

ALDABRA MANAGEMENT PLAN

**A management plan for Aldabra Atoll, Seychelles
Natural World Heritage Site
1998 - 2005
(Version 1: 1998)**

Section 1 : Management Plan

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INTRODUCTION

The Aldabra Management Plan is intended to serve for a period of seven years (1998-2005). It should be reviewed annually to monitor performance and progress, and modified if necessary. There are two sections in the Aldabra Management Plan. Section 1: The Management Plan, addresses policies and guidelines to be used in the management of Aldabra. Section 2: Operations Manual addresses the practical procedures for the running of the atoll. Both documents are based on three much longer ones drafted by Susan Pierce and Dave Augeri in 1996 (“Management & Operations Plan”, “Science & Conservation Plan”, and “Operations Manual”). Augeri and Pierce were Research Officers during 1995.

Copies of both the Management Plan and the Operations Manual should be always available in print, on computer and on back-up computer diskettes, both on Aldabra and in the SIF office on Mahé.

EXECUTIVE SUMMARY

The Aldabra Management Plan is divided into two sections. The Management Plan itself addresses policies and guidelines to be used in the management of Aldabra. The Operations Manual, which is a separate document, addresses the practical procedures for the running of the atoll. The Aldabra Management Plan is intended to serve for a period of seven years (1998-2005) and **should be reviewed annually to monitor performance and progress.**

Aldabra atoll, one of the Republic of Seychelles southernmost islands in the Indian Ocean, is approximately 1066 km south west of the main island of Mahé, 420 km north west of Madagascar, and 640 km east of Tanzania. The Aldabra group of islands - Assumption, Cosmoledo, Astove and Aldabra - make up a distinct and isolated group of raised coral islands which share many species of flora and fauna. With the exception of Assumption, which has an important all-weather airstrip and a small settlement, these islands are now of little financial or commercial significance. Aldabra's geographical isolation, rough terrain and scarcity of fresh water have been the primary factors deterring large human populations from settling.

Aldabra is a prime example of a raised coral atoll and is significantly less disturbed than most other atolls in the Indian Ocean and elsewhere in the world. It is a refuge for many endangered and unique species. Amongst these are the Aldabran giant tortoise (*Dipsochelys dussumieri* = *Geochelone gigantea*) of which there are about 100,000; one of the largest congregations of nesting green turtles (*Chelonia mydas*) in the Indian Ocean; the world's second largest breeding population of greater and lesser frigate birds (*Fregata minor* and *Fregata ariel*); the last flightless bird species in the Indian Ocean - the white-throated rail (*Dryolimnas cuvieri aldabranus*); and many endemic taxa of plants and animals. As a result of Aldabra's unique ecosystems and species it is listed as a Seychelles Special Reserve and a World Heritage Site.

The Royal Society built a research station on Aldabra in 1971 and there followed a period of intense research into the terrestrial and marine ecology. In 1981 the Seychelles Islands Foundation (SIF) took over the management of Aldabra. Established by presidential decree in 1979, SIF is a government statutory body which also manages Seychelles' other World Heritage Site, Vallée de Mai on Praslin island. The mandate of SIF with respect to Aldabra is to manage and conserve the natural life of the atoll and to initiate and instigate scientific research into this natural life. The main policies of SIF therefore relate to conservation, research, restoration and education (Part 1). This new Management Plan introduces policies on limited and controlled eco-tourism (Part 6), and on the zonation of the atoll (Part 2.5). Other major changes outlined in the Plan relate to the administrative structure of SIF, the Aldabra management structure, improving the quality of staffing (all in Part 5), and revamping research programmes on the atoll (Part 4). A summary of the main strategies and actions proposed and outlined in this Management Plan is given on the following pages (Management Strategy and Action Plan).

A SWOT analysis for Aldabra is given in Appendix One. This summarises Aldabra's **Strengths**, (including the presence of SIF on the atoll), its **Weaknesses** (of which most relate to poor management), the **Opportunities** for positive change, and **Threats** to the atoll (both natural and due to poor management).

A number of possible management scenarios are outlined and evaluated in Appendix Two, including the implications of maintaining the status quo as at 1997.

MANAGEMENT STRATEGY AND ACTION PLAN

VISION : Aldabra should be an environmental “flagship” for Seychelles - an example of a well managed protected area and World Heritage Site in which, despite its isolation, conservation, research, education and limited nature conservation tourism are sustainably balanced and the atoll has a firm financial base.

The management strategy and action plan outlined here is arranged in a way which reflects the basic priorities required for positive changes to the current situation. It can be used as a tool for the annual review of performance and progress during the AGM of SIF. Additional items and refinements can be incorporated at that time.

NOTE:

1. After each Management Action in the chart below is the reference number of the appropriate section(s) of this Management Plan (e.g. 3.3.2).
2. ++ Initiation of action
3. + Continuation of action

1. ADMINISTRATION

a) SIF Annual General Meeting

Management Objective: to improve the effectiveness of the AGM in directing the future of Aldabra

Actions	1998-1999	2000-2001	2002-2005
• Annually assess progress on the whole of this Action Plan (see Introduction)	++	+	+
• At or directly after the AGM, produce a summary of policy changes and amendments relating to this Management Plan. This should be appended to the Management Plan and also circulated to all Trustees and senior staff on Aldabra.	++	+	+

b) SIF on Mahé

Management Objective: to improve the management structure and efficiency of SIF on Mahé

Actions	1998-1999	2000-2001	2002-2005
• Develop policies on those issues which are not already covered in this Management Plan (See No. 2 below)	++		
• Each member of the office staff should be given a copy of their particular responsibilities and duties (5.2)	++	+	+
• Report distribution and communication should be improved (5.1.2 and 5.2.1a)	++	+	+
• Ensure that action is taken on matters which arise from the bimonthly reports which are sent from Aldabra (5.7)	+	+	+
• Ensure that any additional relevant legislation, e.g. additions to the Environment Protection Act, is appended to this Management Plan (2.6 and Appendix 3)	+	+	+

c) SIF on Aldabra

Management Objective: to improve the management structure on Aldabra

Actions	1998-1999	2000-2001	2002-2005
• Implement changes in the management structure (5.3)	++	+	+
• Improve the communications system between Aldabra and the Mahé office (5.3.1)	++	+	+
• Conduct regular staff meetings (5.4)	+	+	+
• Ensure that all Bi-monthly Reports are written and submitted to SIF (5.7)	+	+	+
• Each member of staff should be given a copy of:			
* his or her particular responsibilities and duties (see 5.3.1 to 5.3.12)	++	+	+
* the “Working Conditions” for staff on Aldabra (5.5 and Appendix Four)	++	+	+
* SIF Tourism Guidelines for Staff (6.4.4)	++	+	+
• This can be replaced at a later date by a Code of Conduct which should be given to all staff.	+	++	+

2. POLICY DEVELOPMENT

Management objective: to develop policies on important issues which are not currently addressed in the Management Plan.

Actions	1998-1999	2000-2001	2002-2005
• Develop financial policies and strategies for SIF	++	+	+
• Develop policies on communications systems between Mahé and Aldabra, on the atoll itself, and on the control and usage of these systems	++	+	+
• Develop sustainable environmentally friendly policies for future energy and power production, sewage disposal, water supplies, etc.	++	+	+
• Affirm the proposed policy on workers’ gardens (3.1.1c(b))	++	+	+
• Update the management policies on tortoises (3.1.2c(a))	++	+	+
• Develop policies or devise contingency plans for natural emergencies on Aldabra (e.g. fire, oil spill, alien species introduction) (3.1b(g), 3.2.3(h), 3.1.2c(f))		++	+
• Review the use of plant species on the atoll and devise policies for utilisation, e.g. coconuts, wood (3.1.1c(c))	++	+	+
• Devise policy on use (or non-use) of toxic chemicals on Aldabra (3.1b(h))		++	+

3. FINANCE

Management objective: to expand SIF's financial support base and make it more secure.

Actions	1998-1999	2000-2001	2002-2005
• Financial policy and strategy for SIF to be devised (See No.2 above)	++	+	+
• Fund Raising Sub-Committee to be activated (5.1.2d and 7.1)	++	+	+
• Budget to be prepared and presented annually (7.1 and 7.2)	+	+	+

4. STAFFING

Management objective: to improve the quality of all staff (including improving staff attitudes to working for an environmental organisation)

Actions	1998-1999	2000-2001	2002-2005
• Upgrade the quality of recruits for all posts (5.2, 5.3)	++	+	+
• Activate the mandatory Orientation Programme for all new staff (3.5.1, 3.5.3, 5.5 and 5.6.1)	++	+	+
• Activate the local Ranger Training Programme (3.5.2 and 5.6.1)	++	+	+
• Activate the Ranger Rotation Programme (3.5.2 and 5.6.2)	++	+	+
• Ensure that advertisements, interviews, reference checks and police checks are conducted for all local staff recruitments (5.3)	++	+	+
• Introduce a programme of volunteer Scientific Assistants (5.3.5)	++	+	+
• Locate possible overseas training programmes for rangers (3.5.2 and 5.6.1)		++	+

5. TOURISM

Management objective: to prepare for an increased (but strictly limited) level of nature conservation tourism.

Actions	1998-1999	2000-2001	2002-2005
• Develop a sensitive marketing programme for limited nature conservation and nature education tourism (6.2)	++	+	+
• Ensure that all tourism guidelines are followed on Aldabra, including zonation policies (6.3, 6.4.3 and 6.4.4 and Operations Manual Part 2)	++	+	+
• Prepare interpretative materials for visitors (3.5.4)	++	+	+
• Set up a Visitor Information Centre on the atoll (3.5.4)		++	
• Tour operator guidelines should be sent to all current tour operators (6.3, 6.4.1 and 6.4.2)	+	+	+
• Devise Monitoring Programmes for:			

* tourism's effects on the natural systems of Aldabra	++	+	+
* tourists' satisfaction with their experience on Aldabra (6.5)		++	+

6. RESEARCH

Management objective: to revamp the research programme on Aldabra, and to provide better information to scientists.

Actions	1998-1999	2000-2001	2002-2005
• Actively promote and market Aldabra's research potential (4.5)	++	+	+
• Ensure that all research guidelines are followed (Part 4)	++	+	+
• Ensure that research priorities are followed and reassessed when necessary (4.2)	+	+	+
• Prepare a handbook for researchers and scientific visitors (3.5.3 and 4.5)	++	+	
• Create a computerised Data Base for all scientific records (4.2.1)		++	+
• Ensure that work on the GIS (Geographical Information System) for Aldabra is continued (4.2.1)	+	+	+
• Strengthen marine research (3.3.2d)	+	+	+

7. MONITORING

Management objective: to improve the quality of the monitoring programme.

Actions	1998-1999	2000-2001	2002-2005
• Reassess the value of each monitoring programme and review the methodology (Operations Manual Part 6 & 7)	++	+	+
• Improve the standard of entry and capacity of the Rangers (see above, No.4)	+	+	+
• Re-activate the beach erosion and accretion monitoring programme (3.2.3(d))	++	+	+
• Establish a vegetation monitoring system (3.1.1c(a))	+	++	+

8. ENVIRONMENTAL PROTECTION MEASURES

Management objective: a) to improve the environmental protection and conservation measures on Aldabra, b) to ensure that environmentally friendly technology is used as far as possible.

Actions	1998-1999	2000-2001	2002-2005
• Establish permanent mooring buoys or other anchoring facilities (3.3.2c(f))	++	+	+
• Ensure that all breaches of Aldabra Conservation Policy are dealt with appropriately	+	+	+
• Carry out the last phase of goat eradication programme (3.1.1c(b))	++	+	

• Assess the possibilities for alien species extermination on Assumption and submit recommendations (2.3, 3.1.2b(e), 3.1.2c(f))	+	++	
• Establish a patrol and surveillance system (Operations Manual 5.4)	+	++	+
• Reassess the procedure for fuel/oil transport and storage (3.2.3 (h))	++	+	+
• Ensure waste management policy is carried out (Operations Manual Part 4)	+	+	+
• Review freshwater storage and use and make changes where necessary (Operations Manual 3.2.1)		++	+
• Assess the possibilities for ex-situ conservation of rare species and make recommendations (3.1.1c(c))		++	+
• Assess the feasibility of re-establishing shade trees in certain areas and make recommendations (3.1.1c(d))		++	+
• Ensure that necessary policies for environmental protection are developed (see No. 2 above)	++	+	+

CONSTRAINTS

1. One of the major constraints for many of these actions will be finance.
2. Another will be finding suitable personnel to a) staff Aldabra and b) carry out some of the items in the action plan.

Additional support may therefore be necessary for both staffing and finance, perhaps in the form of grants or externally funded projects.

CRITICAL UNCERTAINTIES

1. Unknown factors could affect the whole economy of Seychelles, or the world economy, and this might affect the amount of tourism and the number or size of research projects.
2. Natural disasters, such as the coral bleaching and death which occurred in 1998, could affect Aldabra and reduce its value as a World Heritage Site or its attractiveness for visitors or researchers.

PART ONE

POLICIES

1.1 MISSION STATEMENT

“The object of the Foundation shall be to manage and conserve the natural life of the group of islands comprising the atoll of Aldabra in the Republic of Seychelles and to initiate and instigate scientific research into such natural life.”
SEYCHELLES ISLANDS FOUNDATION DECREE, 1979. (See Appendix Three)

WORLD HERITAGE CONVENTION CRITERIA WHICH ARE RELEVANT TO ALDABRA:

“An outstanding example representing significant on-going ecological and biological processes”

“Contains superlative natural phenomena or areas of exceptional natural beauty”

“Contains the most significant natural habitats for in-situ conservation of biological diversity”

1.2 MAJOR POLICIES FOR ALDABRA

- a) To **PROTECT** terrestrial and marine processes, biological and genetic diversity, geological features, ecological systems and

to **CONSERVE** all naturally occurring species, communities and habitats.

- b) To **DIRECT** all scientific **RESEARCH and MONITORING** towards conservation, restoration and maintenance of the biological and genetic diversity of the atoll and its surrounding reefs, and

to **MAINTAIN** on site research facilities at a level that will ensure a high standard of research and conservation.

To **MONITOR** and ensure sustainable use of natural resources for subsistence needs of the residents of Aldabra.

- c) To **RESTORE** the environment, where possible, to its previously undisturbed state by the elimination or control of alien invasive species and

to **MAINTAIN** and uphold appropriate guidelines and management policies for human impacts resulting from tourism, research projects and activities at the settlement.

- d) To **EDUCATE** the public through reports, scientific papers, local education programmes and documentaries and through limited and strictly controlled nature conservation tourism.

To **ENCOURAGE** better-educated staff to work on Aldabra, by promoting self-improvement through further education, and

to **INTEGRATE** training programmes and exchanges of staff with the Ministry of Environment.

PART TWO

INTRODUCTION TO ALDABRA

2.1 ALDABRA AS A PROTECTED AREA

2.1.1 The importance of protecting Aldabra

There are many factors that make Aldabra ecologically and scientifically valuable. Aldabra is a prime example of a raised coral atoll and is significantly less disturbed than most other atolls in the Indian Ocean and elsewhere in the world. Aldabra is a refuge for many endangered species. These include the giant tortoise (*Dipsochelys dussumieri*) (= *Geochelone gigantea*); one of the largest congregations of nesting green turtles (*Chelonia mydas*) in the Indian Ocean; the world's second largest breeding population of greater and lesser frigate birds (*Fregata minor* and *Fregata ariel*); the last flightless bird species in the Indian Ocean - the white-throated flightless rail (*Dryolimnas cuvieri aldabranus*); and a number of endemic taxa of plants and animals. As a result of Aldabra's unique ecosystems and species it is listed as a Seychelles Special Reserve as well as a World Heritage Site.

2.1.2 National context of Aldabra

The first protected areas in the Republic of Seychelles were established in the mid-nineteenth century for the protection of the coco-de-mer palm (*Lodoicea maldivica*). Since 1969 a series of protected areas have been designated in the Seychelles, including four Special Reserves, seven National Parks (of which four are Marine Parks), nine Nature Reserves for wild birds (the majority of which are islets), four Shell Reserves, and two Protected Areas. Protected natural areas in the Seychelles cover a total land area of 19,760 ha. (43% of the Seychelles total land area) with an additional 23,000 ha. of reef and marine areas. Aldabra and Vallée de Mai are administered by a government statutory body, the Seychelles Islands Foundation (SIF), while the majority of Seychelles other protected areas are administered by the government via the Conservation and National Parks Section of the Division of Environment. Two nature reserves are managed independently by overseas organisations.

2.2 GEOGRAPHICAL, CULTURAL AND CONSERVATION BACKGROUND

2.2.1 Location

The Republic of Seychelles is an island nation within the Indian Ocean consisting of 115 islands which are of two types; granite islands in the northern portions and limestone islands in the southern reaches of its boundaries (Seaton 1995). Aldabra, a raised coral atoll, is located approximately 1066 km from the capital, Victoria, 420 km north-west of Madagascar and 640 km east of Tanzania (46°20' E. Long., 9°24' S. Lat.). (Merton et al, 1976). Aldabra has a total land area of about 150 sq. km, but together with the lagoon and the channels occupies an area of almost 340 sq. km. Aldabra's geographical isolation, rough terrain and scarcity of fresh water have been the primary factors deterring large human populations from settling, and subsequently have served as the atoll's semi-protective shield. Twenty-seven kilometres to the south-east lies Assumption, which has only a handful of inhabitants, yet carries the closest available airstrip to Aldabra.

2.2.2 Access to Aldabra

At present (1997), only two cruise liners, two diving vessels, various private yachts and a bimonthly Islands Development Company (IDC) supply ship call at Aldabra. Although it was once possible to sail directly from Africa (usually Mombasa) to Aldabra, today all vessels must pass through Customs at Mahé before visiting Aldabra. Vessels may enter Seychelles via Assumption by prior arrangement with the

Seychelles Port Authority. This entails a pre-arranged flight for Seychelles Customs staff from Mahé to Assumption to inspect the vessel.

With previous authorisation from SIF, planes can also be chartered by visitors and scientists wishing to fly to Assumption and then connect with a pre-arranged boat trip to Aldabra. Such boat connections need to be reserved well in advance as they are very infrequent. The charter plane fees are prohibitive for most organisations and individuals. Another option is to contact SIF and arrange to travel independently via a yacht or with the IDC supply ship that will carry passengers and their equipment to and from Aldabra. Access is controlled by SIF and permission to visit Aldabra is obligatory even for cruise ships and yachts that include Aldabra in their itinerary.

2.2.3 Population

Aldabra has no indigenous human population. From the time of the first lease of Aldabra in 1878, it has supported teams of contract workers and more recently, scientific researchers. Currently, all inhabitants of Aldabra are SIF employees on contract, or scientific visitors. Generally, a support staff numbering between 10 and 14 people, plus a fluctuating number of scientific visitors are the sole inhabitants. The average population on Aldabra for the last decade has been approximately twelve SIF staff and special visitors (scientists, photographers, etc.)

2.2.4 Historical features of Aldabra

The primary historical feature on Aldabra is the cemetery where several of the Chinese harvesters of sea cucumbers, and others who ended their days on Aldabra, are buried. Also of interest are the church and jail in the old settlement, and the remains of a turtle bone crushing establishment at La Gigi. The Research Station itself is a symbol of an evolving era in science and conservation in Seychelles and the coral cairn and plaque at La Gigi dedicates Aldabra as a Special Reserve and World Heritage Site .

2.2.5 Climate

Aldabra has a seasonal climate typical of the tropics. There is one wet and one dry season although the amount of rainfall can vary considerably from year to year. During the period 1949-1978 the annual rainfall ranged from 349-1467mm. The majority of rainfall occurs during the north-west monsoon (typically November to April). The south-east trade winds blow during April to November when rainfall is scarce and in fact droughts of 10 to 12 months duration have been recorded. Aldabra has a mean temperature of 27.0°C with an annual range of approximately 3.4°C. The highest recorded temperature on Aldabra was 36.3°C and the lowest was 17.5°C.

2.2.6 Historical threats to Aldabra

Though Aldabra's harsh environment and isolated location have spared it from a large permanent human population, the atoll has not escaped natural resource exploitation. Beginning in the 1600's passing ships stopped to fill their hulls with tortoises to eat along their journey. In 1878 a survey team searching for giant tortoises could find only one tortoise. Around this same time, other animals such as goats and pigs were left on Aldabra to serve as a mid-voyage food source. The pigs in particular were thought to have preyed heavily upon the tortoises and turtles. It is known that if the goats increase their population to significant numbers, they exert notable impacts on the tortoises, mainly by removing shade resources. In the 1890's, one of the atoll's lessees is said to have killed 12,000 green turtles and also brought Chinese workers to harvest sea cucumbers. Several schemes such as guano and phosphate mining as well as extensive mangrove logging were also attempted, but dropped when the conditions on Aldabra defied their logistic and financial feasibility. Nevertheless, some of their impacts remain today, including the firm establishment of many alien plant species and an uncontrolled rat and cat populations.

Aldabra experienced heavy turtle harvesting and uncontrolled fishing for much of the 19th and 20th centuries. In addition, by 1928 over-harvest by labourers threatened many of the sea and land birds with extinction. Eventually, by the 1940's and 1950's, modest restrictions on tortoise and turtle harvests were mandated, though the mangroves, sea birds, fish and shellfish remained unprotected.

By far the greatest threat that Aldabra has ever faced was in 1962 when the British military conducted a secret survey to evaluate Aldabra's potential as an Anglo-American military base. By 1965, the military's plans were exposed and in 1966 the Royal Society requested that two of their colleagues, Dr. D. R. Stoddart and Dr. C. A. Wright, accompany a survey conducted by the Ministry of Defence and the British Broadcasting Corporation, who wished to build a relay station on the atoll. The public outcry which followed the Royal Society's report, combined with economic cutbacks by the British Government resulted in the plans being abandoned.

A feral goat population comprising descendants of animals released onto the atoll as a source of fresh meat posed a serious threat to the vegetation and therefore to the tortoises. The full impact of this threat was never fully investigated but measures were taken to eradicate the goats in 1993. This has severely reduced the number of goats but control measures remain in place and the ultimate goal is total eradication.

Potential threats to Aldabra are outlined in sections 3.1a and 3.1b of this management plan and also in the "SWOT" analysis presented in Appendix One.

2.3 RELATIONSHIP WITH THE OTHER ISLANDS IN THE ALDABRA GROUP

The Aldabra group of islands; Assumption, Astove, Cosmoledo and Aldabra, make up a distinct and isolated group that share many species of fauna and flora. These islands lie downwind from Madagascar and the Comores during the south-east trades. Aldabra was colonised by much of its fauna and flora by this route. Such natural colonisation is still possible, but alien introduced species currently found on Assumption Island (which lies only 27 km from Aldabra) present a real danger, especially to the avifauna of Aldabra. (Prys-Jones 1988). During the period of 1968-1976 four species of birds were introduced to Assumption: the Madagascar fody (*Foudia madagascariensis*), Mozambique serin (*Serinus mozambicus*), barred ground dove (*Geopelia striata*), and red-whiskered bulbul (*Pycnonotus jocosus*). If these birds arrive and establish themselves on Aldabra, hybridisation and competition would have an impact on the native fauna. This situation could be addressed by the eradication of the alien birds on Assumption.

With the exception of Assumption, which has an important all-weather airstrip and a small settlement, these islands are currently of little financial or commercial significance. They could be incorporated into a large nature reserve that would put the entire Aldabra group under protected status. Each island has abandoned but habitable houses that could be used for permanent rangers. By protecting these islands as a unit, poachers would be less likely to undertake the long journey from the Amirantes to Cosmoledo and Astove to plunder the turtle nesting beaches and seabird colonies.

2.4 ALDABRA TODAY

Following the public outcry and the withdrawal of plans to develop Aldabra as a military base, the Royal Society of London acquired the lease on the atoll. The Royal Society planned and built the research station on Picard in 1971, and there followed a period of intense research into the terrestrial and marine ecology. The Smithsonian Institution of Washington D.C. was also heavily involved with research programmes.

In 1981, the Royal Society surrendered its lease to the newly-formed Seychelles Islands Foundation. This government statutory body was formed with the express purpose of managing Aldabra and was subsequently requested to manage Vallée de Mai on Praslin. Revenue raised from Vallée de Mai, which

is the most important and most visited reserve in Seychelles, pays a major part of the running costs of Aldabra.

Under SIF management, Aldabra had some years of achievement, followed since 1989 by a steady deterioration in the infra-structure and in scientific achievements. This decline resulted in an SIF initiative in 1992, supported and financed by the Global Environment Facility (GEF) administered through the World Bank, to renovate the research facilities, purchase a new rapid reaction boat, conduct a goat eradication programme, and prepare and print this current management plan. The SIF has, at the same time, used much of its own financial resources to renovate the accommodation block, the dining room/recreation area and much of the general infrastructure.

The research facilities and supporting infrastructure were built on the foundations of the earlier buildings to minimise any impact on the environment. The new facilities include a laboratory/library building, accommodation for the Warden and the Research Officer, a duplex building for two rangers, an accommodation block of six double rooms for visiting scientists or tourists when the rooms are not occupied by scientists, and a dining room/kitchen/recreation building. Between the rangers' accommodation and the old settlement buildings there are six aluminium-clad bungalows which are occupied by the support staff. Beyond that is the "old settlement", housing support staff in recently renovated houses. Service buildings such as the store, workshop and generator house are located between the dining room and the laboratory building.

Field camps are located around the atoll at various sites. These are basic shelters for field excursions and monitoring.

With the new impetus provided by the GEF, together with SIF investment in Aldabra, scientific research and monitoring should increase. Existing monitoring programmes for tortoises, turtles and coccids will be enhanced in the manner detailed in Part 3 - Conservation Management. A monthly hunt for the remaining goats aims to complete the goat eradication programme that was funded by the GEF through the World Bank

2.5 A NEW POLICY FOR THE ESTABLISHMENT OF ZONES

The establishment of zones on Aldabra, limiting the uses for each zone, is considered an important new strategy in the management of the atoll. Full details and policies for the zones are given in the Operations Manual but are summarised here and in the accompanying map:

1. Restricted Zone: Sensitive areas for non-manipulative research and monitoring only, with some areas closed seasonally.
2. Protected Zone: The major part of Aldabra, set aside for research and monitoring but with limited access for photographic and other special visitors. Some areas closed seasonally.
3. Tourist Access Zone: The areas designated for educational tourism.

2.6 LEGISLATION PERTAINING TO ALDABRA

In Appendix Three, summaries of the following legal documents are included.

1. National Parks and Nature Conservancy Act - Chapter 141
 - a. Designation of Special Reserve (Aldabra) Order S/I 86/1981
 - b. Aldabra Special Reserve Regulations S/I 87/1981

ALDABRA PROTECTION AND ACCESS ZONES

Restricted Zone

Protected Zone + Areas Subject to Seasonal Closure

Tourist Access Zone

2. Seychelles Islands Foundation Decree - Chapter 217
3. Fisheries Act - Chapter 82 (1986) including Fisheries Regulations (1987)
4. Wild Animals and Bird Protection Act - Chapter 247
 - a. Wild Birds Protection Regulations S/I 26/1966
 - b. Wild Birds Protection (Nature Reserves) Regulations S/I 27/1966
 - c. Wild Animals (Giant Land Tortoises) Protection Regulations S/I 59/1974
 - d. Wild Animals (Turtles) Protection Regulations S/I 46/1994
5. Maritime Zones Act - Chapter 122
 - a. Maritime Zones (Marine Pollution) Regulations S/I 51/1981
 - b. Merchant Shipping (Oil Pollution) (Seychelles) Order 1975
6. Licences Act - Chapter 113
 - a. Licences (Accommodation, Catering and Entertainment Establishments) Regulations S/I 16/1987
 - b. Licences (Fisheries) Regulations S/I 24/1987

PART THREE

CONSERVATION MANAGEMENT

OVERALL GOALS AND OBJECTIVES

1. To preserve and protect the ecological integrity of Aldabra's terrestrial and marine ecosystems, including the flora and fauna, biological and genetic diversity, natural ecological and evolutionary processes, physical features, historical and cultural features, and scenic beauty.
2. To advance and facilitate the continuation of scientific research and environmental monitoring, with priority designated to the conservation, maintenance, and restoration of the biological and genetic diversity of Aldabra's native species, their communities and ecosystems.
3. To ensure that the primary purpose of the limited tourism on Aldabra is conservation education, by means of accurate and entertaining interpretation of the natural and cultural features of the atoll.
4. To increase the environmental awareness of all staff on Aldabra, so that they can contribute actively to bringing about the three goals delineated above.

TO THIS EFFECT ALL SIF POLICIES FOR ALDABRA PERTAIN (see Operations Manual Part 1)

In the following section, ecosystems are separated for convenience into:

- Terrestrial (see 3.1) - with general issues being treated first, followed by separate sections on flora and fauna (see 3.1.1 and 3.1.2).
- Coastal (see 3.2) - which includes beaches, mangroves and lagoon islets.
- Aquatic (see 3.3) - which includes freshwater and brackish pools (see 3.3.1) and marine systems such as lagoons, reefs and open water (see 3.3.2)

3.1 TERRESTRIAL ECOSYSTEMS

As Aldabra is a raised coral atoll, most of the limestone terrain lies some 4 to 8 metres above sea level. Smoother 'platin' rock forms much of the eastern part of Grande Terre and part of Picard, with a thin layer of soil and a vegetation cover of varying height, density and composition. Much of the rest of the atoll has very eroded and pitted limestone ('champignon') with only pockets of soil and usually a dense scrub vegetation, often dominated by *Pemphis acidula*. About 20% of plant species are endemic. The giant tortoise is the dominant land vertebrate, along with terrestrial bird species, most of which are endemic at the species or sub-species level. The only native mammals are bats. Of the three native lizards one is endemic. There are several species of land crab, including the coconut (or robber) crab *Birgus latro* and a wide variety of other terrestrial invertebrates, of which quite a number are endemic.

3.1a General threats to terrestrial ecosystems

- a) Climate change, resulting from natural or man-induced causes, could affect Aldabra's terrestrial ecosystems, producing vegetation and/or habitat alterations.
- b) Fire. Large scale fires could occur on the atoll, especially with the combination of dry vegetation, burning of wastes and vegetation, cigarette smoking, and wind (particularly during the south east trade wind season). This would have a devastating effect on the endemic vegetation and would certainly impact all endemic land animals.
- c) Alien species. The impact of alien species already present on Aldabra could increase due to range extension, population increases, etc. Further introductions could occur. The close

proximity of Assumption (27 km) is cause for worry because of the number of alien species on the island. Details are given below in specific sections.

- d) Damage and disturbance related to tourism and the activities of photographers and film crews, e.g. trampling of vegetation, unauthorised trail cutting, disturbance of for example birds and tortoises, particularly during their breeding seasons.
- e) Damage related to unauthorised scientific research projects, e.g. those which include environmental manipulation.
- f) Problems due to improper waste disposal, including oil and poisonous chemicals.

3.1b General management policies relating to threats to terrestrial ecosystems

- a) General policies regarding protection of vegetation and animals. These are outlined in 2.6 of this Management Plan and in the Operations Manual Part One.
 - All forms of wildlife (including plants, birds, bats, insects, marine organisms, etc.) and natural features (including bones, carapace, fossils, etc.) are strictly protected on Aldabra.
 - There should be no unnecessary disturbance of any wildlife on Aldabra. Disturbance is restricted to that deemed necessary by the Board of Trustees, for the purposes of research and the future of conservation of these species.
- b) Long-term monitoring programmes. These should reveal any major trends in vegetation or habitat modification and also population changes of certain key animals, which might be related to climate change. Quality monitoring is vital for such programmes.

ACTION: SIF should liaise with the National Climate Change Committee.
- c) Zonation of the atoll. Strict adherence to zonation policies are necessary (see 2.5 in this Management Plan and Operations Manual Part Two)
 - Specific areas are identified using geographical and biological attributes and designated as zones that are designed to fulfil given objectives.
 - While all habitats are critical on individual or ecosystem-wide levels, areas that are less biologically sensitive serve to absorb the impacts of use, e.g. by tourism, in order to preserve other more biologically sensitive areas.
- d) Tourism policy and regulations:
 - Tourists are limited to the Tourist Access Zone.
 - Photography/filming is to be strictly within the guidelines of the Zonation Policy.
 - All visitors are to be accompanied by SIF staff, on designated trails or within specified limits.
 - No biological specimens are to be collected.
- e) Research policy:
 - All projects are to be fully assessed for their possible ecological impacts.
 - Research is to be within the guidelines of the Zonation Policy.
- f) Waste management policy: (see also Operations Manual Part 4)
 - All organic waste is to be composted if possible (or burnt).
 - Paper products may be burned in designated areas on the Station grounds.
 - Toxic waste is to be placed in special containers and removed from the atoll.
 - Non-biodegradable waste is to be packaged and removed from the atoll.
 - Waste from field camps is to be taken back to the Station and properly dealt with.
 - In places away from the Station, faeces should be buried or covered. If the number of people visiting camps increases, consideration should be given to alternative methods of dealing with human faecal matter
- g) Fire precautions and policy.
 - Prevention plays the most vital role:
 - * Cigarettes and campfires should be extinguished completely.

- * All deliberate fires (e.g. rubbish) should be completely controlled and attended at all times until the fire is out.
- * Burning of vegetation should be avoided during the dry season when strong winds are common.

- In the case of a fire, safety is the first priority.
- If conditions are not overly hazardous, then all measures should be taken to bring the fire under control.

ACTION: A Fire Contingency Plan is needed

h) Toxic chemical use. There is currently no specific policy on the use or non-use of chemicals on Aldabra, e.g. rat poison, herbicides, formalin and other toxic substances used by scientists.

ACTION: A policy on the use or non-use of chemicals should be devised.

i) Bio-prospecting. There is currently no policy, nor regulations, on access to genetic resources in Seychelles (=bio-prospecting). The Seychelles National Biodiversity Assessment recommends that the issue is urgently addressed and that all biological resources of Seychelles should be protected against uncontrolled prospecting activities.

In the meantime no prospecting should be allowed on Aldabra, nor within 1km around the atoll. All species removal, particularly by botanists or by marine research groups should be viewed with extreme caution. The reasons for all species removal should be stated quite clearly by the researcher, and if necessary a guarantee form signed to the effect that the specimens will not be used for medical research or genetic prospecting. If the researcher refuses to sign such a form, legal advice should be obtained.

3.1.1 VEGETATION

3.1.1a Conservation objectives

- a) Maintain biodiversity and genetic diversity of the vegetation.
- b) Maintain habitat diversity and integrity.
- c) Monitor for any changes in the vegetation of the atoll.
- d) If found necessary, restore vegetation to a more natural state.

3.1.1b Threats

- a) General threats as outlined above in 3.1.a.
- b) Overpopulation of tortoises (?) This could result in degradation of the vegetation and reduced regeneration of some plant species. Current trends indicate a reduction in the tortoise population.
- c) Threats from alien species:
 - Overpopulation by goats, rats. The effects of goats on the vegetation have been well documented; goats remain on the atoll and could easily multiply very quickly if not eradicated. The effects of rats on the vegetation are not well documented.
 - Coccids. Damage by *Icerya seychellarum* has greatly affected certain plant species and caused mortality in some, including rare species. Various factors could result in increased populations of the coccids.
 - Competition from certain alien plants. A few introduced species have become widespread and even invasive, e.g. *Stachytarpheta jamaicensis*, others are more localised but spreading, e.g. *Agave sisalana*, *Casuarina equisetifolia*.
 - Further introductions of alien species. This is always a threat. Increasing numbers of visitors will increase the chance of new plant introductions, particularly by seeds or spores left on clothes and shoes.
 - Introduction of plant disease or pest organisms. This could be accidental, e.g. on fresh vegetables.
- d) Possible exploitation, e.g. future exploitation for sources of medicine.

3.1.1c Management policies

a) Long term monitoring:

- Rain gauge readings. These are important for all scientific and conservation work because rainfall affects nearly all aspects of Aldabra. There are thirteen rain gauges around the atoll, which should be read once a month. (see Operations Manual)
- Vegetation monitoring. Refer to the ERGO report 1997 on tortoise population studies and vegetation monitoring. (see also Operations Manual)
ACTION: Vegetation monitoring system needs to be properly established.
- Coccids. Infestation levels should be monitored twice a year (wet and dry seasons) using the re-established coccid transects. (see Operations Manual)

b) Control of alien species:

- Eradication of goats. The last phase of the goat eradication programme should be carried through.
- Assessment of the coccid / coccinellid situation. A species of ladybird (*Rodolia sp.*) was introduced in the late 1980s as a biological control agent for coccids, but there has been no follow-up research. A reassessment of the situation is needed.
- Assessment of the effects of rats. As part of a study of the impacts that rats have on the vegetation (and the fauna), a feasibility study of their eradication should be carried out.
- Assessment of the effects and spread of alien plant species, followed by policy and action (it may be possible to state a policy now for certain species such as *Agave sisalana*)
- Reduce the risk of further alien introductions:
 - * No plant may be brought into Aldabra from outside the atoll. The only exceptions are: certified vegetable seed for the garden(s), and fresh vegetables that have passed government inspection for consumption by island residents.
 - * When coming ashore from another island or country, all SIF workers and all visitors must wear freshly laundered trousers and socks, and their shoes must have clean treads.
- Strict controls on garden(s) used by workers:
 - * All gardens (it is preferable to have one communal garden) must be approved by the SIF Board of Trustees.
 - * Gardens should be raised off the ground and enclosed.
 - * Only government-certified seed and a limited number of vegetable types are permitted.
 - * Only natural organic fertiliser from the atoll compost heap should be used (together with a limited amount of tortoise manure and seaweed).
 - * Only water from individual house roof collection systems should be used for garden(s).

c) Policies for the utilisation of plant species (including coconuts, palmiste from coconuts, casuarina wood, mangrove poles, medicinal plants, dead wood, etc.) need reviewing.

ACTION: There should be a review of any old policies (e.g. those which allowed the removal of coconuts from the atoll) and current policies (e.g. the use of dead wood for cooking fires on field trips) and new policies must be devised as soon as possible.

d) Some other priorities with respect to management of vegetation:

- A vegetation survey, to indicate the status of endemic species and restricted range indigenous species, should be carried out (particularly for those species given as rare or very rare by Friedmann in the late 1980s. A list of priority plant species for conservation on Aldabra could then be created.

- Re-establishment of shade trees for tortoises. Various factors have contributed to the reduction in numbers of shade trees used by tortoises in some coastal areas of Grande Terre e.g. Cinq Cases.

ACTION: An assessment of the possibility of re-establishing shade trees in such areas should be carried out.

- Restoration of the Aldabra herbarium. Although the herbarium contains an adequate representation of the atoll's plant species, the existing specimens require periodic quality assessments and possible restocking of new specimens. In addition, many species are not represented in the herbarium. It is extremely important that an expert identify all plants which are placed in the herbarium in order to ensure a credible collection.

- Ex-situ conservation of rare species.

ACTION: The possibilities of ex-situ conservation, both on Aldabra and on Mahé, should be considered and action taken based on the assessment.

3.1.1d Research priorities

- a) Wet season vegetation survey (the follow-up to the 1997 dry season survey).
- b) Correlation of vegetation survey with altered tortoise and goat populations (basic study done in 1997).
- c) Re-examination of original vegetation exclosures.
- d) Determination of the effects of the introduced coccinellid beetle on coccid populations.
- e) Effects of the spread of alien plant species (including *Cyperus ligularis*) and possible control methods.
- f) Rare endemic plants survey.
- g) Effects of rats on plants.

3.1.2 TERRESTRIAL FAUNA

3.1.2a Conservation objectives

- a) Maintain the biodiversity and genetic diversity of all native animal species.
- b) Maintain habitats and communities for these species.
- c) Protection of tortoises, but acknowledging the possibility of limited exploitation. (see 3.1.2c(a))
- d) If it is found to be necessary, restoration of habitats to a more natural state.

3.1.2b Threats

- a) General threats as outlined above in 3.1.a.
- b) Overpopulation of tortoises (resulting in reduction of vegetation habitats for other species) - this seems unlikely in the short term as the 1997 ERGO survey revealed a reduction in the tortoise population since the 1970s.
- c) Over-exploitation and/or poaching of tortoises, which would reduce total numbers on the atoll or certain age classes in the population. The structure of the tortoise population on Picard may be skewed due to the poaching of juvenile tortoises.
- d) Poaching of other edible species, e.g. larger birds, coconut crabs, 'tyangoman' and other crabs. Much poaching has occurred in the past, of both tortoises and other edible species, by Aldabra staff, the crew of the supply boat, as well as by outsiders.
- e) Threats from alien species:

- Competition from (and predation by) alien species, e.g. goats, rats, cats, coccids. Goats destroy tortoise habitat and shade trees, and if the eradication programme is not successful, goat numbers will increase again. Rats (*Rattus rattus*) take birds' eggs and nestlings, and tortoise/turtle eggs and hatchlings, and they occur on all the main islands; however there is little data available. The introduction of *Rattus norvegicus*, would be disastrous for ground nesting birds. Cats are known predators of a variety of smaller native animals on Aldabra, although they now occur only on Grande Terre. The absence of rails on Grande Terre and Picard may be due to the presence of cats (now eliminated from Picard). There is little data available on the cat population size and dynamics.
- Further introductions of alien species. This could occur by accidental introduction (particularly of small invertebrate species) or by natural invasion, for example from Assumption which is only 27 km away). Several alien bird species, which could compete with similar species on Aldabra, exist on Assumption, such as the red-whiskered bulbul, Mozambique serin and Madagascar fody. The latter could also interbreed with the Aldabran red-headed forest fody.

ACTION: A proposal should be put to IDC to attempt eradication of alien bird species on Assumption.

- Introduction of animal disease, pest or parasite organisms. This could occur through natural or accidental means, e.g. with migratory birds or imported chickens. A particular problem would be the introduction of tortoise diseases to Aldabra (such as URTD which has disastrous effects on tortoises world-wide). This could reach epidemic proportions in the crowded conditions on Aldabra.

3.1.2c Management policies

a) Priority species:

- Tortoises. Aldabra has the largest population of giant land tortoises in the world. Management policies are to be defined in the near future, following the recent tortoise population census.

ACTION: Develop management policies on tortoises by referring to the ERGO report (1997) and the recommendations of Mortimer (1998).

- White throated rail. This is the last remaining flightless bird species in the Indian Ocean. It is restricted to Malabar, Polymnie and some lagoon islets, such as Ile aux Cedres. An informal population estimate made by Chapman in 1997 was 1500-2000 pairs. There is a single bird on Picard (two were apparently introduced a few years ago, without permission). With the current absence of cats on Picard and the large numbers of rails on two other islands of the atoll, translocation of some rails to Picard should be considered. Tourists are also very interested to see this flightless bird. At present they have to be taken to Malabar or Polymnie to see it.

ACTION: A study of the white-throated rail should be conducted and serious consideration be given to the possibility of translocating some birds to Picard.

- Endemic species and sub-species. The status of most invertebrate species has not been recently assessed and could form a research project (see below).

b) Zonation of the atoll. Highly sensitive species can be fully protected if necessary, either within the Restricted Zone or seasonally within the Protected Zone.

c) General policy on the protection of animals. (see 3.1b(a) above) Giant tortoises, land crabs, robber crabs, all native birds (including pied crows) are not to be killed or disturbed. (see also Operations Manual Part One: 'SIF Policies for Aldabra')

d) Long term monitoring:

- Tortoise transects. These give information about the tortoise population structure and dynamics. Twelve tortoise monitoring transects now exist on the

- atoll. Each transect is to be surveyed at least four times per year. (see Operations Manual)
- White-throated rail transects. These give basic census data of the populations on Malabar and Polymnie. There are five standard rail transects. Each transect is to be monitored once per month if possible until a full study of the rail is undertaken. (see Operations Manual)
- e) Opportunistic monitoring:
- Aldabra brush warbler. It is unknown whether this bird has become extinct (the last confirmed sighting was in 1983). Monitoring should occur as and when possible. (see Operations Manual)
- f) Control of aliens:
- Policy on eradication of aliens. No individual of any species should be eradicated without a thorough scientific study and the explicit approval of the Research Officer, the SIF Scientific Sub-Committee and the SIF Board of Trustees
 - Eradication of goats, cats and rats:
 - * The programme for goat eradication should continue until goats are completely removed from the atoll. (see Operations Manual 10.1)
 - * A systematic trapping programme should be organised for all known cat sites, and opportunistic trapping of cats should continue whenever staff are in the field. (see Operations Manual 10.2)
 - * A major eradication programme for cats should be considered.
 - * Rat trapping should be routine around the Station and at field camps, particularly as the Station is the most likely entry point of *Rattus norvegicus*. (see Operations Manual 10.3)
 - * Further studies of the effects of rats on the Aldabra ecosystem should be initiated. These should include the feasibility of eliminating rats.
 - Policy on domestic animals:
 - * Under no circumstances are pigeons, rabbits, pigs, dogs, cats or other non-native species allowed on the atoll.
 - * Chickens must be kept in coops at all times.
 - * If any chicken shows signs of illness, it must be killed and cremated immediately.
 - * It may be necessary to periodically send a few chickens to replace the stock and gene pool - only those certified by the Veterinary Service.
 - Reduce the risk of further alien introductions:
 - * Introduced birds (and other species?) on Assumption should be eradicated = **top priority conservation action**
 - Policy regarding what to do if unwanted introductions occur. There are no guidelines at present.
ACTION: An alien species introduction contingency plan should be devised.
- g) Policy on poaching:
- Poaching is considered a major offence and punishable according to Seychelles law. It is covered under the Wild Animals and Birds Protection Act, which is currently under review. (see also 5.5b below)
 - The baggage of all staff leaving Aldabra should be checked by the Warden and/or Research Officer.

3.1.2d Research priorities

- a) Assessment of the white throated rail population, together with an impact assessment of its possible reintroduction to Picard.
- b) Bat ecology and population dynamics, in particular insectivorous bats.
- c) Cat population and its effects on other animals.

- d) Rat population and its effects on vegetation and birds, in particular.
- e) Terrestrial invertebrates, particularly the identification of possible ecological indicator species.
- f) Kestrel population and genetics.
- g) Genetic studies to determine the status of the endemic ibis and red-headed forest fody (as possible full species rather than sub-species).
- h) Census of land birds.

3.2 COASTAL ECOSYSTEMS (BEACHES, MANGROVES, LAGOON ISLETS)

Some fifty small sandy beaches are scattered along the coastline of Aldabra, especially on the north, west and south coasts. Behind some of them are dunes up to about 15 metres high. Together these beaches form a very important breeding ground for green turtles (*Chelonia mydas*). Some hawksbill turtles also nest there, although this species tends to prefer the small beaches inside the lagoon. Along the inner atoll edge, the lagoon is bordered with mangrove forest, which is more extensive along the eastern edges of the lagoon and is a very important breeding site for greater and lesser frigate birds, and also red-footed boobies. Intertidal mudflats are important feeding grounds for wading birds and shore birds, including migrants. The small lagoon islands and islets are mostly clustered at the western and eastern ends of the lagoon, some of them serving as the only rat-free refuge for ground nesting birds.

3.2.1 Conservation objectives

- a) Maintain biodiversity and habitat diversity of coastal ecosystems, including mangrove, beaches, lagoon islets.
- b) Protection of turtles and turtle nesting sites.
- c) Protection of frigate and booby colonies and their nesting areas.
- d) Protection of nesting sites of other marine birds.

3.2.2 Threats

- a) Sea level rise due to global warming.
- b) Loss of beaches and smaller islets by erosion.
- c) Predation by alien species, particularly cats, which eat a variety of coastal animals. The spread of rats to small islets would threaten many nesting sea birds.
- d) Tourism-related disturbance, for example of nesting turtles and nesting frigate birds, boobies, Caspian terns, crested terns and red-tailed tropic birds.
- e) Poaching of turtles, turtle eggs, birds and birds' eggs.
- f) Pollution:
 - Oil tanker spills. These represent a potential threat which would be disastrous for Aldabra's turtles, sea birds and mangrove organisms, as well as for other organisms directly or indirectly dependent on the coastal marine habitats. The catastrophic effects of an oil spill (or other toxic waste spill) can extend for hundreds of kilometres and other islands in the area are vital for Aldabra's ecosystems.
 - Improper waste disposal, particularly of hazardous waste materials.

3.2.3 Management policies

- a) General policy on the protection of animals. (see 3.1b(a) above) Marine turtles are strictly protected. Hunting, killing, disturbance of nesting females and taking of turtle eggs are strictly forbidden. All sea birds are protected. (see Operations Manual Part One: 'SIF Policies for Aldabra')
- b) Priority species:

- Turtles. Aldabra is a major Indian Ocean nesting site for green turtles. All turtles are protected by Seychelles law (Wild Animals [Turtles] Protection Regulations). Turtles on Aldabra are being monitored and tagged, including juvenile hawksbill turtles. Other management policies will be defined following the recommendations of Mortimer (1998).
 - Frigates and boobies. Aldabra has the second largest breeding population of lesser and greater frigate birds in the world. Visitors are allowed to visit one of the frigate colonies, with SIF guidance, keeping a minimum distance. This policy may change in the light of monitoring results.
 - Other seabird species listed below may be subject to full protection (see Zonation below).
 - * Caspian tern. Aldabra is the only oceanic breeding site for this tern.
 - * Black-naped tern. Aldabra may be the stronghold for this species in the entire Afro-Malagasy region.
 - * Red-tailed tropic bird. Aldabra is an important breeding site in the Indian Ocean.
 - * Shearwaters. There have been claims and counter-claims of a possible endemic race on Aldabra. Little is known of its population size.
- c) Zonation of the atoll. All seabird and frigate colonies east of Camp Frigate Gionnet are in the Restricted Zone. Other highly sensitive species can be fully protected if necessary, either within the Restricted Zone or seasonally within the Protected Zone. (see Operations Manual Part Two)
- d) Long term monitoring:
- Turtles (See Operations Manual 6.4, and Appendix 2):
 - * Turtle track survey. This gives an indication of the numbers, distribution and timing of turtle nesting activity on Aldabra each year. All nesting beaches should be visited at least once per month, with some beaches being checked 4 to 8 times per month.
 - * Turtle tagging. This is done on a regular basis to help answer questions about turtle behaviour and ecology.
 - * Immature turtles in the lagoon. This provides information on population size, distribution, growth rates and behaviour.
 - Beach erosion and accretion. This will help to quantify any long-term changes in coastal zone habitats, particularly beaches. Ideally photographic records should be taken from the photo benchmarks every three months. (See Operations Manual 6.9)
- ACTION: The beach erosion and accretion monitoring programme should be re-activated.***
- e) Opportunistic and secondary monitoring (see Operations Manual for details):
- Effects of tourism on frigate colonies. Specific surveys should be carried out not more than once per month from February to May to assess the impacts resulting from the main tourist season.
 - Caspian terns. Surveys of nesting activity should be conducted twice a year if possible, in the wet and dry seasons.
- f) Tourism policy and regulations. (see 3.1b(d) and Part Six of this Management Plan)
- g) Policy on poaching. (see 3.1.2c(g))
- h) Oil spill contingency plan.

ACTION: Ensure that Aldabra is included in the Oil Spill Contingency Plan for Seychelles.

In the meantime, any major spill should be reported to SIF headquarters (if no contact can be made, report to any other organisation or person who can take immediate action to alert the appropriate authorities). When reporting the incident, include as much detail as

possible, e.g. location of the spill, the ship's identity, size of the spill, and the substance involved (if known).

ACTION: The procedure for the transport of fuel and oil to Aldabra and their storage on the atoll should be re-assessed as soon as possible.

i) Waste management policy. (see 3.1b(f) above and Operations Manual Part 4)

3.2.4 Research priorities

- a) Lagoon islet surveys.
- b) Effects of tourism policy on frigate and booby colonies.
- c) Study of rats on Ile Moustique, including genetics and eradication possibilities.
- d) Shearwater genetics and population studies.

3.3 AQUATIC ECOSYSTEMS

3.3.1 FRESHWATER/BRACKISH POOLS

Freshwater and brackish water pools are important, unusual and varied habitats found on Aldabra. Fresh water collects in pools as a direct result of rainfall, therefore truly freshwater habitats are mostly ephemeral and only a few pools are permanent sources of fresh water throughout the year. Many larger animals such as tortoises, birds and land crabs rely on the pools for water and often also for food. Most pools are brackish and many are linked with the sea through underground passages. A freshwater lens is sometimes present on the surface of the saline water.

3.3.1a Conservation objectives

- a) Maintain the pool habitats and the communities and biodiversity within them.
- b) Note any changes that might be affecting the freshwater supply for Aldabra plants and animals.

3.3.1b Threats

- a) Rainfall changes due to natural or man-induced climate changes.
- b) Sea level rise due to global warming.
- c) Overuse of freshwater from pools at or near camps.
- d) Pollution from human sources, e.g. faecal matter or improperly disposed wastes.
- e) A major oil spill could affect brackish water pools by contamination from the sea through underground channels

3.3.1c Management policies

- a) Long-term monitoring of rainfall: rain gauge readings (see Operations Manual)
- b) Zonation of the atoll. Certain inland pools such as Bassin Frigate, Bassin Flaman, are within the Restricted Zone. Most fall within the Protected Zone, and a few are within the Tourist Access Zone.
- c) General policies regarding protection of vegetation and animals. (see 3.1b (a) above)
- d) Incidental monitoring. Any noticeable changes in pool size, which are likely to have a lasting effect on the ecosystem or represent an extreme in variation, should be reported to the Warden and recorded as an Event (=Event Record).
- e) Water use policy at camps:
 - All field huts should have freshwater collection tanks.
 - Use of freshwater from pools, for personal washing etc., should be strictly limited.
 - During the dry season, sea water should be used for washing dishes.

f) Waste management policy. General policies should be followed (see 3.1b(f) above and also Operations Manual Part 4); in addition:

- In camps, faeces should not be deposited anywhere near a source of water which is used for washing.

g) Priority species:

- Flamingos. This bird was first recorded as breeding in 1995. Surveys should be conducted on an opportunistic basis. (see Operations Manual 7.2)
- Red shrimps on Picard should be checked on occasion (because they were exploited excessively a few years ago, against all regulations).
- Upside-down jellyfish (*Cassiopea sp.*) on Picard should be observed and any unusual changes in the population noted.

3.3.1d Research priorities

None at present.

3.3.2 MARINE (LAGOON/REEFS/OPEN WATER)

There are several large channels which link Aldabra's large lagoon with the reefs and ocean outside. Of these Grande Passe is the largest, through which about 60% of lagoon water passes in and out at speeds of up to 6 knots at each change of tide. A wide variety of marine habitats is found within the lagoon and through the channels, extending out to the reef flats and fringing coral reefs surrounding the atoll. Beyond the reef there is a gradual slope down to 400 metres or more. The lagoon is an important sheltered site for numerous fish (including sharks and rays) and other marine organisms. Fish life is diverse, although certain invertebrate groups, such as echinoderms, seem to be under-represented.

3.3.2a Conservation objectives

- Maintain habitat diversity, and biodiversity within habitats, including coral reefs, sea grass beds, reef flats and habitats within the lagoon and channels.
- Protection of the coastline, through protection of the fringing reefs.
- Protection of breeding grounds for fish, lobsters, octopus, prawns, etc.
- Protection of populations of foraging immature turtles and their habitat.

3.3.2b Threats

- Coral damage resulting from sea temperature changes induced by climate change.
- Coral damage from anchors.
- Pollution:
 - Oil tanker spills. These are a potential threat which would be a disaster for Aldabra's marine flora and fauna, particularly coral reefs, seagrass beds, and channel and lagoon habitats. It would impact corals, fish, turtles and sea birds, as well as other organisms directly or indirectly dependent on the marine ecosystem.
 - Improper waste disposal.
- Damage by tourists, including damage to corals by trampling when walking over reef flats, or when snorkelling or diving.
- Poaching of turtles, sharks, rays and lobsters or over-exploitation of other fishes. Illegal fishing activities are frequent, by local staff and by visiting boats and foreign purse seiners.

3.3.2c Management policies

- General policy on the protection of coral reefs, marine animals, etc. (See 2.6 above and Operations Manual Part 1.)

- b) Policy regarding fish utilisation - including monitoring.
 - Sharks and rays are not to be killed for any purpose.
 - No fishing is permitted for sport or leisure.
 - Fishing outside of the reef may be permitted for subsistence purposes only for the Station and field camps.
 - Fishing in the lagoon is strictly limited to basic subsistence for staff en route to field camps, and only when travel along the exterior of the atoll is impossible.
 - Fishing in the inner island pools and on the coral reefs is strictly prohibited.
 - Fish may be dried for consumption on the atoll, but not for export from the atoll.
 - Monitoring of all fishing activities is mandatory. Fishing record forms are to be used. (see Operations Manual)
- c) Policy regarding poaching. See 3.1.2c(g) above. In addition there should be patrols and surveillance (See Operations Manual 5.4).
- d) Tourism policy with respect to snorkelling and diving. (See “Tourism Regulations for Aldabra”, 6.3 of this Management Plan, and “Tourist Access Zone”, 2.3 in the Operations Manual). No corals or shells may be removed. Chasing of marine organisms is forbidden.
- e) Opportunistic monitoring of the impact of tourism, using set criteria as outlined in the Operations Manual, Part Two. This needs to be devised and put into operation.
- f) Policy regarding permanent anchoring facilities. Permanent mooring buoys need to be put in place as soon as possible.

ACTION: High priority should be given to establishing permanent mooring buoys or other anchoring facilities near the Station and at the entrances to channels visited by live-aboard dive vessels.
- g) Oil spill contingency plan and other policies. See 3.2.3(h) above.
- h) Waste management policy. General policies should be followed (see 3.1b(f) above and also Operations Manual Part 4); in addition:
 - It is only permissible to dispose of clean iron/metal waste at sea, and no closer than 5km from the atoll’s high water line.

3.3.2d Research priorities

ACTION: There is a need to strengthen marine research. While much marine research could be carried out in conjunction with regional and international research groups, it will be necessary to set priorities.

Suggestions:

- a) Coral reef studies, or monitoring, to assess the impacts of climate change events and tourism.
- b) Continuation of the studies on growth rates and migrations of immature hawksbill and green turtles inside the lagoon.
- c) Lagoon research, particularly bathymetric studies.
- d) Marine invertebrate populations.
- e) Marine mammals.

3.4 HISTORICAL AND CULTURAL FEATURES

Some of these features are described briefly in Part Two of this Management Plan.

3.4.1 Conservation objectives

- a) Maintain records of the past (photos, letters, reports, etc.).

- b) Maintain certain historically significant structures (buildings, graves, World Heritage Site plaque, etc.).
- c) Ensure that the first-hand knowledge of people who have been associated with Aldabra is recorded in some way.

3.4.2 Threats

- a) Disintegration of important historical infrastructure through neglect.
- b) Loss of historical information through failure to record.
- c) Fire could destroy certain historical features and also records.
- d) Removal of historical artefacts, e.g. by unscrupulous collectors.

3.4.3 Management policies

- a) Maintain old buildings, etc. of value, e.g. church, prison, graves, plaque.
- b) Liaise with the National Archives and National Heritage for the recording of information and maintenance of records, etc.
- c) Ensure tourism information includes historical and cultural aspects.
- d) Adhere to tourism management policies, e.g. all visitors to be accompanied. (see 6.3)

3.4.4 Research priorities

- a) Oral history. There are several individuals who have worked on Aldabra for extended periods of time. Their unique experiences and perceptions should be recorded before they are lost forever.

3.5 ENVIRONMENTAL AWARENESS, INFORMATION AND EDUCATION

All workers and visitors to Aldabra should be made aware of the special status of Aldabra, and the policies and guidelines which govern their behaviour while on the atoll (as laid out in this Management Plan). Basic understanding of these policies and also of the atoll's ecosystems are important to the survival of Aldabra and contribute to a better experience for all. (See also 5.6 of this Management Plan)

GOALS

- To increase the environmental awareness of all staff.
- To upgrade the standard of Rangers.
- To increase the amount of interpretative material available for tourists and visitors.
- To provide appropriate information for visiting scientists.

3.5.1 All staff

Objectives

- To increase the level of understanding and environmental awareness with respect to Aldabra's special status as a World Heritage Site and Special Reserve.
- To give a sense of pride in working for SIF on Aldabra.

Orientation programme

This should be mandatory for all staff going to Aldabra and also for all SIF office staff. The "General Staff Orientation" produced by Pierce and Augeri (1996) as an unpublished document can be used as a basis for the programme. The emphasis in the orientation programme should be a) to ensure that the staff understand the reasons why activities on Aldabra are regulated by the needs of conservation and b) to encourage staff to play an active and co-operative role in the protection and operation of Aldabra. The programme should include the following topics:

- The special significance of Aldabra atoll, its importance and functions.
- A brief history of the atoll.
- Basic information about the plants and animals.
- Important policies and regulations and the reasons for them.
- The role and responsibilities of staff members and the need for team work.
- Guidelines with respect to tourists and other visitors.

ACTION: Implement the orientation programme as soon as possible, as an internal programme within SIF.

Note: All staff need some sort of orientation. Expatriate staff should also receive information on the social and cultural attitudes of the Seychellois.

3.5.2 Rangers

An increase in the level of qualification required of new recruits will improve the ability of rangers to contribute to the science programme, to conservation and to tourism on Aldabra. The proposed secondment of rangers from the Ministry of Environment, Marine Parks Authority and Tourism Division, to Aldabra for six to twelve months (see 5.6.2 of this Management Plan) will allow for sharing of skills and experience, and should enhance the level of ranger contributions on Aldabra. In addition, a ranger training programme should be initiated, specific for work carried out on Aldabra. This can vary according to the needs of particular groups of rangers, and can be partly internal (by SIF on Mahé and Aldabra) and partly external (using training programmes available through MoE/MPA, etc., and including training abroad if at all possible.)

ACTION: Start an exchange programme with Ministry of Environment and Marine Parks Authority rangers as soon as possible.

Objectives

- To increase the recruitment qualification level of incoming Rangers.
- To introduce a training programme for rangers.

Ranger training programme

The “Ranger Training Handbook” prepared by Pierce and Augeri (1996) as an unpublished document can be used as a guide to certain aspects of the training programme. The programme should be adapted to the needs of individual rangers, but at the end each Ranger should:

- Know the roles of a ranger.
- Be familiar with the atoll (including map reading).
- Understand conservation goals, policies (including zoning) and regulations.
- Understand important ecological concepts and ecological features of the atoll, (including the marine environment).
- Be able to identify important species and have a knowledge of their natural history.
- Be familiar with all monitoring programmes (including data recording) and eradication programmes.
- Have some interpretation skills (tourist guiding, information centre).
- Understand and be able to enforce SIF policies relating to wildlife and the environment.
- Be able to maintain scientific and other equipment.
- Know how to handle animals.
- Have certain specific skills such as first aid, snorkelling and diving, fire fighting, etc.

Note: other staff could join certain sessions on Aldabra if their work schedule allows.

ACTION: Identify the personnel and means to put this programme into action, and locate possible overseas training programmes.

3.5.3 Visiting scientists (and scientific assistants)

A handbook for scientists and researchers is required, as a guide to living and working conditions on Aldabra and to facilitate research planning and logistics. It should provide

general information about travel to and from Aldabra, what facilities and supplies are available, the responsibilities of research workers on the atoll, etc. A basic orientation programme also needs to be devised for visiting scientists.

Objectives

- To produce a handbook for scientific researchers.
- To provide orientation for research workers on the atoll.

Handbook for research workers

This should include the following information:

- Mission statement and goals of SIF for Aldabra.
- Some basic sources of information on Aldabra (including the Bibliography, Management Plan and Operations Manual).
- SIF policies and regulations (including regulations on manipulative research work and removal of specimens).
- Research facilities and station facilities (accommodation, food, power supply, boats, laboratory supplies, communications, medical supplies, etc., plus standard fees).
- Basic management information (management structure, roles of staff, etc.).
- Field trips and operation of field camps.
- Insurance requirements.
- Guidelines on support staff, training, etc..
- The role of tourism.
- Management of research proposals.
- Requirements regarding research reports and publications.

ACTION: Identify the means and personnel to produce the handbook for research scientists as soon as possible. It can be implemented as part of the research marketing programme.

3.5.4 Tourists and other visitors (e.g. film crews)

The focus for tourism on Aldabra should be conservation education. Good interpretation allows tourists to learn about the natural and cultural features of Aldabra and to appreciate the atoll. This is important for Aldabra as a protected area, in order to gain moral, financial and political support for its preservation. Interpretation will be mainly through guided walks on land. Interpretation for snorkelling and diving trips has to be mainly before and after the trip. Currently there is no proper receiving area for visitors, nor a visitor information centre where material about Aldabra's natural history could be displayed. Visitors need quality interpretation (provided in a friendly manner), interpretative materials such as posters, exhibits and interactive displays, and also brochures, books, videos, slides, etc. which they can buy and take away with them.

Objectives

- Provide adequate information for tour and cruise operators, expedition leaders, etc., (as laid out in 6.3 and 6.4.2 of this Management Plan).
- Provide a visitor centre/information centre and interpretative materials for visitors.
- Ensure that visitors are aware of regulations.
- Provide good quality guidance for visitors

ACTION: Prepare basic interpretative material in the form of posters, exhibits, brochures, etc. Exhibits can be produced on Aldabra, much of the rest on Mahé. Identify the means and personnel to implement this as soon as possible.

ACTION: Provide a visitor centre/information centre where interpretative material can be displayed, and books, postcards, "souvenirs", etc. sold.

3.5.5 Review of environmental awareness programme

An annual review of progress on the various projects outlined above should be made.

PART FOUR

RESEARCH

4.1 INTRODUCTION

As a World Heritage Site, Aldabra provides an outstanding opportunity to study natural ecological and biological processes. Scientific research on Aldabra is extremely important both to the world's information base and to Aldabra's survival. A significant volume of basic research was carried out from 1969 and into the 1980s, which serves as a base for further studies. In addition, several monitoring programmes are in place which provide long-term data on significant species and natural phenomena. While there are many research possibilities and needs, emphasis is given to those studies which provide information on which sound management and conservation can be based.

4.1.1 Goals

To gain better understanding of:

- a) Aldabra's natural ecosystems and the interactions between them,
- b) The biology and ecology of Aldabra's endemic taxa,
- c) The role of alien species in Aldabra's ecological dynamics.

4.1.2 Criteria for research

- a) Ensure that research promotes the long-term protection and evolution of Aldabra.
- b) Scientific research should focus primarily on conservation and management issues, and thereby form the basis of management and conservation prescriptions.
- c) Scientific research should provide further understanding of all Aldabra ecosystems, their functioning, change over time, relationships and inter-relationships.
- d) Scientific research should provide further understanding of individual species, their ecology, dynamics and relationships with other species.

4.1.3 Objectives

- a) High quality research is necessary, with an emphasis on management-oriented research projects.
- b) All research and monitoring programmes should be as non-intrusive and non-manipulative as possible, using pre-existing trails, markers, etc., and must be developed and reviewed with serious consideration of the implications and impacts of the programme.
- c) Scientific research is to be conducted only in accordance with the zonation policy of the atoll. (see Operations Manual Part Two) In the Restricted Zone only limited non-manipulative, non-intrusive research is allowed, and only if it cannot be carried out elsewhere in the reserve.
- d) Research results should be presented in a form that is available and understandable to the SIF staff, SIF Board and National Research and Development Council.
- e) Where appropriate, research results should be integrated into interpretation material, thereby contributing to the education of staff and visitors.

4.2 RESEARCH PRIORITIES

Note: Current research priorities (1998) are underlined

4.2.1 General

- a) Creation of a computerised Data Base, into which all the scientific records at the research station are incorporated.

- b) Geographical Information System (GIS). Confirm vegetation types with the satellite imagery already obtained (N.B. to be used as management tool). Incorporate other information such as monitoring transects and sites, management zones, etc..
- c) Assessment of the impact of alien species on the native flora and fauna and their habitats.
- d) Population studies of indicator and keystone species.
- e) Links and relationships between organisms and systems.
- f) Long term changes to the atoll's ecosystems.
- g) Research on endemic taxa.

4.2.2 Vegetation

- a) Determination of the effect of introduced coccinellid beetles on the coccid population and on non-target species.
- b) Vegetation survey + correlation with tortoise and goat populations (basic study done 1997).
- c) Re-examination of original vegetation exclosures.
- d) Effects of the spread of alien plant species, and possible control methods (including *Cyperus ligularis*).
- e) Rare endemic plants survey.
- f) Effects of rats on the regeneration of plants.

4.2.3 Terrestrial Fauna

- a) Assessment of the white-throated rail population.
- b) Bat ecology and population dynamics (particularly insectivorous bats).
- c) Impact analysis of feral cats on Aldabran wildlife.
- d) Assessment of the impact of rats (and mice) on the vegetation and birds.
- e) Identification of suitable invertebrate species to use as indicator species.
- f) Kestrel ecology and population dynamics (some work done in 1997).
- g) Genetic studies to determine the status of the endemic Ibis and Red-headed forest fody (as possible full species rather than sub-species).
- h) Census of land birds.

4.2.4 Coastal and Marine Ecosystems

- a) Lagoon islet surveys.
- b) Survey of the coral reefs following the 1998 bleaching episode.
- c) Frigate bird population study and census.
- d) Marine invertebrates.
- e) Lagoon studies.
- f) Study of rats on Ile Moustique, including genetics and eradication possibilities.
- g) Shearwater genetics and population estimates.
- h) Marine mammals.

ACTION: Although research on Aldabra's marine life could be carried out mainly in conjunction with regional and international research initiatives, priorities should be set. (See 3.3.2d above)

4.2.5 Historical and Cultural Features

- a) Oral history of the human community, and of life and work on Aldabra in the past.

4.2.6 Recent, current, approved and proposed research projects

- Tortoise population census (July - September 1997) Environmental Research Group Oxford Ltd. Full report available.
- Limited vegetation survey (July - September 1997) Environmental Research Group Oxford Ltd. Full report available.
- Botanical work on the herbarium (September - November 1997) Wayne Page. Preliminary report available.

- Kestrel genetic studies (February - November 1997) Roselle Chapman and Jim Groombridge. No report.
- Marine research on the Mascarene Ridge (between 1998 and 2000) Shoals of Capricorn expedition.
- Study of the white-throated rail, including experimental translocation to Picard (possibly 1999 by Avian Demography Unit, Cape Town University).

4.3 MANAGEMENT OF RESEARCH PROPOSALS

4.3.1 Information to be included in Project Proposals

- Goals and objectives of the project.
- Number of scientists requiring permission to conduct the project.
- Detailed description on methods to be used in the project.
- Possible impacts of the research on the Aldabra environment.
- Amount of time to be spent on Aldabra.
- Number of field days expected (preferably by site and number of separate trips).
- Number of field assistants needed.
- Logistical needs, special requests, equipment requirements.
- Project budget.

4.3.2 Project approval and evaluation process

- Proposals for all projects are to be submitted a minimum of six months prior to the proposed starting date.
- Proposals should be sent to both the SIF office and the NRDC (National Research and Development Council, currently based at Seychelles Bureau of Standards). NRDC has a standard form to complete.
- All projects that are conducted on Aldabra must be approved by the Scientific Sub-Committee (see 5.1.2c) as well as by NRDC. This evaluation process helps to ensure that all projects are in harmony with Aldabra's scientific research and conservation goals, objectives, criteria and policies. Only those projects that are approved by the Scientific Sub-Committee will be allowed. The Board of Trustees should be informed of all research projects which have been approved by the Scientific Sub-Committee.
- Projects that include any type of environmental manipulation or intrusion on sensitive species and habitats are required to undergo an impact assessment and review before they can be approved. The Warden and Research Officer should be consulted with respect to such projects, to provide current input on the state and needs of the atoll.
- Handling and collection of flora, fauna, fossils, etc. is only allowed with written authority, after consultation with the Scientific Sub-Committee. No dead or living specimens are to be removed from the atoll without written approval. (see other parts of the Management Plan)
- All research must be in accordance with Seychelles laws and SIF policies and regulations.
- Priority will be given to those projects which are already on the priority list for research (see 4.2 above).
- Priority will be given to those projects which contain training opportunities for Seychellois scientists and SIF personnel.
- Major research projects may require the approval of the SIF Board of Trustees.

4.3.3 Research fees

- Station fees of SR 2,500 per week (or SR 350 per day) are currently charged per person, covering three meals per day, housing, maid and linen service, and all scientific services and facilities.

- Perhaps it is necessary to have a weekly fee for accommodation and an additional monthly fee of \$US200-300 to cover field personnel assistance, research facilities and transportation around the atoll.
- A bond of \$ US 500 should be paid to SIF from the research project budget. This will be refunded on receipt of the final report.

4.4 RESEARCH REPORTS

- All scientific visitors involved in research are required to submit a bi-monthly progress report to SIF. These reports should include information about all excursions, any manipulative or intrusive experimentation or activity, a general update on the progress of the project, and any important or unusual findings.
- All scientific visitors involved in research are required to submit a final report within six months of their departure from Aldabra. This report should include, but is not limited to, a summary of the project, any important or unusual conclusions, specific analyses pertinent to the conservation and management of the atoll, and any necessary or recommended follow-up studies.
- Scientists are to present their research results to SIF in a form which is understandable to the SIF staff and the SIF Board.
- Three copies of all publications resulting from research conducted on Aldabra are required, and must be submitted to SIF within six months of their publication date. Those publications which are not in either English or French should be translated into one of these two languages within one year of their publication date.
- SIF has the right of access to any scientific information acquired on Aldabra, even if it is not published. ***ACTION: Check the legalities of this.***

4.5 PROMOTION OF RESEARCH

4.5.1 Introduction

With new research facilities now in place on the atoll, a pro-active marketing programme is needed to publicise to the scientific world the natural wonders of Aldabra and its potential for scientific research. Promotion should be directed towards universities, scientific and conservation organisations and scientific journals, particularly those of the Indian Ocean region, Europe, USA, and later to other parts of the world.

4.5.2 Objectives

- To increase awareness of Aldabra's research potential amongst the scientific community.
- To increase the number of researchers visiting the atoll.
- To introduce a programme for voluntary scientific research assistants. These volunteers would help with scientific monitoring and research for short periods of time and at the same time gain experience. (See also 5.3.5 of this Management Plan)
- To introduce small projects, in line with priorities for research, which could be funded locally and carried out by suitably qualified scientists.

ACTIONS:

- ***Prepare and send out promotional material, both printed and on the Internet, including information about project proposals and requirements.***
- ***Make links with organisations which deal with scientific volunteers and look into local and regional possibilities.***
- ***Prepare a handbook for research scientists and scientific visitors. (See also Environmental Awareness section, 3.5.3 above.)***
- ***Look into the possibilities presented by research/tourism organisations which offer working vacations in remote locations for clients.***

- *Prepare proposals for small projects.*

PART FIVE

ADMINISTRATION

5.1 S.I.F. ADMINISTRATIVE MANAGEMENT STRUCTURE

5.1.1 Seychelles Islands Foundation

5.1.1a Introduction

The SIF was established by presidential decree on 2nd February 1979, (see Appendix II) with a mandate to “manage and conserve the natural life of the group of islands comprising the atoll of Aldabra in the Republic and to initiate and instigate scientific research into such natural life”. The decree also allows the Foundation to manage and conserve any other land at the request of the, then, National Parks and Nature Conservancy Board, as is the case with Vallée de Mai on Praslin island.

5.1.1b S.I.F. structure

The 1979 decree set out the following structure for the SIF:

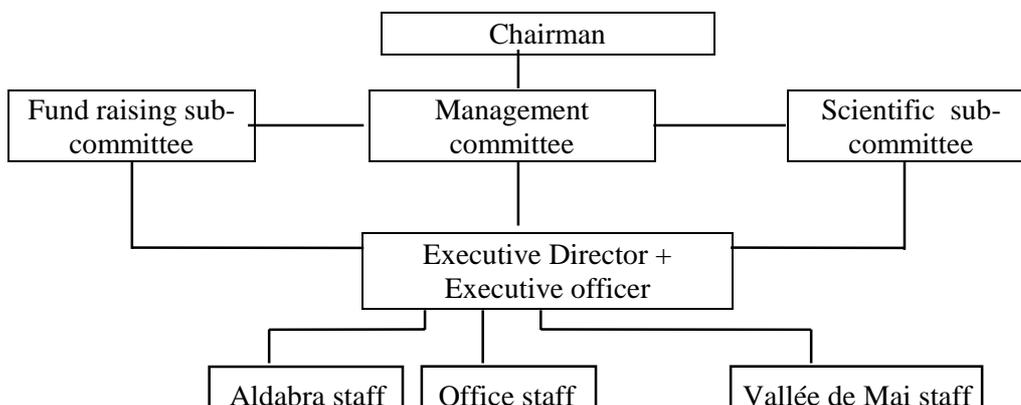


5.1.1c Perception of the S.I.F. as a Non-Government Organisation (NGO)

The wording of the decree has been misconstrued by the public and Trustees and understood to mean that as the Board is numerically biased towards overseas members who are obviously not Seychelles government representatives, it is therefore an NGO. The SIF is not an NGO; it is a government corporate body established by presidential decree. Unlike the SIF, an NGO is an organisation that is totally independent from government in its decision-making in terms of membership, election of authorities, policy decisions and establishment of programmes. NGOs consist of volunteer members who elect their own officers for a specific term, in accordance with their written Constitutions. In contrast, the Chairman and Trustees of the SIF are all appointed by the President for indefinite periods and the Seychelles Trustees are almost all government employees.

5.1.2 Executive structure for day to day management

For the day-to-day running of SIF affairs, the structure below has been established. The Management Committee consists of all Trustees who are resident in Seychelles and may include from time to time overseas Trustees when available. Meetings are scheduled on a regular basis at least once per month. The Chairman presides over meetings and in his absence the Trustees elect one of their number to be Chairman for the meeting. Four members constitute a quorum. Decisions arrived at during these meetings are carried out by the Executive Officer or person/s delegated to take action.



5.1.2a SIF Board of Trustees/Management Committee

All major decisions regarding the administration and management of Aldabra and Vallée de Mai reserves are discussed and voted upon during periodic meetings held at least once per month. These meetings must be attended by a quorum. All Board members are expected to attend the Annual General Meeting (AGM) and are expected to agree by consensus on the future direction of Aldabra and Vallée de Mai.

5.1.2b Appointment of Trustees

All members of the SIF Board of Trustees are selected by the Chairman, who sends his recommendations to the Minister for the Environment who in turn, forwards the names to the President of the Republic of Seychelles, who either approves or vetoes the nominees, including any international nominees. Appointment to the Board of Trustees is for three years.

5.1.2c Scientific Sub-Committee

The Scientific Sub-Committee consists of six persons with a biological/scientific and/or conservation background. This committee is appointed at the AGM without recourse to a higher authority. It is responsible for reviewing, accepting or declining all research proposals, alterations to the Science and Conservation Programmes and any activities associated with, or affecting, science and conservation in the two reserves. Members also consult on scientific and conservation management issues and review the Research Officer's bi-monthly reports. Members of this committee should be prepared to meet on an ad-hoc basis. The Chairman of this committee is appointed by the AGM each year. The Chairman will schedule all meetings during the year and will instruct the Executive Officer to distribute all relevant documentation, reports and minutes promptly to the members of the committee, and copies of the minutes to the Warden and Research Officer on Aldabra.

The Management Committee should refer to and take advice from the Scientific Sub-Committee on all matters pertaining to research projects and the Science and Conservation Programmes.

5.1.2d Fund-raising Committee

A Committee of up to six members attends to all matters pertaining to raising funds for the SIF and its reserves. The Committee is selected at the AGM without recourse to higher authority and

is comprised of persons with the right personality and skills to promote the SIF and its needs. The Chairman of this Committee is appointed by the AGM each year. The Chairman will schedule all meetings during the year and will instruct the Executive Officer to distribute all relevant documentation, reports and minutes promptly to the members of the Committee.

5.2 S.I.F. OFFICE STAFF RESPONSIBILITIES

5.2.1 Executive Director and Executive Officer

The Executive Director's responsibilities include acting as the principal representative of the SIF in both local and international contexts. This may entail organising educational, fund-raising and information campaigns to further the SIF's support base, responding to enquiries from the public, escorting international visitors and local authorities and in general acting as the key representative of the SIF and its two Reserves; Aldabra and Vallée de Mai.

The Executive Director has a support staff typically consisting of an Executive Officer, a Secretary and an Assistant Executive Officer.

5.2.1a Duties of the Executive Director

- To direct all daily office operations.
- To supervise all personnel issues including selection of non-technical SIF staff, their dismissal and complaints.
- To assist with the selection of technical staff members in conjunction with the Board of Trustees.
- The E.D. is also responsible for organising and hosting the AGM, taking the Minutes of all meetings and distributing them to all Board members within 14 days.
- The E.D. will organise meetings of the Management Committee at intervals of three weeks. A timetable for these meetings will be distributed to all Trustees (including overseas Trustees) at the beginning of each year. The E.D. must distribute minutes of every meeting to all Trustees prior to the next meeting.
- The E.D. is responsible for ensuring the execution of all directives from the Board of Trustees and the Management Committee.
- The E.D. and/or the E.O. will liaise between the Management Committee and the Wardens of Aldabra and Vallée de Mai, with respect to all decisions made by the Management Committee.

5.2.1b Duties of the Executive Officer

- The E.O. is responsible to the Executive Director.
- To assist the E.D. in all matters relating to SIF, Aldabra and Vallée de Mai.
- In the absence of the E.D., the E.O. assumes the responsibilities of the E.D.
- The E.O. and/or his assistant must be available for radio contact with the Warden of Aldabra for routine needs and emergencies. The E.O. will assist the Logistics Superintendent in filling all SIF supply requests issued from the Reserves. This is important for the proper operation of Aldabra and the well-being of all those on the atoll.

5.2.2 Assistant to Executive Officer

This post requires a determined and highly organised person upon whom the well-being of the staff on Aldabra depends. The central function of the assistant is to ensure that the store on Aldabra is permanently stocked with all the essential items needed by the staff and visitors residing at the settlement. All supplies and materials required on Aldabra are purchased, packed and despatched by the assistant. Logistical co-ordination and accounting skills are an essential requirement for this post. All accounts for SIF and its reserves are kept by the assistant and are subsequently inspected and verified by the SIF auditors.

The assistant to the E.O. may also be requested to meet arriving or departing SIF visitors on behalf of the E.O., and to transport them to their hotels or to the airport or harbour.

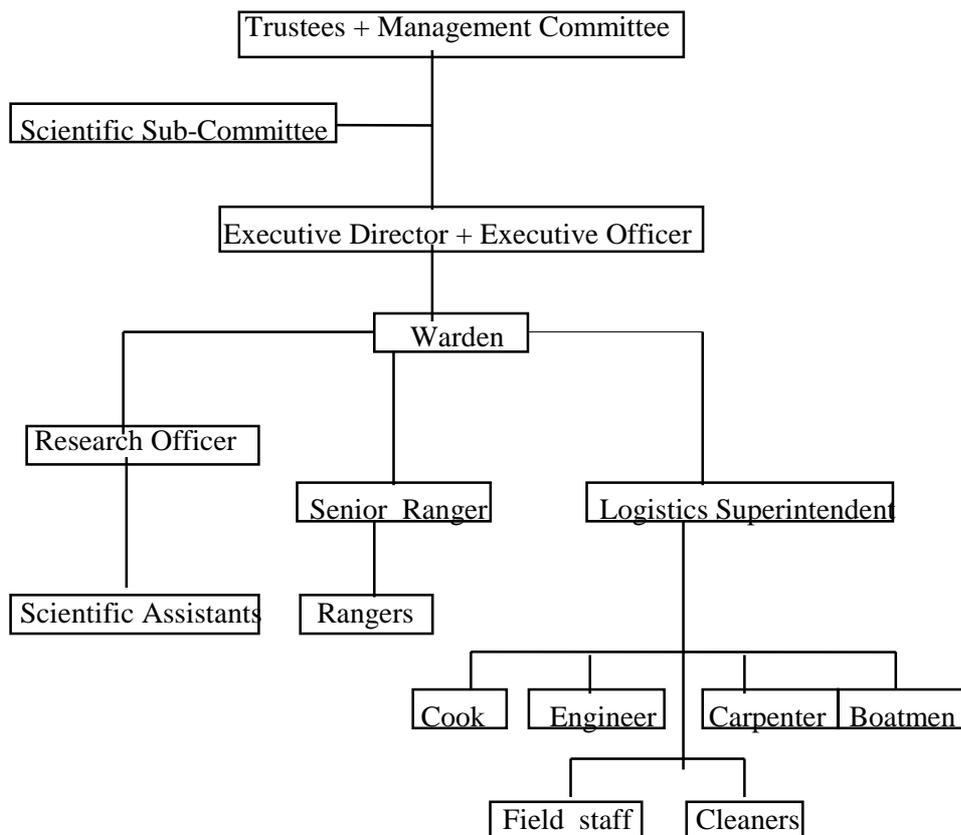
5.2.2a Duties of the Assistant to the Executive Officer

- To act as the deputy to the E.O. when requested.
- To assist and support the E.O. and Logistics Superintendent to order, purchase, pack and despatch all supplies to Aldabra.
- To ensure that all mail and packages for personnel on Aldabra are despatched promptly and also to deliver or post all mail from Aldabra within 24 hours of receipt.
- To assist with purchasing and despatching goods or equipment to the Vallée de Mai warden.
- To keep all accounts pertaining to SIF operations and to prepare these for submission to the auditors.
- To maintain regular contact with the warden on Aldabra when the E.O. is not available.

5.2.3 Secretary

The secretary will assist both the Executive Officer and his assistant and will fulfil all duties expected of a diligent and efficient secretary.

5.3 ALDABRA MANAGEMENT STRUCTURE AND STAFF RESPONSIBILITIES



5.3.1 Warden

The warden has overall responsibility for Aldabra, the resident SIF staff, all visitors, the infra-structure and the upholding of the status of Strict Nature Reserve and World Heritage Site.

While the warden is directly responsible to the Board of Trustees of the SIF, he/she would under most circumstances communicate with the Board of Trustees via the Executive Officer or Executive Director. In cases where no action is forthcoming from requests sent via the SIF Mahé office, direct communication with the Chairman of the Board to clarify the situation is permissible.

5.3.1a Duties of the Warden

As the most senior appointment on Aldabra, the Warden has responsibility for and authority over all other persons within the legal boundaries of the atoll. The duties of the Warden are as follows:

- To ensure that the day to day management of the research station, settlement and field camps is carried out efficiently by the Logistics Superintendent.
- To ensure that all science and conservation programmes are carried out efficiently by the Research Officer.
- To deal with all staff problems and grievances, take judicious and reasonable disciplinary action where staff have behaved unreasonably or are in breach of the regulations. Where serious offences or violent behaviour are concerned, disciplinary action should be taken in consultation with the Research Officer and Logistics Superintendent or through direct contact with the Executive Officer.
- To assist and advise all visitors (including scientists, yachts and cruise ships) on their programmes and itineraries, and ensure that they comply with the regulations.
- To devise and instigate security patrols for the atoll in order to uphold its status as a Strict Nature Reserve and World Heritage Site.
- To maintain regular contact with the Executive Officer via the station communications equipment which is the responsibility of the Warden.

5.3.2 Research Officer

It is the responsibility of the Research Officer to manage the Science and Conservation Programme. The Research Officer may from time to time be called upon to deputise for the Warden during his/her absence from the station or during periods of change-over.

5.3.2a Duties of the Research Officer

- To co-operate with the Warden on all matters concerning the research facilities, field trips, visiting scientists, volunteers and other visitors.
- To ensure that the research and conservation programme, including all research and monitoring, is carried out in an efficient manner.
- To supervise the work of all rangers and scientific volunteers and to oversee the boatmen and field staff when at field sites and camps.
- To assist and advise visiting research groups and to ensure that such groups comply with the regulations when in the field.
- To maintain all Aldabra specimen collections in good order, including the herbarium collection.
- To keep all records and data up-to-date and ensure that these records are kept in order and are easily accessible.
- To maintain the library and to inform the Warden of library requirements and new publications requests.
- To assist wherever possible in the education of rangers and field assistants and to encourage self-improvement through higher education.

5.3.3 Logistics Superintendent

The efficient maintenance of the research station, the settlement and field camps is the responsibility of the Logistics Superintendent who will co-operate with the Warden (or his deputy) and the Research Officer at all times.

5.3.3a Duties of the Logistics Superintendent

- To ensure that the research station, settlement and field camps are maintained to the highest standard and to the satisfaction of the Warden.
- To ensure that all staff co-operate at all times with the Warden, Research Officer and Rangers.
- To maintain the essential infrastructure such as a constant supply of electricity and water and to inform the Warden of any anticipated failure or shortage.
- To ensure that adequate stocks of fuel for generators and boats are kept.
- To ensure that the shop/store is always adequately stocked and to keep proper stock analysis and accounts.
- To co-operate with the Warden and Research Officer on all aspects of logistics and supplies for field trips.
- To ensure the maintenance, to the highest standards, of all boats, outboards, safety equipment and camping equipment.

5.3.4 Rangers

Rangers are important for the conservation and monitoring programmes as well as patrolling/protection needs. Rangers must be dedicated to the principle of nature conservation, willing to learn new skills and should be willing to spend long hours in harsh, isolated conditions. The Warden will appoint the Ranger he considers to be the most competent and efficient to be the Senior Ranger.

All Rangers are supervised directly by the Research Officer and Warden. Unless otherwise instructed, all Rangers will supervise and carry authority over the field staff and boatmen.

5.3.4a Duties of the Rangers

- To assist the Research Officer and Warden, and/or visiting scientists with all monitoring and data recording.
- To assist with eradication programmes.
- To assist the Research Officer and Warden, visiting scientists and special visitors with all issues relating to nature conservation, science, education and tourism.
- To enforce all SIF policies relating to wildlife, plants and the environment.
- To assist the Warden on poaching patrols and surveillance.
- To accompany and guide visitors on Aldabra, ensure that their conduct is environmentally sound and that they abide by SIF policies.
- To care for sick, stranded or injured animals.
- To enforce waste policies and conduct periodic litter clean-ups with field staff, especially within those areas used by tourists and other visitors.
- To help with the maintenance and upkeep of the Station research facilities, library, laboratory and equipment.
- To work with the field staff on the maintenance and upkeep of field camps, trails, scientific transects and other science and conservation programme-related needs in the field.

5.3.5 Scientific Assistants

This will be a new programme for Aldabra and one that will be important for training Seychelles nationals and increasing the international support base for Aldabra. These individuals are overseas volunteers and Seychellois who desire to contribute to Aldabra's conservation and science and gain field experience for a period of 2-6 months. In consideration of their work, these assistants receive housing, food and transportation between Mahé and the atoll. These scientific assistants will be

university natural science graduates and Seychelles Polytechnic students in the natural sciences who wish to pursue a career in biological research and conservation.

These assistants fall under the direct supervision and authority of the Research Officer. In the absence of the Warden, Research Officer or Rangers, the Scientific Assistants will have supervisory capacity over field staff and boatmen only with regard to issues and decisions related to the Science and Conservation Programmes.

These “volunteers” will assist the Research Officer in the field and in the laboratory. Various activities include: assisting with monitoring programmes, guiding tourists (in the absence of Rangers), assisting visiting scientists, creating interpretive materials, maintaining trails and transects, conducting laboratory tests, assisting with experiments and wildlife rehabilitation etc. and performing all tasks associated with the Science and Conservation Programmes.

5.3.6 Engineer

The Engineer is important for the efficient operation of the Station’s equipment. This position will be supervised directly by the Station Logistics Superintendent and indirectly by the Warden. The Engineer will have supervisory capacity and decision-making authority over the field staff and boatmen with issues directly related to the Engineer’s work.

5.3.6a Duties of the Engineer

- To maintain and repair all the station equipment, including the generators, water pumps, boat engines and other mechanical devices necessary for the efficient running of the research station.
- To establish and maintain a full inventory of spares and supplies, such as fuel stocks, in co-operation with the Logistics Superintendent.
- To ensure that all boatmen are able to maintain their outboard engines and carry out basic repairs.
- To maintain the entire station electrical installation and to ensure its reliability and safety.

5.3.7 Boatmen

Aldabra presents a navigational challenge with its tides, reefs, channels and coral pinnacles making the expertise of these individuals particularly important. The Boatmen will be directly supervised by, and will work closely with the Logistics Superintendent (including when planning food and equipment needs for field trips). The Boatmen are key support staff for the Science and Conservation Programmes, technical staff, scientists and special visitors, and as such, must always co-operate with and assist these persons. The Boatmen will supervise boat crews and will be responsible for the safety of all personnel and visitors during boat trips. While activities will be decided by the Warden, Research Officer and Logistics Superintendent, the Boatman is the official foreman of the non-technical field staff on all field trips.

Other responsibilities include the maintenance of all boats and boat-related equipment in collaboration with the Engineer, operating boats in all cases except when the Warden deems it necessary to use the boats for emergencies or important field observations (e.g. marine mammal observations).

5.3.8 Field Staff

These individuals are the non-technical work-force on Aldabra and are essential for the day-to-day operation of the atoll and, in particular, as a support team for the Science and Conservation Programmes. These workers must be committed to the SIF mandates of conservation, science and education, be physically capable of performing the work, hard-working and able to work individually or in a team. Field staff will assist boatmen, catch fish for station consumption, cook for the scientific personnel and other visitors while in the field, cut and maintain trails under supervision of Rangers,

assist with the maintenance of the station and surrounding area, clean and repair the field huts and equipment.

5.3.9 Station Cook

The station Cook usually cooks for all technical staff, the Logistics Superintendent and the Engineer. Not only should this individual be able to cook a variety of dishes, bake bread, etc., but he/she is responsible for all aspects of the kitchen and meals, including stocking, storage, kitchen hygiene, meal clean-up etc. The Cook should be courteous and friendly towards those who are served, who may occasionally include tourists. The Cook is supervised by the Warden and Logistics Superintendent and should be prepared to alter the menu according to changing needs and conditions.

5.3.10 Carpenter

All buildings at the station, settlement and field camps are constructed in such a manner that their maintenance by a skilled carpenter is essential. The carpenter is supervised by the Logistics Superintendent and Warden and will work closely with the Engineer to form a maintenance team that will deal with all repairs and upkeep, including carpentry, plumbing and painting.

5.3.11 Cleaners

Cleaning staff are supervised by the Logistics Superintendent and will be expected to keep the research and accommodation buildings and surroundings clean and tidy. They may, if so requested by resident scientific staff or visitors, undertake extra laundry duties out of their normal working hours. They should be paid for any such extra duties by the person requesting the service.

5.3.12 Visiting Scientists

Scientists working on Aldabra will be conducting research projects that have been approved by the Board of Trustees and the Scientific Sub-Committee. All policies, rules and regulations for Aldabra and its staff apply equally to visiting scientists.

5.4 STAFF MEETINGS

Miscommunication, misinterpretations and misperceptions have been the root cause of many problems plaguing Aldabra. In order to avoid problems it is essential that monthly general staff meetings are held and facilitated by the Warden or, in his absence, the Research Officer and Logistics Superintendent. These meetings should deal only with work-related issues. Meetings would help answer questions and increase understanding of both the role of Aldabra and respect for fellow staff. As suggested by Aldabra staff, this monthly communication could also help increase job satisfaction and reduce discontent, idle gossip and trouble-making. Therefore, monthly general staff meetings should be conducted to encourage participation in discussion of all work-related issues.

5.4.1 Management meetings

Senior staff members (Warden, Research Officer, Logistics Superintendent and Senior Ranger) should meet once a week to discuss and plan station needs, conservation and research programmes, cruise ship visits, boat schedules and other priorities for the week. The time and location of the meetings will be determined by the Warden or his designated deputy.

5.4.2 General staff meetings

All SIF staff members will attend monthly staff meetings to discuss work-related issues. These meetings to be under the chairmanship of the Warden or his designated deputy.

5.4.3 Meetings to discuss staff grievances and personal problems

Normally, these matters will be dealt with directly by the Warden. Visiting members of the SIF Board of Trustees or Executive Director may request the Warden to convene a general meeting to deal with unresolved problems.

In cases where grievances involve the Warden and another staff member, one of the senior staff may liaise with the Executive Director to resolve the issue.

5.5 STAFF ATTITUDES AND BEHAVIOUR

All staff employed by the SIF to work on Aldabra must be made aware of the privileged position they occupy in nature conservation in Seychelles. Aldabra is administered and managed in a different way from other outer islands and employment on Aldabra carries with it the responsibility of upholding all SIF policies for Aldabra, to abide by all regulations, to ensure that all other staff members and visitors abide by the same regulations. It is also important that all staff work together as a team sharing the SIF goals of conservation, scientific research and education.

Aldabra Staff Working Conditions are given in full detail in Appendix Four.

5.5.1 Flexibility and teamwork

Due to the nature of ecological systems, research and data collection are very often carried out at unusual times or for long periods. This demands that all staff involved in such activities must adopt a flexible attitude to working hours. This applies equally at the station when staff are required to assist with unloading and loading supply boats or assisting cruise ships on tight schedules. No staff member requested to work abnormal hours by the Warden, Research Officer, Logistics Superintendent or Senior Ranger may refuse to do so.

The nature of all work on Aldabra is such that it demands a high degree of team work. This can only be achieved if all staff (technical and non-technical) co-operate at all times. Any staff member deemed to be uncooperative by the Warden will be dismissed and returned to Mahé at the earliest opportunity.

5.5b. Disciplinary Action

Any disciplinary action taken by the Warden or his deputy should be based on sound judgement of the circumstances and should be judicious in nature. Cases of serious breach of regulations or violence should be dealt with by the Warden in consultation with the Research Officer and Logistics Superintendent and the final decision relayed immediately to the Executive Officer/Executive Director on Mahé.

The following behaviour will result in disciplinary action including staff dismissal:

- Breach of regulations.
- Continual unreasonable behaviour.
- Threats of violence to other staff.
- Refusal to work.
- Causing purposeful damage to station infrastructure and equipment.
- Continual attempts to disrupt other staff or undermine the authority of senior staff.
- Endangering the life of other staff at any time.
- Aiding and abetting other persons involved in poaching activities.
- Drunken, disorderly behaviour.

Where the laws of the Republic of Seychelles have been violated, follow-up police action should take place immediately the offender is returned to Mahé.

5.6 STAFF TRAINING

5.6.1 Staff training programme

Two staff training programmes were developed for Aldabra in 1996 by Pierce and Augeri (“Ranger Training Handbook” and “General Staff Orientation”, both of which are unpublished documents). These should be used as the basis for essential training of rangers and general staff. The aim is to educate staff about the importance of conservation and to instil a sense of pride in the role each staff member plays in the protection and operation of Aldabra. (See also 3.5 of this Management Plan).

The orientation programmes are mandatory for all new Seychellois staff employed to work on Aldabra (or Vallée de Mai) and for all new staff on Mahé. The rangers’ training programme is mandatory for all rangers.

Senior staff on Aldabra should encourage all rangers to pursue courses in further education as the only route to self-improvement. Senior staff should also provide rangers and ambitious field staff with reading lists of materials relevant to their work and available in the library.

5.6.2 Ranger rotation with Division of Environment

SIF, the Division of Environment and the Marine Parks Authority should work together to develop a national pool of educated and dedicated rangers. One DoE or MPA ranger should be seconded annually for a period of six to twelve months to work with rangers on Aldabra. This gives the ranger the opportunity to work under the close supervision of the Research Officer and thereby gain invaluable experience, and to share their own experience of working in the DoE and/or MPA with the staff on Aldabra. SIF rangers should in return be seconded to the DoE or MPA to work in their reserves and marine parks for a similar period, and to attend any training programmes available through either organisation.

5.7 REPORTS

All senior staff must submit bi-monthly reports to the Board of Trustees and Scientific Sub-Committee via the Executive Director. The E.D. will distribute copies of reports to all Trustees.

5.7.1 Warden’s Report

The Warden’s report should cover the general management of Aldabra, the research facilities and the staff. It should give an overall view of the current research and conservation projects, and of visitor activities. It should also highlight major issues that require discussion by the Management Committee and recommend actions that could be taken. This report will be circulated to members of the SIF Board’s Management Committee (and to Trustees) for discussion and action.

5.7.2 Research Officer’s Report

The Research Officer’s report should cover details of the research and conservation programmes, including monitoring programmes, and other activities carried out by rangers, volunteers and visiting scientists. It should also highlight issues that require discussion by the Scientific Sub-Committee and recommend actions that could be taken. This report is to be copied to the Warden who may attach his comments to the report. The E.D. will submit the report to the Scientific Sub-Committee no later than seven days thereafter. The E.D. is responsible for keeping minutes of all Scientific Sub-Committee meetings and at the request of the Sub-Committee, will deal with any urgent requests via the current communications system. The E.D. will deal with all other matters as directed by the Sub-Committee.

5.7.3 Logistics Superintendent’s Report

This report will deal with general issues directly related to the station facilities, equipment and supplies. It will also report the condition and projected maintenance needs of all boats and engines, fuel stocks for boats and generators and the capacity situation of all water storage tanks. This report is to be copied

to the Warden who may add comments prior to its despatch to the E.D. It will be circulated to all SIF Management Committee members for discussion and action.

5.7.4 Rangers' Reports

Each Ranger will submit a report on his/her activities over the two-month period. The reports will be copied to the Research Officer who may add comments prior to despatch to the E.D. and the Research Sub-Committee. The E.D. will circulate these reports attached to the Research Officer's report.

5.7.5 Report formats

While there is a need for individual expression in reporting, certain information is common to all reports and must be presented in a format that can be used in all subsequent reports. Essential subject headings for the reports are as follows:

5.7.5a Wardens reports

- Period covered by report.
- Summary of activities
- Major issues and recommended actions.
- Summary of Research and Conservation Programme.
- Summary of Station and Settlement Logistics.
- Scientific Visitors and activities.
- Tourist visits and activities.
- Other visitors and activities.
- Staff numbers and changes.
- Forward planning requests.

5.7.5b Research Officer's Reports

- Period covered by report.
- Weather report.
- Summary of activities.
- Major issues and recommended actions.
- Work schedule.
- Science and conservation programmes (data, analyses)
- Ranger and volunteer activities.
- Details of visiting scientists' activities.
- Library report and publication requests.
- Laboratory forward planning requests.

5.7.5c Logistics Superintendent's Reports

- Period covered by report.
- Summary of activities.
- Major issues and recommended actions.
- Shop report (stock takes, discrepancies, etc.)
- Fuel stocks.
- Water storage levels.
- Boats.
- Station and settlement maintenance report.
- Field camps maintenance report.
- Forward planning requests.
- Long-term maintenance requests.

5.7.5d Rangers' Reports

- Period covered by report.
- Summary of activities.
- Visiting scientists, project involvement.
- Turtle monitoring.
- Tortoise monitoring.
- Other monitoring.
- Transect and trail cutting.
- Surveillance patrols.
- Tourist guiding.
- Education programme and achievements.

PART SIX

TOURISM

6.1 INTRODUCTION

The decree which states the goals for the management of Aldabra makes no mention of tourism. At the Annual General Meeting of the SIF in November 1995 the need to establish a policy was agreed (1995 AGM Minutes - Item 2).

6.2 POLICY

The purpose of tourism on Aldabra is to increase the revenue raised by the SIF in order to support the protection and conservation of the atoll. This policy is intended to generate income through limited and strictly controlled tourism with a focus on nature tourism and education.

Tourism will be limited to the areas defined in the zoning policy and be conducted in a sustainable manner with impact being continually assessed. Proof of adverse impacts in any area will result in adjustments to the zoning policy.

Tourism will be limited to the following operations:

- Cruise ship tourism.
- Live-aboard charter boats and private yachts.
- Live-aboard dive boats.
- Land-based nature tourism limited to 12 persons at any one time.
- Conservation volunteer tourism (e.g. Earthwatch) controlled by accommodation availability.
- Educational expeditions limited to 12 participants including expedition leaders.

6.2.1 Policy on Tourism Access to Aldabra

With the obvious exceptions of cruise ships, private charter boats and private yachts, all other tourism access is dependent upon air connections between Mahé and Assumption and subsequent boat connections to Aldabra. While the SIF may assist with such arrangements if the supply boat is in the area, it is not SIF policy to be involved in tourism development on Assumption, nor will SIF be involved in the establishment of the boat connection between Assumption and Aldabra.

6.2.2 Landing Fees

Landing fees for all passengers and crew are charged at a rate of Rs. 250 per person per day as from January 1999. This amount may be altered by agreement at an Annual General Meeting. Any such alteration will be communicated to all tour operators and cruise ship operators at least twelve months in advance, in order to allow reasonable time to update brochures and costs.

The landing fees will apply to all classes of tourism as described in 6.2. Exceptions for individuals or educational expeditions may be made only by agreement of the SIF Management Committee.

6.2.3 Other fees

The following list of fees apply to professional photographers and journalists:

- Still photography Rs. 5,000
- Cine and video photography Rs. 25,000

- Commercial film fees by negotiation with SIF

6.2.4 Land-based tourism fees

A fee of Rs 1,500 per person per day (excluding transport to and from Aldabra) is in force. Details of items included in this fee should be obtained from the Mahé office of S.I.F.

6.3 TOURISM GUIDELINES AND POLICIES

The following guidelines apply to all classes of tourism and will be supplied to all tour and cruise ship operators, charter boats and dive operators in advance of their visit to Aldabra. These guidelines will be supplied to the operator each time a visit is confirmed. This is the responsibility of the Executive Officer and must be adhered to.

SEYCHELLES ISLANDS FOUNDATION

TOURISM REGULATIONS FOR ALDABRA

1. All vessels must have clearance in writing from SIF head office and the Seychelles Port Authority before visiting Aldabra. Vessels approaching Aldabra must identify themselves and when within one kilometre of the shore will be answerable to the Warden of Aldabra. The vessel should select its anchorage or mooring within view of the research station and do so in an environmentally responsible way. Vessels should use mooring buoys if these are available. Access to the lagoon and landing on any part of the atoll other than in designated tourism areas is prohibited.
2. Visiting vessels must remove all rubbish occasioned by their visit.
3. All visitors must be accompanied by SIF staff at all times, except within the station grounds. Tour operator guides who are familiar with Aldabra and SIF policies, and have been vetted by SIF, may be allowed to lead small groups on permitted trails on Picard.
4. Visitors are to remain on designated trails or when in open areas, within the limits set by their guide.
5. Visitors, particularly film crews, must comply with their guide's instructions regarding approaches to and viewing of animals and plants.
6. Aldabra is a strict nature reserve. It is prohibited to remove shells or pieces of coral from any area visited.
No biological, or geological specimen, alive or dead, may be collected by any visitor.
7. Fishing is not permitted within one kilometre from the shoreline. All boat operators should ensure that this restriction is conveyed to all their crew.
8. Accidental introductions of alien species is a major problem in wilderness areas like Aldabra. Passengers and crew of cruise ships and charter boats are asked to assist in the prevention of this problem by always ensuring that they wear freshly laundered trousers and socks, and that their shoes have clean treads.

Continued on next page.....
9. Diving and snorkelling groups shall use only those areas designated and shall be in groups of five or less per guide, except when snorkelling along the reef off the research station where the expedition leader should decide on the safe number per guide.

10. Standing on or handling coral or any other marine life is strictly prohibited.
11. All expedition leaders must conduct a short course for their clients on low impact snorkelling before they enter Aldabra's coral reefs, marine and lagoon system.
12. Boats and zodiacs entering the lagoon to visit the frigate colonies must stay in close contact with the SIF lead boat. Zodiac drivers must at all times endeavour to keep outboard engine noise to a minimum when within the bird colonies. Mufflers should be used if possible. No-one is allowed to leave the boat.
13. It is prohibited to approach closer than ten metres to birds roosting or nesting.
14. Giant tortoises should not be stroked, patted or otherwise disturbed except at the research station where one or two individual tortoises are used to humans. It is strictly forbidden to sit on or ride any tortoise.

6.4 TOURISM MANAGEMENT

6.4.1 Tour Operators

Aldabra is one of the world's few remaining wilderness areas where natural processes still function almost as they did before the advent of man. This is why people come to visit the atoll. In order to sustain this wilderness image, all tourism must operate in a limited, exclusive and small scale. Tourism must also be operated in an environmentally conscious way and with the accent on conservation "education". The great majority of visitors to Aldabra wish to learn about the natural processes that sustain this wilderness.

Aldabra is not a beach resort and must never be marketed as anything other than the harsh inhospitable nature reserve that it is. Accommodation is basic but comfortable, food and water are limited but sustaining. There are no fine restaurants, bars, night clubs or any form of entertainment other than the observation of nature. Tour operators should make these limitations known to their prospective clients.

6.4.2 Tour Operator Guidelines

1. All tour operators are to ensure that their operations and clients comply with the SIF policy for tourism (Part 6.3).
2. All visits to Aldabra require a permit issued by the Executive Officer of the SIF. Vessels or their agents should apply for clearance in the normal way but must supply the SIF with the following information:-
 - Vessel's origin and registration details
 - Crew manifest
 - Passenger manifest
 - Dates, duration of visit
 - Purpose of visit
3. Landing fees are fixed by the Board of Trustees at the AGM. Twelve months notice of variations are given to tour operators and ships' agents. The fees are charged according to the Harbour Dues Regulations, 1994, Item 7.2. The present fees are Rs.250 per person aboard. Current landing fee and rates for other fees for photographers are obtainable from the SIF office.
4. All vessels are to be informed that no anchoring is permitted within the reef system.
5. All shore visits are restricted to Picard island on designated trails. Shore visits to any other tourism designated zone must be cleared with the Warden who will ensure that the tour is accompanied by SIF technical staff.

6. While tour operators may wish to bend the rules to satisfy the demands of their clients, any infringement of SIF policy may result in the operator being refused permission for future visits.
7. Tour operators are responsible for the security, safety and well-being of their clients. They should ensure that adequate precautions are taken against the bright equatorial sun and wind, in the form of wide-brimmed hats, sunscreen, good strong footwear and adequate supplies of water.
8. All zodiac and boat trips must be conducted with care for the clients and the environment. All passengers must wear life-jackets while on boat trips.
9. All dive groups must be accompanied by a guide qualified to Dive Master standard.
10. Land-based tours that will be arriving from Assumption must inform the Warden of their time of departure from Assumption and expected time of arrival on Aldabra. Alterations to schedules may be required to suit the tides on Aldabra.
11. Land-based tourism is limited by the available accommodation on Aldabra. A maximum of 12 clients at any one time could be catered for BUT research scientists have priority regarding accommodation. Bookings must be made well in advance.
12. Itineraries for land-based tours must be drawn up in co-operation with the Warden on Aldabra. All such tours are dependent upon availability of staff, boats, equipment and tide conditions in the lagoon. Operators must ensure that their publicity clearly states that no fixed tours can be set prior to arrival of the group on Aldabra. SIF staff on Aldabra will make every effort to ensure customer satisfaction during the group's visit.
13. Tour operators are warned that conditions in field camps are primitive. Tourists embarking on itineraries that include overnight stays at field camps must be warned in advance that there are no washing or toilet facilities at the camps.
14. There are no medical facilities on Aldabra. Injured persons will have to be evacuated to Assumption and then flown to Mahé. Tour operators must ensure that their clients carry sufficient insurance to cover the possibility of medical evacuation.
15. Tour operators are advised that leaving alcoholic beverages, or drugs for the staff on Aldabra is prohibited.

6.4.3 SIF Management of Tourism

It is the responsibility of the SIF office on Mahé to inform the warden of all impending visits as soon as the booking is made. It is the responsibility of all staff on Aldabra to ensure that tourism is conducted in a limited and sustainable manner. All visitors to Aldabra must be made to feel welcome and must be treated in a considerate and friendly manner. Most visitors are already well informed about Aldabra and every effort must be made to give them clear and intelligent information.

All tour operators have been, or should be, informed of SIF policies and tourism limitations. It is therefore imperative that any infringements of policy are dealt with firmly but diplomatically. It should be borne in mind that both visitors and tour guides should be treated with courtesy even when a reprimand is necessary for misinterpretation of SIF policies. The Warden should be informed of any policy infringements.

6.4.4 SIF Tourism Guidelines for Staff

1. While the primary role of all staff is to uphold the SIF goals for Aldabra for Protection, Conservation, Research and Education, any staff member may be called upon to assist with some aspect of tourism.
2. All staff dealing with tourists must be friendly, polite and considerate. Many cruise-ship passengers are elderly and care must be taken to set the pace of any walk to that of the slowest visitor.
3. Staff should assist expedition teams with landing tourists on the beach and showing them to the Visitors' Centre. They should assist with departing groups also.
4. All tour guides must give clear and intelligent information to the groups.
5. Staff dealing with tourists must always be properly dressed in clean clothing and uniforms where available.

6. It is the duty of all staff members to ensure that visitors comply with SIF policy. All staff members must have read and understood the SIF policy document.
7. Longer term, land-based tourists and conservation volunteers should be treated with the same care and attention as cruise-ship passengers.
8. Longer term tourists using the station facilities are entitled to a clean, comfortable and quiet room. While they will not expect gourmet food, all meals should be well presented and should be as variable as circumstances permit.
9. If land-based tours involve overnight stays at field camps, it is essential that the camps be clean and relatively comfortable. The staff should be seen to be cleaning and maintaining the camp when not otherwise employed.
10. The most difficult clients to deal with are likely to be photographers. Staff must ensure that photographers comply with all SIF policies. If unable to prevent an infringement, the Warden must be informed as soon as possible after the incident.
11. It is the responsibility of the Warden and the Logistics Superintendent to plan and manage all tourist visits. In particular, careful forward planning of consumable items required by land-based tourists is essential. Equally important is careful planning and co-ordination of land-based tourism excursions.

6.5 TOURISM MONITORING

6.5.1 Monitoring tourism impacts

All monitoring programmes conducted in areas within the tourism zone should include an element of tourism impact assessment. Continual assessment of the number of visitors must be carried out with a view to limiting numbers if they have an adverse impact on the environment or wildlife.

6.5.2 Monitoring visitor experience

Regular visitor surveys should be carried out by SIF staff to determine the level of tourist satisfaction and future needs.

PART SEVEN

FINANCE

7.1 INTRODUCTION

An essential part of the future management of Aldabra is the presentation at all future Annual General Meetings of a planned budget for the next year. The current income derived from Vallée de Mai, landing fees on Aldabra, SIF investments and Government subventions form the basis upon which the budget is planned.

Many opportunities are open to SIF to increase the potential earnings from both of its World Heritage sites. It is the responsibility of the Fund-Raising Sub-Committee to pursue these opportunities.

7.2 BUDGET

The budget for Aldabra for each coming financial year (1st January - 31st December) is a responsibility to be shared by the Warden, Research Officer, Logistics Superintendent and the Executive Officer. Final approval of the proposed budget must be ratified at a management committee meeting prior to the AGM. This will speed up approval of the budget by the Trustees at the AGM.

7.2.1 Budget Planning

A budget planning meeting is to be held in July of each year attended by the Warden, Research Officer and Logistics Superintendent.

The Warden will consider budgetary needs for:

- Staff levels required for Aldabra
- Communications equipment
- Security and surveillance.

The Research Officer will budget for:

- Laboratory equipment
- Replacement of laboratory and fieldwork consumables
- Computers and computer consumables
- Library equipment and furniture
- Publications subscriptions
- New publications and replacements

The Logistics Superintendent will budget for:

- Maintenance materials for the buildings
- Maintenance materials for generators and electrical system
- Plumbing and carpentry materials
- Repair and/or replacement of boats and engines
- Spares for all equipment
- Replacement of field equipment
- Replacement of cleaning equipment and tools
- Replacement of kitchen/dining room equipment
- Shop stocks

- Fuel stocks

A second meeting to finalise the proposed budget will be held in September. It will be the responsibility of the Warden to compile the budget from those presented by the Research Officer and Logistics Superintendent. This budget will be sent to the Executive Director who will add all other incidental costs (such as transport to and from Aldabra) and all budgetary needs for the SIF office and Vallée de Mai. The Executive Director is responsible for the preparation of the final budget proposal which will then be presented for discussion and approval to the Management Committee. Full and final approval of the budget will be given by the full Board of Trustees at the Annual General Meeting.

APPENDIX ONE

“SWOT” ANALYSIS FOR ALDABRA

1. Strengths

- Aldabra is a prime example of a raised coral atoll and is a refuge for many unique or endangered species.
- Aldabra is significantly less disturbed than most other atolls in the Indian Ocean and elsewhere in the world, partly because of its isolation and inhospitable terrain.
- As a result of Aldabra’s unique ecosystems and species it has been listed as a Seychelles Special Reserve since 1981, and a UNESCO World Heritage Site since 1982.
- Because of its uniqueness and isolation, people are keen to see Aldabra and to learn about its ecosystems.
- The presence of a research station on the atoll, together with the excellent research which has already been carried out on Aldabra, is conducive to attracting further scientific studies.
- Through the prestigious international organisations represented on the SIF Board, Aldabra has access to considerable expertise at both Board level and research level.

2. Weaknesses

a. Aldabra, the atoll

- The continued presence of a number of alien species, such as goats, rats, cats, sisal, ‘zepi ble’, can be seen as depreciating the image of Aldabra as a pristine, undisturbed atoll (which is often the picture people have of Aldabra).

b. On Aldabra

- Aldabra’s isolation contributes to a number of problems:
 - * distance from Mahé means delays in acquiring necessary goods.
 - * personal difficulties in adjusting to the isolation and small human population.
 - * communication problems between SIF and the atoll and the outside world.
 - * difficulties in acquiring suitable staff to work on the atoll.
- Staffing difficulties created by:
 - * inappropriate choices of personnel, often resulting from a lack of suitable candidates and reliance on a network of island workers rather than advertising and promotion.
 - * poor reputation for conditions on Aldabra.
 - * inadequate training.
 - * inter-personal conflicts.
 - * lack of continuity of staff, resulting from broken contracts and/or insufficient handing-over time.
- Many of the staff are not sufficiently conservation-oriented and do not have the right attitude towards Aldabra as a Special Nature Reserve and a World Heritage Site.
- Scientific monitoring is not always carried out as it should be, sometimes as a result of a management problem on Aldabra, sometimes because there are insufficient personnel.
- Insufficient ability to police poaching and unauthorised landings on the atoll.
- Certain long-term policies for the atoll are still missing, for example with respect to energy use (renewable sources), communications systems.
- There are no proper contingency plans for emergencies on Aldabra.

c. SIF and Management

- Finance for the running of Aldabra is too dependent on Seychelles government and the revenue from entrance fees to Vallée de Mai.
 - * There are financial constraints in bringing to fruition certain necessary changes.

- * Transport to and from the atoll is very expensive and/or time-consuming.
- * There is insufficient marketing of Aldabra as a place for research.
- * A proper financial strategy has yet to be formulated.
- Poor or inefficient management. This is relevant at all levels:
 - * some SIF Board of Trustee members live abroad; all are fully employed in other jobs; and therefore the time and energy they can give to SIF must be balanced with their other pursuits.
 - * poor communications between Aldabra and Mahé, and between Aldabra and the outside world.
 - * agreements, arrangements and decisions are often verbal, with no written record, leading to misunderstanding and confusion.
 - * lack of suitable candidates for supervisory posts on Aldabra results in periods of questionable management, during which valuable progress is often reversed.

3. Opportunities

- The final removal of goats and more action on the removal or control of other alien animal and plant species would perhaps allow Aldabra to become a more natural ecological system.
- With sensitive marketing and handling of eco-tourism, improved visitor information, active promotion of research, and enlightened management, Aldabra has the potential to become a well-managed environmental and scientific ‘showcase’ for Seychelles.
- Limited low-impact nature conservation tourism and good quality scientific research could also help Aldabra become more financially self sufficient.
- Additional strategies for raising money for SIF, other than tourism and research, could be sought.
- The high profile presently enjoyed by Aldabra indicates that there are possibilities for attracting donations.
- Aldabra could become more ‘green’ in its resource management and waste management.
- Rangers working on Aldabra could have the opportunity to train and gain experience in other national parks and reserves, and form part of a cadre of well qualified and dedicated conservation workers.

4. Threats

- Sea-level rise due to global warming could spell disaster for the terrestrial fauna and flora of Aldabra.
- Sea surface temperature changes due to global warming could spell disaster for coral reefs.
- Alien species populations could increase dramatically and upset ecological balances.
- The risk of new alien species introductions is high, particularly with increased tourism and increased traffic between Assumption and Aldabra.
- Poor management of the atoll could result in increased damage and disturbance of ecosystems by visitors, pollution, water shortages, discontinuous monitoring, etc.
- Poaching of both terrestrial and marine species is a continuing threat to Aldabra’s ecosystems.
- Tourism as a dominant activity on Aldabra could be catastrophic for its natural life.
- A large scale fire would impact on all terrestrial life on Aldabra.
- An oil spill in the area would be a disaster for Aldabra’s marine ecosystems, and would have impacts throughout the atoll because of the porosity of the limestone under the land surface.
- Drought is not rare on Aldabra; if it persisted long enough it could present difficulties for the staff and visitors on Aldabra who rely on rainwater.

APPENDIX TWO

ALTERNATIVE SCENARIOS FOR THE FUTURE OF ALDABRA

(Adapted from Augeri and Pierce 1996 and ERGO 1997)

Aldabra's remote, rugged and relatively inhospitable environment imposes constraints on its conservation and management. Financial resources and practical interventions are limited. Several management options

for the future of Aldabra are outlined below. Some of the more obvious advantages and disadvantages of each option are also identified.

SCENARIO 1 : MAINTAINING THE STATUS QUO

Historical background leading to the status quo (as at 1996)

Since the early 1980s, Aldabra has been operated essentially in the same manner as an IDC island, except that there have been periodic Conservation Officers (who in practice have had little authority on the atoll) and a few short-term Wardens with some knowledge of conservation. Aldabra has usually been managed by a "warden" who in reality has been more like a logistics manager, remaining at the station for the majority of his time, supervising workers and tending the store. No patrolling and few other protection/conservation measures have been practised. Indeed poaching of turtles, birds, juvenile tortoises, fresh and salted fish, coconuts and other protected species has often been encouraged or deliberately overlooked by the "warden". Such officers have had little or no education in conservation or science, and have been unable to fulfil their responsibilities in overseeing the Science and Conservation programmes. For more than a decade, visiting scientists have been few and far between and poor management and infrastructure has often hampered operations. When no scientists have been present, the SIF mandate of conservation, monitoring, research and education has frequently been virtually ignored. There have also been considerable problems with staff attitudes, drinking, deleterious behaviour and violence, all of which have taken their toll on the Station, the Science and Conservation programmes and the community. Expatriate workers contracted as Conservation Officer have frequently broken their contracts because of these problems.

Approximately 900 tourists visit Aldabra annually, and they are accommodated on their respective vessels. Zoning of the atoll for different purposes, and tourism policies such as visitor carrying capacity and control of tourism activities have not existed.

Except for the Government grant and the recent GEF grant, Aldabra is minimally supported by its own landing fees and revenues received primarily from entrance fees to Vallée de Mai (SIF's other World Heritage Site).

Consequences of Continuing the Status Quo

In essence, a tremendous potential would be wasted if the status quo is continued. The new scientific facilities and accommodation have expanded Aldabra's capacity to be a world class research station. Unless a concerted effort is made to attract scientists, conservationists, educators, and their projects, the risk exists that these facilities will operate well below their potential, and support and protection for the atoll will continue to decline. If quality monitoring is not maintained, inappropriate wildlife and habitat management decisions will continue to occur and SIF will fail in its mandated priorities of conservation, science and education. Also, if the new facilities are not used, high maintenance expenses and the lack of funding from research programmes will surely take their toll, and there will be heightened pressure to

increase tourism at the expense of the environment. It would then become more difficult to find other sources of funds.

Another important issue revolves around the quality of staff and the authority that scientifically trained personnel have on Aldabra. Although the IDC management structure seems to function fine for islands that produce copra and other products, this structure is clearly not appropriate for a protected area. The people involved with conservation and science should have top authority, as happens in protected areas throughout the world. Wildlife on Aldabra will suffer if poaching is allowed to continue. Violence and other detrimental behaviour, as well as poor attitudes, cannot be tolerated in a Special Nature Reserve and World Heritage Site. The new management structure and policies outlined in this Management Plan should help to some extent, but will not serve their intended functions without properly qualified, honest, conservation-oriented staff who are willing to uphold SIF's mandates of conservation, research and education. Aldabra is operating significantly below its potential and if the status quo continues, the world will lose the essence of Aldabra's richness and all that it stands for, teaches and inspires.

SCENARIO 2: NO INTERVENTION OR MINIMAL INTERVENTION

Arguably, the simplest management option would be for there to be **no human intervention whatsoever** on Aldabra, and for ecological processes to be allowed to take their natural course, particularly in the light of Aldabra's status as a Strict Nature Reserve, World Heritage Site and wilderness area. In the absence of human interference, animal and plant populations would no doubt persist as they have for millennia before; but so too would goats, cats, rats and other introduced species, with uncertain consequences. Also there would certainly be a free-for-all collection of tortoises, turtles, birds, etc. by increasingly sophisticated poachers. It would be impossible to tell what was happening on the atoll.

With **minimal intervention**, a human presence would be maintained on the atoll and routine monitoring would be carried out, but little other additional workload or expenditure would be required. Possibly there would also be some routine patrolling around the atoll. Clandestine removal of animals and plants would be prevented. The advantages would be that costs would be reduced but it would still be possible to gain a scientific understanding of natural processes on Aldabra. However, given the recent major investment in rehabilitation of facilities, this option for non-intervention would be unacceptable, both nationally and internationally. The question then becomes, should the intervention be minimal, as at the present time, or should it take a more pro-active approach? A more pro-active approach incurs greater costs, a substantial increase in workload (and therefore personnel) on the atoll as well as further administrative work and personnel on Mahé.

PROACTIVE APPROACHES

SCENARIO 3: SCIENCE AND CONSERVATION AS DOMINANT GOALS

The best and most highly recommended scenario by experts around the world would be to maintain science and conservation as the top priorities on Aldabra. The atoll is a globally unique group of ecosystems which for evolutionary, ecological, conservation, scientific and educational reasons should not be lost. Preservation of Aldabra's natural systems and instigation of scientific research into these systems are not only the decreed goals of SIF for Aldabra but are key contributions to the world, and fundamental for Aldabra's survival.

If only three science projects were to be conducted per year, a firm scientific presence would be established, ensuring that Aldabra's primary goals are fulfilled and providing SIF with some income. However, specific management procedures and actions that would promote these goals have been lacking. This Management Plan outlines the basic foundation that should ensure the success of this scenario. If

conservation is to remain a top priority, SIF should facilitate staff training and education, implement a true surveillance system, make sure that zoning categories are respected, and firmly enforce poaching and all other policy regulations. Also paramount to preservation is the presence of a qualified Chief Science Officer/Warden, Conservation Officer(s) and Rangers, who have authority over the management and operations of the atoll. Research would be directed toward, and applicable to, conservation and management needs.

A concerted effort would be taken to market for scientists, conservationists and educators, including key contacts at prominent universities. Marketing would be through, for example, advertisements in professional journals and job listings; and also brochures and videos which would be distributed and shown to appropriate audiences. These would feature Aldabra as a research station, and identify research objectives and priorities. Through research projects SIF would receive fees for permits, lodging, transportation, food, personnel and facilities. In addition, an Aldabra Research Fund could be established, to which interested parties would be invited to apply. Regulations would be established for scientists, and manipulative or intrusive research would be extremely limited.

Upholding conservation and scientific research as top priorities would ensure the long-term protection and evolution of Aldabra, while generating funds for its operation. In the long term this scenario would ultimately generate the greatest amount of moral (and financial?) support and protection, not only for Aldabra but also for SIF and Vallée de Mai.

However, in this scenario the education mandate would perhaps be under-emphasised and scientific research alone might not bring in enough funds for SIF and Aldabra to become sufficiently self reliant. An amalgam of scenarios 3 and 4 might provide a more realistic balance.

SCENARIO 4: LIMITED, LOW-IMPACT, NATURE CONSERVATION TOURISM

Limited, low-impact, nature conservation tourism could help support Aldabra financially and, if properly conducted, could be an ecologically sustainable way to educate the public and gain local and international support. In November 1995 a policy for tourism on Aldabra was established, the purpose of tourism being to increase revenue for Aldabra through limited and strictly controlled tourism with a focus on nature tourism and education. In addition to cruise ship tourism, some land based tourism would be allowed. There are several keys to making this scenario work:

- Conservation and science should be maintained as top priorities,
- Marketing should be towards nature conscientious organisations,
- The number and size of groups should be limited,
- Strict conservation and zoning policies should be implemented and enforced,
- All visitors must be properly supervised,
- All visitors should supply the majority (if not all) of their basic living requirements from outside of Aldabra,
- Information for visitors should be improved,
- There should be monitoring for any adverse effects of tourism on the environment or wildlife,
- Freshwater provision should be restricted, unless this issue is addressed in some other way (by desalination operations, for example).

The Management Plan outlines necessary policies and guidelines for tourism management and education. Pro-active management should prepare for increased tourism and ensure that a) all possible precautions are taken to reduce the possibility of negative impacts on Aldabra's environment, and b) tourists are provided with a good quality educational experience while on Aldabra.

There is always the chance that if limited tourism proves successful, there will be a temptation to increase the number of tourists and thus the financial profits. (See Scenario 5)

SCENARIO 5: TOURISM AS THE DOMINANT GOAL AND ACTIVITY

Although the mandate of SIF is to manage and conserve the natural systems of Aldabra and to instigate scientific research into such systems, one possible scenario is that tourism will become the major focus of SIF on Aldabra. If tourism is conducted appropriately and there is enough demand for visiting the atoll, it could be an important source of revenue and a method through which to generate public support (see above). However, placing tourism at the top of the priority list could be devastating for Aldabra in the long term. *Essential to any successful eco-tourism operation is that the preservation and protection of all natural features be the first consideration. Scientific research and monitoring should form the basis from which management and conservation actions that protect those natural features are taken.* Large scale tourism on Aldabra is simply not sustainable. Land-based tourism would be limited by the very nature of the atoll because a) the climate and terrain are harsh, b) transporting tourists around the atoll depends on the tide cycles and would be expensive, c) the natural resources could not sustain heavy use, and d) the atoll does not offer enough diversity or majesty to warrant long treks overland.

There are other aspects to consider in relation to tourism on Aldabra:

- Impacts on wildlife. Many species are vulnerable to disturbance, especially during nesting activities, e.g. turtles, frigate birds, Caspian terns, flamingos, tropic birds. Increased visitation creates stress, nest abandonment, lower nestling survival, etc. Other organisms likely to be impacted by increasing visitation are many of the coral reef and reef flat species. It is now well documented that alien species introductions are an inevitable consequence of increased visitation, and because so many of the introductions are micro-organisms (entering in soil on shoes for example) the impacts are impossible to predict. Fish and other marine food species would be reduced in numbers (see below).
- Impacts on infrastructure. The new accommodation which was recently constructed for scientific visitors would most likely be occupied by higher-paying tourists because they would bring in more money, and therefore the number of researchers, conservationists and educators would decline. In addition, competition for boats, fuel, staff support, etc. could occur between the two user groups.
- Impacts on natural resources. Supporting the basic living requirements of large scale tourism would be catastrophic to Aldabra's natural resources. Fresh water supplies in particular would be totally inadequate for tourist demand (freshwater showers as well as laundry). The impacts of over-harvesting fish would be long-term and would have a consequent effect on many other species because of the complexity of ecological relationships. In addition, resources such as firewood, coconuts, tortoise manure (for gardens), etc. would be under pressure because of the need to provide tourists with a "tropical" experience and fresh vegetables (with consequent likelihood of imported plant diseases and/or pests).
- Waste management. This is already a considerable problem on Aldabra. Tourists are great waste-producers and the problem would simply be exacerbated.
- SIF Staff. The staffing of SIF would have to change completely, because the Executive Officer would become basically a tourist agent and the atoll staff would become tourist guides and "hotel" service workers.
- The need for an airstrip. This possibility has already been raised. Suitable flat land on Aldabra is prime tortoise habitat. Human air safety would be jeopardised by the large numbers of frigate birds and other sea birds.

There are no advantages to having tourism as the dominant goal for Aldabra other than more money.

SCENARIO 6: ALIEN SPECIES INVASIONS FROM ASSUMPTION

Unfortunately, if no preventative measures are taken, a likely future scenario is that one or more alien bird species will invade Aldabra from the island of Assumption (27 km south east of Aldabra). This situation has been recognised since the early 1980s but little has been done in a practical sense, apart from the removal of domestic pigeons.

The effects on some of Aldabra's bird species would be disastrous. From Assumption, the Madagascar Fody (*Foudia madagascariensis*) would probably out-compete and/or create hybrids with Aldabra's endemic sub-species, the Red-headed Forest Fody (*F. eminentissima aldabrana*). The Red-whiskered Bulbul (*Pycnonotus jocosus*) would probably compete severely with Aldabra's endemic sub-species of the Malagasy Bulbul (*Ixos madagascariensis rostratus*) and also impact negatively on other small native birds and some plant species. The Mozambique Serin (*Serinus mozambicus*) and Barred Ground Dove (*Geopelia striata*) would certainly disrupt the ecology of Aldabra.

A pro-active management policy could prevent this scenario from happening. The eradication of alien bird species from Assumption would require the supervision of an expert team, but the cost of this would surely be less than the extinction of endemic subspecies and the disruption of Aldabra's ecology. This needs to be given further consideration. There has been a recommendation that the two islands, Aldabra and Assumption, should be managed in co-operation with each other and ideally as one large reserve. This too needs further consideration.

APPENDIX THREE

LEGISLATION PERTAINING TO ALDABRA

The summary below is taken from a) “Compilation of Environmental Laws and Regulations” by Frank Ally, May 1996, COI Regional Environment Programme, and b) the “Legal Management Framework” prepared by Augeri and Pierce in their draft Aldabra Management Plan. Full legal documents should be available on Aldabra for consultation.

1. National Parks and Nature Conservancy Act - Chapter 141

Primary purpose is to define procedures and regulations for the establishment of a National Park, Special Reserve, Strict Nature Reserve and Area of Outstanding Natural Beauty.

- “Special Reserve” = area in which the characteristic wildlife requires protection and in which all other interests and activities are subordinate.
- Note that the designation “Strict Nature Reserve” is an area set aside to permit the free interaction of natural ecological factors without outside interference except for that which is indispensable for the existence of the reserve. In these areas certain activities are prohibited (see S.10).
- Seychelles National Environment Commission established (this has been superseded by the National Environmental Advisory Council (1994))

a. Designation of Special Reserve (Aldabra) Order S/I 86/1981

- Demarcation of Aldabra Special Reserve.

b. Aldabra Special Reserve Regulations S/I 87/1981

- No person shall damage, remove, or interfere with any property within the reserve.
- No person shall damage or disturb wildlife in the reserve.
- No person shall possess any weapon or explosive device in the reserve.
- No person shall introduce into the reserve any animal, egg, spawn, plant, seed or fruit.
- No fires to be lit in the reserve.
- No pollution or litter to be permitted. Compensation may be paid for any damage caused by pollution.
- A levy of up to one hundred rupees may be charged for entry or services provided. Notice shall be given in the *Gazette* of any fees levied.
- The Foundation (SIF) may with agreement of the Commission (NEAC see above) authorise any act which would otherwise contravene these regulations provided that the act permitted is for the furtherance of scientific research or better management of the reserve.
- The Foundation may with agreement of the Commission restrict public access and the movement of craft.
- Anyone in the reserve shall comply with any directions given by the warden or officer of the Foundation. Any craft in the reserve may be searched by warden, police officer or officer of the Foundation.
- Warden or officer of the Foundation or police officer may board and inspect craft in the reserve if reasonably suspect contravening regulation.
- No person shall obstruct or hinder any warden or officer of the Foundation.
- Any person violating provisions of these regulations liable to imprisonment for three months or a fine of two thousand rupees.

2. Seychelles Island Foundation Decree - Chapter 217

- Interpretation
- Seychelles Island Foundation established as a body corporate to manage and conserve the natural life of Aldabra and to initiate and control scientific research into such natural life.
- The Foundation may at the request of the Seychelles National Environment Commission manage and conserve any other designated area.
- President to be Patron of the Foundation.
- Establishment of Board of Trustees responsible for administering the Foundation.
- Composition of the Board.
- Meetings and conduct of the Board.
- Board may appoint staff and committees.
- A management plan shall be drawn up for the management and conservation of Aldabra which shall be submitted to the Government for approval.
- All income to be exempt from stamp duty and income tax.
- Board may with approval of Minister make regulations.

3. Fisheries Act - Chapter 82 (1986) including Fisheries Regulations (1987)

- Licence regulations.
- Fishing for the purpose of scientific research may be authorised.
- Authorised officer may search and examine any vessel in Seychelles waters.
- Any person using any poisonous or explosive substance to fish liable to a fine of five thousand rupees.
- Any person who kills, chase or takes any marine mammal whether alive or dead liable to a fine of fifty thousand rupees.
- Regulations on shell collection and disturbance.
- No blasting of coral reefs with explosives without permission.
- Regulations on turtle catching (superseded by 1994 Turtle regulations)
- No fishing in protected areas with net dragged across the sea bed.
- No spear guns to be used.
- Protection of female and other specific crustaceans.
- Any protected aquatic organism caught unintentionally shall be returned to the sea immediately with the least injury.

4. Wild Animals and Birds Protection Act - Chapter 247

- Regulations may be made for the protection of wild birds and animals to
 - a. prohibit killing,
 - b. prohibit sale or exhibition,
 - c. prohibit destroying or tampering with nests or eggs,
 - d. prohibit export,
 - e. provide penalties
 and may define areas and periods affected, and wild animal and bird applied or not.

a. Wild Birds Protection Regulations S/I 26/1966

- List of birds which are not protected (i.e. exempt from Ordinance).
- Prohibitions on killing, selling, purchasing or tampering with birds.
- Penalty one thousand rupees or imprisonment or both.

b. Wild Birds Protection (Nature Reserves) Regulations S/I 27/1966

Note: This refers to particular listed nature reserves. Aldabra is served by other legislation.

- Appointment, powers and rights of wardens.
- In a nature reserve no person may
 - a. disturb, catch, shoot or kill any bird,
 - b. tamper with, take or destroy eggs or nests of any bird except those not protected under the Wild Birds Protection Regulations.
- Responsibilities of owners of nature reserves,

- List of islands plus Vallée de Mai which are nature reserves.
- c. Wild Animals (Giant Land Tortoises) Protection Regulations S/I 59/1974**
 - Giant Land Tortoises (*Testudo elephantina*) declared to be protected.
 - No person shall take or kill any giant land tortoises.
 - No person shall purchase, sell, expose for sale or export any preserved or stuffed giant land tortoise.
 - Fine of one thousand rupees or imprisonment for one year or both,

d. Wild Animals (Turtles) Protection Regulations S/I 46/1994

- Turtles declared protected.
- No person may disturb, catch, injure, kill, sell, purchase, keep any turtle or turtle eggs.
- No person may possess, sell, purchase any raw, worked or treated shell of turtle or products made from turtle shell or any part of a turtle.
- Procedures for holder of turtle shells owned prior to the implementation of this Act.
- No person shall export or import turtle shell or any product of turtle shell
- Penalties for contravention.
- Institution of proceedings.
- Permission may be granted by Minister to any person for scientific research or monitoring of turtles.

5. Maritime Zones Act - Chapter 122

Defines the EEZ and Continental Shelf and regulations pertaining to these. Of relevance:

- All foreign ships except as specified below shall enjoy the right of innocent passage in the territorial waters. (Specified are foreign warships, submarines, which must inform the President's Office first)

a. Maritime Zones (Marine Pollution) Regulations S/I 51/1981

- No oil or oily mixture may be discharged into the territorial seas of Seychelles or discharged elsewhere so as to pollute the territorial seas. Any person violating this, imprisonment for five years.
- There are certain conditions which may be used as special defence, e.g. discharge necessary for safety reasons, or due to damage to the vessel and all steps taken to reduce the discharge.
- Duty to report any discharge to the Harbour Master indicating amount and position of discharge.
- Pollution Control officer may be appointed who may without warrant stop and board any vessel and carry out inspection, seize any offending vessel and arrest anyone believed to have committed an offence.
- Person causing discharge liable to costs incurred in restoring any land, animal, wildlife affected by discharge.

b. Merchant Shipping (Oil Pollution)(Seychelles) Order, 1975

Defines the liabilities of the owner of any ship discharging or allowing the escape of oil, and regulations concerning vessels carrying more than two thousand tons of oil, insurers of ships, jurisdiction, etc.

6. Licences Act - Chapter 113

Licensing Authority established and definitions given for its functions, its authority, applications for a licence, offences, penalties. Of relevance:

- No person shall without a licence
 - * engage in any activity, trade or business listed in schedule one,
 - * keep, use or possess any animal, goods or vehicles listed in schedule two,
 - * keep, or manage any premises listed in schedule three.
- Minister may exempt any person or premises from the operation of this provision.

Schedule one: Activities, professions, trades and businesses requiring a licence.

Schedule two: Goods, animals, vehicles and vessels requiring a licence.

Schedule three: Premises requiring to be licensed.

Under this Act, the following regulations may be pertinent:

- a. Licences (Accommodation, Catering and Entertainment Establishments) Regulations S/I 16/1987**
- b. Licences (Fisheries) Regulations S/I 24/1987**

APPENDIX FOUR

ALDABRA STAFF WORKING CONDITIONS 1998

1. RESIDENCE ON ALDABA

- 1.1 Staff are expected to be resident on Aldabra for the period of their contracts.
- 1.2 Accommodation is provided free of charge.

2. AUTHORITY ON ALDABRA

- 2.1 The warden has authority over everyone resident on or visiting Aldabra. He/she will set and supervise the work programme according to the SIF Management Plan and is responsible for staff assessment, pay and discipline, including dismissal.

3. HOURS OF WORK

- 3.1 Hours of work will be 7am - 3pm Monday to Friday with one hour break or, if authorised by the Warden, 7am - 4pm with two hours break. In addition, hours will include 7am - 12 noon on Saturday. Field trips often involve night work. 12 hours at normal rate per camp day will be paid to cover all work done.
- 3.2 All staff are subject to the provisions of the Employment Act. A copy is held in the Warden's office.
- 3.3 Any worker feeling unable to work through injury or illness must inform the Warden immediately.

4. SALARIES AND STAFF ASSESSMENT

- 4.1 Staff will be assessed annually by the Warden and salaries may be reviewed based on merit and Government guidelines, subject to approval of SIF.

5. LEAVE

- 5.1 Staff are entitled to 1.75 days paid leave per month plus public holidays when no work is required. Staff are expected to work on public holidays when required, and will be paid overtime rate for hours completed or given additional leave at the due date.
- 5.2 Leave must fit in with the work programme and must be authorised in advance by the Warden, who must be given at least 2 months notice of intended time off Aldabra. Leave will normally be taken off Aldabra, i.e. on return to Mahé.

6. NATURE RESERVE

- 6.1 Part of the work of the staff is to keep the atoll, particularly around houses and camps, clean and tidy. This will include clearing litter and maintaining buildings and equipment.
- 6.2 Management and monitoring work for Rangers will include vegetation clearance and path-cutting, and Field Workers will also be expected to carry out animal and bird counts etc., if required.
- 6.3 All wildlife in and around the atoll is protected. Any member of staff removing any plant, egg or animal (including birds, turtles, tortoises and Robber Crabs), unless specifically authorised by the Warden, will be dismissed and be liable to prosecution.
- 6.4 The island reefs are also protected and no marine life is to be taken within 1000 metres of the shoreline, except for subsistence fishing (see clause 7.2 below).

7. AGRICULTURE AND FISHING

- 7.1 Any growing of vegetables for communal use will be integrated into the work programme by the Warden.

7.2 Fishing trips must be authorised by the Warden in consultation with the Boatmen, such trips to be for supply of island residents only. Fishing must always be outside protected areas (which include the lagoon) as defined by SIF, unless specifically authorised by the Warden.

8. BOATS

8.1 All staff are expected to help with boats when required.

8.2 Boats should be on moorings by 6pm for reasons of safety unless authorised by the Warden.

8.3 All boats and engines must be maintained in good condition. This is the responsibility of the Boatman, with the assistance of the Mechanic. Any faults or replacement parts required must be notified immediately to the Warden.

8.4 Boats and engines are to be used only for island business. All trips must be authorised by the Warden. Only designated Boatmen should drive the boats.

8.5 No intoxicating substances may be consumed on the boats.

8.6 Prior to any boat trip, it is the responsibility of the Boatman to ensure all safety equipment is on board and in good working condition.

9. TOURISTS

9.1 All staff are expected to help land and launch tourists when required.

9.2 It is part of staff responsibility to help present a good image of the Station to visitors.

9.3 No person is allowed to visit Aldabra without the prior permission of SIF.

10. ANTI-POACHING

10.1 Anti-poaching patrols are part of the work of the staff. Any indications of the taking of wildlife, especially birds, turtles, tortoises and Robber Crabs, must be reported to the Warden. In the event of staff being called by the Warden to help with a poaching incident outside normal working hours, they will be given time off subsequently or paid overtime as appropriate.

11. GENERAL

11.1 Staff are responsible for clearing away all domestic rubbish from around their houses and for disposing of it in agreed pits or bins. Burnable waste should be carefully burned at agreed sites. No litter is to be thrown anywhere except in agreed pits and bins.

11.2 All houses must be kept clean and well maintained. Minor repairs, wall painting, etc., will be carried out as necessary using tools and materials provided. The Warden will authorise structural or carpentry work as required.

11.3 All equipment and tools must be used safely and correctly, and cleaned and stored after use. Breakage or loss should be reported immediately to the Warden.

11.4 Insecticide chemicals or other noxious substances may not be used due to the danger to wildlife, except as agreed by the Warden.

11.5 Copies of the Employment Act (1995) and revised Public Services Order are held in the Warden's office.

11.6 Staff must show courtesy and respect at all times to all other island staff and to researchers, tourists and other visitors. Failure to do so constitutes a Disciplinary Offence, and repeated failure a Serious Disciplinary Offence.

11.7 Staff are reminded that under Seychelles law it is gross misconduct to be under the influence of alcohol at any time during working hours. The use of 'lapire', 'bacca' or illegal drugs will also result in immediate dismissal.

ALDABRA MANAGEMENT PLAN

**A management plan for Aldabra Atoll, Seychelles
Natural World Heritage Site
1998 - 2005
(Version 1: 1998)**

Section 2 : Operations Manual

**prepared by
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for**

Seychelles Islands Foundation

GEF/World Bank

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INTRODUCTION

This operations manual is intended to be used as a guide to the day-to-day management of Aldabra and also sets out all monitoring procedures and guidelines for the science and conservation programmes. While these guidelines have been selected by the Seychelles Islands Foundation as the best way to manage Aldabra, adjustments may be necessary when on site experience demands. Any such alterations need to be authorised by the Warden who should inform the Executive Director and include a justification in the next bi-monthly Warden's report. Copies of this Operations Manual are to be kept by all senior staff on Aldabra and must be made available for reference to all other staff and visitors to Aldabra.

A. BASIC OPERATIONS

PART ONE

SEYCHELLES ISLANDS FOUNDATION POLICIES FOR ALDABRA

- 1.1 No live animals, plants or other species may be taken out of the Reserve. Disturbance and habitat interference should be kept to a minimum and be restricted to research and conservation needs, as dictated by the Scientific Sub-Committee, Warden or Research Officer.
- 1.2 No corals, shells, geological, botanical or zoological specimens may be removed from the Reserve unless expressly approved for research projects by the Board of Trustees on the advice of the Scientific Sub-Committee, Warden or Research Officer.
- 1.3 Sharks and rays are not to be killed for any purpose.
- 1.4 Land crabs and robber crabs are not to be killed for any purpose.
- 1.5 All birds are protected and are not to be killed or disturbed.
- 1.6 Marine turtles are strictly protected. Hunting and killing of turtles, disturbing nesting females or the taking of eggs are strictly forbidden.
- 1.7 Giant land tortoises are strictly protected and are not to be hunted, killed or disturbed. Young animals are not to be collected, penned or removed from the atoll.
- 1.8 No fishing is permitted for sport and leisure within the boundary of the reserve. Fishing outside the reef may be permitted only for subsistence purposes for the Station and field camps. Fishing in the lagoon is strictly limited to basic subsistence for staff en route to field camps, only when travel along the exterior of the atoll is not possible. Fishing in the inner island pools and on the coral reefs is strictly prohibited.
- 1.9 Fishing is allowed only to feed those persons living on the atoll. Fish may be dried for consumption on the island, but not for export from the island.
- 1.10 Killing of any species (other than basic fish requirements) for consumption by staff or visitors is strictly prohibited. Poaching is considered a major offence and punishable according to Seychelles law.
- 1.11 No live animal or vegetable matter may be imported into the reserve without prior permission of the full Board of Trustees and clearance by pest control services. Any unauthorised entry will be immediately destroyed or removed in an appropriate fashion.
- 1.12 Chickens must be kept in coops at all times. Under no circumstances are other non-native species allowed on the island.
- 1.13 All vessels must have clearance in writing from SIF head office before visiting Aldabra. Vessels approaching Aldabra must identify themselves and when within 1 km. of the shore are answerable to the Warden.
- 1.14 All boat visits must be reported to and authorised by the Executive Director. No fishing boats should enter Aldabra waters. Charter boats must always be supervised and must never enter the lagoon unless special circumstances prevail (cyclone, etc.).

- 1.15 Visiting vessels must not bring rubbish ashore nor leave rubbish behind for disposal.
- 1.16 Only the Foundation's boats and zodiacs, and zodiacs from visiting vessels, under the supervision of the Warden, Research Officer or delegated staff, are permitted in the lagoon.
- 1.17 The use of boats is by authorisation of the Warden only.
- 1.18 No solo trips out of sight of the station are permitted. Use of boats without authorisation will incur the cumulative cost of the trip to the offender and will be deducted from his salary.
- 1.19 All persons leaving the station by boat for field camps or other work-related trips are obliged to wear life jackets.
- 1.20 No visitors are allowed to wander unsupervised anywhere within the Reserve. Visits are restricted to guided trail walks on Picard, boat excursions to the frigate colony west of Passe Gionnet, and guided visits to view white-throated rails on Polymnie, Gionnet or Middle Camp. Drift diving is only permitted in the channels. No other locations within the Reserve are open to visitors.
- 1.21 Use of the communication equipment for SIF business is permitted to all senior staff but by authorisation of the Warden only. All personnel should be given a brief training session on its use; the unauthorised use of this equipment is permissible only in cases of emergency. All private calls, e-mails or faxes will be charged to the caller (N.B. Faxes to/from Aldabra are prohibitively expensive).
- 1.22 The scientific station facilities, including library and laboratories, are reserved for scientific and authorised personnel only.
- 1.23 The premises around the station, research block and other facilities should be kept clean at all times.
- 1.24 All debris/waste should be disposed of in an appropriate fashion. Refer to "Operations Manual, Part Four: Waste Management".
- 1.25 All personnel are liable for malicious or negligent damage to SIF property.
- 1.26 All staff luggage will be checked by the Warden before staff leave the atoll.
- 1.27 The importation and use of loud sophisticated hi-fi equipment, tapes, radios etc. is not permitted. This is to avoid disturbance to the environment, particularly to avoid disturbance of nesting turtles close to accommodation units. Noise levels causing discomfort for other staff members are not permitted.
- 1.28 The only liquor that is allowed to be consumed on the atoll by the workers is that which they purchase from the station store. Anyone found contravening this policy will have his contract terminated and will return to Mahé on the next available boat.
- 1.29 The availability of beer from the station store is controlled by SIF and overseen by the Warden and Logistics Superintendent. No Guinness stout or hard alcohol is allowed on Aldabra.
- 1.30 Threats with and use of dangerous implements with intent to harm is strictly prohibited. Dangerous weapons include knives, machetes, penknives, axes, saws, blades, etc.. Included in this list are dangerous substances, such as explosives, that pose a threat to the security of persons or property. Offences under this policy will incur a strict warning on first offence; the offender should be made aware at this point that any further breach will result in immediate contract termination and dismissal as well as possible incarceration while waiting for the next available transportation to Mahé.

1.31 Any exceptions to the policies for legitimate scientific research purposes must receive prior approval from the Board of Trustees of Seychelles Islands Foundation.

PART TWO

ALDABRA PROTECTION AND ACCESS ZONES

2.1 RESTRICTED ZONE

2.1.1 Zone Definition

Access is restricted to these areas due to their ecologically sensitive nature. Breeding and nesting sites, and critical habitat areas are included and may be subject to seasonal closures. The environment is in a healthy state and samples of the native bio-diversity that require absolute protection are also included. All precautions to avoid alien species introductions must be practised and in general, the activities allowed in this zone are selective and limited. These include limited, non-intrusive, non-manipulative research and monitoring. No tourism activities are allowed in this zone.

2.1.2 Zone Description

- a) The Takamaka flamingo pool where greater flamingos have been known to breed.
- b) All seabird and frigate colonies east of Camp Frigate Gionnet and inland habitats.
- c) Areas around Caspian tern, sacred ibis and greater flamingo breeding sites.
- d) Portions of Malabar and Grande Terre, some lagoon islets and inland habitats (e.g. Bassin Frigate, Bassin Flamant, etc.)(see Map).
- e) The discovery of unknown populations of rare endemic fauna or flora may necessitate Restricted Zone status being given to areas outside this zone.

2.1.3 Zone Objectives

1. To protect highly sensitive species and habitats.
2. To provide limited and controlled opportunities for research in relatively unaltered areas.

2.1.4 Restricted Zone General Human Uses

1. Scientific and conservation related monitoring.
2. Limited non-manipulative scientific and conservation related research
3. Alien species removals.
4. Limited, controlled official visits.
5. Limited, controlled filming and photography.

2.1.5 Specific Restricted Zone Policies

1. Any activity that alters or damages any species and its natural environment is strictly prohibited.
2. Strict management actions will be taken to discourage any species introductions or inappropriate uses.
3. The number of people allowed in the zone is limited to six per group. No two groups may occupy an area simultaneously. Entry is allowed only with official permission from the Warden, Research Officer and SIF headquarters.
4. Limited scientific studies may be allowed, with SIF and the Warden's approval, only when the objectives cannot be accomplished in other areas of the Reserve. All measures must be taken to reduce the possibility of wildlife detecting human presence (i.e. bird blinds, etc.), approved by SIF and the Warden for this zone.
5. Film and special visitor groups must be accompanied by either the Warden or Research Officer during any visit to this zone.
6. The work of SIF scientific/conservation staff and authorised researchers will have precedence over cinematographers/photographers and other special visitors.

ALDABRA PROTECTION AND ACCESS ZONES

Restricted Zone

Protected Zone + Areas Subject to Seasonal Closure

Tourist Access Zone

7. Seasonal closures (i.e. breeding, nesting, etc.), closures due to excessive or unnecessary impacts, and closures for scientific/conservation reasons may be issued by the Warden after careful analyses. All such closures should be reported in the Warden's bi-monthly report, stating the reasons.
8. All visits to these areas will be monitored and strictly limited.

2.1.6 Indicators of Impact

1. Increase in introduced alien species or success of any removals of alien species.
2. Alteration in the population structure, abundance, function, or behaviour of wildlife.
3. Increase in egg/nesting mortality.
4. Destruction or alteration of habitats.
5. Evidence of poaching.
6. Number of groups or individuals entering the zone annually and during peak nesting seasons.
7. Number of warnings or fines issued for violating the zone's policies.
8. Pollution.

2.2 PROTECTED ZONE

2.2.1 Zone Definition

This zone covers the largest portion of the atoll where the environment is in a relatively natural state. Introduced species are present, but all precautions should be practised in order to eliminate them and prevent further introductions. Opportunities for scientific monitoring and research predominate with film/photography and special visitors allowed under strict supervision and limits. No formal tourism activity is allowed in this zone. Areas within this zone are subject to seasonal closure.

2.2.2 Zone Description

This zone covers the majority of all four of the atoll's islands and many islets. Small areas are excluded from this zone such as those requiring Restricted Zone protection due to sensitive species, the Station and Settlement areas, and Tourism Zones. All other land and marine areas fall under this category.

2.2.3 Zone Objectives

1. To maintain and restore the area's ecosystems to ensure the continued existence of the bio-physical aspects of the Reserve.
2. To offer experience in research, conservation education and training in field methods.
3. To provide opportunities for scientific monitoring and research with minimal intrusion and manipulation.
4. To provide an environment where wildlife and flora can reproduce and exist without interference.
5. To offer film/photography opportunities to authorised visitors and personnel.

2.2.4 Protected Zone General Human Uses

1. Scientific and Conservation related research and monitoring.
2. Film/photography.
3. Visits by authorised visitors only (authorisation to be given in writing by Head Office, Mahé).
4. Alien species removals.

2.2.5 Specific Protected Zone Policies

1. Only rustic infrastructure that is essential for scientific research and resource protection is allowed (i.e. field huts, necessary trails, water storage tanks, etc.).
2. Scientific research activities may take place only with prior authorisation by SIF.
3. Personnel are allowed to eradicate introduced pest species, but only under the supervision of the Warden, the Research Officer, Rangers or Scientific Assistants.
4. Only those visitors or researchers authorised in writing by SIF and accompanied by a technical SIF staff member are allowed to visit.

5. All management precautions should be taken to eliminate and prevent the introduction of alien species in this zone.
6. No forms of tourism are allowed in this zone.

2.2.6 Indicators of Impact

1. The degree of degradation or recuperation of the natural environment.
2. The presence of unauthorised camping sites.
3. The establishment of unnecessary and excessive trails.
4. The number of visitors and researchers entering this zone per year.
5. The number of warnings or fines issued for policy violations.
6. Change in population structure, abundance, function or behaviour of wildlife due to human impact.
7. The level of success in the elimination of alien species.
8. Increased abundance of existing alien species or introduction of any new alien species.

2.2.7 Seasonal Closure Objectives

1. To provide an environment as conducive as possible to the successful reproduction, breeding, nesting, recruitment and rejuvenation of particular species that are highly sensitive to human disturbance.
2. To provide very limited and controlled opportunities for research and photography/film documentation of these life cycle processes.

2.2.8 Areas Subject to Seasonal Closure within the Protected Zone

1. Camp Fregate, Middle Camp and Gionnet frigate colonies and inland habitats.
2. Ile Michel, Bras Cinq Cases, Ile Polymnie, Ile Moustiques, Ile Esprit

2.2.9 Specific Seasonal Closure Policies

1. No-one is allowed in seasonal closure areas except for very limited authorised monitoring and research projects or special film/photography projects.
2. No motorised vessels are allowed to approach the frigate colonies under seasonal closure, except for poaching surveillance for which all vessels must remain at a reasonable distance.
3. The closure period for the Takamaka flamingo basin is under Restricted Zone status until accurate research can suggest otherwise. If evidence of breeding and nesting occurs on other sites, these sites shall also be included in this classification.
4. The closure period for those frigate bird colonies in this zone is 1st July through 31st January.

2.3 TOURIST ACCESS ZONE

2.3.1 Zone Definition

These areas have been selected for their rich biodiversity and scenic value as well as their ability to support limited, well-managed nature conservation and educational tourism. Due to physical limitations (accessibility, erosion, etc.) or biological limitations (vulnerability of species) these areas can only support a limited number of visitors and special considerations/guidelines must be practised. The natural environment in these areas is relatively unaltered and usually of exceptional interest to tourists because of the wildlife and plant species located therein.

2.3.2 Zone Description

In general, this zone includes the Old Settlement area to La Gigi, Grande Passe, and inside the lagoon from Grande Passe to Camp Fregate. Snorkelling and diving along the barrier reef in front of the station, Gionnet Passe and Grande Passe are permissible for small groups only. Also permissible are guided and strictly controlled trail walks from Anse Var to La Gigi, Bassin Labine and along the Station "Back Path" from the cemetery to the station. SIF guided and strictly controlled small boat tours to view frigate colonies between Grande Passe and Camp Fregate including Gros Ilot Polymnie

and Gros Ilot Gionnet. A special arrangement with diving vessels allows them diving access to all channels and the barrier reef, but no landing rights except on Ile Picard (for an extra fee).

The path through the casuarina grove at Camp Malabar is reserved as a possible guided trail walk if cruise ships are unable to use any of the regular excursions.

2.3.3 Zone objectives

1. To provide opportunities for visitors to experience the uniqueness of Aldabra.
2. To provide opportunities for financial support for Aldabra via tourism.

2.3.4 Tourist Access Zone General Human Uses

1. Scientific and Conservation-related research and monitoring.
2. Limited, well-managed nature conservation and educational tourism.
3. Training, education, film/photography, and other special programmes.

2.3.5 Specific Tourist Access Zone Policies

1. Only groups with a maximum of 20 persons per guide on land will be permitted, not to exceed 120 persons per visit. Only groups with a maximum of 10 persons per guide by boat will be permitted, not to exceed 10 boats per visit in small groups of 3-4 boats spaced approximately ten metres apart. No-one is allowed to leave the boat during visits to the frigate colonies.
2. All visiting groups must be accompanied by an SIF guide.
3. A visitor-carrying capacity shall be determined through approved scientific research and adhered to for each site.
4. All visitors must stay on the designated trails except in those open areas where the guide will supervise the group's movement.
5. No visitor will be allowed to collect any shells, animals, plants, geological or other specimens or artefacts anywhere on the atoll.
6. While diving or snorkelling extreme caution must be practised to avoid damaging corals and/or other sensitive marine organisms.
7. No support vessels are permitted to anchor except in designated sites off the Station beach and, while diving, must moor or maintain positions without anchoring.
8. All policies and regulations listed under the Tourism and other sections in the Management Plan apply.
9. Chasing or following any wildlife species, including marine organisms, for any reason other than approved scientific research and monitoring, is prohibited.
10. All dive operations are obliged to carry one SIF Ranger, ideally qualified to Dive Master standard, to act as both guide and monitor.
11. A record of all tourist activity will be maintained by the Warden on a standard recording form. This will record date, site, activity, duration, numbers, guide, any other observations (particularly of disturbance to wildlife or misbehaviour).

2.3.6 Indicators of Impact

1. Change in population structure, abundance, function or behaviour of wildlife.
2. Increase in erosion.
3. Presence of garbage or pollution left by visitors or tour operators.
4. Damage to coral and reef systems.
5. Level of tourists' satisfaction.
6. Increase in egg/nestling mortality or predation on seabirds, turtles, tortoises or other sensitive species.
7. Degradation or recuperation of natural environment.
8. Increased abundance of existing alien species, introduction of other alien species, and level of success in removals.

PART THREE

INFRASTRUCTURE

3.1 INTRODUCTION

All infrastructure, except for the field huts, is located on the island of Picard along the Station and Settlement beaches. The oldest buildings are located in the “Old Settlement”. During the days of the Royal Society, the support staff lived in the Old Settlement and the scientists stayed in an accommodation block that has since been rebuilt. The chapel and prison in the Old Settlement were renovated during the 1996 GEF reconstruction. Other older buildings that are standing and are being utilised include five bungalows, the shop and storage room, the generator building and the workshop. No further expansion of the research station or settlement may be undertaken without a full environment impact assessment.

3.2 BUILDINGS RENOVATED IN 1996

3.2.1 Laboratory and Library

A wet and dry laboratory and a new library are located in the laboratory building. This building has a darkroom and storage space for field collections. The air-conditioned library contains many scientific articles published about research on Aldabra and also a wide variety of scientific texts, maps etc.

3.2.2 Technical Staff Housing

The Warden, Research Officer and Rangers’ quarters have been improved. The Warden’s house and office is conveniently located within one building where the communications equipment is located. The Research Officer also has a separate 2 bed-roomed house complete with kitchen and bathroom. A Duplex for the Rangers is equipped with kitchen, bath and study rooms.

3.2.3 Dining and Recreation Complex

A new dining complex has been built and features not only a large dining area, kitchen and T.V. room, but there is also a liquor store, bar and counter top as well as two toilets.

3.2.4 Visitor Centre

The old coral building between bungalows No.3 and No. 4 is used as a reception area for cruise ship passengers. They are able to leave their life-jackets, snorkelling gear and bags in this building. It is also the obvious place to display information and to sell fund-raising items.

3.3 FRESH WATER SOURCES

3.3.1 Sources

Almost all fresh water on Aldabra is rainwater collected from roofs of buildings and stored in large water collection tanks. Barrels are set up at some staff houses to collect rain water. This system is precarious even when only SIF staff members are occupying the station. Several drought years have led to very sparse water supplies towards the end of the dry season. This is an issue that must be taken very seriously. Water for flushing toilets is on a separate system using sea-water and is not restricted. There is also a portable electric de-salinators.

3.3.2 Fresh Water Use

Water conservation practices should be discussed at the general staff meetings. Management should ensure that these practices are implemented.

- All drinking water should ideally be boiled first.
- All field huts must be equipped with proper water collection tanks, complete with good filtering screens.
- Extra water barrels and jerry cans filled with fresh water should be stored and periodically replaced at all field camps.
- During the dry season, dish-washing in the field should be conducted with sea-water and liquid soap, rather than using precious fresh water.
- Separate water collection barrels and collection systems on all roofs should be compulsorily used and maintained, in addition to the large community tanks. All water for approved gardens should come from these additional water collection barrels only.
- Water filters should be in place, maintained and periodically replaced for all Station and Settlement drinking.

3.4 FIELD CAMPS AND TRAILS

There are several field camps/huts around the atoll that are used as base camps for technical staff and researchers. Many of the technical staff and researchers will spend much more time in these facilities than in the Station facilities. The huts are simple shelters equipped with cupboards, tables and a rainwater collection tank or barrel.

Although much of Aldabra is virtually impenetrable due to dense shrub and coral pinnacles, there is a series of trails leading to field camps and points of interest such as to Bassin Lebine, Bassin Flamant, Croix Blanc and the Upside-down Jellyfish Pool etc. Most trails are single track, averaging 45-50cm wide and maintenance is based on need only. There are trails that run from the north-eastern point of Grande Terre to the East Channels, making it possible to walk back to the station in case of emergency, but there are several channels to cross that can be quite dangerous, especially during Spring tides.

3.5 GENERAL MAINTENANCE

3.5.1 Station Buildings (Annual)

1. Treat all external timber on new buildings with treatment substance provided by manufacturer.
2. Check all doors and windows and replace faulty catches, locks, hinges or glass panes.
3. Check all guttering and down pipes and ensure there are no leaks or blockages.
4. Inspect interior of all buildings and make good any damage. Re-varnish if walls show signs of wear.
5. Check all cupboards, drawers and worktops for damage and make good if necessary.
6. Check all electric sockets and lighting circuits for proper functioning and repair any damage.
7. Inspect floor tiles and replace any cracked or damaged tiles.
8. Treat all external floor decking and handrails.

3.5.2 Bungalows (Annual)

1. Check all external sheeting and roofs for corrosion and replace damaged sheets.
2. Check all louvre windows and ensure mechanisms are functioning. Replace any broken louvres.
3. Inspect doors and repair or replace hinges or locks as necessary.
4. Inspect floors for damage or rot and repair where necessary.
5. Repaint doors, window frames and internal walls.
6. Check all electric sockets and lighting circuits for proper functioning and repair any damage.

3.5.3 Old Settlement Buildings

1. Check roof sheeting, replace any damaged or corroded sheets and repaint all roofs.
2. Thoroughly check all buildings and repair and repaint. Exterior paintwork to be repainted annually.

3.5.4 Water Storage Tanks (Annual)

1. Inspect and make good any damage to walls and floors.
2. Inspect roofs, replace any damaged or corroded sheeting.
3. Inspect all supply piping and clean out or replace where necessary.

3.5.5 Maintenance of Station and Settlement Grounds

- The station and settlement grounds must be kept clean and free of any rubbish. Twice weekly the grounds are to be cleaned up, and extra clean-ups should be made in preparation for any cruise-ship visit. This clean-up is to include the area between the bungalows, houses and the edge of the vegetation.
- Trails in the vicinity of the settlement are to be inspected monthly and any rubbish is to be removed. When leading tours, guides must make sure that they personally retrieve any rubbish that the tourists remark on.
- Rubbish bins must be placed at suitable sites around the research station and settlement. These bins must indicate that they are to be used for paper and other biodegradable waste, not for bottles and tins. Separate bins for glass and metal must be used.

3.5.6 Beach Cleaning

- All rubbish that is washed up along beaches where tourists and other visitors may visit must be removed.
- The Settlement beach and the shoreline of Passe Femme must be cleaned once a week, and extra clean-ups should be made in preparation for any cruise-ship visit.
- Rubbish is never to be disposed of by burning it on the beach crest as has been done in the past.

3.5.7 Maintenance of Field Camps

- All field camps are to be cleaned and the field huts are to be left ready for occupation at the end of each visit. There is to be no rubbish dumped, buried or otherwise disposed of at any field camp - all rubbish is to be returned to the Station for proper disposal.
- Before leaving a field camp an inspection is to be carried out by the most senior member of the party and a report on the maintenance needs, emergency supplies and water storage is to be made to the Warden.
- Note that all field trips, including maintenance visits, should be entered on Event Record cards and recorded in the Aldabra Data Unit.

3.5.8 Field Hut Maintenance

After each visit:

1. Inspect the hut and report to the Warden, in writing, any damage or serious wear and tear.
2. Make an inventory of emergency supplies left at the camp.
3. Inspect water storage, roof gutters and downpipe.
4. Check field camp has been cleaned and that no rubbish has been left. Return all rubbish to the Station.

Note that hut maintenance should be recorded as above.

3.5.9 Trail Maintenance and Impact Assessment

- Trails are to be maintained by Rangers and field staff on a continual basis by removing fallen vegetation and debris. Each trail should be cleared and the markers repainted at approximately six-monthly intervals.
- All trail clearances should be recorded in the Aldabra Data Unit file under 'Trails' (see Part Eight).
- Any change to the trails must be authorised by the Warden. Major alterations also require the approval of the Scientific Sub-Committee.

PART FOUR

WASTE MANAGEMENT

4.1 ORGANIC WASTE

4.1.1 Food scraps

- Food scraps are not to be thrown behind the kitchen where they can be consumed by tortoises, sacred ibises, crabs and pied-crows. Reliance on this unnatural source of food among these animals, particularly the sacred ibis, should not be encouraged.
- In the field, food scraps that are thrown out are usually consumed by tortoises. This occurs sporadically enough and in small enough amounts that there is little need for concern about the animals becoming dependent upon food scraps.

4.1.2 Station/Settlement Compost Site

- All organic waste at the Station and Settlement is to be collected and disposed of in one enclosed area. This will reduce problems caused by disposing of food scraps in random locations.
- While it is recognised that compost requires some ventilation; sunlight, etc., this site should be firmly secured with fencing on all sides, top and bottom, against invasions by birds and tortoises.
- The product of this compost can be used as fertiliser for the Station garden.
- Note that regular rat trapping should be carried out around the compost site (see 10.3).

4.2 HAZARDOUS WASTE

4.2.1 Toxic Waste and Combustible Materials

All such materials, (including all batteries) must be properly contained in metal barrels, completely sealed and safely stored until they are transported to Mahé on the supply boat for proper disposal. Under no circumstances are toxic waste and combustible materials to be disposed of on land or sea!! In addition, the captain of any ship transporting this waste to Mahé must present SIF with a ship's manifest to verify that the waste has been landed on Mahé.

4.3 OTHER WASTE

4.3.1 Solid Waste

- Paper products may be burned in designated areas on the station grounds.
- All glass, tin, plastic and other non-paper/wood products are to be stored in metal barrels and transported via the supply boat to Mahé for proper disposal. Any form of solid waste, other than iron/metal is not to be disposed of on land or sea.
- All metal waste must be completely cleaned of all oils or other toxic compounds if it is to be disposed of at sea. Such cleaning should be conducted in one area that is at least 100m away from any critical habitat or water body.
- Clean metal, may be disposed of at sea no closer than 5 km from the atoll's high water line. It is, however, preferable to return scrap metal to Mahé.

4.3.2 Waste Water and Sewage Treatment

The former soak-pit system has been upgraded to a septic tank system. This should be adequate for the present. However, if station use increases due to more scientific and tourism activity, a small treatment plant may become necessary. The proper functioning of the present system should be watched by the Engineer and Warden in case it needs upgrading.

4.3.3 Waste Disposal in Field Camps

The amount of packaging utilised in field food and supplies must be minimised.

The previous system of disposing of solid waste in holes among the coral pinnacles is no longer permitted.

All rubbish must be returned to the Station after every trip. This is the responsibility of the Boatmen to organise and the Research Officer to oversee. In addition, all existing rubbish in field camps, including that in champignon pits, must be removed, returned to Picard and be disposed of properly. Sewage disposal at field camps will become a problem with increased usage. Consideration should be given to the location and maintenance of permanent toilets.

PART FIVE

OPERATION OF BOATS

5.1 PERSONS WITH AUTHORITY TO OPERATE BOATS

Extensive training is needed to prepare SIF staff to operate all boats, including coastguard or similar training to drive and navigate the powerful and valuable rapid response boat. Those staff with the authority to operate this particular vessel and who should receive training if needed are the Warden, Research Officer and properly trained boatmen. The following individuals are permitted to operate other Station boats. All of these individuals must also receive training in engine and boat repair and maintenance, location of key passages through the lagoon, reef and channels as well as dangerous areas to avoid, and the reading of tides and tide charts.

5.1.1 Boatmen

SIF has designated boatmen who are responsible for the operation of SIF boats.

5.1.2 Warden

The Warden may operate boats at any time providing that he/she is experienced with boat operation and has had proper training.

5.1.3 Research Officer

If the Research Officer has a sufficient amount of experience and training with boats, he/she may operate a boat in special situations. These situations include and are not limited to: investigating marine mammals or other marine wildlife that may be passing the atoll; conducting conservation-related observations when the boatmen are not available and the opportunity to make such observations is timely; poaching patrols; and emergencies when the boatmen are either absent or incapacitated.

5.1.4 Logistics Superintendent

Given proper training and experience, the Logistics Superintendent may operate a Station boat during situations that require more boatmen than are available (e.g. with tourists, visiting scientists, or other special visitors), during supply boat or other vessel visitations, emergencies, etc.

5.1.5 Engineer

The Engineer may operate boats during maintenance and repair only.

5.1.6 Non-Technical Staff

All staff, including all Field Workers, Carpenters, Cleaners etc. as well as any long-term visiting scientists and special visitors on Aldabra shall be trained in the safe operation of boats, minor engine and boat repair, location of key passages through the lagoon, reef, and channels as well as dangerous areas to avoid, and reading tides and the tide charts. These non-technical staff members are permitted to operate boats only in emergency situations.

5.1.7 Penalties

There should be severe penalties for any unauthorised use of any boat.

5.2 BOAT MAINTENANCE

Proper maintenance of boats is absolutely essential. Maintaining equipment in good condition is always less expensive than repairs. The engineer is responsible for boat and engine repairs and maintenance. He is to conduct thorough checks and carry out all necessary repairs and maintenance

on all boats and engines before every field excursion, including routine operations such as fishing trips. All boats and all engines (including all spare engines) should be regularly serviced each week or more often when in constant operation. Refer to table below for lists of basic routine maintenance.

Problems do occur when boats break down in the field and the engineer is not present. The engineer shall instruct the boatmen, Officers and Rangers in basic maintenance skills, and steps in how to repair the most common problems. Boatmen must report all problems to the Logistics Superintendent.

GENERAL MAINTENANCE	ENGINE MAINTENANCE	
1) Inspect boats for external damage; report and repair any damage. 2) Clean boats thoroughly. 3) Clean and paint /oil oars (if necessary). 4) Check all ropes for wear and tear; report any damage and replace as necessary. 5) Check rope attachments to all anchors, repair if necessary. 6) Inspect life jackets; clean if necessary and report any damage. 7) Inspect and charge all radios as needed. 8) Inspect and update all necessary first aid kits. 9) Inspect and update all emergency food, water, and fishing supplies. 10) Check and ensure spare engine is present, accessible and in good operating condition.	Part	Maintenance
	Spark Plugs	Clean and adjust gaps.
	Points	Grease all engine points.
	Fuel Filters	Clean and change as needed.
	Anodes (zinc) (under cavitation plates and engine brackets)	Check condition and remove scales with a wire brush or scraper.
	Engine Blocks	Remove accumulated salt crystals with small brush or scraper and petrol.
	Engine Bodies	Wash with fresh water.
	Cooling Water Passages	Flush with freshwater (for 25 hp engines, run at low speed in a freshwater tank).
	Propellers	Inspect for damage and repair/replace as needed.
	Split Pans	Replace any with cracks.
Note: <i>When moving or storing an outboard engine, keep the power unit higher than the propeller to prevent water from entering the cylinders and damaging the engine.</i>	Battery Fluid	Add distilled water to low cells (levels should be between upper and lower marks).

5.3 BOAT OPERATION POLICIES

A log book should be kept and all outgoing vessels, particularly SIF's boats, should be required to sign in their departure time and date, itinerary, number and names of people, and their expected return date and approximate time. This logging procedure should be completed even for day excursions, such as fishing trips and/or short trail maintenance trips.

5.3.1 Safe Boat Operation

- Under no circumstance shall any person operate any vessel while under the influence of alcohol. Any infringement of this policy will result in immediate dismissal.

2. Operation of boats in the dark is prohibited except in emergencies or in cases dictated by tides when:
 - a) it is necessary to reach a particular destination before encountering difficulty,
 - b) in early mornings the sunrise is less than one hour from the time of departure,
 - c) in early evenings the sunset is less than one hour from arrival, and
 - d) it is necessary to reach another vessel or return to the station from another vessel before encountering difficulty. In all cases, all safety precautions should be strictly followed.
3. The operator is to inform all people on board before making any sudden manoeuvre.
4. All anchor and mooring lines will be properly coiled and ready to use at all times.
5. Special care will be taken when boating through shallow waters and/or corals. If necessary, the engine shall be tipped up and a person will be at the bow surveying for obstacles while the boat proceeds slowly. If conditions appear unsafe for an engine, then oars should be used and it may be necessary to get out and walk the boat through the area.
6. When two boats are approaching each other and will cross, the boat on the right has the right of way. The boat on the left should yield and the boat on the right should hold its course while observing the other boat to make sure that it is yielding.
7. All passengers and the boatman are to wear life-jackets until ashore.
8. All boats must avoid proximity to snorkellers and scuba divers.
9. When a boat is over-taking another boat, the boat in the front has the right of way and should keep its course while the boat in the rear manoeuvres around it.

5.3.2 Tide Charts

An accurate tide chart specifically for Aldabra should be constructed and distributed to SIF/Aldabra staff as well as to all vessels operating in the vicinity. The most accurate tide chart for Aldabra that was available at the time of writing this Plan is the Africa, East Coast - Dar es Salaam chart Lat:6°50'S Long: 39°17'E. Tide charts for Mahe and the granitic islands are not as relevant or accurate for Aldabra as the Dar es Salaam chart. This chart has been tested and used for many years because it exhibits the closest approximations for Aldabra's tides, but only with a 50 minute addition to all tide times.

Tide tables for Port Victoria have contained conversion data for Aldabra since 1998.

5.4 PATROLS AND SURVEILLANCE

All protected areas, particularly Special Reserves, require constant patrolling and surveillance. In general, the Warden, Research Officer and the Rangers will be the principal people involved in patrols and surveillance. However, the boatmen and field workers will play a supporting role. The primary purpose of patrolling and surveillance is to:

1. Survey the condition of the natural features, including algae blooms, unusual die-off of vegetation or animals, nesting animals, trail conditions, unusual behaviour in animals, unusual animal sightings, etc.
2. Observe, investigate and apprehend if conditions are safe, any individual conducting illegal activities including poaching of any animal or plant from the Reserve; contaminating the land or water with pollution; illegally entering Aldabra's boundaries, etc.

5.4.1 Patrolling

Patrolling should be conducted in a random fashion in terms of times and locations so that potential violators, whether these be staff or outsiders, cannot predict the patrol routine and thereby avoid encounters. The Warden and/or Research Officer will accompany the marine patrols and ensure that all encounters are handled in a safe and appropriate manner. It is recommended that patrols are conducted at least three times per week, alternating the days and times of the patrol.

Safety should always come first!! There may be times when the violators are considered dangerous and/or armed, making it unwise to approach them. These are situations where a powerful zoom lens on a camera is essential. Even if the violators are not armed, photos depicting evidence should be

taken. No matter whether a situation is dangerous or minor, as much evidence as possible should be gathered in order to make a good case. All illegal and/or questionable activities should be reported to the Executive Officer on Mahé immediately. Judgement must be used in deciding the best methods for proceeding. If there is a chance of stopping the illegal activity, especially if it will save the life of a person or animal, then action should be taken providing conditions are safe.

5.4.2 Data to Gather When Investigating an Illegal or Questionable Activity

- Physical descriptions, identities (if possible) and the number of people involved in the incident.
- Description of incident with as much detail as possible, including photos. Make sure to note the methods used (e.g., poaching with spears, nets, knives, guns, etc.).
- A detailed description of the location where the incident occurred.
- Time and date of incident.
- How the incident occurred, the procedures taken before, during and after an incident and how particular events transpired as a result.
- Name, colour, make and type of vessel involved and any identification number.

5.4.3 Handling an Incident

Each case is unique and you must make a judgement on how best to handle it, based on:

a) Intention of Violator

What was the intention of the violator? Did he do something intentionally illegal? Was the intention harmful/dangerous or was he just unaware of the consequences of his action?

b) Seriousness of Violation and Situation

Was the violation something that endangered the Reserve's wildlife, natural resources, or other people's lives? Was the action something that has serious consequences? Is the situation dangerous (i.e. rough seas, weapons, etc.)? Are the circumstances usual?

c) Character of Violator

Is the violator dangerous? Drunk? Armed? Is the violator a visitor who may not have been aware of the rules due to a language or literacy barrier? Is the violator a guest or an intruder? Is the violator a friend or fellow staff member?

B. MONITORING OPERATIONS

INTRODUCTION

This section of the Operations Manual is aimed at the Research Officer, Rangers, Scientific Assistants and Warden in particular.

The role of monitoring activities on Aldabra is to provide the information required by Seychelles Islands Foundation to carry out its mandate to manage and conserve the natural life of the atoll. This information is gained through objective and regular assessment of resources and environmental conditions. The most important monitoring programmes are therefore designed for long-term assessment of key species and for analysis of ecological trends over time. It is important that these programmes are followed and sustained. It is also vital to maintain clear, accurate and consistent records of all monitoring work so that long-term trends can be analysed. Records should be readily available for future reference at the Research Station. In this way valuable long-term data on certain aspects of Aldabra's unique ecosystems will also be available for future analysis by research scientists.

Unless otherwise noted, the monitoring programmes should be conducted under the supervision of the Research Officer or Warden. In the absence of these officers, the Rangers and/or Scientific Assistants should follow the minimum monitoring programme (see 6.1). The programmes have been designed to achieve the necessary goals without being too complex, so that any trained Research Officer and some Rangers can conduct them without difficulty or excessive time commitment. In any monitoring activity, data collection procedures need to be standardised as far as possible, so all guidelines given in the procedures should be followed. If permanent alterations or deletions are required due to changing needs and conditions, or if necessary improvements to methodology are required, approval should be sought from the Scientific Sub-committee. Changes should then be appended to this Operations Manual.

A number of opportunistic monitoring programmes are included here, which can be followed as and when there are personnel, time and interest. Many of these could be considered part of the Research officer's general observational responsibilities. All measurements and observations should be as accurate as possible, since non-scientific data can be at best, useless, or worse, totally misleading!

One important aspect of all these monitoring programmes is to observe and study without intrusion, making every possible effort to execute studies with caution and not disrupt any animal's natural behaviour.

Note that during the period of operation of this Management Plan (1998-2005), all monitoring programmes are to be reviewed, so there may be some changes. All alterations to the monitoring programmes should be appended to this Operations Manual.

PART SIX

LONG TERM MONITORING PROGRAMMES

6.1 MONITORING PROGRAMME PRIORITIES AND SCHEDULE

Prioritisation and scheduling is vital for the success of monitoring on Aldabra.

The number of programmes and the work required are not as extensive as they appear. Although some programmes require frequent monitoring, others are conducted only once per season or a few times per year. In addition, most of the programmes only require 1-2 hours per monitoring event, excluding preparation or travel time, and can be conducted while working on other programmes. With two or three trained individuals and efficient use of time and labour, all of these programmes can be accomplished within a normal working week. However, flexibility in schedules and hours are necessary when studying wildlife on Aldabra. Extra time may be required to accommodate tides, sea/weather conditions and logistics. There also may be occasions when rare opportunities to observe particular phenomena, record important information or conduct specific programmes (such as turtle tagging at night) require odd hours or odd schedules. Such abnormal working hours while at camp are recognised in the Working Conditions (see Section 1, Appendix Four) and in the pay structure.

Conservation management is reassessed annually by the SIF Board and priorities for monitoring may change. Bimonthly reports by the Research Officer are important in this process and should include key information, analyses, recommendations and, where appropriate, data for decision-making by SIF.

Scientific staff should adjust their schedules according to their specific job responsibilities, existing needs and conditions, and tide times and levels for that particular year. Rainfall monitoring is essential. Priorities for other long-term monitoring programmes should be checked in this manual, where details of frequency, timing and personnel requirements are given. An example of a monthly work schedule is given in "Turtle Monitoring at Aldabra" (Appendix 2).

6.2 RAINFALL MONITORING

6.2.1 Purpose

Records of rainfall are extremely important for all aspects of science and conservation on Aldabra. Complete rainfall records can help explain population cycles, animal behavioural patterns and many other dynamics that occur on Aldabra. Nearly all aspects of Aldabra are somehow affected by the amount of precipitation, making the regular recording of rain gauge readings a top monitoring priority.

6.2.2 Rain gauge locations

There are 13 rain gauges dispersed throughout the atoll. A description of their exact location is given in the Aldabra Data Unit Records, filed under Meteorology. There are rain gauges at:

- 1) Anse Mais
- 2) Anse Malabar
- 3) Anse Var
- 4) Bassin Lebine
- 5) Cinq Cases
- 6) Airstrip
- 7) Dune Jean-Louis
- 8) Dune d'Messe
- 9) Ile Esprit
- 10) Gionnet

- 11) Middle Camp
- 12) Polymnie
- 13) Station

6.2.3 Timing

The gauges should be read, if possible, at least once a month so that area differences in precipitation can be monitored. In particular, the Anse Var rain gauge should be monitored and emptied twice monthly during periods of prolonged rain due to its smaller capacity.

6.2.4 Method

In each gauge there should be a mm rain gauge stick. If the stick is missing or the gauge itself is damaged, replacements should be made as soon as possible. As a temporary measure, an ordinary straight stick can be used, together with a mm ruler. The reading should be made to the nearest mm and recorded. After recording the reading, empty the rain gauge and return to its proper position.

6.2.5 Data

Records should be filed in the Aldabra Data Unit, under Meteorology. There is a separate card for each gauge. When an electronic data base is created for rain gauge readings, all historical records should be entered, and the new records can be added.

6.3 TORTOISE MONITORING

6.3.1 Introduction

The status of the tortoise monitoring programme was reviewed during the tortoise population study conducted by ERGO (Environmental Research Group Oxford) at the end of 1997. The review concluded that the basic method of transect sampling is the most appropriate means of monitoring the various sub-populations of tortoise on Aldabra.

A total of twelve transects are monitored on a monthly basis. Three of these transects were established in the late 1970s in the Cinq Cases region, and the other nine were established in 1995 at various sites on Grande Terre, Malabar and Picard. All transects are shown on the Map which accompanies the transect descriptions below.

6.3.2 Purpose

The primary objective of the tortoise monitoring programme is to provide information required for better understanding, management and conservation of Aldabra's giant tortoise population. Regular assessments of the tortoise population, including the sub-populations on Grande Terre, Malabar and Picard, together with maintenance of long-term records and a computer database, will allow for identification and examination of major changes and trends in population size and structure. This in turn allows periodic review of management implications and options.

6.3.3 Frequency and timing

Tortoise transects should be carried out on a monthly basis if possible because the purpose is to monitor both short term seasonal changes and longer term multi-year trends. The transects can be integrated with the other monitoring programmes, e.g. rainfall and turtle programmes. If this is not practical for any reason, then the transects should be surveyed on a quarterly basis: January (early wet season); April (late wet season); July (early dry season); and October (late dry season).

Previous researchers have shown that tortoises on Aldabra seek shade from about 9am onwards. After that time tortoises retreat from open areas and become generally less accessible, especially during the hot wet season. It is therefore critical to ensure that all transects are completed by 9am. If a transect cannot be finished by that time, it should not be started. If it is necessary to conduct one transect immediately after another, to avoid repeated counting of individuals that could move between nearby transects (e.g. Picard Station Coastal Path and Back Path transects; Passe Houareau and Inland Traverse transects), the first transect should begin early enough that both transects are completed by 9am.

6.3.4 Personnel requirements

Ideally, tortoise transects should be carried out by three well-trained and experienced personnel: a scribe to record data while walking the centre line of the transect, and two others to gather information about tortoises to the left and right of that centre line. If three people are not available, transect surveys should be carried out by a minimum of two individuals, with at least one having had previous experience of walking the transects and assessing tortoise characteristics. This minimum requirement is necessary to standardise the data collected. Other field staff accompanying the survey party should be co-opted, as and when required, as part of their general duties and in-service training requirements.

6.3.5 Methods

6.3.5a Transect sampling

The basic method of sampling is for the scribe to walk the centre line of the transect, accompanied (more or less line abreast) by monitors to census all tortoises within standard strips on either side, calling out observations as they go. The scribe should “echo” each observation by repeating it out loud to ensure that it has been heard and recorded correctly.

Sample strip width is constant throughout the length of any given transect, but differs from transect to transect, depending on the density of vegetation and general visibility. Strip widths have been pre-determined and are set at 2.5m, 5m or 10m on either side of the centre line. The centre lines of all tortoise transects were re-marked with yellow paint and numbered at 50m intervals during the 1997 ERGO field study. The outer boundary can be determined using pre-cut lengths of string, although with practice these can be dispensed with.

6.3.5b Data collection

Information requirements are indicated in the data collection form (revised in 1997) shown in the Appendix. It is recommended that such a form be used for all tortoise transects, and that the scribe should make an entry in each and every cell of the form, even if it is merely a dash to indicate inapplicability. This is necessary to ensure that information is not lost through carelessness, and makes subsequent data entry and validation much easier.

Similar information is required for all live adult, juvenile, and dead tortoises encountered along each transect, and should be recorded on the data collection form, as explained in detail below. It is important that exceptional vigilance be maintained for small, young tortoises that may be partially, or completely, covered by shrubs and tall grasses, such as *Cyperus ligularis*, or lie hidden in crevices in the champignon.

- Tortoise #:** In order to reduce confusion and make it easier to track individual tortoises from the data form to the computer data base, the scribe should allocate an incremental number of each tortoise as it is recorded along each transect, e.g. the first (1), tenth (10), etc.
- Section #:** As mentioned above, each transect is divided into 50m sections, marked with yellow paint. In 1997 the ERGO field study team assigned vegetation codes, based on the Gibson and Phillipson (1983) Vegetation Map, to each 50m transect sub-section. For each tortoise, the scribe should record the full sub-section identifier, e.g. section 0-1, 6-7, 19-20, 29-30, etc.
- 3rd Dorsal Scute Width:** Tortoise body dimensions are highly correlated with the width of the third dorsal scute (Bourn and Coe, 1978). Third scute width is the easiest and the most reliably assessed parameter, and involves minimum disturbance. It is therefore recommended that third scute width be used as the standard index of tortoise size. To conform with earlier methods, a flexible and retractable metal tape with a hooked lip at one end should be used. Measurement should be to the nearest millimetre, between corner points and across the apex of the third dorsal scute,

with the hooked lip of the tape gently anchored in the inter-scute depression (see figure).

Third dorsal scute width measurement:

- Sex:** For each individual with a 3rd dorsal scute width equal to or greater than 20cm, sex should be recorded. This information is required to determine population structure and potential changes over time. Sex should be recorded as male (M), female (F) or unknown (U). It is important to be accurate. If there is uncertainty, simply note the tortoise as undetermined sex (U). Sexing should only be conducted by individuals familiar with the technique. In case of doubt, record secondary sexual characteristics: Tail Length; Plastron Concavity; and Hind Claw Length.
- Tail Length:** The gender of some tortoises, particular smaller individuals, is difficult to determine and other variables, such as the relative length of their tails, can help. Males generally have long tapered tails, whilst those of females tend to be short and stubby. For all tortoises with a 3rd dorsal scute width equal to or greater than 20cm, note whether the tail length is long (L) or short (S).
- Plastron Concavity:** As with tail length, the concavity of a tortoise's plastron can help workers determine its gender. In general, males have more concave plastrons, while females have flatter plastrons. Be aware that some small tortoises in the Cinq Cases region have irregular plastron concavity and it is assumed that such individuals may be older females. For all tortoises with a 3rd dorsal scute equal to or greater than 20cm, note plastron concavity as concave (C) or flat (F).
- Alive or Dead:** As an index of mortality it is important to record whether a censused individual is alive (A) or dead (D). Dead tortoises should be assessed and measured in the same manner as live tortoises, including noting any disk numbers or missing disks. The relative stage of decay of the tortoise should be noted (see below and Table).
- Decay stage:** To provide an indication of how long it has been since an animal died, the decay stage (1-7) of each mortality should be noted, as defined in the Table.
N.B. Once mortality has been recorded, the remains should be moved well away from the transect area, to avoid inclusion on subsequent transect surveys. *This removal should be recorded.*
- Disk # or Missing Disk:** Recaptured marked tortoises are of interest because they provide evidence of growth, movement and survival. The number of any disked animal, whether alive or dead, should be recorded. If the disk has fallen out, record Missing (M). For unmarked animals record Not Disked (ND).
- Disk position:** Tortoises marked during 1969 and 1970 were disked along the midline of the

fourth dorsal scute. From January to July 1973 they were placed to the right of the midline, and from November 1973 to September 1974 to the left. Even though a disk may have fallen out in the meantime, evidence of marking, in the form of grey epoxy resin or a circular drilled out area, usually remains. The position of marking should be recorded as left (L), right (R) or centre (C).

(Note: this has not been recorded since 1997)

Activity: Indicate whether the tortoise is resting or active. If active, note what type of activity, e.g. walking, feeding, drinking, excreting, reproductive behaviour.

Table: Giant Tortoise Mortality Decay Stages
(after Bourn and Coe 1979)

Stage 1: Freshly Dead	No bloat. No smell. Limbs entire, fleshy and covered in skin. Scutes all in place and firmly attached.
Stage 2: Putrid	Initially bloated with oozing orifices. Subsequently skin may begin to peel. Fleshy parts drying out and blackened. Foul putrid odour throughout. Scutes firmly attached.
Stage 3: Soft Parts Absent	Fleshy remains and entrails removed or thoroughly dried out and mummified. All scutes attached, although some marginals may have become detached. Little or no smell.
Stage 4: Scutes Attached	Most, or all, dorsal scutes in place, although often raised off underlying carapace bones and separated from each other. Where scutes have fallen off, exposed carapace bone usually has connective tissue still visible and attached.
Stage 5: Scutes Shed	Most dorsal scutes detached. Exposed carapace bones usually bleached white. Initially some connective tissue between scutes and carapace may be evident. Carapace bone sutures still holding.
Stage 6: Sutures Opening	Individual carapace bones starting to separate along sutures. Depending on exposure, bones may be more or less darkened by algal/bacterial growth.
Stage 7: Collapsing	Carapace collapsing, with individual bones falling in.

6.3.5c Data storage

All results for each transect should be logged in two places:

1. as hard copy on field recording forms, and kept under the appropriate transect file in the Tortoise Transect Monitoring records in the Picard Research Station library,
2. on the Station's computer database. Do not change or delete existing information on the databases. If there is a need to create new data fields for different types of information previously unrecorded, create the new fields in the appropriate data base(s). See Part Eight: "Data Base Guide".

6.3.6 Tortoise Transect Descriptions

The locations of all tortoise population monitoring transects on Grande Terre, Malabar and Picard are shown on the Map which accompanies these descriptions. Salient features of each transect are summarised below. More detailed descriptions, including GPS co-ordinates, length, width and vegetation classification by 50 metre sections, are given in the ERGO report (1997).

GRANDE TERRE

Coco transect

Length: 1,500m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located ca. 200m north of the Cinq Cases hut on the inland Coco trail. The transect runs along the inland Coco trail, and ends at marker # 30 at the inland coconut palm, which is ca. 1.5km north-west of the hut.

GPS Co-ordinates:

Marker # 0:	Easting: 666003	Northing: 8957292
Marker # 30:	Easting: 664848	Northing: 8958191

Southern transect

Length: 1,900m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located ca. 5m west of a large cairn at marker # 28 along the landing stage path. The transect traverses west/south-west meeting the coast at marker # 16. At marker # 16 the transect direction turns east back toward the hut, traversing through the centre of the coastal *Sporobolus* belt to marker # 35 at Anse Cinq Cases. The transect then turns north and runs on the west side of the central group of *Guettarda* trees, ending at marker # 38, which is 19m north of Cinq Cases hut.

GPS Co-ordinates:

Marker # 0:	Easting: 665450	Northing: 8957042
Marker # 16:	Easting: 665707	Northing: 8956423
Marker # 38:	Easting: 666153	Northing: 8957175

Groves transect

Length: 1,500m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is at its original start ca. 1.2km north-west of the junction between the Bassin Flamant and Runway Trace trails. The transect runs north-west through mixed scrub and groves woodland ending at marker # 30.

GPS Co-ordinates:

Marker # 0:	Easting: 664501	Northing: 8959359
Marker # 30:	Easting: 663307	Northing: 8960114

Dune Jean-Louis transect

Length: 700m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located 30m north of the Dune Jean-Louis hut on the landing stage path. The transect follows the landing stage path and ends at marker # 14 just 4m from the landing stage lagoon water edge.

GPS Co-ordinates:

Marker # 0:	Easting: 653031	Northing: 8955034
Marker # 14:	Easting: 652780	Northing: 8955640

Dune d'Messe Coastal transect

Length: 1,500m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located ca. 400m west from the hut and ca. 25m inland from the coast in a *Sporobolus* patch surrounded by *Sclerodactylon*. The transect line runs along the coast, traverses behind coastal dunes and ends at marker # 30 which is located ca. 25m inland from the coast near a group of *Tournefortia argentea* trees.

GPS Co-ordinates:

Marker # 0:	Easting: 645368	Northing: 8952441
Marker # 30:	Easting: 644281	Northing: 8951816

Dune d'Messe Interior transect

Length: 1,600m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located 40m north of the Dune d'Messe hut along the landing stage path. The transect follows the landing stage path and ends at marker # 32 which is 18m south of the landing stage lagoon water edge.

GPS Co-ordinates:

Marker # 0:	Easting: 645521	Northing: 8952719
Marker # 32:	Easting: 645125	Northing: 8954207

MALABAR

NOTE: In order to reduce repeated counting of tortoises between adjacent transects, the Casuarina Groves transect and Inland Traverse transect should be conducted consecutively in the same morning prior to 9:00 am.

Passe Houareau Casuarina Groves transect

Length: 1,000m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located ca. 0.5km north of the Middle Camp hut on the coastal trail at the *Casuarina* groves/*Pemphis* edge where the coastal trail begins heading west. The transect runs through the coastal *Casuarina* groves and ends at marker # 30.

GPS Co-ordinates:

Marker # 0:	Easting: 658049	Northing: 8963430
Marker # 30:	Easting: 657111	Northing: 8963578

Passe Houareau Inland Traverse transect

Length: 1,000m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located ca. 200m south of the coast along the historic coccid/flightless rail trail # 15, and is ca. 3m north of coccid tree # 63 with a sign on a base rock designating the direction to the east. The transect runs to the east through open mixed scrub and ends at marker # 20 at the edge of mixed scrub and *Pemphis*.

GPS Co-ordinates:

Marker # 0:	Easting: 656852	Northing: 8963373
Marker # 20:	Easting: 657525	Northing: 8963202

Anse Malabar Coast / Inland Mixed Scrub transect

Length: 1,500m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located ca. 100m west of Petit Anse Malabar. The transect runs along the coast, just behind the Anse Malabar hut, through open coastal mixed scrub to Anse Badamier Malabar. At marker # 10 the transect turns south-east and follows the inland coastal path through mixed scrub to end at marker # 30.

GPS Co-ordinates:

Marker # 0:	Easting: 651791	Northing: 8964107
Marker # 30:	Easting: 653179	Northing: 8964134

PICARD

NOTE: In order to reduce possible repeated counting of tortoises between adjacent transects, the Station Coastal transect and Back Path transect should be conducted consecutively in the same morning prior to 9:00 am.

Station Coastal Path transect

Length: 1,500m

Width: All tortoises within a **20m** wide strip, **10m** to the left and **10m** to the right of the Station to Old Settlement path, to be counted and measured.

Location: Marker # 0 is located along the coast ca. 25m south of the Research Officer's residence. The transect follows the coastal path through the Station and Old Settlement areas and ends at marker # 30 at the north end of the Old Settlement.

GPS Co-ordinates:

Marker # 0:	Easting: 632542	Northing: 8960371
Marker # 30:	Easting: 632208	Northing: 8961666

Station Back Path transect

Length: 1,950m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the Station Back Path, to be counted and measured.

Location: Marker # 0 is located just south of the cemetery next to the sign marking the Back Path. The transect follows the Back Path to the south through mixed scrub and ends at marker # 39 just behind the Warden's residence.

GPS Co-ordinates:

Marker # 0:	Easting: 632303	Northing: 8962237
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Marker # 39: Easting: 632509

Northing: 8960450

Anse Var Mixed Scrub transect

Length: 1,000m

Width: All tortoises within a **10m** wide strip, **5m** to the left and **5m** to the right of the transect centre line, to be counted and measured.

Location: Marker # 0 is located at the end of the coastal *Casuarina*, ca. 10m north of a *Pandanus* clump. The transect follows the Anse Var trail to the hut and rain gauge, and continues to marker # 20, ca. 10m short of Anse Var.

GPS Co-ordinates:

Marker # 0: Easting: 632781

Northing: 8962798

Rain Gauge: Easting: 633108

Northing: 8962955

Marker # 20: Easting: 633479

Northing: 8963365

6.4 TURTLE MONITORING

6.4.1 Introduction

The nesting of Green Turtles (*Chelonia mydas*) was monitored sporadically on Aldabra between 1968 and 1981, and more consistently using standard methodologies for morning beach surveys and nightly turtle tagging since 1981 (Mortimer 1988). Studies of growth rates and migrations in foraging populations of immature hawksbill turtles (*Eretmochelys imbricata*) have been ongoing since 1987. A guide to turtle monitoring on Aldabra, prepared by Dr Jeanne Mortimer, is included at the end of this Management Plan (see Appendix 2 “Turtle Monitoring at Aldabra”). It contains comprehensive information on monitoring procedures, and should be referred to for details.

6.4.2 Purpose

Three types of turtle monitoring reveals are conducted on Aldabra: a) morning beach surveys to count turtle tracks; b) nightly tagging of turtles; and c) tagging and measuring of immature foraging populations within the lagoon. Beach surveys give us an overview of various aspects of nesting activity on Aldabra including: its spatial distribution around the atoll; the seasonality of nesting within the calendar year; and how nesting activity fluctuates from one year to another. With these data we can better understand the status of the nesting population - whether it is increasing, decreasing or stable. By tagging nesting females we learn about aspects of turtle behaviour that include: nesting site fidelity; nesting frequency within a nesting season (how many clutches laid and how many days between nestings); how many years separate the nesting seasons of individual turtles; and locations of distant foraging grounds for the population. International tag returns provide an index of the rates at which turtles are slaughtered at these foraging grounds.

Monitoring the foraging populations of immature turtles in the lagoon reveals information on the size and distribution of the population, growth rates, and migrations.

6.4.3 Timing and methods of data collection

See Appendix 2: “Turtle Monitoring at Aldabra-1997 version” for detailed descriptions of methodologies.

- Priority should be given to morning beach surveys. Every effort should be made to visit all beaches on the outside of the atoll at least once per month, to survey the West Grande Terre beaches at least four times per month, and to visit beaches within the lagoon several times per month during the hawksbill nesting season (September to March).
- Nocturnal tagging of nesting turtles should be conducted during monthly visits to the camps. Even if no new tags are applied, an effort should be made to check nesting turtles for previously applied

tags. Tagging and measuring of immature turtles within the lagoon should be conducted by the SIF Rangers on an opportunistic basis throughout the year.

Due to the difficulty of procuring new tagging equipment, the following modifications in policy regarding turtle tagging are being implemented during 1998:

- a) Each SIF Ranger is assigned a tagging applicator for which he/she is responsible. In the event of loss or damage through negligence, the amount of R800 will be deducted from that Ranger's wages.
- b) Until further notice, nesting green turtles will be SINGLE tagged on only ONE flipper (although both flippers will be checked for old tags during the tagging process). Nesting hawksbills and immature turtles of both species will continue to be DOUBLE tagged (as described in Appendix 2).

6.4.4 Data

Three copies of all data should be made: One to be kept at the Station, one to be sent to SIF on Mahé, and one to be sent to Dr Jeanne Mortimer, c/o SIF, Mahé.

6.5 COCCID MONITORING

6.5.1 Introduction

The coccid (mealy bug), *Icerya seychellarum*, was introduced accidentally sometime in the 1960s and impacted the vegetation extensively, threatening the survival of some woody species. Surveys and research were conducted during the late 1970s by Newbery and Hill, and a monitoring programme was set up in 1980. In the late 1980s a coccinelid (ladybird) *Rodolia chermesina* was introduced as a biological control agent. There have unfortunately been some gaps in the monitoring.

6.5.2 Purpose

To assess the level of infestation of *Icerya* on various woody plant species and to reveal any coccid population fluctuations which might occur.

To assess the effectiveness of *Rodolia* as a biological control agent on Aldabra.

Both of these assessments may need to be used for management purposes. Scientifically it is also an unusual study of an insect pest invasion in a relatively undisturbed environment where other factors are also being monitored.

6.5.3 Timing

Monitoring should be conducted once during the rainy season (January/February if possible) and once during the dry season (August/September if possible).

6.5.4 Plant species to be monitored and transect locations

The following species are monitored at the given locations:

1. *Scaevola sericea** : La Gigi/Station trail (reported defunct 1998)
2. *Ficus lutea*** : Cinq Cases
3. *Avicennia marina* : La Gigi and Cinq Cases
4. *Sideroxylon inerme* : Middle Camp and Gionnet
5. *Euphorbia pyrifolia* : Anse Var

* previously known as *Scaevola taccada*

** previously known as *Ficus nautarum*

6.5.4a Descriptions of plant species

1. *Scaevola sericea*: Unmistakable shrub found usually on the beach crest. Large light green waxy leaves (15-21cm x 7-9cm) arranged in clusters of up to 20. Easily recognisable white flowers and rounded green or white fruits common in the wet season. (Kreol name: vouloutye)
Transects for this species reported in 1998 to be defunct.

2. *Ficus lutea*: Large fig tree which exudes latex from broken branches and leaves (as do the other two fig species on the atoll). Large dark green leathery leaves (15-25cm x 8-12cm). This is the best field characteristic for distinguishing it from the other fig species (*F. reflexa* has small leaves, 3-6cm x 2-3cm, and *F. rubra* (ex. *F. avi-avi*) has intermediate leaves). (Kreol name: **lafous gran fey**)
3. *Avicennia marina*: Unmistakable mangrove species which is commonly found from seedlings up to 4-5m trees. Aerial roots are thin and pencil-like, seen at low tide. Leaves are small and pointed (5-8cm x 2-3.5cm) and have a grey-green felt-like underside. Fruits are common, shaped roughly like a broad bean and have a felt-like skin. Flowers are yellow and scented. (Kreol name: **mangliye blan**)
4. *Sideroxylon inerme*: This is the only tree which is commonly found in otherwise pure areas of *Pemphis* scrub. It is also found in mixed scrub. Most trees are 3-4m and saplings are rare. Leaves are 3-8cm x 3-5cm with a small indent at the apex. They are brittle and dry when broken. A small amount of milky sap usually exudes from broken twigs. Flowers and fruits are uncommon on coccid-infested trees. (Kreol name: **bwa zak**)
Take care not to confuse this species with the 3 or 4 *Margaritaria anomala* var. *cheloniphorbe* trees near to the path in the mixed scrub along the goat path at Middle Camp. *Sideroxylon* has veins meeting the midrib at an angle of 45°, *Margaritaria* at an angle of 80°.
5. *Euphorbia pyrifolia*: Unmistakable shrub/small tree ranging from seedlings to 5m high. The trunks are bendy and if the bark is cut, large amounts of milky sap flow. This sap is a skin irritant and painful to the eyes. Leaves occur in clusters of up to 15 at the ends of branches, and are dark green, becoming reddish, and long and narrow (5-10cm x 2cm). Leaves fall during the dry season, leaving narrow leaf scars. (Kreol name: **bwa dile**)

6.5.4b Coccid Transects

Note that some transects were altered in 1995 due to their condition. Refer to the Coccid Monitoring Files for updated coccid transects before departing for the field.

1. La Gigi (*Avicennia marina*): Start point is the far side of the open sandy area which floods with the tide, SE of the old pirogue (062E092N). Trees are closely spaced running in a northerly direction.

This transect can only be undertaken at low tide. Time: approx. 60 minutes.

2. Anse Var (*Euphorbia pyrifolia*): Start point is ca.100m at 340° from the N side of Anse Var hut (which is at 068E118N).

Time approx. 30 minutes (+ 40min to walk from the Station)

3. Cinq Cases creek (*Avicennia marina*): Start point is the Landing Stage (375E065N). Tagged trees are on either side of the path going SE to the hut.

This transect can only be undertaken at low tide. Time approx. 30 minutes.

4. Cinq Cases inland (*Ficus lutea*): Trees are scattered to the N, NW, W and SW of the hut (398E058N). They are located through GPS co-ordinates or through bearings and distances from fixed points. There should be a map in the file.

5. Middle Camp (*Sideroxylon inerme*): Trail No. 15. Start point is the intersection with "Inland Traverse" tortoise transect (303E118N), transect continuing S.

Time approx. 90 minutes.

6. Gionnet (*Sideroxylon inerme*): Trail No. 9. Start point is at the rear of Anse Coco (139E125N) just E of the hut, transect continuing E.

Time approx. 90 minutes.

6.5.5 Method

1. Become familiar with the plant species being surveyed (see 6.5.4a above). More detailed descriptions are given in "The Flora of Aldabra and Neighbouring Islands" by Fosberg and Renvoize and "Flore des Seychelles: Dicotylédones" by Friedmann.
2. For each plant species, 30 individuals are monitored. These plants are situated along a line transect in each area, except in Cinq Cases for which all the available trees in the area are surveyed. All trees have numbered tags. All trees were re-marked in 1998 with numbered red ribbons but most also have numbered plastic and/or aluminium tags.

3. The following observations must be made on each tree at each sampling occasion
 - a. Plant species surveyed, location of transect, name of person monitoring and date.
 - b. The tag number.
 - c. Coccid infestation level - using the following scale:
 - 0 - Nil. No coccids found after searching.
 - 1 - Light. A few coccids found after searching.
 - 2 - Moderate. Coccids evident without searching, but not abundant.
 - 3 - Heavy. Coccids abundant.
 - d. Plant death - this is assessed from the level of branch death, using the following scale:
 - 0 - No dead branches.
 - 1 - Less than 1/3 of the branches dead.
 - 2 - Between 1/3 and 2/3 of the branches dead.
 - 3 - More than 2/3 of the branches dead.
 - 4 - Whole plant dead.
 - e. Coccinelid (ladybird) abundance.
 In the late 1980s a coccinelid (ladybird) *Rodolia chermesina* was introduced as a biological control agent. Until such time as proper follow-up research is conducted, note the presence or absence of coccinelids on the surveyed plants using the following scale:
 - 0 - Nil. No ladybirds found after searching.
 - 1 - Few. A few ladybirds found after searching.
 - 2 - Medium. Ladybirds evident without searching, but not abundant.
 - 3 - Many. Ladybirds abundant.
 - f. Optional comments.
 These may include 1) the presence of other coccid species on the trees surveyed, which can be scored in the same way as *Icerya*. Coccids liable to be encountered are usually scale-like and much smaller than *Icerya*. 2) the presence of ladybird species other than *Rodolia cardinalis*, which can be scored in the same way.

Important notes:

1. Considering that these scales are subjective, it is important to ensure a consistency of interpretation between observers. When responsibility for the survey is transferred, the previous surveyor and the new person should go to the field and review the monitoring process together.
2. Tags should be examined at every sampling occasion, and replaced if needed.
3. Trees which die or are lost should be replaced immediately by the nearest tree of the same species.

6.5.6 Data

1. Data should be entered into the Computer Database at the Station (see 8.1)
2. Two hard copies of all data should be made. One should be filed in the Coccid Monitoring file and the other sent to SIF.

6.6 WHITE-THROATED RAIL MONITORING

6.6.1 Introduction and Purpose

The white-throated rail (*Dryolimnas cuvieri aldabranus*) is the last “flightless” avian species in the Indian Ocean. Populations currently occur on Malabar and Polymnie islands, as well as a (probably) lone individual on Picard, which is thought to have been introduced. In 1995 a monitoring programme was set up by Augeri and Pierce to census some of the main sub-populations. The collected data can form a useful baseline assessment of the rail population on Aldabra prior to a proposed full scale scientific study of the rail which will include its possible reintroduction to Picard.

The (slightly modified) method of Augeri and Pierce is recorded here but it should be modified in the event of a full research study of the rail, so that long-term monitoring can continue.

6.6.2 Timing

- Rail transects can be conducted once per month, on the same days as tortoise or turtle monitoring.

- Censuses should be carried out in the late afternoon (after 16.00 hours), when rails are most active. (This allows the tortoise and turtle work to be conducted in the mornings)
- In addition, opportunistic monitoring can be conducted during other field excursions.

6.6.3 Method

Monitoring methods are based on a simple experimental design for existing trails.

- A cassette recording of the rail's call is available in the Station library. If this is unavailable or if suitable play-back equipment is unavailable, other calling methods can be used:
 - * whistling imitations of the rail's call,
 - * clapping sticks or coconut shells together,
 - * rustling leaves and branches.

The cassette can be used alone or in conjunction with the other methods.

- One person (two people, spaced approximately 10 metres apart, is more successful), walks slowly along the trail.
- At each 50m interval the person stops, issues a series of calls/sounds for a standard 2 minutes while listening for responses.
- Calls/sounds are stopped and the person listens and watches for rails in silence for a further 2 minutes.
- At the end of the silent period the person continues along the trail until the next 50m interval.

6.6.4 Data

All data should be stored on legible forms and kept on file in the Monitoring Programme files, on event cards for each survey, and on the existing computer database (see 8.1). Prior to conducting these rail censuses, review the computer database in order to familiarise yourself with the necessary data fields to record. The following data should be recorded:

- The number of birds seen (count only those birds that are actually seen along the transect),
- The sex of each individual (if possible), or if it is a juvenile,
- The presence of rings (coloured or otherwise) on the legs.
- The distance (metres) from the last sighted individual,
- At the 50m intervals, record occurrence of rails, habitat/vegetation type, and any unusual phenomena,
- Calls can also be recorded, but be sure to record each individual rail only once! Because these birds are territorial, this can be done by estimating relative locations and distances of the calls, sightings, etc.

6.6.5 Standard Rail Transects

These transects are based on trails used for other purposes.

1. Passe Houareau Coccid Transect Trail #15

This transect begins approximately 1.5km west of Middle Camp and is marked by a large cairn with white, yellow and pink paint, approximately 20m inland from the coast. Follow the entire trail from the lagoon to the coastal cairn (approx. 400m). (Walking to the lagoon first and then conducting the census from the lagoon back towards the coast appears to generate more rail responses)

2. Anse Malabar Hut/Inland Transect

Begin at the hut and follow the coastal trail west to Petit Anse Malabar. Then take the inland trail toward the lagoon for at least 400m. Include all rails at the hut in the census.

3. Gionnet Coccid Transect Trail #9

Follow the trail to its junction and continue to the lagoon so that the total length is at least 400m.

4. Gionnet Coastal Trail #10

Follow the coastal trail east from the hut for at least 400m. Include all rails at the hut.

5. Polymnie Loop Trail

Follow the loop trail from the hut to the north coast and back. Include all rails at the hut.

6.7 VEGETATION MONITORING

6.7.1 Introduction and purpose

The monitoring of vegetation is important because so many terrestrial organisms depend on plants and their productivity, either directly or indirectly. “The dominant factors explaining the species composition of Aldabra’s vegetation are the degree of influence from salty ground water and the degree of shelter from the salt laden south-east trade winds, which blow for a significant proportion of the year” (ERGO 1997). Vegetation transects were established by Gibson and Phillipson (1983) in the Cinq Cases area, but they represent only a small sub-set of the mixed scrub vegetation in that part of the atoll. Some of the transects were re-sampled in 1988 by Scoones et al. (1989) and again in 1997 by the ERGO group (1997). Although the 1983 field studies were carried out in the rainy season, the 1988 and 1997 surveys were undertaken in the dry season, when many ground flora species are not detectable and some woody species lose their leaves and are difficult to identify.

There is a need, therefore, to repeat the four transects which were surveyed in 1997 during the rainy season (see ERGO 1997).

In addition, a more extensive vegetation monitoring programme covering all of the vegetation types needs to be devised. This could use GIS maps combined with field surveys. Vegetation monitoring generally only needs to be undertaken every five to ten years, preferably in the wet season. When methodologies are worked out they should be added to this Operations Manual.

6.8 SUBSISTENCE FISHING MONITORING

6.8.1 Purpose

The purpose of the fish monitoring programme is to obtain information on the types, numbers and weight of fish caught around Aldabra for consumption purposes. Petrol consumption, the number of people fishing and the number of hours spent fishing are recorded so that an indication of “fishing effort” can be gained for different sites and different months of the year.

The results can also be analysed to reveal spatial and temporal trends in, for example, relative densities and size ranges of different edible fish species. Such information can be used for management purposes (for example, reducing the pressure on certain target species) as well as providing useful information for the scientific understanding of edible fish populations.

6.8.2 Timing

- Data should be collected for all organised fishing excursions (see Section 1, 3.3.2c(e)).
- Monthly totals are to be collated and recorded on a separate form (see Appendix 1).

6.8.3 Method

- The data forms are self-explanatory (see Appendix 1).
- Forms should be filled in by a responsible person who has knowledge of the fish species (see Table below).
- If no-one is available to conduct the monitoring during the actual excursion, the data can be recorded immediately on return. Note that the total weight of whole fish is required, so that weighing must be carried out before the fish are gutted.
- Fish species which are not listed on the form, and non-target species such as sharks and rays, should be added under “Others”

6.8.4 Data

- If necessary, copy field data onto new clean forms in order to keep clear records of all data in easily located files in the Station library. This data should be entered in the Aldabra computer database (see 8.1).
- Data for each month should be tallied by the Research Officer or Warden and included in the bi-monthly reports.

- Analysis of data should be carried out by an experienced person designated by the Scientific Sub-Committee.

COMMONLY CAUGHT FISHES OF ALDABRA

Group Name:

<u>Kreol Name</u>	<u>Family Name</u>	<u>Scientific Name</u>	<u>English Name</u>
<u>Trevallies:</u>			
Karang Ledan	Carangidae	<i>Caranx ignobilis</i>	Giant Trevally
Karang Ver	Carangidae	<i>Caranx melampygus</i>	Bluefin Trevally
<u>Emperors:</u>			
Baksou	Lethrinidae	<i>Lethrinus variegatus</i>	Variegated Emperor
Barwa	Lethrinidae	<i>Lethrinus ramak</i>	Spangled Emperor
Bek Long	Lethrinidae	<i>Lethrinus microdon</i>	Small Tooth Emperor
Kaptenn Rouz	Lethrinidae	<i>Lethrinus nebulosus</i>	Blue-scaled Emperor
<u>Wrasses:</u>			
Aya Zerar	Labridae	<i>Cheilinus undulatus</i>	Napoleonfish; Giant Wrasse
<u>Snappers:</u>			
Semiz	Lutjanidae	<i>Lutjanus monostigma</i>	One Spot Sea Perch
Terez	Lutjanidae	<i>Lutjanus gibbus</i>	Humpback Red Snapper
Varvara	Lutjanidae	<i>Lutjanus bohar</i>	Two Spot Red Snapper
Zob Gri	Lutjanidae	<i>Aprion virescens</i>	Green Jobfish
Zob Zonn	Lutjanidae	<i>Aphareus rutilans</i>	Rusty Jobfish
<u>Tunas:</u>			
Kin Fis	Scombridae	<i>Acantocybium solandri</i>	Wahoo
Ton Ledan	Scombridae	<i>Gynnosarda unicolor</i>	Dog Tooth Tuna
Ton Zonn	Scombridae	<i>Thunnus albacares</i>	Yellowfin Tuna
<u>Groupers:</u>			
Krwasan	Serranidae	<i>Variola louti</i>	Moontail Seabass
Msye Angar	Serranidae	<i>Cephalopholis sonnerati</i>	Tomato Hind
Seval Dibwa	Serranidae	<i>Amyperodon leucogrammicus</i>	White-lined Rock Cod
Vyey Babonn	Serranidae	<i>Plectropomus laevis</i>	Black Saddle Coral Trout
Vyey Goni	Serranidae	<i>Epinephelus fuscoguttatus</i>	Bullhead Cod
Vyey Kwizinyen	Serranidae	<i>Cephalopholis argus</i>	Peacock Grouper
Vyey Labou	Serranidae	<i>Epinephelus ongus</i>	?
Vyey Masata	Serranidae	<i>Epinephelus tauvina</i>	Greasy Cod
Vyey Plat ?	Serranidae	<i>Epinephelus flavocaeruleus</i>	Blue & Yellow Grouper
?		(or <i>E. multinotatus</i>)	(or White-Blotched Grouper)
Vyey Sat	Serranidae	<i>Epinephelus macrospilos</i>	Big Spot Grouper
Vyey Toukoula	Serranidae	<i>Epinephelus tukula</i>	Potato Grouper

6.9 BEACH EROSION AND ACCRETION

6.9.1 Introduction

A new programme was established by Augeri and Pierce in 1995 to quantify beach loss and accretion. The study began by focusing primarily on key turtle nesting beaches to help researchers quantify any correlation or causal relationships with seasonal and long-term shifts in nesting activity around the atoll. A series of numbered marker posts were placed along the entire length of Settlement Beach 3m inland from the beach edge. Measurements of changes in the distance of each post from the beach edge

should reveal relative quantitative changes. Marker posts still need to be established on some other turtle nesting beaches.

However, in the light of probable global warming and consequent sea level rise, it will be important to monitor coastal changes on Aldabra and this programme will need to be expanded. In addition to quantitative measurements (which may prove unreliable if marker posts are washed away), one of the best methods for evaluating and monitoring beach loss is through photographic benchmarks.

6.9.2 Purpose

1. To help quantify any long-term changes in coastal zone habitats.
2. To quantify beach dynamics relative to critical turtle nesting habitat. Information can be used to monitor changes in turtle nesting activity where management actions change human disturbances at particular sites, change zoning plans, etc.
3. Photographic benchmarks will provide reliable references for both management actions and scientific studies.

6.9.3 Timing;

- Wide angle photographs should be taken from each beach marker (benchmark) once every three months. Copies of these photographs should be kept in the Beach Erosion and Accretion file in the library.
- Quantitative measurements of distances of marker posts from the beach edge should be conducted on an opportunistic basis, but at least once a year, preferably at about the same time of the year.

6.9.4 Methods

6.9.4a Photo benchmarks

The beach markers described below should be used as photographic bench-marks to monitor both seasonal and long-term changes. This can be accomplished by Research Officer, Rangers, and Scientific Assistants (volunteers). If possible, old benchmarks that are on beaches or on the coastline (from the original 1970s benchmarks) should be relocated and marked, to add to the study. In the future additional photo benchmarks along beaches and other coastal terrain will need to be added, to give a broader picture of any changes.

6.9.4b Beach markers

- Marker posts along Settlement Beach: these are approximately 30cm tall after placement, have small ca.10x10cm numbered signs, and are located every 50m to 100m between the north end of Settlement Beach and Passe Femme. The seaward side of each post was located 3 metres (in a flat horizontal line) inland from the beach edge. This “edge” was defined as the linear boundary between “true beach” sand and turf/grass or other non-substrate edges. The edge was generally located on the seaward side of the beach crest.
- Statistical quantification of beach erosion or gain is derived from any changes in the original distance from the marker post to the beach edge and averaged across the total beach length. This can then be calculated for any given time scale and will generate relative change indices. Simply measure (to the nearest centimetre) the distance between the marker sign and its noted beach edge. Because the beach crest is often ambiguous and can vary considerably between beaches, this edge was sometimes demarcated by grass or herb vegetation/sand edges or trees with unexposed roots. The vegetation edge provides a good point from which to measure. However, substrate or grass/herb vegetation is not always present where sand erosion/accretion occurs and other alternatives are required, such as beach edge limestone (vertical measurements), unexposed and exposed roots, etc. In one instance (marker #13), both the horizontal and vertical distances were used. It is important to note that there will be variability in edges, measurements etc., and it is understood that these measurements are intended to quantify relative changes.

6.9.5 Data

The original marker locations and marker/beach crest distances are located on 1995 Event Cards and in the Monitoring Programme files in the Station library. Detailed methods are noted in the monitoring files located in the Station library. All data should be kept on file by location and year in the

Monitoring Programme file drawer in the Station library. Once enough data is collected, a computer data base could also be developed to aid analyses. **These files should be amended with any additions, changes, and enhancements, and all new locations noted on Event Cards and in the appropriate Station file.**

PART SEVEN

OPPORTUNISTIC MONITORING

7.1 INTRODUCTION

In addition to the species studied in the regular long-term monitoring programmes, there are several species that merit continuous but non-regular investigation. Due to time restrictions, limits must be set to the monitoring programmes and priorities must be determined. SIF will have different priorities at different times and therefore the monitoring schedule will vary, but the following programmes involve species which are important to Aldabra, so that effort should be made to record observations whenever possible. Note also that certain organisms may later become the focus of specific research (see part 4.2 of Section 1 of this Management Plan).

In addition, whenever SIF staff or visiting scientists are in the field it is the responsibility of those in charge to ensure that all unusual, rare, or scientifically interesting phenomena be recorded. Staff and visitors should be encouraged to note and report anything of interest to the Research Officer or Warden, who can fill in an appropriate record card or computer record for the Aldabra Data Base.

Many other organisms need investigation and recording, and staff and scientists may have their own special interests in species or phenomena. Anything of interest should be recorded, even though it may not be used directly.

7.2 GREATER FLAMINGOS

7.2.1 Purpose

In April 1995 a pair of greater flamingos (*Phoenicopterus ruber*) with a grey chick of the season was sighted at an unnamed bassin in the Takamaka region of East Grande Terre. This was the first known record of flamingo breeding on Aldabra and the chick was observed several months later at Bassin Flamant with the flock. It is still unknown whether breeding is sporadic or annual, but this breeding discovery gives Aldabra the unique distinction of being the only coral atoll in the world where this species breeds.

Flamingos have been observed in flocks of up to 500 birds according to Skerrett (see Amin, Willetts and Skerrett 1995), although recent censuses show a maximum of 28 birds in one flock (Augeri and Pierce, Technical Reports to SIF 1995). If this small population is resident on the atoll, rather than migratory, information is needed on its adaptations to Aldabra, its demographics and basic ecology. As there is increasing pressure to view and film this species on Aldabra, such information can be invaluable for management purposes.

7.2.1 Timing

If flamingos are encountered on an opportunistic basis, the observer should record the sighting in the Flamingo Monitoring file in the Aldabra Data Unit.

Surveys should be conducted on an opportunistic basis no more than four times a year.

7.2.2 Methods

- It is important to remember that flamingos are very sensitive on Aldabra and if human presence is detected the flamingos will abandon the area.
- As many inland bassins and mangrove Bras areas as possible throughout east Grande Terre should be carefully visited. If it is possible to survey different bassins simultaneously then this should be done. Resulting data will generate important information about migration patterns, flock behaviour and preferred sites.

- Observers should note date, time of day, weather conditions, location, tide levels and times (important because water levels in the bassins are determined by the tides), group size, males, females, juveniles, behaviour, signs of breeding activity, nests (usually short 20-30 cm high cylindrical platforms). Records should be kept on Species Record Cards or, in the case of surveys, on Event Record Cards in the Aldabra Data Unit, and on the Computer Database when possible.

7.3 CASPIAN TERNS

7.3.1 Purpose

Caspian terns (*Sterna caspia*) are annual resident breeders on Aldabra, which makes the atoll the only oceanic site in the world where they breed. However, as a result of the nature and location of their very exposed ground nests at or below the high water line, low chick survival rates occur, often due to environmental conditions and predation. More information is therefore needed on Aldabra's Caspian tern population.

7.3.2 Timing

- Careful surveys should be conducted twice per year (in the wet and dry seasons) for nesting Caspian terns throughout the atoll.
- Surveys should be conducted as quickly as possible at any one site, to avoid excessive disturbance.

7.3.3 Method

- Note that nesting Caspian terns are highly sensitive, and are liable to abandon eggs or chicks when approached within 100m. Eggs or chicks are then vulnerable to predation.
- Potential areas for surveys are La Gigi, Isle Moustique, Isle Esprit, Isle Michel, Coffee Camp and other lagoon islets, as well as some shore lines.
- Nesting birds are easily observed through their aerial defence behaviour, which is directed toward all intruders. If this is observed, do not approach the nest. Accurately count the number of adults and note whether individuals are part of a possible breeding pair. Try to locate the nest using binoculars, or if this is impossible, approach cautiously but do not remain in the area very long.
- If the nest is found, note the number of eggs and chicks, the habitat type, the exact location of the nest, distance from the high water line and any other characteristics or distinguishing features.
- Note that by the end of one week after the chick hatches it may leave the nest and hide in scrub cover, so it is worth checking the scrub in a 25-50m radius around the nest site for young birds. If chicks are found, quickly note their location, activity, behaviour and the presence of adults.
- Records of data and observations should be made on specific monitoring files, Species Record Cards, and in the case of specific surveys on Event Record Cards, as well as on the Computer Database when possible.

7.4 FRIGATE BIRDS

7.4.1 Introduction

An experimental research project, initiated in 1995 by Augeri and Pierce, to test and analyse human/boat induced abandonment behaviour in frigate birds (*Fregata ariel*, *F. minor*), boobies (mainly *Sula sula rubripes*) and brown noddy (*Anous stolidus*) around the atoll, revealed very high abandonments by frigates, especially by females, when approached within 30m by boats with the engines on. Although fewer impacts were observed with some silent approaches at close distance, these inevitably led to even more abandonments because of the necessity to suddenly restart the boat engines due to currents or when leaving the area.

7.4.2 Purpose

Abandonment of nests by frigate birds is potentially detrimental to both individual birds and to some of the colonies on Aldabra. Specific surveys at the more highly visited sites, conducted regularly, should reveal over time any changes in abundance or shifts in populations which might be due to the impact of

visitation by humans. This information can be used for management purposes, and also forms part of the tourism monitoring programme (see 6.5 of Section 1 of this Management Plan). For example, the current minimum distance for visitors approaching frigate colonies is 10m (see Section 1 of this Management Plan, 6.3, item no.13), but it might be necessary to change this distance in the light of this frigate monitoring programme.

7.4.3 Timing

Specific surveys at the more highly visited sites should be conducted on an opportunistic basis no more than once per month from February through May (or as determined by the Research Officer or Warden) in order to assess any impacts over the course of the tourist season. These surveys should be conducted with the minimum of disturbance to the birds, for example by taking one small boat with a maximum of three people very slowly and no closer than 30m from the site.

Monitoring on a more qualitative basis can also be conducted during guided tourist visits to the frigate colonies, when approach will probably be closer than 30m.

7.4.1 Method

During specific site surveys, observations should be noted of:

- Frigate behaviour, especially abandonment of nests, eggs or chicks. It is possible to map random nest sites and their characteristics (e.g. nest, egg, chick) in December/January, and then note any changes in these particular sites and characteristics over time.
- An estimate of the number of individuals at the site (there are several references in the library for census methods) and any changes in relative abundance. If possible, an estimate should be given for numbers of males, females and juveniles.
- Records of data and observations should be made on specific monitoring files, Species Record Cards, and in the case of specific surveys on Event Record Cards, as well as on the Computer Database when possible.

7.5 ALDABRA BRUSH WARBLER

7.5.1 Purpose

The Aldabra Brush Warbler (*Nessilas aldabranus*) is one of only two fully confirmed endemic avian species on Aldabra. It was last sighted in 1983 and may be extinct. If not, it is certainly one of the rarest birds in the world. The habitat in which it is found is densely covered with scrub vegetation, making sighting difficult. There is therefore a possibility the brush warbler still exists. The method recorded here is modified from the one developed by Augeri and Pierce (in which a warbler's call was played continuously along the whole length of a transect as well as at 20m intervals).

7.5.2 Method

- A cassette tape recording of the brush warbler's call is available in the Station library.
- Locations should include the Gionnet Coastal Trail #10 (the location of the last confirmed sighting of the bird) and the Gionnet Coccid Inland Trail #9. For the coastal transect, follow the coastal trail east from the hut to its termination near Au Parc. The inland transect should encompass the entire trail from the hut to the trail junction and then both directions: the lagoon as well as Anse Porche.
- Monitoring is carried out as follows:
 - a. The researcher begins slowly walking the transect.
 - b. At set 20m intervals the researcher stops to play the call for a set period (2 minutes) while listening for responses.
 - c. The call is then turned off to listen for responses for another set period (2 minutes). Any sighted or heard responses and vegetation types is to be noted at every call site.
 - d. At the end of the silent listening period the researcher walks on to the next 20m interval and stops again to play the call.

- Clear records of all monitoring results should be maintained, whether or not there were any warbler responses. All records should be kept in card form in the Aldabra Data Unit and, if possible, on a computer data base.

PART EIGHT

DATABASE GUIDE

8.1 COMPUTER DATABASE GUIDE

8.1.1 Introduction

Monitoring and research are vital for proper understanding of Aldabra's ecological processes and must serve as the foundation for management and protection. An essential aspect of this is organising the information and data in a manner that is understandable and that can be properly analysed to help decision making today and in the future. A very effective means for this is the use of computer database software. As of November 1998 thirty seven databases have been established for Aldabra's long-term monitoring programmes.

All databases are located in the "DATABASE" portion of the *Microsoft Works for Windows 3.1* programme on the Station's Super VGA computer. All databases are located in one directory called "database" and individual databases are found there under their abbreviations, e.g. "rail.wdb" for the white-throated rail transect data. The ".wdb" extension is *Microsoft Works'* code for a database file. A list of all databases and their computer file abbreviations follows in 8.1.4. All databases should be updated where appropriate, but original data should never be altered.

All existing and future databases should be designed to organise and catalogue data in general formats, so that researchers can copy the information for different statistical software packages. Whenever copying information from these databases for personal or Station analysis, please leave the original data files intact.

8.1.2 Database navigation

In general, the databases are self explanatory and an online *Help* manual is available within the software programme. Please update and add new information where appropriate. However, DO NOT DELETE any existing information. The original researchers may have intended a use for that data that may not be apparent at the present time. Furthermore, there may be a need for information in the future that may seem obscure or unnecessary at the present time.

If different types of data require new data "fields" (i.e. a particular category of data or information), add them where appropriate and leave notes and information about them in this guide or in a supplement to this Operations Manual. Most of the existing fields are self-explanatory. "General Notes" is simply any significant or relevant information that is not covered by other fields.

8.1.2a Opening the programme and databases

- 1) Enter password
- 2) Main screen Programme Manager, double click on *Microsoft Works*.
- 3) Open existing document
- 4) Select directory, e.g. cats, turtles, goats
- 5) Select file

8.1.2b Database guidelines

- First, save your work as often as possible!!! Although this programme now has automated backup function, the Station's power occasionally surges or shuts down. Also, save and update your hard drive work onto floppy discs whenever possible. It is always advantageous to have spare copies of everything. Label discs clearly.
- It is usually easier to enter data and other information in "List View" rather than "Form View". These can be selected either on the tool bar at the top of the screen or in the "VIEW" pull-down menu. For a layout of the fields within the database see the "FORM VIEW" of the database.

The “Form View” screen will show all fields for one row. This was set up to allow for printed copies of any row (i.e. the survey’s totals or a particular individual’s results) in an easily decipherable form.

- All field records should be “coded” (i.e. filled with some form of information or data). Never leave a field record blank (i.e. uncoded). This is to avoid confusion when future researchers use the data, for example if there is a blank does it mean the surveyor found nothing? or that the measurement was not made? or that the entry was forgotten? Furthermore, blank records cannot be analysed by statistical packages.
- Alphabetical codes should be used for relevant descriptive entries such as sex (“m”, “f” or “u”), age (“a”, “j” or “u”), activity (e.g. “DBP” = digging body pit), or missing information (“x”). Note that quotation marks do not form part of the code. Unfortunately, numerical records are required for some statistical packages, so that some researchers prefer to use numerical codes rather than alphabetical ones. For example a “1” can be used to designate a male animal rather than “m”. However, there is an infinite variety of codes, all dependent on a particular software programme or a user’s preference, and it can become quite confusing for future researchers using the data. Hence the aim to standardise to some extent by using alphabetical codes where possible.

Note: These alphabetical codes can be easily changed for a researcher’s personal files by using the “Search and Replace” command. However, never change the original codes in the original files. Any changes should be made in **copied** files.

- Use the “x” code only for missing information. A non-response or negative data is actual data and is not the same as missing information. For example, in a rail census if there is no response by a bird at one of the transect stopping points, this should be recorded as “0” in the defined field, rather than leaving the field blank or putting “x”; if a captured juvenile turtle has no injuries, this should be recorded as “N” (no), rather than leaving the field blank or putting “x”.

Note: On Aldabra the “x” is used to avoid confusion with any other codes (that might be required for certain statistical software packages) and can be replaced where necessary in personal databases by using an appropriate “Search and Replace” command.

8.1.2c Changing databases

- Update and add to all databases, but **do not change any of the original data or information in existing databases. Do not use the original database file for any changes other than adding new data or information.** Only use a copy of the original database for making changes.
- All changes to codes or other major changes should only be done by the Research Officer in consultation with the Scientific Sub-Committee of SIF, who will consult with the original researchers if necessary.
- To copy a database and change field codes, follow the procedures below:
 - a) Open the needed database in the *Microsoft Works* “DATABASE” package.
 - b) Select the “File” pull down menu and select the “Save As” command.
 - c) Choose the necessary drive and directory where the file will be saved.
 - d) Choose the necessary format for your statistical software. For example, the most universal format available in this package is “Text and Tabs (DOS)” equating to an ASCII type of .txt file accepted by most other software. Give the file a new name with a .txt extension and select “Save” for general format, or with a .wdb extension for *Microsoft Works* files.
 - e) Close the original database file.
 - f) Open the new file in *Microsoft Works* or another package and use the “Search and Replace” command to change particular field.

8.1.2d Database references and locations

All Science and Conservation Programme computer databases are located on the Station’s Super VGA computer with backups on 3.5” floppy discs. For simplicity all databases are in the *Microsoft Works for Windows 3.1* DATABASE programme in individual documents. Under the main database programme separate sub-directories have been developed, such as “cats”, “turtles”, “goats”. The following is a list of all 1998 updated databases. Please update this list when necessary, putting the information into a supplement to this Operations Manual.

Programme: *Microsoft Works for Windows 3.1*, DATABASE programme

Directory: msworks

1998 databases: Total: 37 individual databases.

Main categories: turtle tracks, turtle tagging, tortoise transects, tortoise opportunistic censuses, rail transects, coccid transects, rainfall.

1998 Aldabra Computer Database Abbreviations Reference

1. rail.wdb - all 1995 white-throated Rail transect data
2. avar.wdb - 1996-1998 Anse Var tortoise transect data
3. cccoco.wdb - 1996-1998 Cinq Cases Coco tortoise transect data
4. djl.wdb - 1996-1998 Dune Jean-Louis tortoise transect data
5. ddmcoast.wdb - 1996-1998 Dune d'Messe tortoise Coastal transect data
6. ddmlag.wdb - 1996-1998 Dune d'Messe tortoise Lagoon transect data
7. groves.wdb - 1996-1998 Cinq Cases tortoise Groves transect data
8. mccas.wdb - 1996-1998 Malabar Casuarina Groves tortoise transect data
9. ansemal.wdb - 1996-1998 Anse Malabar tortoise transect data
10. mcinland.wdb - 1996-1998 Malabar Inland Traverse tortoise transect data
11. ccsouth.wdb - 1996-1998 Cinq Cases Southern tortoise transect data
12. tortopp.wdb - 1995 Tortoise Opportunistic data
13. piccoast.wdb - 1996-1998 Picard Station Coastal tortoise transect data
14. backpath.wdb - 1996-1998 Picard Backpath tortoise transect data
15. turtandc.wdb - 1995 Green Turtle Anse Cedres track data
16. turtavar.wdb - 1995 Green Turtle Anse Var track data
17. ccases.wdb - 1996-1998 Green Turtle Cinq Cases track data (inc. Anse Cedres)
18. ddm.wdb - 1996-1998 Green Turtle Dune d'Messe track data
19. djl.wdb - 1996-1998 Green Turtle Dune Jean-Louis track data
20. hblag.wdb - 1996-1998 Hawksbill and Green Turtle lagoon islet track data
21. polmal.wdb - 1996-1998 Green Turtle Polymnie and Malabar track data
22. sett.wdb - 1996-1998 Green Turtle Settlement Beach track data (inc. Anse Var)
23. gtag.wdb - 1996-1998 Green Turtle tagging and nesting Hawksbill data
24. Wgt.wdb - 1996-1998 Green Turtle West Grand Terre beaches (1-22) track data
25. hbtav.wdb - 1996-1998 In-water tagging of juvenile Hawksbill and Green Turtles
26. ansevar.wdb - 1996-1998 Anse Var *Euphorbia* coccid transect data
27. ccavicen.wdb - 1996-1998 Cinq Cases *Avicennia marina* coccid transect data
28. ccficus.wdb - 1996-1998 Cinq Cases *Ficus lutea(nautarum)* coccid transect data
29. Gionnet.wdb - 1996-1998 Gionnet *Sideroxylon inerme* coccid transect data
30. houareau.wdb - 1996-1998 Passe Houareau *Sideroxylon inerme* coccid transect data
31. lagigi.wdb - 1996-1998 La Gigi *Avicennia marina* coccid transect data
32. picscav.wdb - 1996 Station *Scaevola sericea(taccada)* coccid transect data
33. rain96.wks - 1996 rainfall data
34. rain97.wks - 1997 rainfall data
35. rain98.wks - 1998 rainfall data
36. rainfall.wks - 1949-1997 rainfall data
37. fish.wdb - Feb 1998 onwards monthly subsistence fish catch data

8.2 DATA RECORD CARDS

8.2.1 Species Record Card

These cards are for use in multiple recording of individual species found in all habitats, both marine and terrestrial. Only **one** species is recorded per card.

SPECIES: Give both common and Latin names, if possible.

RECORDER: Give full name.

TERRESTRIAL, TERRESTRIAL/AQUATIC:	Specify whether the species occurs in strictly terrestrial habitat, or if the habitat is a mixture of terrestrial and aquatic, e.g. mangrove swamp, mud by pools, rock crevices containing water.
AQUATIC:	Occurring in fresh water.
MARINE:	No section available on the card, but it can easily be added.
DATE:	For example, 12 August 1998.
LOCALITY:	Usually give the nearest named site, e.g. Anse Mais.
GRID REFERENCE:	Use kilometre map grid, and if possible to six figures. Delete + or –, as appropriate, for co-ordinate north or south of the grid origin. The Gazetteer lists the grid references of all the named locations on the atoll. When GPS co-ordinates are known for all named locations, it should be possible to use GPS co-ordinates.
HABITAT:	See categories given for the Field Record Card, and categories given in Gibson and Phillipson (1983).
ABUNDANCE:	If an estimate is given, state that it is so.
NOTES:	Provides further details for which space is not provided elsewhere on the card. Note that if you have a lot of details on the habitat or ecology or behaviour of the species, you should use a Field Record Card instead.

8.2.2 Field Record Card

This card should be used for recording observations on a terrestrial species when detailed habitat is to be included, and/or behavioural notes.

Note: these cards are less used now than in the earlier days of research. However, many species on Aldabra remain little studied and any scientist researching these species should use Field Record Cards.

The recording scheme is arranged so that the recorder is led from the locality in which the organism is observed, through a series of habitat descriptions, to the nature of the substrate on which the organism is observed. The recorder may not be able to fill in every category on the card but as much information as possible should be recorded. The section at the top of the card covers general collection data, the rest is devoted to terrestrial habitat data.

RECORDED BY:	Give full name.
DATE:	For example, 12 August 1998.
ORDER, FAMILY, SPECIES:	One species only per card. Give both common and Latin names if possible.
ABUNDANCE:	If an estimate is given, state that it is so.
LOCALITY:	Usually give the nearest named site, e.g. Anse Mais, and the name of the island.
GRID REFERENCE:	Use kilometre map grid, and if possible to six figures. Delete + or –, as appropriate, for co-ordinate north or south of the grid origin. The

Gazetteer lists the grid references of all the named locations on the atoll. When GPS co-ordinates are known for all named locations, it should be possible to use GPS co-ordinates.

- ALTITUDE:** Estimate.
- COLLECTING METHOD:** For example, using net, by hand, using trap.
- NO. OF SPECIMENS:** Give the number of specimens collected (if any).
- PRESERVATION:** Dry or wet; preservative used.
- LIFE STAGES:** For example: Mammals - infant, juvenile, adult; Reptiles - egg, young, adult; Plant - seedling, immature plant, mature plant.
- DETERMINED BY:** Surname and initials of identifier of specimen(s), if not the recorder.
- TERRESTRIAL, AQUATIC/TERRESTRIAL:** Indicate whether the habitat is strictly terrestrial or aquatic/terrestrial. Examples of the latter are mangrove, mud by pools, rock crevices containing standing water.
- DOMESTIC/DISTURBED:** Domestic sites are those around camps and where there is considerable human activity and alteration of the surroundings. Disturbed sites are those crossed by trails under constant use, and where there is human activity but the surrounding area is not seriously altered.
- HABITAT TYPE:** Record the dominant habitat type only.
Area covered should be used as the criterion of dominance.
- The division between Scrub and Woodland is ca. 4.5m above the ground.
 - The division between Tall Herb/Low Scrub and Scrub is ca. 2m above the ground.
 - The division between Low Vegetation and Tall Herb/Low Scrub is ca. 15cm above the ground.
 - “General” includes small habitats which are common to a wide range of habitats. They do not have green plant matter as their major resource. The most common are listed under “General” type, and others may be added in notes.
 - Special relationship includes parasites, commensals and symbionts. The associated species should be given in the appropriate section at the back of the card.
- QUALIFIERS:**
- Area: of habitat in question. This is particularly important where small areas are being considered.
 - Edge: tick when the individual(s) is found near the interface between two habitat types.
 - Uniform/Mixture: large areas of Aldabra are covered by a mosaic of habitat types. When the area being considered contains more than one type, record this against Mixture. For example, record if there are scattered trees in scrub; so that trees are recorded as the sub-dominant cover type.
- COVER TYPE:** Record the dominant and sub-dominant cover types present when the area is a mosaic of habitat types. Use area covered as the criterion of dominance. Percentage cover may also be recorded. The background

habitat data for individuals recorded under General or Special Relationship may be recorded here.

GEOMORPHOLOGICAL TYPE:

There are four main groups based on the structure and form of drainage:

- a. Granular substrate, e.g. silt, sand, soil.
- b. Rock: Platin - rock type impervious to water, taking the form of smooth-surfaced pavement.
- c. Rock: Champignon - deeply pitted and irregular solution-fretted reef rock.
- d. Rock: Pavé - rough limestone with a relief usually not more than 0.5m, with points and edges rubbed dull, without abundant pinnacles or deep pits, and with shallow flat-bottomed solution pans. Pockets or depressions contain deposits of fine silt or marl, and long sharp ridges up to 20-25cm high are found in the surface.

STRATUM:

Record the level at which the individual(s) was found.

- a. Air above.
- b. Canopy: above 4.5m.
- c. Scrub: ca. 2 - 4.5m.
- d. Low Scrub or Herb: ca. 15cm - 2m.
- e. Ground Zone: ca. 0 - 15cm, excluding the surface.
- f. Surface.
- g. Soil: below the surface of any granular substrate.
- h. Subterranean: includes deep crevices in rocks.

QUALIFIERS:

Record the type of substrate on, in, or under which the individual(s) was found.

- a. Sand: particles 0.02 - 2.0mm diameter.
- b. Silt: particles 0.002 - 0.02mm diameter.
- c. Soil: a structured deposit with layers.

ASSOCIATED SPECIES:

Record species or higher taxa of:

- a. Fungi, dead wood, vegetation or carrion with which the individual(s) was associated.
- b. Host or parasite, etc. in a special relationship.

NOTES:

Record any further details, e.g. weather conditions, sex ratio, whether individual(s) was found dead or alive, etc.

8.3 EVENT RECORD CARDS

These cards are used for recording natural phenomena, management and research programmes, as well as the effect that the recorder has upon the environment or a species. The purpose of the Event Record is to ensure that all events which could be of importance to the future understanding of the biology and management of Aldabra are recorded in a precise and uniform manner. The information should be beneficial for the following reasons:

- a. Research workers and SIF employees would have a detailed and complete record of the different kinds of events that have taken place on Aldabra and their biological importance and location.
- b. Those in charge could obtain a concise review of the work being done at any period and the fields in which research has been undertaken in the past.

Each event should be recorded on a single Event Record card. When events occur repeatedly, frequency of occurrence will determine whether events (usually human activities) are to be grouped or recorded separately.

GRID REFERENCE:	Use kilometre map grid. Delete + or – as appropriate for co-ordinates north or south of the grid of origin. The Gazetteer lists the grid references of all the named locations on the atoll.
STATION:	Give the nearest named site and indicate the island.
DATE: START/FINISH:	If possible, record the exact dates when the event began and ended.
RECORDER:	Give full name.
SURVEYS AND RECORDING:	When surveys or counts are carried out annually, or repeated at fairly infrequent intervals, each survey should be treated as a separate event.
OTHER HUMAN ACTIVITIES:	An action by any person liable to lead to change within the ecosystem, e.g. trail maintenance, weed clearance, etc.
NATURAL OCCURRENCES:	Usually departures from the normal state of affairs which are likely to have a lasting effect on the ecosystem, or which represent an extreme in the variation of natural phenomena.
TITLE:	Use standardised title if possible, or a brief descriptive title.
FILE:	For example, records of any correspondence, reports, etc. derived from the event.
NOTES:	Use for recording details for which space is not provided elsewhere on the card.

8.3.1 Each visiting research worker should complete Event Record cards, recording his/her research programme, his/her own biotic effect and any natural phenomena of importance observed. By recording visits away from the Station (see 8.3.3), the coverage of the island by research workers may be confirmed, and areas not covered also revealed as real rather than due to absence of recording activity.

8.3.2 Wardens should record any management carried out away from the Station, e.g. trail maintenance, exclosures, weed clearance, hut repairs, etc.. (See 8.3.3 and 8.3.4)

8.3.3 Field trips (all trips away from the Station) should be entered on Event Record cards. This includes research and practical management trips. Record under a sub-section of 'Field Trips' within the event card records. The following details should be recorded:

1. Date trip started and finished
2. Location(s) of field trip
3. Name of recorder
4. The 'Note' section should be used to provide details of the type of work carried out, and any other relevant points.

8.3.4 Trails. All trail clearances should be recorded in the Aldabra Data Unit, filed under 'Trails'. Each trail on the atoll has a numerical listing. Refer to these listings and update, if necessary, the appropriate card, Then fill out an Event Record card and state the following:

1. Date trip started and completed
2. The trail number and location
3. If the trail is a new one, describe in detail its location, direction, etc. and note whether it is intended for permanent or temporary use.
4. Any trail marking undertaken.

This card should be placed in the 'Trail Management' section, in order of trail number.

8.4 DIVE RECORD CARDS

The dive record card has been designed to 'build up a picture' of Aldabra underwater, using information collected during dives. The aims of the cards are therefore to:

- a. Have on record the amount of diving being carried out around the atoll, and the personnel involved.
- b. Record the slope profiles around the atoll which in time should build up a picture of the submarine geography.
- c. Record the general substrate types around the atoll, and how these vary with depth.
- d. Record any noteworthy observations.

GRID REFERENCE: Use kilometre map grid. Delete + or –, as appropriate, for co-ordinates north or south of the grid origin. The Gazetteer lists the grid references of all the named locations on the atoll.

DATE: For example, 12 August 1998.

TIME: Use the 24 hour clock.

TIDE HEIGHT: The height of the tide during the period of the dive.

TIDE STATE: Nearest high tide + or – hours.

DIVERS PRESENT: Give the names of the divers.

DURATION: Length of the dive in minutes.

MAXIMUM DEPTH: Give in metres.

MEAN ANGLE OF SLOPE: Degree from horizontal.

FILE: For example, record of any correspondence, reports, etc.

% COVER: Estimate the % cover of four categories of substrate types:
a. Hard coral: Coral with calcareous skeleton.
b. Soft coral: Coral without a hard skeleton.
c. Rock: Bare rock.
d. Sand: includes talus, sand and rubble.
The cover of these four substrate types should be noted at 10m, 20m and 30m.

NOTES: Provide further details for which space is not provided elsewhere on the card. All interesting sightings should be recorded. For example, shark or turtle sightings; unusual fish species, aggregations or numbers. Feeding noted of fish should also be made.

SKETCH: A sketch should be made of the bottom profile. This is the easiest method of describing the geography of the area. On the sketch can be noted the cessation of coral, start of sand, gorgonians, etc.

PART NINE

CARE AND HANDLING OF ANIMALS

SIF staff, particularly the technical staff, are likely to be involved in the handling and care of animals on Aldabra. It is therefore important that they be sensitive to the needs of the animals and knowledgeable in their handling and care. If possible, hands-on training and experience with handling of tortoises, turtles and birds should be made available by the Warden and/or Research Officer. ***All handling should be conducted under the supervision of knowledgeable and experienced personnel.*** It is important to set high standards and good examples, as staff behaviour may be noted and copied by visitors and others. Remember with all animals to be respectful, sensitive and caring.

9.1 INJURED ANIMALS IN GENERAL

Generally, people should observe an injured animal for a period of time before approaching it. In this way its symptoms can be analysed and a decision made as to whether it needs special care or not. Approaching an animal nearly always causes stress, which can exacerbate illness or injury and make healing more difficult. Some animals do better without human contact, so only approach if really necessary. If the animal is small enough to put into a cage or box, put this container in a quiet place and cover with a cloth, allowing air spaces. If a larger animal is captured for care, provide a quiet place that mimics its natural habitat if possible. Be sure that the animal is kept at a suitable temperature. Provide water and appropriate food. Use common sense and be aware of the overall picture (e.g. what will happen during the night? Will the tide rise or fall? Will the sun move? Is it too windy in the shade? Can you make a natural holding pen? Can you provide food and water until it is healed? etc.).

9.2 TURTLES

9.2.1 Sensitivities

1. Green turtles are VERY sensitive to **light**, including torches, camera flashes, electric lights and camp fires. Torches can be covered with a cloth to lessen the harshness of the light. Use camera flash (preferable dimmed) only when a turtle is half way through egg laying, and then only limited use. Hatchlings can be misled by any source of light, so extinguish all light sources in their presence to allow them to find their way to the sea. However, if hatchlings are astray, lights can be used to lead them back to the sea.
2. Marine turtles are sensitive to **noise**. Keep noise to a minimum.
3. Turtles are sensitive to **touch** all over the body, including the carapace.
4. Turtles are sensitive to visible movement. The fewer people around a turtle the better, and everyone should remain behind turtle, out of range of vision.

9.2.2 Approaching a nesting turtle

Turtles can be very sensitive to visible movements on the beach, even when the turtles are in the sea. Also, if a turtle is approached at the wrong moment she is likely to abandon the nesting attempt and flee to the ocean. The following rule should be applied for all nesting turtles, whether it be to tag (**but see also 'Turtle Monitoring at Aldabra'**), to photograph or simply to observe them:

The best time to approach a nesting turtle without disturbing her is after she has begun to lay her eggs. At this time the turtle is very intent on laying her eggs and can be approached quietly. Nevertheless, even at this stage it is best to minimise physical contact with the turtle, as it is possible to frighten a laying turtle off the nest. Tagging is best done immediately after all eggs have been laid. So, when you find a turtle, first assess at what stage she is at in the nesting process, as described below:

- The turtle climbs onto the beach, usually up to the beach crest or high water line, and searches for a suitable spot to dig a nest.
- With front flippers she digs a body pit which is at least 15cm deep.
- With back flippers she digs the egg chamber (at least another 40cm deep). She may dig several pits and chambers before laying any eggs.
- She lays her eggs, typically 110-150 eggs, in the egg chamber.

- Much of the nesting process is covering the nest: she uses her back flippers to cover the egg chamber, then she throws sand over the body pit using her front flippers. By the time she has finished, her body pit has moved a distance of about 2m away from her egg chamber.
- She will then return to the sea.

9.2.3 Mating turtles

Turtles mate off the coast and are very conspicuous at this time, making them very vulnerable to disturbance. Technical staff should ensure that no person (including boatmen, field staff, tourists, photographers, etc.) disturbs mating turtles by approaching too close. A minimum distance of 50m should be observed. If research work requires closer distances for scientific purposes, then this work can be conducted at the discretion of the Warden and Research Officer.

9.2.4 Handling hatchlings

Every species of marine turtle in the world is endangered and hatchlings are extremely important to their populations. Once emerged from the nest, hatchlings are vulnerable to predation both on the beach and in the ocean, and also to sun exposure. Therefore hatchlings may need assistance to the ocean, especially if there are many beach predators around, or they have become disoriented by artificial lights.

- Be careful not to put too much pressure on the hatchling while holding it.
- If necessary, take many hatchlings at a time, to ensure maximum survival rate (but avoid crushing or damaging them)..
- Take them to a calm safe edge of the sea and allow them to walk the rest of the way into the surf.

9.2.5 Rescuing stranded turtles

At times it may be necessary to move an adult turtle when it is stranded. If a turtle is blocked from the ocean at low tide it may literally bake to death in the sun. Rescuing a female turtle may enable her to become old and produce larger batches of eggs, so it is well worth the effort. However, moving stranded turtles is stressful to the turtles and may at times be unnecessary. For further information see “Turtle Monitoring at Aldabra” (Appendix 2)

9.2.5a How to decide if a turtle needs your help

- Will the turtle be able to return to the sea on her own before the sun gets too hot?
- Are there other dangers (such as people) around?
- What is the state of the tide? If the tide is descending, will the turtle be trapped on dry land? If the turtle is in shallow water and the tide is already low, she will probably be OK. If the tide continues to descend, she could become stranded on dry land in the sun.

9.2.5b Deciding on the best way to move a turtle

- How many people (if any) are around to assist you? A weak turtle that has already been in the sun too long will need more help than a freshly stranded turtle.
- Depending on the above points, decide whether to HERD, DRAG or LIFT the turtle.

9.2.5c Herding turtles

- This method uses the strength and energy of the turtle herself to move it. Herding means guiding and encouraging the turtle towards the sea by positioning yourself in such a way that she will move away from you.
- If you want the turtle to move forward, stand behind her; if you want her to turn to the right, stand on her left side, etc.
- Sometimes it is necessary to tap her carapace gently to encourage her to move, but be aware that it may take a long time to herd a turtle back to the sea. Do not hurry her.

9.2.5d Dragging turtles

- If a turtle is too tired to walk back to the sea, she may need dragging.
- The best way is to turn her on her back, hold her front flippers, and carefully drag her through the sand to the sea.
- Avoid rocky areas, so as not to injure her carapace.

9.2.5e Lifting turtles

- Note that adult turtles are very heavy and are easier to drag than to lift! It will only be possible if you have enough people to assist.

- Lift the turtle by holding onto the shell (supporting it). Do not put too much pressure on the flippers as they can be broken or dislocated. Take care.

9.2.6 Flipped turtles

Sometimes, on her way back to the sea, a turtle falls over an edge and gets flipped over. If she is not put the right way up she will bake in the sun (assuming that she didn't get killed by the fall).

1. A single person can turn a turtle the right way up. Take hold of one of the front flippers with your hands and lift the turtle while applying pressure to the carapace with your knee and lower leg. (Try to position the other front flipper in its natural position back against the body to avoid damaging it).
2. If two or more people work together, it will not be necessary to apply as much pressure to the flipper. Rather, most of the pressure can be put on the carapace.

9.3 TORTOISES

1. Tortoises can be frightened by quick movements, especially those that are near the head. So, do not jab or poke tortoises, especially near the head.
2. To make a tortoise stand up (to determine its sex for example), tap gently on one of its hind legs or the lower back scutes with a small stick or stone.
3. Though the carapace looks very tough, tortoises are actually sensitive to touch all over their body, including the carapace and plastron. The (white) growth line between the scutes is especially sensitive and should never be rubbed or scratched.
4. Handling of baby and young tortoises should be kept to a minimum. When a tortoise is picked up, because it is stressed it may excrete a large amount of urine. During the dry season especially, this could result in a fatal loss of water.
5. Certain tortoises are familiar with humans and seem to enjoy being stroked on the chin, neck or carapace, but in general avoid such intimacies!

9.4 BIRDS

1. Avoid approaching too close to a bird sitting on eggs because it will be extremely stressed, even though it may remain until you are very close.
2. Birds in general are easily disturbed and stressed, so it is better to avoid handling them. However, if it is necessary, be careful, quiet, slow and patient. Secure its wings so that it does not try to free itself.
 - With a small bird this can be done by putting your hand over the wings, then your forefingers around its neck and its legs between your remaining fingers. If you hold it on its back, cradled in your hand, it will panic less.
 - With a large bird, such as a booby or frigate, hold the wings with both hands firmly to its body in their naturally folded position and keep the head away from your face as it may try to peck you.
3. If possible cover the bird's head with a cloth (not plastic!) to reduce stress during handling. Refer to 9.1 above for care of an injured animal.
4. Beware of birds' beaks, especially those of larger birds!
5. Always put birds back in the same place you found them. With frigate birds make sure that you put them high enough in the branches for a good take off.

9.5 FISH

Treatment of fish is usually not considered. However, they too have pain sensors and deserve respect, so some simple considerations can be taken when handling fish:

1. Try to kill the fish as quickly as possible.
2. Make sure that the fish is dead before gutting or cutting up for bait.
3. Handle non-target fish with wet hands. Release all juvenile and non-target fish to ensure future populations.

9.6 OTHER ANIMALS

Many of the general techniques outlined above can be applied to most animals. It is important to remember to show respect, care and sensitivity towards animals, and to retain your own composure. Some animals may not need your help and may do better without human contact. The situation must be assessed each time you are considering helping an animal. All members of staff should confer with the Warden and Research Officer for advice, instructions and guidelines.

In the unlikely event of a marine mammal being beached on the reef or reef flat, a few simple guidelines can be followed:

1. Marine mammals are not dangerous, but watch out for the tail.
2. For smaller marine mammals such as dolphins, keep the animals cool and wet. Use a large canvas or plastic tarp to slide under the animal and carry it out into deeper water where it can safely swim back out to sea.
3. For larger marine mammals, the only possible thing is to keep it cool and wet until the high tide comes in. If necessary a boat and rope can be used to drag the animal nearer to the sea at high tide, but only if the terrain is suitable and only if you can protect the part of the animal where the rope is tied.

PART TEN

ERADICATION PROGRAMMES

10.1 GOAT MONITORING AND ERADICATION

10.1.1 Introduction and Purpose

Due to historical threats and possible future threats to Aldabra's terrestrial ecosystems from feral goats (see Section 1, Part 3), the policy of SIF is to eradicate goats from the atoll. During the first two phases of the eradication programme, goats were eliminated from Malabar and from Picard. "Judas" goats were utilised (marked with a collar giving off radio signals) and all goats associating with them were shot by a marksman. By the end of Phase 2 (1996?), there were thought to be only 50-100 goats left on Grande Terre.

Until such time as Phase 3 is carried out, goats and signs of goats should be monitored whenever possible, by any staff member, scientist or visitor. Goats should be shot (or killed in some other humane way) if at all possible.

10.1.2 Timing

Observations should be carried out on an opportunistic basis.

10.1.3 Method

- All SIF staff should be instructed by the Warden and/or Research Officer as to which key information needs to be recorded in the case of opportunistic sighting or kill (see the data forms in Appendix 1 for details).
- Signs of goats, such as fresh droppings, footprints or calls, should also be reported.
- It is recommended that data forms are taken on all field trips to Grande Terre in case of sightings. All information should be written on the data forms.

10.1.4 Data

- Records (data forms) should be kept on file in the Station library and the information also entered on Species Record Cards.
- Data should be compiled by the Research Officer or Warden and a summary included in the bi-monthly report.

10.2 CAT MONITORING AND ERADICATION

10.2.1 Introduction and Purpose

Cats are known predators of a variety of smaller animals on Aldabra and present a threat to Aldabra's native animals. These include turtle and tortoise hatchlings, nesting sea birds, small birds, skinks and geckos. Rats and cockroaches (which are alien to Aldabra) are also taken by cats. Based on field observations, cats are seen regularly on Grande Terre but are assumed to be absent from Picard, Polymnie and Malabar. The absence of white-throated rails on Grande Terre is thought to be due to the presence of cats on this island. The cats on Aldabra have no known predators. Refer to papers by Wendy Seabrook for further details.

SIF policy is to conduct systematic trapping of cats at all known sites on Grande Terre, and also opportunistic trapping whenever Officers, Rangers or Field Staff are in the field, until such time as a study of cats (their effects on native animals, and possible eradication methods) can be conducted (see Section 1, Part 3).

10.2.2 Timing

- Systematic trapping can be conducted during monitoring of tortoises, etc.
- Opportunistic trapping is to be conducted whenever possible.

10.2.3 Method

- Cat traps are live traps. They should be placed in shaded areas and checked within 24 hours. This reduces unnecessary heat stress on non-target species such as coucals, crabs, etc. as well as the cats themselves.
- All SIF staff should be instructed by the Warden and/or Research Officer as to which key information needs to be recorded in the case of opportunistic sighting or kill (see the data forms in Appendix 1 for details).
- Signs of cats, such as scat (droppings), footprints or calls, should also be reported.
- It is recommended that data forms are taken on all field trips to Grande Terre in case of sightings and/or kill, as well as for opportunistic trapping. All information should be written on the data forms.

10.2.4 Data

- Records (data forms) should be kept on file in the Station library and the information also entered on Species Record Cards.
- Data should be compiled by the Research Officer or Warden and a summary included in the bi-monthly report.

10.3 RAT ERADICATION

10.3.1 Introduction and purpose

Rats (*Rattus rattus*, the black rat) inhabit all four of Aldabra's principal islands and many of the islets within the lagoon. These rats are good climbers. The only rat-free areas are some of the small limestone islets where ground-nesting sea birds take refuge, for the rats are omnivorous and will take eggs and nestlings. Rats also prey on small passerine birds, and the eggs and hatchlings of turtles and tortoises. Vegetation is affected by girdling, cropping and seed dispersal. The majority of rats on Aldabra are thought to be *Rattus rattus frugivorous*, with *R.r. alexandrinus* also present (Racey and Nicoll). The only known predators of rats are cats and ?coconut crabs??

Little scientific research has been carried out on the impact of rats on Aldabra ecosystems. Until such time as a study is carried out and the possibilities of rat eradication considered, continuous efforts should be made to keep the population in check.

Given the number of ships visiting Aldabra, there is always the possibility of other rat species being accidentally introduced, particularly *Rattus norvegicus*. Mice were also recorded by the warden in the early 1990s around the Station, and sightings/trappings should be recorded.

10.3.2 Timing

Rats should be trapped in and around the Station area on a daily basis if possible. Elsewhere, particularly around Camps, trapping should be carried out whenever it is possible.

10.3.3 Method

Live-traps are used so that non-target species can be released if they find their way into them. Traps should be laid out around the Station in suitable locations, such as near the kitchen, store and compost heap. All traps should be checked every 24 hours to avoid the accidental death of non-target species.

Use a quick and humane method of killing the rats

A watch should be kept for mice and for other related species which might gain accidental access to Aldabra, in particular around the Station, e.g. *Rattus norvegicus* (brown rat).

10.3.4 Data

No consistent data have been kept on rat trappings. Report anything unusual.

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APPENDIX 1

MONITORING AND OTHER DATA FORMS

TURTLE TRACK COUNT DATA FORMS

The following Turtle Track Count Data Forms and other data forms are to be found in “Turtle Monitoring at Aldabra: 1997 version” by Jeanne Mortimer.

1. West Grand Terre & Settlement Beach (Beaches # 1-22 and 47) *Page 21*
2. DuneD’Messe Region (Beaches # 23-28) *Page 22*
3. Dune Jean-Louis Region (Beaches # 29-36) *Page 23*
4. Cinq Cases Region (Beaches # 37-40) *Page 24*
5. Anse Cedres / Ile Malabar / Ile Polymnie Beaches / Anse Var (Beaches # 40-46 and 51) *Page 25*
6. Hawksbill Beaches Inside Lagoon *Page 26*
7. Nesting Turtle Tagging Data Form for Aldabra *Page 30*
8. In-Water (Juvenile) Turtle Tagging Data Form *Page 45/46*

Location:

Record the location where goats were killed according to the **number** on the grid below.

Habitat Type:

Record the **number** of the habitat type where goats were killed according to the list below:

- 1 Beach
- 2 Mangrove Forest
- 3 Unvegetated Champignon
- 4 Grassland
- 5 Pemphis scrub
- 6 Mixed scrub
- 7 Casuarina / Coco Woodland

Location:

Record the location where cats were killed according to the **number** on the grid below.

Habitat Type:

Record the **number** of the habitat type where cats were killed according to the list below:

- 1 Beach
- 2 Mangrove Forest
- 3 Unvegetated Champignon
- 4 Grassland
- 5 Pemphis scrub
- 6 Mixed scrub
- 7 Casuarina / Coco Woodland

DAILY FISH MONITORING FORM

Date: _____

Site: _____ Amount Fuel Used: _____

Time Started: _____

Time Finished: _____ Total

Hours: _____

(check map on reverse)

No. of people fishing: _____

Kreol name	Total Number of Fish	Total Weight of Ungutted fish (kg)	Kreol name	Total Number of Fish	Total Weight of Ungutted fish (kg)
<u>Trevallies:</u>			<u>Groupers:</u>		
Karang Ledan			Krwasan		
Karang Ver			Msyé Angar		
<u>Emperors:</u>			Seval Dibwa		
Baksou			Vyey Babonn		
Barwa			Vyey Goni		
Bek Long			Vyey Kwizingen		
Kaptemm Rouz			Vyey Labou		
<u>Wrasses:</u>			Vyey Masata		
Aya Zerar			Vyey Plat		
<u>Snappers:</u>			Vyey Sat		
Semiz			Vyey Toukoulá		
Terez			<u>Others (not listed):</u>		
Varvara					
Zob Gri					
Zob Zonn					
<u>Tuna:</u>					

Kin Fis		
Ton Ledan		
Ton Zonn		

MONTHLY FISH MONITORING FORM

Month / Year: _____

Total Amount Fuel used for Month: _____ Total Hours Fished: - _____

Kreol name	Total Number of Fish	Total Weight of Ungutted fish (kg)	Kreol name	Total Number of Fish	Total Weight of Ungutted fish (kg)
<u>Trevallies:</u>			<u>Groupers:</u>		
Karang Ledan			Krwasan		
Karang Ver			Msyé Angar		
<u>Emperors:</u>			Seval Dibwa		
Baksou			Vyey Babonn		
Barwa			Vyey Goni		
Bek Long			Vyey		
			Kwizingen		
Kaptenn Rouz			Vyey Labou		
<u>Wrasses:</u>			Vyey Masata		
Aya Zerar			Vyey Plat		
<u>Snappers:</u>			Vyey Sat		
Semiz			Vyey Toukoula		
Terez			Others (not listed):		
Varvara					
Zob Gri					

Zob Zonn						
<u>Tuna:</u>						
Kin Fis						
Ton Ledan						
Ton Zonn						

APPENDIX 3

GPS CO-ORDINATES OF FIELD STUDY SITES

These co-ordinates are taken from “Aldabra Revisited: Final Report on the 1997 Aldabran Giant Tortoise and Vegetation Study” by the Environmental Research Group Oxford.

The list should be expanded to include all other transects, rain gauges, turtle beaches, etc. as and when possible.

LOCATION	GPS UTM EASTING	GPS UTM NORTHING
Anse Malabar mid beach	651960	8964121
Bassin Frigate	662456	8960336
Bassin Lebine trail end (beyond basin at mangrove edge)	633377	8961423
Bassin Lebine trail mid point (Basin Cabri)	632837	8961257
Bassin Lebine trail start	632402	8960937
Bassin Flamant (north end)	665613	8959260
Bassin Flamant (south end)	665551	8959113
Bassin Flamant/Groves trails junction	665568	8958738
Cedres Brillles (western side of Grande Passe)	636141	8963832
Cinq Cases hut	666166	8957158
Cinq Cases mid beach	666274	8957072
Croix Blanc	662634	8960515
Dune d’Messe hut	645573	8952689
Dune d’Messe top of dune	645621	8952625
Dune Jean-Louis mid beach	652919	8954999
Passe Houareau/Middle Camp	657964	8963129
Picard “Nature Reserve” sign at end of Settlement	632501	8962458
Picard Met Station	632448	8960475
Takamaka Grove (on trail north edge of basin)	660084	8956846
Benchmarks		
AB28	645202	8953347
AB34	650660	8954040
AB44	658887	8954561
AB50	660174	8957743
AB57	665704	8957071
AB58	664948	8957303
AB73	665040	8959086
AB74	664350	8959467
AB75	663699	8959839
AB76	662948	8960297
Tortoise transects		
Anse Var tortoise transect start	632781	8962798
Anse Var rain gauge - mid transect	633108	8962955
Anse Var tortoise transect end	633479	8963365
Back path tortoise transect start/end (behind warden’s house)	632509	8960450
Back path turn off to Bassin Lebine	632402	8960937
Back path transect start/end (path sign near cemetery)	632303	8962237
Picard coastal tortoise transect start (50m S of R.O.’s house)	632542	8960371
Picard coastal tortoise transect end	632208	8961666

Dune d’Messe inland tortoise transect start	645521	8952719
Dune d’Messe inland tortoise transect end	645180	8954090
DdM coastal tortoise transect west end	644281	8951816
DdM coastal tortoise transect east end	645368	8963202
Groves tortoise/vegetation transect start (Marker #0)	664501	8959359
Groves rain gauge (mid transect; Marker #12)	664040	8959663
Groves tortoise/vegetation transect end (Marker #30)	663307	8960114
Groves vegetation transect end (Marker #36)	663053	8960280
Middle Camp Casuarina tortoise transect start	658049	8963430
Middle Camp Casuarina tortoise transect end	657111	8963578
Coco vegetation transect start	664906	8957282
Coco vegetation transect end	664867	8958273
Coco vegetation transect eastern spur start	664875	8957733
Coco vegetation transect eastern spur end	665375	8957733?
Coco tortoise transect start	666003	8957282
Coco tortoise transect end	664848	8958191
Southern vegetation transect start	665704	8957071
Southern vegetation transect intermediate point	665636	8956631
Southern vegetation transect end	665677	8956401
Southern tortoise transect start	665450	8957042
Southern tortoise transect coastal intersection (Marker #16)	665707	8956423
Southern tortoise transect end	666153	8957175
Inland traverse tortoise transect start	656852	8963373
Inland traverse tortoise transect end	657525	8963202
Anse Malabar tortoise transect start	651791	8964107
Anse Malabar tortoise transect (Anse Badamier)	652266	8964183
Anse Malabar tortoise transect end	653179	8964134
Dune Jean-Louis tortoise transect start (hut)	653031	8955034
Dune Jean-Louis tortoise transect mid point	652919	8955477
Dune Jean-Louis tortoise transect end (landing stage)	652780	8955640