also noted that a gradual degradation of vegetation (enhanced by the effect of cyclones) coupled with soil erosion is still causing serious problems in spite of the elimination of goats and partial reduction of the rabbit population. The continued survival of most animal and plant species seems to centre around the conservation of an adequate substrate and vegetation cover. The petrel may be mentioned here as an example of a bird which is extremely sensitive to these environmental degradations.

The noddies and lesser noddies are fairly abundant on both Ile aux Cocos and Ile aux Sables of Rodrigues and on St Brandon islets. In the former, protection is adequate due to the presence of a watchman on Ile aux Cocos and the fact that a permit is required in order to visit the island. Protection of birds on the St Brandon islets, which are endowed with an extremely rich avifauna, leaves much to be desired. Collection of birds' eggs, particularly those of the sooty tern, which provide an additional source of protein to the inhabitants, is not regulated. In addition, there is poaching. Colonies of sooty tern, frigates and roseate terns found on Albatross Island have diminished and need urgent protection from man's interference. The Rodrigues fody and the Rodrigues warbler, both endemic birds, are protected by law. Nevertheless, they have become extremely rare and endangered due to loss of indigenous vegetation. Steps are being taken to remedy the situation.

Reptiles

None of the reptiles on Round Island can be considered secure. The two boas are endangered, possibly threatened with extinction. The other lizards and geckos are disappearing rapidly due to environmental degradation.

Marine turtles

Legally, marine turtles are well protected. The Fisheries Act 1980 prohibits fishing or sale of any turtles within Mauritian waters. Until recently, the company exploiting fishery and guano resources of the St Brandon shoal was given a quota for catching and exporting the male turtle Chelonia mydas to Mauritius. As from this year a complete ban has been implemented on fishing and exportation of green turtles. There are no means of ensuring the extent to which turtle life is protected on the islets, which form one of the most important reserves under Mauritian jurisdiction. Enforcement of legislation and of its own regulations for the management of resources rests with the company.

Molluscs

All the mollusc species appear to be insufficiently protected. The high demand for shells world-wide, particularly rare ones, does not help the situation in Mauritius. A large number of amateur divers and tourists, who visit the island throughout the year and who explore the reefs for the purpose of collecting shells exacerbate the existing assault on the species for commercial purposes. There is no restricted area where collection is banned completely and the law concerns export and import of shells and corals only.

Corals

None of the coral species mentioned are secure. Already there is extensive destruction of coral communities around Mauritius due to the use of explosives and excessive seinings. However, black coral communities are also found at great depths (30 m or more on the external slope of the fringing coral reef). Due to its relative inaccessibility, some measure of protection is already afforded to this group. Furthermore, the making of black coral jewelry and trade in black coral are not yet carried on in Mauritius. It is probable that the quality available is not suitable for jewelry. However, according to recent information, it is feared that some black coral communities have drawn the attention of tourist divers from a nearby island; thus coral is gradually removed without the knowledge of the Mauritian authorities.

Regulations concerning corals are restricted to import and export as in the case of molluscs and other invertebrates. There are no designated areas of reefs that are protected from man's interference.

Crustaceans

Of the crustaceans, those which are attached to intertidal habitats. e.g., Ocypode ceratophthalmus, and those requiring fresh or brackish water at some time in their life cycle appear to be more threatened either by pollution from land-based sources or from direct human exploitation. The freshwater crab is rarely seen in rivers or estuaries. Macrobrachium lar and M. australe, both requiring brackish water for reproduction, have been decimated by pollution and over-exploitation. Likewise, Penaeus monodon, whose juvenile phase requires estuaries, has become rare. The Wild Life Act 1983 governs Macrobrachium sp. fishing, whereas section 18 of the Fisheries Act regulates, to some extent, fishing of Penaeid sp. with artificial light. Apart from these regulations there are no provisions for other shore species.

Fishes

Most of the commercial fish species are relatively well protected by the Fisheries Act which also provides for reserve areas mentioned earlier. However, there are no specific provisions governing minimum size for Chanos chanos, Agnostomus telfairri etc. which may have become more prone to pollution than to over-exploitation. Estuarine-linked species, therefore, appear to be more vulnerable at a certain stage in their life history. The two freshwater mullets are rarely seen today.

It is difficult to state with any confidence whether the small fish collected for export as aquarium fish are relatively safe from exploitation; such activities are restricted to a small group of people. A few rare species are found at great depths which partly ensures their protection. Nevertheless, there is a need to exercise a stricter control over this type of fishery which, until now, has been restricted by export permits.

Plants

With the exception of Latania loddigesii, which forms the dominant species on Round Island and which is also cultivated on the mainland, the other species mentioned appear to be poorly protected in the wild. A few endemic species on Rodrigues Island also appear to be on the verge of extinction.

Steps required to improve protection

Round Island and other islets

From the foregoing paragraphs it is at once apparent that the most serious problems encountered concern Round Island which is already a Nature Reserve. The unique flora and fauna are seriously threatened and urgent measures must be taken without delay to save what is left. The following remedial steps have been proposed:

- (a) search and elimination of the few goats that may still be on the island;
- (b) complete elimination of rabbits by a carefully selected poison which would not be harmful to other animals;
- (c) reduction of erosion by construction of bunds and use of vegetation;
- (d) propagation of native plants on other islets or the mainland for the re-establishment of a vegetation cover;
- (e) building a system for the collection and preservation of water, i.e., step dams;
- (f) proper patrolling system of island by wardens to deter poachers from destroying the avifauna. It may be necessary to build a permanent cyclone-proof store or shelter on the islet and later extend similar facilities to nearby islets. A radio link ought to be established between the mainland and Round Island and walkie-talkie facilities should be used between islets;
- (g) a seaworthy patrol boat, with a suitable dinghy (for landing purposes), must be made available regularly for travel between Round Island, the mainland and nearby islets;
- (h) the store/shelter facility (f) may be expanded at a later stage to provide accommodation for visiting scientists. When the need arises, staff can be increased to include wardens, etc.
- (i) funds must be made available to set up supporting infrastructure;
- (j) for some islets, priority must be given to the elimination of rats which are preventing regeneration of some endemic plants; also, to fence in pockets of native vegetation (as on Ile aux Aigrettes).

St Brandon

The islets on the shoal are leased to a fishing company which has the responsibility for their proper management. The leasees have taken a number of steps to minimize interference with the fauna within the framework of their economic activities by imposing certain regulations of their own concerning collection of young birds and eggs. North Island was even set aside as a turtle reserve and a ban has been in force against the taking of marine turtle eggs at any time of the year. These measures, though commendable, cannot be considered sufficient in view of the lack of enforcement. The islets have a great potential for the development of wildlife and tourism, and as such should be left in their most natural condition.

The State should therefore take an active part in regulating the activities of the leasee on the island. Constant supervision may be necessary and this may possibly involve the posting of an officer or warden with residence facilities on one of the islands. Another important step would be to declare some of the islets as Nature Reserves. The possibilities for allowing green turtle and bird populations to recuperate are tremendous.

Rodrigues

The two endemic bird species of Rodrigues are in need of protection. Steps have already been taken to breed them in captivity at the Government Aviary in Mauritius. This may not be enough and their natural habitat should be protected by reafforestation with indigenous flora. Areas like Cascade Pigeon, where these species occur in the wild, should be declared Nature Reserves.

Marine habitats/species

Mention has been made of the lack of adequate protective measures and enforcement procedures for protecting most marine invertebrates of the lagoon, reef and shore, and also of some marine habitats themselves. In order to overcome these difficulties, it is advisable at this point to declare a few selected areas of the lagoon, including reefs and mangroves, as marine parks where no human interference of any sort will be permitted. Provision must also be made for their security by appointing and training an appropriate number of park guards and other field staff. The necessary equipment for facilitating protection and enforcement should be purchased.

In the short term, however, some critical areas in the reserves may be zoned, thus prohibiting activity of any sort. This may include mangrove, reef or nursery areas until such time as the Government is ready to implement a marine park policy. Strict control should be exercised over the exploitation of 'aquarium' organisms in the reef. Collection of beach crabs or tec-tec should be forbidden on some of the beaches at certain times of the year.

In addition to the references mentioned in the data sheets, the following general references have been cited:

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- Desjardin, J. (1834) Rapport annuel sur les travaux de la société d'Histoire Naturelle de l'Ile Maurice pendant le courant de l'année 1883. Ann. Sc. nat. zool. (2)2.
- Dupont, J. de R. de Saint Antonie (1970) Annual Report of Mauritius Institute, 1969.
- Hugh, G. (1976) The St Brandon Turtle Fishery. Proc. R. Soc. Arts & Sci. Mauritius, 3(12): 166-189.
- Thomson R.K. (1981) Nesting of the green sea turtle, Chelonia mydas (Linnaeus) 1758 in Mauritius. Rev. Agric. Suc. de l'Ile Maurice, 60: 125-130.
- Vaughan, R.E. (1940) Annual Report of the Board of Directors of the Mauritius Institute for 1938. (Records the capture of a leathery turtle Dermochelys coriacea 5'6", weight 800 lbs, Trou d'Eau Douce on the coast of Mauritius, p.6)
- Anonymous, (1932) Les tortues et autres reptiles. Proc. R. Soc. Arts & Sci., Mauritius. Centenary volume: 89-92. (Mentions two marine turtles occurring in Mauritius, edible green turtle and tortoise shell species).

PROPOSALS FOR NEW PROTECTED AREAS

Habitats which require further protection are coral reefs, lagoons, mangroves, estuaries and some offshore islets with important wildlife resources such as St Brandon. Lagoons encompass various other habitats such as sea-grasses, intertidal mud or sand-flats, etc.

Species which are badly in need of protection can be classified as follows:

1. Fishes/shellfishes associated with brackish water (estuaries), either wholly or periodically exposed to the threat of pollution; these include freshwater mullet, Macrobrachium spp., Penaeid spp. Chanos chanos, freshwater crab, etc.
2. Animals depending on the intertidal environment, the beach or marine islets where interference by humans is easy. These animals include, among others, the crab Ocypode sp., the mollusc Donax faba (both collected intensively) and turtles, whose critical habitat is the beach. Numerous bird species, in particular the blue-faced booby, frigate and sooty tern, which nest on the sandy substrate of the islets of St Brandon, may require protection. Birds of Round Island need protection but this has been dealt with adequately. The two endemic birds of Rodrigues are on the verge of extinction and must be given priority.
3. Slow-moving organisms inhabiting lagoons (sandy, rocky areas, etc.) or coral reefs can be picked off easily by amateur or professional divers who catch these organisms at great depths. Most of the attractive shells or those having commercial value fall in this category, e.g. the Conus, Cyprea, etc.
4. Small reef-inhabiting fishes, providing a rich and varied life, are exploited as aquarium fishes for export. Special mention is made of the endemic anemone fish Amphiprion chrysoaster, exploited along with the anemone with which they associate.
5. Most of the rare and endemic plants are poorly protected especially species from Rodrigues Islands and Ile aux Aigrettes. The Rodrigues Antirrhoea frungulacea, Nesogenus decembens and Hyophorbe tanqenicaulis are all endangered and need urgent consideration.

The categories of protected areas which need further protection of habitats and species are as follows:

Category (I): Scientific Reserve (Strict Nature Reserve)

This would cover parts of coral reef, lagoon and mangrove habitats. At the same time, threatened reef-inhabiting fishes, molluscs and other invertebrates will be protected through the complete elimination of human interference. A few islets in the St Brandon archipelago, containing important bird life, can be protected under this category.

Category (IV): Nature Conservation Reserve/Managed Nature Reserve/Wildlife Sanctuary

Endemic birds and plants of Rodrigues and some of the threatened coastal plants of Mauritius will be protected under this category. Manipulation and transplant of some of these species or their habitats are absolutely essential for ensuring their survival and regeneration. Marine turtle sanctuaries on some of the St Brandon islets can be protected either under this category or under the previous one.

Category (VIII): Multiple Use Management Area/Managed Resource Area

The fishing reserves already implemented in Mauritius fall under this category. Should the Government find it financially unfeasible to implement a strict nature reserve in the lagoon, a zoning system of the present reserves could be introduced so that conservation of certain habitats (e.g. coral reefs, estuaries) is assured.

Estuaries must be given considerable attention due to a decline in a number of species. The problem lies, most likely, with land-based pollution. Selected areas of estuaries must be designated for the careful management and protection of fish and crustaceans already mentioned.

Guidance on gaps in the protected area system in Mauritius

There are serious deficiencies in the protected area system in Mauritius. They are as follows:

- (a) No management plans are being designed to cater to specific problem areas;
- (b) No additional funds are supplied for improving the protection of some of the Nature Reserves. In some cases, even a minimum of surveillance cannot be maintained. The Forestry Service does not have a boat for patrolling the numerous islets (or declared Nature Reserves) off the coast of Mauritius. Accessibility to places like Round Island, Gunner's Quoin, Flat Island etc., is a problem; cost is another. Occasional patrolling of the islets occurs when boats are put at the disposal of Forestry Service officers either by the Fisheries Department or Marine Authority. Due to economic difficulties in Mauritius, disbursing funds for such services is always given low priority;
- (c) Forestry and Fishery protection personnel often work in isolated parts of the country where communication is impossible; this inhibits prompt action;
- (d) Constant monitoring and evaluation work cannot be carried out on the islets because of the above-mentioned constraints. The consequences may be damaging since some rare endemic species are on the verge of extinction. With the exception of occasional surveys, proper management of these areas is out of the question. Measures recommended for minimizing erosion, etc. depend on the availability of adequate funds;
- (e) In marine areas, Fisheries Assistants or Protection Officers are not usually equipped to cover the vast area of the lagoon on a 24-hour basis. The number of patrols is also limited, although maximum effort is made to cover the whole island with the limited facilities available.

List of proposed protected areas

New Protected Area - Already proposed

New area proposed	Size (ha)	Proposed by	Form of original proposal	IUCN Category
Blue-Bay-Le Chaland Flat Island-	390	I.S.B. Robertson, 1974		I
Gabriel coupled	420	"	"	I
Le Morne Brabant		"	Marine controlled Area	IV
Flic-en-Flac		"	"	IV
Arsernal/Pointe aux Cannoniers	100	"	"	IV
Grande Baie		"		IV
Roches Noires/ Poste Lafayette		"	"	IV
Trou d'Eau Douce		"	"	IV
Ile aux Cerfs		"	"	IV
Area of sea around Round Island up to 10 fathoms*		"	Special Marine Reserve	VIII
Area of sea around Gunner's Quoin up to 10 fathoms*		"	"	VIII
Pearl Island	20.3	G.R. Hugh, 1976	Turtle Reserve	IV
Frigate Island	30.4	"	"	IV
Ile du Nord	20.3	Staub/Gueho, 1968	Bird Sanctuary	IV
Ile Paul	20.3	"	"	IV
Ile Poulailier	12.2	"	"	IV
Ile Puits à Eau	30.4	"	"	IV
Petit Capitaine	2.8	"	"	IV
Grand Capitaine	4.1	"	"	IV
Grande Montagne	Not seated	D.D. Tirvengadam (1980)	Nature Reserve for endemic plants	I
Mon Malartic	"	A.W. Owadally, 1975	"	I
Cascade Victoire	"	"	"	I
Plaine Corail	"	"	"	I
Cascade Pigeon	"	"	Nature Reserve for land birds and bats	I
Solitude	"	"	"	I
Ile Coco, Ile aux Sables**	14.5 & 8 ha	"	Nature Reserve for sea-birds	I

* to allow for a controlled zone-buffer for any approach to the islands

** already implemented; declared as Nature Reserve on 30.05.81

Likelihood of implementation of proposed areas

Marine areas

Given the state of degradation in lagoon and marine habitats, the following areas appear to be most appropriate to the Mauritian situation from the point of view of conservation. Several socio-economic factors, however, have complicated implementation of at least part of the Robertson recommendation:

1. The authorities claim that there are already large areas of the lagoon set aside as reserves; if the proposed areas are to be added to existing ones, this would greatly limit fishing grounds for artisanal fishermen;
2. The catch from the lagoon has declined over the years and the various management measures in force, such as close seasons and other restrictions, have resulted in a substantial reduction in fishermen's income;
3. The result is that Government has been subjected to considerable social pressure to be lax on such management measures as reduction of mesh size, abolition of close seasons and, most importantly, opening Reserve Areas for seine fishing. Government abolished the close season for three consecutive years; it was reinstated this year;
4. Declaring marine parks in the lagoon would require the displacement of a large number of fishermen who regularly depend on the resources found in such areas. Examples of displacement are: i) Blue-Bay-Le Chaland, 60 fishermen; Le Morne, 136 fishermen; and Flat Island, 127 fishermen. Authorities may be deterred by the amount of capital required for initial investments and by recurring costs, especially when no immediate return can be expected. In the long run, however, protective measures would more than pay for themselves and be of immense value to the habitat.

As a result, development of marine parks, although necessary in Mauritius, will not take place in a spectacular way. One can only hope that sufficient motivation will initiate the process for establishing at least one or two areas as Nature Reserves where there is a minimum of social and economic pressure, e.g., Bay de l'Arsenal (see report by R. Salm, 1976). In such a case, it may be necessary to enlist international funds and technical assistance in order to launch the project.

Rodrigues

Government has already implemented suggestions regarding the bird sanctuary at Ile Cocos and Ile aux Sables. Steps are being taken to make Cascade Pigeon a Nature Reserve; it may be safely assumed that the other proposition will be carried out.

St Brandon

The archipelago has been leased to a private company under such terms and conditions that may not allow imposition of new terms. However, the company has been practising rational management of the islet resources (Hugh, 1976). The company may, provided this does not run counter to its economic interests, agree to implement all or part of the recommendations. Since the leases of at least 13 of the islets have expired and will have to be renewed on a yearly basis, the Government is provided with an opportunity to impose such terms and conditions as it sees fit.

On the other hand, although bringing the islands under government control may be a good idea, the expenses of maintaining properly controlled reserves may be too

prohibitive. If the entire area were to be made into a wildlife sanctuary with small tourist-resort facilities on some of the islands, and communication and transport facilities from Mauritius were to be improved, such an enterprise would more than pay for the initial investment and cover expenses incurred in the maintenance of the nature reserve. The company would still have the primary responsibility of enforcing legislation and regulations. An increase in government control is to be recommended.

New proposals (generated by this report)

1. Serpent Island to be declared Nature Reserve: It should be noted that this suggestion is already being put forward by the Forestry Department.
2. Part of Anse Quitar and Plaine Corail (airport region) to be declared Nature Conservation Reserve: Because of grazing problems in Rodrigues, coral block walls or fences may be erected to exclude grazing animals. This would permit conservation of original plant formations, among which are the ebony tree (D. diversifolia), Bois de Ronde (Ca. xylopicron), Bois d'Olive (Elaeodendron orientale), Bois Goudron (Entirrhoea franqulacrea), as well as Polenontylia, Scolopria, Nesogenes decumbens, and numerous other native plant species. Since a new pumping station has been installed at Pointe Corail, an adequate tree cover would prevent excessive loss of moisture in calcarenite beds.
3. All mangrove areas within the existing reserves in the lagoon are to be zoned and given additional protection; the mangrove is to be declared a protected tree. Areas under consideration are Ile d'Ambre, Ile aux Cerfs and Mare aux Lubine which have already been described and are included in a reserved area. Additional protection is needed for the areas mentioned below.
4. Special marine areas (Category VIII) to be declared:
 - around Ile aux Aigrettes and Ile Mariane (Nature Reserves), due to rich mollusc life; buffer zone should be provided for adequate policing of Nature Reserves;
 - near estuaries, such as those at Grand River South East and Rivière La Chaux, both to the east of the island, and Rivière Tamarin to the west. The first two estuaries are covered in the Fishing Reserves described in section 4; the latter is not in any reserve.

How the new proposals fit in the National Development Plans etc.

Proposal 1

The proposal does not negatively affect any sphere of socio-economic activity and has no negative impact on the surrounding coastal or marine environment. As such, it meets the policy laid down in the Schedule of the Natural Development Plan: the Nature Reserve can be created under the Ancient Monuments Act. The area will fall under the administration of the Forestry Service of the Ministry of Agriculture, Fisheries and Natural Resources.

Proposal 2

The proposal aims at the preservation and conservation of endemic and indigenous plants in their original setting. The only impact it may have is exclusion of goats and restriction of grazing lands. This must fit into the policy of preserving natural habitats. Management responsibility for the area will rest with the Forestry Service of the Ministry of Agriculture, Fisheries and Natural Resources.

Proposal 3

Marine conservation is one of the stated policies of the Fisheries Development Sector. The mangrove habitat has long been neglected. Since it plays an important role in the ecology of the lagoon, its preservation is necessary in a development context. This will not have a negative impact on other socio-economic activities.

Mangrove stands in the Mauritian context cannot be considered forests, for they do not stretch far enough inland but only reach up to the high water mark in thin formations. This habitat will best be administered under the Fisheries Division of the Ministry of Agriculture, Fisheries and Natural Resources.

Proposal 4

There would be no constraint on implementing suggestions made in this proposal. For the Special Zone around the islets, the proposal should be administered jointly by the Forestry and Fisheries Department. This may also apply to the original proposition regarding a buffer zone in Round Island and Gunner's Quoin.

As to the estuaries, the landward position at the mouth of any river is protected under the Rivers and Canals Act 1863, whereas the seaward boundary is protected under the Fisheries Act. Additional protection could be provided to an area which overlaps these zones. Again, administration of such a zone would have to be shared between the Forestry and Fisheries Departments.

Procedures for establishing new protected areas

The following procedures should be adopted for establishing new protected areas:

1. Formulation of the proposal before the Ancient Monuments Board. The proposal should include a description of the area, the aims of the project, the habitats or species to be protected, and a full impact assessment of the project.
2. Approval of the Board must be obtained.
3. Proposal is then submitted for the Minister's approval (at present, the Minister for Arts and of Cultural Affairs and Leisure).
4. Following either (2) or (3), a survey must be carried out to define the required legal boundaries.
5. Finally, the Nature Reserve is gazetted and proclaimed.

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PROPOSED NATURE RESERVE

NAME: Ile aux Serpents
MANAGEMENT CATEGORY: I (Strict Nature Reserve)
BIOGEOGRAPHICAL PROVINCE: 3.25.13 (Mascarene Islands)

LEGAL PROTECTION: To be protected under the Ancient Monuments Ordinance Cap 282 of 1944.

DATE ESTABLISHED: Unknown

GEOGRAPHICAL LOCATION: 26.8 km to the north-east of Cap Malheureux; 19°49'S; 57°48.4'E.

ALTITUDE: Sea level to 177 m

AREA: 31.2 ha

PHYSICAL FEATURES: The islet distinctly dome-shaped, mostly of volcanic (basaltic) tuff, its slopes fashioned by more or less large cornices.

HABITAT/VEGETATION: No vegetation except for patches of Portulaca and Brachiaria in the crevices of the rocks. The cornices are favored by the birds as egg-laying sites. A fairly large number of skink Gongylomorphus bojerii bojerii and a few rare Cyrtodactylus serpensinsula are the only reptiles living on the islet.

NOTEWORTHY FAUNA: Islet provides a home for some 30,000 birds. Sooty terns, Sterna fuscata nubilosa in great numbers, noddy Anous stolidus pileatus, lesser noddy, Anous tenuirostris tenuirostris and a few pairs of masked booby Scula dactylatia melanops share its bleak terraces.

ZONING: None

DISTURBANCE OR DEFICIENCIES: Islet is attractive seen from the sea due to the large colony of sea-birds nesting on its slopes. Passing tourists can cause considerable disturbance by shooting into the air to watch the flocks of birds taking off.

SCIENTIFIC RESEARCH: At times visited by scientists; no ongoing research project.

SPECIAL SCIENTIFIC FACILITIES: Herbarium facilities available at the Mauritius Sugar Industry Research Institute (MSIRI) in Mauritius.

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- Vinson, J. (1953) Some present data on fauna of Round and Serpent Island. Proc. R. Soc. Arts & Sci., Mauritius. (13): 253-257.
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- Lloyd, J.A. (1946) Relation d'un voyage à l'Ile Ronde et à l'Ile aux Serpents en décembre 1844. Proc. Soc. Hist. Nat. Maurice, 154-162.
- Bullock, D. & S. North (1975) Report of the Edinburgh University expedition to Round Island.

STAFF: Islet rarely visited by Forest Service and Fisheries Department Officers.

BUDGET: Virtually nil

LOCAL ADMINISTRATION: Forest Department, Ministry of Agriculture, Fisheries and Natural Resources, Curepipe, Mauritius.

The following information was provided with the national report on Conservation of Mauritius. Unfortunately, lack of space precludes their reproduction in the present volume.

1. Revised Laws of Mauritius, 1981 concerning:

Ancient Monuments
Forests and Mountain and River Reserve
Woods and Forests
Pas Géométriques
Rivers and Canals
Maritime Zones
Fisheries
The Fisheries Act
Continental Shelf
Removal of Sand
Pesticides Control
The Wildlife Bill Plants
Town and Country Planning
Shooting and Fishing Leases Ports

2. The State of Aquatic Pollution in Mauritius by M.I. Jehangeer (6th FAO/SIDA Workshop on Aquatic Pollution in relation to Protection of Living Resources FIR. TPLR/78/Inf.28)
3. Ichtyofaune de quelques récifs coralliens des Iles Maurice et la Réunion, par M. L. Harmelin-Vivien (The Mauritius Institute Bulletin, part II, Vol VIII)
4. Quelques poissons intéressants de l'Ile Maurice, par B. Candé et L.P. Jauffre.
5. The establishment of Marine Parks and Marine Controlled Areas, by I.S.B. Robertson (FAO report FI: DP MAR/72/004/2)
6. The structure and successional status of three coral reefs at Mauritius, by R. Salm (Proc. R. Soc. Arts & Sci. Mauritius, Vol. III part 2)
7. Marine parks and marine controlled areas, by I. Jehangeer (for Coordinating Committee on Environment, paper 2)

Annex I

Habitat types which need additional protection

LAGOON

<u>INFORMATION CATEGORY</u>	<u>REMARKS</u>
1. <u>DOES IT OCCUR?</u>	
Occurs around the islands of Mauritius, Rodrigues and the two islets of Agalega.	
2. <u>TOTAL AREA</u>	
Mauritius: 243 km ² (figure 1) Rodrigues: 240 km ² (figure 2) Agaleta : 24 km ² (figure 3)	
3. <u>AREA PROTECTED</u>	
Whole area (2) protected under Fisheries Act 1980.	
4. <u>% AREA PROTECTED</u>	
Whole area as in (3). Some zones are more protected	6 zones in the lagoon known as Fishing Reserves, in which use of seines not allowed at any time.
5. <u>AREA PROPOSED FOR PROTECTION</u>	
6. <u>% AREA PROTECTED & PROPOSED</u>	
Government is studying the possibility of setting aside a Marine Park in one or more of the following regions: Balachlava (on the west coast of Mauritius), Blue Bay, Flat Island.	Surface area proposed; not yet defined.
7. <u>IS PROTECTION ENFORCED?</u>	
Yes	There is a Protection Division within the Fisheries Department staffed with some 143 Fisheries Protection Officers, whose main task is the enforcement of fisheries regulations. This is carried out on a 24-hr basis from 13 fisheries posts around the island of Mauritius.
8. <u>IS ENFORCEMENT ADEQUATE?</u>	
Does not appear to be adequate in spite of large staff.	Lack of equipment and communication network. Consequently, prompt action is limited.

9. USES OF HABITAT

Fishing	Landing from lagoon around Mauritius has stabilized around 2000 tonnes. Fisheries resources probably overexploited. Some 2000 fishermen use lines, traps seines, gillnets and harpoons (artisanal method).
Coral mining	Substantial amount of live corals taken for lime industry (see annex IV).
Coral sand extraction	Out of 200,000 tonnes, 47% may come from lagoon.
Other	Leisure boating, skiing, snorkeling, skin diving and shell collection etc. common near hotels.
Aquaculture	Large amount of fish fingerlings collected annually for stocking some 22 'barachois' around the island of Mauritius.
Boat anchoring area	In sheltered part of lagoon.

10. THREATS TO HABITATS

Destructive harvest method	Regulation permits operation of 30 seines in the lagoon of Mauritius. This is governed by size regulation and close seasons. Illegal seining has aggravated existing problems in lagoon.
Fishing with explosives	Most serious problem; has resulted in extensive destruction of coral communities.
Pollution	Pollutant sources affecting lagoon are wastes from solid sewage, industry, oil and pesticides (M.I. Jehangeer, 1978).
Siltation	Suspended solids from sewage outfalls on part of west coast of Mauritius resulted in extensive siltation and death of most coral communities.
Erosion	Localized sedimentation problem on south-east coast of Mauritius caused by top soil deposits into the sea by rivers during rainy season. Problem aggravated during cyclonic period.
Intentional dumping of toxic chemicals	A recent practice; stuns fish or crustaceans in shallow lagoon water for easy collection.

FRINGING REEF

<u>INFORMATION CATEGORY</u>	<u>REMARKS</u>
1. <u>DOES IT OCCUR?</u>	
Yes; around Mauritius, Rodrigues Islands, Agalega shoal and St Brandon Island.	Mauritius: almost totally surrounded by a peripheral fringing reef (about 150 km long) except for 2 stretches totalling about 26 km (figure 1) Rodrigues: totally surrounded by fringing reef of 90 km (figure 2). St Brandon: 56 km (figure 3). Agalega: 55 km (figure 4). The structure of the Mauritian reef is fully discussed by Faure, G. (1975) and Salm, R. (1976). A summary based on Faure is given in annex III. Fish fauna in coral reefs is abundant; up to 40 m in Trou aux Biches region (Mireille, L. et al, 1976).
2. <u>TOTAL AREA</u>	
Mauritius: 300 km ² Rodrigues: 200 km ² St Brandon: 190 km ² Agalega: 100 km ²	Partly based on Faure (1975).
3. <u>AREA PROTECTED</u>	
None; section 4 of Fisheries Act 1980 prevents export or import of live/dead coral. No special area protected.	There is need to make more legal provisions for better protection of reef. Only export and import of corals regulated. There is need for regulating collection and exploitation of coral.
4. <u>% AREA PROTECTED</u>	
No area set aside for exclusive protection at present.	
5. <u>AREA PROPOSED FOR PROTECTION</u>	
Several sites proposed for Marine Parks, which include large areas of coral reefs.	Most important areas proposed: 1) Baie de l'Ar-senal; 2) Flat/Gabriel Islands. Both have important, varied reef communities (see figure 1).
6. <u>% AREA PROTECTED & PROPOSED</u>	
7. <u>IS PROTECTION ENFORCED?</u>	
Control exercised when permit issued for export and import.	
8. <u>IS ENFORCEMENT ADEQUATE?</u>	
Does not appear to be adequate. Almost no control over removal of corals from lagoon for Mauritian lime industry. Lack of control of aquaria and aquarium fish exploitation.	There are virtually no provisions regulating the exploitation of corals for local use.

9. USES OF HABITAT

Fishing	Traps: numerous trap fishermen in Mauritius and Rodrigues.
Coral mining	Collected from coral patches or dislodged from back reef for use in lime industry. Crowbars, loaded in pirogues, may be used for this purpose.
Other	Marine specimens (aquaria) collected for export.
Collection of specimens for export	Some 80,000 marine organisms (fish and invertebrates) exported annually; observation made by group of professional scuba divers. Shell collection by divers/tourists, etc., concentrated around beach hotels.

10. THREATS TO HABITAT

Destructive harvest method	Intensive seinings resulted in virtual desert conditions in many parts of the lagoon.
Explosive fishing	Coral reefs have already been destroyed in many parts of the lagoon by use of explosives.
Pollution	Most important source of pollution affecting lagoon/coral reef outlined by Jehangeer, I., 1978.

MANGROVE FOREST

INFORMATION CATEGORY

REMARKS

1. DOES IT OCCUR?

Yes; only around Mauritius Island and some islets in the lagoon

Figure 4 shows rough distribution of mangrove around Mauritian coast. Concentration of mangroves on east, south-east, north-east coasts of island; occur as thin stands, sparsely distributed along the intertidal zones (including mud/sand flats, sea-grass and basaltic boulders). Particular concentrations occur near Ile d'Ambre in the north-east, Ile aux Cerfs in the east. Two species, Rhizophora mucronata and Bruquiera gymnorhiza, occur in Mauritius; the latter more tolerant to salinity variation.

2. TOTAL AREA

Between 1 and 2 km²

3. AREA PROTECTED

None

4. % AREA PROTECTED

None

5. AREA PROPOSED FOR PROTECTION

a. area around Mare aux Lu-
bines on east coast of the
reserve to be zoned (see
figure 4);

Area rich in mangroves; contains combination of other habitats rarely found on other parts of island. There are numerous sand and mud banks, some with rocky outcrops. Marshy areas present. Sea-grass and algal beds abound in shallow edges of lagoon. Marine life rich; area excellent nursery ground for juveniles of Chanos chanos, Mugil cephalus, M. seheli, crab Scylla serrata and many species of penaeus prawns, all highly esteemed species. Landward, oysters cultivated in numerous fish ponds.

b. either a zone around Ile
de l'Est, Ile aux Cerfs,
comprising many small flats
densely overgrown with man-
grove or zone around Ile d'
Ambre area (see figure 4)

Both areas situated in the fishing reserves and could be zoned for this purpose.

These areas have rich marine habitats associated with the mangrove, but to a lesser extent, as outlined in (a) above.

6. % AREA PROTECTED & PROPOSED

7. IS PROTECTION ENFORCED?

Not applicable

8. IS ENFORCEMENT ADEQUATE?

Not applicable

9. USES OF HABITAT

Fishing

This includes: a) collection of oysters, crabs and molluscs (among the mangrove or close to it)
b) fishing of prawns at night in parts of the island.

Exploitation of
mangroves trees

Bark of mangrove known locally to have some medicinal properties. Mangrove poles used for fishing purposes and for firewood.

10. THREAT TO HABITAT

Misuse/overexploitation
of mangrove trees.

Annex II

Area of offshore islands/islets of Mauritius (Ha)

A. Islets off Mauritius

Flat Island	253
Round Island	159
Coin de Mire	76
Ilot Cabriel	42
Ile aux Aigrettes	35
Ile Marianne	2
Ile d'Ambre	159
Ile aux Cerfs/Ile de l'Est Complex	150
Ile aux Serpents	31
Ile aux Bénitiers	75
Ile aux Fourneaux	12
Ile aux Cocos	7
Ile aux Fouquets	4
Ile de la Passe	3
Other small islets	20

1,028

B. Rodrigues and islets off Rodrigues

Rodrigues	10,400
Ile Sable	8
Ile Cocos	15
Ile Catherine	2
Ile Crabe	18
Ile Booby	1
Ile Combrani	20
Ile Pierro	18
Ile Plate	4
Ile Hermitage	4
Other	7

10,497

St Brandon

Albatros	101
Avoquer	8
Grand Capitaine	4.1
Petit Capitaine	2.8
Ile Cocos	12.2
Courson	4.1
Frégate	30.4
Ile du Nord	20.3
Ile Paul	20.0
Poulailler	12.2
Puits à Eau	30.4
Raphael (Establishment Island)	10.1
Ile du Sud	14.0
Ile Tortue	0.54

270.14

Agalega

North Island	14.7
South Island	19.8
	<u>34.5</u>

TOTAL AREA: 11,839.5

Annex III

General description of fringing reef

The island is almost completely surrounded by a peripheral fringing reef (about 150 km in length) with frequent intervals of surge channels, narrow passes and river mouths. The reef is absent on the south coast for about 15.5 km and on two stretches totalling 10.5 km on the west coast.

The morphology of the reef is influenced by several natural factors such as strength of waves, turbidity, water quality, depth and original shape of the basaltic substratum. Faure (1975) divides the fringing reef into six different biotopes:

1. External Slope, the seaward and downward slope of the reef towards deep waters, which consists of spurs and grooves of variable density due to wave action (erosion) and the initial shape of the volcanic substratum. This zone can again be subdivided into three regions:

- down to 4 m, where hydrocoral Millepora, and other branched Madreporae such as Acropora spp, Stylophora mordax, Pocillopora damicornis, P. verrucosa are found;
- an intermediate zone consisting of massive, encrusting colonies (Leptoria phrygia, Platygyra daedalea, Favia speciosa, Montipora sp.) and Alcyonaria of genus Lobophytum, Sinularia, Sarcophyton. In overhang caves, madreporae are replaced by calcareous algae, sponges, hydrozoans, bryozoans, polychaetes and serpullides;
- the inferior region, towards the sandy external plain, where massive forms such as Porites solida and species of genera Favia and Tubinaria are found.

2. External Reef Flat, an elevated area, also consists of different regions. The top parts of the spurs and grooves are occupied by madreporae, hydrocorals and calcareous algae depending on prevailing hydrodynamic conditions. Rough regions are colonized by such hardier species as the Millepora platyphylla, whereas madreporae become more numerous in calmer regions; towards the lagoon, smaller sizes are found in association with fauna comprising numerous echinoderms (Echinometra mattaei), Diadema spp., and algae such as Amphiroa fragillissima, Corallina polydactyla, Hydro Mussiformia, Jania spp, Euchema serra, Halimoda tuna and Sargassum densifolium.

3. "Detrital Ridge", consisting of large fragments torn from the external ridge and thrown landwards by rough weather and waves and intertwined with algae.

4. Internal Reef Flat, which begins behind the large fragments and continues towards the lagoon where, after proliferation of living madreporae, there is only 80 per cent coverage and many colonies are dead. These may be secondarily covered by encrusting and branched forms of Acropora and Pocillopora. Towards the lagoon, vertical growth of corals is limited.

5. Lagoonal patches, the deeper zones of the lagoon are colonized by large Porites sp. and encrusting colonies of Montipora sp., Pavona variana or branched, unhealthier colonies due either to exposure during low tide, freshwater infiltration, or sedimentation. Intensive extraction of coral from these patches has contributed to the impoverishment of their colonies.

6. Morphological discontinuities such as passes, channels, river mouths. These are openings into the reef from the lagoon to the external reef front. The upper sides are colonized by small branched corals, Alcyonaria and calcareous algae. Between 4-18 m depth, massive forms (Favia, Goniastrea, Platygyra), large encrusting forms (Echinopora) and smaller colonies of Acanthastrea are found together with Alcyonarians. Below 18 m, various massive and encrusting forms occur along with the branched Dundrophyllia.

Annex IV

Mariculture site

These are dry, stone wall enclosures (Barachois) of small bays or other parts of the lagoon in which young fish are stocked and reared to marketable size. The walls normally have sluiceways fitted with grids which allow water circulation and facilitate the stocking of juvenile fish from the lagoon. Details on each barachois are given below.

Name of Barachois	Area (ha)	Status
1. Bassin Humbert, Poudre d'Or	51	G.L.
2. Bassin Chazal, Poudre d'Or	20	G.L.
3. Bassin Gomon, Poudre d,Or	13	G.L.
4. Bassin Sale, Poudre d'Or	3	G.N.L.
5. Bassin Pacquet, Petit Pacquet, Petit Raffray	5	G.L.
6. Grand Gaube Fishermen's Coop. Barachois	8	G.L.
7. Butte à L'Herbe, Calodine, Grand Gaube	8	G.L.
8. Melville Barachois	23	G.L.
9. Soorsa Fishermen's Coop., Pointe Lascar	3	G.L.
10. Bassin Faouliz, Melville	20	G.L.
11. Belcourt Bay, Poste de Flacq	50	G.L.
12. Bras de Mer aux Huîtres, Trou d'Eau Douce	8	G.L.
13. Beau Rivage, Trou d'Eau Douce	2	G.L.
14. Bassin Ozeerally, Trou d'Eau Douce	3	G.L.
15. Bassin Noziac, Poste de Flacq	4	P.
16. Mahébourg Fish Farm	34	G.N.L.
17. Bambous Virieux	17	P.
18. Ilot Brocus (Le Bouchon)	14	G.L.
19. Bassin Requins, Grand River North West	0.7	G.L.
20. Albion Barachois	60	G.N.L.
21. Bras de Mer du Chaland	0.6	P.
22. Barachois de Ravelle, Case Noyale	9	G.L.

G.L. = Government leased
G.N.L. = Government not leased
P. = Private barachois

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Annex V

Annex to the report on the lime industry 1982

Another survey was conducted between 18-19 February 1983 to verify the extent of fossil coral used in lime factories. The following observations were made:

- i) no other lime-kilns use fossil corals for making lime except the Mahébourg lime factory. About 8,000 tonnes of fossil corals are mined annually;
- ii) from an annual production of 5,000 tonnes of lime at Mahébourg (confirmed by manager) it is estimated that no less than 10,000 tonnes of raw materials are used given that pure limestone can yield quicklime at a ratio of 2 to 1. In the industrial process, such a proportion is never achieved and more coral or limestone is used. In fact, given the 2:1 ratio, the Mahébourg lime factory may be extracting some 2,000 tonnes of corals from the sea, 1,000 tonnes more than the figure provided by the manager of the lime factory;
- iii) during the last survey it was found that the lime-kilns of the west coast were using only dead coral. The present survey suggested that almost all the coral found on the site appeared to have come from live corals. A significantly high percentage of live corals were removed at Bel Air, Haute Rive and Beau Champ. For more accurate statistics on the exploitation of coral, it may be necessary to pay more frequent visits to these lime-kiln sites.
- iv) "The Roche Bois Lime Factory", the seventh lime-kiln in the region produces some 100 tonnes of lime annually and uses about 200 tonnes of dead corals.

Coral/fossil consumption by lime-kilns in tonnes (1982)

K i l n	Annual consumption of lagoon coral	% of lagoon coral used		Annual consumption fossil corals from quarry	Total coral/ fossil corals consumption
		Live	Dead		
Mahébourg	2,000	70	30	8,000	10,000
Bel Air	400	30	70	-	400
Auville	1,000	50	50	-	1,000
Baie du Rambeau	30	-	100	-	30
Haute Rive	600	30	70	-	600
Beau Champ	800	20	80	-	800
Roche Bois	200	-	100	-	200
TOTAL	5,030			8,000	13,030

The total consumption of raw material is about 13,000 tonnes of which 5,000 t are removed from the sea and 8,000 t are derived from quarries. Of the 5,000 t of corals from the sea, between 2,000 and 3,000 t come from breaking live corals.

A complete ban on the removal of either dead or live coral from the lagoon would mean a shortage of 2,500 t of lime on the market; six of the seven lime factories would be paralysed and employment cut in half.

Since corals are an important factor in the lagoon ecosystem, it is suggested instead that the industry find alternative sources for the raw materials needed in producing lime. The removal of corals from the lagoon for this purpose may be stopped eventually to keep in line with such measures as tightening the control on dynamite fishing, banning underwater fishing and conserving fishery resources for continued production.

Appendix

List of important food fishes of Mauritius

LETHRINIDAE	<u>Lethrinus nebulosus</u> <u>L. erythropterus (sanguineus)</u> <u>L. harak</u> <u>L. reticulatus</u> Lethrinid species - various	Capitaine Dame Berri Battardet Caya
LUTIANIDAE	<u>Aprion virescens</u> <u>Pristipomoides filamentosus</u> <u>Etelis carbunculus</u> <u>E. oculatus</u> Lutianid spp. - various	Vacoas Sacré-chien blanc Sacré-chien rouge Sacré-chien grand queue
MULLIDAE	<u>Mulloidichthys vanicolensis</u> Various mullidae, mainly <u>Parupeneus</u> spp.	Rouget fayan
SERRANIDAE	<u>Epinephelus morrhua</u> <u>E. megachir</u> <u>E. macrospilos</u> <u>E. fasciatus</u> <u>E. rotouti</u> <u>Variola albimarginatus</u> Various <u>serranid</u> spp.	Vieille la boue Vieille la grise Vieille la voleuse Vieille la rouge Vieille Maman rouge Croissant queue blanche
SPARIDAE	<u>Rhabdosargus sarba</u>	Geule pavée
CLUPEIDAE	<u>Sardinella dayi</u>	Sardine de France (Carée)
ENGRAULIDAE	<u>Thrissina baelama</u>	Sardine rouge
ATHERINIDAE	<u>Pranesus penquis</u>	Lamama
SPHYRAENIDAE	<u>Sphyraena barracuda</u> <u>Sphyraenella flavicauda</u>	Tazard lichien Tazard clair/goémon
LEIOGNATHIDAE	<u>Leiognathus fasciatus</u>	Sap-sap
CALLYODONTIDAE	<u>Scarus capitaneus</u> <u>S. sordidus</u> <u>S. ghobban</u> <u>Leptoscarus vaegensis</u> Various <u>callyodontidae</u> spp.	Cateau bleu Cateau vert Robin mâle Cabeau goémon
SIGANIDAE	<u>Siganus canaliculatus (-oramin)</u> <u>S. corallinus</u> <u>S. rivulatus</u> ; <u>S. rostratus</u>	Cordonnier Cordonnier corail

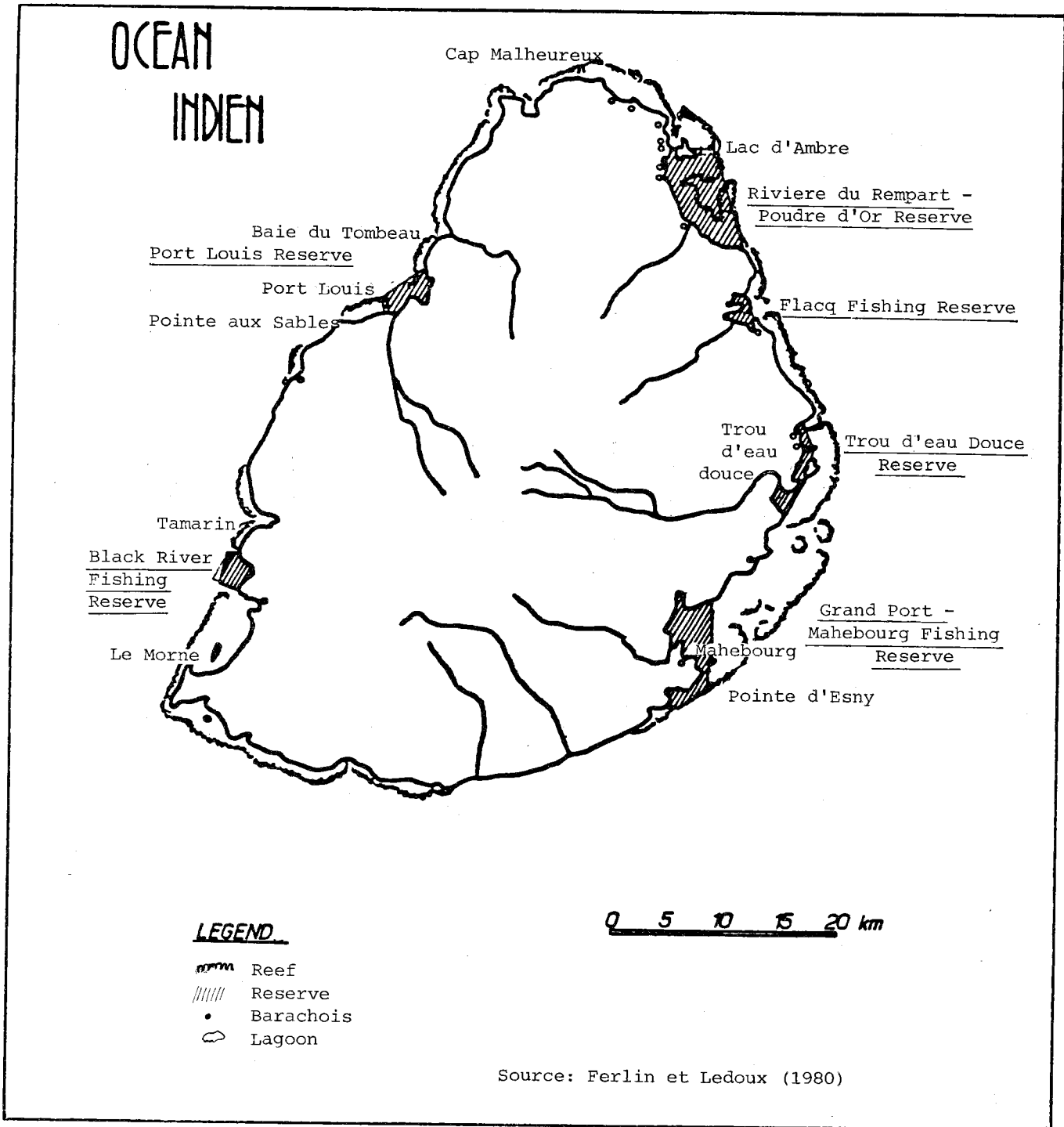


Figure 1: Lagoon, reefs and reserves of Mauritius

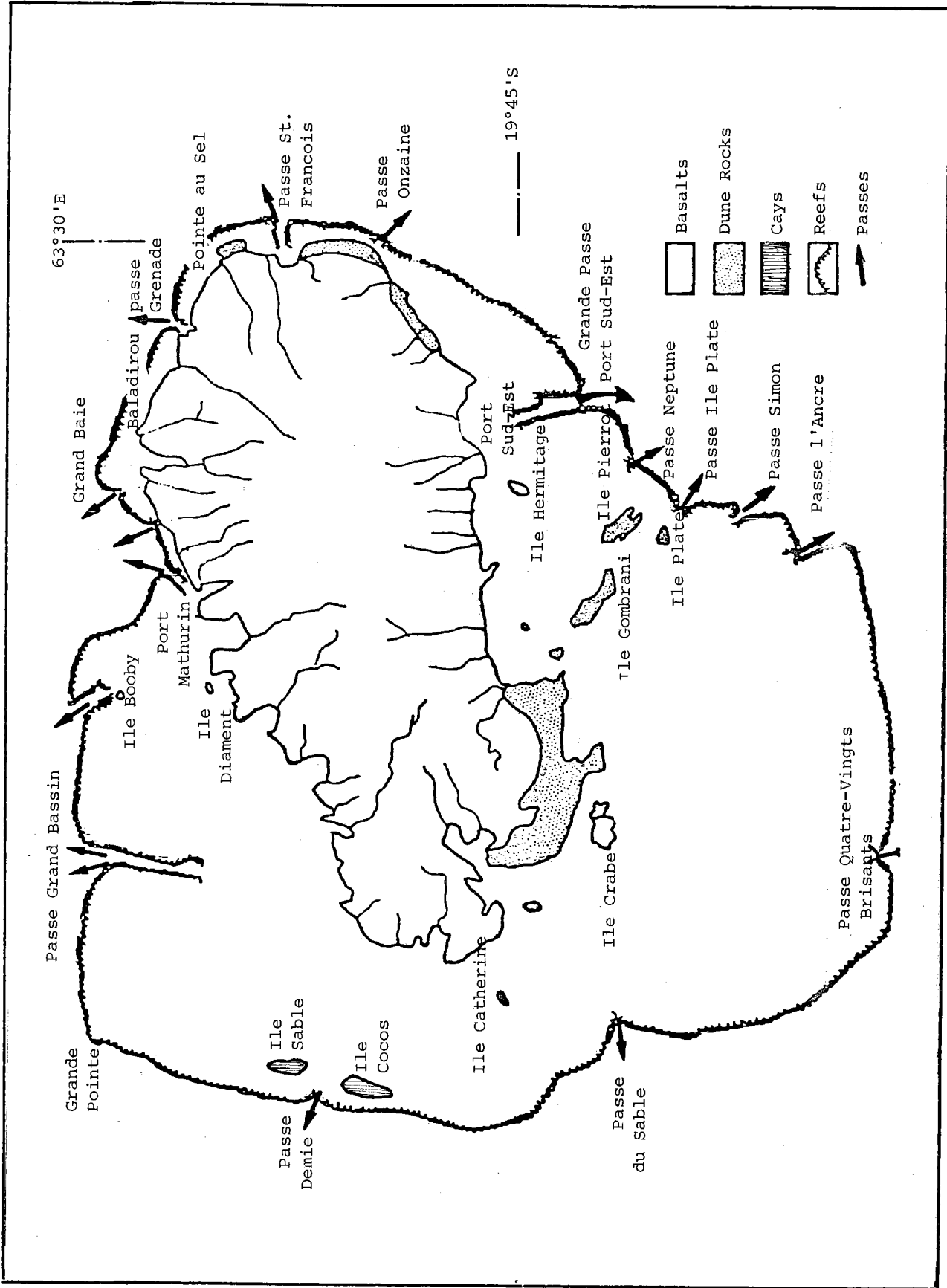


Figure 2: Reefs and lagoon of Rodrigues Island, Dependency of Mauritius (Source: Faure, 1975)

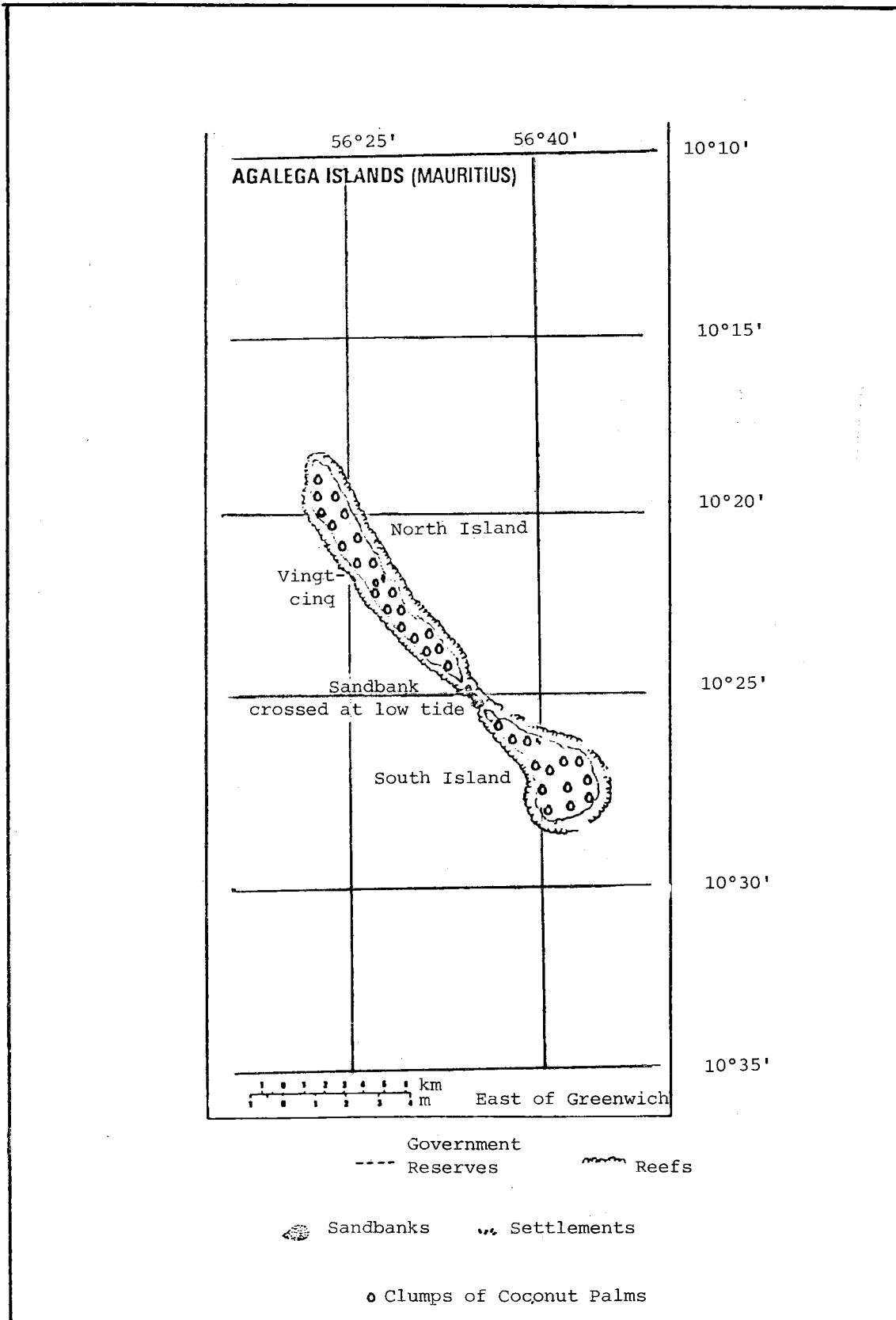


Figure 3: Reef and lagoon of Agalega, in the EEZ of Mauritius

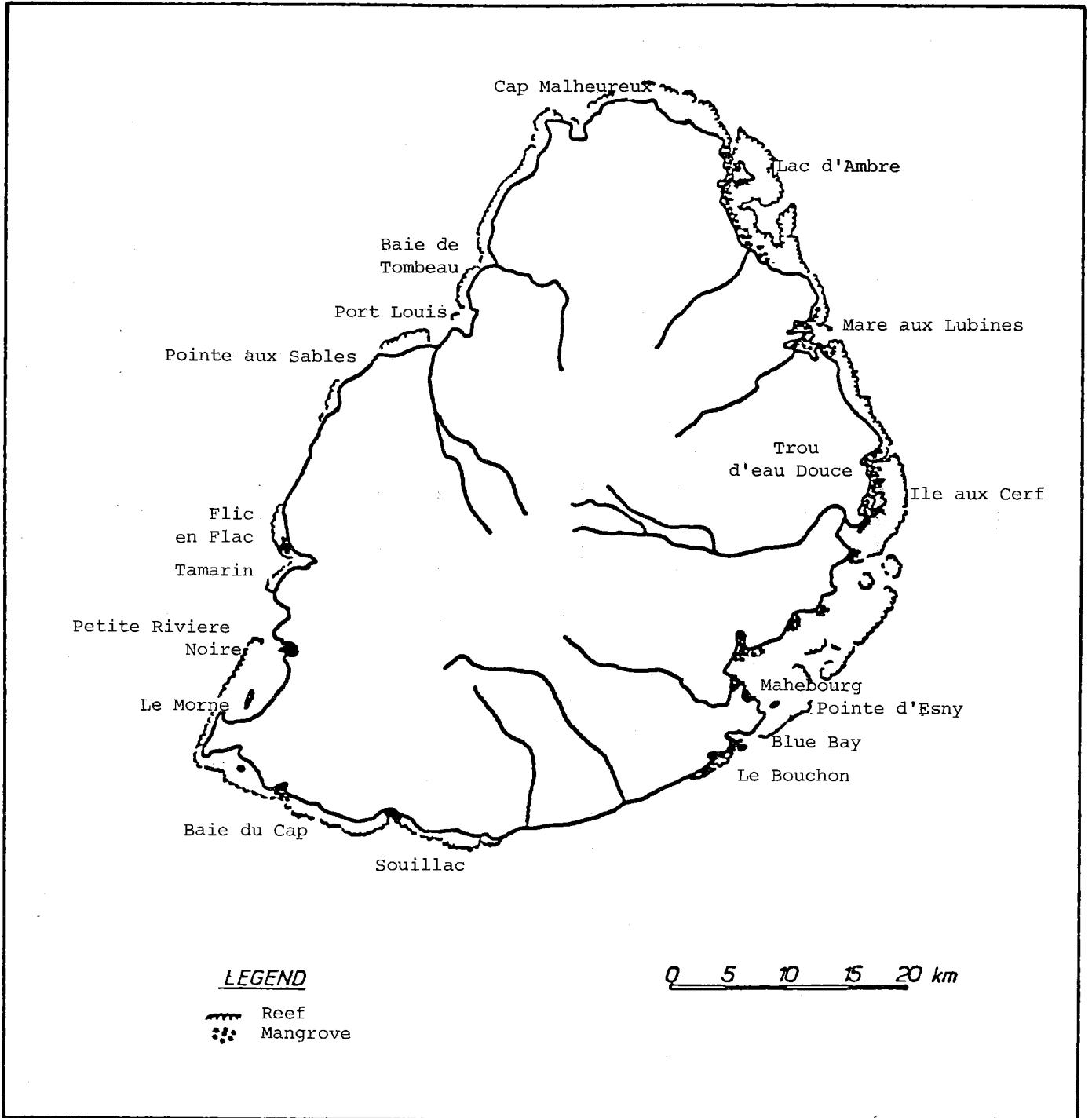


Figure 4: Distribution of mangrove in Mauritius

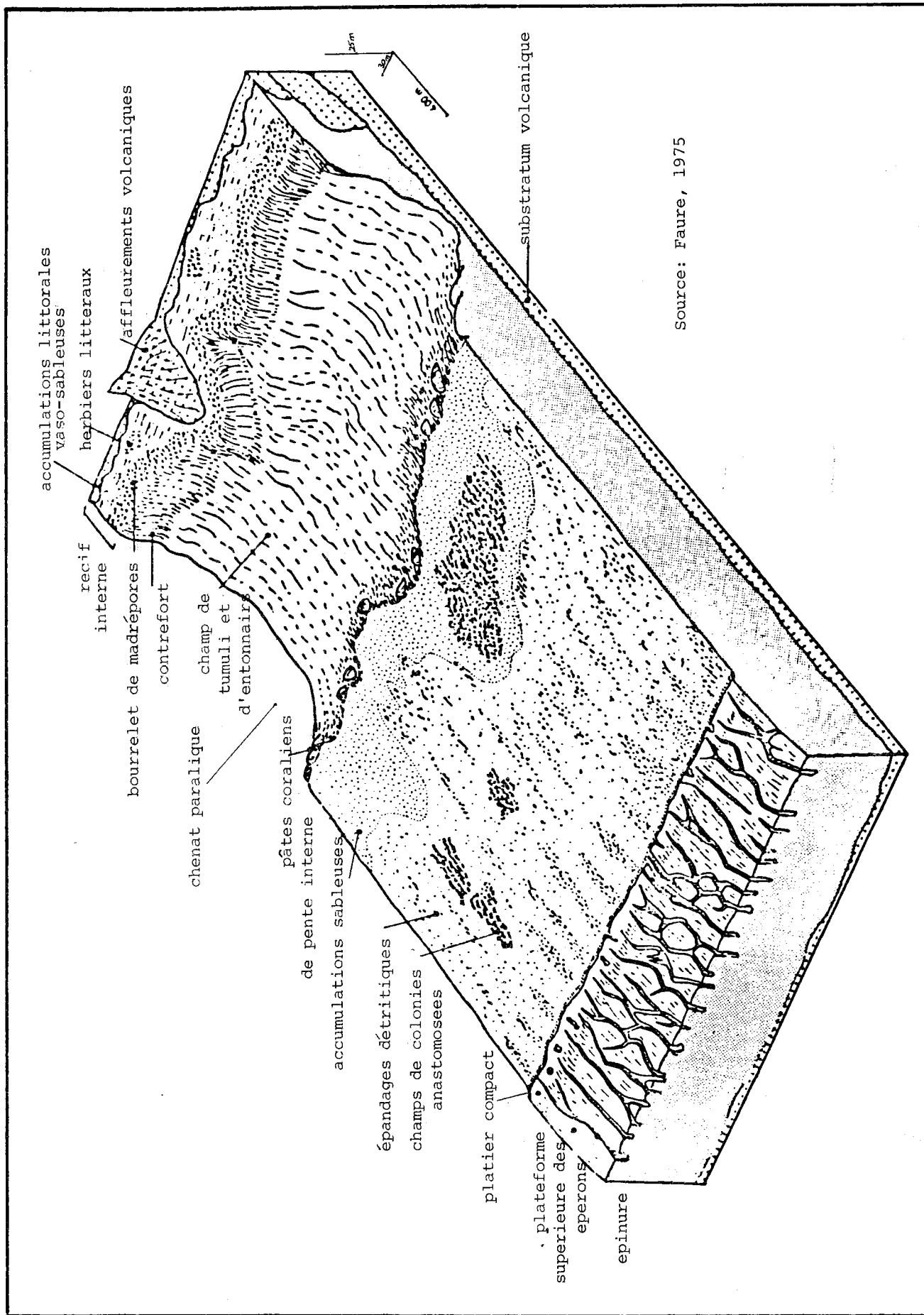


Figure 5: Barrier reef off Mahébourg

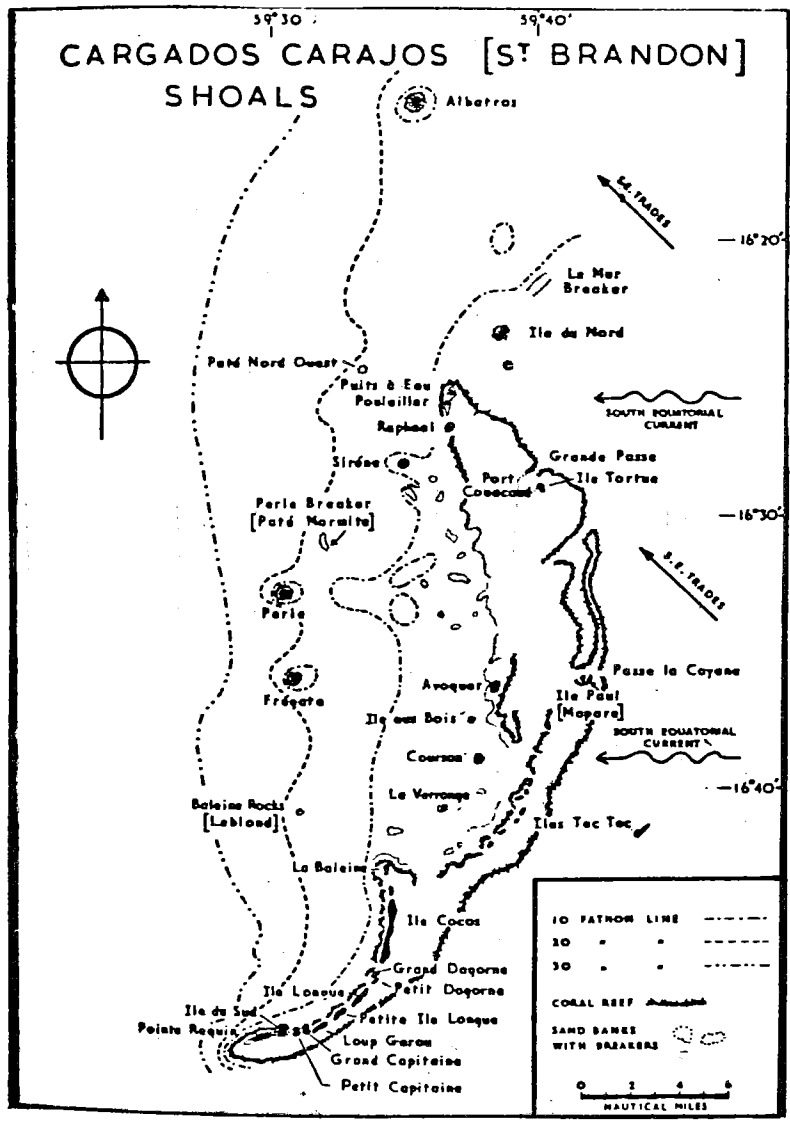


Figure 6: St Brandon Shoals (Source: Staub & Gueho, 1968)

KENYA NATIONAL REPORT : by D. N. Kinyanjui

BASIC DATA ON KENYA

Land area:	564,162 km ²
Arable land:	68,280 km ² - 12 percent of land area
Area of territorial sea:	9,000 km ²
Population:	15.3 m
Population density:	27 inhabitants per km ²
Rate of population growth:	3.8 - 4 per cent per year
Population earning living from agriculture:	80 per cent
Per capita gross national product:	US\$ 100
Literacy rate:	54 per cent (for adults)
Major sources of foreign exchange:	agriculture, tourism, minerals

REVIEW OF NATIONAL MANAGEMENT POLICIES RELATED TO
PROTECTED AREAS AND ENDANGERED SPECIES

Legislation

This will be covered in the report on survey and analysis of national legislation.

Provisions for planning:

National development plan

Kenya has a national development plan for every five years. The national plan lays down objectives, activities, programmes, and projects to be undertaken and targets to be achieved within the plan period.

National conservation strategy

Kenya's national conservation strategy is embodied in the policies and mandates of various government agencies such as the Ministry of Environment and Natural Resources, Ministry of Tourism and Wildlife, Ministry of Agriculture, Ministry of Water Development, etc.

Regional (sub-national) plans

The District has been designated as the basic planning unit. Each district will have its own plan for implementation at the district level.

Management plan for protected areas

The Wildlife Conservation and Management Department of the Ministry of Tourism and Wildlife has a management plan for national parks and reserves. The Forest Department has a management plan for gazetted forest reserves.

Institutional linkages of species and habitat conservation:

The Ministry of Environment and Natural Resources is responsible for co-ordinating all environmental and conservation matters in the country.

Kenya's Forest Department is responsible for the conservation and management of the country's forest estate.

The Department of Fisheries is responsible for the management of the country's inland and marine fisheries.

The Ministry of Tourism and Wildlife is responsible for the protection and management of wildlife, national parks and reserves and biosphere reserves.

Protected area management (based on IUCN paper on categories, objectives and criteria for protected areas)

National Parks	-	category II	-	22 units
National Reserves	-	category IV	-	25 units
Resource Reserves	-	category VI	-	14 units
Biosphere Reserves	-	category IX	-	3 units

Monitoring and evaluation

This is mainly being carried out with regard to the state of habitat, population status, species inventory and ecological changes.

Research

Research is geared towards proper management of protected areas. It is carried out by both agencies charged with the management of protected areas and institutions of higher learning and research.

Enforcement

This is carried out by the responsible agencies through the country's legal and judicial system.

Personnel and training

At the University level, courses in subjects relevant to protected areas such as zoology, botany, genetics, forestry and fisheries management are available.

At the middle level, an institute for wildlife and fisheries management is just about to become operational.

Rangers are trained at the Kenya Administration Police College.

Means of bringing benefits of nature protection to the people:

In most cases local people are hired to work in national parks, national reserves and forests.

Resources exploitation e.g. grazing, firewood collection, is allowed in buffer zones but not in protected areas, e.g. national parks.

The Wildlife Conservation and Management Act (1976) provides for compensation from Government for crop or livestock damage by wild animals.

Some profits from national reserves are allocated to the local County Councils for the development of the area.

NATIONAL INVENTORY OF ECOSYSTEMS

Terrestrial habitats

Number	Type	Relevance	Area (km ²)	Protected area (km ²)
1.1.1.1	Lowland rain forest		2,600	200 (80%)
1.1.1.5	Riverine forest		70	-
1.1.1.6	Swamp and bog forest	n.r*	-	-
1.1.2.1	Lowland seasonal forest		750	-
1.1.3.1	Lowland semi-deciduous forest		3,000	-
1.1.4	Subtropical rainforest	n.r	-	-
1.2.1	Drought-deciduous tropical lowland forest		500	-
2.1.1.1	Broad-leaved evergreen tropical woodland		1,000	-
2.1.1.3	Broad-leaved sub-desert woodland	n.r	-	-
2.2.1	Tropical drought deciduous lowland woodlands	n.r	-	-
2.2.7	Thorn woodland		2,000	-
3.1.1.1	Bamboo scrub		-	-
3.1.1.2	Palm-fern scrub	n.r	-	-
3.1.1.3	Tropical broad-leaved scrub	n.r	-	-
3.1.1.5	Evergreen desert scrub	n.r	-	-
3.1.2	Evergreen needle-leaved scrub	n.r	-	-
3.1.3	Succulent scrub	n.r	-	-
3.2.2.1	Drought deciduous tropical scrub	n.r	-	-
3.2.4	Deciduous desert scrub	n.r	-	-
4.1.2	Desert evergreen dwarf scrub	n.r	-	-
4.1.3	Succulent dwarf scrub	n.r	-	-
4.2.4.	Drought deciduous dwarf scrub	n.r	-	-
5.1.1.1	Tall grass woodland savanna		4,000	-
5.1.1.2	Tall grass tree savanna		14,000	-
5.1.1.3	Tall grass shrub savanna	n.r	-	-
5.1.1.4	Tropical tall grassland	n.r	-	-
5.1.1.5	Flood Savanna		650	-
5.1.2.1	Short-grass tree savanna	n.r	-	-
5.1.2.2	Short-grass shrub savanna	n.r	-	-
5.1.2.3	Tropical short-grassland	n.r	-	-
5.2.4	Sub-desert grassland	n.r	-	-
5.4.4.	Episodical desert forbland	n.r	-	-
5.5.1	Freshwater marsh		80	-
5.5.3	Alkaline marsh	n.r	-	-
5.6.1	Floating meadows	n.r	-	-
5.6.2	Reed swamps	n.r	-	-
6.1	Rock desert	n.r	-	-
6.2	Sand desert	n.r	-	-

Number	Type	Relevance	Area (km ²)	Protected area (km ²)
Marine Habitats				
1.1.5	Mangrove forest	-	529	529 (100%)
5.5.2	Salt marsh	-	60	-
5.6.3	Submerged aquatics	n.r	-	-
5.6.4	Floating aquatics	-	50	-
	Mudflats	-	10	-
	Sandflats	-	75	-
	Back reef lagoons	-	600	-
	Rocky islands	n.r	-	-
Coral Reefs				
	Barrier reefs	n.r	-	-
	Bank barrier reefs	-	-	-
	Fringing reefs	-	-	-
	Atolls	-	-	-
	Patch reefs	n.r	-	-
	Knolls	n.r	-	-
	Other structures (sand bars)	-	-	-
	The open seas	-	200,000	-

* n.r. = not relevant

CONCLUSIONS

While the mangrove forests and the lowland rain forests are protected under the Forest Act 1968, there are other important habitats which need protection too. These include the riverine forests, the floating aquatics, sandflats, back reef lagoons and the coral reef itself.

Two of Kenya's major rivers emptying into the Indian Ocean every year carry millions of tonnes of silt. The silt load gets into the rivers from intensive agricultural activities taking place several miles up country. In many cases riparian forests have been depleted and thus the filtering role of these forests is also diminished. Besides, riverine forests serve the important purpose of bank stabilization and prevent excessive erosion and flooding. The latter is a particularly sensitive issue behind the need to protect riverine forests along Kenya's coast. This is mainly due to the relatively flat terrain and shallow river profile. Flooding and disastrous damage to animals, crops and settlements accruing is frequent.

Kenya's marine floating aquatics are acquiring a growing economic interest mainly through the harvesting of various species of marine algae. The same marine algae form feeding grounds for fish. They are threatened by siltation.

Coastal sandflats form beautiful beaches along which a booming tourism trade flourishes. Valuable marine shells, corals and such related trophies are also collected. These habitats need to be protected against over-use and pollution from oil and industrial solid wastes.

The back reef lagoons are a haven for fish shoals and floating aquatics. Protection of these habitats would entail the strict control of excessive fishing, of shipping activities and pollution.

Kenya's coral reefs are threatened by extinction due to huge loads of sedimentation which subsequently cut off the light that polyps need for their photosynthetic processes. There are reported cases of dead coral reefs. The importance of these coral reefs in breaking strong wave activity, which greatly modifies the coastal morphology, is well known. An attempt will be made to protect the coral reefs by reducing silt and sedimentation discharge into the ocean and prohibiting coral mining activities for lime.

Kenya's coastal area has unique tribal features known as the Kayas. These are limestone caves surrounded by forest groves and are believed to be sacred burial places, refuges and tribal homesteads of the Mjikenda tribes. Over time, these have nurtured unique tree species and some of the caves contain endemic animal life which needs to be protected.

NATIONAL INVENTORY OF EXISTING PROTECTED AREAS

Apart from the data provided by IUCN, additional information has been compiled where available. Emphasis has been laid on coastal and marine ecosystems.

General Notes

According to CNPPA's criteria for protected areas, Kenya has set aside 22 areas as National Parks category II, 25 areas as Nature Reserves category IV, and 14 units as Resource Reserves category VI. Out of these the following are the coastal protected areas:

Boni Forest
Dodori Forest
Tana River Delta
Witu-Utwani
Ganja Forest
Marenji Forest
Rombo Forest
Gogoni Forest
Buda Forest
Umba Forest
Arabuko - Sokoke Forest
Mongoni West and North Forests
Mwena River
Mrima Hill
Shimba Hills National Reserve
Masas Hill
Kayas
Malindi/Watamu Marine National Park
Kisite Marine National Park
Kiunga Marine National Park (proposed)
Diani Marine National Park (proposed)

- Boni Forest: A ground water forest. Believed to contain the almost extinct Apalis chariessa. Protected area for elephants which are heavily poached.
- Dodori Forest: Also a ground water forest. Breeding ground for Dugong dugon and the marine green turtle (Chelonia mydas).
- Tana River Delta: A delta threatened by agricultural activity and a proposed rice irrigation scheme. Only known locality for restriction of cistecola, believed to be almost extinct and Apalis chariessa. Two swamps in the delta Belissa and Shakabobo, are particularly important wild fowl refuges with 15 important heronries.
- Witu-Utwani Forest: This forest is on top of a 1,500 ft hill and contains palms which are preferred nesting places for Falco chiquera birds. It is also a known locality for the frog Scistometopum gregorii, a species not collected since 1934.

Arabuko-Sokoke
Forest:

This forest contains a nature reserve which is being illegally exploited for agricultural purposes. The forest reserve (L. R. 12327) is approximately 2,696 ha and has recently been extended by 1,634 ha. It is the home of endemic birds Otus ireneae (Sokoke scops owl), Ploceus golangi (Clarkes weaver), Anthus sokokensis (Sokoke pipit) and Anthus malindae (Malindi pipit).

Mangrove Forests:

Although currently mangrove forests are not protected areas, their exploitation, especially by cutting for poles, is prohibited.

Coastal Environments

The following coastal environments and coast-associated intertidal habitats are relevant to Kenya's coast.

Environment/Habitat	Use	Conservation/Threats
Beach	rerecreation/tourism	pollution
Rocky shore	settlements	industrial/urban/settlement
Cliffed shore	"	settlement
Barrier island Bay	sailing/fishing	"
Estuary	"	"
Lagoon	"	"
Creek	fishing	"
Algal	-	-
Sea-grass	-	-
Mudflats	sand mining	-
Mangrove forest	timber/fuelwood construction	destructive harvesting
Coastal swamp forest	timber/fuelwood	"
Coastal shrubland	settlement	agricultural developments
Coastal grassland	"	"
Saline marshes	fishing	over-exploitation
Palm forest	timber	destructive felling
Patch reef	coral mining	over-exploitation siltation
Fringing coral reef	"	"
Coral knoll	"	"
Island	sand mining settlements	"
Continental shelf	oil exploration	pollution
Continental shelf	-	-
Submarine canyon	-	-
Shoal	fishing	over-exploitation
Alluvial bar	sand mining	over-exploitation siltation
Inshore circulation eddies	fishing	over-exploitation
Harbour/marina	sailing/shipping	pollution
Sea-bird nesting	hunting/recreation	over-exploitation
Turtle nesting/ feeding		habitat destruction and over-exploitation
Dugong feeding/ shelter	-	over-exploitation
Fish spawning nursery	fishing	over-exploitation siltation & forest depletion
Shrimp spawning nursery	fishing	"

INVENTORY OF THREATENED OR ENDANGERED COASTAL AND MARINE SPECIES

Threatened animals of Kenya

<u>Cercocebus galeritus</u>	Agile mangabey	E
<u>Colobus badius rufomitratu</u> s	Tana River red colobus	E
<u>Lycaon pictus</u>	Hunting dog	V
<u>Panthera pardus</u>	Leopard	V
<u>Acinonyx jubatus</u>	African cheetah	V
<u>Loxodonta africana</u>	African elephant	V
<u>Diceros bicornis</u>	Black rhinoceros	V
<u>Damaliscus hunteri</u>	Hunter's hartebeest, Hirola	R
<u>Otus ireneae</u>	Sokoke scops owl	
<u>Mirafra pulpa</u>	Sagon bushlark	
<u>Mirafra williamsi</u>	Marsabit bushlark	
<u>Turdus helleri</u>	Taita olive thrush	
<u>Turdoides hinei</u>	Hinde's pied babbler	
<u>Ploceus golandi</u>	Clark's weaver	
<u>Cinnyricinclus femoralis</u>	Abbott's starling	
<u>Anthus sokokensis</u>	Sokoke pipit	
<u>Turdus fisheri</u>	Spotted ground thrush	
<u>Sheppardia gunningi</u>	East coast akalat	R
<u>Apalis (thoracia) flavigularis</u>	Yellow bar-throated apalis	R
<u>Anthreptes pallidigaster</u>	Amani sunbird	
<u>Falco peregrinus</u>	Peregrine falcon	
<u>Malacochersus tornieri</u>	Pancake tortoise	I
<u>Crocodylus niloticus</u>	Nile crocodile	V
<u>Papilio teita</u>		

Indian Ocean

<u>Balaenoptera physalus</u>	Fin whale, finback, common rorqual	V
<u>Megaptera novaeangliae</u>	Humpback whale	E
<u>Balaenoptera musculus</u>	Blue whale, sulphur-bottom whale	E
<u>Dugong dugon</u>	Dugong	V
<u>Caretta caretta</u>	Loggerhead turtle	V
<u>Chelonia mydas</u>	Green turtle	E
<u>Dermodochelys coriacea</u>	Leatherback	E
<u>Eretmodochelys imbricata</u>	Hawksbill turtle	E
<u>Lepidochelys olivacea</u>	Olive Ridley	E
Families: <u>Antipathidae</u>	Black coral	I
<u>Leiopathidae</u>		I
<u>Charonia tritonis</u>	Triton's trumpet (giant triton)	I
<u>Iridacna gigas</u>	Giant clam	V
<u>Iridacna squamosa</u>	Scaly or fluted clam	V
<u>Iridacna maxima</u>	Small giant clam	V
<u>Hippopus hippopus</u>	Horse's hoof, bear paw or strawberry clam	V

<u>Trochus niloticus</u>	Mother-of-pearl	
<u>Turbo marmoratus</u>	Mother-of-pearl	
<u>Pinctada</u> spp. (any other molluscs in ornamental trade, or used as food)	Mother-of-pearl	
<u>Palinurus</u> spp.	Spiney lobsters	
<u>Birgus latro</u>	Coconut crab (robber crab)	V

ENDEMIC AND THREATENED TREE-FERNS, CYCADS, SUCCULENT
EUPHORBIAS AND ALOES

ENDEMIC TAXA

Gymnospermae

Zamiaceae

Encephalartos tequilaneus Melville I

Angiospermae

Euphorbiaceae

Euphorbia ballyana Rauh Ex
Euphorbia brevitorta Bally E
Euphorbia classenii Bally & S. Carter E
Euphorbia cussonioides Bally E
Euphorbia longetuberculosa Hochst. Ex Boiss V
Euphorbia saxorum Bally & S. Carter E
Euphorbia tanaensis Bally I
Euphorbia tenuispinosa Gilli V
Euphorbia wakefieldii N.E.Br. E

Liliaceae

Aloe archeri Lavranos V
Aloe cheranganiensis S. Carter & Brandham V
Aloe chrysostachys Lavranos & Newton V
Aloe classenii G. Reyn V
Aloe dumetorum B. Mathew & Brandham V
Aloe elgonica Bullock V
Aloe erensii Christian E
Aloe fibrosa Lavranos & Newton V
Aloe juvenna Brandham & S. Carter E
Aloe kilifiensis Christian E
Aloe lateritia Engler var. Kitaliensis
G. Reyn. nt
Aloe lensayuensis Lavranos & Newton V
Aloe meruana Lavranos E
Aloe morijensis S. Carter & Brandham E
Aloe nyeriensis Christian spp. nyeriensis nt
Aloe nyeriensis Christian spp.
kedongensis (G. Reyn.) S. Carter nt
Aloe turkanensis Christian nt
Aloe ukambensis G. Reyn E
Aloe vituensis Baker V

<u>NON-ENDEMIC TAXA</u>	COUNTRY CATEGORY	REGIONAL CATEGORY
<u>Pteridophyta</u>		
<u>Cyatheaceae</u>		
<u>Cyathea humilis</u> Hieron var. <u>humilis</u>	R	I
<u>Gymnospermae</u>		
<u>Zamiaceae</u>		
<u>Encephalartos bubalinus</u> Melville	R	I
<u>Angiospermae</u>		
<u>Euphorbiaceae</u>		
<u>Euphorbia actinoclada</u> S. Carter	V	V
<u>Euphorbia buruana</u> Pax		
<u>Euphorbia colubrina</u> Bally	E	V
<u>Euphorbia colubrina</u> Bally & S. Carter	V	V
<u>Euphorbia furcata</u> N. E. Br.	V	V
<u>Euphorbia meridionalis</u> Bally & S. Carter	V	V
<u>Euphorbia pseudoburuana</u> Bally & S. Carter	V	V
<u>Euphorbia robecchii</u> Pax	V	V
<u>Euphorbia uhligiana</u> Pax	V	V
<u>Aloe amudatensis</u> G. Reyn	V	V
<u>Aloe ballyi</u> G. Reyn	V	V
<u>Aloe calidophila</u> G. Reyn	V	V
<u>Aloe desertii</u> Engler	V	V
<u>Aloe ottallensis</u> Baker	V	V
<u>Aloe pirottae</u> A. Berger	V	V
<u>Aloe ruspoliana</u> Baker var. <u>ruspoliana</u>	R	R
<u>Aloe tweediae</u> Christian	V	V

E = Endangered, V = Vulnerable, I = Indeterminate, R = Rare, Ex = Extinct,
U or unkn = Unknown

INVENTORY OF THREATENED OR ENDANGERED COASTAL AND MARINE SPECIES

Species	Distribution	Status	Pop. Size	Threats	Critical habitat
<u>Cercocebus galeritus</u>					
<u>Colobus badius</u>					
<u>rufomitratu</u>					
<u>Lycaon pictus</u>					
<u>Panthera pardus</u>					
<u>Acinonyx jubatus</u>					
<u>Loxodonta africana</u>	Boni forest	E	low	poachers	ground water forest
<u>Diceros bicornis</u>					
<u>Damaliscus hunteri</u>					
<u>Otus irenae</u>					
<u>Mirafra williamsi</u>					
<u>Turdus helleri</u>					
<u>Ploceus qoladi</u>					
<u>Turdoides hindei</u>					
<u>Cinnyricinclus</u>					
<u>fermoralis</u>					
<u>Anthus sokokensis</u>					
<u>Turdus fisheri</u>	Sokoko, Gedi & coastal Kenya	R	low	habitat destruction	Kayas
<u>Sheppardia gunningi</u> (east coast Akalat)	Arabuko-Sokoke	E	unkn	habitat destruction	forest
<u>Apalis (thoracia)</u>					
<u>Flarigularis</u>					
<u>Anthreptes</u>					
<u>pallidigaster</u> (Amani sunbird)	Sokoke forest	R	low	habitat destruction	forest
<u>Falco peregrinus</u>	coastal rocks	U	unkn	exploitation	rock hills
<u>Malacochersus</u>					
<u>torneri</u>					
<u>Crocodylus niloticus</u>	along Tana river	V	low	dam construction exploited	river banks
<u>Papilio teita</u>					
<u>Balaenoptera physalus</u> (fin whale)					
<u>Megaptera novaeangliae</u> (humphack whale)					
<u>Balaenoptera musculus</u> (blue whale)					
<u>Dugong dugon</u> (dugong)		V	low	exploited	coastal waters

Species	Distribution	Status	Pop. Size	Threats	Critical habitat
<u>Caretta caretta</u>	unknown	U	unkn	unknown	unknown
<u>Chelonia mydas</u>	Dodori & Boni forests	V	low	exploited	coastal waters
<u>Dermochelys coriacea</u>		E			
<u>Eretmochelys imbricata</u>					
<u>Lepidochelys olivacea</u>	reef habitats	V	low	exploitation	exposed reefs
Families: <u>Anthipothidae</u> ;					
<u>Leiopathidae</u>					
<u>Choronia tritonis</u>	coral reefs	R	low	over-exploitation	coral reefs
<u>Tridacna qigas</u>	beaches and coral	V	)	)	coral reefs
<u>Tridacna squamosa</u>	beaches, coral reefs	"	) unkn	) over-exploited	
<u>Tridacna maxima</u>	beaches, coral reefs	"))	
<u>Hippopus hippopus</u>	coral reefs	"))	
<u>Trochus niloticus</u>					
<u>Turbo marmoratus</u>					
<u>Pinctada</u> spp.					
<u>Palinurus</u> spp.					
<u>Birgus latro</u>	coastal shallow	R	unkn	exploitation	

E = Endangered, V = Vulnerable, I = Indeterminate, R = Rare, Ex = Extinct, U or unkn = Unknown

ADDITIONAL INFORMATION

Species: Circaetus fasciolatus Kaup, southern banded harrier eagle

Distribution: Kenya's coastal areas and just inland. Outside Kenya occurs mainly along Tanzania's coastal areas

Habitat: Woodland and forests

Vulnerability to disturbance: Unknown

Occurrence in protected areas: Arabuko-Sokoke Nature Reserve (forest threatened by heavy cutting) and Simba Hills National Reserve

Present status: Vulnerable

Species: Falco chiquera ruficollis, Swainson red-necked falcon

Distribution: Coastal, lower Tana River, Tsavo East, Lake Turkana. Outside Kenya: mostly west of 35°, Sudan to South Africa

Habitat: Closely associated with palms, Borassus & Hyphaene

Vulnerability to disturbance: Intolerant (nests in palms)

Occurrence in protected area: Tsavo National Park

Present status: Endangered due to agricultural activity at the coast, rice irrigation project at the Tana River Delta and the increased felling of palms

Species: Dromus ardeola pay kull crab plover

Distribution: Lamu area Minda Greek (migrant). Outside Kenya: NE Africa and Arabia to Dar es Salaam

Habitat: Sand flats and mangrove swamps

Vulnerability to disturbance: Probably vulnerable

Occurrence in protected area: Nil

Present status: Insecure

Species: Pachycoccyx audeberti validus, Keichenow thick-billed cuckoo

Distribution: Lower Tana to Sokoke: Outside Kenya: Tanzania coast to Songea

Habitat: Miombo and woodland

Vulnerability to disturbance: Unknown

Occurrence in protected area: Nil

Present status: Endangered

Species: Indicator narokensis Jackson, Kilimanjaro honeyguide

Distribution: Kenya coast, Shimba, Sokoke, Sigor and Kongelai
Outside Kenya: Tanzania

Habitat: Woodland

Vulnerability to disturbance: Unknown

Occurrence in protected area: Unknown

Present status: Vulnerable

Note: Depends on status of habitat and host species

Species: Smithornis capensis suahelicus grote, broadbilled

Distribution: Kenya coastal forests, Sokoke to Shimba hills:
Outside Kenya: coastal Tanzania inland

Habitat: Woodland and forest

Vulnerability to disturbance: Vulnerable

Occurrence in protected area: Nil

Present status: Vulnerable

Species: Anthus malindae Shelley, Malindi pipit
Distribution: Kenya coast and at Samburu and Manji ya Chumvi endemic.
Outside Kenya : Nil
Habitat: Savanna grassland
Vulnerability to disturbance: Probably vulnerable
Occurrence in protected area: Nil
Present status: Insecure

Species: Laniarius aethiopicus, melanistic morph
Distribution: Lamu Hinterland: Outside Kenya: Nil
Habitat: Woodland and scrub
Vulnerability to disturbance: Unknown
Occurrence in protected area: Nil
Present status: Endangered

Species: Cisticola restricta Taylor, Tana River cisticola
Distribution: Tana River area: endemic. Outside Kenya: nil
Habitat: Bushland
Vulnerability to disturbance: Very possible
Occurrence in protected area: Nil
Present status: Endangered due to projected irrigation schemes

Species: Apalis chariessa Reichenow, white-winged apalis

Distribution: In Kenya known only from Mitole and 37°N of Garsen on Tana River. Last found 1961. Endemic. Outside Kenya: subspecies Macphersoni, Uluguru and Malawi

Habitat: Riverine or gallery forest

Vulnerability to disturbance: Probably vulnerable

Occurrence in protected area: Nil

Present status: Presumed extinct

Species: Ploceus golandi Clarke, Clarke's weaver

Distribution: Sokoke Arabuko forest, endemic. Outside Kenya: Nil

Habitat: Brachystegia forest

Vulnerability to disturbance: Unknown

Occurrence in protected area: Nil

Present status: Insecure

ENDANGERED AND THREATENED ANIMALS

Species	Critical habitat	Remarks
<u>Apalis chariessa</u>	Boni forest and Tana river	almost unknown - probably extinct
<u>Dugong dugon</u> (dugong)	Dodori Forest	threatened species due to exploitation
<u>Chelonia mydas</u> (marine green turtle)	"	
<u>Cephalophus netalenses bettegoi</u> (red durkar)	Belissa and Shaka-bobo swamp	swamp threatened by drainage
<u>Paraxerus pallatus tanae</u> (squirrel)	"	"
<u>Aparallactus quenthers</u> (snake)	"	"
<u>Hylarana bravana</u> (frog)	"	"
<u>Falco chiquera</u> (bird)	Witu-Utwani	palms in which the bird nests are being depleted
<u>Scistometopum gregorii</u> (frog)	"	not collected since 1934
<u>Gigospion macrosphon</u>	"	
<u>Didymosolpinx nora</u>	"	
<u>Cola clavata</u>	"	
<u>Pogonocichla stellata</u> (white-starred forest robin)	"	newly discovered bird
<u>Turdus gurneyi</u> (bird)	"	"
<u>Otus ireneae</u> (Sokoke scops owl)	Arabuko-Sokoke forest	endemic bird
<u>Ploceus qolandi</u> (Clarkes weaver)	"	"
<u>Anthus sokokensis</u> (Sokoke pipit)	"	"
<u>Turdus fisheri</u> (spotted ground thrush)	"	forest is holding ground for these species

Species	Critical habitat	Remarks
<u>Pitta angolensis</u> (African pitta)	"	"
<u>Cephalophus adersi</u> (Aders duiker)	Arabuko-Sokoke forest	only known locality of this animal species
<u>Cephalophus monticola</u> (blue duiker)	"	"
<u>Rynchocyon cernei chrysopygus</u> (golden rumped elephant shrew)	"	"
<u>Petrodromus tetradactylus sultan</u> (bristle-tailed elephant shrew)	"	"
<u>Galago crassicaudatus lasiotis</u> (bush-baby)	"	"
<u>Galago senagelanas zanzibaricus</u>	"	"
<u>Colobus rufimitratus</u> (Tana river red colobus)	"	almost extinct
<u>Leptopelis flavomaculatus</u> (frog)	"	
<u>Charaxes lasti</u> (butterfly)		
<u>Charaxes protocles azota</u> (butterfly)		
<u>Anthreptes palidgaster</u> (Amani sunbird)	Ganja, Marenyi, Jombo Gogoni, Buda & Shimmi forests	
<u>Anthreptes neglectus</u> (Uluguru violet-backed sunbird)	"	
<u>Colobus angolensis palliantus</u> (coastal colobus)	"	
<u>Neotragus moschanthu</u> Kirchenpaseri (Suni)	"	
<u>Hippotragus niger</u> (sable)	Shimba Hills	forest heavily exploited

Species	Critical habitat	Remarks
<u>H. equinus</u> (translocated roan)	"	
<u>Neotragus moschateis kirchenpanesis</u>	"	
<u>Chiromantis xerampelina</u> (frog)	"	
<u>Kasina maculata</u> (frog)	"	
<u>Hyperolius tuberlinguis</u> (frog)	"	
<u>H. rubrovermicalatus</u> (frog)	"	
<u>H. mariae</u> (frog)	"	
<u>Leptopelis favomaculatus</u> (frog)	"	
<u>Bufo micronotas</u> (frog)	"	
<u>Charaxes accuminatue Shimbasis</u> (butterfly)	"	
<u>Oriolus chlorocephalus</u> (green-headed oriole; bird)	"	
<u>Smothornis lapensis</u> (broadbill; bird)	"	
<u>Buccanodon oluaceum</u> (green barboo)	"	
<u>Pogoniulus simplex</u> (green tinkerbird)	"	

PLANT SPECIES THREATENED DUE TO INTENSIVE ENCHROACHMENT OF FOREST
ECOSYSTEM BY AGRICULTURE AND DISTURBANCE BY CUTTING AND BURNING

Species	Critical habitat	Remarks
<u>Rhus quartiniana</u>	Tana Delta	threatened by rice irrigation
<u>Maerua triphilla</u>	"	"
<u>Monathataxis sweinfurthii</u>	"	"
<u>Monathataxis parriflora</u>	"	"
<u>Canniphora riparia</u>	"	"
<u>Combretum tanaensis</u>	"	"
<u>Terminaria breripes</u>	"	"
<u>Baurintonia racemosa</u>	"	"
<u>Thepesia populanea</u>	"	"
<u>Sesbania speciosa</u>	"	"
<u>Culubrina asiatica</u>	"	"
<u>Kassina maculata</u>	Witu-Utwani forest	forest on hill-top 1,500 ft alt. & threatened by settlements
<u>Hyperolus vividiflavus rubripes</u>	"	"
<u>Hyperolus tuberilinguis</u>	"	"
<u>Afrivalus brachycremia</u>	"	"
<u>Saint Paulia rupicola</u>	Mwara Kaya	sacred tribal preserves
<u>Cola octolobioides</u>	Chasimba Kaya	"
<u>Savia fadeni</u>	"	"
<u>Caesalpina dalei</u>	"	"
<u>Scoliopsis usambarensis</u>	"	"
<u>Aristoqeitonia monophylla</u>	"	"
<u>Macrococca scariosa</u>	"	"
<u>Oxystigma mzoo</u>	"	species almost extinct
<u>Phyllanthus kirkianus</u>	Arabuko-Sokoke	forest with nature reserve which is being uncontrollably exploited
<u>Phyllanthus stolzianus</u>	"	"
<u>Nectoropetalum kaessuari</u>	"	"
<u>Strychnos motis</u>	"	"
<u>Memecylon melindensis</u>	"	"
<u>Memecylon verrusculosum</u>	"	"
<u>Angylocalyx braunii</u>	"	"
<u>Pavetta uniflora</u>	"	"
<u>Nesogordia parviflora</u>	"	"
<u>Brachylaena hutchinsi</u>	"	"

Species	Critical habitat	Remarks
<u>Ricinochendron hendalotii</u>	Shimba Hills	although protected, forest being cleared for exotic plantation, threat to these species
<u>Pistacea aethipica</u>	"	"
<u>Cammiphora zimmermannii</u>	"	"
<u>Santaloides splendida</u>	"	"
<u>Cannorus</u> sp.	"	"
<u>Alchornea laxiflora</u>	"	"
<u>Cleistanthus schlecteri</u>	"	"
<u>Harungana madagascariensis</u>	"	"
<u>Visma orientalis</u>	"	"
<u>Strychnos scheffleri</u>	"	"
<u>Memecylon verruculosum</u>	"	"
<u>Dalbergia bractealata</u>	"	"
<u>Hirtella zanzibarica</u>	"	"
<u>Cathium hispidum</u>	"	"
<u>Gardenia posoquerioides</u>	"	
<u>Psychotria lauracea</u>	"	
<u>Heinsia densiflora</u>	"	
<u>Panetta tarinoides</u>	"	
<u>Panetta trichosphera</u>	"	
<u>Malacantha aluifolia</u>	"	
<u>Odyndia zimmermanni</u>	"	
<u>Cola greenwayi keniensis</u>	"	
<u>Maytenus buchananii</u>	"	
<u>Caesalpinia dalei</u>	"	gathered in 1936; extinct known from a gathering in 1934
<u>Grevea inadascaviensis</u>	"	
<u>Uvariadendron gorgonis</u>	Mvima Hill	occurs on Mvima Hill and greatly threatened
<u>Uvariadendron kirkii</u>	"	"
<u>Gyrocarpus jacquini</u>	"	
<u>Thesesia populnea</u>	"	
<u>Ficus depauperate</u>	"	
<u>Angylocalyx braunii</u>	"	
<u>Cordyla africana</u>	"	
<u>Lasiodiscus ferrugineus</u>	"	
<u>Coffea zanzibarica</u>	"	
<u>Kraussia spenosa</u>	"	
<u>Majidea zanzibarica</u>	"	
<u>Melanodiscus</u> sp. nov.	"	
<u>Cola clarata</u>	"	
<u>Nesogordome parriflora</u>	"	
<u>Vitex corrathi</u>	"	

Species	Critical habitat	Remarks
<u>Aristogetitoma monophylla</u>	Rocky outcrops	
<u>Cola octoleboides</u>	"	
<u>Saint Paulia rupicola</u>	"	
<u>Savia fadenii</u>	"	
<u>Rhizophora mucronata</u>	Coastal lagoons and swamps	species of mangrove threatened by exploitation
<u>Sonnertia alba</u>	"	"
<u>Avicennia marina</u>	"	"
<u>Bruquiera gymnorhiza</u>	"	"
<u>Cexiops togal</u>	"	"
<u>Lumnitzera racemosa</u>	"	"
<u>Haritiera littoralis</u>	"	"
<u>Padina gymnospora</u>	Rocky platforms	
<u>Padina commersonii</u>	"	
<u>Dictyotales bartayresiana</u>	"	
<u>D. delicatula</u>	"	
<u>Styopodium zonale</u>	"	
<u>Colpomenia sinnosa</u>	"	
<u>Hydroclathrus clathratus</u>	"	
<u>Boodlea composta</u>	"	
<u>Cytoseira myrica</u>	"	
<u>Rhodophyta (red algae)</u>	"	
<u>Acrocystis nana</u>	"	
<u>Cracilaria cacalia</u>	"	
<u>C. edulis</u>	"	
<u>Hypnea valentiae</u>	"	
<u>Carpopeltis maillardi</u>	"	
<u>Actinotrichia fragilis</u>	"	
<u>Galaxaura subverticillata</u>	"	
<u>G. squalida</u>	"	
<u>Jania capillacea</u>	"	
<u>Cymodocea ciliata</u>	"	
<u>Amphiroa foliacea</u>	"	
<u>Chondrococcus hornemanni</u>	"	
<u>C. harveyi</u>	"	
<u>Halymenia venusta</u>		
<u>Amansia glomerata</u>		
<u>Neurymenia fraxinifolia</u>		
<u>Gelidiella acerosa</u>		
<u>Centrocevas clanulatum</u>		
<u>Polysiphonia ferulacea</u>		
<u>Vanvoovstia spectabilis</u>		
<u>Digenea simplex</u>		
<u>Cyanophyta (blue-green algae)</u>		
<u>Lyngbya majuscula</u>		

Species	Critical habitat	Remarks
<u>Chlorophyte</u> (green algae)		
<u>Ulva lactuca</u>		
<u>U. fasciata</u>		
<u>U. vigilda</u>		
<u>U. reticulata</u>		
<u>Enteromorpha compressa</u>		
<u>Bostrychie binderi</u>		
<u>Boegenia forbesii</u>		
<u>Valoniopsis pachyrema</u>		
<u>Cladophoropsis membranacea</u>		
<u>Ernodesmis verticullata</u>		
<u>Udotea indica</u>		
<u>U. orientalis</u>		
<u>Halimeda opuntia</u>		
<u>H. macroloba</u>		
<u>H. tuna</u>		
<u>Cymodocea ciliata</u> Aschers	Back reef lagoons	
<u>Cymodocea serrulata</u> Aschers	"	
<u>Cymodocea rotundata</u> Schwinf	"	
<u>Halodule uninervis</u> Aschers	"	
<u>Halodule wrightii</u> Aschers	"	
<u>Syringodium isoetifolium</u> Dandy	"	
<u>Halophila ovalis</u> Hook	"	
<u>Halophila balfourii</u> Solered	"	
<u>Halophila minor</u> (Zool) Hartog	"	
<u>Thalassia hemprichii</u> Aschers	"	
<u>Enhalus acoroides</u> stud	"	
<u>Zostera capensis</u> setchell	"	
<u>Arrainvillea amadelpha</u>	Algae of sandy & mud flats	
<u>Caulerpa scalpelliformis</u>	"	
<u>C. sertulavioides</u>	"	
<u>C. racemosa</u>	"	
<u>C. verticullata</u>	"	
<u>Halimeda macroloba</u>	"	
<u>Neomeris van boseae</u>	"	
<u>Phaeophyta</u> (brown algae)	Algae on rocky platforms	
<u>Cytoseira myrica</u>	"	
<u>Laurencia papillosa</u> (red algae)	"	
<u>Hormophysa trinodis</u>	"	
<u>Sargassum duplicatum</u>	"	

PROPOSALS FOR NEW COASTAL AND MARINE PROTECTED AREAS

Two areas have been proposed for the establishment of marine national parks:

- Kiunga Marine National Park (north coast) and Diani Marine National park (south coast).

- Current ecological research in coastal and marine environment in Kenya could reveal unique ecosystems that would warrant protection. Until this investigation is undertaken, it may be difficult to make new proposals using available information.

RAPPORT NATIONAL COMORIEN : par Ahmed A. B. Noman

DONNEES DE BASE

Superficie:	2 236 km ²
Terres arables:	1 080 km ² - 48.3 pour-cent des terres
Population:	400 000
Densité:	180 habitants au km ²
Taux de croissance démographique:	3.6 pour-cent par an
Population vivant de l'agriculture:	80 pour-cent
Population vivant de la pêche:	2 pour-cent
Produit national brut par habitant:	US\$ 200
Taux d'alphabétisation:	60.3 pour-cent
Principales sources de devises étrangères:	Essences de parfum, vanille, girofle, café, coprah, cacao, cannelle

EXAMEN DES POLITIQUES NATIONALES DE GESTION RELATIVES
AUX AIRES PROTEGEES ET AUX ESPECES EN DANGER

Législation

Législation internationale:

Notre pays n'est pas partie aux instruments normatifs cités.

Législation nationale:

Législation sur les endroits protégés

Le Gouvernement a l'intention de déclarer certains endroits comme endroits protégés du point de vue économique. Seul le lagon de Mayotte possède un texte qui le protège, mais la pêche est autorisée dans ce lagon.

Planification

Jusqu'à maintenant il n'existe pas de plan de développement national. Toutefois un plan de développement pour une période de trois ans est en train d'être élaboré par la direction générale du Plan Triennal.

Il n'existe pas de stratégie nationale pour la conservation, ni de plans régionaux ou pour les zones côtières. De même, il n'y a pas de plans pour les aires protégées puisque celles-ci n'existent pas aux Comores.

Institutions ayant des relations avec l'habitat de certaines espèces

Ministère de l'Équipement, de l'Environnement et de l'Urbanisme. C'est le Ministère de tutelle qui s'occupe de l'Environnement. Tous les problèmes de l'environnement qui se posent dans le pays sont coordonnés par ce Ministère. En effet, certains problèmes de l'environnement sont directement traités par les ministères concernés. C'est ainsi que la dégradation du sol est traitée par le Ministère de la Production.

Ministère de la Production, de l'Industrie et de l'Artisanat. Ce Ministère a la charge de la production agricole, forestière, animale, de la pêche, de l'industrie et de l'artisanat. La production agricole, forestière, animale ou halieutique est dirigée par un Centre Fédéral d'Appui au développement rural (CEFADER). Depuis quelques années l'agriculteur comorien connaît les engrais chimiques. L'utilisation de ces produits ira en augmentant dans les années à venir, d'après les responsables du CEFADER.

La direction générale de la forêt se trouve au sein du Ministère de la Production agricole, de l'Industrie et de l'Artisanat. C'est cette direction qui s'occupe du reboisement et du problème de l'érosion. Ce reboisement se fait avec des arbres importés, car ceux-ci poussent très vite. Cette direction s'occupe aussi de l'érosion des sols et du reboisement à ces endroits.

Mais comme le bois est beaucoup utilisé dans le bâtiment, les exploitants de la forêt comme la Société Anonyme de la Grande Comore, reboise avec des espèces importées. Il est regrettable que ce reboisement ne se fasse pas avec des espèces autochtones. L'explication est que celles-ci poussent très lentement. Actuellement le bois est rare à basse altitude (599m) et il faut monter jusqu'à 800m pour en avoir. Les exploitants de la forêt disent que d'ici cinq ans, il n'y aura plus de bois si dès maintenant des mesures ne sont pas prises. Il n'existe pas dans le pays de parc forestier.

Le département de la pêche est dirigé par la SODEPEC (Société de développement des pêches aux Comores) pour servir de courroie de transmission entre le pouvoir et les pêcheurs. Cette Société est sous la dépendance du Ministère de la Production, de l'Industrie et de l'Artisanat.

Outre la pêche à la ligne à main ou palangrotte, la technique du filet pour la capture des thonides est utilisée. Mais dans certaines régions, les pêcheurs l'ont prescrit dans leurs zones. La pêche de nuit à la palangrotte à aide de lamparo (lampe sous pression) est beaucoup pratiquée.

La pêche à la dynamite et aux plantes vénéneuses est strictement interdite. La prise des langoustes et des crevettes a atteint des proportions telles qu'actuellement on trouve sur le marché des langoustes de très petites dimensions. Ceci vient du fait qu'il n'existe pas de loi réglementant la prise des espèces marines.

La destruction du récif corallien et du prélèvement du sable sont tels que la mer dans certaines régions a envahi des terrains destinés aux cultures. Il faut noter qu'il existe une loi qui interdit le prélèvement des coraux et du sable, mais que celle-ci n'est pas appliquée. En effet, le Comorien moyen continue à prendre les coraux pour faire de la chaux, et le sable des plages pour la construction de sa maison, ou pour vendre ces matériaux de construction à d'autres Comoriens. La tonne de ciment coûte actuellement 50 000 F CFA soit 1 000 FF.

La pêche sous-marine n'est pas interdite. La prise du coelacanth n'est pas interdite non plus, mais comme ce mammifère vit dans des eaux très profondes, sa capture est très rare.

La Société de développement des pêches aux Comores, (SODEPEC) est conscient de tous ces problèmes tout en ayant confiance qu'on va petit à petit les résoudre.

Le département du tourisme dépend du Secrétariat d'Etat aux Transports et au Tourisme. La publicité pour attirer les touristes, dans le genre:

"venez aux Comores, vous aurez de beaux coraux, vous mangerez beaucoup de langoustes, vous pouvez pratiquer la pêche sous-marine"..... etc. ne se fait pas. Mais ceci ne saurait tarder car actuellement le tourisme est présenté comme un secteur clé pour le développement du pays.

La direction générale du Plan est sous la dépendance de la Présidence de la République. Ce département n'est pas encore assez développé pour pouvoir répondre aux aspirations du Gouvernement. Actuellement cette direction est en train de préparer le plan intérimaire du pays pour une période de trois ans. Le développement "tous azimut" du pays est le seul slogan lancé actuellement par tous les responsables comoriens. Aussi, aucune étude n'a été faite pour savoir si l'implantation de telle usine dans telle région pourrait avoir des conséquences très graves pour l'environnement.

Gestion des endroits protégés (reposant sur le document de l'UICN sur les catégories, objectifs et critères pour les aires protégées):

- I. Les monuments nationaux existent. Il n'y a pas de texte qui interdit leur destruction, mais les Comoriens les respectent. Ils sont considérés comme faisant partie du développement du pays.
- II. Il existe des paysages culturels comme, par exemple, les villages traditionnels. Cependant, le développement du pays entraînant le désenclavement des régions, il en résulte que la maison traditionnelle disparaît peu à peu pour faire place à une maison plus moderne et plus durable.
- III. Il existé à N'Dzouani (Anjouan) un village qui vit traditionnellement et qui ne connaît pas encore le développement. Mais, le désenclavement et la mise en valeur de ce village sont prévus dans les plans.
- IV. Il n'y a pas de réserve de biosphère mais le volcan Karthala pourrait en être une.
- V. Il n'y a pas de site de Patrimoine mondial. Mais le Karthala pourrait être considéré comme site de Patrimoine mondial. Cependant dans le cadre du plan de développement du pays, il est prévu d'exploiter l'énergie géothermique du Karthala.

Procédures de mise en oeuvre

Les lois dans ce domaine existent mais pas spécialement pour les aires protégées puisque celles-ci n'existent pas. Par exemple, la loi qui interdit le prélèvement du sable des plages ou la prise des coraux pour la fabrication de la chaux pour la construction existe mais n'est pas appliquée, car les Comoriens continuent toujours à détruire le récif coralien et à prélever le sable des plages. Ceci vient du fait

que tous les matériaux de construction coûtent trop cher. Pour qu'une telle loi soit applicable, il faudrait proposer une solution de rechange. Il en est de même pour la pêche à la dynamite puisque, bien qu'interdit les Comoriens continuent à utiliser ce moyen. Il s'avère donc que les lois existent dans ces domaines mais ne sont pas appliquées.

Personnel et formation

Il n'y a pas d'agences qui emploient du personnel pour la protection ou la conservation de la nature. Comme les endroits protégés n'existent pas, la formation spécifique pour ces endroits n'est pas assurée.

HABITATS LITTORAUX

A. Environnement du milieu côtier (superficie non évaluée)

Plage (sable, gravier, galets) :	oui
Rivage rocheux :	"
Rivage escarpé :	"
Iles barrières :	non
Baie :	oui
Estuaire :	non
Lagune :	oui

B. Habitats entre-marées et associés avec la côte

Algues :	oui
Goémon :	non
Banc sable/boue entre-marées :	oui
Mangrove :	"
Forêt maritime, forêt dune :	non
Forêt marécageuse du littoral :	"
Arbuste côtier :	oui
Prairie côtière :	non
Saline (marécage salé) :	"
Forêt de palmier :	"

C. Récifs vivants

Atoll corallien :	non
Récif corallien-barrière :	oui
Banc-barrière :	non
Récif corallien :	oui
Récif morceau :	non
Récif corallien frange :	oui
Coraux "faro" :	non
Coraux monticule :	"

D. Environnement au large (offshore)

Iles	:	oui
Pierre à chaux récif frangeant	:	"
Plateau continental	:	"
Pente continentale	:	non
Crevasse/chasmes sous-marines	:	oui
Récif corallien moyen	:	"
Plaine abyssale	:	"
Tranchée océanique	:	non
Mont dans la mer	:	"
Crête sous-marine	:	oui
Plateau sous-marine	:	non
Banc peu profond	:	"

E. Ecosystèmes pélagiques

Tourbillion près de la côte	:	oui
Tourbillion au large	:	"
Upwellings	:	"
Courant convergent	:	"

F. Environnement artificiel

Décharge de dépouille	:	non
Emplacement mariculture	:	"
Port	:	oui

G. Endroits d'intérêt particulier

Oiseaux de mer:

- îlot M'Chaco (Mohéli), site de ponte
- îlot Magnougni (Mohéli), site de ponte

Ces deux îlots constituent un parc naturel pour les oiseaux de mer.

Tortues de mer:

- Itsamia et aux îlots de Nioumachoua (Mohéli), site de ponte
- Presqu'île de Sima (Anjouan)
- Mayotte (tout le long de la côte), site de ponte

Dugong, oui, site de ponte (le long de la côte de Mohéli)

Crevettes, oui.

Le manque d'inventaire sur les espèces marines et côtières du pays ne nous permettent pas de citer avec exactitude les espèces menacées ou en voie de disparition. Cependant, d'après la SODEPEC, certaines espèces comme les tortues de mer et le dugong sont menacées de disparition car elles sont trop pêchées. Mais aucune statistique sur ces espèces en voie de disparition n'a été établie. En ce qui concerne certaines espèces menacées de disparition et qui sont identifiées, comme la tortue de mer et le dugong, l'Etat par un arrêté présidentiel interdit leur capture. Mais les Comoriens continuent malgré cette interdiction à capturer ces espèces. La loi existe mais n'est pas appliquée.

Aucune étude de recherche dans ce domaine concernant l'habitat marin et côtier n'a été faite dans notre pays. Actuellement rien ne se fait dans ce domaine.

Notre pays n'est pas membre de la CITES. A Anjouan, l'érosion côtière est très forte à certains endroits (presqu'île de Sima), si bien que la terre rouge envahit directement les bancs de sable et menace ainsi l'habitat côtier. Aucune mesure pour arrêter ce phénomène n'est prévue.

INVENTAIRE NATIONAL DES AIRES PROTEGEES EXISTANTES

Il n'existe pas d'aire protégée dans notre pays, aussi bien marine, côtière que terrestre. Cependant le Gouvernement par l'intermédiaire de la SODEPEC, a l'intention de créer des parcs marins. Ainsi à Mohéli, aux îlots de Nioumachoua (Wenefou et Boinaidi) sera créé un parc marin de cinq hectares. Ce sera une zone protégée intégrale où la pêche sera strictement interdite. Ce parc sera cependant ouvert aux scientifiques. C'est à cet endroit que les tortues de mer viennent pondre et où les plus beaux coraux des Comores se trouvent. Quant au dugong, on le trouve tout le long de la côte de Mohéli. Il sera aussi créé tout autour de ces îlots une zone protégée où cependant la pêche artisanale sera autorisée.

En Grande Comore, seront créés deux parcs marins à Bangoi Kouni - Ivoini (au nord) et à Chindini - Malé (au sud) qui seront des parcs marins où la pêche artisanale sera autorisée.

A Anjouan ce sera à Chiroroni (au sud) où la pêche artisanale sera aussi autorisée.

Les superficies de ces zones ne sont pas encore déterminées.

A Mayotte, le lagon est depuis longtemps une zone protégée où la pêche est aussi autorisée.

Vous trouverez en appendices à ce rapport des cartes avec les propositions éventuelles où les parcs pourraient être créés, ainsi que les endroits où se trouvent les mangroves.

Certains endroits comme la zone du karthala pourrait être déclarée zone protégée. Si le Gouvernement comorien se décide à en créer, il pourrait y avoir 5000 ha autour du Karthala; 1000 ha à Anjouan; 1000 ha à Mayotte et 300 ha à Mohéli. Les lieux pour les trois autres îles ne sont pas déterminés.

Il n'y a pas de parc privé aux Comores et si les parcs ci-dessus cités étaient créés, ce seraient des parcs de l'Etat.

CONCLUSIONS

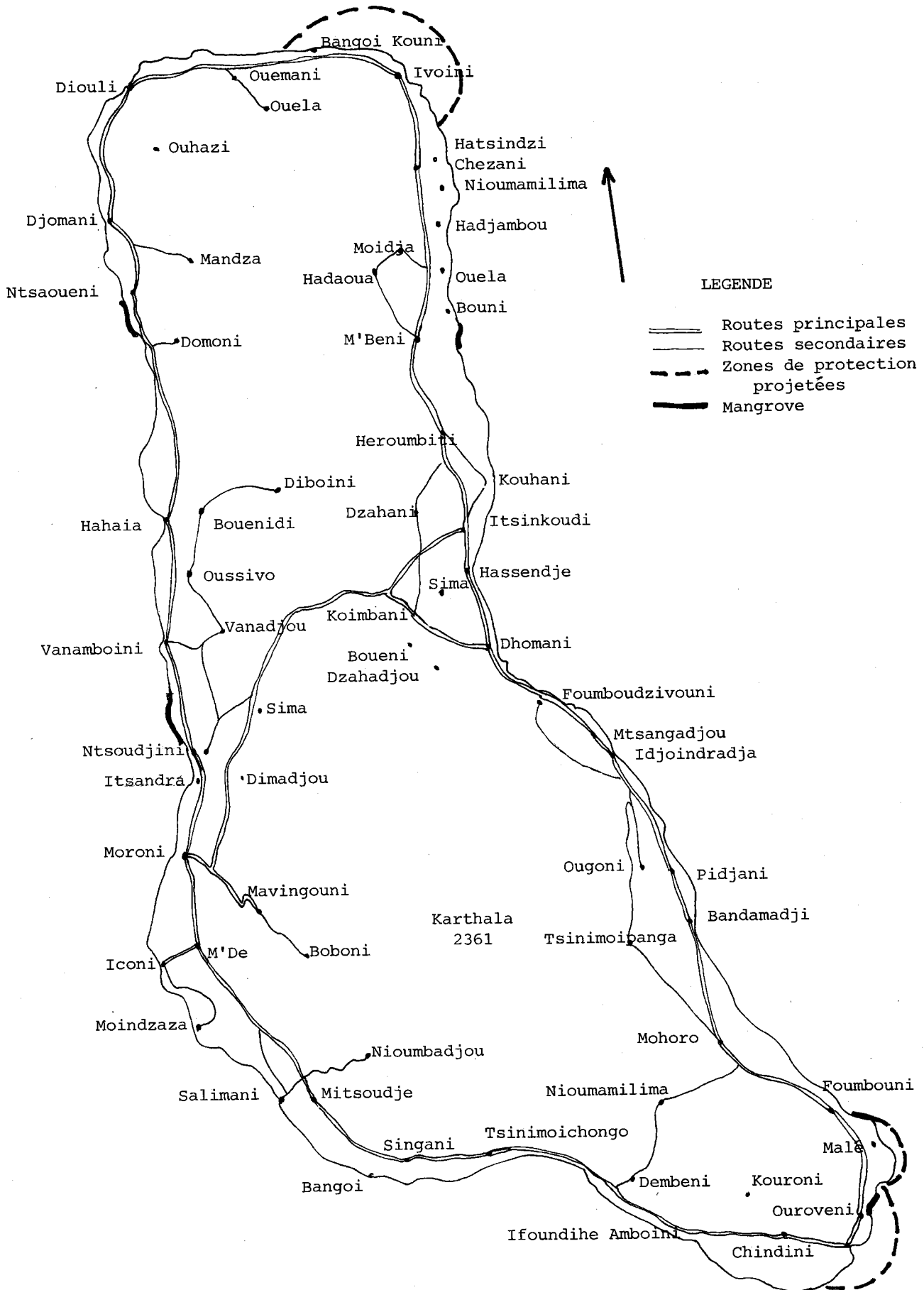
Comme il a été montré dans ce rapport les zones à protéger sont identifiées. Seulement, par manque de moyens financiers et techniques (formation), l'Etat n'a pas pu les instituer en tant que telles.

Annexe

HABITATS TERRESTRES
(superficie-totale et surface protégée non évaluées)
Principales essences forestières des Comores

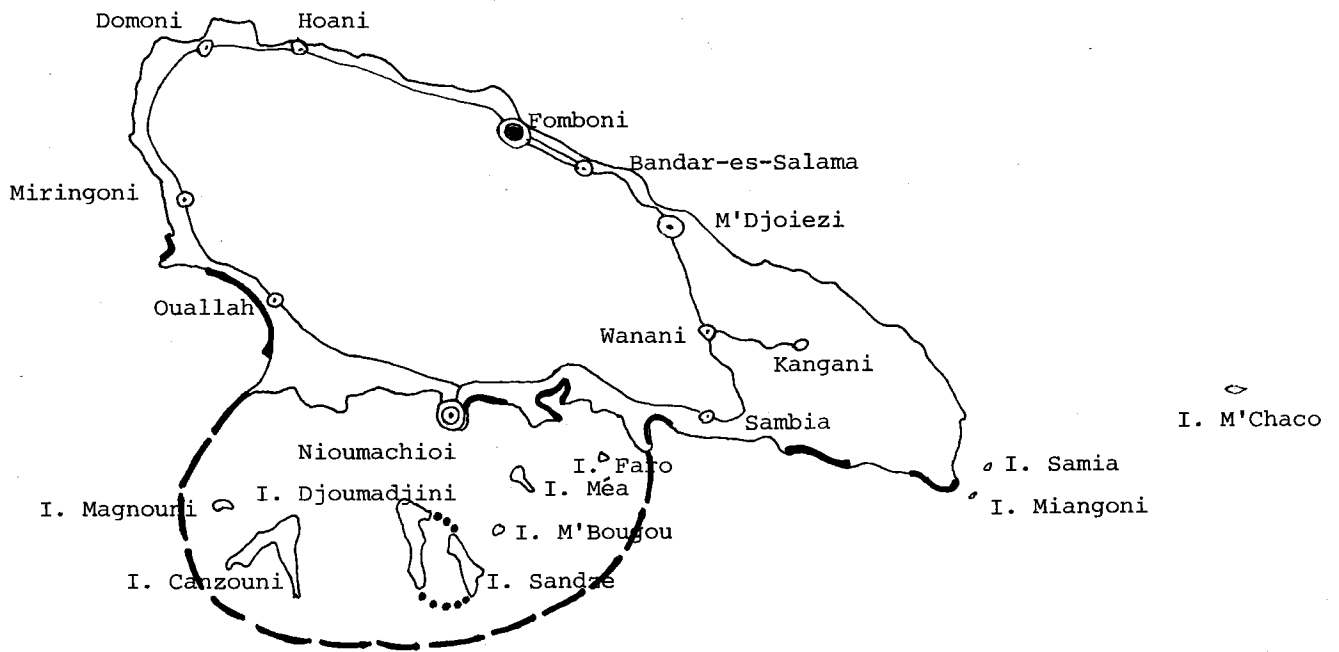
Noms vernaculaires, scientifiques et familles	Altitude
Bidjo - <u>Lasiodiscus articulatus</u> - Rhannacées	600 - 900 m
Mrimehou (mri = bois, mehou = blanc) <u>Eugenia</u> - Myrtacées	450 - 1200 m
Gangani - <u>Macaranga</u> - Euphorbiacées	400 - 1800 m
Mrikoudi - <u>Wainmania</u> - Cunionacées	400 - 1800 m
Camphore - <u>Ocotea</u> - Lauracées	400 - 1000 m
Bangoma - <u>Chrisophyllum</u> - Boiviniamu - Sapotacées	600 - 1000 m
Kouloukou - <u>Strychnos</u> - Loganiacées	600 - 1000 m
Mroboue - Anacardiacees	600 - 1000 m
Mmchimadjy - <u>Ficus</u> - Moracées	600 - 1000 m
Udjendje - <u>Albizzia</u> - Mimosées	600 - 1000 m
Takamaka ou Mrimbonzi <u>Knaya</u> - Méliacées	600 - 1200 m

GRANDE COMORE
(Echelle 1/200 000)



MOHELI

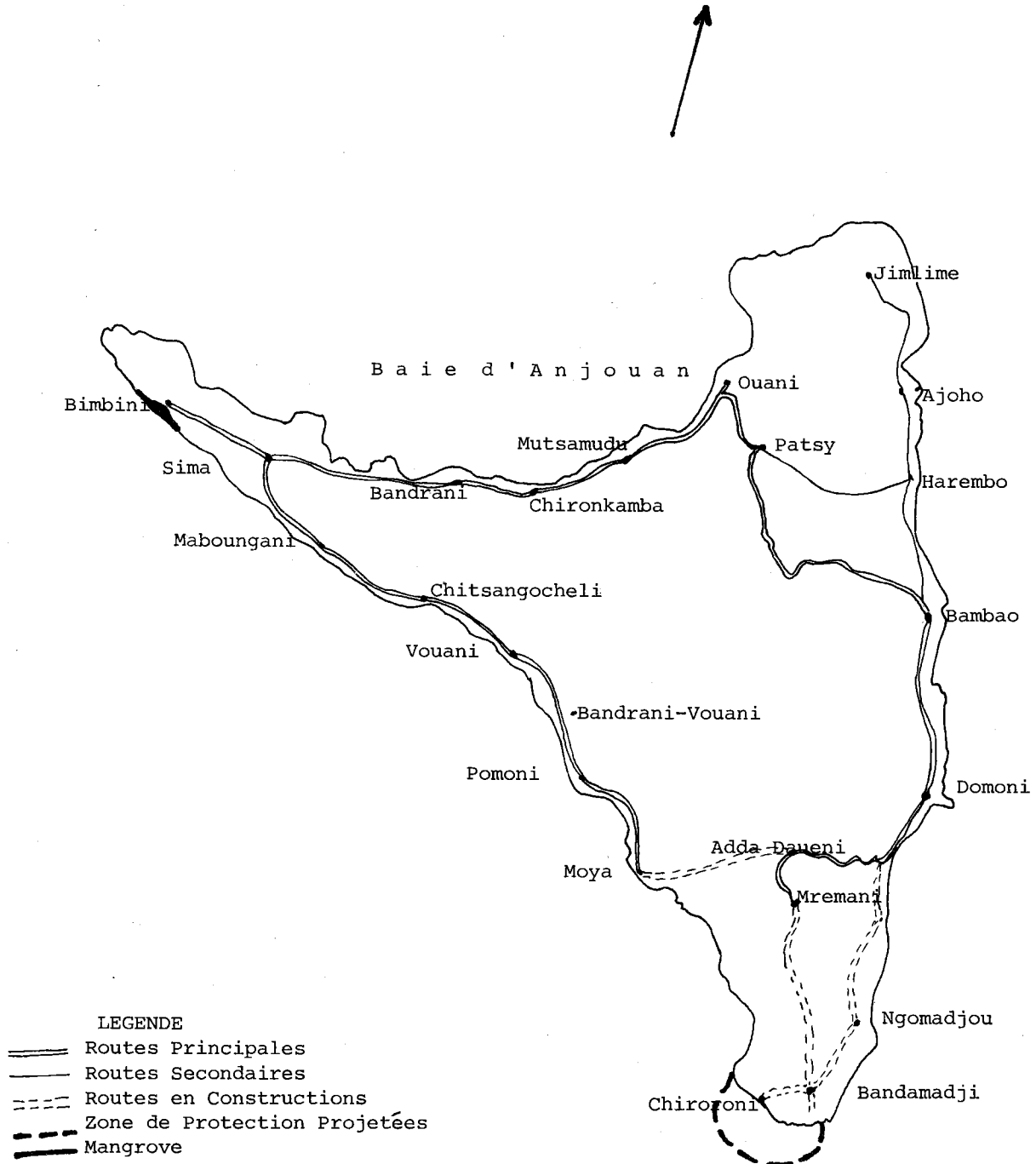
(Echelle 1/200 000; Superficie 250km²)



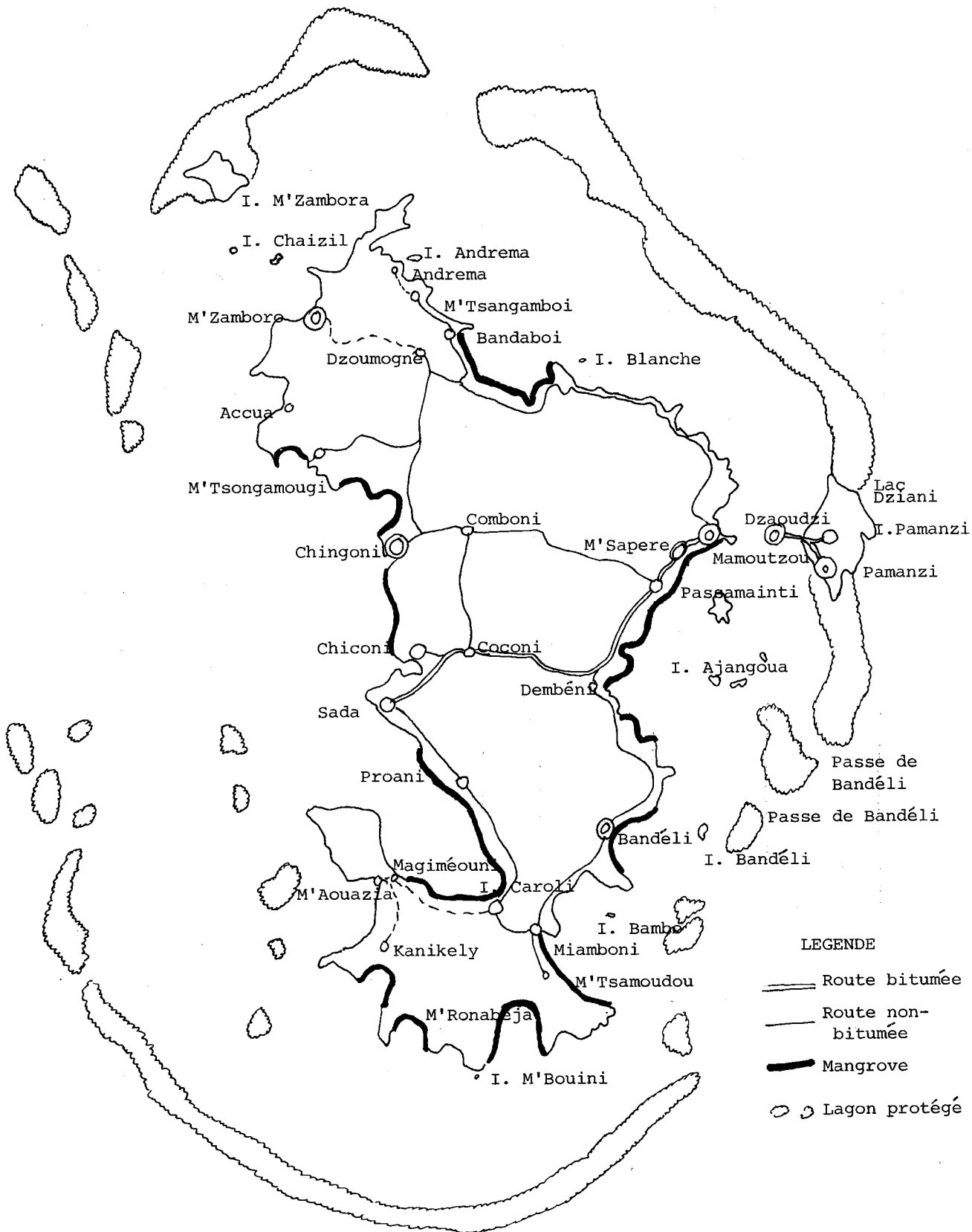
LEGENDE

- ==== Route bitumée
- Route non-bitumée
- Zones integrales projetée
- - - - - Zones de protection "
- Mangroves

ANJOUAN
(Echelle 1/200 000)



MAYOTTE
(Echelle 1/200 000; Superficie 375km²)



RAPPORT NATIONAL POUR MADAGASCAR : par Ph. Randrianarijaona et E. Razafimbelo

DONNEES DE BASE

Superficie:	590 000 km ²
Terres arables:	88 800 km ² , 15 pour-cent des terres
Superficie de la mer territoriale:	112 000 km ²
Population:	8 471 814*
Densité:	14* habitants au km ²
Taux de croissance démographique:	2,5* pour-cent par an
Population vivant de l'agriculture:	78,6 pour-cent
Population vivant de la pêche:	0,36 pour-cent
Produit national brut par habitant:	US\$ 150
Taux d'alphabétisation:	40 pour-cent
Principales sources de devises étrangères:	café, vanille, girofle, etc. crevettes, langoustes, fruits

Ce rapport national comporte deux parties divisées comme suit:

Première partie: Ecosystèmes terrestres de Madagascar (politique de gestion, inventaire des habitats, inventaire des aires protégées, inventaire des espèces menacées).

Deuxième partie: Ecosystèmes marins (politique de gestion, inventaire des habitats, inventaire des aires protégées, inventaire des espèces menacées).

* année 1977

INTRODUCTION

Cette première partie traite des aspects terrestres et cotiers des écosystèmes de Madagascar: inventaire des habitats, inventaire des aires protégées, inventaire des espèces menacées, politique de gestion. Sa structure est conforme aux indications du canevas-guide fourni aux auteurs et elle comporte les différents points suivants:

- a) Examen des politiques de gestion nationale relatives aux aires protégées et aux espèces menacées (législation forestière relative à la protection de la nature, mode et champ d'application de ces textes législatifs, moyens utilisés);
- b) Inventaire National des écosystèmes terrestres;
- c) Inventaire National des aires protégées existantes;
- d) Proposition de création de nouvelles aires terrestres protégées.

EXAMEN DES POLITIQUES NATIONALES DE GESTION RELATIVES AUX AIRES PROTEGEES ET AUX ESPECES EN DANGER

Législation

Législation internationale:

Affiliation de Madagascar aux instruments normatifs suivants:

Convention 1/

- du Patrimoine mondial..... oui (06.02.83)
- sur le commerce international des espèces menacées (CITES)..... oui (18.11.75)
- relative aux zones humides d'importance internationale (Ramsar)..... non
- sur les espèces migratrices (Bonn)..... oui 2/
- africaine sur la conservation de la nature..... oui (09.10.69)
- Convention internationale pour la prévention de la pollution des eaux de la mer par les hydrocarbures.... oui (01.05.65)
- Convention sur le plateau continental..... oui (10.06.64)
- Convention sur la pêche et la conservation des ressources biologiques de la haute mer..... oui (20.03.66)
- Convention sur la haute mer..... oui (30.09.62)
- traité interdisant les essais d'armes nucléaires..... oui (15.03.65)

1/ La date mise en parenthèses est celle d'entrée en vigueur de la convention à Madagascar.

2/ Madagascar a signé la convention mais n'a pas ratifié.

Législation nationale:

a) Législation sur les aires protégées

Madagascar dispose des aires protégées suivantes:

- Les réserves naturelles intégrales (catégorie I suivant classement CNPPA's Committee on Protected Area Nomenclature);
- Les parcs nationaux (catégorie II);
- Les réserves spéciales (catégorie IV);
- Les forêts classées (catégorie VI);
- Les périmètres de reboisement et de restauration (catégorie VIII).

Ces différentes aires ont fait l'objet de textes législatifs ci-après.

Sur les réserves naturelles intégrales: Décret no 66-242 du 01.06.66 constituant certains territoires en réserves naturelles intégrales pour la protection de la flore et de la faune.

Ce texte est basé sur:

- les dispositions de la Convention internationale de la Conférence de Londres (1933) sur la protection de la Faune et de la Flore en Afrique, notamment des dispositions de la Loi du 10.12.1937 et de celle du décret du 31.05.1938 respectivement portant l'approbation de la dite convention et portant sa ratification;
- les dispositions d'une série de décrets instituant et portant création de certaines réserves naturelles à Madagascar à savoir: décret du 31.12.1927, décret du 11.06.1939, décret du 03.01.1952;
- les recommandations de la conférence au sommet des Etats groupés dans l'U.A.M. (Libreville 10-15 septembre 1962) sur la protection de la nature et la création des réserves naturelles intégrales.

En vertu des dispositions du décret no 66-242 en question:

- les réserves naturelles intégrales font parties du domaine forestier national;
- leur accès est strictement interdit sauf pour les besoins de la recherche scientifique (auquel cas, l'autorisation d'accès est, à titre exceptionnel, délivrée par le Ministre chargé de l'Administration des Eaux et Forêts).

Sur les parcs Nationaux: Décrets no 58-07 et 62-371 des 28.10.58 et 19.07.62.

Ces textes sont fondés sur les dispositions de la Convention internationale de Londres. On y relève les principales dispositions suivantes:

- accès et circulation spécialement réglementés;
- dérogation accordée aux collectivités villageoises riveraines, quant à l'exploitation de certains produits forestiers (ces dérogations sont liées à certaines responsabilités incombant aux collectivités bénéficiaires).

Sur les réserves spéciales (catégorie IV)

Vingt réserves spéciales couvrant une superficie de 3.759 km² constituent un réseau destiné à sauvegarder certaines espèces botaniques ou zoologiques. Elles sont régies par une série de décrets qui ont défini leur création. Ces décrets stipulent que:

- la circulation est libre à l'intérieur de la réserve;
- la chasse, la pêche, le pâturage, toute récolte de produits naturels, toute extraction de matériaux, toute introduction de végétaux et d'animaux sont interdites.

Sur les forêts classées (catégorie VI)

Ces forêts actuellement au nombre de 158 et portant sur une superficie totale de 26.710 km² ont fait l'objet d'arrêtés ministériels individuels de classement. Le point commun de ces textes réglementaires sont que:

- les forêts classées sont fermées à toute exploitation forestière;
- elles ont comme objectif de constituer de réserves forestières dans le sens économique du terme;
- les collectivités riveraines peuvent exercer certains droits coutumiers d'usage dans ces forêts (droits limités au prélèvement des produits secondaires de forêts miel, raphia etc.);
- la constitution des forêts classées se fait sur l'initiative du ministre chargé des Eaux et Forêts après enquête et avis d'une commission composée de représentants de l'administration et de collectivités riveraines.

Sur le périmètre de reboisement et de restauration

De tels périmètres peuvent être classés dans la catégorie VIII de la nomenclature UICN (Réserves à usages multiples). La procédure de classement se fait par arrêté ministériel suivant les mêmes modalités que pour les forêts classées de la catégorie VI ci-dessus. On peut relever les différents points suivants:

- ces aires ont pour but de protéger des bassins versants afin de régulariser les débits hydriques ou d'éviter l'érosion des terres;
- l'utilisation des terres est réglementée à l'intérieur de ces aires;
- les périmètres bénéficient de certains aménagements particuliers tels que le reboisement, l'aménagement des pâturages, l'implantation de certains dispositifs anti-érosifs;
- la mise en défense y est souvent décrétée.

b) Législation sur la conservation des espèces

Une série de décrets portant réglementation du régime de la chasse, de la pêche et de la protection de la faune sont entrés en vigueur dans les années soixantes. Ils ont surtout pour base les dispositions de la convention internationale sur la protection de la nature (Londres 1933) et celles de l'ordonnance no 60-126 du 3.10.60, ainsi que du décret du 25.1.30 portant réorganisation du régime forestier à Madagascar.

Vue dans son ensemble, cette série de textes législatifs fait ressortir schématiquement les points de vue suivants: la faune en particulier, une fois répartie en trois catégories (protégées, gibier, nuisible) est soumise à une série de dispositions fixant la chasse ou la pêche. Lorsque une partie de cette faune peut être l'objet d'une capture quelconque à titre exceptionnel ou pour des fins commerciales, les textes fixent les différentes dispositions régissant son exploitation (Décret no 61-093). Ces dispositions portent généralement sur les moyens de capture, la restriction des lieux, leur utilisation et la fixation des périodes autorisées. La capture à but scientifique est généralement autorisée moyennant le paiement d'une certaine taxe. Le montant de cette dernière est fixé proportionnellement à la valeur scientifique de l'espèce concernée (Loi no 71-006). Enfin, des commissions spéciales dotées d'une certaine technicité sont appelées à statuer sur des cas spécifiques en matière de protection de la faune, de la flore, des sites et des ressources naturelles (Décret no 62-321 et arrêté no 0220).

Le souci pour le pays de sauvegarder certaines espèces menacées d'extinction se traduit par des textes interdisant leur capture par quelque motif que se soit. En particulier, les lémuriens bénéficient de certaines dispositions spéciales quant à leur détention en captivité (Décret no 62-020).

Ordonnance no 60-126: Le texte fixe le régime de la chasse, de la pêche et de la protection de la faune:

- en explicitant parmi trois catégories d'animaux celle qui comprend les oiseaux et animaux protégés;
- en spécifiant que la chasse et la pêche de la faune sauvage rentrant dans cette catégorie sont interdites en tout temps et par quelque moyen que ce soit;
- en interdisant la chasse et la pêche de tous les animaux y compris les nuisibles et le gibier à l'intérieur des réserves naturelles intégrales des parcs nationaux, des réserves spéciales de faune, et des autres aires protégées;
- en prévoyant des dérogations aux chasses ou aux pêches à but scientifique;
- en interdisant en outre l'introduction à Madagascar de tout animal vivant ou mort visé par la convention internationale de Londres (1933) sauf dans le cas où un certificat délivré par les autorités du pays d'origine accompagne l'animal introduit;
- en n'admettant aucune circonstance atténuante dans le cas où la chasse ou la pêche est réputée, pratiquée à l'intérieur d'une réserve naturelle intégrale ou d'un parc national;
- en spécifiant que la même rigueur s'applique lorsqu'il s'agit d'une infraction portant sur des espèces protégées.

Décret no 61-096 du 16.02.61: Ce texte répartit en trois catégories les oiseaux et autres animaux sauvages vivants sur le territoire de la République Malgache:

- en explicitant entre autres la liste des animaux protégés, en application des dispositions de la convention de Londres (1933). Figurent entre autres dans cette liste tous les lémuriens (Lémures, Indris, Avahis, Daubentonia, etc.);
- en spécifiant que ces animaux sont protégés de façon absolue sur toute l'étendue du territoire.

Les deux autres catégories sont: les gibiers et les nuisibles.

Décret no 61-093 du 16.02.61: Ce décret porte application de l'ordonnance no 60-126 en précisant les diverses conditions auxquelles est soumise la chasse. Il définit les différents points suivants:

- la chasse est libre pendant une certaine période de l'année sur toute l'étendue du territoire national sauf à l'intérieur des aires protégées. Elle est alors soumise à une amodiation payante entourée de certaines dispositions comme le respect de cahier des charges, la liste des espèces visées, etc;
- la quantité d'animaux à capturer est limitée même dans le cas d'une chasse à but scientifique, de même la durée de validité du permis y afférent. Parallèlement, toute exportation d'animaux protégés n'est autorisée que dans le cas où ils sont issus d'une capture scientifique.

Décret no 61-088 du 16.02.61: Ce texte fixe la destination à donner aux oiseaux, animaux ou poissons saisis à la suite d'infractions à la réglementation de la pêche, de la chasse et de la protection de la faune en précisant:

- que les animaux protégés vivants, objets du délit sont expédiés à l'Institut de Recherche scientifique;
- que les animaux "gibier" délictueux sont remis en liberté dans un habitat approprié;
- que les animaux morts sont remis aux établissements hospitaliers, etc. si ces animaux sont consommables, ou enfouis lorsqu'ils ne le sont plus.

Ordonnance no 62-020 du 18.08.62: Cette ordonnance met fin à tout droit de détention des Lémuriens (en tant qu'animaux spécialement protégés). Elle accorde une certaine dérogation à l'égard des cas de détention entreprise avant l'entrée en vigueur du texte, dérogation accordée moyennant une déclaration préalable.

Décret no 75-014 du 05.08.75: Ce décret porte simplement ratification de la CITES par la République Démocratique de Madagascar.

Loi no 71-006 du 30.06.71; et Arrêté no 1316 du 13.07.61: Ces deux textes fixent respectivement le montant de droit de sortie vers l'extérieur et le montant de permis de chasse des animaux protégés ou non ayant fait l'objet d'autorisation scientifique ou commercial. Ces dispositions explicitent des montants relativement élevés pour les animaux protégés (capture et sortie à but scientifique).

Décret no 62-321 du 03.07.62 et Arrêté no 0220 du 20.01.72: Deux institutions mises en place par ces deux textes réglementaires (conseil supérieur de la Protection de la Nature et commission spéciale sur le droit de sortie) sont respectivement chargées:

- i) Le conseil supérieur de la protection de la Nature:
 - d'émettre son avis sur tous les projets de textes réglementaires concernant la question relevant de sa compétence (textes nationaux, application des conventions internationales);
 - de formuler des propositions sur les programmes liés à la protection de la nature;

ii) d'examiner les particularités des cas d'exonération de droit de sortie des animaux sauvages et des orchidées.

Ces deux textes témoignent sur le plan institutionnel de la nécessité de certaines dispositions interministérielles quant à l'examen de certaines questions réclamant une certaine technicité.

c) Législation concernant la planification de l'utilisation des terres.

La législation en vigueur revêt deux aspects de l'utilisation des terres: l'aspect lié à la vocation et l'aspect foncier. Cette législation se trouve condensée dans les ordonnances no 62-123, son décret d'application no 64-196 ainsi que les ordonnances no 74-021 et no 74-022.

Ordonnance no 62-123 du 1.10.62: Cette ordonnance porte classement des terres à caractère rural de Madagascar. Ces terres sont classées et réparties en zones préférentielles suivant leur vocation dominante:

- vocation forestière et de protection;
- vocation pastorale;
- vocation agricole et d'élevage intensif.

Le classement se fait par voie d'enquêtes entreprises par des commissions spéciales.

Le texte définit en outre certaines dispositions liées aux diverses contraintes auxquelles sont soumises les différentes terres selon leur vocation: obligation d'assolement, interdiction de pâturage pour les terres à vocation agricole, restriction aux seules causes de l'élevage pour les terres à vocation pastorale, interdiction de divagation d'animaux et de pacage dans les zones à vocation forestière. Toutes ces dispositions sont assorties de prévision de sanction d'ordre civil ou pénal, sanction applicable à tout contrevenant aux dispositions de l'ordonnance.

Décret no 64-196 du 13.5.64: Ce décret porte application de l'ordonnance 62-123 du 1.10.62 analysé ci-dessus. Il précise que:

- le classement des zones préférentielles des terres suivant leur vocation (forestière, pastorale ou agricole) se fait progressivement à Madagascar;
- les membres de la commission d'enquête relèvent des autorités administratives locales, des services techniques du ministère de la production agricole, du service du domaine, du service décentralisé de l'économie, des représentants locaux des collectivités intéressées (à titre consultatif);
- les attributions de la commission porte sur la délimitation des zones préférentielles, délimitation basée sur des critères techniques;
- la décision de classement, une fois prise, est applicable au niveau du terrain au moyen de convention établie à l'intérieur de l'ensemble des collectivités concernées après approbation par les autorités de tutelle;
- un cahier des charges générales prévoyant les normes par unité de surface et suivant la nature du sol sert de guide lors de l'exploitation.

La vocation des zones est susceptible de révision, compte tenu de leur évolution ultérieure en fonction des techniques qui seront mises en oeuvre.

Deux ordonnances entrées en vigueur en 1974 définissent les lignes générales d'une politique d'utilisation des terres.

Ordonnance no 74-021 et l'ordonnance no 74-022 du 29.06.74: Jetant les bases d'un nouveau régime foncier, elle a pour objectif d'instaurer une série de mesures coercitives destinées à promouvoir la mise en valeur des terres en mettant un terme aux abus de droit de propriété. Un tel abus s'il existe, est sanctionné par le transfert à l'Etat de toutes propriétés insuffisamment ou non mises en valeur par son propriétaire (pour les terres de plus de 5 ha en milieu rural et 1,000 m² en milieu urbain). Les mesures de transfert frappent en priorité les terres de plus grandes superficies pour en finir avec les espaces minima de 5 ha.

Ordonnance no 74-022: Cette ordonnance s'attache à: définir les orientations du régime foncier et préciser les conditions générales d'exécution des travaux d'aménagement foncier en milieu rural. Pour cela, elle prévoit une restructuration foncière basée sur une superficie de référence. Celle-ci peut s'obtenir soit par lotissement, soit par remembrement, le principe est axé sur la notion du revenu agricole.

d) Législation concernant les pêches

Le texte de base réglementant les pêches à Madagascar se trouve être l'ordonnance no 60-126 du 3.10.60 déjà analysée. Les dispositions de cette réglementation sont fondées sur le principe selon lequel le droit de pêche dans les eaux du domaine public et privé de l'Etat appartient à l'Etat. Dans ces conditions, l'ordonnance et les textes subséquents interdisent:

- l'exercice de la pêche dans les aires protégées (réserves naturelles, parcs nationaux, réserves spéciales, station piscicole, etc.);
- la pêche de certaines espèces pendant une certaine période et à certains endroits (si les conditions biologiques le suggèrent);
- l'emploi des procédés: engin et certains modes de pêche de nature à compromettre l'avenir de la population à court ou à long terme;
- la capture des poissons de tailles inférieures à certaines normes suivant les espèces (arrêté 2233-MAP/FOR du 22.12.62, décret no 61-092, décret no 61-094, arrêté no 253-MAER/PROVULG).

En outre, ces derniers textes fixent les modes d'octroi de droit de pêche à but commercial.

Dispositions de planification

Plan de développement national

Le plan de développement national se fonde sur le principe suivant: "l'Agriculture est la base du Développement et l'Industrie en est le moteur". Ce qui se traduit sur le domaine de la planification de la manière suivante:

Sur le secteur agricole:

- révolution agraire;
- extension des superficies aménagées;
- amélioration des techniques;
- mise en place des structures socio-économiques de production (coopératives, fermes d'état etc.);

Sur le secteur industriel:

- mise en place de l'industrie de base;
- élargissement de l'industrie de transformation des produits agricoles;
- mise en place des industries lourdes;
- intensification des industries légères (devant satisfaire les besoins internes, et en outre dégager un surplus).

Sur le secteur de service:

- poursuivre le processus tendant à la maîtrise et à la rationalisation du Commerce extérieur;
- étendre la maîtrise et la rationalisation des circuits intérieurs de collecte et de distribution;
- intensifier les mesures tendant à améliorer progressivement les transports intérieurs et extérieurs;
- étendre le réseau bancaire.

Sur l'infrastructure:

- remettre en état les infrastructures existantes;
- accentuer la mise en place des principaux réseaux de base (intra et inter régionaux) (dans le domaine des communications et des télécommunications).

Sur le social:

- lutter contre le chômage et sous-emploi;
- mettre en place et multiplier les équipements sociaux de base (notamment éducation de base, santé et culture);
- rationaliser, intensifier et améliorer les moyens de communication de masse;
- améliorer le niveau de vie moyen des couches les plus défavorisées (sécurité sociale, politique adéquate de logement);
- intensifier le programme de formation pour les compétences requises par le développement.

Conseil de planification nationale (ou organe similaire)

Il existe un Conseil Supérieur du plan nanti d'un pouvoir de décision en matière de planification à l'échelon national. Le Conseil est assisté par des comités sectoriels chargés chacun en ce qui le concerne de l'élaboration des éléments du plan relevant de sa compétence.

Stratégie nationale de conservation

La stratégie nationale de Conservation repose sur le souci de mettre les ressources naturelles à l'abri de tout acte de gaspillage. En particulier, la forêt (en tant qu'habitat et en tant que sources de matières), le sol, l'eau sont pris pour des éléments fondamentaux de développement agricole. Il faut protéger et étendre ce qui existe.

Plans régionaux (sub-nationaux)

Les plans régionaux n'existent pas encore. La mise en place des appareils administratifs et techniques de planification à l'échelon régional est assez récente. On s'attache à la démocratisation du plan, c'est-à-dire à la sensibilisation de la population sur le contenu, la portée et l'exécution du plan.

Plans pour les zones littorales

Il n'existe pas de plans particuliers concernant les zones littorales étant donné que ces zones sont pour le moment associées à l'ensemble du pays. Tout au moins pourraient-elles être assimilées à des entités subnationales. Ce qui n'est pas encore le cas en vertu de ce qui a été mentionné ci-dessus.

Plans pour le réseau d'aires protégées

Il n'y a pas non plus de plans prévus pour le réseau d'aires protégées. Le statu-quo est maintenu pour le moment en ce qui concerne la consistance de ces dernières.

Plans de gestion pour les aires protégées

On se réfère plutôt à des effectifs à caractère prévisionnel concernant le personnel de gestion (voir tableau I). Il est à associer à ces différentes catégories de personnel des prévisions de moyens matériels et financiers appropriés (horizon 1987).

Liens institutionnels entre la conservation des espèces et celle des habitats

Les types d'institutions figurant aux alinéas 231, 232, 233 et 234 du canevas-guide de ce rapport national sont intégrés dans le Ministère de la Production Agricole et de la Réforme Agraire. Il s'agit des institutions chargées:

- de l'environnement) qui sont intégrées dans la Direction
- des forêts) des
- de la pêche continentale) eaux et forêts
- de la pêche maritime intégrée dans la Direction de la production animale
- de l'agriculture intégrée dans la Direction de la vulgarisation agricole

Ces différents départements sont chargés chacun en ce qui le concerne de la gestion des aires protégées (aires terrestres et aires marines) et ceci à l'exception du département chargé de l'agriculture qui lui n'a pas de liens apparents avec la conservation. La conservation des espèces et des habitats fait partie des attributions de ces départements.

Ministère du tourisme

Ce département ministériel n'intervient pas directement sur le plan institutionnel dans la conservation des espèces et des habitats. L'exploitation de certains sites touristiques par ce ministère revient à la canalisation des touristes vers ces sites, auquel cas d'ailleurs, ce ministère se réfère à la Direction des Eaux et Forêts pour la délivrance de l'autorisation de pénétration.

Ministère de la planification

Il n'existe pas un lien direct entre le Ministère du plan et le problème de la conservation des espèces et des habitats.

Table 1: Personnel nécessaire pour les aires protégées (11 réserves naturelles, 2 parcs nationaux, 1 réserve spéciale)

Personnel requis

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Personnel requis en 1987 I d e a l
Gestion (administrateur)	0 (1)	0	0	14
Protection/gestion des ressources (garde)	41 (2)	41	41	46
Ecologie (écologiste)	0	0	0	1
Interprétation (interprète)	0	0	0	0
Administration/comptes (directeur administratif)	0	0	0	0
Entretien (spécialiste de l'entretien)	0	0	0	0
Sociologie (sociologue)	0	0	0	1
Economie (économiste)	0	0	0	1
Sciences naturelles (scientifique)	0	0	0	1
Droit, politique des ressources (spécialiste du droit et des politiques)	0	0	0	0
Propriété de la terre/achat (spécialiste de la propriété/achat de la terre)	0	0	0	0
Relations publiques (spécialiste des relations publiques)	0	0	0	1
Planification (planificateur)	0	0	0	1
Architecture paysagiste (ingénierie architecte paysagiste/ingénieur)	0	0	0	0
Technique art/exposition (artiste/concepteur d'expositions)	0	0	0	0
	41	41	41	66

(1) les Chefs de Services provinciaux résidant dans les chefs lieux de province n'ont pas été pris en compte (gestionnaires à temps partiels: ils sont au nombre de 5).

(2) dont 28 guides (non cadres)

Niveau de Personnel

1. Pourcentage actuel	2. Pourcentage dans cinq ans
a) Professionnel (par ex. responsable en chef du parc, planificateur etc.): 0%	a) Professionnel 28%
b) Personnel qualifié (par ex. responsable du parc etc.): 0%	b) Personnel qualifié 9%

Ministère de l'Intérieur et Ministère de la Défense

Ces deux ministères jouent un rôle actif dans la conservation des espèces et des habitats dans la mesure où la lutte contre le feu de brousse constitue une action dans le sens de cette conservation. Ils s'associent au Ministère de la production agricole pour former un comité interministériel central placé sous l'égide du Premier Ministre et sous la présidence des Eaux et Forêts pour mener une campagne active contre la pratique de feu de brousse. L'action consiste à instaurer dans le milieu paysannal un dialogue de sensibilisation (entretiens oraux sur les méfaits du feu de brousse, etc.). A cet effet, des émanations du comité central ont été créées au niveau provincial. Ces émanations travaillent à une période de l'année où le fléau commence à être menaçant (avant le début de la saison sèche).

Gestion des aires protégées

Le réseau d'aires protégées de Madagascar comprend les catégories suivantes:

	Surface (en ha)	Nombre
I. Réserve naturelle stricte	549.542	11
II. Parc national	99.740	2
III. Monument national	-	-
VI. Réserve de gibier (1)	375.912	20
V. Paysage naturel	-	-
VI. Réserve de ressources (2)	2.671.051	158
VII. Réserve anthropologique	-	-
VIII. Réserve à usages multiples (3)	823.978	77
IX. Réserve de la biosphère	-	-
X. Bien du Patrimoine mondial	-	-

(1) Réserve spéciale

(2) Forêt classée

(3) Périmètre de restauration

Liste des noms et adresses des organes de gestion chargés de gérer chacune de ces catégories d'aires protégées.

Service de la Protection et de la Conservation, Direction des Eaux et Forêts.
B.P. 243 Antananarivo pour:

- les réserves naturelles strictes;
- les parcs nationaux;
- les réserves de gibier;
- les réserves de ressources;
- les réserves à usages multiples.

Politiques adoptées par les organes de gestion

La politique générale adoptée par les organes chargés de la gestion se réduit à surveiller les aires existantes placées sous leur responsabilité. Ce qui se traduit par les activités qui seront évoquées ci-dessous. Mais là, on se heurte à des problèmes d'insuffisance de moyens en personnel.

Recommandations:

Il faudra:

- envisager le renforcement du personnel en place;
- doter les responsables locaux de matériel approprié;
- appliquer au mieux la stratégie basée sur la sensibilisation des populations riveraines;
- sur le plan éducatif, développer des actions consistant à fixer les populations sur les zones tampons où elles seront particulièrement initiées à des pratiques rationnelles de productions agricoles (aménagements agronomiques, barrages hydroagricoles, adduction d'eau etc.).

Surveillance continue et évaluation

Les agents chargés de la surveillance continue n'arrivent à parcourir mensuellement qu'une partie des aires placées sous leur responsabilité. Suivant les endroits (étendue des aires, état du terrain), le taux de couverture lié à ces tournées varie de 0,05 à 0,2 de la superficie des aires surveillées. Toute perspective d'évaluation s'avère assez illusoire du fait de l'insuffisance des moyens en personnel.

Recommandations:

Partant de cette situation d'insuffisance, on se rend compte que l'effectif du personnel proposé comme nécessaire et idéal en 1987 (voir tableau I) n'est que très provisoire. Seule, une étude plus approfondie de la situation permettra de mieux cerner les besoins et cela en fonction des problèmes spécifiques de terrain qui se posent à l'endroit de chaque aire protégée.

Recherche

La politique de recherches pour les aires protégées est liée au souci majeur de mieux connaître les tendances (sous les diverses pressions) de ces écosystèmes en vue de maintenir leur intégrité. L'un des objectifs immédiats de cette politique est de pouvoir:

- "situer" ces aires sur le plan faunistique et floristique et cela à travers la systématique (bien des études ont été réalisées à cet effet mais elles sont loins d'être exhaustives);
- connaître d'avantage la biologie de certaines espèces.

Mais on ressent en général un certain blocage du fait de la restriction des moyens (à l'échelon national).

Recommandations:

- il faudrait encourager la recherche et alors vers cette direction. On pourra seulement compléter les connaissances actuelles en matière d'écosystèmes (les aires protégées existantes constituent un réseau assez diversifié de terrains permettant d'identifier en profondeur la personnalité et la richesse de la faune et de la flore malgaches compte tenu de son cadre écologiques);

- on devrait orienter également la recherche (tout en exploitant les résultats déjà existants) de manière à revoir les limites actuelles sous l'angle scientifique;
- enfin il faudrait susciter la coopération multilatérale pour atteindre ces objectifs.

Procédures de mise en oeuvre

La mise en application des règlements se heurtent le plus souvent à quelques difficultés:

- incompréhension de la part de la population riveraine (on conçoit mal pourquoi un périmètre placé dans son propre territoire puisse être affranchi de tout ou partie des droits d'usages et cela malgré les justifications fournies par l'organe de gestion);
- incompréhension aussi du côté de certains hommes politiques (ce type d'incompréhension peut être suivant le cas lié soit au manque d'informations, soit à la prééminence de certains intérêts politiques aux yeux de ces autorités);
- insuffisance de l'effectif des agents de repression (en moyenne 25 000 hectares d'aires protégées par agent) en ne parlant que des Réserves naturelles et des parcs nationaux;
- carence de certains services chargés d'appliquer les peines prononcées par les tribunaux.

Divers

Les effectifs du personnel évoqué dans le tableau I ne concernent que les onze réserves naturelles, les parcs nationaux et une des vingt réserves spéciales. Cet état de fait s'explique par l'importance relative accordée à ces catégories d'aires. En ce qui concerne les autres réserves spéciales, les forêts classées (réserves de ressources) et les réserves à usages multiples, leur surveillance est assurée par les services classiques de la Direction des Eaux et Forêts.

Pour les réserves de ressources les actions se ramènent à la restriction des délivrances des permis d'exploitation à l'endroit de ces réserves. Les défrichements y sont strictement interdits (surveillance relativement rigoureuse).

Dans certaines réserves à usages multiples, on mène des travaux spécifiques tels que la protection des bassins versants. Ces actions centrées sur la lutte contre l'érosion et la sédimentation sont en connexion avec des travaux de grands aménagements rizicoles de la plaine aval.

Enfin, à titre de recommandations, on peut suggérer la multiplication des actions à portée éducative dans le voisinage immédiat des aires protégées les plus exposées aux pressions humaines. De telles actions conduites sous forme d'aménagements agronomiques y sont très indiquées pour avoir fait preuve d'efficacité là où les risques et le développement des cultures itinérantes se révèlent plus menaçants.

Personnel et formation

Formation

a) Université

En 2ème cycle de l'Université (Etablissement d'Enseignement supérieur des Sciences agronomiques), il est donné aux étudiants 40 heures de cours d'Environnement dont 20 heures de protection de la nature. Il n'y a pas d'autres formations spéciales, du niveau universitaire, en ce qui concerne la gestion des aires protégées.

b) Grades

Des cours de protection de la nature étaient données aux élèves des anciens Lycées et collèges agricoles. Ces cours se réduisaient à signaler:

- les objectifs de chaque type d'aires protégées (schéma des objectifs d'ordre scientifique (le pourquoi du réseau);
- le mode de gestion, surtout les attributions d'un agent de surveillance;
- le statut juridique de chaque type d'aires, le classement des aires (hiérarchie).

Ces cours étaient appuyés par des visites de terrain, mais à l'heure actuelle, ces lycées et collèges sont fermés.

c) Main d'oeuvre

Aucune formation particulière, sinon quelques informations données à la main d'oeuvre sur les interdictions propres à chaque type d'aires. Informations données succinctement sur place par les agents de surveillance (qui sont eux-mêmes les Chefs hiérarchiques de cette catégorie de personnel).

Recommandation en vue d'améliorer la formation.

a) A l'Université:

- s'étendre d'avantage sur les espèces existant dans le pays sur leurs habitats (augmentation des heures de cours à l'Etablissement Supérieur des Sciences Agronomiques);
- approfondir les connaissances sur la biologie de certaines espèces menacées;
- insister beaucoup plus sur les modes de gestion des aires protégées avec analyse approfondie des formes de pressions qui s'exercent sur elles (facteurs politiques, sociologiques, économiques);
- promouvoir et encourager les recherches sur les espèces faunistiques et floristiques;
- mettre en exergue l'intérêt scientifique du patrimoine.

b) Grades:

- recycler les agents de surveillance en insistant sur l'aspect de la conservation et sur la valeur scientifique des actions.

Moyens par lesquels faire bénéficier la population locale de la leurs protection de la nature.

Engagement de personnel local pour travailler dans les aires protégées

Les paysans ressortissants des villages limitrophes passent en priorité dans le recrutement de la main-d'oeuvre utilisée dans les parcs et réserves naturelles. Ce n'est que lorsqu'ils ne sont pas disponibles que l'embauche s'adresse aux autres villageois, mais cela toujours en premier lieu aux villages les moins éloignés.

Exploitation des ressources (y compris pâturages, collecte de bois de feu, chasse, etc.) dans les zones tampon (ou à l'intérieur des zones protégées).

Les réserves naturelles intégrales étant exclues, les autres aires sont respectivement ouvertes aux populations locales pour l'exploitation de certaines ressources et cela dans les conditions suivantes:

- Parcs nationaux: les riverains ont droit de récolter des produits secondaires des forêts tels que miels, bois secs, etc. mais sur autorisations spéciales écrites de l'agent chargé du contrôle;
- Réserves spéciales: seule la circulation y est ouverte. Toutefois les habitants des villages limitrophes peuvent extraire des produits dans des lots spécialement réservés aux droits d'usages. Ces lots sont distraits de la réserve pour supporter ces exploitations destinées à des fins exclusivement domestiques.
- Forêts classées: mêmes dispositions que pour les réserves spéciales.

Compensations accordées par le Gouvernement pour les dommages causés aux cultures ou au bétail.

Il ne s'est produit aucun dommage pour la raison suivante. Lors du classement de ces aires, le Gouvernement avait fait en sorte qu'il n'y avait pas cause de dommages aux populations locales en différant la date du classement jusqu'à l'extraction des récoltes éventuellement pendantes. Les bestiaux étaient transférés sans aucun dégâts à d'autres lieux de parcours.

Avantages de la protection des bassins versants

Les travaux de protection de bassins versants sont pour le moment menés dans des zones où l'érosion et la sédimentation sont à craindre sur le plan économique (protection des plaines rizicoles). Aucune population riveraine des aires protégées ne bénéficie encore de ce genre d'intervention.

Autres (décrivez en détail)

Lors du classement de ces aires protégées qui remonte généralement aux environs des années 60, les avantages accordés consistaient d'une manière générale dans l'octroi des périmètres de cultures aux populations des villages limitrophes. Les paysans bénéficiaient alors de l'assistance technique de l'Etat (ouverture de réseaux de banquettes antiérosives par exemple).

Recommandation en vue d'augmenter les avantages pour la population locale.

Les mesures suivantes pourraient être prises pour améliorer la collaboration avec la population locale:

- créer un conseil de gestion pour chaque aire protégée et y faire participer la population locale par ses deux ou trois membres. (Etendre la représentation jusqu'au niveau provincial). On pourrait choisir les représentants parmi les notabilités locales ou parmi les habitants de la zone directement intéressée. (Le choix devrait porter sur les personnes les plus influentes);
- élaborer des programmes spéciaux d'assistance gouvernementale au profit de la population locale en choisissant ceux qui auront la chance d'avoir un impact psychologique sur les intéressés (santé, aménagements agronomique, hydraulique, adduction d'eau. Parmi les types d'aménagements agronomiques, on pourrait proposer les systèmes de type "aménagement de vallées forestières", systèmes adoptés dans certaines zones forestières pour lutter contre le développement des cultures itinérantes. Il s'agit de promouvoir la riziculture irriguée dans les environs immédiats de la zone tampon. On pourrait adjoindre à cette action des aménagements agricoles à but lucratif: agrumes, vanille, café, fruitiers, etc. L'assistance pourrait s'étendre à l'aménagement complet du bassin versant: pâturage, système de reboisement antiérosif. L'intervention pourrait également consister dans la fourniture des semences de plants, d'emprunts de petits matériels agricoles etc. avec renforcement de l'encadrement.

INVENTAIRE NATIONAL DES ECOSYSTEMES

Ecosystèmes de Madagascar

L'ensemble des écosystèmes terrestres de Madagascar couvre une superficie totale de 165.736 km²; prairies à savane non comprises. Ils sont caractérisés par des formations allant du type de forêts tropicales humides aux savanes arborées. Leur répartition suivant les types de formations figure au tableau III. Sur ces écosystèmes, 2,5% sont théoriquement protégés sous forme de réserves naturelles (5695 km²) de parcs nationaux (997 km²) de réserves spéciales (3759 km²). La distribution de ces formations (classification UICN) à l'intérieur de différentes catégories d'aires protégées est reportée au tableau II bis. Cette distribution est très approximative. Il existe d'autres types d'aires protégées comme des forêts classées (ou réserves de ressources (26.710 km²) et des réserves à usages multiples (8.237 km²) dont la protection est plus qu'incertaine du fait du caractère très dérisoire des moyens disponibles à l'échelon national. Ces deux derniers types d'aires n'ont pas été comptées dans le tableau II.

Types d'habitats ayant le plus besoin d'une protection accrue

Ont le plus besoin d'une protection accrue pour le cas de Madagascar, les habitats suivants:

- Lowland rainforests (1.1.1.1)
- Drought deciduous tropical lowland forests (1.2.1)
- Mangrove forests (voir deuxième partie) (1.1.5)
- Tropical short grassland (5.1.2.3)

Et cela pour les raisons suivantes:

Les deux premiers types sont les habitats par excellence de la faune sauvages et en particulier sous sa forme endémique. Or ces types de forêts sont constamment soumies à la pression humaine et surtout à la progression de la culture itinérante, au feu de végétation et à des exploitations abusives.

Les mangroves, sans être particulièrement menacées pour le moment, pourraient l'être à brève échéance du fait du recul de certains lots de forêts côtières susceptibles de fournir du bois à la population cotière. Dans la mesure où ces peuplements de mangroves sont alors potentiellement menacés, il y a lieu de créer des boisements artificiels aptes à couvrir les besoins locaux.

Les prairies à savanes, quant à elles, méritent aussi une protection accrue en raison des risques énormes qu'elles encourent face au feu de brousse. Or elles constituent le dernier recours en tant que végétation naturelle destinée à protéger le sol contre l'érosion. L'érosion et l'érodibilité du sol sont en effet un des faits marquants du paysage et de l'habitat malgaches.

Tableau II

Inventaire des écosystèmes de Madagascar

Numéro	Type	Superficie total km2	Surface protégée km2	% protégé
Habitats terrestres				
1.1.1.1	Lowland rainforest	97.169	3.818	3,9
1.1.1.5	Riverine forest	2.639	-	
1.1.1.6	Swamp and bog forest	968	-	
1.1.2.1	Lowland seasonal forest	1.954	564,21	28,8
1.1.3.1	Lowland semi-deciduous forest	(*)	-	
1.1.4	Subtropical rainforest	(*)	-	
1.2.1	Drought-deciduous tropical lowland forest	31.819	5.228,09	16,4
2.1.1.1	Broad-leaved evergreen tropical woodland	(*)	-	
2.1.1.3	Broad-leaved sub-desert woodland	(*)	-	
2.2.1	Tropical drought deciduous lowland woodlands	(*)	-	
2.2.7	Thorn woodland	(*)	-	
3.1.1.1	Bamboo scrub	(*)	-	
3.1.1.2	Palm-fern scrub	(*)	-	
3.1.1.3	Tropical broad-leaved scrub	(*)	-	
3.1.1.5	Evergreen desert scrub	(*)	-	
3.1.2	Evergreen needle-leaved scrub	(*)	-	
3.1.3	Succulent scrub	(*)	-	
3.2.2.1	Drought-deciduous tropical scrub	30.050	361,11	1,2
3.2.4	Deciduous desert scrub	(*)	-	
4.1.2	Desert evergreen dwarf scrub	(*)	-	
4.1.3	Succulent dwarf scrub	(*)	-	
4.2.1	Drought-deciduous dwarf scrub	(*)	-	
4.2.4	Desert deciduous dwarf scrub	(*)	-	
5.1.1.1	Tall-grass woodland savanna	1.137	569,34	50
5.1.1.2	Tall-grass tree savanna	(*)	-	
5.1.1.3	Tall-grass shrub savanna	(*)	-	
5.1.1.4	Tropical tall-grassland	(*)	-	
5.1.1.5	Flood savanna	(*)	-	
5.1.2.1	Short-grass tree savanna	(*)	-	
5.1.2.2	Short-grass shrub savanna	(*)	-	
5.1.2.3	Tropical short-grassland	249.996	0	0
5.2.4	Sub-desert grassland	(*)	-	
5.4.4	Episodical desert forbland	(*)	-	
5.5.1	Freshwater marsh	(*)	-	
5.5.3	Alkaline marsh	(*)	-	
5.6.1	Floating meadows	(*)	-	
5.6.2	Reed-swamp	(*)	-	
6.1	Rock desert	(*)	-	
6.2	Sand desert	(*)	-	
		415.702	10.550,75	2,5

Tableau II (suite)

Numéro	Type	Superficie total km2	Surface protegée km2	% protégé
Habitats marins				
1.1.5	Mangrove Forest	(-)		
5.5.2	Salt marsh	(-)		
5.6.3	Submerged aquatics (sea grass beds)	(-)		
5.6.4	Floating aquatics (algal beds)	(-)		
	Mudflats	(-)		
	Sandflats	(-)		
	Back reef lagoons	(-)		
	Rocky islands (sea bird rookeries)	(-)		
Récifs coralliens				
	Récifs-barrière	(-)		
	Bank barrier reefs	(-)		
	Récifs frangeants	(-)		
	Atolls	(-)		
	Patch reef	(-)		
	Knolls	(-)		
	Autres structures	(-)		
La haute mer				
	(*) : "non applicable"			
	(-) : "voir deuxième partie"			

Tableau II bis.

Distribution des types d'écosystèmes dans les aires protégées
(RN = Réserves Naturelles; RS = Réserves Spéciales)

	1111	1115	1116	1121	121	3221	5111
RN1 : Betampona	2.228						
RN3 : Zahamena	73.160						14.586
RN4 : Tsaratanana	34.036						
RN5 : Andringitra	24.928			6.232			
RN6 : Lokobe	740						
RN7 : Ankarafantsika					60.520		
RN8 : Tsingy de Namoroka					17.394		4.348
RN9 : Tsingy de Bemaraha					114.000		38.000
RN10 : Tsimanampetsotsa					35.560	7.640	
RN11 : Andohahela	15.204				48.653	12.163	
RN12 : Marojejy	60.150						
Sous-total	210.446			6.232	276.127	19.803	56.934
Parc National 1 : Montagne d'Ambre	18.200						
Parc National 2 : Isalo					65.232	16.308	
Sous-total	18.200				65.232	16.308	
Province Antsiranana							
RS : Analamerana					34.700		
RS : Ankara					18.225		
RS : Manongarivo	35.250						
RS : Anjanaharive	32.090						
RS : Forêt d'Ambre	4.810						
Province Mahajanga							
RS : Maningory					7.900		
RS : Marotandrano					42.200		
RS : Kasily					18.800		
RS : Bemarivo					11.575		
RS : Ambohijanahary					24.750		
RS : Tampoketsa d'Analamaitso				17.150			
RS : Bora				4.784			
Province Toamasina							
RS : Ambatovaky	60.050						
RS : Mangerivola	11.900						
RS : Nosy Mangabe	520						
Province Antananarivo							
RS : Ambohitantely					15.130		
Province Toliary							
RS : Andranomena					6.420		
RS : Cap Ste Marie					1.750		
Province Fianarantsoa							
RS : Kalambatritra				28.255			
RS : Pic d'Ivohibe	3.453						
RS : Manombo	5.080						
Sous-total	81.003			28.255	23.300		

Tableau III

Etat et protection des espèces menacées dans les aires protégées
(RN=Réerves Naturelles; RS=Réerves Spéciales; PN=Parc National)

Espèces	Population ^{a/} + habitats	Population ^{a/} dans l'aire protégée
<u>FAUNE</u>		
<u>Lemur macaco</u>	Forêt humide du nord et de l'ouest	RN 6: Lokobe
<u>Lemur variegatus</u>	Forêt humide de l'est, du nord et du centre	RN 1: Betampona RN 3: Zahamena RN 5: Andringitra RN 5: Nosy Mangabe
<u>Lemur rubriventer</u>	Forêt humide du nord	RN 4: Tsaratanana
<u>Lemur fulvus</u>	Forêt humide du nord et forêt riche de l'ouest	RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 12: Marojejy PN : Montagne d'Ambre
<u>Microcebus murinus</u>	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy
<u>Daubertoma madagascariensis</u>	Forêt humide de l'est et du nord-ouest	RN 1: Betampona RN 3: Zahamena RN : Nosy Mangabe(introduite)
<u>Lemur albifrons</u>	Forêt tropicale humide de l'est	RN 1: Betampona RN 4: Tsaratanana RN 12: Marojejy
<u>Lemur collaris</u>	Forêt humide de haute altitude	RN 5: Andringitra

^{a/} Effectif non déterminé

<u>Lemur mongoz</u>	Forêt et taillis du nord-ouest en forêt et dans la savane, dans la brousse sèche et en lisière de forêt	RN 5: Andringitra RN 7: Ankarafantsika
<u>Lemur catta</u>	Forêt sèche du sud et de l'ouest, forêt sèche des hautes terres	RN 5: Andringitra RN 10: Tsimanampetsotsa RN 11: Andohahela PN : Isalo
<u>Indri indri</u>	Forêt tropicale humide de l'est	RN 1: Betampona RN 3: Zahamena
<u>Hapalemurqriseus</u>	Zône littorale Plateau du nord-est et de l'est	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 9: Tsingy de Bemaraha RN 12: Marojejy
<u>Lepilemur mustelinus</u>	Forêt humide bush du sud, forêt ripicole	RN 1: Betampona RN 4: Tsaratanana RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 10: Tsimanampetsotsa RN 12: Marojejy
<u>Lepilemur ruficaudatus</u>	Savane arborée sèche de l'ouest	RN 9: Tsingy de Bemaraha
<u>Propithecus diadema</u>	Forêt tropicale humide de l'est et du nord (de haute et basse altitude)	RN 1: Betampona RN 3: Zahamena RN 5: Andringitra RN 11: Andohahela RN 12: Marojejy PN 1: Montagne d'Ambre
<u>Propithecus verreauxi</u>	Forêt du nord-ouest Forêt du sud	RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotra RN 11: Andohahela PN : Isalo
<u>Cheirogaleus major</u>	Forêt humide de l'est et du nord	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana
<u>Cheirogaleus medius</u>	Forêt sèche de l'ouest et du nord et du sud	RN 7: Ankarafantsika RN 9: Tsingy de Bemaraha RN 11: Andohahela
<u>Avahi laniger</u>	Forêt sèche de l'ouest Forêt humide de l'est	RN 1: Betampona RN 3: Zahamena RN 7: Ankarafantsika

<u>Phaner furcifer</u>	Forêt humide de l'ouest Forêt des hautes terres, forêt et savannes des hautes terres de l'ouest et de l'est	RN 1: Betampona RN 4: Tsaratanana RN 9: Tsingy de Bemaraha PN : Montagne d'Ambre
<u>Cryptoprocta ferox</u>	Forêt humide de l'est et des hautes terres	RN 1: Betampona RN 3: Zahamena RN 5: Andringitra RN 12: Marojejy PN : Isalo
<u>Eupleres goudotii</u>	Forêt humide de l'est	RN 1: Betampona RN 3: Zahamena RN 12: Marojejy
<u>Fossa fossana</u>	Forêt tropical humide de l'est et du nord	RN 1: Betampona RN 12: Marojejy PN : Montagne d'Ambre
<u>Phelsuma</u> spp.	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy RS : Nosy Mangabe
<u>Chamaeleo</u> spp.	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Marojejy PN : Montagne d'Ambre PN : Isalo RS : Nosy Mangabe
<u>Acranthopis madaqascariensis</u>	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy RS : Nosy Mangabe

<u>Acranthopis dumerlii</u>	Forêt humide du nord	PN : Montagne d'Ambre
<u>Sanzinia</u> <u>madagascariensis</u>	Forêt tropicale humide de l'est, du nord et de l'ouest	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela PN : Marojejy
<u>Testudo radiata</u>	Forêt sèche du sud	RN 10: Tsimanampetsotsa RN 11: Andohahela
<u>Phoenicopterus minor</u>	Forêt sèche du sud	RN 10: Tsimanampetsotsa
<u>Falconidae</u> spp.	Tous les écosystèmes mal- gaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy
<u>Sarkidiornis</u> <u>melanotos</u>	Tous les écosystèmes mal- gaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy
<u>Diomedea albatius</u>	Tous les écosystèmes mal- gaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy

<u>Psittacidae</u> spp.	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy
<u>Strigidae</u> spp.	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy
<u>Eqretta alba mela</u> <u>norhynchus</u>	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy
<u>Eqretta gazetta</u> <u>dimorpha</u>	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy
<u>Bulbulcus ibis</u> <u>ibis</u>	Tous les écosystèmes malgaches (sauf la savane)	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana RN 5: Andringitra RN 6: Lokobe RN 7: Ankarafantsika RN 8: Tsingy de Namoroka RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela RN 12: Marojejy

<u>Lephotibis cristata</u>	Forêt humide de l'est et forêt sèche de l'ouest	RN 1: Betampona RN 3: Zahamena RN 7: Ankarafantsika
<u>FLORE</u>		
<u>Euphorbes succulentes</u>	Forêt humide de l'est Forêt sèche de l'ouest et des hautes terres	RN 1: Betampona RN 5: Andringitra RN 9: Tsingy de Bemaraha RN 10: Tsimanampetsotsa RN 11: Andohahela
Orchidées	Forêt humide de l'est et du nord Forêt sèche de l'ouest	RN 1: Betampona RN 4: Tsaratanana RN 9: Tsingy de Bemaraha RN 10: Marojejy PN 1: Montagne d'Ambre
Cyathacées	Forêt humide du nord	RN 4: Tsaratanana
<u>Rhipsalis</u>	Forêt humide du nord	RN 4: Tsaratanana
Aloès	Forêt humide de haute altitude Forêt sèche de l'ouest et du sud	RN 5: Andringitra RN 9: Tsingy de Bemaraha RN 11: Andohahela
Apocynacées: <u>pachy- podium rosolatum</u>	Forêt humide de l'est Forêt sèche de l'ouest et du sud	RN 7: Ankarafantsika RN 12: Marojejy PN : Isalo
Didicreacées: <u>Alluau- dia montagnacii</u>	Forêt humide de l'est Forêt sèche du sud	RN 10: Tsimanampetsotsa RN 11: Andohahela
<u>Neodypsis decaryi</u>	Forêt humide de l'est Forêt sèche du sud	RN 11: Andohahela
Cycadacées	Forêt humide de l'est	RN 1: Betampona RN 3: Zahamena RN 4: Tsaratanana
<u>Cactacae</u>	Forêt sèche du sud	RN 10: Tsimanampetsotsa
<u>Chrysalydocarpus descipiens</u>	Forêt humide du nord	RN 4: Tsaratanana
<u>Chrysalydocarpus lutescens</u>	Forêt humide du nord	RN 4: Tsaratanana

INVENTAIRE NATIONAL DES AIRES PROTEGEES EXISTANTES

Introduction sauf pour Nosy Mangabe

Les réserves suivantes n'ont pas fait l'objet d'inventaires pour qu'on puisse dresser des données monographiques à leur égard: les 20 réserves spéciales annoncées à la section 2, "Gestion des aires protégées; les 158 réserves de ressources; et les 77 réserves d'usages multiples. Seules seront fournies dans le paragraphe qui va suivre des données se rapportant aux:

- 11 réserves naturelles
- 2 parcs nationaux
- 1 réserve spéciale (Nosy Mangabe)

Les Réserves Naturelles Intégrales

NOM DE L'AIRES PROTEGEE: Réserve Naturelle no 1 "Betampona"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.3.1 (Malagasy Rainforest)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: à 40km au Nord-ouest de la ville de Toamasina (côte orientale). Longitude est: 49°12'-49°15'; Latitude sud: 17°51'-17°55'.

ALTITUDE: 275 à 550m

SUPERFICIE: 2.228 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Zone accidenté où de nombreux ruisseaux prennent leur source. Climat tropical humide, précipitations supérieures à 2000mm/an, pas de mois sec. Température moyenne du mois le plus frais, supérieure à 20°C. La réserve constitue un échantillon de biotopes naturels de basse altitude du domaine oriental malgache.

HABITAT: La plus grande partie de la réserve est couvert par de la végétation du type forêt dense humide sempervirente de basse altitude caractérisée par les: Euphorbiacées, Rubiacées, Araliacées, Ebenacées, Sapindacées, Lauracées, Myristicacées, Myrtacées, Monimiacées, Flacourtiacées, Arecées, Légumineuses, Acanthacées, Balsaminacées, Gesneracées, Melastomacées, Epiphytes, Fougères, Orchidacées, Ravenala, Abthostima, Bambous, Campilosperumanceps, Tinafurbonensis, Prosperum ferrovestitum, Pachytrophe dimepate.

FAUNE REMARQUABLE: Diverses espèces de Lémuriens: Lemur albifrons, Lemur variegatus, Indri indri, Hapalemur griseus, Propithecus diadema, Microcebus murinus, Cheirogalens major, Lepilemur, Avahi laniger, Phaner furcifer, Daubentonia madaqascariensis.

Les carnivores sont caractérisés par: Cryptoprocta ferox, Fossa fossana, Eupleres gouldii et Galidia elegans. Il y a plusieurs espèces endémiques d'oiseaux: Lophotibis cristata, Centropus toulon, Vanga curcistrostris et Alectroenas madaqascariensis.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Quelques occupations et cultures clandestines surtout à proximité des villages

RECHERCHE SCIENTIFIQUE: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Aucune

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Un agent forestier et deux auxiliaires

BUDGET: Budget de l'Etat, pour les salaires du personnel

ADMINISTRATION LOCALE: Poste de la réserve à Rendrirendry

NOM DE L'AIRES PROTEGEE: Réserve Naturelle no 3 "Zahamena"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.3.1 (Malagasy Rainforest)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: Province de Toamasina (à 40 km d'Andreba), région orientale.
Longitude est: 48°56'-49°00'; Latitude sud: 17°26'-17°44'.

ALTITUDE: 500 à 1055m

SUPERFICIE: 73.160 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: La réserve comprend deux zones bien séparées par une vaste enclave: à l'ouest, un plateau à forêt peu élevée et à l'Est, une forêt typique du domaine orientale. Relief très accidenté, vallées très encaissées. Précipitation entre 1500 - 2000 mm/an, 1 à 2 mois secs. Température moyenne du mois le plus frais entre 10 et 15°C.

HABITAT: Caractéristique de la falaise orientale. Forêts primaires et secondaires tropicales d'altitude à feuilles persistantes. Zone à bambous et Sylve à lichens. Plusieurs espèces des genres Iambourissa et Weissmania. Présence de quelques rares espèces caducifoliées. Dans les forêts dégradées, présence de Philippia, Acauria, Helichrysum, bambous, Anthostema, Myristicacées.

FAUNE REMARQUABLE: Les Lémuriens sont représentés par: Lemur albifrons, Lemur variegatus, Indri indri, Hapalemur griseus, Propithecus diadema, Microbus murinus, Cheirogaleus major, Avahi laniger et Dabentonia madagascariensis. Les animaux sont: Cryptoproctasecox, Galidia spp, Eupleres goudotii et Lophotibis cristata (oiseaux).

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Occupations et cultures clandestines, surtout aux abords de l'enclave.

RECHERCHE SCIENTIFIQUE: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Aucune

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Un agent forestier et deux auxiliaires

BUDGET: Budget de l'Etat, pour les salaires du personnel

ADMINISTRATION LOCALE: Poste de la réserve à Manakambahiny Est

NOM DE L'AIRES PROTEGEE: Réserve naturelle no 4 "Tsaratanana"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.9.4 (Malagasy woodland/Savanna)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: Province d'Antsiranana (à 120 km de cette ville) Longitude est : 48°44' - 48°59'; Latitude sud: 13°49' - 14°05'.

ALTITUDE: 700 à 2876m

SUPERFICIE: 48.622 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: La réserve forme un énorme ensemble montagneux constitué par des roches cristallines et des formations volcaniques d'âge miocène. Région extrêmement pluvieuse. De mai à octobre, les sommets sont enveloppés de brouillards accompagnés de crachin et de pluie fine. Seuls octobre et novembre sont des mois relativement secs.

HABITAT: Forêts primaires et secondaires tropicales à feuilles persistantes de basse et haute altitude. Sylve à lichens et formations éricoïdes. Flore riche en endémiques surtout en altitude. Podocarpus madagascariensis, nombreuses orchidées et autres épiphytes. Au sommet végétation herbacée et broussailleuse.

a) De 1000 - 2000m les espèces végétaives sont: Canarium, Aphloia theiformis, Raensara, Ocotea, Beisih media appontifolia, Malleastrum, Noronhia, Erythroxyllum, Corymbosum, Dichaefauthera, Eleacarpus, Coffea tsaratananae, Gardenia, Peddiaea involuctata, Buddleia, Sennecio, Vernonia, Oncostemon, Acanthacées, Labiées (coleus), Miticacées (pilea). Panicum uvulatum, Pocilostachys tsaratananensis, Opplismenus, Leptaspis cochleata, Cyatheacées, Peperonia, Kalanchoe, Medinilla, Viscum, Rhipsalis et de nombreuses fougères et orchidées.

b) De 2000 - 2200m une ceinture de bambous géants en peuplement monophytique sert de transition.

c) Plus de 2200m on trouve Arabiacées, Cumoniacées, des composées des Ericacées (Aqauria, Philippia), des Sterculiacées (Dombeya), des Taxacées, Epiphytescharnus (Buibophyllum, Aeranqis, Angraccum) et de Lichens (d'Usnées); des peuplements de palmiers Chrysali docarpus. Le sous bois est composé de Shismatoclada, Helichrysum et Philippia et de graminées Danthonia, Bronius et Anthoxanthum.

FAUNE REMARQUABLE: Lemur albifrons, Hapalemur griseus, Cheirogaleus major, Lepilemur spp, Lemur rubriventer et Phaner furcifer.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Aucune

RECHERCHE SCIENTIFIQUE: Aucune

INSTALLATIONS SCIENTIFIQUES SPECIALES: Aucune

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Deux agents forestiers

BUDGET: Budget de l'Etat pour les salaires du personnel

ADMINISTRATION LOCALE: Poste de la réserve à Ambanja et un secteur à Mangindrano.

NOM DE L'AIRE PROTEGEE: Réserve Naturelle no 5 "Andringitra"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.3.1 (Malagasy Rainforest)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: Province de Fianarantsoa (à 80km au sud-est de cette ville)
Longitude est : 46°47' - 47°02'; Latitude sud: 22°07' - 22°21'.

ALTITUDE: 1000 à 2650m

SUPERFICIE: 31.160 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Massif très accidenté, formé par de hauts reliefs granitiques, où prennent naissance de nombreux cours d'eaux. Climat frais des Hauts-Plateaux avec saison sèche bien marquée (3-4 mois secs). Précipitations entre 1500 - 2000 mm/an. La réserve comprend une partie caractéristique des Hauts-Plateau et une autre qui a les mêmes formations que le domaine oriental.

HABITAT: Le massif de l'Andringitra est riche en endémiques, 80% des espèces, qui constituent la flore des dépressions humides et des roches et qui sont spéciaux au Massif. Sur les sommets, brousse éricoïde avec des dépressions tourbeuses qui abritent notamment le remarquable Restro madagascariensis. Sur les rochers, flore xérophyte (Aloè, Kalanchoe). Parmi les arbres: Cunionacées et Euphorbiacées, Ravenea glanca.

FAUNE REMARQUABLE: Lemur collaris, Lemur mongoz, Lemur variegatus, Lemur catta, Microcebus murinus et Propithecus diadema. Autres espèces animales: Cryptoprocta ferox.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Presque pas d'occupations humaines, mais souvent incendies dus à la foudre et à la propagation des feux de pâturage allumés de l'extérieur.

RECHERCHE SCIENTIFIQUE: Etude des écosystèmes montagnards en 1970 par la RCP (225)

INSTALLATIONS SCIENTIFIQUES SPECIALES: Aucune

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Un agent forestier et 3 auxiliaires

BUDGET: Budget de l'Etat pour les salaires du personnel

ADMINISTRATION LOCALE: Poste de la réserve à Ambalavao et un secteur à Ivohibe

NOM DE L'AIRE PROTEGEE: Réserve Naturelle no 6 "Lokobe"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.9.4 (Malagasy Woodland/Savanna)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: Réserve située dans l'île de Nosy-Be, Province D'Antsiranana. Longitude est: 48°18' - 48°20'; Latitude sud: 13°23' - 13°25'.

ALTITUDE: 0 à 550m

SUPERFICIE: 740 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Relief tourmenté et volcanique remplissant un rôle important pour l'hygrométrie locale. L'île de Nosy-Be est formée de basalte-néogène et de sédiments marins du Lias supérieur. Le climat se distingue de celui de la côte orientale par une pluviosité mal répartie (quelques jours pendant toute l'année). La saison sèche est très marquée. Climat du domaine oriental, bien que la réserve soit située au nord-ouest. La réserve est le seul vestige forestier de l'île.

HABITAT: La végétation appartient à la forêt dense humide sempervirente. On remarque entre autres un endémisme bien marqué. On y rencontre des espèces de la famille de Chlaccacées et de nombreuses espèces de genre : Anthostema et Myristicacées.

FAUNE REMARQUABLE: La faune est moins riche mais comprend de nombreux oiseaux. On distingue parmi les Lémuriens : Lemur macaco, Microcebus murinus, Lepilemur mustelinus et Lemur fulvus; on y trouve aussi des caméléons et reptiles diverses.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Néant

RECHERCHE SCIENTIFIQUE: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Le Centre National de recherche océanographiques possède un laboratoire près de la Réserve, mais ses travaux sont surtout axés sur la faune marine.

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Un agent forestier

BUDGET: Budget de l'Etat pour le salaire du personnel

ADMINISTRATION LOCALE: A Hell-vill (Nosy-Be)

NOM DE L'AIRES PROTEGEE: Réserve Naturelle no 7 "Ankarafantsika"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.9.4 (Malagasy Woodland/Savanna)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: à 40 km au nord-ouest d'Ambato-Boeni, Province de Mahajanga.
Longitude est: 45°56'-47°12'; Latitude sud: 15°59'-16°22'.

ALTITUDE: 75 à 390m

SUPERFICIE: 60.520 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat. Titre de propriété 633-BT.

GEOGRAPHIE PHYSIQUE : Relief assez accidenté à l'est. Une falaise en rend l'accès difficile de ce côté. Vers l'ouest, le plateau descend en pente douce. Précipitation entre 1000 et 1500mm/an avec saison sèche bien marquée (5 à 6 mois). La réserve constitue un échantillon de formations sur le sol arénacé du domaine de l'ouest.

HABITAT: La forêt est de type dense sec qui appartient à la série des Dalbergia, Commiphora, Hildegardia, Pachypodium, Vanilla, Ampelidacées, Passifloracées et Lianas nombreuses. Nombreuses légumineuses et Myrtacées.

FAUNE REMARQUABLE: Les Lémuriens sont représentés par Lemur fulvus, Microcebus murinus, Cheirogaleus medius, Lepilemus mustelinus, Lemur mongoz, Avahi laniger et Propithecus verreauxi.

Les oiseaux et les reptiles y sont très abondants. Coracopsisvas, Pteropus rufus, Acranthophis madagascariensis, Hoplorus spp, Phelsuma spp, Chameleo spp, Brookesia spp.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Incendies fréquents pendant la saison sèche, pénétration de bovidés.

RECHERCHE SCIENTIFIQUE: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Néant

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Deux auxiliaires

BUDGET: Budget de l'Etat pour salaire du personnel

ADMINISTRATION LOCALE: Le poste se trouve à Bevazaha

NOM DE L'AIRE PROTEGEE: Réserve Naturelle no 8 "Tsingy de Namoroka"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.9.4 (Malagasy Woodland/Savanna)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: à Soalala province de Mahajanga (à 100 km de cette localité). Longitude est: 45°16' - 45°25'; Latitude sud: 16°19' - 16°30'.

ALTITUDE: 180 à 370m

SUPERFICIE: 21.742 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat. Titre de propriété no 5-BX

GEOGRAPHIE PHYSIQUE: Massif calcaire (karst) avec des failles et des crevasses. Précipitations entre 1000 et 1500 mm/an avec saison sèche bien marquée de mai à novembre. Température moyenne du mois le plus frais supérieure à 20°C. Nombreuses grottes et une source vaclusienne.

HABITAT: Forêts denses, sèches adaptées au calcaire karstique appartenant à la série des : Dalbergia, Commiphora, Hildegardia; Andansonia rubrostipa est très fréquent, nombreux ébéniers, grand nombre de plantes xérophiles et crassuléscentes.

FAUNE REMARQUABLE: Cette réserve abrite de nombreuses espèces d'oiseaux : Coua Coquereli, des reptiles typiques de la faune de l'ouest, Hoplorus spp, Phelsuma spp, Chameleo spp, Brookesia spp. Parmi les Lémuriens, on y rencontre : Lemur fulvus rufus, Propithecus verreauxi, Deckeni et Lepilemur mustelinis.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Incendies fréquents pendant la saison sèche

RECHERCHE SCIENTIFIQUE: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Aucune

DOCUMENTS DE REFERENCE PRINCIPAUX: Neant

PERSONNEL: Un agent forestier et un auxiliaire

BUDGET: Budget de l'Etat pour salaire du personnel

ADMINISTRATION LOCALE: Le poste se trouve à Vilanandro

NOM DE L'AIRES PROTEGE: Réserve Naturelle no 9 "Tsingy de Bemaraha".
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.9.4 (Malagasy Woodland/Savanna)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: Province de Mahajanga (Maintirano) à 80 km au sud-est de cette localité. Longitude est: 44°34'-44°57'; Latitude sud: 18°13'-19°07'.

ALTITUDE: 75 à 700m

SUPERFICIE: 152.000 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Massif accidenté avec présence de lapiaz calcaires, de grottes et de résurgences. Trois rivières coulent à l'est séparées par des hauteurs successives. Toute la région ouest est formée d'un plateau mamelonné s'abaissant d'abord assez rapidement, puis en pente douce. Le climat présente une tendance à l'assèchement; il y a 7 - 8 mois secs. La température diminue du nord au sud, mais elle est toujours supérieure à 20°C.

HABITAT: Espèces spéciales à la formation calcaire telles que : Musa perrieri, Delonix regia, Diospyros perrieri, Adansonia, plantes xérophytes, Aloè, Liliacées, autres familles : Orchidacées, Légumineuses, Euphorbiacées, Flacourtiacées, Annonacées, Bombacacées, Moracées.

FAUNE REMARQUABLE: Microcebus murinus, Propithecus verreauxi deckeni, Lemur fulvus rufus, Hapalemur grisens, Phaner furcifer, Lepilemur ruficandatus, Cheirogaleus medius, Leandria perarmata - chameleo.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Pénétrations des bovidés, campements illicites.

RECHERCHE SCIENTIFIQUES: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Néant

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Un agent forestier et deux auxiliaires

BUDGET: Budget de l'Etat pour salaire du personnel

ADMINISTRATION LOCALE: Poste de la réserve à Antsalova et un secteur à Balpaka.

NOM DE L'AIRE PROTEGEE: Réserve Naturelle no 10 "Tsimanampetsotra"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.10.4 (Malagasy Thornforest)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 31 décembre 1927

SITUATION GEOGRAPHIQUE: Province de Toliary à 100 km au sud-est de cette ville.
Longitude est: 43°36'-43°51'; Latitude sud: 24°02'-24°11'.

ALTITUDE: 10 à 160m

SUPERFICIE: 43.200 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat. Titre de propriété no 716-CJ

GEOGRAPHIE PHYSIQUE : La réserve comprend deux zones: le lac Tsimanampetsotra (20 x 3 km), saumâtre, peu profond, saturé de sulfate de chaux; et la forêt xérophyte sur calcaire. Nombreuses grottes souterraines. Climat sec, précipitations inférieures à 400 mm/an avec 9 à 11 mois secs. Température moyenne du mois le plus frais entre 15 et 20°C.

HABITAT: Les espèces existantes sont caractéristiques des forêts sud de Madagascar : Didiereacées (famille endémique) (Alluandia montagnaci), Euphorbiacées. Toutes les plantes présentent des phénomènes de xérophytie plus ou moins marquées d'une originalité considérable. On y trouve en outre de nombreuses légumineuses : Combretacées, Capparidacées, Tiliacées, Liliacées.

FAUNE REMARQUABLE: Les Lémuriens sont représentés par : Lemur catta, Lepilemur mustelinus, Microcebus murinus, Propithecus verreauxi. Nombreux flamants roses : Phoenicopterus ruber et Phoenicopterus minor. Nombreux échassiers canards et autres oiseaux d'eaux endémiques ou de passage comme les Vangides Falcullea palliata (très abondants). Nombreuses tortues radiées comme Testudo radiata espèce endémique du sud.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Pénétrations de bovidés

RECHERCHE SCIENTIFIQUE: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Aucune

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Un auxiliaire

BUDGET: Néant

ADMINISTRATION LOCALE: Néant

NOM DE L'AIRES PROTEGEE: Réserve Naturelle no 11 "Andohahela"
CATEGORIE DE GESTION: I (Réserve Naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.3.1 (Malagasy Rainforest)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 11 juin 1939

SITUATION GEOGRAPHIQUE: Province de Toliary à 40 km au nord-est de Fort-Dauphin.
Longitude ouest: 46°32'-46°52'; Latitude sud: 24°30'-24°58'.

ALTITUDE: 120 à 1956m

SUPERFICIE: 76.020 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: La réserve est formée de 3 parcelles distinctes séparées par quelques kilomètres seulement. La première parcelle marque la limite la plus au sud de la "Rainforest" de l'est de Madagascar. La deuxième est représentative de la forêt endémique sèche du sud qui autrefois s'étalait sur tout le sud de Madagascar. La troisième, la plus petite, est un refuge pour le Neodypsis decaryi : palmier endémique de la région. La réserve jouit de deux climats différents : à l'est climat humide, précipitations entre 1500 - 2000 mm/an presque sans mois sec : à l'ouest climat sec (5-6 mois).

HABITAT: La végétation comprend des espèces du domaine de l'est, de l'ouest et du sud : Alluandia sp, Didierea sp, Euphorbia sp, Aloès sp, Neodypsis decaryi.

FAUNE REMARQUABLE: Les lémuriens représentatifs sont : Les Lemur collaris, Lemur fulvus, Propithecus diadema edwardii, Propithecus verreauxi, Lemur catta, Microcebus murinus. Avifaune très riche.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Incendies fréquents dans la zone sèche

RECHERCHE SCIENTIFIQUE: Néant

PERSONNEL: Un agent forestier et deux auxiliaires

BUDGET: Budget de l'Etat pour salaire du personnel

ADMINISTRATION LOCALE: Poste à Amboasary-Sud et un secteur à Manantenina.

NOM DE L'AIRES PROTEGEE: Réserve Naturelle no 12 "Marojejy"
CATEGORIE DE GESTION: I (Réserve naturelle stricte)
PROVINCE BIOGEOGRAPHIQUE: 3.3.1 (Malagasy Rainforest)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 3 janvier 1952

SITUATION GEOGRAPHIQUE: Province d'Antsirana. Longitude est : 49°33' - 49°52';
Latitude sud: 14°18' - 14°39'.

ALTITUDE: 90 à 2137m

SUPERFICIE: 60.150 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Massif très accidenté, compartimenté avec de nombreuses stations soumises à des microclimats différents d'où une succession continue des étapes de végétation du domaine oriental depuis 100 m jusqu'à 2100 m d'altitude sur un espace de quelques kilomètres à peine. Plus forte pluviosité de Madagascar (3m/an).

HABITAT: Le massif de Marojejy est le plus prestigieux de l'île par sa richesse floristique. Plus de 100 genres et de 2000 espèces de Lauracées, Ebenacées, Apocynacées, Balsaminacées, Mélastomacées, Acanthacées. Plusieurs espèces de palmiers endémique, de fougères et d'orchidées.

FAUNE REMARQUABLE: Les lémuriens sont représentés par Lemur albifrons, Lemur fulvus, Propithecus diadema, Microcebus murinus, Lepilemur mustelinus, Hapalemur griseux. Quelques carnivores: Cryptoprocta ferox, Galidia elegans. On y observe une riche faune d'oiseaux de forêt et de nombreuses espèces d'insectes particulières à la région.

NOM DE L'AIRES PROTEGEE: Réserve spéciale "Nosy Mangabe"
CATEGORIE DE GESTION: IV (Managed Nature Réserve)
PROVINCE BIOGEOGRAPHIQUE: 3.3.1 (Malagasy Rainforest)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 14 décembre 1965

SITUATION GEOGRAPHIQUE: Province de Toamasina à 6 km de Maroantsetra. Longitude est: 49°45'; Latitude sud: 15°25.

ALTITUDE: 0 à 331m

SUPERFICIE: 520 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Petite île à formation forestière tropicale de la côte orientale, très accidenté et ayant une succession rapide d'altitudes sur quelques km seulement.

HABITAT: Espèces des forêts de la côte est avec Canarium, Ocotea, Ravensara, Aphloia, Vernonia, diverses fougères, divers palmiers, labiacées.

FAUNE REMARQUABLE: Espèces introduites : Lemur variegatus, Daubentonia madagascariensis, Lemur fulvus, Microcebus mustelinis. De nombreux oiseaux : Pteropus et reptiles : Ancratophis, Chameleo, Phelsuma, Uroplatus, Discophus antonquiller.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Nécessité de construction destinée au personnel.

RECHERCHE SCIENTIFIQUE: Introduction de Daubentonia madagascariensis.

INSTALLATIONS SCIENTIFIQUES SPECIALES: Néant

DOCUMENTS DE REFERENCE PRINCIPAUX: IUCN Project 1953, IUCN Gland, La Suisse

PERSONNEL: Deux agents forestiers et deux auxiliaires

BUDGET: Budget de l'Etat, pour salaire du personnel

ADMINISTRATION LOCALE: Néant

NOM DE L'AIRES PROTEGEE: Parc National no 1 "Montagne d'Ambre"
CATEGORIE DE GESTION: II (Parc National)
PROVINCE BIOGEOGRAPHIQUE: 3.9.4 (Malagasy Woodland/Savanna)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 28 octobre 1958

SITUATION GEOGRAPHIQUE: Province d'Antsiranana. Longitude est: 49°04' - 49°13';
Latitude sud: 12°28' - 12°44'

ALTITUDE: 1000 à 1446m

SUPERFICIE: 18.200 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Ce parc National est située dans 3.9.4 (Province d'Udwardy) mais devra faire partie de 3.3.I car il a le même climat et la même formation végétale que le domaine oriental de Madagascar. C'est un massif volcanique aux nombreux lacs de cratères. Présence de cascades. Précipitations supérieures à 2000 mm/an sans aucun mois sec.

HABITAT: Espèces des forêts tropicales d'altitude, avec de nombreuses espèces de fougères d'Epiphytes d'orchidées.

FAUNE REMARQUABLE: Lémuriens représentés par : Propithecus diadema, Lemur fulvus. De nombreuses espèces d'oiseaux.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Néant

RECHERCHES SCIENTIFIQUES: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Aucune

DOCUMENTS DE REFERENCE PRINCIPAUX: Néant

PERSONNEL: Sept auxiliaires

BUDGET: Néant

ADMINISTRATION LOCALE: Néant

NOM DE L'AIRE PROTEGEE: Parc National no 2 "Isalo"
CATEGORIE DE GESTION: II (Parc National)
PROVINCE BIOGEOGRAPHIQUE: 3.9.4 (Malagasy Woodland/Savanna)

PROTECTION LEGALE: Intégrale 100%

DATE DE CREATION: 19 juillet 1962

SITUATION GEOGRAPHIQUE: Province de Fianarantsoa. Longitude est: 49°21'; Latitude sud 22°41'.

ALTITUDE: 800 à 1082m

SUPERFICIE: 81.540 hectares

PROPRIETE DE LA TERRE: Domaine de l'Etat

GEOGRAPHIE PHYSIQUE: Massif ruiniforme avec des escarpements vertigineux, coupés de gorges et de canions profondément encaissés. Il renferme des constructions datant du XVIème siècle, appelées Grottes des Portugais. Climat sec avec sept à huit mois de pluie.

HABITAT: La végétation renferme quelques espèces endémiques. Apocynacées : Pachypodium rosolatum Le palmier : Ravenea revularis Sarcolenacée : Uapaca bojeri.

FAUNE REMARQUABLE: Comme lémuriens, on y trouve : Lemur catta, Propithecus verreauxi. On y rencontre aussi. Cryptoprocta ferox (Viverridé), herbivores endémiques : Tenrex ecaudatus et comme bovidé : Acrantophis madagascariensis.

ZONAGE: Aucun

PERTURBATIONS ET LACUNES: Pénétration des bovidés, feux de pâturage

RECHERCHE SCIENTIFIQUE: Néant

INSTALLATIONS SCIENTIFIQUES SPECIALES: Néant

DOCUMENTS DE REFERENCE PRINCIPAUX: Revue de l'Office du tourisme de Madagascar no 33 (La Grotte des Portugais par P. Ginther et J.C. Herbert).

PERSONNEL: Un agent forestier et un auxiliaire

BUDGET: Budget de l'Etat, pour salaire du personnel

ADMINISTRATION LOCALE: Poste à Ranohira

INVENTAIRE NATIONAL DES ESPECES MARINES ET LITTORALES EN DANGER OU MENACEES

Les espèces reconnues comme menacées à Madagascar figurent au tableau III. Dans la 2ème colonne de ce tableau, on a inclus l'habitat général de l'espèce, mais le point de la connaissance actuelle ne permet malheureusement pas de situer (même à titre très approximatif) l'importance de la "population". Il en est de même pour la "population" existant dans chaque type d'aire protégée (colonne 3 du tableau III). Nous pensons que seules des études approfondies de terrain permettraient de venir à bout de la question.

Habitats critiques

On admet, en ce qui concerne Madagascar que certaines espèces dont la présence n'a pu :

- soit être réperée jusqu'à ce moment que dans une zone restreinte;
- soit être réperé que dans certaines aires au nombre très limité malgré leur dispersion, sont considérées comme particulièrement menacées. Tels sont les cas de *Phoenicopterus*, *Lemur collaris*, *Lepilemur ruficaudatus* et l'espèce floristique *Neodypsis decaryi*.

Le tableau IV fait ressortir la liste de ces espèces. Mais il convient de noter que des études approfondies manquent sur la détermination exacte de l'emprise géographique de ces aires et a fortiori sur l'importance de la population y existant. Ce qui doit impliquer d'une façon prioritaire, non seulement des mesures de protection accrue à l'endroit de ces aires, mais aussi des études sur le biotype et des investigations plus approfondies sur la biologie ou l'écologie de ces espèces.

Conclusion

En partant du fait que seules deux réserves naturelles (Lokobe et Tsaratanana) ne subissent pratiquement aucune pression humaine (activités agricoles, diverses pénétrations, feu de brousse, etc.), on pourrait établir les trois listes suivantes par ordre de menaces croissantes :

- certaines espèces de faune ou de flore existant à Lokobe et à Tsaratanana ainsi qu'à d'autres aires protégées relativement dispersées;
- espèces n'existant ni à Tsaratanana mais présentes dans d'autres aires notoirement exposées à des pressions humaines;
- espèces existant dans des aires assimilées à des habitats critiques.

Sur ces bases, on peut admettre que les espèces existant dans la première liste semblant relativement en sécurité et celles appartenant à la troisième liste mal protégées.

Première liste (relativement en sécurité): *Microcebus murinus*; *Phelsuma* spp; *Chameleo* spp; *Acranthophis madagascariensis*.

Deuxième liste (intermédiaire): *Cryptoprocta fecox*; *Lemur catta*; *Propithecus diadema*; *Propithecus verreauxi*.

Troisième liste (mal protégées): *Daubentonia madagascariensis*; *Lemur collaris*; *Lemur macaco*; *Testudo radiata*; *Phoenicopterus ruber*; *Phoenicopterus minor*.

Tableau IV

Habitats critiques pour les espèces en danger

Espèces menacées	Habitats critiques
<u>FAUNE</u>	
<u>Daubentonia madagascariensis</u>	RN 1: Betampona RN 3: Zahamena
<u>Lemur macaco</u>	RN 6: Lokobe
<u>Lemur rubriventer</u>	RN 4: Tsaratanana
<u>Lemur collaris</u>	RN 5: Andringitra
<u>Lepilemur ruficaudatus</u>	RN 9: Tsingy de Bemaraha
<u>Acranthophis dumerlii</u>	PN 1: Montagne d'Ambre
<u>Phoenicopterus ruber</u>	RN 10: Tsimanampetsotsa
<u>Phoenicopterus minor</u>	RN 10: Tsimanampetsotsa
<u>FLORE</u>	
<u>Cyatheacées</u>	RN 4: Tsaratanana
<u>Rhipsalis</u>	RN 4: Tsaratanana
<u>Chrysalydocarpus descipiens</u>	RN 4: Tsaratanana
<u>Chrysalydocarpus lutescens</u>	
<u>Neodypsis decaryi</u>	RN 11: Andohahela
<u>Cactacae</u>	RN 10: Tsimanampetsotsa

Remarque sur le tableau IV

Sauf pour les Réserves Naturelles de Lokobe et de Tsaratanana où l'on n'enregistre aucune pression inquiétante de la part des installations limitrophes, les autres aires sont dangereusement exposées à de fortes pénétrations soit humaines soit de bovidés. Mais la propagation du feu de brousse venant de l'extérieur constitue pour elles un danger permanent.

PROPOSITIONS DE CREATION DE NOUVELLES AIRES

Malgré la restriction de leurs aires de dispersion, on ne peut pour le moment envisager pour certaines espèces apparemment menacées la création de nouvelles aires protégées. Cela à cause du manque d'informations sur l'état de leur population (impossibilité d'établir les pourcentages de la colonne 3 du tableau III).

On ne pourrait donc que s'en tenir aux informations des tableaux II et III bis dans l'estimation des habitats méritant une protection accrue. Ce serait les habitats relevant de l'écosystème 3.2.2.1 (Drought-deciduous tropical scrub - 1,2% de protégés).

Les habitats relevant des écosystèmes 1.1.1.5 (Riverine forest) et 1.1.1.6 (Swamp and bog forest) ne sont pas représentés clairement dans les aires protégées existantes ou du moins l'y sont mal. Dans cette mesure, on peut admettre que les réseaux d'aires protégées existantes présentent une certaine lacune.

Liste des aires protégées proposées

D'abord, la Réserve spéciale d'Ambohitantely, la dernière proposée, a été officiellement promue à ce titre en février 1982. En ce qui concerne les autres propositions de création, on peut dire que :

- aucune nouvelle aire n'est proposée pour le moment par diverses parties (Gouvernement, organisations internationales de conservation de la nature, agence de développement);
- on ne peut avancer pour l'instant aucune liste et cela pour les raisons suivantes :

i) Les aires "protégées" existantes ne sont effectivement à l'abri de toute pression de tout ordre qui affecte réellement leur intégrité. Les moyens financiers, matériels et en personnel disponibles sont à l'échelon national vraiment dérisoires pour faire face à ces pressions (effective et potentielles). La politique de gestion semble devoir être axé sur l'affermissement de la protection de ce qui existe;

ii) Des études approfondies à lancer sur les aires protégées existantes, sur les autres habitats et sur les espèces menacées semblent impérieuses. De telles études devront porter sur la systématique d'abord et ensuite sur la biologie des espèces menacées (ou non) existantes dans ces aires.

Les deux points de vue ci-dessus résument la situation générale exposé tout au long de ce rapport.

EXAMEN DES POLITIQUES NATIONALES DE GESTION RELATIVES
AUX AIRES PROTEGEES ET AUX ESPECES EN DANGER

Législation nationale

Législation sur les aires protégées

En ce qui concerne le milieu marin, il n'y a pas à vrai dire d'aires protégées. Seulement, il faut noter l'existence d'une législation qui institue des lieux de réserve pour la reproduction des tortues (Arrêté du 23 mai 1923). Ainsi les îlots suivants sont touchés par cette réglementation :

- Nosy Anambo ou îlot boisé (Antsiranana);
- Nosy Iranja (près de Nosy-Be);
- Les Chesterfield (près de Morondava);
- Nosy Trozona, Nosy Ve (près de Toliary).

Les deux types de tortues concernés sont:

- les tortues franches (*Chelonia mydas*);
- les tortues à écailles (*Eretmochelys imbricata*).

Législation sur la conservation des espèces

Dans le domaine maritime, plusieurs textes prévoient la conservation de certaines espèces et, d'une façon générale, la ressource afin qu'elle soit parente et exploitable à souhait. Il conviendrait donc de citer, pour chaque espèce, les dispositions législatives actuellement en vigueur.

Sur les tortues: Outre le texte instituant des lieux de réserve pour les tortues, cité ci-dessus, l'arrêté du 24 octobre 1923 interdit la capture des tortues:

- en état de ponte ou procédant à l'enfouissement de leurs oeufs;
- dont la carapace, mesurée sous le plastron, n'atteint pas 50 cm de diamètre.

Il est également à signaler la difficulté d'interdire cette capture avec quelque chance de succès, compte tenu des habitudes alimentaires des populations côtières.

Sur les huîtres: L'arrêté provincial no 054-AG du 06 mai 1966 interdit le ramassage d'huîtres durant toute l'année en baie de Sarodrano (Toliary) et pendant la période de reproduction sur tout le territoire du Faritany de Toliary.

L'esprit de ce texte était d'assurer le succès des essais ostréicoles entrepris par le Ministère chargé des Pêches et la Station marine de Toliary. A l'heure actuelle, les essais en question, en conséquence, sont plus ou moins suivis. Il

serait néanmoins judiciable, aussi bien pour l'économie du pays que pour le bien des pêcheurs, de reprendre ces travaux ostréicoles aux fins de vulgariser et de diffuser dans une très large mesure les résultats pour que tout un chacun soit conscient certes de l'utilité de cette activité mais aussi et surtout, de la priorité à réserver quant à la conservation des espèces et à la préservation de leur habitat.

Sur les huîtres perlières, les coquillages à nacres et les éponges (Arrêté du 23 Août 1929): Outre la réglementation de l'utilisation du domaine public maritime concernant l'exploitation de ces espèces (demande de concession), le texte visé supra fixe un certain nombre de critères normatifs pour lesdites espèces :

- Les dimensions minima des huîtres perlières et nacrières dont la pêche est autorisée sont fixées comme suit:
 - i) Huîtres perlières: (*Meleagrina occa*, *Meleagrina irradians*) ayant atteint de 6 cm au moins, mesurés du côté interne des valves et suivant le plus grand diamètre;
 - ii) Huîtres nacrières et perlières: (*Meleagrina margaritifera*) au moins 10 cm.
- Pour les coquillages à nacre; les dimensions limites suivantes sont prescrites:
 - i) Turbos ou Burgos: 55 mm au minimum (bord externe du péristome à la partie externe de l'oreille) et 140 mm au maximum;
 - ii) Trochus ou trochas: 110 mm au minimum.

Les supports quelconques (madrépores, stoiens, cymodocées;) d'huîtres perlières ou nacrières doivent toujours être rejetés à la mer.

Langoustes: Le décret du 27 décembre 1962 interdit la pêche aux langoustes, leur vente, leur transport ou leur mise en conservation du 1er au 30 avril de chaque année. Par ailleurs, mais alors pour toute l'année, sont interdite la vente, le transport, la commercialisation:

- des langoustes femelles ovées;
- des langoustes mâles ou femelles, mesurant moins de 20 cm entre l'extrémité du telson et celle du rostre, antennes non comprises.

Enfin, l'arrêté de janvier 1921 n'autorise pour leur capture que les casiers et les filets. Cette prohibition de l'utilisation des harpons se justifie car c'est seulement lorsque la langouste est une fois harponnée, que le pêcheur peut se rendre compte si c'est une femelle ovée ou non.

Holothuries (ou trépangs): Une taille minimum est fixée pour leur capture en vue de la commercialisation: 11 cm pour les exemplaires frais, 8 cm pour les exemplaires séchés.

Crevettes: Le décret du 18 mai 1971 régit l'exercice de la pêche au chalut dans la mer territoriale de Madagascar. Cette pratique est d'abord subordonnée à la possession d'une licence pour les bateaux ou embarcations de pêche. La pêche crevettière est fermée annuellement du 15 décembre au 15 février de l'année suivante.

Le maillage du chalut est réglementé (différent pour les chaluts à crevette et poisson) et les navires de puissance motrice supérieure à 25 CV ne peuvent pas chaluter dans la zone des deux milles comptés à partir de la côte. Il est à noter que les larves et les jeunes crevettes se développent dans les eaux saumâtres des mangroves et dans cette zone peu profonde des deux milles, d'où l'importance du respect de ce texte par les grands chalutiers de gros tonnage dont les effets meurtriers des engins de capture ne sont plus à démontrer.

Poissons et autres espèces: le décret du 5 juin 1922 défend la pêche, le traitement, la commercialisation et l'emploi à un usage quelconque :

- des poissons qui ne sont pas encore parvenus à une taille d'adulte;
- des huîtres ordinaires de diamètre inférieur à 4 cm;
- des moules au dessous de 3,5 cm de longueur.

Les pêcheurs doivent immédiatement rejeter à la mer, les poissons, coquillages pris par eux et n'atteignant pas les dimensions fixées. En outre, il est interdit de pêcher ou de recueillir les oeufs de tous les poissons ainsi que de tous les crustacés compris dans la dénomination de frais. Il est également interdit de récolter les herbes marines qui croissent dans les ports, le long des quais, ponts et ouvrages en maçonnerie construits en mer ou sur le rivage. Enfin l'emploi de matières explosives, le rejet à la mer de toutes les substances de quelque nature et de quelque forme que ce soit, capables d'enivrer ou d'empoisonner le poisson et les produits marins d'origine animale.

Législation concernant la gestion des zones littorales

Aucun établissement de pêche, quelque nature que ce soit, ne peut être créé sur le littoral sans une autorisation préalable des Autorités administrative. (Décret du 5 juin 1922). En outre, ce décret détermine les conditions d'établissement des pêcheries, celles spéciales aux pêcheries fixes, les dispositions communes aux établissements de pêche de toute nature. Le Code Maritime (Livre V), renforce ces dispositions.

Législation concernant les pêches

Il sera question seulement ici de la législation relative à la capture des espèces biologiques marines. Les côtés transformation et commercialisation seront délibérément laissés de côté n'ayant trait à l'objet principal de notre propos.

D'une façon générale, les textes déterminent:

- l'étendue de la côte devant laquelle la pêche de chaque espèce est permise;
- la distance de la côte ainsi que des embouchures des rivières, étangs ou canaux à laquelle les pêcheurs devront se tenir;
- les époques d'ouverture et de clôture de diverses pêches; l'indication de celles qui seront libres toute l'année;
- les filets, engins, instruments de pêche prohibés;
- les dispositions propres à prévenir la destruction du frai et assurer la conservation des ressources;
- les interdictions relatives à la pêche, à la mise en vente, à l'achat, au transport, colportage ou à l'emploi du frai, de certaines espèces qui n'atteignent pas les dimensions prescrites;
- les conditions d'établissement et d'exploitation des pêcheries;
- les appâts défendus;
- les mesures d'ordres et de police tant en mer que sur le littoral propres à assurer la conservation de la pêche qu'à en régler l'exercice.

En outre. des dispositions dénales sont prévues.

Liens institutionnels entre la conservation des espèces et celle des habitats

Ministère des Pêches

Madagascar, malgré son insularité, ne dispose pas d'un ministère des pêches au sens strict du terme. Les pêches (continentale et maritime) sont gérées par le Ministère de la Production Agricole. Ainsi l'Administration des Pêches, au sens dudit Ministère, dispose des agents sur le littoral qui surveille l'application de la réglementation générale de la pêche maritime citée ci-dessus. Outre le contrôle de la production elle-même, les agents s'occupent de celle de la commercialisation des produits (taille minimale par exemple). En cas de délit, un procès-verbal est dressé, puis envoyé auprès de l'Arrondissement maritime de la région qui instruit lui-même l'affaire auprès du Procureur de la république du lieu.

Gestion des aires protégées

Les aires protégées - si on dénomme ainsi certains lieux de réserve déjà cités - sont pratiquement sans surveillance du fait de l'inexistence de moyens financiers, matériels et humains. Il serait donc opportun, dès à présent, que des décisions soient prises dans l'intérêt de la préservation de ces lieux de réserve puisque les textes, sans application directe, ne seraient d'aucune utilité. Quoi qu'il en soit, toute mesure de protection ou de gestion des aires devrait être prise tout en tenant compte de l'environnement socio-économique prévalant local. Une sensibilisation intense est également utile dans la mesure où elle contribue à une meilleure compréhension de la population et donc à l'intégration totale de celle-ci aux dispositions préconisées. Ceci est particulièrement vrai dans le secteur halieutique où les habitudes séculaires des pêcheurs vont à l'encontre de la conservation de la ressource.

Personnel et formation

Aucun renseignement à fournir en ce qui concerne le milieu marin. Il serait néanmoins important de prévoir dès maintenant la mise en place d'un système de formation en ce qui concerne la conservation et la gestion des aires marines. En effet tôt ou tard, des textes finiront par réglementer certains habitats marins. La formation à dispenser intéressera chaque catégorie de personnel requis (universitaire, intermédiaires, gardes, main d'oeuvre). Pour les universitaires (niveau de conception), des scientifiques (biologistes, zoologistes, écologistes, etc.); des sociologues, des économistes, des législateurs, des planificateurs seront requis. Pour le personnel de niveau intermédiaire, il pourra être recruté et formé sur le tas par des cycles de formation (stages, séminaires, etc.).

INVENTAIRE NATIONAL DES ECOSYSTEMES (MARINS)

Du fait de la multitude des écosystèmes marins à Madagascar résultant naturellement de la longueur du littoral, de nombreuses données font défaut à l'heure actuelle pour pouvoir cerner d'une façon précise leur inventaire. On peut toutefois mentionner l'existence d'une étude entreprise sur les mangroves (Rabesandratana et col, 1971).

Eu égard au contexte général sus évoqué, il n'a pas été possible de quantifier les surfaces respectives de chaque écosystème. A cela s'ajoute l'inexistence d'aires protégées, sensu stricto, en ce qui concerne plus particulièrement le milieu marin. C'est alors, au regard de ces quelques considérations que l'inventaire ci-après a été établi.

Environnement côtier

Plage

a) Plage de sable

Côte Est du sud vers le nord: Du cap Sainte Marie à l'embouchure de la Manambovo protégée par une barre gréseuse; de Tolanaro (Fort Dauphin) jusqu'à la Pointe Larrée (en face de l'île Sainte Marie) et de part et d'autres des embouchures des fleuves; plage protégée par la présence de récifs coralliens (Carte Géologique 1/1.000.000, 1964).

Côte ouest du sud vers le nord: A l'est de Lavanono jusqu'au niveau de la Baie de Saint Augustin; de Toliara jusqu'à Mangoky; de part et d'autre des embouchures des rivières: Kirindy, Morondava, Tsiribihina, Mahambolo, Demoka, Manambas, (Carte Physique de Madagascar, 1977; Atlas de Madagascar, 1969).

b) Plage de galets (du sud au nord)

Côte est: De Lavanone au sud de Beloha; au sud d'Ambovombe, à Tolanaro (Fort Dauphin); au nord de Tolanaro jusqu'à Mahanoro sauf au niveau des embouchures des rivières; du cap Mascala à Sambava mais quelquefois interrompu de plages sableuses.

Côte ouest: Des affleurements gréseux existent dans la région de Toliary; depuis la Baie de Saint Augustin jusqu'à la partie nord de l'île; à la pointe nord et côte ouest du Massif D'ambre.

Rivage escarpé:

On note la présence de côtes rocheuses élevées au Cap Sainte Marie (+ de 150 m); aux côtes situées de part et d'autres de la Baie d'Antongil; au Cap Masoala avec toutefois apparition d'une plateforme d'abrasion (Atlas de Madagascar, 1969).

Iles barrières:

Le seul exemple est l'île Sainte Marie.

Les Baies:

Côte ouest du nord au sud: Lotsaina, Ambanasina, Ambavanibe, Ampokarana, du Courrier, Ambararato, Befotaka, Antalaha, D'Ampasimena, Ankazomalemy, Rantovoño; autour de l'île Nosy-Be : B. de Befotaka (à l'ouest) et B. de Mahazandry (à l'est); B. d'Ambara, B. de Tsimipaika, B. d'Ampasindava, B. d'Ambararata, B. d'Ambavatoby, B. de Kakambana, B. de Rafaralahy, B. de Sahamalaza, B. de Ramanetaka, B. de Narinda, B. de Moramba, B. de Mahajamba, B. de Bombetoka, B. de Boeny, B. de Marambitsy, B. de Baly, B. d'Antalihy, B. de Koararaika; B. de Tsingilofilo, B. des Assains, B. de Ranobe, B. de Saint-Augustin, B. de Salapaly (en face d'Itampolo), B. de Lambelabe, Langarano, B. d'Ampalaza, B. de Bevoalavo, B. de Fenambosy, B. de Lavanono.

Côte est, du nord au sud: Antaly, la grande Baie de Diégo comprenant quatre petites baies (baie Cailloux Blancs, B. du Tonnerre, B. de Diégo, B. des Français), B. des Dunes, B. des Sakalava, B. de Matsatsolaoka, Ambodivahibe, Irodo, Loky, Mangerivy, Andravina, Vohémar, Ambakaka, Vinambe, Ankazofotsy, Ambanizana autour de la presqu'île de Masoala, et dont les deux dernières se trouvent dans la grande Baie d'Antongil; B. d'Ivondro (au sud de Tamatave); B. de Sainte Luce et B. de Mananivo au nord de Fort-Dauphin; Baie de Ranofotsy.

Estuaires:

De par l'existence de nombreux fleuves et rivières qui se jettent dans la mer, on note une multitude d'estuaires à côté des baies citées ci-dessus.

Sur la côte ouest (du nord au sud): Vavan'Ambohinangy, Ambazoana, Andrahibo, Sambirano, Ambavatoby, Samonta, Loza, Narindra (intérieur), Moramba, Mahajamba, Antsena, Betsiboka, Androhibe, Andamoty, Mahavavy, Marambitsy, Mavo, Andrananjongy, Manombo, Maningoza, Manambao, Demoka, Manambola, Tsiribihina, Morondava, Mangoky, Fierenana, Onilahy, Linta, Menarandra.

Sur la côte est (du nord au sud): Loky, Manambato, Fanambana, Bemarivo, Lokohy, Antainambalana, Rantabe, Mananara Nord, Anove, Simianona, Sandratsio, Maningory, Onibe, Ivondro, Mongoro, Sakaleôna, Mananjary, Namorona, Faraofy, Sandranata, Manambatra, Mananara Sud, Isandra, Manampanihy, Mandrare, Manambovo.

Lagune:

Le Canal des Pangalanes situé sur la côte est (de Fenoarive au nord de Toamasina jusqu'à Farafangana au sud), Loza (au-dessus de la Baie de Narinda), Anony, Région de Tolañaro, Ampahana, (au nord d'Antalaha), Masianaka (au sud de Farafangana), Tampolo (au sud de Fenoarivo).

Habitat entre marée et associé avec la côte

Algues:

Sur le platier algal de tous les récifs coralliens ou sur la plateforme d'abrasion du rivage rocheux. On les rencontre surtout à Tolanaro (Fort-Dauphin) et à Nosy-Be.

Goémon:

Sur le platier friable des récifs coralliens.

Bancs de sable:

Constitués par les dunes hydrauliques des récifs coralliens.

Mangrove:

Ces formations littorales poussant dans les vases côtières couvrent à Madagascar une surface évaluée à 300.000 ha. Elles sont localisées soit :

- A l'embouchure des fleuves et des rivières (planche I)

Menarandra, Linta, Itampolo, Onilahy (baie de Saint-Augustin), Fiherenana (nord de Tuléar), Bas Mongoky (région de Morombe), Morondava, Tsiribihina, Manambolo, Mahavavy, Bestiboka, Antanimasaja, Boanamary, Katsepy (baie de Boina), Amborovy, Mangatsa, dans la région de Majunga, Tsianinkira, côté nord-ouest dans la baie de Mahajamba, Sofia, Loza, Antsampano, Ampepamena (région d'Ambanja), Andranomalza, Sambirano, Mahavavy nord, Port Saint-Louis dans la région d'Ambilobe; dans la région de Diégo-Suarez (route de Ramena, Ambodivahibe); Vohémar, Monompana (lieu de débarquement pour Sainte-Marie), Fort-Dauphin (Lokaro, Sainte-Luce).

- En bordure de la côte avec résurgence d'eau douce comme dans la région de Tuléar (Sarodrano, Ankilibe, Ankiabe, Tuléar, Songoritelo, etc.)

La carte (planche I) montre que ces mangroves sont localisées surtout sur la côte-ouest de Madagascar.

Forêt maritime:

Sur la côte est le long du Canal des Pangalanes.

Forêt marécageuse littorale:

Sur certaines mangroves du nord-est: Soalala, Besalampy, Maintirano, dans la Baie d'Ambaro, dans la région de Tsiribihina, dans la Baie de Mahajamba.

Saline (marécage salés):

On en trouve dans les régions de Morombe, Toliara, Antsiranana (Diégo-Suarez), Mahajanga.

Récif vivant: (cf. planches I-II)

Récif corallien barrière:

Le Grand récif de Toliara; entre Toliara et Morombe.

Les bancs:

Côte ouest, du nord au sud: B. Intermédiaire, B. de Leven (au large du Cap St. Sébastien), B. de Dives, B. du Castor, Les Quatre Frères, B. Vert, B. du Goliath, B. Edwin, Gd B. de l'Entrée, B. du Touareg, B. de la Lyre, B. de Langna, B. de la Table, B. du Diamond, B. du Boursaint, B. du Vigilaut, B. de la Romanche, B. du Vaudreuil, B. du Forfait, B. du Marinier, B. de Euryalus, B. de la Turquoise, B. du Nacissus, B. du Lavalier, B. de la Téthys, B. Barker, B. de la Grenouille, du Lynx, Milanja, Nestale, Mpanjaka, de Prancel, Flying Fish, Philomèle, B. Volla, B. du Vaucluse, B. de Tambohorano, B. du Taunton Castle, Lorho, B. de l'Ouest, B. d'Andolompanahy, B. du Nord, B. du Milieu, B. du Sud-Est, Santon, B. d'Estaing, B. de l'Emile Héloïse, Bayfield, B. de la Surprise, B. du Mpanjaka, B. de l'Albatros, Amarella, B. du Milieu, Rontonina, B. du Boursaint, Simpson, B. du Sud, B. du Vaucluse, B. de l'Indien, B. d'Andambo, B. Rivomena, B. du Ruby, B. de la Bayadère, B. de la Marjolaine, B. Anakio, B. du Pélerin, B. des Moines, B. de la Cordelière, B. de la Mitaine, B. Médian, B. de l'Imerina, B. Ankaramay, B. du Jais, B. Ankarana, B. de l'Émeraude, B. de la Nacre, B. d'Ankevo, B. Bawden, B. du Cachalot, B. du Petit Robert, B. Persépolis (nord et sud), B. de Fanemotra, B. Le Grand Récif du Tuléar, B. Toxer, (en face de la Baie d'Ampalaza), B. de l'Etoile (au sud de Madagascar).

Côte est entre Mananara et Lac Ampitabe au sud de Tamatave : B. des Baleineaux, B. de l'Alidade, B. du Rubis, B. du Diamant, B. Saphi, (à l'est de l'île Ste Marie), B. de Blevec, B. Fry, B. Tampolo, B. du Lapérouse, Le petit Banc, B. de Mahambo, B. du Capricorne, B. de Foulpointe, B. du large, B. du Sud, B. d'Antetezana, B. d'Ifontsy, B. Marie Eugénie, B. des 6 mètres, B. Malagasy.

Récif morceau:

Dans les chenaux postrécifaux qui sont nombreux sur les côtes dont par exemple: Sarodrano (près de Toliara); Foul-pointe (au nord de Toamasina) et à Ambodifototra (Ile Sainte Marie).

Autres structures récifs: (cf. planche II)

Huîtres: récif Fanambosa, région de Boeny (sud-ouest de Mahajanga), Ambodipont à Sahanta (sud Antalaha à Cap Est); Lavanono (Rabesandratana H.): Gisements d'huîtres (*Crassostrea cucullata*).

Environnement au large

Iles (N = Nosy):

Côte ouest (du nord au sud): N. Hao, N. Anambo, N. Rao, Iles Glorieuses, Iles Leven, N. Mpay, N. Vaha, N. Foty, N. Antanalovo, N. Hara, N. Faly, N. Famaho, N. Kola, N. Belomotro, N. Lakandava, N. Anjombavola, n. Andatsara, N. Mely, N. Valiha, N. Manonoka, N. Lava, N. Ankarea, N. Mitsio, N. Kajohy, N. Antaly, N. Tsitampenina, N. Toloho, N. Karabo, N. Tsarabanjina, N. Be, N. Faly, N. Sakatia, N. Ambariobe, N. Komba, N. Tanikely, N. Vorona, N. Iranja, N. Ankazoberavina, N. Radama (formée des îles : Kalakajoro, Berafia, Antanimora, Valiha), N. Saba, N. Lava, N. Makamby, N. Antsoherindava, N. Antsoheribory, Ile Chesterfield, N. Voalavo, N. Vao, N. Marify, les îles Barren comprenant sept îlots : N. Mavony, N. Maroantaly, N. Androtra, N. Dondosy, N. Andrano, N. Mangily, N. Lava, N. Andravoho, N. Matsadiniky, N. Tania, N. Andriangory, N. Angarahoka, N. Maheloholo, N. Andriamitaroka, N. Andramona, Nosin-dolo, N. Ratafanika, N. Andranombala, N. Ve (au nord d'Andavadoaka), N. Fasy, N. Ve (au sud de Toliara), N. Satrana, Nosimborona (en face d'Androka), N. Manitsa, N. Trozona.

Côte est (du nord au sud): Ilot Long, N. Antaly Be, N. Antalikely, N. Toreky, N. Antseranana, N. Lava, N. Fano, N. Boka, N. Hely, N. Longo; N. Angongo, N. Tsara, N. Bengy, N. Kabija, N. Kafontsa, N. Andovonkonko, N. Mirahavavy, N. Tafiamivony, N. Vivy, N. Ampasindava; N. Tendro, N. Lowry, N. Ankomba, N. Manambiby, N. Ankao, N. Manampaho, N. Ratsy, N. Satrana, N. Vahala, N. Mangambe (à l'intérieur de la Baie d'Antogil), Ile Sainte Marie, Ile aux Prunes, Iles des Nattes, N. Alañana, N. Faho, N. Dombala, N. Fonga.

Pierre à chaux récif frangeants:

Surtout côte sud-ouest (Morombe à Toliara).

Plateau continental à fond mou chalutable (100 m) (cf. planches II et III):

Côte nord-ouest et ouest; c'est-à-dire de la Baie d'Ambaro au nord de Morombe; extrême sud-ouest; Baie d'Antongil.

Plateau continental (100 m) à fond dur (cf. planche III):

Entre Morombe et Toliara; du Cap Sainte Marie à Toamasina en passant par Tolamaro et tout le long de la côte est.

Pente continentale (100-300 m) (cf. planches II et III):

On note que sur la côte est, la pente continentale est très abrupte, alors que sur le reste des côtes, elle ne l'est pas.

Tranchée océanique:

Canyons de Saint Augustin (au sud de Toliara), canyon de Maningory (au sud de l'île Sainte Marie), dont la profondeur dépasse 1000 m; fosse de la Tsiribihina et fosse de Morondava.

Bas alluvial:

Embouchures des fleuves: Onilahy, Mangoky, Morondava, Tsiribihina, Mahavavy Sud, Betsiboka, Mahajamba, Loza, Mahavavy Nord.

Environnement artificiel

Ports:

Antseranana, Mahajanga, Morondava, Toliara, Tolanaro, Farafangana, Manakara, Toamasina.

Endroits aux intérêts spéciales

Tortues de mer:

Site de ponte dans le sable du littoral et dans les îlots.

Crevettes:

Se reproduit dans les baies et les zones de balancement des marées.

Espèces commerciales menacées

Holothuries (Tsévang) entre la région d'Androka et la Baie de Mangoky; Coquillages (Murex, Casque rouge, Turbos, Porcelaine) dans les régions d'Androka, Morombe, Nosy-Be.

INVENTAIRE NATIONAL DES AIRES PROTEGEES EXISTANTES

Types d'habitat

Mangroves, marécages, estuaires et vasières

- Surface des mangroves = environ 300.000ha
- Surface protégée = néant
- Surface proposée à être protégée = non déterminée pour le moment
- Utilisation: pêche (crustacés, poissons)

Notons que dans certaines zones de balancement des marées (baies, estuaires), les habitants utilisent des pièges fixes dits "valakira" qui retiennent les immatures lors des marées descendantes. Ces "valakira" sont des barrages fixes en forme de "V" dont les ailes sont formées de lattis très serrés plantés dans le sol. La grande ouverture fait face à la terre. Lorsque la marée monte, les "valakira" sont immergés et lorsqu'elle descend, ils retiennent les immatures (crevettes, poissons).

Les autorités trouvent des difficultés à éliminer et à réglementer la pratique du "valakira" qui se rencontre surtout sur la côte nord-ouest de Madagascar. Ces "valakira" sont, à juste titre, illégaux et leur suppression préoccupe au plus haut point le Pouvoir Public car bon nombre de pêcheurs gagnent leur vie par ce type de barrage.

Plages de sable

- Surface totale = inconnue
- Surface protégée = certaines portions interdites aux touristes
- Surface proposée pour la protection = non encore connue
- Utilisation = tourisme, collecte de coquillages
- Rôle écologique = habitat de mollusques et lieu de ponte des tortues de mer (ramassage d'oeufs)

Banc de corail et lagunes

- Surface totale = inconnue
- Surface protégée = néant
- Surface proposée pour la protection = non encore déterminée
- Utilisation = collecte de coraux et coquillages, pêche, collecte du mollusques et échinodermes (oursin et holothuries)

Lits de postères maritimes

- Surface totale = inconnue
- Surface protégée = néant
- Surface proposée pour la protection = non encore déterminée
- Utilisation = activité de pêches

Bancs d'huîtres

- Surface totale = inconnue
- Surface protégée = néant
- Surface proposée pour la protection = non encore déterminée
- Utilisation = exploitation des huîtres

Ilots

- Surface totale = inconnue
- Surface protégée : cinq îlots sont protégés
- Surface proposée = d'autres îlots pourraient être proposées

INVENTAIRE NATIONAL DES ESPECES MARINES
ET LITTORALES EN DANGER OU MENACEES

Tableau des espèces menacées

Espèces	Population	Population de l'aire	% protégé
<u>Dugong dugon</u>	inconnue	inconnue	(protégé par la loi)
<u>Chelonia mydas</u> (tourtue verte)	"	"	"
<u>Eretmochelys imbricata</u> (tourtue à écaille)	"	"	"
<u>Lepidochelys olivacea</u>	"	"	"
<u>Caretta caretta</u>	"	"	"

Remarques

Les espèces de tortues marines continuent d'être menacées. Les habitudes, culinaires entre autres, de la population inhibent tout effort de rationaliser leur protection. En fait, il s'agit de l'insuffisance générale des moyens de contrôle, d'information des Pouvoirs Publics d'une part et du traditionalisme très enraciné de la population d'autre part qui contribuent ensemble à raviver le mal.

On constate également ces derniers temps que les Holothuries commencent à être surexploités dans certains endroits de l'île, notamment sur la côte sudouest de Madagascar. Une fois séché, ou trévang, ce produit est surtout destiné à l'exportation (Extrême Orient). Rappelons que le trévang fait l'objet d'un texte réglementaire qui détermine la taille minimal des espèces commercialisables.

Par ailleurs, dans cette région du sud occidental malgache, certains coquillages deviennent de plus en plus rares (Murex, Casque rouge, Turbos, Porcelaines).

CONCLUSIONS

Si dans le domaine terrestre, certaines dispositions ont déjà été prises en ce qui concerne la protection de certaines espèces, ce qui, en partie résoud le problème, le domaine maritime par contre, en raison de l'insuffisance des textes réglementaires et de l'énormité des tâches à accomplir en matière de conservation de la ressource, demeure un sujet à peine maîtrisé.

En premier lieu, la principale action à mener consiste à établir l'inventaire détaillé des écosystèmes littoraux et des espèces et aires méritant une protection. Cette oeuvre est des plus urgentes de manière à préserver suffisamment tôt le devenir d'un milieu naturel devant la précipitation et parfois l'arrogance des actions destructives de l'homme (industrialisation, urbanisation, surexploitation du stock, etc.).

Une fois cet inventaire accompli, la deuxième tâche consiste à mettre en place les mesures restrictives puis les coordonner avec des opérations socio-économiques. En effet, on constate bien souvent que l'homme déprave un système écologique pour subvenir à ses besoins quotidiens (nourriture, pêche commerciale, etc.). On devrait donc éliminer petit à petit chez l'homme cette tendance naturelle "destructive" par la création d'autres activités qui puissent l'intéresser (par exemple : protéger un récif mais fournir aux pêcheurs les moyens de production leur permettant d'avoir accès à d'autres zones de pêche non encore exploitées).

Corollaire à ce précédent point, il faudrait également faire participer la population au contrôle des mesures instaurées afin, par exemple, que tous les membres d'une communauté villageoise côtière prennent part à une véritable surveillance entre eux-mêmes d'abord puis envers les étrangers (touristes) également. Le Pouvoir Public, généralement dépourvu de moyens de tous genres, ne peut à lui seul, - du moins dans un court terme - se réserver l'exclusivité du suivi, du contrôle et de la surveillance des mesures qui auront été adoptées. Par ailleurs, un système d'émulation pourrait être mis en place soit au niveau régional, soit au niveau national.

Enfin, le problème de la protection d'une zone ou d'une espèce donnée se pose non seulement en terme d'écologie mais également et surtout de sociologie et de pédagogie.

NOTA: Deux annexes contenant les principaux textes législatifs relatifs à la protection des écosystèmes terrestres et marins ont été jointes au rapport. Malheureusement la manque d'espace a empêché leur reproduction dans ce présent volume.

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Annexe

Personnel requis pour la réserve naturelle no 1 Betampona

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	3	3	3	3
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	2	3	3	4 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 33%
- b) Personnel qualifié = 0%
- c) Personnel général = 67%

2. Pourcentage dans cinq ans

- a) Professionnel = 45%
- b) Personnel qualifié = 10%
- c) Personnel général = 45%

Personnel requis pour la réserve naturelle no 3 Zahamena

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	3	3	3	3
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	3	3	3	4 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 33%
- b) Personnel qualifié = 0%
- c) Personnel général = 67%

2. Pourcentage dans cinq ans

- a) Professionnel = 45%
- b) Personnel qualifié = 10%
- c) Personnel général = 45%

Personnel requis pour la réserve naturelle no 4 Tsaratanana

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	2	2	2	3
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	2	2	2	4 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 100%
- b) Personnel qualifié = 0%
- c) Personnel général = 0%

2. Pourcentage dans cinq ans

- a) Professionnel = 68%
- b) Personnel qualifié = 10%
- c) Personnel général = 22%

Personnel requis pour la réserve naturelle no 5 Andringitra

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	4	4	4	4
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	4	4	4	5 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 25%
- b) Personnel qualifié = 0%
- c) Personnel général = 75%

2. Pourcentage dans cinq ans

- a) Professionnel = 37%
- b) Personnel qualifié = 8%
- c) Personnel général = 55%

Personnel requis pour la réserve naturelle no 6 Lokobe

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	1	1	1	2
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	1	1	1	3 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 100%
- b) Personnel qualifié = 0%
- c) Personnel général = 0%

2. Pourcentage dans cinq ans

- a) Professionnel = 58%
- b) Personnel qualifié = 13%
- c) Personnel général = 29%

Personnel requis pour la réserve naturelle no 7 Ankarafantsika

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	2	2	2	3
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	2	2	2	4 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 0%
- b) Personnel qualifié = 0%
- c) Personnel général = 100%

2. Pourcentage dans cinq ans

- a) Professionnel = 45%
- b) Personnel qualifié = 10%
- c) Personnel général = 45%

Personnel requis pour la réserve naturelle no 8 Tsingy de Namoroka

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	2	2	2	2
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	2	2	2	3 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 50%
- b) Personnel qualifié = 0%
- c) Personnel général = 50%

2. Pourcentage dans cinq ans

- a) Professionnel = 58%
- b) Personnel qualifié = 13%
- c) Personnel général = 29%

Personnel requis pour la réserve naturelle no 9 Tsingy de Bemaraha

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	3	3	3	3
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	3	3	3	4 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 33%
- b) Personnel qualifié = 0%
- c) Personnel général = 67%

2. Pourcentage dans cinq ans

- a) Professionnel = 45%
- b) Personnel qualifié = 10%
- c) Personnel général = 45%

Personnel requis pour la réserve naturelle no 10 Tsimanampetsotsa

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	1	1	1	2
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	1	1	1	3 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 0%
- b) Personnel qualifié = 0%
- c) Personnel général = 100%

2. Pourcentage dans cinq ans

- a) Professionnel = 58%
- b) Personnel qualifié = 13%
- c) Personnel général = 29%

Personnel requis pour la réserve naturelle no 11 Andohahela

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	3	3	3	3
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	3	3	3	4 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 33%
- b) Personnel qualifié = 0%
- c) Personnel général = 67%

2. Pourcentage dans cinq ans

- a) Professionnel = 45%
- b) Personnel qualifié = 10%
- c) Personnel général = 45%

Personnel requis pour la réserve naturelle no 12 Marojejy

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	4	4	4	4
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	4	4	4	5 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 25%
- b) Personnel qualifié = 0%
- c) Personnel général = 75%

2. Pourcentage dans cinq ans

- a) Professionnel = 37%
- b) Personnel qualifié = 8%
- c) Personnel général = 55%

Personnel requis pour le parc national Montagne d'Ambre.

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	7	7	7	8
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	7	7	7	9 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 0%
- b) Personnel qualifié = 0%
- c) Personnel général = 100%

2. Pourcentage dans cinq ans

- a) Professionnel = 21%
- b) Personnel qualifié = 5%
- c) Personnel général = 74%

Personnel requis pour le parc national Isalo

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	2	2	2	2
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	2	2	2	3 + 6/14

(1) à temps partiel

Niveau du personnel

1. Pourcentage actuel

- a) Professionnel = 50%
- b) Personnel qualifié = 0%
- c) Personnel général = 50%

2. Pourcentage dans cinq ans

- a) Professionnel = 58%
- b) Personnel qualifié = 13%
- c) Personnel général = 29%

Personnel requis pour Réserve spéciale de Nosy Mangabe

Fonctions (rôle)	Personnel actuel	Personnel requis actuellement	Personnel prévu	Requis en 1987 Ideal
1. Gestion (administrateur)				1
2. Protection/gestion des ressources (gardes)	4	4	4	4
3. Ecologie (écologiste)				1/14 (1)
4. Interprétation (interprète)				
5. Administrateur/compte, (directeur administratif)				
6. Entretien (spécialiste de l'entretien)				
7. Sociologie (sociologue)				1/14 (1)
8. Economie (économiste)				1/14 (1)
9. Sciences naturelles (scientifique)				1/14 (1)
10. Droit, politique des ressources (spécialiste droit)				
11. Propriété de la terre/achat (spécialiste)				
12. Relations publiques (spécialiste)				1/14 (1)
13. Planification (planificateur)				1/14 (1)
14. Architecture paysagiste/ingénieur				
15. Technique art/exposition (spécialiste)				
	4	4	4	5 + 6/14

(1) à temps partiel

Niveau du personnel

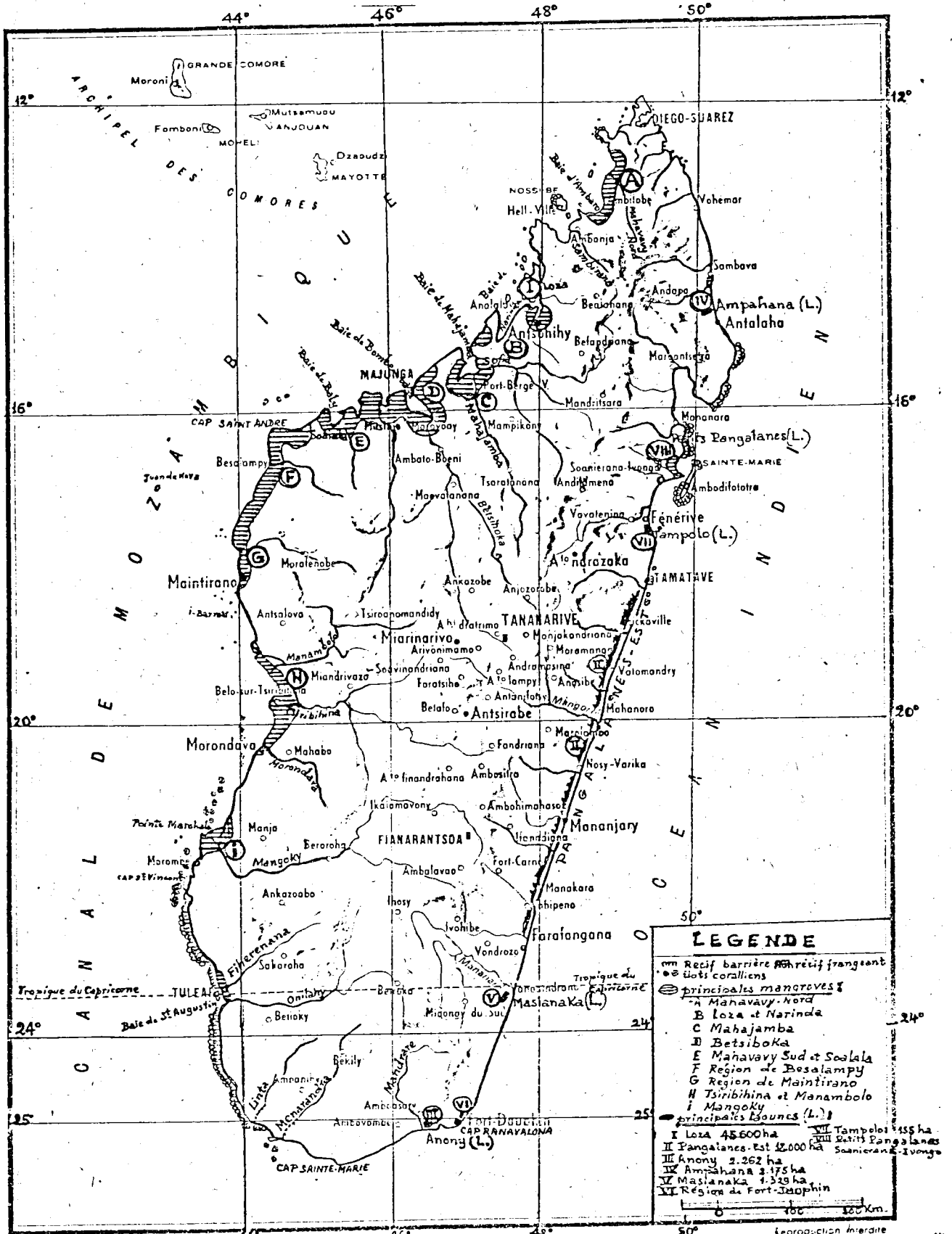
1. Pourcentage actuel

- a) Professionnel = 50%
- b) Personnel qualifié = 0%
- c) Personnel général = 50%

2. Pourcentage dans cinq ans

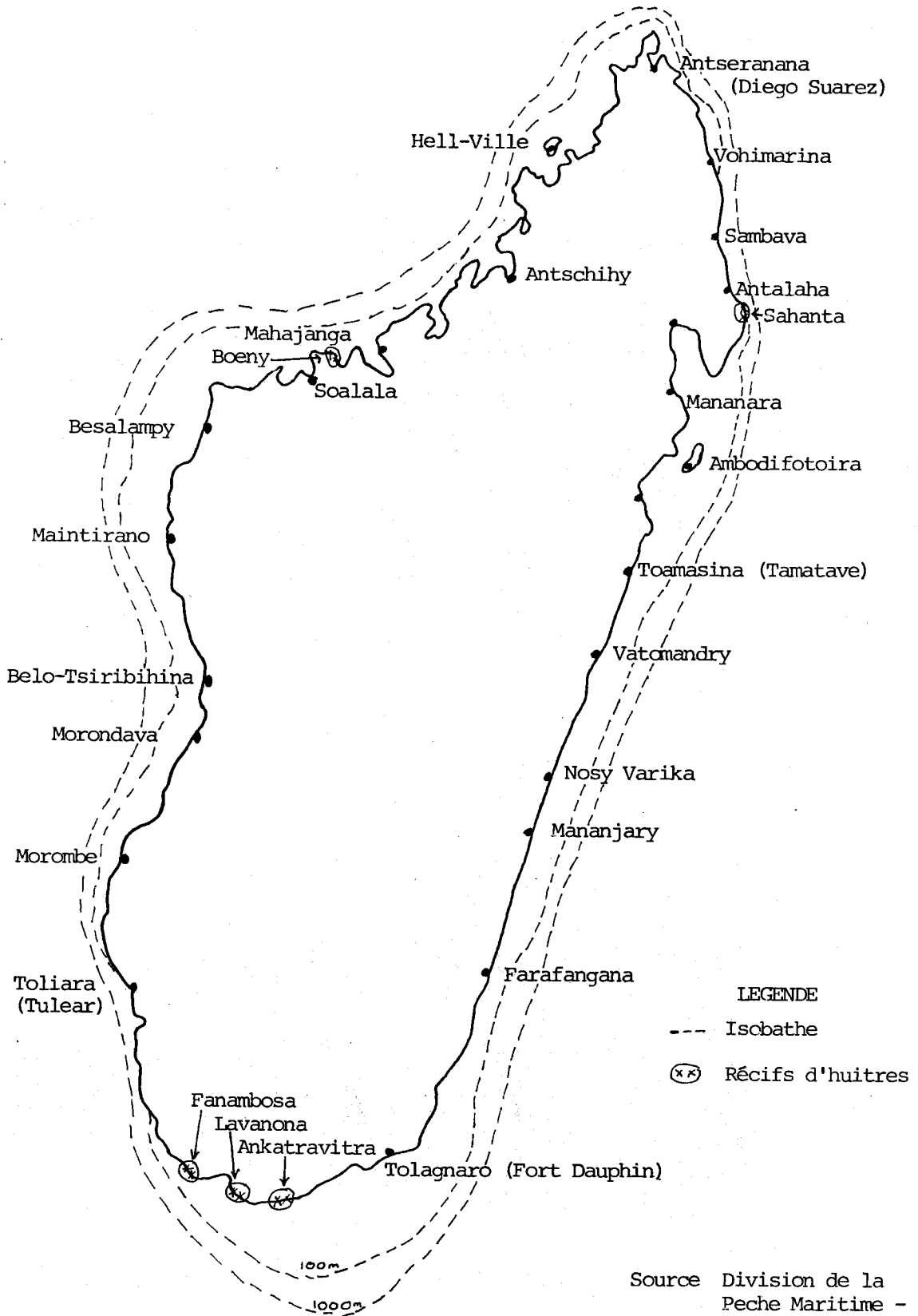
- a) Professionnel = 37%
- b) Personnel qualifié = 8%
- c) Personnel général = 55%

PLANCHE I



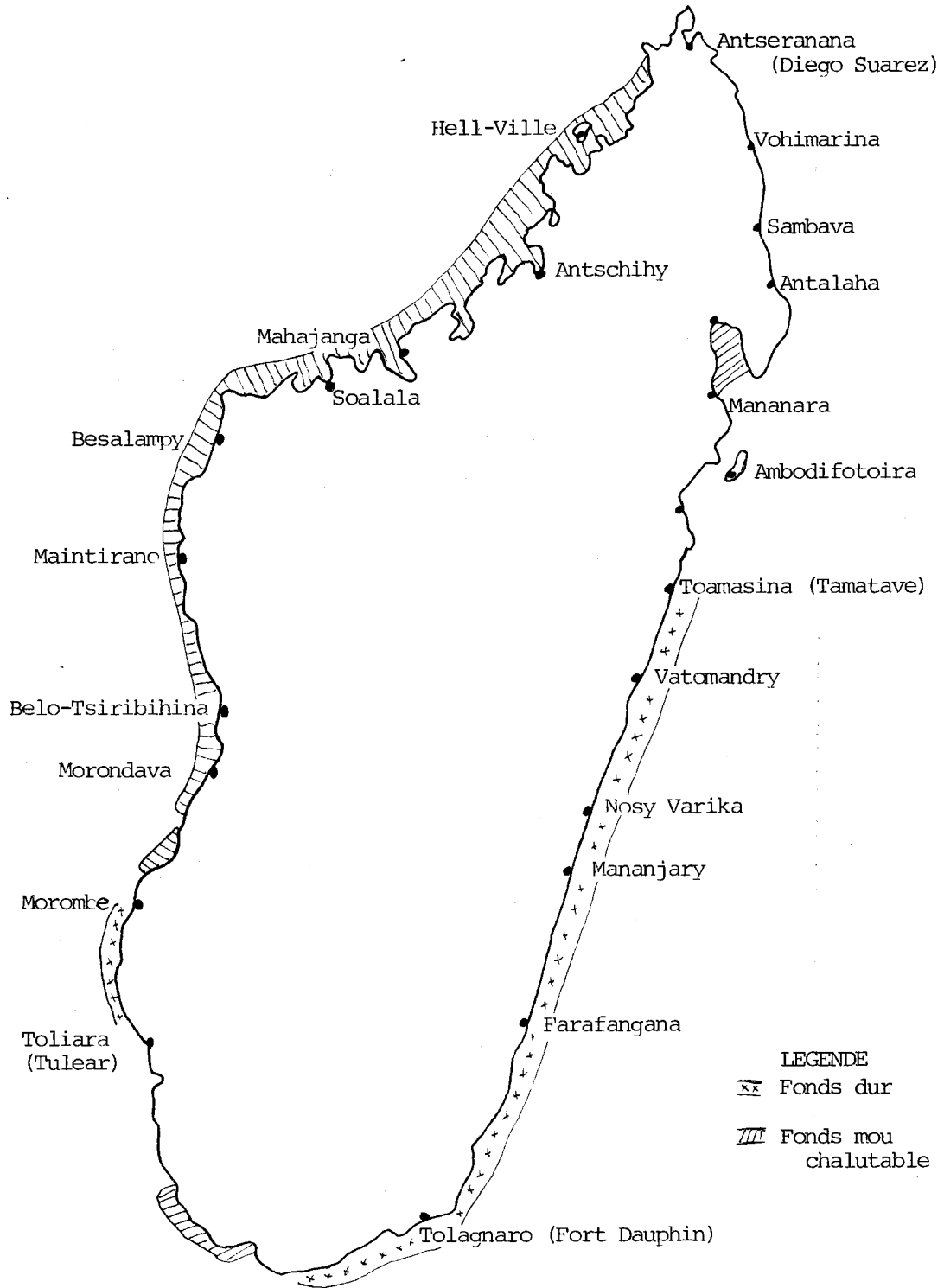
PRINCIPAUX RECFIS CORALLIENS, MANGROVES ET LAGUNES de MADAGASCAR

PLANCHE II





LEGENDE
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⊗ Récifs d'huitres
Source Division de la Pêche Maritime - Tananarive

PLANCHE III



LEGENDE

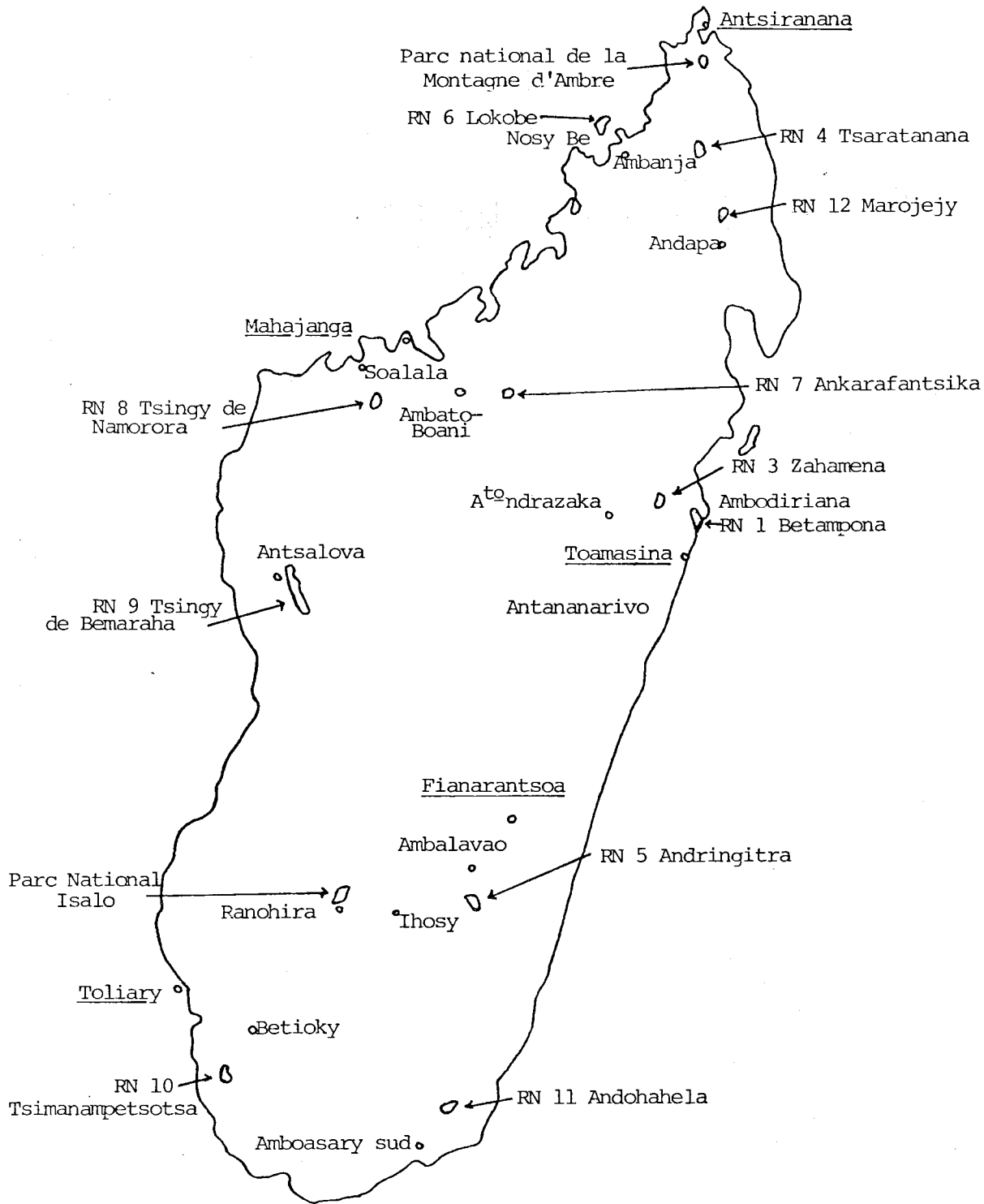
 Fonds dur

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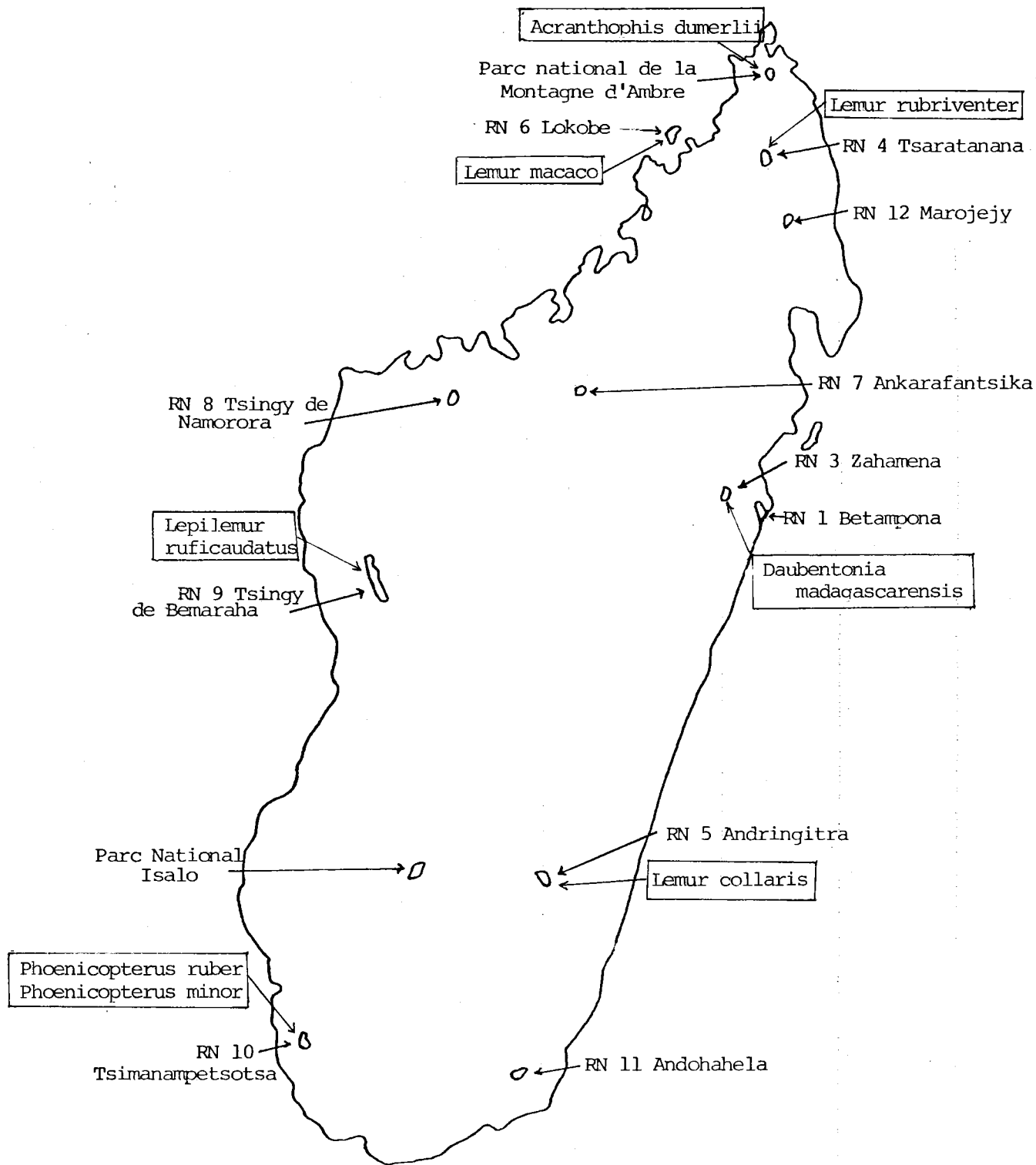
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RESERVES NATURELLES ET PARCS NATIONAUX

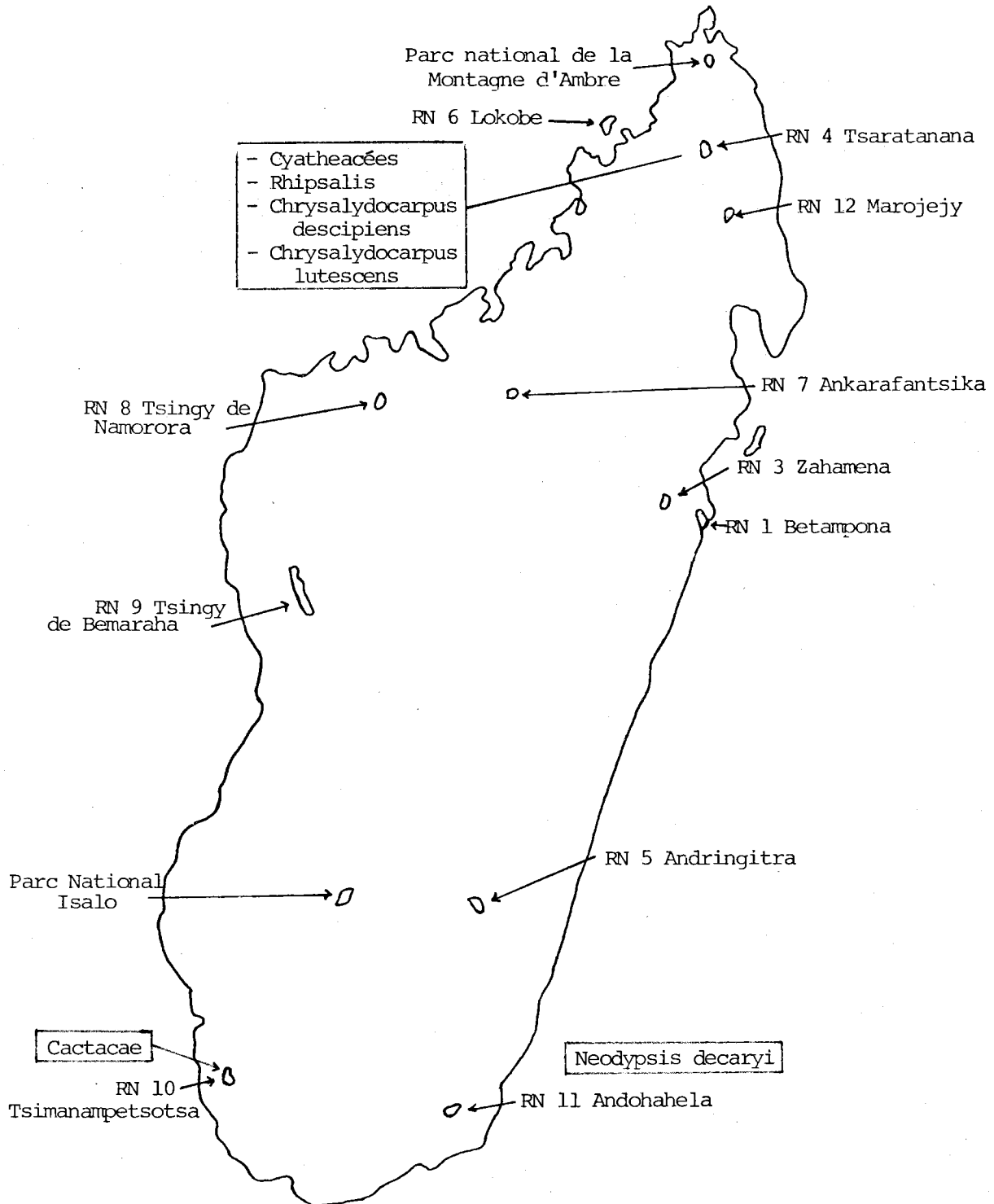
MADAGASIKARA



Aires protégées abritant
les espèces les plus menacées (faune)



Aires protégées abritant
les espèces les plus menacées (flore)



SOMALIA NATIONAL REPORT : by M. A. Salah

BASIC DATA ON SOMALIA

Land area:	637,657 km ²
Arable land:	82,000 km ² - 12.3 per cent of land area
Population:	5.158 million
Population density:	approximately 8 inhabitants per km ²
Population earning living from agriculture:	3 per cent
Population earning living from fishing:	2 per cent
Literacy rate:	approximately 70 per cent
Major sources of foreign exchange:	livestock and agriculture

INTRODUCTION

In recent years the Government of the Somali Democratic Republic has become especially conscious of the fragility of the country's ecosystem and the hazard of desertification. Largely because of successive droughts and increased pressure of human and livestock population, there has been an increase in the occurrence and scale of such symptoms of desertification as total depletion of forest or pasture cover, soil erosion, salinization of irrigated land, and formation of sand dunes. In the present development plan, the Government gives increased emphasis to measures to halt and reverse symptoms of desertification.

The land

The greater part of the country's land surface is utilized by domestic livestock at some time or other, but the land is predominantly arid (75 per cent has less than 300 mm average annual rainfall) and therefore relatively unresponsive. The inter-riverine zone and a small area in the north-west have better rainfall expectancy and provide the best opportunity for integrated crop and livestock land use and future settlement of pastoralists.

Range

The recent establishment of 136 reserves and 16 range co-operatives, totalling 72,000 km² and related to specific watering facilities, provides an immediate opportunity for some improvement in land utilization.

As part of the Drought Rehabilitation Programme, the National Range Agency was established in 1976 with countrywide responsibility for conservation and development of range, forest and wildlife resources. Because the rangelands are so crucial to the survival of the majority of Somalis and to the nation itself, and because of the reminder drought of 1979-1980, major emphasis is being given to continuing range development. The infrastructural development achieved in three northern regions is being expanded into the adjoining north-western and north-eastern regions and into the three central regions. The establishment of grazing reserves, especially of drought reserves with new water supplies, is being continued but emphasis will be more on achieving effective management of existing reserves through associations of users, rather than simply increasing the number demarcated. The survey and mapping of ecological zones are being completed for all the northern and central regions, monitoring sites are being established, and management plans prepared and implemented. Informal educational activities are being intensified and the operation of new organizational groupings such as range co-operatives and grazing associations is being developed with the participation of the graziers.

Forestry

The importance of the forestry sector stems from the fact that it is the main source of household energy and home construction materials for the bulk of the population. The 8.8 million hectares which are classified as forest (13.8 per cent of the country's total land area) vary greatly in type and include vast areas of degraded scrub and bush land as well as real forest. The true forest includes remnants of juniper and evergreen woodlands on the higher parts of the northern mountain ranges, remnants of tall-trees on the alluvial flats along the Juba River, and scattered areas of mangroves in the south-east. Important native trees include *Boswellia* species, which produce frankincense, in the north-east, *Commiphora*, which produces myrrh, in the south-west, and *Cordeauxia edulis*, which produces yicib nuts, in the central regions.

The estimated areas of major forest types in thousands of ha are as follows:

Juniperus	40
Riverine	60
Dense savanna	2,500
Bush and scrub	6,191
Trial plantations and shelter belts	3

The main forest products are fuelwood for cooking mainly in rural areas, wood for charcoal production for cooking mainly in urban areas, roundwood small poles and brush bundles for house and hut construction, frankincense, myrrh and gum arabic for export, and a variety of nuts, seeds and medicinal plants for the local market and export.

Wildlife

The fauna of the country is among the most interesting in Africa, relatively rich both in variety of species and in size of population. Somalia's wildlife includes some species that are unique to the country and some that are on the list of endangered species identified by the IUCN. There are more than 100 species of birds. The range of species naturally reflects the diversity of habitats provided by the various ecosystems found in Somalia, where average annual rainfall ranges from 50 to 600 mm and altitude ranges from sea level to 2,400 metres. The range of wildlife therefore includes species as disparate as elephant, hippopotamus, water

buck, giraffe, oryx, gerenuk, ostrich, klipspringer, bush buck, warthog, leopard, cheetah, kudu, dikdik, gazelle, etc. It also includes such rare and endangered species as the Somali wild ass, the Beira, Dibtag and Pelzeln's gazelle. The populations of individual species are not known but estimates of a few species in certain areas are being formed from the results of aerial surveys conducted under the major rangeland development projects.

Eleven wildlife areas have been declared protected or reserved since 1970, but only two are actually functional. The hunting of wildlife for meat has never been widely practised in Somalia and does not contribute significantly to domestic meat consumption. However, prior to enactment of the 1969 Law of Fauna (Hunting) and Forest Conservation, certain animals were hunted for commercial exploitation of their skins or other trophies. During the 1960s approximately 60,000 gazelle skins, 10,000 kudu skins and 250,000 dikdik skins were exported annually, and presumably the meat was eaten. During the same period up to 18,000 kg of elephant ivory and between 3,000 and 5,000 live monkeys (for medical research) were also exported annually. However the law passed in 1969 resulted ultimately in a virtual ban on hunting and the cessation of game skin exports.

Fisheries

Somalia has a coastline of about 3,300 km of which about 1,300 km forms the south coast of the Gulf of Aden and 2,000 km fringes the Indian Ocean. It consists of a series of sandy beaches interrupted at intervals by rocky cliffs which at places extend into the sea. The continental shelf is generally narrow falling off sharply into deep water and rarely exceeds 15 km but between Ras Asir and Ras Hafun on the north-east coast, a distance of 135 km, it extends to 60-80 km. The total area of the continental shelf is estimated at between 35,000 and 40,000 km². Marine habitats and coral reefs on the coastline are not known.

NATIONAL MANAGEMENT POLICIES RELATED TO PROTECTED AREAS AND ENDANGERED SPECIES

Legislation

International legislation:

Somalia has become party to the African Convention on Conservation of Nature.

National legislation:

a) Protected area legislation

Law No. 15 - Fauna (Hunting) and Forest Conservation. This law was decreed on 25 January 1969 and amended on 31 August 1970. It covers forest, grazing and game reserves and mining, with related articles for offences and penalties. The objective of the law is to protect the natural resources from destruction and regulate their management.

b) Species conservation legislation

This is covered by Law No. 15 - Fauna (Hunting).

c) Legislation dealing with land-use planning

There is no such legislation but estimated areas by land use category have been prepared.

d) Legislation dealing with coastal zone management

Basic marine fisheries legislation is contained in the Maritime Code of 1959 (Legislative Decree No.1 of 31/2/59 amended by Decree Law No.7 of 1/11/66, converted and amended by Law No. 3 of 7/1/66) which entrusts fisheries regulation to the maritime authority which now falls under the Ministry of Marine Transport and Ports.

e) Legislation dealing with fisheries

This is covered by the Maritime Code of 1959, Law No. 37 of 10/9/72 - 200 nautical miles for economic zone.

Provisions for planning

National development plan

This procedure is practised in Somalia and it is written into the Five-Year Development Plan 1982-1986.

National planning board (or similar body)

This is a Ministry of National Planning instead of a National Planning Board.

National conservation strategy

Law No. 15 - Fauna (Hunting) and Forest Conservation.

Regional (sub-regional) plans

These are covered by the National Five-Year Development Plan 1982-86.

Coastal zone plans

These are also covered by the National Five-Year Development Plan.

Protected area systems plan

This is covered by the National Range Agency (NRA), Ministry of Livestock, Forestry and Range.

Management plans for protected areas

These are administered by the National Range Agency.

Zoning plans for protected areas

These are under the control of the National Range Agency.

Institutional linkages of species and habitat conservation

There is no Ministry of Environment. The following ministries and departments are all concerned with species and habitat conservation, although the role of each institution is not clearly defined: Ministry of Agriculture; Department of Forestry; Department of Fisheries; Ministry of Tourism; Ministry of Planning.

Protected area management (based on IUCN paper on categories, objectives and criteria for protected areas)

The following categories are represented by the protected area system in Somalia:

- I. National Park)
- II. National Monument)
- III. Game Reserve) Number of units not available
- IV. Cultural Landscape)

The agencies charged with managing protected areas are as follows:

- Policies: Ministry of Livestock, Forestry and Range
- Monitoring & evaluation: National Range Agency
- Research: Faculty of Agriculture and Faculty of Animal, Production and Veterinary Sciences.
- Enforcement procedures: National Range Agency

Personnel and training

Training:

a) University

(i) Faculty of Agriculture

The University of Mogadishu Faculty of Agriculture has an annual intake of 60, of whom five should be trained in forestry. The first foresters are expected to graduate in 1984. The graduates from this faculty are employed by several government agencies.

(ii) Faculty of Animal Production and Veterinary Sciences

The annual output of this faculty is about 55. Animal husbandry and veterinary sciences are taught. The graduates are employed mostly by the Ministry of Livestock, Forestry and Range, including the NRA.

b) Middle-Level

(i) School at Burao

The Range Management Institute, Burao, was established in 1976. The school is range management orientated, with limited courses in forestry. So far, 43 students have graduated. At present there are 60 students in the school.

c) Ranger-level

(i) Afgoi Livestock and Range School

This school opened in 1982. It provides technical training in agriculture, livestock and forestry for four years. Enrollment is about 90 annually, of whom 30 are trained in forestry.

d) Labourer - at one of the above schools

As far as the Range Management of the NRA is concerned, there seems to be an adequate number of technical staff being trained compared with the Forestry Department.

Means of bringing benefits of nature protection to people

- Hiring of local people to work in protected areas;
- Resource exploitation in buffer zone;
- Compensation from Government for crop or livestock damage (Ministry of Agriculture);
- Special education, health and other government programmes for people living around protected areas;
- Participation of local people on protected area management boards;
- Watershed protection benefits;
- Provision of fishing rights.

Proposals for new protected areas
(none)

NATIONAL INVENTORY OF ECOSYSTEMS
(NO INFORMATION AVAILABLE)

NATIONAL INVENTORY OF EXISTING PROTECTED AREAS

List of National Parks and Protected Areas

Name of Area	Biogeographical code	Area	Year
Lag Badana (Category II)	13/4/07	334,000	1978

NATIONAL INVENTORY OF THREATENED OR ENDANGERED
COASTAL AND MARINE SPECIES

Threatened animals of Somalia

<u>Lycaon pictus</u>	Hunting dog	V
<u>Panthera pardus</u>	Leopard	V
<u>Acinonyx jubatus</u>	African cheetah	V
<u>Loxodonta africana</u>	African elephant	V
<u>Equus africanus</u>	African ass	E
<u>Diceros bicornis</u>	Black rhinoceros	V
<u>Alcelaphus buselaphus swanei</u>	Swayne's hartebeest	E
<u>Damaliscus hunteri</u>	Hunter's hartebeest, Hirola	R
<u>Ammodorcas clarkei</u>	Dibatag, Clarke's gazelle	V
<u>Dorcatragus megalotis</u>	Beira antelope	V
<u>Gazella dorcas pelzelni</u>	Pelzeln's gazelle	E
<u>Gazella spekei</u>	Speke's gazelle	I
<u>Columbia oliviae</u>	Somali pigeon	
<u>Mirafra ashi</u>	Asha's lark	
<u>Falco peregrinus</u>	Peregrine falcon	
<u>Crocodylus niloticus</u>	Nile crocodile	V

Endemic and Threatened Species of Aloes and Euphorbias

Endemic taxa

Angiospermae

Euphorbiaceae

<u>Euphorbia atrox</u> Bally & S. Carter	R
<u>Euphorbia ballyi</u> S. Carter	I
<u>Euphorbia cameronii</u> N.E. Br.	E
<u>Euphorbia carterana</u> Bally	R
<u>Euphorbia columaris</u> Bally	E
<u>Euphorbia fascicaulis</u> S. Carter	R
<u>Euphorbia gillettii</u> Bally & S. Carter spp. gillettii	I

Table 1: Estimated areas by land use category

Category	Area ('000 ha)	Percentage of total
(i) Suitable for crops or potentially cultivable:	8 200	12.3
Under crops or fallow	700	(1.1)
- under irrigation	(160)	
- under dry land farming	(540)	
Uncultivated, but cultivable	7 500	(11.7)
(ii) Suitable for grazing, including:	35 000	
Bushes and scrubs	(14 000)	(21.9) 54.9
Northern rangelands	(14 900)	(23.4)
Central rangelands	(6 100)	(9.6)
Southern rangelands		
(iii) Forests:	8 800	13.8
Juniperus, closed forests including -		
- riverine	(40)	
- dense savanna	(2 500)	(3.9)
- bushes & scrubs	(6 197)	(9.7)
- trial plantations including shelterbelts		
(iv) Other lands mostly unsuitable for any cultivation or grazing	11 800	18.4
Total land area	63 800	100.0

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