FINAL REPORT OF THE

EDINBURGH UNIVERSITY CORAL AWARENESS & RESEARCH EXPEDITION

MADAGASCAR 2001

The expedition film and a CD copy of this report (including survey data spreadsheets) are available on request from enquiries@eucarenet.com

Further information about all *Eucare*'s projects can be found at www.eucarenet.com

Report written by Alasdair Harris

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The project was a collaborative venture between *Eucare* and four institutions within Madagascar:

- **IH.SM** (L'Institut Halieutique et des Sciences Marines)
- **ONG Azafady**
- **QMM** (QIT Madagascar Minerals)
- **COUT** (Cellule des Océanographes de L'Université de Toliara)

Throughout the project, the team relied on constant support, help and guidance from these host institutions. It is impossible to mention individually all those that played a part in making the collaborations such a success, but the achievements of the expedition were a direct result of the long hours worked by so many of our friends in Madagascar. Nous ne vous remercions jamais assez!

In particular *Eucare* would like to thank Dr. Christopher Inchley, Dr. Terry Dawson, Dr. Graham Russell, Brett Massoud, Ny Fanja Rakotomalala, Mark Jacobs, Man Wei Rabenevanana, Andrew Cooke, Jurg Brand, Alphonse Dina, Alain Peyrot, Mademoiselle Vero, Le Grand Bleu, Colby Gottert, Vovo Telo, Lakana Vezo, Florent Ramanantsoa, The Presidents of Fokontany, Mangily, Ifaty & Salary, The British Ambassador to Madagascar, Nicola Moran, Lahery Manera, Christina Corbett, Amerante Ranerason, Nety Rakotomalala, Bruno Razafindrambola, Lomba Hasoavana, Roland Randriamampionona, Richard Paper, Graham Paper, L'Office Nationale our L'Environment, Andrew Bishop, Chris Tiso, Alastair Harbourne, Andrew Murray, Scott Henderson, parents, families and flatmates for their invaluable help, support and encouragement along the way.

Misaotse bevata atsika aiby!

EXPEDITION TEAM

EDINBURGH UNIVERSITY PERSONNEL

Alasdair Harris (AH)	-	Expedition leader, research co-ordinator
Robert Conway (RC)	-	Medical officer
Juliette Green (JG)	-	International liason officer
Donald Asprey (DA)	-	Diving officer, underwater photographer
Fred Lavén (FL)	-	Treasurer
Olivia Lindau-Jonsson (OL)	-	Logistics officer
Matthew Linnecar (ML)	-	Science officer
Helen Auster (HA)	-	Research diver (phase 2)
James Carter-Johnson (CJ)	-	Expedition cameraman

MALAGASAY PERSONNEL

Phase I (Lokaro)

Eugène Ranaivoson (ER)	-	Research diver (invertebrates and algae)
Madame C. Rigoberd	-	Expedition cook
Florent Ramanantsoa	-	Support vehicle driver
NGO Azafady	-	Guides and translators
Brett Massoud	-	Fort Dauphin logistics and support
Ankoba Sports	-	Dive boat captain
Monsieur Rigoberd	-	Camp guardian

Phase II (Ifaty)

Jean-Charles Lope (JL)	-	Research diver (corals)
Ignace Razanakoto (IR)	-	Research diver (invertebrates)
Tsirivelo Ranaivoson (TR)	-	Research diver (fishes and invertebrates)
Veronique Ratovoson	-	Expedition cook
Monsieur Alphonse	-	Boatman (dive boat 1)
Graham Paper	-	Boatman (dive boat 2)
Monsieur Man Wei Rabenevanana	-	Toliara logistics and support (IHSM)
Monsieur Emile	-	Camp guardian

INTRODUCTION

Eucare was founded in autumn 2000 to organise expeditions sending teams of divers to survey and chart unexplored coral reefs. Working alongside local scientific personnel, the underwater research is carried out in countries that can benefit from our resources and abilities.

The 2001 expedition was *Eucare*'s first project, and consisted of two phases, both in Southern Madagascar. The two phases concentrated on two very different reef systems, and involved working with local scientific personnel both above and below the water, as well as with local non-governmental organisations, businesses, fishermen, and the Malagasy Marine Institute (Institut Halieutique et des Sciences Marines - IHSM).

This report summarises the findings of the expedition, which was concerned principally with the collection and analysis of data from the two unresearched marine habitats. The data collected have been distributed to all interested parties, both governmental and local, and it is hoped that these data will be used to strengthen public awareness of the need to conserve these unique environments.

PHASE ONE: JULY 2001

Phase one was based in the Baie de Lokaro, 15km North of the coastal town of Fort Dauphin in Southeastern Madagascar. The aim of the project was to survey the unexplored coral habitat located in a sheltered lagoon between the two 'halves' of Lokaro Island.

PHASE TWO: AUGUST 2001

Phase two was based in the village of Ifaty in the Baie de Ranobe, 30km North of the regional capital Toliara, in the Southwest of the country. The aim of the project was to carry out the first ever species-level base line surveys of the interior and exterior of the fringing reef in the Baie de Ranobe. Part of the research in this phase also focussed on the village of Salary, 60km north of Ifaty.

PHASE THREE: SEPTEMBER 2001

Phase three comprised the reconnaissance trip to the offshore fringing reefs of Belo-sur-Mer, proposed site for *Eucare*'s work in 2002. The reconnaissance expedition involved visits to the reefs where *Eucare* will carry out its underwater research.

Right, satellite image of Madagascar showing the positions of the three phases of the expedition

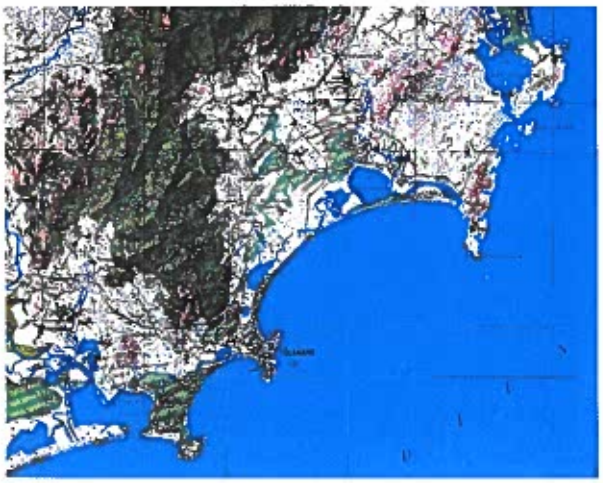
EUCARE FILM

A film crew (self funded) accompanied the expedition from Late June until mid August. A copy of the film will be forwarded to our funders with this report of the project. It is hoped that this film will provide a better insight into the work carried out by *Eucare* both above and below the water.

PHASE ONE: LOKARO ISLAND

INTRODUCTION

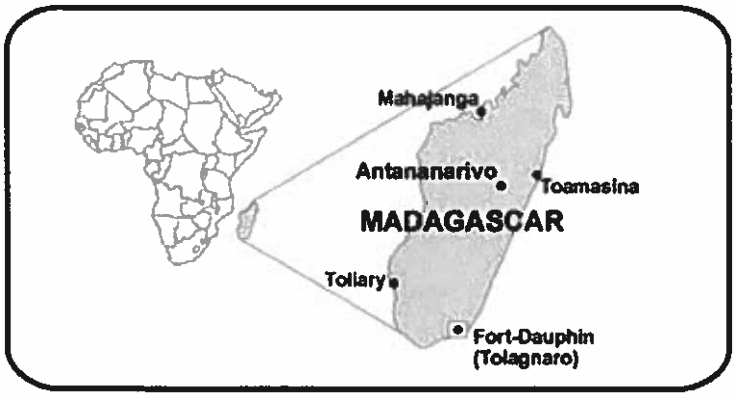
In the first phase of the expedition the team was based in the coastal town of Fort Dauphin. Reconnaissance snorkelling carried out for *Eucare* by Dr. Terrence Dawson (Environmental Change Institute, Oxford) earlier in 2001 and 2000 showed that significant coral habitats could be found in sheltered regions of the bays of Lokaro and St. Luce, situated 15 and 50 km north of Fort Dauphin respectively. The aim of phase one was to locate and survey these unique unknown habitats, carrying out underwater base-line surveys of the coral, fish and invertebrate species present.



Map showing the coastline running north of Fort Dauphin

Coast line running north from Fort Dauphin towards Lokaro, from the 1995 Panchromatic SPOT imagery (MIR Télédétection Inc., 1998)

PREPARATIONS



On arrival in the area, reconnaissance work was carried out from 28th June until the end of the first week of July. During this time the team was based in its research headquarters accommodation in Fort Dauphin, and commuted to and from the reconnaissance sites in the *Azafady* 4x4 vehicle. The vehicle and the Fort Dauphin accommodation were kindly provided by *Azafady*, and were crucial in giving the team the flexibility and independence needed to make final preparations before moving into the field.

Discussions with *QIT Madagascar Minerals* (*QMM*) in Fort Dauphin finalised arrangements for the team to borrow the company's electric *Bauer* diving compressor. *QMM* also generously agreed to lend its diving cylinders to *Eucare*, and made the necessary arrangements to transfer both the compressor and the cylinders to locations that were convenient for the team's work. This equipment was given to *Eucare* for the duration of the phase, and without this generosity it would not have been possible for any diving to have taken place.

As part of *Eucare*'s collaboration with the *Institut Haliéutique et des Sciences Marines* (*IH.SM*) and *la Cellule des Océanographes de l'Université de Toliara* (*COUT*) Eugene Ranaivoson was released from his office at the fisheries institute to take part in *Eucare*'s research. Eugene lived and worked with the team for the most of the phase, and made an excellent contribution to the team's knowledge of local invertebrates.

Negotiations with *Ankoba* in Fort Dauphin enabled the team to hire a suitable dive boat to use on survey work. The boat fulfilled the criteria of the *Eucare* casualty evacuation plan, which stipulated that a rescue boat should be in the water with survey divers at all times.

Medical oxygen was obtained from *Gaz Liquide* in Antananarivo, and was carried both on the dive boat ($1m^3$) and in the *Azafady* support vehicle ($2 \times 1m^3$). Reserve oxygen ($7m^3$) was kept at the research headquarters in Fort Dauphin. Contact was maintained between the boat marshal and shore guard using VHF radios. In addition to this, a satellite phone was carried by the boat marshal and/or shore guard in case of emergencies.

RECONNAISSANCE DIVING IN LOKARO, EVATRAHA & ST. LUCE

During the reconnaissance period Bruno Razafindrambola and Lahery Manera, local guides and employees of *Azafady*, took the team to the two proposed field sites, at the Baie de Lokaro and the Baie de Sainte Luce. The aim of the reconnaissance work was to carry out exploratory dives and survey snorkels in order to find the most substantial coral habitats in each region. Advice was also taken from local fishermen, who were able to guide the team to coral-rich areas.

(i) Lokaro

In Lokaro, the divers carried out 6 reconnaissance dives in sheltered and exposed areas of the bay at a range of depths. Numerous survey snorkels and skin-dives were also carried out to select the dive sites.

Very little coral was found in exposed sections of the bay, and no coral was observed below 16m. Massive corals (mainly *Porites sp.*) were occasionally observed on the sheltered sides of the bay's many rocky islets, but were never classified as more than 'rare' on the *Eucare* abundance scale.

Right, aerial photo of the Baie de Lokaro. The sandy spit running from the northern-most point of the bay to the Lokaro Island is learly visible (marked 'S'), as is the sandy beach joining the two 'halves' of Lokaro Island. Coral is visible in the centre of the lagoon (marked 'L').

It was found that, on the whole, coral growth could not be found in the exposed (and often turbulent) regions of the bay, such as the seaward sides of the many rocky islets and outcrops found in the area. Limited coral was found in shallow (up to 16m), sheltered sections of the bay, but nowhere could this coral be termed substantial or abundant.

On the advice of *Azafady* the team carried out reconnaissance work in the small South facing lagoon created by the two islands, connected by a sand bar, that make up what is known as Lokaro Island. The lagoon was immediately found to support significant amounts of well developed corals, including an abundance of fragile *Acroporidae*, not observed anywhere else in the region. It was apparent that this was by far the most substantial coral habitat in the area. All the coral was found to grow at relatively shallow depths (2-14m), and the two small islands in the mouth of the lagoon served to protect the waters from the large swells that were often present in the rest of the bay.

(ii) St Luce

Members of the team carried out reconnaissance dives in the Baie de Sainte-Luce, the second proposed site for *Eucare*'s research. Previous visits to the area by *Azafady* personnel and Dr. Terrence Dawson had observed some coral growth in the region, although coral was seen in smaller amounts and at lower abundances than in the Lokaro Island lagoon. Divers and survey snorkellers swam in and around the bay searching for significant habitats using the same spotting techniques that had been used in the Baie de Lokaro.

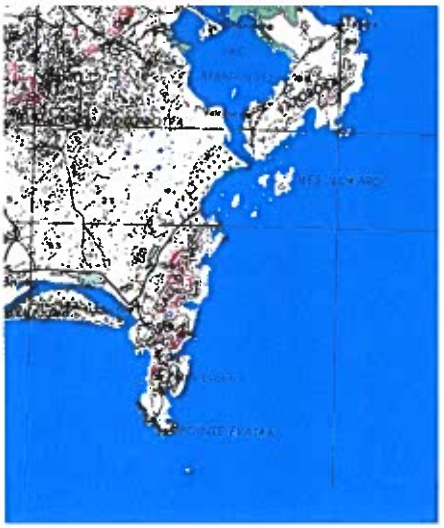
The team found that St. Luce's waters were considerably more exposed than those in the Baie de Lokaro. The turbidity of the water was high, and underwater visibility was less than 2m. This, along with the swell, made diving and swimming conditions dangerous. The limited coral found by the divers was restricted in its distribution and growth. Coral heads were generally covered in sediment, and this was attributed to the turbulent conditions stirring the sediment from the sea bed. No substantial coral habitat was found in the bay, and the poor underwater visibility and conditions prevented the team from carrying out any deep-water reconnaissance work. Despite extensive surface snorkelling up to 1km from shore, the divers was unable to find an area of the bay that was sufficiently sheltered to permit safe underwater surveying.

The team was advised that conditions were unlikely to improve in the bay because, unlike the sheltered lagoon in the Baie de Lokaro, St. Luce does not have such sheltered habitats that permit safe diving in rough conditions (as are common throughout the Southern winter). If underwater research is to be undertaken in the bay, it should be attempted during the summer months, when underwater visibility improves.

(iii) Evatraha

Ankoba in Fort Dauphin suggested that other coral habitats might be found in the region between Lokaro and Fort Dauphin, although probably not as extensive as those seen in the Lokaro Island lagoon. Skin dives carried out around the rocks on the north side of Evatraha point found no coral growth. This was attributed to the rough conditions that often make the region inaccessible, even by boat. The Southern side of Evatraha point is more sheltered, particularly under the rocks towards the fishing beach. Healthy coral was found here at depths of up to 22m, and the coral habitat in this region was considered to be the most substantial after that found in the Lokaro Island lagoon. Unfortunately, owing to dangerous conditions caused by large surges of swell onto the rocks, it was considered unsafe to carry out full surveys in the area.

Throughout phase one, many other reconnaissance skin dives were carried out both from shore and from the dive boat, South from Lokaro to Fort Dauphin and North from Lokaro to St Luce. These dives were often undertaken following the advice of local pirogue fishermen. Limited coral was often found in sheltered areas, but no-where was the growth as substantial or as abundant as in the Lokaro Island lagoon. It was therefore decided to concentrate the team's resources on studying the Lokaro Island coral habitat.



Evatraha point and the Baie de Lokaro, with the Iles Lokaro shown in the centre of the bay.

The lagoon lies between the two 'halves' of the Iles Lokaro, on the southern side of the sandy spit that connects the two islands.

SURVEY DIVING IN LOKARO

In-field logistics

When in the field, the team's accommodation was in bungalows belonging to *Azafady* in the fishing village of Evatraha. Divers and equipment were driven (in the team's *Azafady* vehicle) to Lokaro bay, and then on over the sandy spit that connects Lokaro Island with the Northern-most point of the beach. Beyond this point, kit had to be carried by hand over the rocks to the small beach at the head of the lagoon. The *Ankoba* dive boat was driven from Fort Dauphin daily, and met the team each morning on the lagoon beach soon after dawn.

Right, the team's in-field accommodation, kindly provided by *NGO Azafady* in Evatraha village.

Right, Don Asprey, Eucare's Diving Officer, carrying cylinders from the support vehicle across Lokaro Island to the dive sites in the lagoon

Meals were prepared by the Rigoberd family in Evatraha village using food brought by the team from Fort Dauphin. During surveying, meals were prepared on the beach at Lokaro. Bottled water and fuel were also brought in from Fort Dauphin. After diving, kit was washed in the village stream in Evatraha, and stored in a specially constructed kit locker adjacent to the team's bungalows.

QMM kindly agreed to re-locate their compressor to their field research station at Mandena, which is equipped with a generator capable of powering the compressor. Empty diving cylinders were driven to Mandena each evening for filling. Staff at the station regularly worked long hours late at night supervising the electrical generator to drive the compressor. Without this dedication the team would not have been able to dive on a daily basis in the Lokaro region. Florent Ramanantsoa, the team's driver, worked almost continuously during the phase, and without his enthusiasm, the team's diving in Lokaro would have been greatly restricted.

Above left: looking north from the sandy spit of Lokaro Island; Right, Charging dive cylinders at QMM's field research station at Mandena.

Below left: local fisherman carrying scalloped hammerhead sharks (courtesy of *Azafady*); Right, aerial photo of the Baie de Lokaro. The two halves of Lokaro Island are circled, with the South facing lagoon facing the camera.

Research methodology

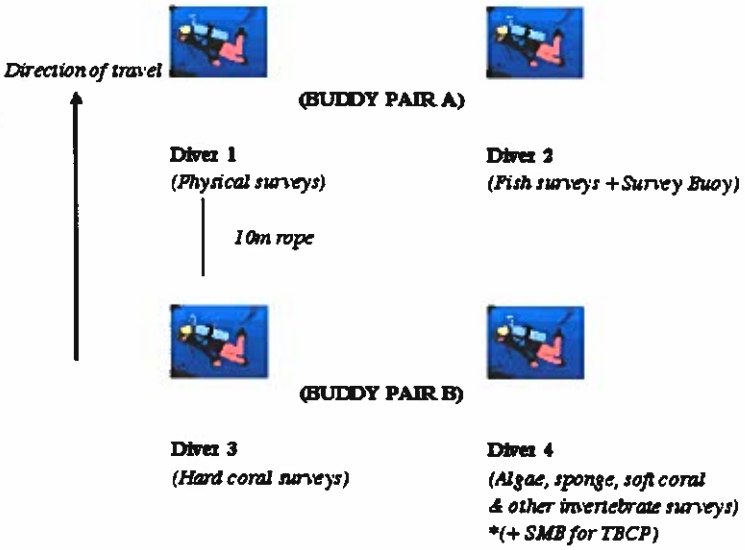
The distribution and physical topography of the Lokaro Island coral habitat were identified using a combination of surface snorkels, reconnaissance divers, boat viewers and GPS mapping techniques. These physical features were then plotted on charts drawn from satellite images (LANDSAT 7) in order to plan the precise locations of the survey dives.

Survey dives were carried out by teams of four divers along predetermined transect lines within the lagoon, and around its outer margins. The relatively small size and shallow depth of the lagoon made contour transects un-feasable. Transects were therefore carried out along set bearings across or along the lagoon. The bearings were set to run between prominent landmarks around the lagoon, so that they may repeated in future years.

Each member of the survey team was responsible for identifying the presence and abundance of species belonging to a particular taxonomic group along the transect line. Diver one monitored the geomorphological class of reef and the reef benthic cover, creating a basic map of the physical topography of the reef. Diver two was responsible for monitoring the fish species, diver three monitored coral and algae species and diver four monitored macroinvertebrates. These data were complimented by basic and oceanographic measurements recorded by the boat marshal. These measurements included visibility (vertical turbidity), current speed and direction, and water temperature. The boat marshal also noted the presence of anthropogenic activities on the reef.

Wherever possible, fishes, corals and invertebrates were identified to species level. In the event that divers were overwhelmed with species (for example when surveying a particularly healthy section of coral in strong currents), species were identified as far as family level, with additional identification of important target species.

Sponges and octocorals were recorded in various life form categories and identified to a range of taxonomic levels such as life form, genera or species.



Most transects required two or more dives to complete, therefore transect surveys were divided up into sections (or sub-transects) with surveys of each sub-transect being carried out by the team of four divers divided into two buddy pairs (A and B) as shown in the diagram above.

At the start point of each sub-transect, Buddy Pair B remained stationary with Diver 3 holding one end of a 10 m length of rope, whilst Buddy Pair A swam away from them, navigating up or along the reef slope in the pre-determined direction until the 10 m line connecting Diver 1 and 3 becomes taught. Buddy Pair A then remained stationary whilst Buddy Pair B swam towards them.

This process was repeated until the end of the planned dive profile, when a surface marker buoy (SMB) carried by Diver 2 was deployed to mark the end of that sub-transect. The SMB acted as the start point for the next survey team and this process was repeated until the entire transect was completed. The positions of the SMB at the start and end of each dive were fixed using the boat's Global Positioning System.

The survey manual for tropical marine resources published by the Australian Institute of Marine Science (English et al. 1994) has shown the technique to generate precise and consistent data appropriate for classifying remotely sensed imagery and hence producing marine habitat maps. Species were recorded using a standard *Eucare* abundance scale. In both phases of the expedition, the research methodology was taught to local personnel involved in the project.

Below and right, Eucare training documents used for briefing local personnel involved in underwater surveys

EDINBURGH UNIVERSITY CORAL AWARENESS AND RESEARCH EXPEDITION

KEY TO EUCARE ABUNDANCE RATINGS

Score 0-5 Abundance	Corals and Algae	Fish and Invertebrates
0	None	0
1	Rare	1-5
2	Occasional	6-20
3	Frequent	21-50
4	Abundant	51-250
5	Dominant	250

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Identifying Features for the Main Fish Families

Butterfly Fish

- "Hoking out" mouth
- Body plate-like
- Continuous dorsal fin
- 15 - 20 cm (30cm)

Angel Fish

- Spine on preoperculer
- Small spines on head
- 10 - 15 cm (30cm)

Surgeon Fish

- Continuous dorsal and anal fins
- Scalpel blade before tail
- 25 - 35 cm (55cm)

Trigger Fish

- Deep bodied and compressed
- 1st D-Fin with large spine
- Pelvic fin reduced to a knob
- Large, stout teeth
- Eyes high on head
- 25 - 35 cm (75cm)

Parrot Fish

- Teeth fused into beak
- Distinctive swimming style ('flapping')
- 30 - 50 cm (130cm)

Sweetlips

- Sloping forehead
- Thickened lips
- 70 - 90 cm (95cm)

Grouper

- Well defined D-Fin
- Large mouth
- 50 - 70 cm (270cm)

Goatfish

- Pair of distinct barbels on chin
- 2 separate D-Fins
- Forked Tail
- 30 - 40cm (60cm)

Seaperch

- Continuous D-Fin
- Large, canine teeth
- 35 - 45 cm (100cm)

Emperors

- Thickened lips
- Emarginate to forked tail
- Snapper-like
- 40 - 50 cm (100cm)

Fusiliers

- Elongate, fusiform bodies
- Continuous D-Fin
- Forked Tails
- 15 - 25 cm (32cm)

Rabbitfish

- Well defined, venomous D-Fins
- Terminal mouth
- 30 - 40 cm (53cm)

Pufferfish

- Bulbous and scaleless
- Teeth fused to beak
- Small, single D-Fin with no fin spines
- 10 - 40 cm (120cm)

Jacks and Trevallies

- Compressed and silvery
- Two D-fins
- Forked Tail
- 60 - 100 cm (170cm)

Barracuda

- Elongate and silvery
- Two widely spaced D-Fins
- Pointed Head
- Large Mouth
- 70 - 100 cm (190cm)

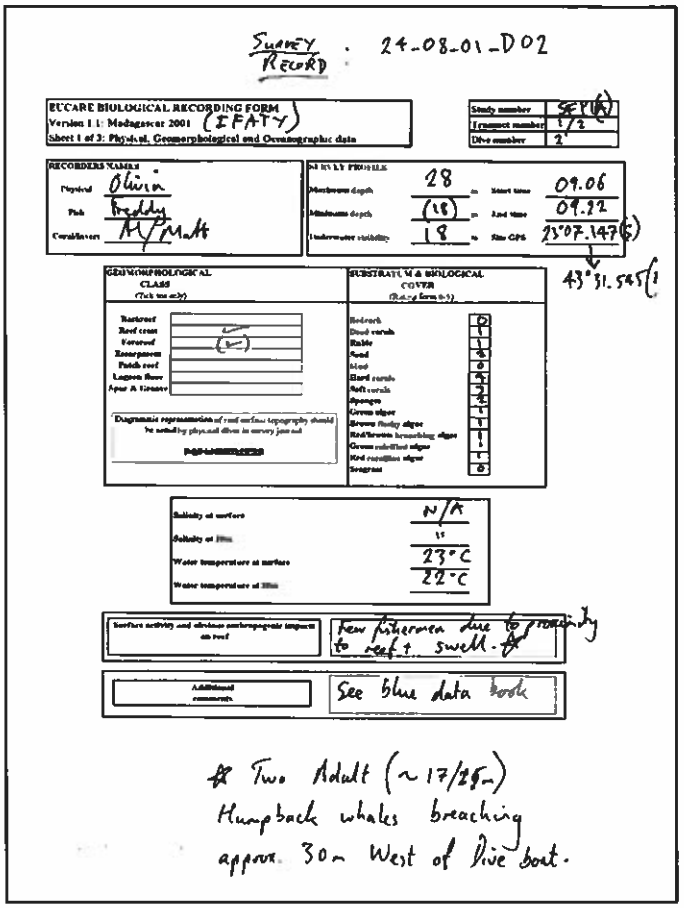
Mullets

- Extremely elongated
- Restricted gill openings
- No pectoral or pelvic fins
- 60 - 90 cm (300cm)

Results

At the end of each survey, divers transferred the information written on their underwater slates to data recording forms, as shown below.

Right, the first sheet of a Eucare biological recording form, showing the physical information collected on the dive by diver no. 1 (OLJ), after a survey dive in phase II.



Once each day's diving was completed, the data on these forms were put into survey spreadsheets. These spreadsheets were kept in both electronic and paper format. In the spreadsheets, each transect is referred to by a specific survey code. An explanation of each survey code is given overleaf. The locations referred to by each survey code can be found on the Lokaro Island lagoon marine habitat map, shown on the next page. The names of each survey location can be found on the marine habitat map, which can be seen after the key to survey codes, shown overleaf. Survey results are documented in appendices 1,2 and 3 as follows:

- Appendix one: Coral species data
- Appendix two: Fish species data
- Appendix three: Invertebrate species data

Key to Lokaro Island Lagoon survey codes, and geographical information

All the survey locations mentioned below can be found under the appropriate name on the marine habitat map for Lokaro Island Lagoon.

Dive code	Survey Location
D01	Contour around lost island wall
D02	Contour continued into gully
D03	Zebu island on a bearing to 1st rock
D04	Gully between lost island and sth point
D05	South point to jawbone transect
D06	Sail rock to south point
D07	Boulder to jawbone transect
D01'	Contour around lost island wall
D02'	Contour continued into gully
D03'	Zebu island on a bearing to 1st rock
D04'	Gully between lost island and sth point
D05'	South point to jawbone transect
D06'	Sail rock to south point
D07'	Boulder to jawbone transect

Dive code	Survey no.	Date	GPS start (S)	GPS start (E)	GPS end (S)	GPS end (E)	Total distance dived (m)	Dive start time
D01	1	12-Jul	24, 56.586	47,07.127	-	-	20	10.02
D02	2	12-Jul	24,56.566	47,07.106	-	-	40	11.55
D03	3	13-Jul	24,56.566	47,07.106	24,56.444	47,07.106	30	9.55
D04	4	13-Jul	24,56.566	47,07.106	-	-	40	12.37
D05	5	15-Jul	24,56.598	47,07.189	24,56.566	47,07.106	70	9.05
D06	6	15-Jul	-	-	-	-	200	11.01
D07	7	16-Jul	24,56.501	47,07.106	24,56.598	47,07.189	50	9.22
					-	-		
D01'	8	16-Jul	24, 56.575	47,07.124	-	-	20	12.21
D02'	9	17-Jul	24,56.565	47,07.104	-	-	40	10.05
D03'	10	17-Jul	24,56.566	47,07.106	24,56.443	47,07.108	30	12.32
D04'	11	18-Jul	24,56.571	47,07.108	-	-	40	9.55
D05'	12	18-Jul	24,56.595	47,07.183	24,56.564	47,07.103	70	11.26
D06'	13	19-Jul	-	-	-	-	200	10
D07'	14	19-Jul	24,56.501	47,07.108	24,56.596	47,07.189	50	12.05

Details of Lokaro Island Lagoon survey dives

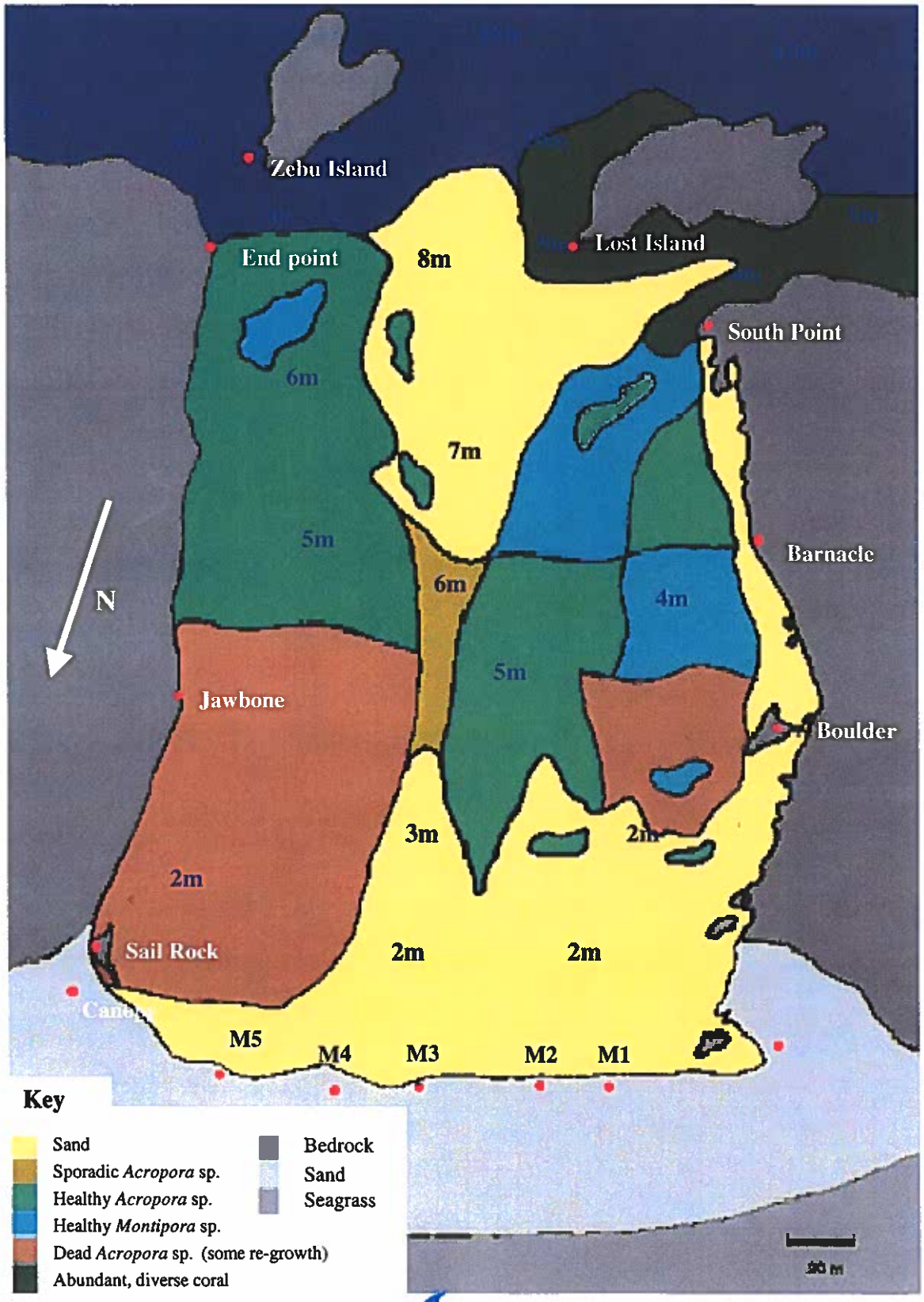
(Basic oceanographic and biological data)

Survey ID / Survey code	Water temp (surface) (°C)	Water temp (bottom) (°C)	Maximum depth (m)	Dive duration (mins)	Underwater visibility (m)
D01	22	21	9	35	7
D02	22	21	7	27	7
D03	22	21	6	35	4
D04	21	20	3.4	26	8
D05	21	21	5.8	47	8
D06	21	21	3.5	41	7
D07	20	20	8	30	2
D01'	21	21	9.1	32	8
D02'	22	21	7	35	9
D03'	22	22	6.2	41	5
D04'	21	20	3.2	28	7
D05'	21	21	5.6	35	7
D06'	20	20	3.5	36	8
D07'	20	20	7.6	31	7

	- SURVEY TEAM 1				Substratum and biological cover (abundance rating 0-5)							
Survey code	Physical -1-	Fish -2-	Inverts. -3-	Coral -4-	Bed-rock	Dead coral	Rub-ble	Sand	Mud	Hard coral	Soft coral	Spnge
D01	OLJ	FL	DA	ML	3	1	1	2	0	4	2	1
D02	JG	Eugene	RC	AH	3	1	1	2	0	4	2	1
D03	RC	DA	OLJ	AH	3	1	1	2	0	4	2	1
D04	ML	JG	FL	RC	3	1	1	3	0	4	2	2
D05	OLJ	FL	DA	AH	2	1	1	3	0	3	2	1
D06	DA	JG	RC	ML	2	4	4	4	0	3	0	0
D07	OLJ	ML	RC	AH	0	2	3	4	0	3	1	1
D01'	DA	OLJ	JG	AH	2	1	1	3	0	4	2	1
D02'	RC	JG	FL	ML	3	2	1	2	0	4	2	1
D03'	JG	OLJ	DA	AH	2	1	2	2	0	3	2	1
D04'	OLJ	FL	RC	AH	3	1	1	3	0	4	3	1
D05'	FL	OLJ	ML	AH	2	1	1	3	0	3	2	1
D06'	ML	DA	FL	AH	3	3	4	4	0	3	0	0
D07'	DA	RC	AH	ML	0	2	3	4	1	3	1	1

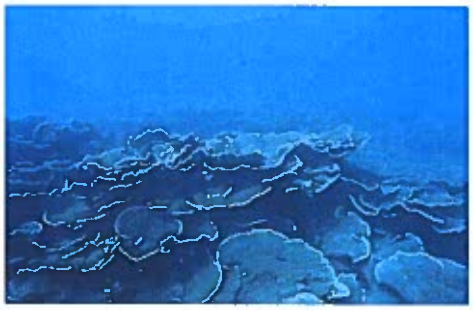
Lokaro Island lagoon marine habitat map

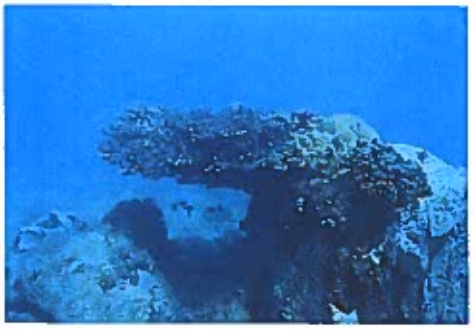
(see individual species data in appendices I – III for detailed habitat analysis)



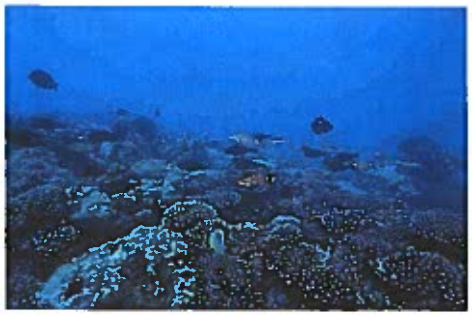
Underwater photos of the main Lokaro Island lagoon habitats:
(Courtesy of Jurg Brand)

Above, below and above left: Thriving *Acropora* colonies in the centre of the lagoon. Below left: Montipora colonies in the Southwest corner of the lagoon





Above, below and right: diverse hard coral growth on the north and east sides of Lost Island, which displays the most abundant coral in the lagoon



PHASE TWO: BAIE DE RANOBE/SALARY

INTRODUCTION

After completion of survey work at Lokaro at the end of July 2001, the team moved to Toliara to finalise preparations for phase two of the expedition, which was to last until mid September. The main aim of the phase was to carry out species level base line surveys of the extensive offshore fringing reef system in the Baie de Ranobe, 40km north of Toliara. The secondary aim was to carry out similar surveys on the remote fringing reef of Salary, north of Ranobe, comparing the data obtained from the two areas in an attempt to establish the effects of increasing tourism on the Ranobe reef.

Specific objectives were as follows:

- Description of important habitats
- Mapping of the coral reefs
- Description of the status of the coral reefs and resources (eg. Reef cover, coral identification, fish & invertebrate counts)
- Description of physical processes and threats influencing life on the reefs.

All work in this phase was carried out in close collaboration with the *Institut Haliéutique et des Sciences Marines* (*IH.SM*) and *la Cellule des Océanographes de l'Université de Toliara* (*COUT*).

BACKGROUND AND JUSTIFICATION

The coral reefs in the Southwest of Madagascar are a vital resource base for the area's coastal communities. With the continued growth of coastal populations and the concomitant increase in the need for marine resources, the region's coral reefs stand at the face of overexploitation, and are being subjected to widespread degradation due to destructive fishing practices and increasing levels of pollutants from expanding human populations.

The expansion of urban areas and the development of coastal tourist facilities (particularly in the Ranobe region) means that the area's coral reefs are coming under increasing pressure to provide even more resources than they have historically been required to deliver.

The site was chosen because the villages of Ifaty and Mangily, in the Baie de Ranobe, are the most important tourist sites in the Toliara region. In addition, the proximity of the research site to Route Nationale 49 facilitated the solving of many logistical difficulties associated with diving in the area – in particular the re-supplying of food, materials, fuel and medical equipment. The team's work would serve as a continuation of the basic surveying carried out on the reef in 1993 by Andrew Cooke *et al.*

BIOGEOGRAPHY OF REGION

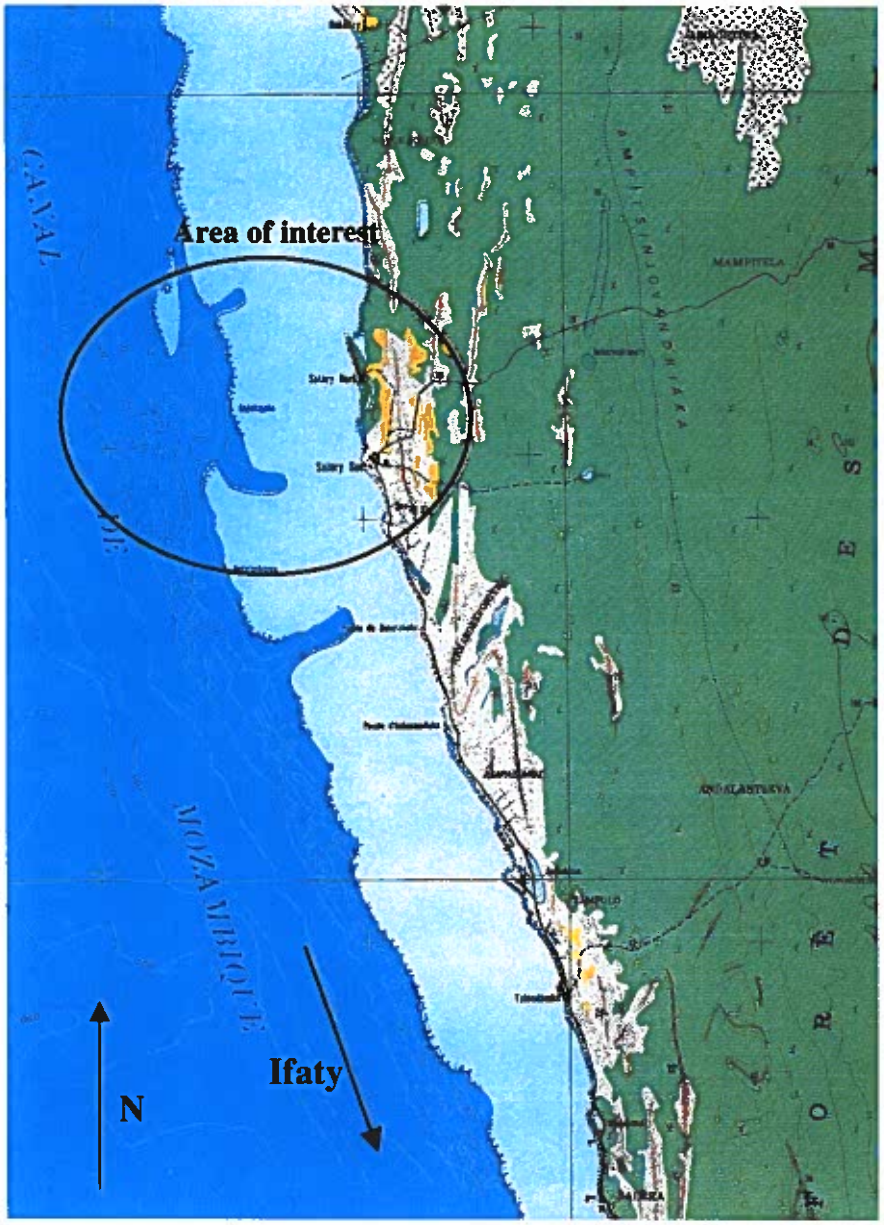
The zone of the Baie de Ranobe lies in the centre of the reef system of the Southwest of Madagascar. It's northern point lies at 22°57'47" South / 43°27'31" East, and its southern point lies at 23°13'00" South / 43°37'30" East. The littoral zone of the bay is 35km long, and contains the fishing villages of Songeritelo, Beravy, Ifaty, Mangily, Andrevo and Fitsitike. The Manombo and Fiherenana rivers flow into the northern and southern ends of the lagoon respectively, and are responsible for much of the sedimentation that occurs on the reefs. This effect is exacerbated by increasing amounts of deforestation occurring upstream.

The fringing reef lies 8km from shore at the lagoon's widest point, and is broken by two main passes (Passe Sud d'Ifaty and Passe Nord de Ranobe) as well as numerous false passes. The south pass is formed by a deep channel (up to 36m) approximately 120m wide. The north pass is considerably wider and shallower (19m).

The main coral habitats on the interior of the reef (in the lagoon) are easily accessible to pirogues, fishing boats, and tourist boats. These habitats (known locally as Jardin de Roses, Vatu, Piscine, Jardin des Coraux and Aquarium) have been most badly affected by the damage caused by anthropogenic impacts and activities in the lagoon. The exterior of the reef is only accessible to boats that have travelled through one of the passes, and is often inaccessible due to bad weather and dangerous conditions in the passes. The outer reef slope is characterised by canyon and 'spur and groove' formations.

Right, map of the Baie de Ranobe, showing major villages, routes, and the position of the fringing reef. The letters N, S & F code for the North, South and False passes respectively.

The village of Salary is situated some 60km North of Ifaty. The village faces a lagoon protected by an offshore fringing reef, similar to the reef in the Baie de Ranobe. The area is considerably more remote than the Baie de Ranobe, with poor communications, very limited transport, and no tourism. As a result, the Salary reef faces fewer anthropogenic impacts than the Ifaty reef, and provided a good location for a comparative study.



Above, Salary and the coastline north of the Baie de Ranobe. The fringing reef opposite the village of Salary is clearly visible.

FISHERIES

Fisheries are the principal source of income for the region's coastal communities. The current over fishing of key species may be leading to a decline in certain economic species as well as ecological shifts in the benthic communities of some reef areas. Effective management plans for these fisheries hinge on sufficient data being available. Whilst in the field, project team members lived and worked alongside fishermen, including accompanied trips net and line-fishing on traditional pirogues.

Fisheries monitoring surveys were carried out by Colby Gottert alongside local fishermen to determine the sustainability of fishing practices in the area. It is hoped that future monitoring of the extensive artisanal fishery will yield essential data for sustainable management of this resource.

Artisanal fishery in Ifaty (by Colby Gottert)

The local economy in Ifaty has historically been based on artisanal fishing. The first pioneers that settled in Ifaty came because the waters off its costs were teaming with marine life. The composition of the artisanal fishery in Ifaty has changed greatly over the past fifty years. Historical matricies, as well as interviews that our research team conducted in the village, indicate that it was common for one pirogue to catch 3 *soubikes* (a large wicker basket used to transport fish) of fish on a single trip as recently as fifteen years ago[1]. This number has declined over the past 15 years to a current average of 0.5-1 *soubike* per trip. The major change in the artisanal fishery occurred with the arrival of the tourism industry in 1990 and the seafood export industry in 1991. These two industries introduced strong demands for new types of seafood that were previously rarely caught, or were only caught for subsistence. For example, the hotels created a lucrative market for lobsters, because foreign tourists were willing to pay high prices for the local spiny lobsters. The export companies on the other hand target species that can be exploited on a much larger scale, and demand squid and octopus. These new markets have sustained if not increased the income of artisanal fishermen despite the drop in productivity of the ecosystem. Market prices reflect the supply and demand of the products, therefore as seafood populations diminish, but the demands increase, sale prices increase and fishermen make a sizable income despite the diminishing quantity of their catch.

[1] Rapid Rural Appraisal exercise conducted with the community group on July 11th 2001

Ifaty's Artisanal Fishery

Top – Pirogues from the Ifaty spear fishing fleet
Bottom – single net fisherman

Nature of the Artisanal Fishery:

Currently, approximately 60% of the families in Ifaty derive the majority of their income from some activity that is related to the capture or sale of marine resources.[2] There is a consistent division of labor between men and women within the fisheries sector. Men tend to be deep sea fishermen in outriggers who fish with nets, spear guns, fishing lines, or jigs, while women tend to be pedestrian fishermen who fish with *volosh*, or intermediaries who transfer fish landed on the beach to the markets in Toliara. The type of species caught by a fishermen depends on the materials they are using (see box below). The type of materials a fishermen owns also correlates to his income, because fishermen who own most or all of the material listed above will be able to target different species at different times of the year to take advantage of the seasonal fluctuations in the populations of different species.

Hook and Line – Fishermen who use hook and line tend to fish alone in small pirogues. During the day they fish over sea grass beds for smaller fish (8-12 inches) such as *Amboramasaka*. On the other hand night fishermen, who go out from 5 pm to 2 am, catch bigger fish (12-24 inches) such as Capitain and Carranga to sell to the hotels.

Nets – Nets are usually used by a group of pirogues either over grassy areas, near coral islands, or outside the reef. There are usually 3-4 fishermen in a single pirogue and a number of pirogues from a single extended family will collaborate to work the nets. Fishermen with nets will bring in a range of valuable products such as unicorn fish, sardines, and squid.

Jigs – Fishermen will use jigs to fish squid at night during the week around the full moon. The fishermen will go out alone in small pirogues when the tide is low.

Spear guns – fishermen who use spear guns will usually go out individually or in pairs and will catch larger fish such as captain fish, carranga, and barracuda or lobsters to sell to the hotels, or sea turtles for the markets in Tulear.

Volosh – Fishermen will use these wooden spears with metal tips to fish shells, sea cucumbers, and octopus. Volosh are carried by all pirogues, because if a fishermen comes across a valuable shell or an octopus, they will always take it.

The fishermen alter their fishing practices with the change in seasons to maximize their incomes. The fishery changes from season to season because the climate influences the marine ecosystem and the size of the populations of different marine resources. The four seasons include Litsaky from December to February, Fararano from March to May, Asotry from May to July, and Faosa from August to November. Seasonal changes in climate have a strong effect on what fishermen earn, because they influence the size of stocks and the durability of the seafood after it is caught, which greatly impacts fish prices (see box for description).

Intermediaries:

The scope of the traditional fishing economy includes market intermediaries who transfer the fish landed by the fishermen to the markets in Toliara. These intermediaries will buy fish from the

[2] Based on data from 50 random household surveys conducted from July 2nd to July 28th 2001 in Ifaty.

fishermen, process the fish in Ifaty, and then send them to Tulear to be sold. There are different types of market intermediaries just as there are different types of fishermen. There are about 16 market intermediaries who operate in Ifaty, and most will buy from the members of their extended family. Intermediaries who are not related to a large family will generally wait on the beach to compete for fish that are caught by fishermen who have not lived in Ifaty for very long and are not members of an established family.

Intermediaries specialize in the traffic of certain products just as fishermen specialize in what they catch. For example, there are only 5 intermediaries who will buy and sell sea turtles, and only a few of them deal with sea turtles regularly because they are linked to the best sea turtle fishermen. Other intermediaries specialize in trafficking octopus and squid because they have established relationships with the major export companies in Tulear. One woman is the sole trafficker in helmet shells and has been collecting the shells from fishermen for 40 years (Intermediaries who sell to export companies will be discussed in greater detail in the seafood export companies section).

The fisheries market is an integral aspect of the economy because most of the money entering into the local economy flows through the intermediaries. The fisheries market has established rules within the community, because every fishermen has a fixed intermediary that they will sell to. However, an intermediary is not certain to gain a profit on every interaction. Their incomes fluctuate with the seasons just as a fisherman's does, and in many cases are much more volatile, because the can actually loose money at the end of the day if they are unable to sell all of the fish they bought.

There are many anthropogenic threats to the bay's coral reefs, which will in turn have a large effect on the region's artisanal fishery. These include anchor damage, pollution, and increased sedimentation from the rivers at each end of the bay. This sedimentation is thought to be linked to the deforestation that is taking place in the rivers' water catchment areas. Additional affects include the over-exploitation and over-fishing of certain species. For example, over-fishing of Langouste out of the lobster season in response to demand from hotel restaurants.

Above, Pirogue fishermen using nets on the exterior of the fringing reef in the Baie de Ranobe, 8km from shore.

SURVEY DIVING IN BAIE DE RANOBE/SALARY

Preparations and logistics

The team was housed in a bungalow provided by the University of Toliara, on the sandy beach 500m North of the village of Ifaty, almost directly opposite the Passe Sud d'Ifaty. Although somewhat derelict, the accommodation provided a suitable base for the team's work. After some construction work, a cooking area was erected in one of the rooms, and a kitchen was put together using materials, stoves and equipment bought in Toliara. Owing to the unstable nature of the bungalow's roof, the team camped on the sand outside the building. Additional tents were borrowed from the IH.SM for this purpose. Mademoiselle Vero, the team's cook, was responsible for buying food and provisions, and this was done on a weekly basis in Toliara. Perishable items were brought daily by pirogue from the villages of Ifaty and Mangily. Medical oxygen was obtained from *Cimelta* in Toliara.

Water from the bungalow's well was saline and exposed to high levels of contamination. Bottled water was therefore brought in by Taxi brousse from Toliara for cooking and drinking, and additional supplies of fresh water from nearby non-saline wells were delivered daily by for washing dive kit. These barrels were brought to the bungalow by a locally hired Zebu carts, which the team used for short distance kit transport throughout the phase. Electrical items such as laptops, VHF radios and the team's satellite phone were charged at generators in *Vovo Telo* and *Lakana Vezo*, in the villages of Mangily and Ifaty respectively.

As part *Eucare*'s collaboration with the IH.SM, three research students from the institute were seconded to work with the team. Jean-Charles Lope, Ignace Razanakoto and Tsirivelo Ranaivoson lived and worked with the team for the duration of the phase. Their keen and active participation in the team's research was a huge benefit to the expedition, and it is hoped that all three scientists will return to work with *Eucare* in 2002.

The IH.SM also provided the team with its research vessel, which was moored in the lagoon in front of the bungalow. This boat was piloted by Alphonse Dina, an IH.SM employee who lived with the team in Ifaty. Unfortunately, the boat's engine proved to be unreliable, and twice the engine broke down while in use on the exterior of the reef. On both of these occasions, the team had to resort to the emergency rescue plan, which involved radioing the *Vovo Telo* in Mangily and relaying a message to the *Grand Bleu*. Richard and Graham Paper at the *Grand Bleu* were fortunately on hand to rescue the divers on both occasions. Owing to the extreme dangers associated with being stranded at sea on the exterior of the reef, the engine was no longer used after the second rescue, and the team was able to hire a 115hp boat from Graham Paper. Unfortunately, the costs associated with this prevented the team from working as long as had been planned, and the last dives were carried out on the 27th August.

Additional limitations to the team's progress were caused by various oceanographic and meteorological factors. The tidal flow in and out of the lagoon is fastest through the passes, reaching speeds of several knots at spring tides. As a result of this, diving in the passes can be extremely

dangerous when the tide is entering and exiting the lagoon, and as such the passes should only be dived at slack tide. During spring tides, it was impossible to launch the boat at low tide, as the sea could be up to 1km from the high water mark. Even when the boat was moored far offshore, carrying dive kit across the exposed lagoon floor at extreme low tide was both difficult (owing to the soft sand and heavy equipment), and dangerous (owing to urchins concealed beneath the sea grass). To avoid these problems, it was often necessary to dive very early in the morning or late in the afternoon, with the added problems of compromised light intensity. In addition, strong currents in regions around the passes often increased divers' air consumption thereby reducing survey times. Bad weather caused by strong Southerly winds occasionally made the South and North passes too dangerous to cross, preventing surveying on the exterior of the reef on many days.

Diving related logistics (and problems encountered with diving in phase II) are covered in more detail in the diving officer's report.

Left, improvised cylinder cleaning in Ifaty – one of the biggest technical problems encountered in phase II. *Eucare* team members are shown de-greasing SCUBA tanks with neat petrol.

The team visited the village of Salary for four days starting on the 9th August, mid-way through phase two. Accommodation was generously provided by the president of the village, and all provisions and equipment were transported to the village by sea on the dive boat. Owing to the high cost of relocating the team and all its equipment to Salary, only limited surveys were carried out. All dives were carried out in the region of the Passe Sud, which faces Salary village.

Research methodology

The fringing reef in the Baie de Ranobe is approximately 30km in length, and survey dives were carried out at intervals along the exterior of the reef. Unfortunately, owing to the high fuel cost associated with taking the dive boat to the far north of the bay, comparatively few dives were carried out in this area. Therefore, a greater number of dives were carried out in the regions of Passe Sud and Fausse Passe than in other, more distant parts of the reef. Popular dive sites were also surveyed, as these displayed some of the most well developed coral habitats, and some of the most biodiverse sections of reef. The interior of the reef, or lagoon, was studied wherever there were significant coral habitats. These lagoon coral habitats were closest to shore and most accessible to fishermen, and therefore represented some of the most severely damaged sections of reef.

The survey methodology used in phase II was based on that used in Lokaro. However, in this phase, two kinds of surveying technique were employed: dives were carried out either at a set depth parallel to the reef crest (a 'parallel transect'), or from a depth of 28m to the reef crest (a 'perpendicular transect'). Parallel transects were carried out a range of depths (3-5m, 10-12m, 17-20m), and were to be used as an alternative to perpendicular transects when conditions at the reef crest were too rough to permit safe diving at shallow depths. Parallel contour transects were also used when diving in the lagoon at a constant depth. Up to four surveys were carried out each day, depending on the time and height of the tides. Night dives were also carried out on the interior of the reef.

Reconnaissance work was carried out in the lagoon, the passes and on the exterior using a combination of surface snorkellers, reconnaissance divers, boat viewers and GPS mapping techniques. This enabled the team to understand the physical topography of the reef in order to plan the precise locations of the survey dives. A light aircraft was also hired to assist in this process. Footage from this aircraft can be seen on the *Eucare* film.

Left, aerial photos taken from the *Joker* light aircraft during reconnaissance: left, Massif des Roses, lagon d'Ifaty; right, Passe Sud d'Ifaty.

A key to the survey codes, along with geographical and oceanographic information about the surveys, can be found on the following pages. Survey results are documented in appendices 4 and 5 as follows:

- Appendix four: Coral species data
- Appendix five: Fish species data

Key to survey codes

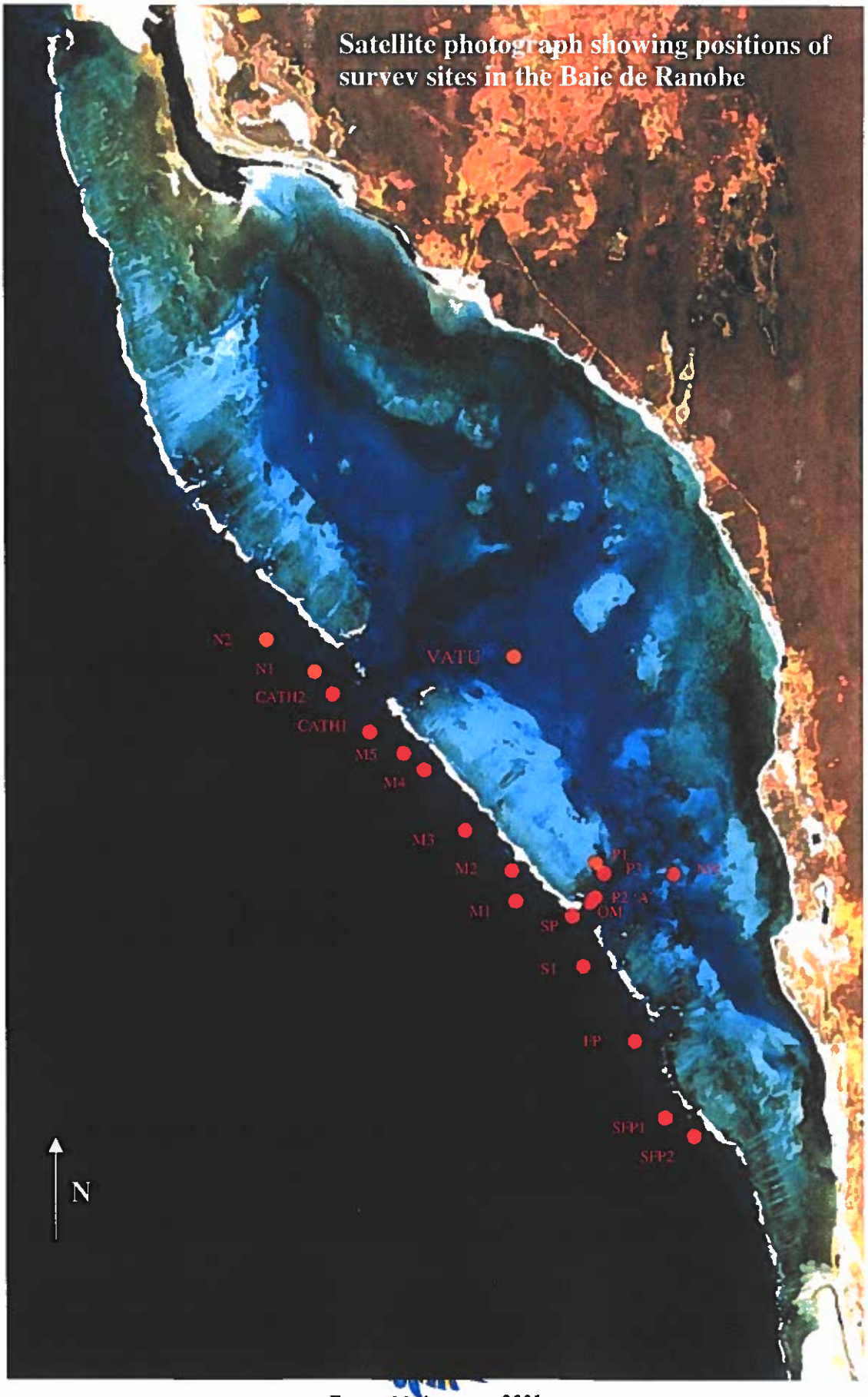
	Dive code	Survey Location
Interior (Lagon de Ranobe)	MR1	Massif des roses
	P1	Piscine
	P2 (A)	Massif 'A' (piscine)
	P3	Piscine, pente ouest
	VAT	Vatu (face d'Ambolimailaka)
	QM1	Les quatres montagnes
	QM2	Les quatres montagnes
	SFP2	Sud de Fausse Passe
	SFP1	Sud de Fausse Passe
	FP1	Fausse Passe 1
	FP2	Fausse Passe 2
	FP3	Fausse Passe 3
	S1	Sud de Passe sud
	SP1a	Passe Sud, partie Nord
	SP1b	Passe Sud, partie Nord
	SP2	Passe Sud, partie Nord
	SP3	Passe Sud, partie Nord
Exterior (Baie de Ranobe)	NSP	Cote nord du Passe Sud
	M1	Sud de Passe Nord
	M2	Sud de Passe Nord
	M3	Sud de Passe Nord
	M4	Sud de Passe Nord
	M5	Sud de Passe Nord
	SNP	Cote sud de Passe Nord
	CTH1	Cathedral (Passe Nord)
	CTH2	Cathedral (Passe Nord)
	N1	Nord de Passe Nord
	N2	Nord de Passe Nord
	N3	Nord de Passe Nord
	N4	Nord de Passe Nord
	N5	Nord de Passe Nord
	?	?
	SAL1	Tres Nord de P.S.
Salary	SAL2	Nord de P. Sud
	SAL3	Passe Sud
	SAL4	Sud de Passe Sud
	SAL5	Plus Sud de P.S.

Satellite photos showing the positions of the survey sites on the reefs can be seen on the next two pages.

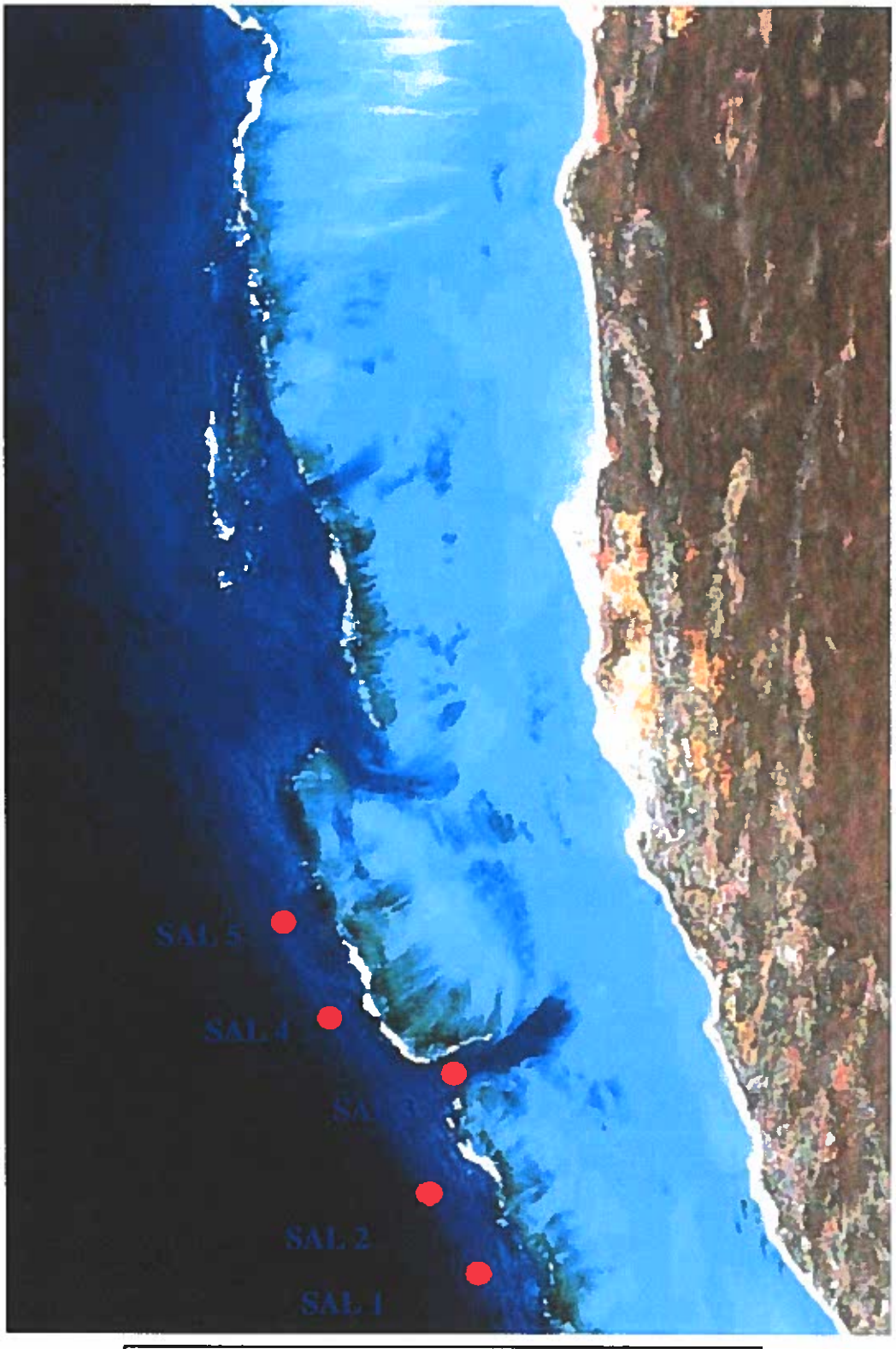
The data from the survey dives can be found in appendices four and five as follows:

- Appendix four: coral species data
- Appendix five: fish species data

Latin and Malagasy translations of fish species names can be found in appendix six.



Eucare Madagascar, 2001



Above, aerial photo of Survey sites around the Passe Sud in Salary

Geographical survey information

Dive code	Survey region	Survey no.	Date	GPS start (S)	GPS start (E)	GPS end (S)	GPS end (E)	Total distance dived (m)
MR1	Interior	4	31-07	23°08.778	43°35.440	23°08.736	43°35.456	120m
P1	Interior	5	01-08	23°08.946	43°34.237	23°09.026	43°34.226	70m
P2 (A)	Interior	9	02-08	23°09.084	43°34.246	23°09.084	43°34.246	50m
P3	Interior	10	05-08	unknown	unknown	unknown	unknown	80m
VAT	Interior	6	01-08	23°05.963	43°34.104	23°05.914	43°34.065	90m
QM1	Interior	21	14-08	unknown	unknown	unknown	unknown	20m
QM2	Interior	31	16-08	unknown	unknown	unknown	unknown	50m
SFP2	Exterior	28	16-08	23°11.985	43°35.423	(due east)	(due east)	50m
SFP1	Exterior	26	15-08	23°11.602	43°35.027	unknown	unknown	70m
FP1	Pass	3	30-07	unknown	unknown	unknown	unknown	50m
FP2	Pass	11	08-08	23°10.911	43°34.795	23°10.916	43°34.694	105m
FP3	Pass	12	08-08	23°10.886	43°34.811	23°10.706	43°34.552	80m
S1	Exterior	22	14-08	unknown	unknown	unknown	unknown	110m
SP1a	Pass	1	29-07	unknown	unknown	unknown	unknown	50m
SP1b	Pass	2	29-07	unknown	unknown	unknown	unknown	60m
SP2	Pass	8	02-08	unknown	unknown	unknown	unknown	150m
SP3	Pass	30	16-08	unknown	unknown	unknown	unknown	100m
NSP	Exterior	29	16-08	23°08.967	43°33.342	23°08.986	43°33.302	70m
M1	Exterior	7	02-08	unknown	unknown	unknown	unknown	55m
M2	Exterior	11	14-08	unknown	unknown	unknown	unknown	80m
M3	Exterior	23	15-08	unknown	unknown	unknown	unknown	60m
M4	Exterior	25	15-08	23°07.147	43°31.545	23°07.093	43°31.507	60m
M5	Exterior	33	17-08	23°07.401	43°31.947	23°07.492	43°31.996	70m
SNP	Pass	32	17-08	23°06.728	43°30.991	23°0.614	43°31.142	80m
CTH1	Pass	18	12-08	23°06.708	43°31.230	23°06.784	43°31.189	70m
CTH2	Pass	33	18-08	23°06.724	43°31.203	23°06.689	43°31.201	55m
N1	Exterior	19	12-08	23°06.282	43°30.798	23°06.189	43°30.962	100m
N2	Exterior	24	15-08	unknown	unknown	unknown	unknown	50m
N3	Exterior	34	20-08	unknown	unknown	unknown	unknown	50m
N4	Exterior	35	20-08	unknown	unknown	unknown	unknown	70m
N5	Exterior	36	20-08	unknown	unknown	unknown	unknown	55m
?	?	27	16-08	unknown	unknown	unknown	unknown	100m
SAL1	Salary	16	11-08	unknown	unknown	unknown	unknown	40m
SAL2	Salary	17	11-08	unknown	unknown	unknown	unknown	60m
SAL3	Salary	13	10-08	22°37.563	43°15.865	22°37.568	43°15.954	65m
SAL4	Salary	15	10-08	22°38.085	43°16.086	22°38.068	43°16.155	180m
SAL5	Salary	14	10-08	22°38.416	43°16.105	22°38.459	43°16.159	75m

Tidal information for surveys

Dive code	Tidal information (Toliara: 23°23'S, 43°40'E)						
	High tide (1)		Low tide (1)		High tide (2)		Low tide (2)
	Time	Ht (m)	Time	Ht (m)	Time	Ht (m)	Time
MR1	2.41	-	8.54	-	15.22	-	21.36
P1	3.41	*2.70*	9.48	*1.25*	16.08	*2.90*	22.22
P2 (A)	4.24	*2.85*	10.29	*1.10*	16.46	*3.05*	22.59
P3	6.06	*3.15*	0.04	*0.90*	18.22	*3.30*	12.09
VAT	3.41	*2.70*	9.48	*1.25*	16.08	*2.90*	22.22
QM1	12.49	*2.40*	6.01	*1.65*	-	-	19.12
QM2	2.59	*2.60*	9.16	*1.30*	15.37	*2.85*	21.48
SFP2	2.59	*2.60*	9.16	*1.30*	15.37	*2.85*	21.48
SFP1	1.31	*2.45*	8.04	*1.55*	14.36	*2.60*	20.50
FP1	1.16	*2.45*	7.37	*1.50*	14.09	*2.55*	20.32
FP2	7.32	*3.10*	1.29	*0.90*	19.45	*3.30*	13.36
FP3	7.32	*3.10*	1.29	*0.90*	19.45	*3.30*	13.36
S1	12.49	*2.40*	6.01	*1.65*	-	-	19.12
SP1a	-	-	5.59	*1.50*	12.25	*2.45*	18.52
SP1b	-	-	5.59	*1.50*	12.25	*2.45*	18.52
SP2	4.24	*2.85*	10.29	*1.10*	16.46	*3.05*	22.59
SP3	2.59	*2.60*	9.16	*1.30*	15.37	*2.85*	21.48
NSP	2.59	*2.60*	9.16	*1.30*	15.37	*2.85*	21.48
M1	4.24	*2.85*	10.29	*1.10*	16.46	*3.05*	22.59
M2	12.49	*2.40*	6.01	*1.65*	-	-	19.12
M3	1.31	*2.45*	8.04	*1.55*	14.36	*2.60*	20.50
M4	1.31	*2.45*	8.04	*1.55*	14.36	*2.60*	20.50
M5	3.54	*2.85*	10.06	*1.00*	16.23	*3.15*	22.33
SNP	3.54	*2.85*	10.06	*1.00*	16.23	*3.15*	22.33
CTH1	9.49	*2.60*	3.27	*1.35*	21.59	*2.60*	15.49
CTH2	4.38	*3.10*	10.48	*0.80*	17.03	*3.35*	23.11
N1	9.49	*2.60*	3.27	*1.35*	21.59	*2.60*	15.49
N2	1.31	*2.45*	8.04	*1.55*	14.36	*2.60*	20.50
N3	3.54	*2.85*	10.06	*1.00*	16.23	*3.15*	22.33
N4	3.54	*2.85*	10.06	*1.00*	16.23	*3.15*	22.33
N5	3.54	*2.85*	10.06	*1.00*	16.23	*3.15*	22.33
?	2.59	*2.60*	9.16	*1.30*	15.37	*2.85*	21.48
SAL1	8.59	*2.80*	2.51	*1.15*	21.14	*2.80*	15.05
SAL2	8.59	*2.80*	2.51	*1.15*	21.14	*2.80*	15.05
SAL3	8.26	*2.90*	2.22	*1.05*	20.41	*2.95*	14.32
SAL4	8.26	*2.90*	2.22	*1.05*	20.41	*2.95*	14.32
SAL5	8.26	*2.90*	2.22	*1.05*	20.41	*2.95*	14.32

Current and timing information for surveys

	Dive	Dive	Water movement		
Dive code	start time	duration (mins)	Tide phase	Tidal current	Underwater swell
MR1	4.12pm	52	slack/in	none	none
P1	9.20am	42	out	mild (out)	none
P2 (A)	5.05pm	45	in	strong (in)	none
P3	10.32am	50	in	fast (out)	none
VAT		40	in	mild (in)	none
QM1	2.32pm	32	fast	very strong	none
QM2	5.00pm	35	slack/out	mild (out)	none
SFP2	5.00pm	35	slack/out	mild (in)	strong
SFP1	4.00pm	35	out	strong	moderate
FP1	11.00am	37	in	mild (in)	none
FP2	9.20am	32	out	none	v. strong
FP3	8.55am	35	slack/out	none	v. strong
S1	11.12am	42	in	none	strong
SP1a	11.30am	40	slack/out	mild (out)	none
SP1b	12.15pm	32	slack/out	mild (out)	none
SP2	1.15pm	40	fast in	v strong (in)	none
SP3	5.00pm	35	slack/out	none	none
NSP	5.00pm	35	slack/out	mild (in)	moderate
M1	8.30am	35	out	none	moderate
M2	12.03pm	21	in	none	strong
M3	9.20am	45	slack/in	none	none
M4	11.00am	34	fast in	strong (in)	strong
M5	11.25am	45	in	negligible	negligible
SNP	11.12am	30	slack/in	mild (in)	none
CTH1	9.55am	40	slack	none	negligible
CTH2	10.57am	45	slack	none	none
N1	11.15am	33	out	mild (out)	moderate
N2	1.00pm	30	in	negligible	v. strong
N3	10.00am	30	slack	none	v. strong
N4	11.00am	40	in	none	v. strong
N5	1.00pm	45	in	none	v. strong
?	5.00pm	33	slack/out	none	none
SAL1	10.45am	30	out	none	none
SAL2	9.20am	45	out	none	none
SAL3	9.55am	45	out	none	none
SAL4	2.15pm	43	out/slack	none	none
SAL5	11.30am	39	out	none	none

Underwater photos of from phase II

(Courtesy of Jurg Brand)

Above and left, schooling *Carcharinus wheeleri* in the South Pass of Ifaty. Below, Sweetlips, Ifaty.

Above, spinner dolphin (Fausse Passe, Ifaty); Right, Emperors (Ifaty); Above right, schooling Jacks, Salary

PHASE THREE: BELO-SUR-MER

The aim of phase three was to find a suitable site for an expedition team in the summer of 2002. Belo-sur-Mer is located in Western Madagascar, 50 km south of Morondave and 100km north of Morombe, in the Menabe region (Between 20°45' and 21°S). This area has been proposed as one of four sites suitable for a potential marine World Heritage site or Biosphere Reserve status. (Vasseur et al, 1998; CNM/UNESCO '99). The area is also being outlined as a conservation area (Reconnaissance has been carried out in October 2001) and is a focus of proposed governmental work highlighting island ownership.

Belo-sur-Mer has a chain of 9 islands located approximately 18km offshore, stretching south and fringed by coral reef. A barrier reef stretches to the west of these islands. The main local industries are fishing, boutre (cargo vessel) construction, salt production and coconut harvesting.

Belo-sur-Mer's tourist industry is increasing. Over the past two years numerous hotels have opened and most dramatically a hotel complex is in the process of being developed on Nosy Andiangory. Another two bungalows are being developed on an island close to the recief de pearle.

RECONNAISSANCE METHODOLOGY

Snorkelling surveys were to be carried out on the fringing reefs of all the islands. These were designed to give an impression of the habitat found in the area. Teams consisted of two research divers, who swam at a specific bearing from the beach for 2.5km. Due to the large number of species seen, and the temporal restrictions of the reconnaissance team, there was a surplus of data that could not be collected.

LOCAL FAUNA

The reconnaissance surveys found a substantial coral habitat in the area surrounding Nosy Andravoho. Reconnaissance surveying carried out at the proposed area of study in Belo-Sur-Mer identified an abundance of the following coral families: *Pocilloporidae, Acroporidae, Poritidae, Siderastreidae, Agaricidae, Fungidae, Oeulinidae, Pectinidae, Mussidae, Nernlinidae, Faviidae, Caryophyllidae, Dendrophyllidae* and *Alcyoniidae*. The reconnaissance surveys also noted a rare diversity of invertebrate species, as well as a large number of both pelagic and reef-associated *Osteichthyes* and *Elasmobrachii* fishes. In August 2001, *Eucare*'s studies on reef systems south of Belo-Sur-Mer identified over 280 species of fish. Owing to the remoteness and lack of anthropogenic impacts on the Belo reef systems, it is thought that these coral reefs possess an even higher abundance and diversity of fish species.

Discussion with the locals and proprietors of hotels showed that there was substantial coral in the region – surrounding the nine islands, up crops in the lagoon and a submerged barrier reef. In the area there are *Caretta caretta* and *Chelonia mydas* - both endangered species. *Megaptera novaegliae*, *Sousa chinensis* and *Stenella longirostris* are present and soon to be endangered or vulnerable. Recent

reports of 2 Dugong dugon, are the first evidence of this mammal in these waters for over 30 years. "Dugongs are Madagascar's single-most concern for marine conservation at this moment in time" (Cooke, A: Pers comm. 2001).

CONCLUSION

Belo-sur-Mer is an area that will provide an excellent site for an Expedition in 2002. It contains a substantial coral habitat on which no baseline data exists and so will fulfil one of the priorities of the International Coral Reef Initiative (UNEP and IUCN) by gaining valuable baseline data on this uncharted area. In addition the site is pinpointed as an area of scientific interest and is a proposed conservation area, which further highlights it for necessary work. It is also under a series of environmental and human threats – with the emergence of tourism and the increased fishing in the area.

Left, Satellite image of Belo-sur-Mer. The islands of interest are shown in the bottom left of the picture.

DIVING OFFICER'S REPORT

INTRODUCTION

During the expedition, there were a number of challenges on the way to completing a successful underwater survey of coral reef habitats in both regions studied. Logistics were difficult in both regions of Madagascar, we had to maintain high safety standards in a region where diving is unregulated and the majority of operations were known to follow unsafe diving practices, and equipment was almost impossible to find at a reasonable price.
The expedition team proved capable of facing these challenges and fortunately the in water activities were completed very successfully. Here is a report of the difficulties we faced in a new and challenging environment

PHASE 1 : LOKARO

1.Equipment and Logistics

Tanks, Compressor and Power Boat
When the team first arrived in Fort Dauphin we set out to find the equipment that we had planned to use from Britain. This included tanks and a compressor very kindly lent by the mining company QMM, as well as tanks and weights from the local water-sports centre. The problem with relying on equipment in Madagascar is that there is no guarantee as to its condition, because there are no regulations. Fortunately the tanks had been tested only 2 years previously, but the compressor was small, old and required a special electrical source, and as it was an older model, it was much slower to fill tanks than we had anticipated. The 'technicians' supplied very kindly by QMM had apparently not used the compressor for some time, but between us it did not take us long to work out how this particular compressor worked. It is imperative that all diving expeditions should have somebody who is experienced with the maintenance of compressors and other equipment. Getting equipment in this part of the world is very difficult, in a place that has seldom been visited by divers. It was because of this that we were unable to obtain more tanks and found power-boat hire so expensive.

Future
In the future it would be ideal to import equipment such as tanks, compressor and even inflatable boat with engines to avoid the time consuming hunt for equipment to hire, and the dangers posed by equipment that has not been properly maintained. Having our own equipment on site would have made our day to day diving and compressing logistics a lot easier and quicker, allowing us to survey more efficiently.

2. Diving Conditions and Logistics

The diving in Lokaro Bay posed little difficulty for our team of divers, being shallow and sheltered. On a few occasions the currents near the opening of the Bay were too strong for diving, but this enabled snorkel surveys to be done. On a few other occasions the visibility was limited to a few centimetres and diving and snorkel surveys had to be postponed. The weather conditions meant that it was not safe to dive outside the shelter of Lokaro bay for most of the time that we were there. Further surveys of the surrounding coastline could be attempted with more success when sea conditions are calmer, perhaps December. During our expedition, the diving in Lokaro proved easy and a good place to start and learn survey techniques. There were no diving incidents during this phase of the expedition.

The shallow diving in Lokaro enabled us to economise with our tanks, on average one tank was used for 2 dives. With only 6 tanks and the compressor situated half an hour's drive away on a very rough track, this was the only way we could conduct enough surveys to obtain sufficient data from the limited time we had. We are enormously grateful to QMM for the use of their compressor and for relocating it to a site we could get to daily, and to Azafady and Floren for his hours of driving in difficult terrain, and his patience and reliability.

PHASE 2 : IFATY

1.Equipment and Logistics

Boat Engine

Ifaty proved to be more challenging than Lokaro in terms of both the diving involved and the logistics now that we had our own boat to use, kindly lent by the IHSM. Here, the barrier reef was between 1 and 2 km away from shore, and the surveys were able to get into deeper water for more comprehensive data. However the currents found in this area that go through the passes of the barrier reef were very strong, and it was important to plan the dives away from mid tide and preferably on the incoming tide. These currents proved too strong for the boat engine, and on the first day the engine failed, leaving the boat in a dangerous position, drifting on the outside of the barrier. We were lucky to attract the attention of another boat, which towed us back into the lagoon. The engine proved unreliable on another occasion, both times a potentially dangerous disaster. We found that is important to ensure that you have a working rescue plan for the boat, our VHF radios and plan proved

very useful during the second engine failure. In future expeditions it would be ideal to have a spare engine on board.

Tanks

A major problem in this phase as well, was trying to obtain tanks and getting them filled. Initially we had 5 of our own tanks to use (3 kindly lent by the IHSM, and 2 purchased by ourselves) leaving us to hire only 3 per day from the local diving operations. However most of these dive operations were reluctant to loan us their tanks (as it was high season for tourists) and we found that tank-hire and air refills were costly. The IHSM tanks seemed to be giving a bad smell so we opened the tanks to find a layer of grease and rust inside, presumably from having been filled repetitively with either a poorly maintained compressor, or by compressing air without adequate ventilation. The corrosion inside meant that the tanks were not safe to use for the rest of the expedition. As this phase went on we were forced to hire not only more tanks, but also a professional boat, both of which proved expensive.

Team Equipment – BCDs and Regulators

Equipment failure was a problem that we encountered. Maintaining BCDs and Regulators was difficult due to the effects of sand blockage, and initial problems with a fresh water supply in an arid area. On future expeditions I would recommend a more stringent maintenance and washing program to be instigated. The SMBs proved a vital piece of equipment and I would recommend that next year they should be used again.

For the Future

A priority for future expeditions to Madagascar would be to import as much equipment as possible, (tanks, weights, boat engine) to avoid high prices, and more importantly to ensure that the safety standards have not been overlooked. Ideally new equipment could be shared with the IHSM and used by their research teams in the future. However it would be important in this case to import good quality equipment and also suitable spare parts. A budget would also have to be made to pay for the annual trip to Antananarivo to test the tanks. It would also be necessary to provide training to certify a mechanic at the IHSM (to UK standards) to maintain the compressor and boat engine. It would also be a high priority to ensure that all of the divers using this equipment are competent with its correct use. This would reduce the risk to IHSM employees, and ensure that equipment will last longer, and is usable on future expeditions.

2. Diving Success, Diving Incidents.

The diving in Ifaty was very successful, and proved to be no problem for our expedition team. However one of our staff members, a scientist from the IHSM and our coral expert, was found to have never dived with the equipment that we supplied, and with no previous official training lacked the required skills for safe recreational diving. A course was conducted for him.

Future Recommendations

In the future it is likely that there will be more involvement with local researchers. In this case we must be able to ascertain the levels of diver training of each researcher to ensure the safety of not only him/herself but also the whole team. With an instructor on the expedition it will be possible to conduct courses for those who have not had training before, without an Instructor, a Divemaster may be able to refresh skills for those who have had previous diver training. However, in the absence of an instructor I would recommend that all scientists who join the expedition must have been certified to PADI Open Water Diver, or equivalent. This may mean that a diver with perhaps hundreds of previous dives may be excluded from the expedition because he lacked an official qualification. But as shown this year this diver may well be incompetent in the use of modern diving equipment and not safe in the water, even with all that previous experience.

Incidents

There was an incident during this phase of the expedition during which a local team member was unable to deflate their buoyancy control device in time to avoid floating quickly to the surface. Luckily there was no serious injury involved. I would now recommend for safety reasons that the diving officer assess all divers joining the expedition, and those deficient in any skills be either instructed or excused from the expedition.

Diving Practice

Keeping to depth limits assigned to each dive, and keeping strictly to dive-table profiles well within the limits of both tables and computers, there was no incidence of Decompression Illness. We also left a member of the expedition in radio contact on shore, which meant that all divers took a day off at least as often as 1 in 4 days, to minimise the effects of 'silent bubbles' of nitrogen. With a difficult Emergency Evacuation Plan it was necessary to be strict with these procedures.

Dive Planning

The most challenging job for the diving officer I found was having to plan for dives leaving when it is not close to low tide, diving at slack tide (to avoid currents), and returning when again it is not close to low tide, as was often the case when diving in the South Pass. I would recommend that at least suitable tide tables to be found for the area of the surveys next year, and if possible admiralty charts to be located. These would provide precise data on currents and together may be used to help the planning of safe dives.

3. On a Personal Note

I would like to end by saying that it was a great challenge to be the Diving Officer of the expedition, and I am thankful for the opportunity. Personally I learnt a great deal and I hope future Diving Officers will benefit in the same way that I have.

4. Thanks – for diving related logistics and support

Phase 1 – Brett Massoud and *Azafady* for the use of their resilient 4x4, and Florent Ramanantsoa for his patience and hard work at the wheel. Also thanks to *Azafady* for the use of the camp close to the dive site, and Bret Massoud for his efforts in locating Oxygen cylinders for the expedition.
- Ny Fanja Rakotomalala and *QMM* for providing us with their *Bauer* compressor, and for the use of their tanks. Thanks also for the re-location of the compressor to the field base, and for the hospitality and refreshments offered during the long hours spent compressing in the evenings.

Phase 2 – IHSM for the kind use of their boat and engine, and tanks, the excellent boat man Alfonse, and mechanic Behave and all their help and advice.
Le Grand Bleu – Thanks for their rescue efforts, and the use of their dive boat and tanks.
Also for the hard work compressing tanks all day and night.
Vovo Telo – for their radio message relay and electricity for recharging equipment
Lakana Vezo – for the use of electricity for recharging equipment
Emile and family – for help carrying equipment, guarding the house, and carrying out a daring pirogue rescue on a runaway dive boat.

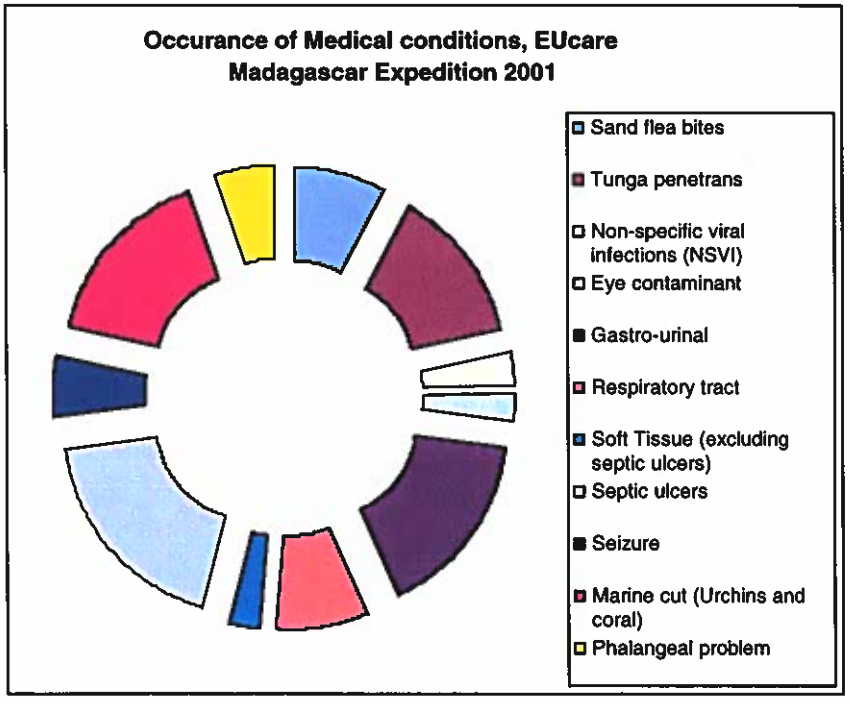
Above, Jean-Charles Lope, DEA, one of the Malagasy researchers seconded to *Eucare* by the IH.SM. Jean-Charles was trained to dive by *Eucare*'s Diving Officer, and this has given him the qualification he needs to carry out his own underwater research in Madagascar. Jean-Charles completed over 40 dives with *Eucare*, and was responsible for coral identification on most survey dives.

Right, studying asphyxiated coral, Salary

MEDICAL REPORT AND EXPEDITION SAFETY

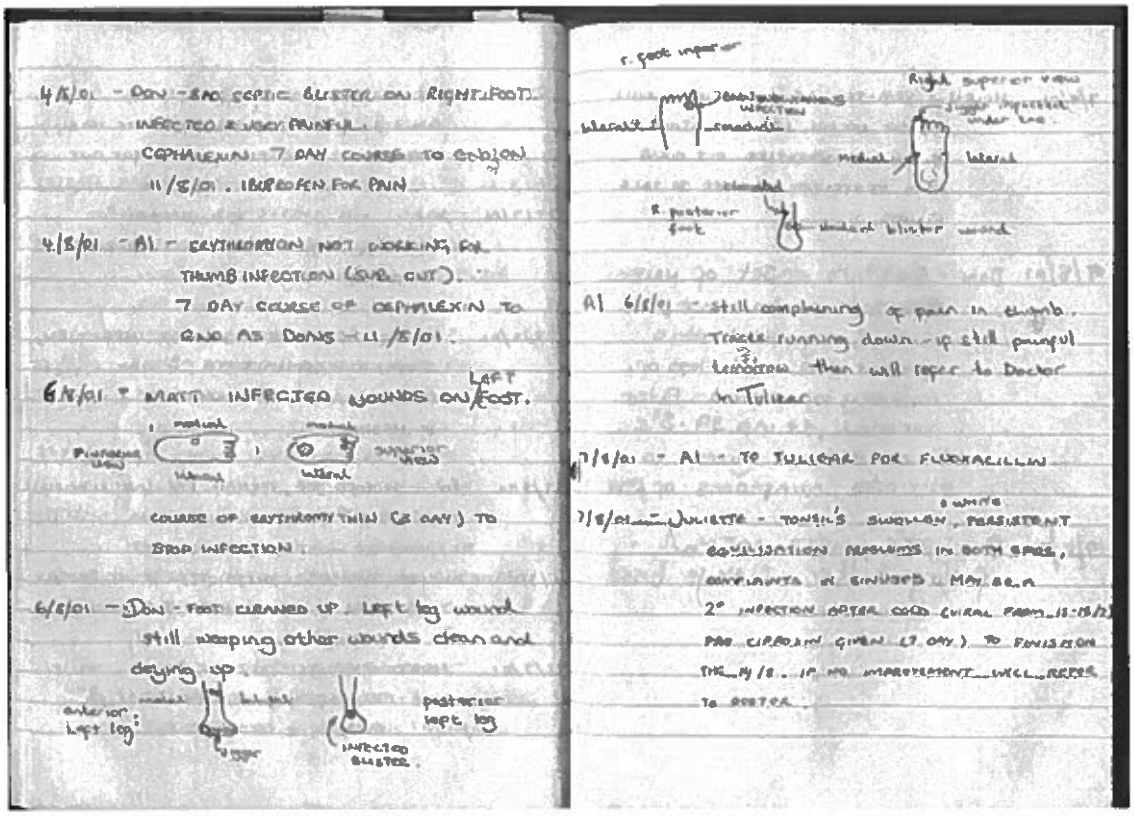
In view of the dangerous nature of the work carried out, the Eucare diving protocol was strictly adhered to at all times, and bottled oxygen was carried on the dive boat and on shore. In addition to the dive boats (115hp), 4x4 vehicles with local drivers were kept on standby as close to the dive sites as possible in both phases of the expedition. Phase two included the use of a light aircraft in its casualty evacuation plan, which, as well as being used for aerial reconnaissance of the reef, was kept permanently on standby near the beach at Ifaty, to fly any casualties at low altitude to Toliara if necessary. Contact was maintained between the dive boat, shore guard and aircraft using VHF radios and satellite phones. No accidents or medical problems occurred on the expedition.

All participants were briefed on hygiene, basic medical advice and advised of necessary vaccinations and personal medications needed, before embarking on the expedition. Throughout both phases of the expedition, a number of medical problems were encountered. These ranged from infected cuts and bites to gastro-urinal and respiratory tact infections (See graph below). In the second phase, at Ifaty, due to poor sanitation in the area, locals defecated on the beach. Although shoes were worn at all times on this section of the beach, there were 5 cases of chigger flea (*Tunga penetrans*). These were removed by teasing the female flea out of the entry wound with a sterile pin. Another common problem was sand flea bites.



The most common drug used was ciprofloxacin (ciproxin), for the treatment of traveller's diarrhoea. This was followed by erythromycin, for the treatment of soft tissue infections, which were common throughout the expedition. Other common medications included paracetemol, ibuprofen, betadine,

cicitrin, plasters and bandages. One course of Malarone was used as a precautionary measure when a team member displayed symptoms of malaria. All medical occurrences were recorded in the field medical book, pictured below.



On return to the United Kingdom all team members were advised to have a medical check up at a dedicated Travel clinic. On return to the UK one of the team members tested positive for Malaria, and another for a tropical roundworm infection. Both have been successfully treated in the UK.

TREASURER'S REPORT

The Eucare 2001 Madagascar Expedition gratefully acknowledges financial support to the organisations mentioned in the income statement below.

SUMMARY OF INCOME	£ (GBP)
University of Edinburgh	
Small Projects Grant	2400
Weir Fund	1300
Student Travel Fund	88
Davis Trust	4700
James Rennie Bequest	1300
PADI Project Aware	1240
BSAC	2200
Royal Geographic Society	2250
Royal Scottish Geographic Society	300
Carnegie Trust	2000
The 2111 foundation GPS Grant	350
Ede & Ravenscroft	1000
Fundraising	1763
Expedition Members' contribution	5927
GRAND TOTAL INCOME	**26818**

SUMMARY OF EXPENDITURE

PRE EXPEDITION	
Administration	378
Insurance	538
Transport (Flights)	6723
Equipment	
Books	171
Hydrometer	76
Tools	60
Silva Mulitnavigator GPS	200
VHF Radios	280
Satellite Telephone	728
Compressor filters	45
Dive equipment	300
Sun cream and Mosquito repellent	100
Camping equipment	1119
Medical	833
Fundraising events (flyers and reef awareness BBQ)	255
Other	370
Total	**12176**

In Field	**£ (GBP)**
Transport	
Flights	838
Airline Overweight Charges	587
4x4 Support vehicle hire	1200
Boat Hire	830
Petrol and Oil	234
Spares	30
Other Transport	870
Equipment	
Oxygen Kit	225
Tanks	275
Camping equipment	170
Dive Equipment Hire (weights and cylinders)	446
Accommodation	790
Food and Water	3630
Communications (local phones, fax & satellite phone)	881
Wages (Driver, Guide, Cook, Researchers)	726
Other	970
Total	**12202**
GRAND TOTAL EXPENDITURE	**24378**

In retrospect, the expedition budget under estimated the cost of necessary communication using the satellite phone, transportation costs for boat and vehicle hire, cost of renting dive equipment as well as cost of oxygen equipment and tanks. Furthermore, the water quality was found to be insufficient and the use of bottled water was necessary, increasing our food and water expenses.

Outstanding expenditure includes cost of printing and circulating the final expedition report. Any remaining money in the account, and all expedition equipment will be given to *Eucare*'s forthcoming expeditions to Madagascar and Zanzibar. *NGO Azafady* in Madagascar currently owes *Eucare* £875, and this money will be kept as credit with *Azafady* to assist with *Eucare*'s future projects in the Lokaro region.

Observations and social considerations for the implementation of a conservation project

(by Juliette Green)

Background.

We conducted a baseline survey of the reef in the area north of Tulear, close to the villages of Ifaty and Mangile, collecting data which would give an indication of the health of the reef. During the short time that we spent there, we tried to gain a basic understanding of the value of the reef to humans, and also to note the interests of different groups of people who use the reef. As a study that is looking to contribute to the conservation of the reef habitat, it is important to try and consider the different groups of people that will be affected by the decline of the reef, or by any management strategies. It is also important to consider the possible pressures past, present and future that affect the reef, caused by both humans, and climate or physical realities.

We did not conduct any large-scale social survey in addition to the reef work.
Most of the information in this report was attained through word of mouth. We learned a lot about Ifaty from a group of fishermen who we invited for a discussion. We also learned a great deal from local people that we worked with including local Malagasy, and French, Belgian and South African immigrants who worked in the tourist industry in Mangile and Ifaty.

A. Tourism in the Area, Dependency and Attitudes to the Reef

The villages of Ifaty and Mangile make up an important tourist destination for Madagascar, with 17 hotels, and 4 scuba diving centres. The nearest airport is at Tulear, where flights from Antananrivo arrive most days. From Tulear it is a two/ two and a half hour drive to Ifaty and Mangile along a rough sandy road, requiring a 4x4, the more expensive hotels arrange transfers from the airport. The public transport to the villages is relatively good, with taxi brousse (lorries and camionettes) leaving at least every few hours during the day from Tulear from 6am.

1. Mangile

Most of the hotels are located along the beach in Mangile and tourism is the main industry in this village. The President of Mangile works at one of the busiest hotels. Other industries in the area include souvenir stands on the beach, selling shells and other tourist souvenirs like clothing. There are also groups of women offering massages and hair braiding to the tourists. There are two main nightclubs in Mangile, one of which is frequented by the tourists, and prostitution is a big industry in this village catering largely for the tourist market. There are notices in some of the hotels warning that child prostitution is not permitted on the premises. Watersports are also a major attraction with 3 diving/ snorkelling clubs making a living on the reef. There are local men offering outings on the local boats to tourists, with anything from a morning's sailing to a five day trip up the coast. Fishing is the other big industry in Mangile, both to provide for the Malagasy family and the hotels. This includes a large demand for langouste. We were told that langouste is available at many of the hotels both in and out of the breeding season, although officially this is not legal.

2. Ifaty

Ifaty is a smaller village, and has some of the older, more established and considerably more expensive hotels situated on the beach. There are only two hotels here. The local girls are not

permitted to offer services to tourists, and there is no night-club. There is not the same volume of informal enterprises on the beach here, although people do offer pirogue sailing outings. These hotels were also much quieter at the time that we visited and appeared to have a smaller turnover of guests. There is a scuba diving shop affiliated to one of the major hotels here. There were many motor boats moored in the bay, and some private yachts, although these are not in use for most of the year.

Fishing is a big industry in Ifaty, and the President of the village is an elderly fisherman. Every morning a fleet of pirogues leave the beach to fish on the reef, both in the lagoon and on the exterior of the reef, returning at midday. They fish to provide food for the family, to sell to the hotels and to export to Tulear. There is also an industry of shell collecting, both close to the shores and out on the reef at low tide. The women from Ifaty, and also from other towns collect the shells to sell to tourists and to export. We were told that a large percentage of the shell collectors come from Tulear to collect shells for the tourism industry in Tulear, and also to export abroad. (Please see the separate report on artisanal fishing.)
Other industries in Ifaty include salt production – currently I have no figures for employment or production.

3. Tourism and Attitudes to the Reef

We received a lot of support from local dive operations, and some local hotels. However it is clear that not all of the hotels in the area are interested in the long-term future of the reef and sea-food stocks. Most hotels still purchase langouste during the breeding season, despite regulations banning the trade at certain times. The tourist expects to be served good quality seafood regardless of the season, and does not usually appreciate the implications of this demand.

Many tourists who come to Ifaty/Mangile, dive at least once, and the local hotel-affiliated dive operations have a vested interest in the condition of the reef and fish numbers. Consequently we have heard that there is continual friction between fishermen and dive operations over the areas that can be fished with nets.

4. Fishing and Attitudes to the Reef

There was an informal vote held in Mangile in the last 5 years to find out who wanted to protect, or manage the reef to ensure a sustainable future for the reef tourism and fishing industry. Around 40% were for protecting the reef and 60% were against any interference.

We decided to hold a meeting with selected representatives from Mangile and Ifaty to make contact with local fishermen to introduce our team. We wanted to hear from them what were the most important species to them on the reef, and to gain some sort of insight into their attitude to the fish and the reef, and indeed our work. We planned to give them a brief presentation of the team, our diving equipment and which fish we were seeing. We visited the two Presidents individually to issue an invitation for him and 9 others, perhaps some old fishermen, some young fishermen, some shell collecters, and some fishermen's wives from the villages. We provided transport to the venue. On the night of the meeting, the party from Mangile went to drink rum at a

village party, making their apologies, the party from Ifaty (5mins walk from the venue) also did not arrive, preferring a night of drinking instead.

We did manage to arrange a meeting with 7 fishermen, old and young from Ifaty. They were invited by the fisherman who guarded our campsite, and the president was not present. These fishermen told me that the party did not attend the meeting before because they were afraid that we were going to tell them not to fish. These fishermen who did attend helped us to compile a species list for the fish on the reef, and we discussed their attitudes to scientists, (European and Malagasy), tourism, and fish stocks.

We ascertained the following from the meeting:
They fish to provide for the hotels, for export to Tulear and to feed the family.
They were mainly descendents from the Vesu tribe, and many of the fishermen in Ifaty and Mangile were not born there, but came from further south. Traditionally, the tribe relocate further north along the coast as fish stocks dwindle, creating new and at first temporary settlements. Ifaty is not a very old village. There are new families arriving every year from the south. The fishing practices are very old, but some of them are new to this area of the coastline.

Nobody that I asked had any alternatives for local people for food production or to earn money if fishing and shell collecting was prohibited.

5. Ways of Fishing Noted (see also the Artisanal fishery report)
Nets –
Apparently the government issued new nets to some fishermen in the area.
Fishing using large nets is conducted both in the lagoon and in the passes. There are reportedly clashes between divers and fishermen using nets when they set them up at the mouths of coral basins on the outgoing tide. According to some locals there is tension between some fishermen and the dive operations who rely on these shallow coral formations and their diversity and volume of reef fish for their tourist first time divers. Nets have been reportedly set up across the passes on an outgoing tide, catching enormous quantities of reef fish.
Nets are also used in perpendicular lines from the shore, although we only saw this on the Mangile coast line. The net fishermen reportedly took fish of all sizes juvenile to adult to eat and sell. It is possible to by fried fish as small as 5cm in most towns and villages near to the coast.

Spear Fishing – combined with nets
I went out with some fishermen from Ifaty to observe the spear fishing. There were about 15 pirogues of men, two larger pirogues with 4 men/boys and nets on board and the others all had European, (Cressi) spear guns, masks and fins, and normally only 2 or 3 men on board each pirogue. We went out on to the Exterior of the reef and worked our way along south to north until they found an area where they could see that there were a lot of fish. They then set out the nets blocking the exits in the reef formation, for the fish, before the rest of the fishermen skin dived down and shot the fish with their spear guns as they tried to hide under ledges and in crevices. There were approximately 2-3 fish caught per man by the end of the morning, and the nets had been set over two areas only. The bulk of the catch were unicorn fish, rabbit fish and there were some large parrot fish in the catch too.

Night Fishing –
We saw octopus and squid catches arriving early in the morning. They used flames to see the octopus and squid in the shallows.

6. Children of school age and fishing

Many of the families in Ifaty do not send their children to school, they say that they do not see the relevance of an academic education when fishing is the future of their children. They send their male children out on the reef to fish with their fathers from a young age. Children can also be seen at low tide searching for the small fish and squid in the rocky areas close to the beach. They also search for shells. Their catches are normally juvenile reef fish, which are eaten at home.

All the children that I spoke to could tell me the local Malagasy dialect names of all the fish in the species identification books from as young as 4 years old.

I asked the fishermen at our meeting if they were concerned for the future of the reef, and they confirmed that they were worried for their children. They also seemed to have a good understanding of the interdependent relationship between the coral and the fish and invertebrates in an ecosystem.

7. Education, and Knowledge of Children

Ifaty has one school, which is very poorly attended. Many of the parents of Ifaty apparently do not see the point of school and send their children out to fish and collect fuel instead.

Mangile has 2 schools. Many but not all families do send their children to school, recognising the role of education in their future. However another source stated that a considerable number of families in Mangile do not send their children to school.

Most local people cannot speak French, and many of the Malagasy who work in the tourist industry come from bigger towns and have had a wider education. We did however come across some very well educated French speaking Malagasy locally, although they had been educated elsewhere.

8. Health and Sanitation

The village of Ifaty clearly use the beach as their toilet just before high tide. Not only is this a potential health risk, but also a serious problem for the nearby hotel Lakana Vezo, whose western tourists want to swim in clear water, and walk bare-foot in the sand.
Not all families can afford to buy tooth-brushes, tooth-paste and soap, although this is a greater problem in other coastal villages where there is no tourism income.
Malaria is a big problem among all age groups, and the cost of doctors and medicines is a problem for many coastal village residents.
The poverty of people in the coastal village is such that when a child gets sick, and medicine is prescribed, and as a product of this an poor understanding, parents often only continue to buy the

expensive medicine until the child appears to be better, and often they do not continue with treatment until the end of the course, which accounts for the death of many children.

B. Implications of the Social Situation on Conservation Attempts

1.Groups who rely on the Reef

1. A large number of people rely on the reef and their traditional methods of fishing to feed themselves and to provide an income for the family.
2. Alarge number of shell collectors provide for their families by selling shells for the tourist industry and export.
3. Hotels rely on the fish and langoustine, octopus and squid for the tourists.
4. Fishermen sell their catches to hotels and export to towns.
5. The diving clubs rely on the reef to attract the tourists for diving.
6. The tourism industry relies on the reef to attract tourists – over 50% of tourists in Mangile dive or snorkel during their visit.

2. Finding a Solution

When considering the implementation of conservation techniques in the area, it is important to consider the implications on local people. The attitudes of the majority of the villagers, is such that they would probably be resistant to conservation schemes. Any scheme that is going to work would have to involve working with local people to discuss the alternative possibilities to the current fishing practices and frequencies. Alternative food or income sources would have to be developed alongside sustainable fishing programmes.

Cooperation of Local Peoples

The main difficulty will be ensuring the cooperation of villages and their presidents in any conservation schemes. In addition to planning possibilities with local people, the best way to achieve cooperation would be to ensure that Malagasy nationals are seen to be running the programmes. Hotels would also have to be persuaded to cooperate and respect breeding seasons of fish.

Education and Preparation

Perhaps one of the first steps towards any kind of conservation reality in the area should be to encourage the village children to attend school. Major investment in the education, especially in Ifaty would start a slow process of preparation. If the reef will not provide indefinitely for the villages and the hotels, residents must be prepared for this eventuality and have the skills and ability to find an alternative income in the future.

Implementation and Monitoring Problems

A large problem for the coral are the practices of the shell collectors at low tide, as the punting action along the reef could be damaging coral. In addition to this the effect of dive-operations and their anchor techniques should be monitored as a priority. Although any solution to these two factors will be difficult to implement and monitor.

Langouste

The hotels' purchase of large quantities of lobster both in and out of season is also a priority for authorities to tackle. At the same time as enforcing the regulations, however it is important to look for an alternative income for the fishermen who are relying on the illicit income of the lobster.

Corruption

Corruption of police and officials and a culture of bribery could be a problem to overcome in any conservation scheme. It is important that all parties involved have a vested interest in the implementation and monitoring of reef conservation schemes. When finding a viable solution, case-studies from other parts of Madagascar should be considered, paying attention to successful policing of conservative measures. Much could be learnt from successes and failures in the inland schemes combating de-forestation by villages.

C. Conclusion

The needs and rights of local people, and the reliance of the tourist industry on the reef have to be considered extremely carefully before any moves to implementation of conservation techniques are proposed. Much more research into the relative effects of the reef degradation versus conservation measures on local villagers, fishermen, and the important tourist industry should be carried out here and along the coast line to find the most suitable location for marine reserves. Any conservation schemes must be preceded by, or accompanied by considerable investment in education, and alternative income projects, perhaps a micro-loan scheme would be appropriate.

Note – All information contained in this report is not based on formal research, and should be treated as informal and subjective observations.

Thanks - All the fishermen who participated in the meeting at Ifaty, especially Emille. Monjol and cousin for fishing excursion. Ignace for his dedication and help with the meeting, questions and translation. Lope and Veronique, for their help with translation. The presidents and people who helped us from Mangile and Ifaty.
The hotels and staff in Mangile and Ifaty. All the dive operations who spoke with us.

Top, looking south from Mangily towards the village of Ifaty from the reconnaissance aircraft. The IH.SM bungalow is just visible on the beach at the right hand side of the photograph. Above, the village of Mangily as seen from the air. The run of tourist hotels and boats can be seen on the sea front.

APPENDIX ONE:

LOKARO ISLAND LAGOON SPECIES DATA

CORAL SPECIES

(Latin and Malagasy translations of species names can be found in appendix six)

Eucare 2001 (phase 1): Survey dive data and results

Phylum Cnidaria species data (corals, anemones and fire corals)

		SURVEY REGION	Isle de Lokaro							Isle de Lokaro: *repeated transects*						
		SURVEY DIVE NO	1	2	3	4	5	6	7	1a	2a	3a	4a	5a	6a	7a
		DIVE LOCATION	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone
		TRANSECT CODE	D01	D02	D03	D04	D05	D06	D07	D01'	D02'	D03'	D04'	D05'	D06'	D07'
		DATE (dd-mm-01)	12-07	12-07	13-07	13-07	15-07	15-07	16-07	16-07	17-07	17-07	18-07	18-07	19-07	19-07
		SURVEYOR	ML	AH	AH	RC	AH	ML	AH	AH	ML	AH	AH	AH	AH	ML
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(A) HARD CORALS / CORAUX DURS																
Pocilloporidae	Pocillopora	*damicornis*	1	2	1	2				1	2	2	3			
	Pocillopora	*verrucosa*	1	1	1	1			2	2	2	1	1			2
	Seriatopora	*hystrix*	1	2		1				1	1		1			
	Stylophora	*pistillata*					1							1		
Acroporidae	Acropora	*austera*					1							1		
	Acropora	*danai*	2	2	1	2				1	2		1			
	Acropora	*digitifera*														
	Acropora	*formosa*		1	1	1					2		1			
	Acropora	*humilis*	1	2	2	2	1			1	3	1	2	1		
	Acropora	*hyacinthus*	1	2	1	2				1	2	1	1			
	Acropora	*palifera*	1	1		3		2	2	2	1		1		1	2
	Acropora	*valida*	2	3	2	3		1		2	2	1	1		1	
	Montipora	*capricornis*	2	1		1				1	2		1			
	Montipora	*danae*					2	1	3					2	1	3
	Montipora	*tuberculosa*	1	1		1	1			1	1		1		1	
Poritidae	Alveopora	*stokesi*	2			3				1			1			
	Goniopora	*stokesi*		1	2	1	1				1	2	2	1		
	Porites	*rus*		1							1					
	Porites	*solida*	1	2	1	2				1	1	2	2			
	Porites	*sp.*			2		2					2		2		

		SURVEY REGION	Isle de Lokaro							Isle de Lokaro: *repeated transects*						
		SURVEY DIVE NO	1	2	3	4	5	6	7	1a	2a	3a	4a	5a	6a	7a
		DIVE LOCATION	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone
		TRANSECT CODE	D01	D02	D03	D04	D05	D06	D07	D01'	D02'	D03'	D04'	D05'	D06'	D07'
		DATE (dd-mm-01)	12-07	12-07	13-07	13-07	15-07	15-07	16-07	16-07	17-07	17-07	18-07	18-07	19-07	19-07
		SURVEYOR	ML	AH	AH	RC	AH	ML	AH	AH	ML	AH	AH	AH	AH	ML
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(A) HARD CORALS / CORAUX DURS (continued)																
Siderastreidae	Anomastrea	*irregularis*					1							1		
	Coscinaraea	*columna*	2		1					1		1	1			
Agariciidae	Coeloseris	*mayeri*					2							2		
	Gardineseris	*planulata*			2		1					1		2		
	Leptoseris	*mycetoseroides*	1		1	1			1	2		1	1			
	Pavona	*clavus*	1	1		1				1	1		1			
Fungidae	Fungia	*concinna*	2	1		1				1	1		1			
	Fungia	*fungites*	1		1	2		1		2		1	1		1	
	Fungia	*scutaria*	1	1	1	1				1	1	1	1			
Oculinidae	Galaxea	*fascicularis*			1		2					1		1		
Pectinidae	Mycedium	*elephantotus*	1	1		1				1			1			
Mussidae	Lobophyllia	*corymbosa*	1	2		2				2	1		2			
Faviidae	Favia	*favus*	2	1			2			1	1			2		
	Favites	*flexuosa*		1			1				1			1		
	Favites	*sp 1*			1		2		1			2		3		1
	Montastrea	*curta*					1		1					1		2
	Platygyra	*daedalea*		1		1					1					
Dendrophyllida	Tubastrea	*sp 1*	1	1			2			1	1			1		
(B) SOFT CORALS / CORAUX MOUX																
Alcyonlidae	Alcyonium	*flaccidum*	2	2	1	2				2	1		1			
	Sarcophyton	*glaucum*	2	2		2	1		2	1	2	1	1	2		1
	Sinuaria	*notanda*	1	2	1	2			2	1	2	2	1			1
	Sinuaria	*leptoclados*	1	2		2				2	3		2			
	Litophyton	*viridis*		1		1					1		1			
	Lemnalia	*sp.*		1	1	1					2	1	1			
	Sea Whip		1	1		1				2	1		1			
	Sea Pen		1	2	1	2				1	1	1	1			

APPENDIX TWO:

LOKARO ISLAND LAGOON SPECIES DATA

FISH SPECIES

(Latin and Malagasy translations of species names can be found in appendix six)

Eucare Madagascar, 2001

Eucare 2001 (phase 1): Survey dive data and results

Fish, reptile and mammal species data

- TAXONOMIC - GROUP -	- COMMON - NAME -	- SCIENTIFIC NAME - Genus	Species	- MALAGASY - NAME -	SURVEY REGION	Isle de Lokaro							Isle de Lokaro: *repeated transects*						
					SURVEY DIVE NO.	1	2	3	4	5	6	7	1a	2a	3a	4a	5a	6a	7a
					DIVE LOCATION	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone
					TRANSECT CODE	D01	D02	D03	D04	D05	D06	D07	D01'	D02'	D03'	D04'	D05'	D06'	D07'
					DATE (dd-mm-01)	12-07	12-07	13-07	13-07	15-07	15-07	16-07	16-07	17-07	17-07	18-07	18-07	19-07	19-07
					SURVEYOR														
						ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(A) CLASS OSTEICHTHYES (BONY FISH): (I) REEF ASSOCIATED SPECIES																			
DAMSELFISHES	Skunk anemonefish	Amphiprion	akallopiosis	*Tsokorokodo*			1	3						5					9
(POMACENTRIDAE)	Twotone chromis	Chromis	dimidiata	*Ariloha*						10			15				1		
	Ternate chromis	Chromis	ternatensis	*Tsokorokodo*															
	Blue-green chromis	Chromis	viridis	*Tsokorokodo*						250	500			100			125	200	
	Humbug dascyllus	Dascyllus	aruanus	*Tsokorokodo*						15	12			16		18	5		
	Indian dascyllus	Dascyllus	carneus	*Fitse*															
	Threespot dascyllus	Dascyllus	trimaculatus	*Ariloha*			1	6			20				1		6	13	
	Black damsel	Neoglyphidodon	melas	*Fitse*			6	9					6			4			
	Carulean damsel	Pomacentrus	caeruleus	*Ariloha*							1			2					
	Bicolour chromis	Chromis	margaritifer				12	16			10	21		5	13			26	30
	Green chromis	Chromis	cinerascens								110					42		25	
	Three spot chromis	Chromis	verator			12	10	12				3	9	5	13		6		4
BUTTERFLYFISHES	Threadfin butterflyfish	Chaetodon	auriga	*Fiau'akoho*			1	1			5	3	12		1		6		
(CHAETODONTIDAE)	Blackback butterflyfish	Chaetodon	melannotus	*Fiau'akoho*			1	1			8	22		7				5	12
	Vagabond butterflyfish	Chaetodon	vagabundus	*Fiau'akoho*							7				5				
	Unknown	species	sp	*Fiau'akoho*			6	5		24	10			26	1	2	12	3	
WRASSES	Indian Ocean bird wrasse	Gomphosus	caeruleus	Unknown							12		1					5	
(LABRIDAE)	Checkerboard wrasse	Halichoeres	hortulannus	Unknown			1	2				2		1				2	2
	Zig Zag	Halichoeres	scapularis	Unknown		3								5		4			1
	Cleaner	Labroides	dimidiatus	*Fiambondiz*						2	24		5		6		23	12	
	Unknown	species	sp	Unknown						8	40				2				6
SURGEONFISHES	Moorish idol	Zanclus	cornutus	*Fiam'akoho*		2	2	2			3	2	8	2	3		4	1	
and UNICORNFISHES	Unknown	species	sp	*Angy*		2					3		1			6		3	
(ACANTHURIDAE)																			
PARROTFISHES	Greenlip parrotfish	Scarus	viridifucatus	*Fiambazaha*			3	2						2	2		2		
(SCARIDAE)	Swarthy	Scarus	niger								1							1	
	Unknown	species	sp	*Fiambazaha*		4				3	1		7	6		2	3	2	5
PUFFERS	Black saddled toby	Canthigaster	valentini	Unknown							2		3		10				8
(TETRAODONTIDAE)																			
TRIGGERFISHES	White barred (Picasso) triggerfish	Rhinecantus	aculeatus	*Votsandja*			1	3						2	2		1		
(BALISTIDAE)	Flagtail (Halfmoon) triggerfish	Sufflamen	chrysopterus	*Tsontso*							1					4		1	
	Other	Unknown	Unknown	Unknown						1									
	Lined triggerfish	Xanthichthys	lineopunctatus	*Votsandja*			4	6						4	2	5			2

SURVEY REGION	Isle de Lokaro							Isle de Lokaro: *repeated transects*						
SURVEY DIVE NO.	1	2	3	4	5	6	7	1a	2a	3a	4a	5a	6a	7a
DIVE LOCATION	Lost Island wall	Lost Island wall east	Zebra Island	Lost Island wall	South point to jewbone	Soft rock to South Point	Boulder to Jewbone	Lost Island wall	Lost Island wall east	Zebra Island	Lost Island wall	South point to jewbone	Soft rock to South Point	Boulder to Jewbone
TRANSECT CODE	D01	D02	D03	D04	D05	D06	D07	D01'	D02'	D03'	D04'	D05'	D06'	D07'
DATE (dd-mm-01)	12-07	12-07	13-07	13-07	15-07	15-07	16-07	16-07	17-07	17-07	18-07	18-07	19-07	19-07
SURVEYOR														

- TAXONOMIC - GROUP -	- COMMON - NAME -	- SCIENTIFIC NAME - Genus	Species	- MALAGASY - NAME -	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(A) CLASS OSTEICHTHYES (BONY FISH): (i) REEF ASSOCIATED SPECIES																	
ANGELFISHES	Semicircle angelfish	Pomacanthus	semicirculatus	*Fiau'akoho*						17		5		1			
(POMACANTHIDAE)	Unknown	species	sp	*Fiau'akoho*	3				32	5		24			5	13	2	
SWEETLIPS	Unknown	species	sp	*Amparero*		1	2									2		
(HAEMULIDAE)																		
ANTHIASES	Other	Unknown	Unknown	Unknown					12				15			8		
(SERRANIDAE, SF ANTHIINAE)																		
GOBIES	Unknown	species	sp	*Tabololo*					22	100			45		32			5
(GOBIIDAE)																		
GOATFISHES	Dash and dot goatfish	Parupeneus	barberinus	*Flantsomotsa*	2				8				2		4			5
(MULLIDAE)	Unknown	species	sp	*Flantsomotsa*						1								
SQUIRRELFISHES	Giant squirrelfish	Sargocentron	spiniferum					1					2					
(HOLOCENTRINAE)	Crown squirrelfish	Sargocentron	diadema					2								1		
SOLDIERFISHES	Whitetip soldierfish	Myripristis	vittata	*Amplfy*						10								
(MYRIPRISTINAE)	Red soldierfish	Myripristis	murdjan					1					2					
SCORPIONFISHES	Lionfish, turkeyfish	Pterois	miles (volitans)	*Kobo*					1			1						
(SCORPAENIDAE)	Progfish	Antennarius	sp.					1										
	Unknown	Unknown	Unknown	Unknown						1		1						
	Leaf scorpionfish	Taenianotus	triacanthus			1												
LIZARDFISHES	Indian lizardfish	Synodus	indicus	Unknown						1			1					
(SYNODONTIDAE)																		
SWEEPERS	Vanicoro sweeper	Pempheris	vanicolensis	*Bemoso*		50		24	9	10		6	25		34			14
(PEMPHERIDAE)																		
FILEFISHES	Blacksaddle mimic filefish	Paraluteres	prionurus	*Tsimalahoke*		1	2		4			3	1			6	2	
(MONOCANTHIDAE)																		
SANDPERCHES	Yellowbar sandperch	Parapercis	xanthozona	*Volomboto*						1								
(PINGUIPEDIDAE)																		
CARDINALFISHES	Five-lined cardinalfish	Cheilodipterus	quinquelineatus	*Bemoso*		7	7					5		2		2		3
(APOGONODAE)																		
SAND TILEFISHES	Striped/Blue blanquillo	Malacanthus	latovittatus	Unknown						10								
(MALACANTHIDAE)																		
RABBITFISHES	Unknown					1	2						1	1		1	1	
(SIGANIDAE)																		
(A) (ii) CLASS OSTEICHTHYES (BONY FISH): PELAGIC SPECIES																		
JACKS & TREVALLYS	Other					1	2										1	
(B) CLASS CHONDRICHTHYES (CARTILAGENOUS FISH): SUBCLASS ELASMOBRANCHII (SHARKS AND RAYS)																		
ELECTRIC RAYS	Torpedo ray							1	2			1				1		
STINGRAYS	Bluespotted ribbontail ray	Taeniura	lymma	*Fay, Makoba*						1				1				
(DASYATIDAE)																		
(C) REPTILES (ORDER CHELONIA)																		
SEA TURTLES	Green sea turtle	Chelonia	mydas	*Tano*		1	1		1	1				1				
(D) ADDITIONAL PELAGIC FISH SPECIES*																		
(i) OSTEICHTHYES																		
BILLFISHES	Black Marlin	Makaira	indica	*Ndwaro*	1													
(ISTIOPHORIDAE)	Sailfish	Istiophorus	platypterus	*Ndwaro*	1													
SWORDFISHES	Swordfish	Xiphias	gladius	*Lawara*	1													
(XIPHIDAE)																		
MAKEREL	Kawa Kawa	Euthynnus	affinis	*Lamara*	2													
(SCOMBRIDAE)																		
FLYINGFISHES	African sailfin flyingfish	Parexocoetus	mento	*Exocets (fr.)*	3													
(EXOCOETIDAE)																		
BARRACUDAS	Great barracuda	Sphyraena	barracuda	Unknown	2													
(SPHYRAENIDAE)																		
(ii) ELASMOBRANCHII																		
REQUIEM SHARKS	Grey reef shark	Carcharhinus	amblyrhynchos	*Aktho*	1													
(CHARCHARHINIDAE)	Scalloped hammerhead shark	Sphyrna	lewini	*Aktho*	1													
	* Pelagic species reported (by Ifaty fishermen) to occur in waters adjacent to the exterior (seaward) side of the reef. Species noted using standard abundance ratings, after discussion with fishermen.																

APPENDIX THREE:

LOKARO ISLAND LAGOON SPECIES DATA

INVERTEBRATE SPECIES

(Latin and Malagasy translations of species names can be found in appendix six)

Eucare Madagascar, 2001

Eucare 2001 (phase 1): Survey dive data and results

Invertberate species data

- TAXONOMIC - - GROUP -	- COMMON - - NAME -	- SCIENTIFIC NAME - Genus	Species	- *MALAGASY* - - *NAME* -	SURVEY REGION	Isle de Lokaro							Isle de Lokaro: *repeated transects*						
					SURVEY DIVE NO	1	2	3	4	5	6	7	1a	2a	3a	4a	5a	6a	7a
					DIVE LOCATION	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone
					TRANSECT CODE	D01	D02	D03	D04	D05	D06	D07	D01'	D02'	D03'	D04'	D05'	D06'	D07'
					DATE (dd-mm-01)	12-07	12-07	13-07	13-07	15-07	15-07	16-07	16-07	17-07	17-07	18-07	18-07	19-07	19-07
					SURVEYOR	DA	RC	OLJ	FL	DA	RC	RC	JG	FL	DA	RC	ML	FL	AH
						ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(A) PHYLUM MOLLUSCA																			
(i) CLASS CEPHALOPODA	White-spotted octopus	Octopus	macropus	*Orita*						1									
	Reef squid	Sepioteuthis	lessoniana	*Calamaras (fr.)*															
(ii) CLASS GASTROPODA (*SUBCLASS PROSOBRANCHIA*)	Cone shell	Conis	eburneus	*Cones* (fr.)															
	Cone shell	Unknown	species	*Cones* (fr.)						1	1						1		
	Triton shell	Charonia	tritonis	*Triton*															
	Cowrie shell	Cypraea	caputserpentis	*Porcelaines* (fr.)					1							1			
	Coral shell	Coralliophilia	sp.		1	1	1						2	1					
	Periwinkle	Littoraria						5								5			
(iii) CLASS GASTROPODA (*SUBCLASS OPISTHOBRANCHIA*)	Nudibranch	Jorunna	funebris	unknown						2							2		
	Nudibranch	Chromodoris	sp.							1									
	Nudibranch	Unknown	species	unknown		1		1	5							1	2		
	Sea slug					4	2							2	1				
(iv) CLASS BIVALVIA	Elongate giant clam	Tridacna	maxima	*Hima*															
	Oyster	Hyotissa	hyotis	*Zoity*		11	6				3			15	64			2	
	Unknown									2							5		
(B) PHYLUM ECHINODERMATA																			
(i) CLASS ECHINODEA	Regular urchin	Echinothrix	diadema	*Soky*	70	31	36	37	50	5	38	54	47	22	20	40	1	25	
	Regular urchin	Salmacis	bicolor	*Soky*	8		2	2		21		4		2	4		17		
		Tripneustes	gratilla	*Soky*	14		1	14	30			12		3	8	21			
(ii) CLASS ASTEROIDEA	Horned sea star	Protoreaster	linckl	*Asterides* (fr.)															
	Blue starfish	Linckia	laevigata	*Asterides (fr.)*															
	Crown of thorns starfish	Acanthaster	planci	*Asterides (fr.)*															
	Cushion star	Cucita	schmideliana	*Asterides (fr.)*															
	Sea star	Archaster	lorioli		2	2	2					2	2	2					
		unknown	species	*sp.*					1							1			
(iii) CLASS CRINOIDEA	Feather star																		
	Unknown species	unknown	species	*sp.*	3	4	3	8	5		1	2	2	1	5	2			
(iv) CLASS OPHIUROIDEA	Brittle star				1							1							
	Unknown species	unknown	species	*sp.*					9							2			

Eucare 2001 (phase 1): Survey dive data and results

Invertberate species data

SURVEY REGION	Isle de Lokaro							Isle de Lokaro: *repeated transects*						
SURVEY DIVE NO	1	2	3	4	5	6	7	1a	2a	3a	4a	5a	6a	7a
DIVE LOCATION	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone	Lost Island wall	Lost Island wall cont.	Zebu Island	Lost Island wall	South point to jawbone	Sail rock to South Point	Boulder to Jawbone
TRANSECT CODE	D01	D02	D03	D04	D05	D06	D07	D01'	D02'	D03'	D04'	D05'	D06'	D07'
DATE (dd-mm-01)	12-07	12-07	13-07	13-07	15-07	15-07	16-07	16-07	17-07	17-07	18-07	18-07	19-07	19-07
SURVEYOR	DA	RC	OLJ	FL	DA	RC	RC	JG	FL	DA	RC	ML	FL	AH

- TAXONOMIC - GROUP -	- COMMON - NAME -	- SCIENTIFIC NAME - Genus	Species	- *MALAGASY* - *NAME* -	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(v) CLASS HOLOTHUROIDEA	Sea cucumber	Holothuria	edulis	*Zanga*				1							3			
	Sea cucumber	Stichopus	hermanni	*Dingadingana*														
	Sea cucumber	Holothuria	unknown	*Zanga*					4	1	1					2	1	1
	Sea cucumber	Holothuria	nobilis		2							1						
	Sea cucumber	Synapta	maculata	*Zanga*	1							1						
(C) PHYLUM CRUSTACEA																		
	Pebble crab	Leucosiidae									1							1
	Fish louse																	
	Cleaner shrimps									5							5	
(D) PHYLUM PORIFERA																		
	Sponge	Spheciospongia	vagabunda															
	Sponge	Stylotella	aurantium															
	Sponge	Xestospongia	exigua															
	Sponge	Jaspis	stellifera															
	Sponge	Spirastrella	vagabunda															
	Encrusting sponge	Unknown	species	unknown	2	2	2		2		1	2	2	1		2		1
	Barrel sponge	Unknown	species	unknown														
	Vase sponge	Unknown	species	unknown													1	
	Ball sponge	Unknown	species	unknown				1	1			1		1	1	1		
	Rope sponge	Unknown	species	unknown									2				1	
	Plate sponge	Unknown	species	unknown													1	
	Tube sponge	Unknown	species	unknown							8							8
	Branching sponge	Unknown	species	unknown	1	2	1		15			1	2	1		9		
(E) PHYLUM CHORDATA																		
(i) CLASS ASCIDIACEA	Sea squirt	Didemnum	molle															
(F) PHYLUM ANNELIDA																		
(i) CLASS POLYCHAETA	Bristleworm	Didemnum	molle															
	Feather duster worm																	
	Christmas tree worm				1				6			2				2		
	Tubeworm								200		90			15		120		50
	Polychaetes								5							7		
	Unknown				2					95		1					75	
(G) PHYLUM BRYOZOA																		
	Lace coral	Mesonea	radians	unknown														
	Lace coral	Reteporella	graefei	unknown														
		Triphyllozoon	sp.			1	1						2	1				
(H) CORALLIMORPHARIA		Palythoa	natalensis			1	1	3					1	2	1			
		Protopalythoa	nelliae			1	1							1				

APPENDIX FOUR:

BAIE DE RANOBE and SALARY SPECIES DATA

CORAL SPECIES

(Latin and Malagasy translations of species names can be found in appendix six)

Eucare Madagascar, 2001

		SURVEY REGION	PENTE EXTERNE, IFATY / *IFATY EXTERIOR*																		
		SURVEY DIVE NO	27	25	3	11	12	22	1	2	8	29	7	20	23	25	33	18	33	19	24	27
		DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	?
		TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	NSP	M1	M2	M3	M4	M5	CATH1	CATH2	N1	N2	?
		DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	02-08	14-08	15-08	15-08	17-08	12-08	18-08	12-08	15-08	16-08
		SURVEYOR	JCL	IR	IR	JCL	IR	AH	JCL	IR	IR	JCL	JCL	IR	JCL	IR	IG/JCL	JCL	IR	JCL	JCL	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(A) HARD CORALS / CORAUX DURS																						
Pocilloporidae	Pocillopora	*damicornis*	3	2	1	3	3	2				2		2		2	3	2				3
	Pocillopora	*eydouxi*	3	3	1	2	2		3		3	3	2	3	2	2	3	3	3	2	2	3
	Pocillopora	*verrucosa*	2	2	1			2	3		3	2	3			2	3		2	2		3
	Seriatopora	*calendrum*	2	3								2		3	3	2				2	2	2
	Seriatopora	*hystrix*	2	2	1	3	3		1			2	1	3	3	2	2	3	2	2	3	2
	Stylophora	*pistillata*	2	2	1				2		4	2	2	3			2			2		2
Acroporidae	Acropora	*aspera*							2			2						2		2		
	Acropora	*austera*				2	2													2		
	Acropora	*cerealis*			1																	2
	Acropora	*cythera*	2									2			2		1	2			2	
	Acropora	*danai*	3			1	1		3			1		4				1	1	1		2
	Acropora	*digitifera*	2		1	2	2	2	2		3	1	2	3		2	2	2	1	2	2	2
	Acropora	*echinata*										2		3								
	Acropora	*elseyi*	2																			
	Acropora	*florida*																				
	Acropora	*formosa*	2	2		1	1				3	2		3	3			1		1	2	2
	Acropora	*glauca*				2	2		1				3							2		
	Acropora	*grandis*											2	3	2							
	Acropora	*horrida*	2						2		3	2			2						1	
	Acropora	*humilis*	2			1	1		2				2	3	2					2		2
	Acropora	*hyacinthus*	2	2	1	4	4		1			2			2	2	2	2	1	2	2	4
	Acropora	*latistella*							2				1	2		2	2	2	1	2		3
	Acropora	*loriipes*	1									3	2		2							
	Acropora	*millepora*						1	2		3		3					2		2		
	Acropora	*monticulosa*			1				2						2							
	Acropora	*montipora*							2		2		1					1				
	Acropora	*nobilis*	2																	2		
	Acropora	*palifera*	2		1	1	1	1	2			1		3	1		2					2
	Acropora	*robusta*	2	2					2					2		2		2	1	2		
	Acropora	*secale*											2									
	Acropora	*specifera*							2													
	Acropora	*tenius*	1						2			2	2					2				
	Acropora	*valenciennesi*									3				2							
	Acropora	*valida*				2	2	1					1							2		
	Anacropora	*puertogalera*	2									2			1							
	Astreopora	*gracilis*		3	1	3	3		3		3		1	3	2		2		2		2	3
	Astreopora	*myriophtalma*						1														
	Montipora	*aequituberculata*	3	3		2	2	3				2		3		2	2	2	1	3	2	3
	Montipora	*capricornis*	2		2							2		3	2				2		2	3
	Montipora	*confusa*		3	1				2							2	2					
	Montipora	*danae*		3	3	4	4	2	3		3			4	2			2		3		
	Montipora	*digitata*	2						2			2	2	4				2		2		
	Montipora	*monasteriata*			2				2				2				2	2				3
	Montipora	*sp 1*				2	2		2											2		
	Montipora	*sp 2*	2			2	2		2			1	2		2			2		2		2
	Montipora	*sp 3*	3						1			2	1					2		2	2	2
	Montipora	*spumosa*	1						2			2	2					2		2		
	Montipora	*stellata*	2					1				2			2					2		
	Montipora	*tuberculosa*	3						1				2		2							
	Montipora	*venosa*	2						2			1	2		2					2	2	
	Montipora	*verrucosa*	1					1	3				2					2	2	2		

		SURVEY REGION	PENTE EXTERNE, IFATY / *IFATY EXTERIOR*																		
		SURVEY DIVE NO	27	25	3	11	13	22	1	2	8	29	7	20	23	25	33	18	33	19	24	27
		DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Passe Passe 1	Passe Passe 2	Passe Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	? ?
		TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	NSP	M1	M2	M3	M4	M5	CATH1	CATH2	N1	N2	?
		DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	02-08	14-08	15-08	15-08	17-08	12-08	18-08	12-08	15-08	16-08
		SURVEYOR	JCL	IR	IR	JCL	IR	AH	JCL	IR	IR	JCL	JCL	IR	JCL	IR	IG/JCL	JCL	IR	JCL	JCL	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
Poritidae	Alveopora	*allingi*			3			3														
	Alveopora	*catalai*	2			2	2		1			1		2			2					3
	Alveopora	*fenestata*	2			2	2		2			2				2						
	Alveopora	*spongiosa*	2		3	2	2		2			1			2			2		2		3
	Alveopora	*stokesi*				2	2													2		
	Goniopora	*columna*	2		2			1	2		2	2	1	3	2	2	2	2	2	2		2
	Goniopora	*sp1*	2								3	2		3								2
	Goniopora	*sp2*	2			3	3															
	Porites	*antenuata*	2						3		3	3	1		3		2	2		2	2	
	Porites	*cylindrica*									2			3					2			
	Porites	*lutristella*	3								2	2			2			2	2	2	1	
	Porites	*loboita*							3				2									
	Porites	*lutea*	2	2		2	2	1				3			2	2	2	2		2		
	Porites	*myrindonensis*	2	2								2	3									
	Porites	*nigrescens*				2	2							3				2				
	Porites	*rus*		2		3	3	2	3		2		3	3		2				2		2
	Porites	*solida*	3	2		2	2	3	2			3	2	3				2	1	2		2
	Porites	*somaliensis*	1		2	2	2		1		3	3										2
Siderastreidae	Anomastrea	*irregularis*	2			2	2	1							1					2		
	Coscinaraea	*columna*	3	3	3				3		3	2	2		3	3	2	2	2	2	2	3
	Coscinaraea	*mossile*	2									2			3					2	1	
	Goniopora	*sp3*	3																			
	Psammacora	*contigua*	4									2			2	2		2				
	Psammacora	*digitata*	2	2					3			3	2		3	2			2	2		
	Psammacora	*haimeana*	2			2	2								1							
Agariciidae	Cocloseris	*mayeri*	2	2	1				2					3			2					3
	Gardineseris	*planulata*	2	2	3	2	2	2	3				2		2	2				2	1	2
	Leptoseris	*explanulata*	3			2	2		3		3	2			3			2		2		
	Leptoseris	*gardineri*	2	3					3			2	2		3	3		2	2	2		
	Leptoseris	*hawaiiensis*				2	2					2			2						1	
	Leptoseris	*mycetoseroides*	2	2	1	2	2		2			3		3	3	3	3	2	2	2	2	3
	Pachyseris	*foliosa*	2			2	2					2										
	Pachyseris	*rugosa*	2	2	1			1	2			2	2	3	2	3				2		
	Pachyseris	*speciosa*	2			2	2	2	3			2	3		2		2				1	3
	Pavona	*cactus*			1																	
	Pavona	*clavus*	2	2					3		3	2	2									
	Pavona	*descicata*		2		2	2				3											
	Pavona	*explanulata*			3	3	3		3		3		3	3	2	3	2			2	2	3
	Pavona	*minuta*	2									2										
	Pavona	*phrygia*							2													
	Pavona	*scabra*	2						1		3	2						2				
	Pavona	*varians*						2														
Poritidae	Diaseris	*fragilis*																				
	Porites	*sp*	2		1			1					2		2							
Fungidae	Ctenactis	*echinata*																				
	Cycloseris	*cyclolits*																				
	Diaseris	*fragilis*																				
	Fungia	*concinna*	2	1	1				1		1	2	2		2		3		2			
	Fungia	*fungites*	2	2	1				1				3		3		2		2		2	2
	Fungia	*moluccensis*	2												2						2	
	Fungia	*repanda*			1				1					2	2							2
	Fungia	*scutaria*																				
	Fungia	*simplex*							2						2							
	Fungia	*valida*		2					1				3				2					2
	Halomitra	*pileus*																				
	Herpolithia	*limax*		3				2	1			3	1	2			2	2				
	Lithophyllon	*sp*																				
	Podobacia	*crustacea*				2	2		2				3									

		SURVEY REGION	PENTE EXTERNE, IFATY / *IFATY EXTERIOR*																		
		SURVEY DIVE NO	27	25	3	11	12	22	1	2	8	29	7	28	23	25	33	18	33	19	24	27
		DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nord	Passe Sud, partie Nord	Passe Sud, partie Nord	Cote Nord de P. Sud	Sud de Passe Nord	Sud de Passe Nord	Sud de Passe Nord	Sud de Passe Nord	Sud de Passe Nord	Cathedral 1	Cathedral 2	Nord de Passe Nord	Nord de Passe Nord	? ?
		TRANSECT CODE	SPP2	SPP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	NSP	M1	M2	M3	M4	M5	CATH1	CATH2	N1	N2	?
		DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	02-08	14-08	15-08	15-08	17-08	12-08	18-08	12-08	15-08	16-08
		SURVEYOR	JCL	IR	IR	JCL	IR	AH	JCL	IR	IR	JCL	JCL	IR	JCL	IR	IG/JCL	JCL	IR	JCL	JCL	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
Oculinidae	Galaxea	*astreata*	2	3	2			2	3			2	3	3	3	3	2			2	2	3
	Galaxea	*fascicularis*	3	3	3	3	3	2	3			2	3	2	3	3	2	2	2	2	1	3
	Galaxea	*horrescens*				3	3															
	Galaxea	*sp*	2					2				1		3	1		2			2		
Pectiniidae	Echinophyllia	*orpheensis*	2		3						2	2	1		2							2
	Echinophyllia	*sp 1*				3	3		4				2		2							
	Mycedium	*elephantotus*	3		2	3	3	1	2		3	2	3	3	2	3			2			2
	Oxypora	*flabra*	2	2	3				3			2		2	3		2		2			2
	Oxypora	*lacera*	2	2								2		3	2	3	2			2	2	2
	Pectinia	*alcicornis*	2																			
	Pectinia	*lactuca*	2									2										
Mussidae	Acanthastrea	*echinata*																1				
	Blastomussa	*merleti*							1				1							2		
	Lobophyllia	*corymbosa*	3	3	3	2	2	0	3		4	2	3	3	3	3	2	2	2	3	2	3
	Lobophyllia	*diminutata*	3	2	3	3	3	2	3		3	2	2	2	3		2	1	2	2	2	2
	Lobophyllia	*hataï*	4						2			1			3					1		
	Lobophyllia	*hemprichii*	4	2	3	3	3		2		3	1		3	3	3	2	2		3	3	3
	Symphyllia	*agaricia*	2					1	3				2		3	3	2			2	2	
	Hydnophora	*hemprichii*	2									2			3			1	2			
	Symphyllia	*radians*			2			1	2		2		2	2				1	1	2		
	Symphyllia	*recta*	2	2		2	2		3			2	2	3	3	3	2	1		2	2	3
	Symphyllia	*robusta*	2		1	2							4						1	2		
	Symphyllia	*valenciennesii*																				
Merulinidae	Hydnophora	*excesa*	3			2	2	1				2			2	3	2	1				
	Hydnophora	*grandis*	1									1			2							
	Hydnophora	*microconos*	2	2	1	3	3	1	2			1	2	3	2	3	2			2	2	
	Hydnophora	*rigida*													2					2		
Faviidae	Barbattoia	*amicorum*	3	2		1	1					3										
	Cyphastrea	*serailia*	3		2	3	3					2	2	3	3			2		2		
	Echinopora	*lamellosa*	3	2	3				2				2	3	2		3				1	4
	Echinopora	*pacificus*			1				2				2		2							
	Echinopora	*sp 1*				1	1		2				2		1					2		
	Favia	*favus*	2	4	4	4	4	1	4			2	3	3	4	3	3	2	2	2	2	3
	Favia	*lizardensis*	2	3		2	2		3			2	1		2			2		2	2	
	Favia	*matthai*	3	2	3	2	2		3						2		3					
	Favia	*pallida*	3			2	2		3				3		3		3	2	2	2	2	
	Favia	*speciosa*	2		2	2	2	2						4		3						4
	Favites	*abdita*	2					1				3					2			2		4
	Favites	*complanata*	2	2	2	2	2		2					3	4	3			2	3		3
	Favites	*flexuosa*	2	2	3									3	2	2	2	1	2	3	2	
	Favites	*pentagona*	2			3	3						2		2					2		
	Favites	*sp 1*							2				2	2	3	3						
	Goniastrea	*palauensis*	2			2	2					2	3									
	Goniastrea	*pectinata*	3		1	2	2		3			3		3						2		
	Goniastrea	*pentagona*	2	2				2				2	2		2	2				2		
	Goniastrea	*retiformis*		2		3	3						2				2					
	Goniastrea	*sp 1*	2					1	3			2	2		2							
	Goniastrea	*sp 2*							2				2		2						2	
	Leptoria	*phrygia*	2	2	3				3			2	2	3	3	4	2	2	2		2	4
	Montastrea	*annuligera*	3	2					2			2		2	3		2	1	2	2		
	Montastrea	*curta*			3	2	2	1	2				2	3	3		2	1		2		
	Montastrea	*magnistellata*	2			3	3		2				1	4	2	3				2		
	Montastrea	*sp 1*	2						1			2	3		2			2		3	1	
	Montastrea	*valenciensi*						1	2			1	2							2		
	Oulophyllia	*bennettae*		2		2	2		2				2	3	2					2		
	Oulophyllia	*crispa*	2	2				3	1			2		2	2		2			2		
	Platygyra	*daedalea*	4	2	3	3	3	2	4			3	2	4	4	3	2	3	3	3	2	3
	Platygyra	*lamellina*	4	2		3	3		3			3	3	3	4		3	2	2	3	3	
	Platygyra	*pini*	2						2			2	2	2	3			2	2	3	1	
	Platygyra	*ryukyuensis*	1	2	2				1			4		3	3	3	2	2	2	3		3
	Platygyra	*sinensis*	3			3	3		2			2	2					2	1			
	Platygyra	*sp 1*				2	2		2				2									

		SURVEY REGION	PENTE EXTERNE, IFATY / *IFATY EXTERIOR*																		
		SURVEY DIVE NO	27	25	3	11	12	22	1	2	8	29	7	20	23	25	33	18	33	19	24	27
		DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	?
		TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	NSP	M1	M2	M3	M4	M5	CATH1	CATH2	N1	N2	?
		DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	02-08	14-08	15-08	15-08	17-08	12-08	18-08	12-08	15-08	16-08
		SURVEYOR	JCL	IR	IR	JCL	IR	AH	JCL	IR	IR	JCL	JCL	IR	JCL	IR	IG/JCL	JCL	IR	JCL	JCL	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
Caryophyllidae	Euphyllia	*ancora*	2			2	2					2		2	2		3		3	2		
	Euphyllia	*divisa*	2			2	2		2			2	2	3	1					2		
	Euphyllia	*glabrescens*																				
	Euphyllia	*paradivisa*	2		2				2			2							3			
	Physogyra	*lichtensteini*							1					3								
	Trachyphyllia	*geoffroyi*	2			2	2		3			2	2		1		2			2		
Dendrophyllidae	Tubastrea	*faulkneri*						2														
	Tubastrea	*micrantha*										3										
	Tubastrea	*sp 1*																		2		
	Tubastrea	*sp 2*																		2		
	Tubastrea	*sp 3*																		2		
	Turbinaria	*frondens*	2					1				2			2		2				2	
	Turbinaria	*reniformis*		2				2	2								2	2	2			2
	Turbinaria	*sp 1*			2	2	2		2								3			2		
Faviidae	Cyphastrea	*microphthalma*	2						1			2					2					3
	Cyphastrea	*serailia*							1													
	Diploastrea	*heliopora*	2	4								2				3						3
	Leptastrea	*maegualis*	3	0				0	1			2		0	0	0		0		0	0	0
	Physogyra	*lychtensteina*																				
	Pierogyra	*sinuosa*																				
(B) SOFT CORALS / CORAUX MOUX																						
Alcyoniidae	Lobophyton	*venustrum*	3	4	3	3	3	2	2			1		4	3	4	4	3	4	4	3	4
	Lobophyton	*crassum*	3	4	3	3	3	2	2			2		4	3	4	4	3		3	3	4
	Lobophyton	*sp 2*	3			3	3	2	2						4		3	3		3	3	
	Lobophyton	*sp 3*	3			3	3	3	1					4	3		4	3	4	4	3	
	Lobophyton	*sp 4*	3	0				3	1			4		3	1	0		4		3	3	0
			3					3				4		0	3			3		3	4	
			3					3				1		4	3			4		4	4	
			3					3									4	3		3		
	Sarcophyton	*sp 1*	2		3				2			2		3	3			1		3	4	
	Sarcophyton	*sp 2*							2				2									
	Sarcophyton	*glaucum*	2	3				3	2			3	2	4	2	4	4	2	4	2	3	3
	Sarcophyton	*cochylophorm*	2	3				1				2		3	2	3	4	3		2	4	3
	Heliopora	*coerulea*				3	3						3		4			2		1	4	
	Simularia	*notanda*	2	2				1	2			2		2	2	4	4	2	3	2	3	4
	Simularia	*leptoclados*	2	3				2	1		2	2		3	4	4		2		2	2	3
	Simularia	*sp 1*	3			3	3		3			2	3	4	3			3		4	3	
	Simularia	*sp 2*	3			2	2		3			2	3	3	3			2		2	3	
	Simularia	*abrupta*	3			2	2					2	3	4	4			3		3	4	
	Xenia	*sp 1*	3	4								2		4	3	3	2	1	1	3	4	4
	Octopus	*cyanea*																				
	Nephtea	*sp 1*	2	4								2				4						4
(C) ALGAE																						
Calcaires	Lithothamnium	*sp*	4	4		5	5	4	2			4	3	4		4	4	4	4	4		4
	Halimeda	*spuntia*	1	4				4					2	4		4	3	2	2	3		4
	Lithothyllon					4	4															
	Gaulerpa	*sp*				1	1						2									
(survey region)			SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	NSP	M1	M2	M3	M4	M5	CATH1	CATH2	N1	N2	?
CORAUX MORTS			45	60	-	-	-	40	-	-	-	55	-	30	35	40	55	65	60	60	45	-
CORAUX VIVANTS			55	40	-	-	-	60	-	-	-	45	-	70	65	60	45	35	40	40	55	-

		SURVEY REGION	LAGON DE RANOBE						SALARY				
		SURVEY DIVE NO	4	5	9	6	21	30	16	17	13	15	14
		DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Vatu	Quatres rnigues	Quatres rnigues	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
		TRANSECT CODE	MR1	P1	P2	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
		DATE (dd-mm-01)	31-07	01-08	02-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
		SURVEYOR	IR	IR	JCL	IR	JCL	IR	JCL	IR	JCL	AH	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(A) HARD CORALS / CORAUX DURS													
Pocilloporidae	Pocillopora	*damicornis*		2	3	3	3	3	2		2		
	Pocillopora	*eydouxi*	2	2	2	2	3	3	2	3	3		2
	Pocillopora	*verrucosa*	2		2	2	2	3	3	4	2	4	3
	Seriatopora	*calendrum*			2		2	3	2	4			
	Seriatopora	*hystrix*			3		2	3	2		2		3
	Stylophora	*pistillata*		2	2	2	3	3	2	3	2		
Acroporidae	Acropora	*aspera*					2						
	Acropora	*austera*					1						
	Acropora	*cerealis*			2		2				2		
	Acropora	*cythera*					1						
	Acropora	*danai*			3		3		3	3	2	3	3
	Acropora	*digitifera*	1		2		3	2	2		3	4	3
	Acropora	*echinata*			1						2		
	Acropora	*elseyi*			2		2				2		
	Acropora	*florida*			1						3	3	3
	Acropora	*formosa*	1	2	2	4	1		2	2	1	2	3
	Acropora	*glauca*					2		2				
	Acropora	*grandis*		2	2		2	2			2	3	3
	Acropora	*horrida*			2		1				3	4	4
	Acropora	*humilis*	1		1		3	2	2	3	3		
	Acropora	*hyacinthus*			1		2		2	2	4	3	4
	Acropora	*latistella*			2		2	2			3	3	4
	Acropora	*loriipes*			1								
	Acropora	*millepora*			2		2					1	
	Acropora	*monticulosa*	1		1		3	2					
	Acropora	*montipora*			1								
	Acropora	*nobilis*			1		2				2	1	
	Acropora	*palifera*	1	1		3	2	2	2	3	2		3
	Acropora	*robusta*			1		3	2	2				4
	Acropora	*secale*			1					3			
	Acropora	*specifera*					2						
	Acropora	*tenius*			2		3		2	2	2	2	
	Acropora	*valenciennesi*		1	1		2						
	Acropora	*valida*			3		3						
	Anacropora	*puertogalera*											
	Astreopora	*gracilis*		3	2	3			2	3	2	1	
	Astreopora	*myriophtalma*			2								
	Montipora	*aequituberculata*	1		2			2	2	2	2	2	3
	Montipora	*capricornis*	5	1	2			2					3
	Montipora	*confusa*			2		3	2					3
	Montipora	*danae*	5	1	2		4		3	2			4
	Montipora	*digitata*			2		3	2	2	3	3		
	Montipora	*monasteriata*			2						2		3
	Montipora	*sp 1*	1		3						2		
	Montipora	*sp 2*			2		2				2		
	Montipora	*sp 3*			2		3				2		
	Montipora	*spumosa*			2								
	Montipora	*stellata*			2		2				2		
	Montipora	*tuberculosa*			2						3		
	Montipora	*venosa*			2		2				2		
	Montipora	*verrucosa*			2		2				2		

		SURVEY REGION	LAGON DE RANOBE						SALARY				
		SURVEY DIVE NO	4	5	9	6	21	30	16	17	13	15	14
		DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Vatu	Quatres rnaignes	Quatres rnaignes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
		TRANSECT CODE	MR1	P1	P2	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
		DATE (dd-mm-01)	31-07	01-08	02-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
		SURVEYOR	IR	IR	JCL	IR	JCL	IR	JCL	IR	JCL	AH	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
Poritidae	Alveopora	*allingi*	1		1		3					2	3
	Alveopora	*catalai*			2		3					2	
	Alveopora	*fenestata*		1	2		2	3			2		
	Alveopora	*spongiosa*			2	2	3	3			2		
	Alveopora	*stokesi*			2		3						
	Goniopora	*columna*			2	3						2	3
	Goniopora	*sp1*		2		3	3		2	3		2	
	Goniopora	*sp2*		2			2		2				3
	Porites	*antenuata*			2		3		2	2	3		
	Porites	*cylindrica*			1	3	1				2		
	Porites	*latistella*			1		3				2		
	Porites	*lobolta*			2						3		
	Porites	*lutea*	2		1	2	3	2	2	2	2		
	Porites	*myrindonensis*						2		4			
	Porites	*nigrescens*			2	2	3						
	Porites	*rus*	1		3		4	2	2		3		3
	Porites	*solida*			3	2	3	2			2		
	Porites	*somaliensis*		2		3	1	2		3			3
Siderastreidae	Anomastrea	*irregularis*			1								
	Coscinaraea	*columna*	2	3	2	3	3	2			2		
	Coscinaraea	*mossile*			2		2	2		2	3		
	Goniopora	*sp3*	2	2			3						
	Psammacora	*contigua*			2				2	3	2		
	Psammacora	*digitata*			2								
	Psammacora	*haimeana*			1				2				
Agariciidae	Coeloseris	*mayeri*		2	2		3	3					
	Gardinoseris	*planulata*			1		2	3	2	3		3	
	Leptoseris	*explanulata*	2		3		3		2		2		
	Leptoseris	*gardineri*			2		2						
	Leptoseris	*hawaiiensis*		2	1		2	1	2	2	2		2
	Leptoseris	*mycetoseroides*	2	2	1		4	3	1		2		2
	Pachyseris	*foliosa*			2		2	3					3
	Pachyseris	*rugosa*		2	2		2	3					
	Pachyseris	*speciosa*			3		1	3	2		2	2	3
	Pavona	*cactus*			2								
	Pavona	*clavus*			1		2	2					
	Pavona	*dessicata*			1								
	Pavona	*explanulata*			1		3	3					
	Pavona	*minuta*			1		3						
	Pavona	*phrygia*			2								
	Pavona	*scabra*			1								
	Pavona	*varians*			1		2						

		SURVEY REGION	LAGON DE RANOBE						SALARY				
		SURVEY DIVE NO	4	5	9	6	21	30	16	17	13	15	14
		DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Vatu	Quatres rnatgnes	Quatres rnatgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
		TRANSECT CODE	MR1	P1	P2	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
		DATE (dd-mm-01)	31-07	01-08	02-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
		SURVEYOR	IR	IR	JCL	IR	JCL	IR	JCL	IR	JCL	AH	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
Poritidae	Diaseris	*fragilis*											
	Porites	*sp*		1	1		2	2					
Fungidae	Ctenactis	*echinata*			1			3					
	Cycloseris	*cyclolits*			2	3		3					
	Diaseris	*fragilis*			1								
	Fungia	*concinna*	4	3	1	3		3		1			3
	Fungia	*fungites*	3	4	1	3	3	3					
	Fungia	*molucinensis*		3	2		1						
	Fungia	*repanda*			1	3							
	Fungia	*scutaria*			1								
	Fungia	*simplex*	2	4	2		2						
	Fungia	*valida*			2		2						
	Halomitra	*pileus*			2								
	Herpolithia	*limax*		2	1			3					
	Lithophyllon	*sp*		3	2								
	Podobacia	*crustacea*			1								
Oculinidae	Galaxea	*astreata*		3	2		1	2					
	Galaxea	*fasicularis*		3		2	2	2				1	
	Galaxea	*honenssens*		3						2	2	2	1
	Galaxea	*sp*					2	2					
Pectinidae	Echinophyllia	*orpheensis*		3	2		2	2				1	
	Echinophyllia	*sp 1*			2	2	2						4
	Mycedium	*elephantotus*		3	2	2	3	2					3
	Oxypora	*flabra*	2	3		3	2	2					
	Oxypora	*lacera*					2	2					
	Pectinia	*alcicornis*			2								
	Pectinia	*lactuca*			3			2					
Mussidae	Acanthastrea	*echiniata*			1								
	Blastomussa	*merleti*			1				2				
	Lobophyllia	*corymobosa*	2	4	2	2	4	2	3	3	2	2	3
	Lobophyllia	*diminutata*		2	2	3	3	2	1		2		
	Lobophyllia	*hatai*			2		2		1	2	2	1	3
	Lobophylia	*hemprichii*		2		3	3	3	2	2	2		3
	Symphyllia	*agaricia*					3						
	Hydnopora	*hemprichii*											
	Symphyllia	*radiaris*			2		2						
	Symphyllia	*recta*		2	2		2	2	2	2	2	1	
	Symphyllia	*robusta*			2		2		2		2	1	
	Symphyllia	*valensiennesli*			2		2		2	3	2	1	

		SURVEY REGION	LAGON DE RANOBE						SALARY				
		SURVEY DIVE NO	4	5	9	6	21	30	16	17	13	15	14
		DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Vatu	Quatres mutgnes	Quatres mutgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
		TRANSECT CODE	MR1	P1	P2	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
		DATE (dd-mm-01)	31-07	01-08	02-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
		SURVEYOR	IR	IR	JCL	IR	JCL	IR	JCL	IR	JCL	AH	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
Nerullnidae	Hydnopora	*excesa*		3	1	2	2						
	Hydnopora	*grandis*			2		2		3	2			
	Hydnopora	*microconos*		2	2	2	2						3
	Hydnopora	*rigida*			1		2		2		2		
Faviidae	Barbattoia	*amicorum*			1		3	2					
	Cyphastrea	*serailia*			2	4			2	3	2		3
	Echinopora	*lamellosa*		2	2		3	3		4			
	Echinopora	*pacificus*			2								
	Echinopora	*sp 1*			2								
	Favia	*favus*		2	3	4	3	2	2	3	2	2	
	Favia	*lizardensis*		2	3			2	2	2	2		
	Favia	*matthai*			1		3	2	2	2			
	Favia	*pallida*		2	3	3	3	2	3	2	3	2	
	Favia	*speciosa*		2	3	3	3				2		4
	Favites	*abdita*		2	1					3			
	Favites	*complanata*			1		3	2					
	Favites	*flexuosa*			2	3	2	2		3			3
	Favites	*pentagona*			2		3						
	Favites	*sp 1*			3		3						
	Goniastrea	*palauensis*			3		3	2					
	Goniastrea	*pectinata*					2						
	Goniastrea	*pentagona*			3		3						
	Goniastrea	*retiformis*					1		2	3	2	3	3
	Goniastrea	*sp 1*			1	3	2			3			
	Goniastrea	*sp 2*			2		2						
	Leptoria	*phrygia*		1	2		3	2	2	2			
	Montastrea	*annuligera*			1		2	2	2		2		
	Montastrea	*curta*		2				2				1	
	Montastrea	*magnistellata*											
	Montastrea	*sp 1*			3				2		2		3
	Montastrea	*valenciensi*		2	2		2		2		2		
	Oulophyllia	*bennattae*			3		3	2				1	
	Oulophyllia	*crispa*					4	2				2	
	Platygyra	*daedalea*	2	1	2		3	3			3		4
	Platygyra	*lamellina*			3	3	3	3	3	3	2	1	
	Platygyra	*pini*			2		1	2	2	2	2		
	Platygyra	*ryukyueusis*		1			1	2	1		2	1	
	Platygyra	*sineusis*		1	2		2	2	2	3			
	Platygyra	*sp 1*			2				3		2		

		SURVEY REGION	LAGON DE RANOBE						SALARY				
		SURVEY DIVE NO	4	5	9	6	21	30	16	17	13	15	14
		DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Vatu	Quatres mutgnes	Quatres mutgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
		TRANSECT CODE	MR1	P1	P2	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
		DATE (dd-mm-01)	31-07	01-08	02-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
		SURVEYOR	IR	IR	JCL	IR	JCL	IR	JCL	IR	JCL	AH	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
Caryophylliidae	Euphyllia	*ancora*			2			2		3			
	Euphyllia	*divisa*			3		3	2					
	Euphyllia	*glabrescens*			1								
	Euphyllia	*puradivisa*			2								
	Physogyra	*litchensteini*			2								
	Trachythyllia	*geoffroyi*			2		2		2		2		
Dendrophyllidae	Tubastrea	*faulkneri*											
	Tubastrea	*micrantha*						3					
	Tubastrea	*sp 1*			1								
	Tubastrea	*sp 2*											
	Tubastrea	*sp 3*											
	Turbinaria	*frondens*											
	Turbinaria	*reniformis*			2			2					
	Turbinaria	*sp 1*			2								
Faviidae	Cyphastrea	*microphthalma*					2		2		2		
	Cyphastrea	*serailia*			2						2		
	Diplostrea	*helioporo*			2		3				2		
	Leptastrea	*maequalis*			2		1		3		2		
	Physogyra	*lychtensteina*											
	Plerogyra	*sinuosa*						3					

		SURVEY REGION	LAGON DE RANOBE						SALARY				
		SURVEY DIVE NO	4	5	9	6	21	30	16	17	13	15	14
		DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Vatu	Quatres rastgues	Quatres rastgues	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
		TRANSECT CODE	MR1	P1	P2	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
		DATE (dd-mm-01)	31-07	01-08	02-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
		SURVEYOR	IR	IR	JCL	IR	JCL	IR	JCL	IR	JCL	AH	IR
FAMILY	GENUS	SPECIES	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE	ABNCE
(B) SOFT CORALS / CORAUX MOUX													
Alcyoniidae	Lobophyton	*venustrum*	2	3	3	3	3	4	1	4	2	1	2
	Lobophyton	*crassum*			3	2	2		2		2		
	Lobophyton	*sp 2*			3		2		2	3	2	1	
	Lobophyton	*sp 3*					2		2	3	2	1	
	Lobophyton	*sp 4*					2				2		
							2						
							1						
	Sarcophyton	*sp 1*		3					2		2		
	Sarcophyton	*sp 2*			3				2	4	2	1	2
	Sarcophyton	*glaucum*			3		2	4	2		2	1	
	Sarcophyton	*cochylophorm*					0	3					
	Helipora	*coerulea*			2	2		3	2		2		
	Sinuaria	*notanda*		3			3	4	2		2	3	
	Sinuaria	*leptoclados*					2	3	3	4	2		2
	Sinuaria	*sp 1*			2	2			3	3	2	1	3
	Sinuaria	*sp 2*			2				3		2		
	Sinuaria	*abrupta*											
	Xenia	*sp 1*					3						
	Octopus	*cyanea*		1									
	Nepthea	*sp 1*											
(C) ALGAE													
Calcaires	Lithothamnium	*sp*	3	3	2			4	4	4	3	3	2
	Halimeda	*spuntia*							4	4			3
	Lithothyllom			3						3		1	
	Gaulerpa	*sp*							3		3	1	3
(Survey region)			RG1	P1	P2 ('A')	VAT	CG1	CG2	SAL1	SAL2	SAL3	SAL4	SAL5
CORAUX MORTS			-	-	-	-	40	60	-	-	40	60	35
CORAUX VIVANTS			-	-	-	-	60	40	-	-	60	40	65

APPENDIX FIVE:

BAIE DE RANOBE and SALARY SPECIES DATA

FISH SPECIES

(Latin and Malagasy translations of species names can be found in appendix six)

Eucare Madagascar, 2001

	SURVEY REGION	PENTE EXTERNE IFATY / (IFATY EXTERIOR)																								
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de P. Passe	Sud de P. Passe	Passe Passe 1	Passe Passe 2	Passe Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - GROUP -	- COMMON - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
(A) CLASS OSTEICHTHYES (BONY FISH): (i) REEF ASSOCIATED SPECIES																										
DAMSELFISHES	Natal sergeant		24																							
(POMACENTRIDAE)	Ragged sergeant																									
	Scissortail sergeant						50					20				20	80									
	False eye sergeant														200		50									
	Indopacific Sergeant																									
	Skunk anemonefish						20	21			3															
	Allard's anemonefish																					6				
	Madagascar anemonefish														2											
	Yellow chromis																									
	Twotone chromis		30	4			100				75	80	74	38	100	20	100				80	5				
	Whitetail chromis																					3				
	Pearl spot chromis		10			3																				
	Ternate chromis		2																							
	Blue-green chromis											10														
	Footballer damsel			2																						
	Grey demoiselle																									
	Goldtail demoiselle												3													
	Onespot demoiselle																									
	Humbug dascyllus															30										
	Indian dascyllus																									
	Threespot dascyllus				3		200	21	37				9	21		80						3				
	Black damsel																									
	African demoiselle			1																						
	Creole damsel																									
	Dark creole damsel																									
	Carulean damsel						50					10	22			30					16					
	Blue damsel				4								34													
	Sulphur damsel																									
	Pailtail damsel																									
	Threeline damsel			2																						
	Johnston damsel																					5				
	Jewel damsel																									
	Unknown												4								26					

	SURVEY REGION	PENTE EXTERNE IFATY / (IFATY EXTERIOR)																								
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de P. Passe	Sud de P. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
BUTTERFLYFISHES	Threadfin butterflyfish						50	7				5		6		15	20				9					
(CHAETODONTIDAE)	Bennett's butterflyfish	2		1											2											
	Blackburn's butterflyfish				1																					
	Collare butterflyfish																		2							
	Indian vagabond butterflyfish								10																	
	Saddleback butterflyfish			2							5										20					
	Spotted butterflyfish										12											5				
	Racoon butterflyfish		18		1						5		1													
	Somali butterflyfish			1																						
	Madagascar (redback) butterflyfish								7												6					
	Blackback butterflyfish			3													10									
	Merton's butterflyfish	10					50					10		4	4		10									
	Blackspotted butterflyfish			5																	14					
	Meyer's butterflyfish		1		1						2		3				2	1								
	Lemon butterflyfish																2									
	Bladespotted butterflyfish		3	6		6																				
	Spot tail butterflyfish																					5				
	Ornate butterflyfish																					11				
	Redback butterflyfish				2						8															
	Latticed butterflyfish				4																					
	Dotted butterflyfish			1	3	5	50								1	15			6							
	Ovalspot butterflyfish														2							1				
	Redfin butterflyfish		10									2														
	Vagabond butterflyfish				1			5														12				
	Zanzibar butterflyfish	6	2								7		1								15	11				
	Longnosed butterflyfish						50										10		4							
	Big longnosed butterflyfish							6			2															
	Black pyramid butterflyfish															15										
	Masked bannerfish	4					2				4															
	Longfin bannerfish							7				3														
	Unknown										8		19	8												

	SURVEY REGION	PENTE EXTERNE IFATY / *(IFATY EXTERIOR)*																								
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
WRASSES	Blue-spotted wrasse																									
(LABRIDAE)	Lined wrasse																									
	Axilspot hogfish																					2				
	Red breasted wrasse																									
	Napoleon wrasse																		5	3						
	African coris											30				35	50									
	Clown coris											2														
	Indian Ocean bird wrasse	6			3		20						7				10					1				
	Bird wrasse	6	12											8						9						
	Adorned wrasse																									
	Checkerboard wrasse				3												20									
	Zig Zag			2																						
	Barred thicklip wrasse	1																								
	Candycane longface wrasse												10													
	Bicolour cleaner																					3				
	Cleaner	40	4				60	8	7		20	5	5	4	7	8	10		20							
	Tubelip wrasse																									
	Ornate wrasse	2										7														
	Longface wrasse																									
	Smalltail wrasse												25													
	Flagfin wrasse																									
	Tail-barred wrasse		7																							
	Twotone (Blunthead)			2			30																			
	Redcheek wrasse										10															
	Sunset (Goldbar) wrasse		16	1	2						30															
	Six bar wrasse																					43				
	Goldbar wrasse		10										3			5										
	Crescent (moon) wrasse		5	10				20				10														
	Klunzinger's wrasse				5																					
	Unknown		12		6				20		30			15						90						

	SURVEY REGION	PENTE EXTERNE IFATY / *(IFATY EXTERIOR)*																								
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
SURGEONFISHES	Orange socket surgeonfish							8	20		20															
and UNICORNFISHES	Ringtailed surgeonfish										20										20					
(ACANTHURIDAE)	Eyestripe surgeonfish																									
	Palelipped surgeonfish																				21					
	Powder blue surgeonfish	2	20	2			50					10		3			50		50							
	Striped surgeonfish		4									30					30					15				
	Blackstreak surgeonfish	50									20		22			50	50		20							
	Bluelined surgeonfish										5															
	Blackbarred surgeonfish																									
	Lieutenant surgeonfish			1																						
	Thomson's surgeonfish																					12				
	Convict surgeonfish										25			2							5						
	Twospot bristletooth surgeonfish				4																					
	Striped bristletooth surgeonfish	50		9	7							20	22			50	50									
	Whitemargin Unicornfish							10	50																	
	Spotted unicornfish																									
	Bluespine Unicornfish							8	50																	
	Bignosed Unicornfish														2											
	Palette surgeonfish																									
	Moorish idol	20	5		3	2	20	15	50			20	1	2	10	20	10		20		6					
	Gem surgeonfish			4	6																					
	Longnose surgeonfish					18					30															
	Brushtail tang	150	20				150	11			20	50		42	30	100	80									
	Unknown		20		25						10										24					

	SURVEY REGION	PENTE EXTERNE HATY / (HATY EXTERIOR)																							
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Passe 1	Passe 2	Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
PARROTFISHES	Bumphead parrotfish																									
(SCARIDAE)	Bicolour parrotfish						10									2			3							
	Green parrotfish		9										6								2					
	Indian Ocean steephead		9	1																						
	Tailbarred parrotfish	4																								
	Greenbelly parrotfish												10					2								
	Bridled parrotfish			2																						
	Bluebarred parrotfish											5														
	Redlip (ember) parrotfish											5	6			6						1				
	Russell's parrotfish					5																				
	Dusky-capped parrotfish																									
	Bullhead parrotfish				6																					
	Tricolour parrotfish				3																					
	Greenlip parrotfish				2								3	6												
	Unknown	3	15			6	40	11	20			10			1				50							
PUFFERS	Porcupine fish								1																	
(TETRAODONTIDAE)	Freckled porcupinefish																1									
	Crown toby (sharpnose puffer)																									
	Spotted toby																									
	Black saddled toby				2																					
	Honeycomb toby										4															
	Star pufferfish	1																								
	Whitespotted puffer																									
	Unknown species																									
	Black spotted pufferfish															1		1	1		1					
	Ambon toby															1										
	Guineafowl pufferfish		1																							
	Spotted boxfish		1		2																					
	Thornback cowfish																									
	Unknown													1												
TRIGGERFISHES	Clown triggerfish	1		1			2									2			8			2				
(BALISTIDAE)	Orangestriped triggerfish																					2				
	Titan triggerfish							1	3																	
	Indian triggerfish	2		2	1							3														
	Black triggerfish																2	3								
	Redtooth triggerfish															3										
	Yellow margin triggerfish							1																		
	White barred (Picasso) triggerfish			3				2			5															
	Blackpatch triggerfish																									
	Scythe triggerfish																	2								
	Flagtail (Halfmoon) triggerfish						50					20				13	20	1				2				
	Bridled trigerfish			1																	12					
	Lined triggerfish										3										14					

	SURVEY REGION	PENTE EXTERNE IFATY / (IFATY EXTERIOR)																							
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Passe Passe 1	Passe Passe 2	Passe Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Nrd de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - GROUP -	- COMMON - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
GROUPERS	Unknown										1			2												
(SERRANIDAE)	Tomato grouper																				1					
	Chocolate hind																					5				
	Speckled grouper						2	1	7									1								
	Hexagon grouper																				1					
	Saucerhead grouper																1									
	Honeycomb grouper										3															
	White blotched grouper																2									
	Blackspot grouper																					2				
	Potato (whitespotted) grouper								1			3							8							
	Marbled coral grouper																1									
	Unknown				1		1						1								1					
ANGELFISHES	African pygmy angelfish				3								34													
(POMACANTHIDAE)	Whitetail angelfish		9	3																	1					
	Japanese pygmy angelfish		2								9															
	Manyspined angelfish										9															
	Bluestriped angelfish							5																		
	Bluering angelfish																									
	Earspot angelfish						1					1							2							
	Emperor angelfish						5		10							3		1	2							
	Semicircle angelfish	2	1	4			10						9			7			5							
	Regal angelfish							6	2			1			2	2	1									
	Unknown			17									20													
FUSILIERS	Goldbanded fusilier						30	22								15	20									
(CAESIONIDAE)	Lunar fusilier																									
	Yellowback fusilier	30	500		20				112			50				200	100					20				
	Yellowtop (scissortail) fusilier		500				300				400		20		500											
	Whitebanded fusilier							40	168																	
	Twinstripe fusilier																									
	Ruddy fusilier												114													
	Unknown				7								45													
SNAPPERS	Paddletail snapper						50										20		300							
(LUTJANIDAE)	Blebanded snapper																									
	Bluestriped snapper										5						10									
	Russell's snapper																					2				
	Black and white snapper	1																				1				
	Black snapper										2											4				
SWEETLIPS	Unknown																									
(HAEMULIDAE)	Harlequin sweetlips		3																							
	Blackspotted sweetlips		5								5															
	Diagonal banded sweetlips							9	11																	
	Oriental sweetlips																3									
	Red-lined sweetlips			6																						
	Unknown																									

	SURVEY REGION	PENTE EXTERNE IFATY / (IFATY EXTERIOR)																							
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Faisant Passe 1	Faisant Passe 2	Faisant Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Nrd, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - GROUP -	- COMMON - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
ANTHIASES	Threadfin anthias						50				114	30				80		300								
(SERRANIDAE,	Twospot anthias										4										6					
SF ANTHIINAE)	Red-bar anthias										225															
	Yellowback anthias																				19					
	Stocky anthias																		20							
	Lyretail (Scalefin?) anthias												1						150							
GOBIES	Sphynx goby										4															
(GOBIIDAE)	Mud reef-goby																				15					
	Decorated																									
	Longfinned							12																		
	Unknown								30																	
GOATFISHES	Dash and dot goatfish		25				2	14			2	10		1				3			14					
(MULLIDAE)	Doublebar (barred) goatfish		2						70		2	5														
	Whitelined goatfish															20										
	Indian goatfish																									
	Unknown				8								1													
EMPERORS	Orangefin emperor				7																					
(LETHRINIDAE)	Longfin emperor																									
	Blackspot emperor	237														4			2							
	Unknown							3																		
SQUIRRELFISHES	Blockfin squirrelfish																									
(HOLOCENTRINAE)	Spotfin squirrelfish												35													
	Tailspot squirrelfish													1			2									
	Seychelles squirrelfish																5									
	Sabre squirrelfish																									
	Unknown				3			42	20		15															
SOLDIERFISHES	Bigscale soldierfish																									
(MYRIPRISTINAE)	Whitetip soldierfish			2								10				6	10									
	Unknown			5																	2					
SCORPIONFISHES	Tasseled scorpionfish																									
(SCORPAENIDAE)	Lionfish; turkeyfish	1															1									
	Raggy scorpionfish	1																								
	Weedy scorpionfish																									

	SURVEY REGION	PENTE EXTERNE IFATY / *(IFATY EXTERIOR)*																							
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de P. Passe	Sud de P. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
DARTFISHES	Curious wormfish											2														
(MICRODESMIDAE)	Fire dartfish	9										7					2		3							
	Blackfin (twotone) dartfish										3						3		1							
	Unknown			1																						
MORAY EELS	Spotted snake eel																									
(MURAENIDAE)	Black spotted moray eel																									
	Unknown species																1									
LIZARDFISHES	Indian lizardfish								10							5										
(SYNODONTIDAE)	Black blotch lizardfish																									
	Reef lizardfish																									
BLENNIES	African eel blennie						5																			
(BLENNIDAE)	Bluestriped fangblenny												10													
	Scale-eating fangblenny						10															6				
HAWKFISHES	Redbar hawkfish										1															
(CIRRHITIDAE)	Arceye hawkfish	2										2					10									
	Unknown																									
SWEEPERS	Vanicoro sweeper								6				20			50										
(PEMPHERIDAE)	Schwenk's sweeper			3							67					100						35				
FILEFISHES	Blacksaddle mimic filefish	15						1	27			15														
(MONOCANTHIDAE)	Longnosed filefish														1											
SANDPERCHES	Speckled sandperch							3																		
(PINGUIPEDIDAE)	Yellowbar sandperch																									
CARDINALFISHES	Tiger cardinalfish			4									66													
(APOGONODAE)	Five-lined cardinalfish																									
SPADEFISHES	Teira batfish																									
(EPHIPPIDAE)	Circular batfish																									

	SURVEY REGION	PENTE EXTERNE IFATY / *(IFATY EXTERIOR)*																							
	SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	27
	DIVE LOCATION	Sud de F. Passe	Sud de F. Passe	Fausse Passe 1	Fausse Passe 2	Fausse Passe 3	Sud de Passe Sud	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Passe Sud, partie Nrd	Cote Nord de P. Sud	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Sud de Passe Nrd	Cote Sud de P. Nrd	Cathedral 1	Cathedral 2	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	Nord de Passe Nrd	? ?
	TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	?
	DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
	SURVEYOR	HA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
SAND TILEFISHES	Striped/Blue blanquillo															7	2		10							
(MALACANTHIDAE)																										
DOTTYBACKS	Lighthead dottyback																				8					
(PSEUDOCHROMIDAE)																										
BIGEYES	Block's bigeye																									
(PRIACANTHIDAE)																										
TRUMPETFISHES	Trumpetfish		1											1												
(AULOSTOMIDAE)																										
PIPEFISHES	Network pipefish																									
(SYNGNATHIDAE)	Banded pipefish																									
	Unknown			1																						
SHRIMPFISHES	Shrimpfish																									
(CENTRISCIDAE)																										
EEL CATFISHES	Striped catfish											30														
(PLOTOSIDAE)																										
TRUNKFISHES	Spotted trunkfish				2																					
(OSTRACIIDAE)																										
DRAGONETS	Starry dragonet											5				3			20							
(CALLIONYMIDAE)																										
CORNETFISHES	Red cornetfish																									
(FISTULARIIDAE)																										
NEEDLEFISHES	Crocodile needlefish																									
(BELONIDAE)																										
RABBITFISHES	Whitespotted rabbitfish																									
(SIGANIDAE)																										
FLATHEADS	Flathead											1														

SURVEY REGION	PENTE EXTERNE IPATY / (IPATY EXTERIOR)																								
SURVEY DIVE NO.	27	25	3	11	12	22	1	2	8	29	28	7	20	23	25	32	31	18	33	19	24	34	35	36	37
DIVE LOCATION	Sud de P. Passe	Sud de P. Passe	Passe Passe 3	Passe Passe 2	Passe Passe 1	Sud de Passe Sud	Passe Sud, partie Nord	Passe Sud, partie Nord	Passe Sud, partie Nord	Passe Sud, partie Nord	Cote Nord de P. Sud	Sud de Passe Nord	Sud de Passe Nord	Sud de Passe Nord	Sud de Passe Nord	Sud de Passe Nord	Cote Sud de P. Nord	Cathedral 1	Cathedral 2	Nord de Passe Nord	Nord de Passe Nord	Nord de Passe Nord	Nord de Passe Nord	Nord de Passe Nord	" "	
TRANSECT CODE	SFP2	SFP1	FP1	FP2	FP3	S1	SP1a	SP1b	SP2	SP3	NSP	M1	M2	M3	M4	M5	SNP	CATH1	CATH2	N1	N2	N3	N4	N5	7
DATE (dd-mm-01)	16-08	15-08	30-07	08-08	08-08	14-08	29-07	29-07	02-08	16-08	16-08	02-08	14-08	15-08	15-08	17-08	17-08	12-08	18-08	12-08	15-08				16-08
SURVEYOR	MA	JG	JG	JG	OLJ	ML	RC	DA	AH	JG	HA	JG	FL	HA	DA	DA	ML	HA	ML	JG	AH				RC
- COMMON - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
ITHYES (BONY FISH): PELAGIC SPECIES																									
Club-nosed Trevally																7									
Bluefin Trevally																				3					
Bigeye Trevally									1																
Unknown						50	103	5			50				20										
Pickhandle barracuda				1									1												
Blackfin barracuda					1													1							
Unknown								1																	
Shark sucker						1															1				
Unknown								1																	
Narrow-banded Spanish Mackerel																	1								
Kingfish										1															
ITHYES (CARTILAGENOUS FISH): SUBCLASS ELASMOBRANCHII																									
Marbled electric ray														1											
Blackspotted electric ray																									
Unknown							1																		
Guterfish																						1			
Bluespotted ribbontail ray				1												1									
Blacktip reef shark							1		1										1						
Whitetailed reef shark Carcharinus wheelen+C474																									
Whitetipped reef shark																									
R CETACEA, SUBORDER ODONTOCETI)																									
Spinner dolphin			1		1									1											
Humpback dolphin																			1						
CHELONIA)																									
Green sea turtle														1											
GIC FISH SPECIES*																									
Black Marlin																									
Sailfish																									
Swordfish																									
Kawa Kawa																									
African mitfin flyingfish																									
Great barracuda																									
Grey reef shark																									
Scalloped hammerhead shark																									
Tiger shark																									

* Pelagic species reported (by Ifaty fishermen) to occur in waters adjacent to the exterior (seaward) side of the reef. Species noted using standard abundance ratings, after discussion with fishermen.

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres mntgnes	Quatres mntgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
(A) CLASS OSTEICHTHYES (BONY FISH): (i) REEF ASSOCIATED SPECIES													
DAMSELFISHES	Natal sergeant												
(POMACENTRIDAE)	Ragged sergeant		40										
	Scissortail sergeant							13					
	False eye sergeant												
	Indopacific Sergeant	1											
	Skunk anemonefish	19	20		8			13		7			
	Allard's anemonefish												
	Madagascar anemonefish												
	Yellow chromis									9			
	Twotone chromis	15	15		11		30	36		37			
	Whitetail chromis				14								
	Pearl spot chromis												
	Ternate chromis												
	Blue-green chromis		45			15							
	Footballer damsel				12								
	Grey demoiselle	17								8			
	Goldtail demoiselle												
	Onespot demoiselle	17											
	Humbug dascyllus	15						13					
	Indian dascyllus						20						
	Threespot dascyllus	13		10	24	25		36					
	Black damsel												
	African demoiselle												
	Creole damsel			11									
	Dark creole damsel			10									
	Carulean damsel												
	Blue damsel												
	Sulphur damsel	22				4							
	Pailtail damsel			6									
	Threeline damsel				10								
	Johnston damsel												
	Jewel damsel		5										
	Unknown		5	49	68	6						18	

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres matgnes	Quatres matgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
BUTTERFLYFISHES	Threadfin butterflyfish	4	16	18	8	8		13	10		4		
(CHAETODONTIDAE)	Bennett's butterflyfish												
	Blackburn's butterflyfish												
	Collare butterflyfish												
	Indian vagabond butterflyfish												
	Saddleback butterflyfish		20		7	6		3					
	Spotted butterflyfish				4								
	Racoon butterflyfish												
	Somali butterflyfish												
	Madagascar (redback) butterflyfish			6									
	Blackback butterflyfish												
	Merton's butterflyfish							13					
	Blackspotted butterflyfish												
	Meyer's butterflyfish												
	Lemon butterflyfish												
	Bladespotted butterflyfish										4		
	Spot tail butterflyfish												
	Ornate butterflyfish												
	Redback butteflyfish												
	Latticed butterflyfish												
	Dotted butterflyfish								5		4		3
	Ovalspot butterflyfish												
	Redfin butterflyfish												
	Vagabond butterflyfish	26	12	12	6								
	Zanzibar butterflyfish												2
	Longnosed butterflyfish	15											
	Big longnosed butterflyfish			15				13					
	Black pyramid butterflyfish												
	Masked bannerfish			7									
	Longfin bannerfish				6								
	Unknown											18	

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres rotgues	Quatres rotgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
WRASSES	Blue-spotted wrasse						1						
(LABRIDAE)	Lined wrasse												1
	Axilspot hogfish												
	Red breasted wrasse				8			13					
	Napoleon wrasse			2				13					
	African coris												
	Clown coris							13					
	Indian Ocean bird wrasse				6	1			1				3
	Bird wrasse							13		9			
	Adorned wrasse							13					
	Checkerboard wrasse									15			
	Zig Zag												
	Barred thicklip wrasse												
	Candycane longface wrasse												
	Bicolour cleaner				12								
	Cleaner	1				4		13	10	13	5		
	Tubelip wrasse												2
	Ornate wrasse												
	Longface wrasse				7								
	Smalltail wrasse												
	Flagfin wrasse				4								
	Tail-barred wrasse												
	Twotone (Blunthead)												3
	Redcheek wrasse												
	Sunset (Goldbar) wrasse									24			
	Six bar wrasse												
	Goldbar wrasse				11								
	Crescent (moon) wrasse												
	Klunzinger's wrasse												
	Unknown	2			89	4				24		1	

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres mètres	Quatres mètres	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
SURGEONFISHES	Orange socket surgeonfish	12			15					5			
and UNICORNFISHES	Ringtailed surgeonfish												
(ACANTHURIDAE)	Eyestripe surgeonfish									31			
	Palelipped surgeonfish										12	13	
	Powder blue surgeonfish				6			13			15		12
	Striped surgeonfish								20	5	3		
	Blackstreak surgeonfish												
	Bluelined surgeonfish									40			
	Blackberred surgeonfish									4			
	Lieutenant surgeonfish												
	Thomson's surgeonfish												
	Convict surgeonfish										37		
	Twospot bristletooth surgeonfish												
	Striped bristletooth surgeonfish									10			
	Whitemargin Unicornfish				12								
	Spotted unicornfish							3					
	Bluespine Unicornfish												
	Bignosed Unicornfish												
	Palette surgeonfish									20			
	Moorish idol	6			12	8	4	13	10	3			1
	Gem surgeonfish									20			
	Longnose surgeonfish						4						10
	Brushtail tang	7	30		14	8		36	60		13	13	24
	Unknown		12		23					20			

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pic ouest	Vatu	Quatres mataines	Quatres mataines	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
PARROTFISHES	Bumphead parrotfish												1
(SCARIDAE)	Bicolour parrotfish								3				
	Green parrotfish												
	Indian Ocean steephead												
	Tailbarred parrotfish										1		1
	Greenbelly parrotfish												
	Bridled parrotfish												
	Bluebarred parrotfish												
	Redlip (ember) parrotfish												
	Russell's parrotfish										1	12	4
	Dusky-capped parrotfish									4			
	Bullhead parrotfish												
	Tricolour parrotfish												
	Greenlip parrotfish					2		13		3	1	13	
	Unknown	7	32		23			151	7				
PUFFERS	Porcupine fish												
(TETRAODONTIDAE)	Freckled porcupinefish												
	Crown toby (sharpnose puffer)	12											
	Spotted toby	2	5										
	Black saddled toby	15											
	Honeycomb toby												
	Star pufferfish												
	Whitespotted puffer					1							
	Unknown species		3										
	Black spotted pufferfish												
	Ambon toby												
	Guineafowl pufferfish												
	Spotted boxfish		1			3		3					
	Thornback cowfish												
	Unknown				16						3		
TRIGGERFISHES	Clown triggerfish												
(BALISTIDAE)	Orangestriped triggerfish												
	Titan triggerfish				1								
	Indian triggerfish								15				
	Black triggerfish												
	Redtooth triggerfish												
	Yellow margin triggerfish												
	White barred (Picasso) triggerfish												
	Blackpatch triggerfish										10		
	Scythe triggerfish												
	Flagtail (Halfmoon) triggerfish							13					
	Bridled trigerfish												
	Lined triggerfish												

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres matgnes	Quatres matgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
GROUPERS	Unknown												
(SERRANIDAE)	Tomato grouper												
	Chocolate hind												
	Specklefin grouper												
	Hexagon grouper												
	Snubnosed grouper												
	Honeycomb grouper												
	White blotched grouper												
	Blackspot grouper												
	Potato (whitespotted) grouper												
	Marbled coral grouper												
	Unknown									2		3	
ANGELFISHES	African pygmy angelfish	6											
(POMACANTHIDAE)	Whitetail angelfish												
	Japanese pygmy angelfish												
	Manyspined angelfish									11			
	Bluestriped angelfish												
	Bluering angelfish		1	1									
	Earspot angelfish				6	1							
	Emperor angelfish			2	1								
	Semicircle angelfish						1	3					
	Regal angelfish			3	2			3			4		
	Unknown		20		19								
FUSILIERS	Goldbanded fusilier									120	150	60	
(CAESIONIDAE)	Lunar fusilier		80	40							25		
	Yellowback fusilier									100			
	Yellowtop (scissortail) fusilier		150	60	112								150
	Whitebanded fusilier												
	Twinstripe fusilier				64								
	Ruddy fusilier												
	Unknown			73									
SNAPPERS	Paddletail snapper												
(LUTJANIDAE)	Bluebanded snapper			4									
	Bluestriped snapper		20	6	16								
	Russell's snapper												
	Black and white snapper												
	Black snapper							1					2
	Unknown				5								
SWEETLIPS	Harlequin sweetlips												
(HAEMULIDAE)	Blackspotted sweetlips			32	3		12						
	Diagonal banded sweetlips												
	Oriental sweetlips							3					
	Red-lined sweetlips												
	Unknown						1			2			

	SURVEY REGION	LAGON DE RANOBE						SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres mntgnes	Quatres mntgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
ANTHIASES	Threadfin anthias												
(SERRANIDAE, S/F ANTHIINAE)	Twospot anthias												
	Red-bar anthias												
	Yellowback anthias												
	Stocky anthias												
	Lyretail (Scalefin?) anthias												
GOBIES	Sphynx goby												
(GOBIIDAE)	Mud reef-goby												
	Decorated		8										
	Longfinned				22			3					
	Unknown												
GOATFISHES	Dash and dot goatfish				4	6		13		3	2	5	3
(MULLIDAE)	Doublebar (barred) goatfish				9			13					
	Whitelined goatfish												
	Indian goatfish												
	Unknown												
EMPERORS	Orangefin emperor												
(LETHRINIDAE)	Longfin emperor									3			
	Blackspot emperor			7	4						6		
	Unknown			5									
SQUIRRELFISHES	Blockfin squirrelfish							3					
(HOLOCENTRINAE)	Spotfin squirrelfish	7											
	Tailspot squirrelfish							13					
	Seychelles squirrelfish												
	Sabre squirrelfish	1											
	Unknown				26		1	13					
SOLDIERFISHES	Bigscale soldierfish	2											
(MYRIPRISTINAE)	Whitetip soldierfish												
	Unknown											1	
SCORPIONFISHES	Tasseled scorpionfish		1										
(SCORPAENIDAE)	Lionfish; turkeyfish			1		1							
	Raggy scorpionfish												
	Weedy scorpionfish							1					

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres mnigues	Quatres mnigues	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
DARTFISHES	Curious wormfish												
(MICRODESMIDAE)	Fire dartfish												
	Blackfin (twotone) dartfish												
	Unknown									4			
MORAY EELS	Spotted snake eel										1		
(MURAENIDAE)	Black spotted moray eel										1		
	Unknown species												
LIZARDFISHES	Indian lizardfish												
(SYNODONTIDAE)	Black blotch lizardfish	2											
	Reef lizardfish					1							
BLENNIES	African eel blennie												
(BLENNIDAE)	Bluestriped fangblenny	4											
	Scale-eating fangblenny												
HAWKFISHES	Redbar hawkfish												
(CIRRHITIDAE)	Arceye hawkfish												
	Unknown							13					
SWEEPERS	Vanicoro sweeper	2						36					
(PEMPHERIDAE)	Schwenk's sweeper									1			
FILEFISHES	Blacksaddle mimic filefish					2	1			1			
(MONOCANTHIDAE)	Longnosed filefish												
SANDPERCHES	Speckled sandperch												
(PINGUIPEDIDAE)	Yellowbar sandperch												
CARDINALFISHES	Tiger cardinalfish												
(APOGONODAE)	Five-lined cardinalfish					4							
SPADEFISHES	Teira batfish												4
(EPHIPPIDAE)	Circular batfish												

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres montgnes	Quatres montgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
SAND TILEFISHES	Striped/Blue blanquillo										10	10	
(MALACANTHIDAE)													
DOTTYBACKS	Lighthead dottyback												
(PSEUDOCHROMIDAE)													
BIGEYES	Block's bigeye	1											
(PRIACANTHIDAE)													
TRUMPETFISHES	Trumpetfish		1		7	1	1	3					
(AULOSTOMIDAE)													
PIPEFISHES	Network pipefish												
(SYNGNATHIDAE)	Banded pipefish					30							
	Unknown												
SHRIMPFISHES	Shrimpfish					8							
(CENTRISCIDAE)													
EEL CATFISHES	Striped catfish					60							
(PLOTOSIDAE)													
TRUNKFISHES	Spotted trunkfish												
(OSTRACIIDAE)													
DRAGONETS	Starry dragonet												
(CALLIONYMIDAE)													
CORNETFISHES	Red cornetfish												
(FISTULARIIDAE)													
NEEDLEFISHES	Crocodile needlefish												
(BELONIDAE)													
RABBITFISHES	Whitespotted rabbitfish												
(SIGANIDAE)													
FLATHEADS	Flathead							1					

	SURVEY REGION	LAGON DE RANOBE							SALARY				
	SURVEY DIVE NO.	4	5	9	10	6	21	30	16	17	13	15	14
	DIVE LOCATION	Massif des Roses	Piscine	Piscine section A	Piscine pte ouest	Vatu	Quatres rastgnes	Quatres rastgnes	Tres Nord de P. Sud	Nord de P. Sud	Passe Sud	Sud de Passe Sud	Plus Sud de P. Sud
	TRANSECT CODE	MR1	P1	P2 ('A')	P3	VAT	QM1	QM2	SAL1	SAL2	SAL3	SAL4	SAL5
	DATE (dd-mm-01)	31-07	01-08	02-08	05-08	01-08	14-08	16-08	11-08	11-08	10-08	10-08	10-08
	SURVEYOR	ML	OLJ	RC	RC	FL	HA	RC	DA	JG	OLJ	OLJ	HA
- TAXONOMIC - - GROUP -	- COMMON - - NAME -	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
(A) (ii) CLASS OSTEICHTHYES (BONY FISH): PELAGIC SPECIES													
JACKS & TREVALLYS	Club-nosed Trevally												1
(CARANGIDAE)	Bluefin Trevally												
	Bigeye Trevally												
	Unknown												
BARRACUDAS	Picklehandle barracuda												
(SPHYRAENIDAE)	Blackfin barracuda												
	Unknown												
REMORAS	Sharksucker												
(ECHENEIDAE)	Unknown												
MACKEREL	Narrow-banded Spanish Mackerel												
SCOMBRIDAE	(Kingfish)												
(B) CLASS CHONDRICHTHYES (CARTILAGENOUS FISH): SUBCLASS ELASMOBRANCHII (SHARKS AND RAYS)													
ELECTRIC RAYS	Marbled electric ray												
(TORPEDINIDAE)	Blackspotted electric ray	1											
	Unknown												
GUITARFISHES	Guitarfish					1							
(RHINOBATIDAE)													
STINGRAYS	Bluespotted ribbontail ray										1		
(DASYATIDAE)													
REQUIEM SHARKS	Blacktip reef shark												
(CARCHARHINIDAE)													
(C) MAMMALS (ORDER CETACEA, SUBORDER ODONTOCETI)													
DOLPHINS	Spinner dolphin												
(DELPHINIDAE)	Humpback dolphin												
(D) REPTILES (ORDER CHELONIA)													
SEA TURTLES	Green sea turtle												
(CELONIIDAE)													

(E) ADDITIONAL PELAGIC FISH SPECIES*		
(i) OSTEICHTHYES		
BILLFISHES	Black Marlin	1
(ISTIOPHORIDAE)	Sailfish	1
SWORDFISHES	Swordfish	1
(XIPHIDAE)		
MAKEREL	Kawa Kawa	2
(SCOMBRIDAE)		
FLYINGFISHES	African sailfin flyingfish	3
(EXOCOETIDAE)		
BARRACUDAS	Great barracuda	2
(SPHYRAENIDAE)		
(ii) ELASMOBRANCHII		
REQUIEM SHARKS	Grey reef shark	1
(CHARCHARHINIDAE)	Scalloped hammerhead shark	1
	Tiger shark	1

* Pelagic species reported (by Ifaty fishermen) to occur in waters adjacent to the exterior (seaward) side of the reef. Species noted using standard abundance ratings, after discussion with fishermen.

APPENDIX SIX

LATIN AND MALAGASY TRANSLATIONS OF SPECIES NAMES OF OBSERVED FISH

- TAXONOMIC - GROUP -	- COMMON - NAME -	- SCIENTIFIC NAME -		- MALAGASY - NAME -
		Genus	Species	
(A) CLASS OSTEICHTHYES (BONY FISH):		(i) REEF ASSOCIATED SPECIES		
DAMSELFISHES (*POMACENTRIDAE*)	Natal sergeant	*Abudefduf*	*natalensis*	Fitse
	Ragged sergeant	*Abudefduf*	*raigiensis*	Ariloha
	Scissortail sergeant	*Abudefduf*	*sexfascialus*	Fitse
	False eye sergeant	*Abudefduf*	*sparoides*	Ariloha
	Indopacific Sergeant	*Abudefduf*	*vaigieusis*	Ariloha
	Skunk anemonefish	*Amphiprion*	*akallopiosis*	Tsokorokodo
	Allard's anemonefish	*Amphiprion*	*allardi*	Fitse
	Madagascar anemonefish	*Amphiprion*	*latifasciatus*	Tsokorokodo
	Yellow chromis	*Chromis*	*analis*	Fitse
	Twotone chromis	*Chromis*	*dimidiata*	Ariloha
	Whitetail chromis	*Chromis*	*leucura*	Ariloha
	Pearl spot chromis	*Chromis*	*notata*	Tsokorokodo
	Ternate chromis	*Chromis*	*ternatensis*	Tsokorokodo
	Blue-green chromis	*Chromis*	*viridis*	Tsokorokodo
	Footballer damsel	*Chrysiptera*	*annulata*	Fitse
	Grey demoiselle	*Chrysiptera*	*glauca*	Ariloha
	Goldtail demoiselle	*Chrysiptera*	*parasema*	Ariloha
	Onespot demoiselle	*Chrysiptera*	*unimaculata*	Ariloha
	Humbug dascyllus	*Dascyllus*	*aruanus*	Tsokorokodo
	Indian dascyllus	*Dascyllus*	*carneus*	Fitse
	Threespot dascyllus	*Dascyllus*	*trimaculatus*	Ariloha
	Black damsel	*Neoglyphidodon*	*melas*	Fitse
	African demoiselle	*Neopomacentrus*	*anabatoides*	Ariloha
	Creole damsel	*Pomacentrus*	*agassizi*	Tsokorokodo
	Dark creole damsel	*Pomacentrus*	*aquilus*	Fitse
	Carulean damsel	*Pomacentrus*	*caeruleus*	Ariloha
	Blue damsel	*Pomacentrus*	*pavo*	Ariloha
	Sulphur damsel	*Pomacentrus*	*sulfureus*	Tsokorokodo
	Pailtail damsel	*Pomacentrus*	*trichrous*	Ariloha
	Threeline damsel	*Pomacentrus*	*trilineatus*	Tsokorokodo
	Johnston damsel	*Plectroglyphidon*	*dickii*	Fitse
	Jewel damsel	*Plectroglyphidon*	*lacrymatus*	Ariloha
	Unknown	*species*	*sp*	Tsokorokodo

- TAXONOMIC - GROUP -	- COMMON - NAME -	- SCIENTIFIC NAME - Genus	Species	- MALAGASY - NAME -
(A) CLASS OSTEICHTHYES (BONY FISH):		(i) REEF ASSOCIATED SPECIES		
BUTTERFLYFISHES (*CHAETODONTIDAE*)	Threadfin butterflyfish	*Chaetodon*	*auriga*	Fiau'akoho
	Bennett's butterflyfish	*Chaetodon*	*bennetti*	Fiau'akoho
	Blackburn's butterflyfish	*Chaetodon*	*blackburni*	Fiau'akoho
	Collare butterflyfish	*Chaetodon*	*collare*	Fiau'akoho
	Indian vagabond butterflyfish	*Chaetodon*	*decussatus*	Fiau'akoho
	Saddleback butterflyfish	*Chaetodon*	*falcula*	Fiau'akoho
	Spotted butterflyfish	*Chaetodon*	*guttatissimus*	Fiau'akoho
	Racoon butterflyfish	*Chaetodon*	*Innula*	Fiau'akoho
	Somali butterflyfish	*Chaetodon*	*leucopleura*	Fiau'akoho
	Madagascar (redback) butterfl	*Chaetodon*	*madagascariensis*	Fiau'akoho
	Blackback butterflyfish	*Chaetodon*	*melannotus*	Fiau'akoho
	Merton's butterflyfish	*Chaetodon*	*mertensii*	Fiau'akoho
	Blackspotted butterflyfish	*Chaetodon*	*mesoleucos*	Fiau'akoho
	Meyer's butterflyfish	*Chaetodon*	*meyeri*	Fiau'akoho
	Lemon butterflyfish	*Chaetodon*	*miliaris*	Fiau'akoho
	Bladespotted butterflyfish	*Chaetodon*	*nigropunctatus*	Fiau'akoho
	Spot tail butterflyfish	*Chaetodon*	*ocellicaudes*	Fiau'akoho
	Ornate butterflyfish	*Chaetodon*	*ornatissimus*	Fiau'akoho
	Redback butteflyfish	*Chaetodon*	*paucifasciatus*	Fiau'akoho
	Latticed butterflyfish	*Chaetodon*	*rafflesi*	Fiau'akoho
	Dotted butterflyfish	*Chaetodon*	*semeion*	Fiau'akoho
	Ovalspot butterflyfish	*Chaetodon*	*speculum*	Fiau'akoho
	Redfin butterflyfish	*Chaetodon*	*trifasciatus*	Fiau'akoho
	Vagabond butterflyfish	*Chaetodon*	*vagabundus*	Fiau'akoho
	Zanzibar butterflyfish	*Chaetodon*	*zanzibariensis*	Fiau'akoho
	Longnosed butterflyfish	*Forcipiger*	*flavissimus*	Fiau'akoho
	Big longnosed butterflyfish	*Forcipiger*	*longirostrus*	Fiau'akoho
	Black pyramid butterflyfish	*Hemitaurichthys*	*zoster*	Fiau'akoho
	Masked bannerfish	*Heniochus*	*monoceros*	Fiau'akoho
	Longfin bannerfish	*Heniochus*	*acuminatus*	Fiau'akoho
	Unknown	*species*	*sp*	Fiau'akoho
WRASSES (*LABRIDAE*)	Blue-spotted wrasse	*Anampses*	*caeruleopunctatus*	Unknown
	Lined wrasse	*Anampses*	*lineatus*	Unknown
	Axilspot hogfish	*Bodicanus*	*axillarius*	Unknown
	Red breasted wrasse	*Cheilinus*	*fasciatus*	Unknown
	Napoleon wrasse	*Cheilinus*	*undulatus*	Unknown
	African coris	*Coris*	*africana*	Unknown
	Clown coris	*Coris*	*aygula*	Unknown
	Indian Ocean bird wrasse	*Gomphosus*	*caeruleus*	Unknown
	Bird wrasse	*Gomphosus*	*varius*	Unknown
	Adorned wrasse	*Halichoeres*	*cosmetus*	Unknown
	Checkerboard wrasse	*Halichoeres*	*hortulannus*	Unknown
	Zig Zag	*Halichoeres*	*scapularis*	Unknown
	Barred thicklip wrasse	*Hemigymnus*	*fasciatus*	Unknown
	Candycane longface wrasse	*Hologymnosus*	*loliatus*	Unknown
	Bicolour cleaner	*Labroides*	*bicolor*	Unknown
	Cleaner	*Labroides*	*dimidiatus*	Fiambondis
	Tubelip wrasse	*Labrichthys*	*unilineatus*	Unknown
	Ornate wrasse	*Macropharyngodan*	*ornatus*	Unknown
	Longface wrasse	*Plobgymnosus*	*doliatus*	Unknown
	Smalltail wrasse	*Pseudojuloides*	*erythrops*	Unknown
	Flagfin wrasse	*Pteragogus*	*flagellifera*	Unknown
	Tail-barred wrasse	*Scarus*	*caudofasciatus*	Unknown
	Twotone (Blunthead)	*Thalassoma*	*amblycephalom*	Unknown
	Redcheek wrasse	*Thalassoma*	*genivittatum*	Unknown

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		Genus	Species	
(A) CLASS OSTEICHTHYES (BONY FISH):		**(i) REEF ASSOCIATED SPECIES**		
SURGEONFISHES and UNICORNFISHES *(ACANTHURIDAE)*	Orange socket surgeonfish	*Acanthurus*	*auranticaurus*	Angy
	Ringtailed surgeonfish	*Acanthurus*	*blockii*	Angy
	Eyestripe surgeonfish	*Acanthurus*	*dussumieri*	Angy
	Palelipped surgeonfish	*Acanthurus*	*leucocheilus*	Angy
	Powder blue surgeonfish	*Acanthurus*	*leucosternon*	Angy
	Striped surgeonfish	*Acanthurus*	*lineatus (xanthopteru*	Angy
	Blackstreak surgeonfish	*Acanthurus*	*nigricauda/nubilis?*	Angy
	Bluelined surgeonfish	*Acanthurus*	*nubilis*	Angy
	Blackbarred surgeonfish	*Acanthurus*	*polyzona*	Angy
	Lieutenant surgeonfish	*Acanthurus*	*tennenti*	Angy
	Thomson's surgeonfish	*Acanthurus*	*thomsonii*	Angy
	Convict surgeonfish	*Acanthurus*	*triostegus*	Angy
	Twospot bristletooth surgeonf	*Ctenochaetus*	*binotatus*	Angy
	Striped bristletooth surgeonfis	*Ctenochaetus*	*striatus*	Angy
	Whitemargin Unicornfish	*Naso*	*annulatus*	Fiautrifa
	Spotted unicornfish	*Naso*	*brevirostris*	Fiautaudioka
	Bluespine Unicornfish	*Naso*	*unicornis*	Fiautrifa
	Bignosed Unicornfish	*Naso*	*vlamingi*	Fiautrifa
	Palette surgeonfish	*Paracanthurus*	*hepatus*	Angy
	Moorish idol	*Zanclus*	*cornutus*	Fiam'akoho
	Gem surgeonfish	*Zebrasoma*	*gemmatum*	Angy
	Longnose surgeonfish	*Zebrasoma*	*rostratum*	Angy
	Brushtail tang	*Zebrasoma*	*scopus*	Angy
	Unknown	*species*	*sp*	Angy
PARROTFISHES *(SCARIDAE)*	Bumphead parrotfish	*Bolbometopen*	*muricatum*	Fiambazaha
	Bicolour parrotfish	*Cetoscarus*	*bicolor*	Fiambazaha
	Green parrotfish	*Chlorurus*	*atrilunula*	Bodoloha
	Indian Ocean steephead	*Chlorurus*	*stongylocephalus*	Bodoloha
	Tailbarred parrotfish	*Scarus*	*caudofasciatus*	Fiambazaha
	Greenbelly parrotfish	*Scarus*	*falcipinnis*	Bodoloha
	Bridled parrotfish	*Scarus*	*frenatus*	Bodoloha
	Bluebarred parrotfish	*Scarus*	*ghobban*	Bodoloha
	Redlip (ember) parrotfish	*Scarus*	*rubroviolaceus*	Fiambazaha
	Russell's parrotfish	*Scarus*	*russelli*	Bodoloha
	Dusky-capped parrotfish	*Scarus*	*scaber*	Fiambazaha
	Bullhead parrotfish	*Scarus*	*sordidus*	Bodoloha
	Tricolour parrotfish	*Scarus*	*tricolour*	Fiambazaha
	Greenlip parrotfish	*Scarus*	*viridifucatus*	Fiambazaha
	Unknown	*species*	*sp*	Fiambazaha
PUFFERS *(TETRAODONTIDAE)*	Porcupine fish	*Diodon*	*hystrix*	Mosoy
	Freckled porcupinefish	*Diodon*	*holocanthus*	Mosoy
	Crown toby (sharpnose puffer	*Canthigaster*	*coronata*	Unknown
	Spotted toby	*Canthigaster*	*solandri*	Unknown
	Black saddled toby	*Canthigaster*	*valentini*	Unknown
	Honeycomb toby	*Canthigaster*	*janthinopera*	Unknown
	Star pufferfish	*Arothron*	*stelatus*	Botova
	Whitespotted puffer	*Arothron*	*hispidus*	Botova
	Unknown species	*sp*		Botova
	Black spotted pufferfish	*Arothron*	*nigropunctatus*	Botova
	Ambon toby	*Canthigaster*	*amboinensis*	Botova
	Guineafowl pufferfish	*Arothron*	*meleagris*	Botova
	Spotted boxfish	*Ostracion*	*meleagris*	Botova
	Thornback cowfish	*Lactaris*	*fornasini*	Botova
	Unknown	*species*	*sp*	Botova

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(A) CLASS OSTEICHTHYES (BONY FISH):		(i) REEF ASSOCIATED SPECIES		
TRIGGERFISHES	Clown triggerfish	*Balistoides*	*conspicillum*	Tsontso
(BALISTIDAE)	Orangestriped triggerfish	*Balistapus*	*undulatus*	Tsontsombola
	Titan triggerfish	*Balistoides*	*viridescens*	Tsontso
	Indian triggerfish	*Melichthys*	*indicus*	Votsandja
	Black triggerfish	*Melichthys*	*niger*	Tsontsombola
	Redtooth triggerfish	*Odonus*	*niger*	Votsandja
	Yellow margin triggerfish	*Pseudobalistes*	*flavimarginatus*	Tsontso
	White barred (Picasso) trigger	*Rhinecantus*	*aculeatus*	Votsandja
	Blackpatch triggerfish	*Rhinecantus*	*verrucosus*	Tsontsombola
	Scythe triggerfish	*Sufflamen*	*bursa*	Votsandja
	Flagtail (Halfmoon) triggerfish	*Sufflamen*	*chrysopterus*	Tsontso
	Bridled trigerfish	*Sufflamen*	*fraenatus*	Tsontsombola
	Lined triggerfish	*Xanthichthys*	*lineopunctatus*	Votsandja
	Unknown	*species*	*sp*	Unknown
GROUPERS	Tomato grouper	*Cephalophalis*	*sonnerati*	Iovo
(SERRANIDAE)	Chocolate hind	*Cephalophalis*	*stridata*	Iovo
	Specklefin grouper	*Epinephelus*	*caeruleopunctatus*	Alovo
	Hexagon grouper	*Epinephelus*	*hexagonatus*	Iovo
	Snubnosed grouper	*Epinephelus*	*macrospilos*	Vivano
	Honeycomb grouper	*Epinephelus*	*merra*	Sampramale
	White blotched grouper	*Epinephelus*	*multinotatus*	Tsaramasy
	Blackspot grouper	*Epinephelus*	*quoyanus*	Alovo
	Potato (whitespotted) grouper	*Epinephelus*	*tukula*	Fintsilaka
	Marbled coral grouper	*Plectropomus*	*punctatus*	Aiovo
	Unknown	*species*	*sp*	Alovo
ANGELFISHES	African pygmy angelfish	*Centropyge*	*acanthops*	Fiau'akoho
(POMACANTHIDAE)	Whitetail angelfish	*Centropyge*	*flavicauda*	Fiau'akoho
	Japanese pygmy angelfish	*Centropyge*	*interruptus*	Fiau'akoho
	Manyspined angelfish	*Centropyge*	*multispinis*	Fiau'akoho
	Bluestriped angelfish	*Chaetodonplus*	*septentrionalis*	Fiau'akoho
	Bluering angelfish	*Pomacanthus*	*annularis*	Fiau'akoho
	Earspot angelfish	*Pomacanthus*	*chrysurus*	Fiau'akoho
	Emperor angelfish	*Pomacanthus*	*imperator*	Fiau'akoho
	Semicircle angelfish	*Pomacanthus*	*semicirculatus*	Fiau'akoho
	Regal angelfish	*Pygoplites*	*diacanthus*	Fiau'akoho
	Unknown	*species*	*sp*	Fiau'akoho
FUSILIERS	Goldbanded fusilier	*Caesio*	*caerularae*	Unknown
(CAESIONIDAE)	Lunar fusilier	*Caesio*	*lunaris*	Unknown
	Yellowback fusilier	*Caesio*	*teres*	Unknown
	Yellowtop (scissortail) fusilier	*Caesio*	*xanthonota*	Unknown
	Whitebanded fusilier	*Pterocaesio*	*lativitata*	Unknown
	Twinstripe fusilier	*Pterocaesio*	*marri*	Unknown
	Ruddy fusilier	*Pterocaesio*	*pisang*	Unknown
	Unknown	*species*	*sp*	Unknown
SNAPPERS	Paddletail snapper	*Lutjanus*	*gibbus*	Tsivaravana
(LUTJANIDAE)	Bluebanded snapper	*Lutjanus*	*kasmira*	Amposama
	Bluestriped snapper	*Lutjanus*	*notatus*	Faimasika
	Russell's snapper	*Lutjanus*	*russelli*	Amposama
	Black and white snapper	*Macolor*	*macularis*	Amposama
	Black snapper	*Macolor*	*niger*	Amposama

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(A) CLASS OSTEICHTHYES (BONY FISH):		**(i) REEF ASSOCIATED SPECIES**		
SWEETLIPS	Harlequin sweetlips	*Plectorhinchus*	*chaetodonoides*	Amgarera
(HAEMULIDAE)	Blackspotted sweetlips	*Plectorhinchus*	*gaterinus*	Amgarera
	Diagonal banded sweetlips	*Plectorhinchus*	*linatus*	Amgarera
	Oriental sweetlips	*Plectorhinchus*	*orientalis*	Amgarera
	Red-lined sweetlips	*Plectorhinchus*	*plagiodesmus*	Amgarera
	Unknown	*species*	*sp*	Amgarera
ANTHIASES	Threadfin anthias	*Nemanthias*	*carberryi*	Bodoloha
(SERRANIDAE, S/F ANTHIINAE)	Twospot anthias	*Pseudanthias*	*bimaculatus*	Bodoloha
	Red-bar anthias	*Pseudanthias*	*cooperi*	Bodoloha
	Yellowback anthias	*Pseudanthias*	*evansi*	Bodoloha
	Stocky anthias	*Pseudanthias*	*hypelosoma*	Bodoloha
	Lyretail (Scalefin?) anthias	*Pseudanthias*	*squamipinnis*	Bodoloha
GOBIES	Sphynx goby	*Amblygobius*	*sphynx*	Tabololo
(GOBIIDAE)	Mud reef-goby	*Exyrias*	*bellissimus*	Tabololo
	Decorated	*Istigobius*	*decoratus*	Tabololo
	Longfinned	*Valenciennea*	*longpinnus*	Tabololo
	Unknown	*species*	*sp*	Tabololo
GOATFISHES	Dash and dot goatfish	*Parupeneus*	*barberinus*	Fiantsomotsa
(MULLIDAE)	Doublebar (barred) goatfish	*Parupeneus*	*bifasciatus*	Fiantsomotsa
	Whitelined goatfish	*Parupeneus*	*ciliatus*	Fiantsomotsa
	Indian goatfish	*Parupeneus*	*indicus*	Fiantsomotsa
	Unknown	*species*	*sp*	Fiantsomotsa
EMPERORS	Orangefin emperor	*Lethrinus*	*erythracanthus*	Amgelika
(LETHRINIDAE)	Longfin emperor	*Lethrinus*	*erythropterus*	Romanjia
	Blackspot emperor	*Lethrinus*	*horak*	Tapaporoha
	Unknown	*species*	*sp*	Ambitsy
SQUIRRELFISHES	Blockfin squirrelfish	*Neoniphon*	*opercularis*	Fautsilla
(HOLOCENTRINAE)	Spotfin squirrelfish	*Neoniphon*	*sammara*	Fautsilla
	Tailspot squirrelfish	*Sargocentron*	*caudimaculatum*	Fautsilla
	Seychelles squirrelfish	*Sargocentron*	*seychellense*	Fautsilla
	Sabre squirrelfish	*Sargocentron*	*spingiferam*	Fautsilla
	Unknown	*species*	*sp*	Fautsilla
SOLDIERFISHES	Bigscale soldierfish	*Myripristis*	*berndti*	Ampify
(MYRIPRISTINAE)	Whitetip soldierfish	*Myripristis*	*vittata*	Ampify
	Unknown	*species*	*sp*	Ampify
SCORPIONFISHES	Tasseled scorpionfish	*Scorpaenopsis*	*oxycephala*	Lafo
(SCORPAENIDAE)	Lionfish; turkeyfish	*Pterois*	*miles (volitans)*	Kabo
	Raggy scorpionfish	*Scorpaenopsis*	*venosa*	Lafo
	Weedy scorpionfish	*Rhinopias*	*aphanes*	Lafo
DARTFISHES	Curious wormfish	*Gunnellichthys*	*curiosus*	Unknown
(MICRODESMIDAE)	Fire dartfish	*Nemateleotris*	*magnifica*	Unknown
	Blackfin (twotone) dartfish	*Ptereleotris*	*evides*	Unknown
	Unknown	*species*	*sp*	Unknown
MORAY EELS	Spotted snake eel	*Myrichtys*	*maculosus*	Lamera
(MURAENIDAE)	Black spotted moray eel	*Gymnothorax*	*tessellata*	Lamera
	Unknown species	*sp*		Lamera

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(A) CLASS OSTEICHTHYES (BONY FISH):		**(i) REEF ASSOCIATED SPECIES**		
LIZARDFISHES	Indian lizardfish	*Synodus*	*indicus*	Unknown
(SYNODONTIDAE)	Black blotch lizardfish	*Synodus*	*faculum*	Unknown
	Reef lizardfish	*Synodus*	*variegatus*	Unknown
BLENNIES	African eel blennie	*Haliophis*	*guttatus*	Lemilemy
(BLENNIDAE)	Bluestriped fangblenny	*Plagiotremus*	*rhinorhynchus*	Meuahelika
	Scale-eating fangblenny	*Plagiotremus*	*tapeinosoma*	Meuahelika
HAWKFISHES	Redbar hawkfish	*Cirrhitops*	*fasciatus*	Unknown
(CIRRHITIDAE)	Arceye hawkfish	*Paracirrhites*	*arcatus*	Unknown
	Unknown	*species*	*sp*	Unknown
SWEEPERS	Vanicoro sweeper	*Pempheris*	*vanicolensis*	Bemosa
(PEMPHERIDAE)	Schwenk's sweeper	*Pempheris*	*schwenkii*	Bemosa
FILEFISHES	Blacksaddle mimic filefish	*Paraluteres*	*prionurus*	Tsimalahoke
(MONOCANTHIDAE)	Longnosed filefish	*Oxymonacanthus*	*longirostris*	Tsimalahoke
SANDPERCHES	Speckled sandperch	*Parapercis*	*hexaphthalma*	Volomboto
(PINGUIPEDIDAE)	Yellowbar sandperch	*Parapercis*	*xanthozona*	Volomboto
CARDINALFISHES	Tiger cardinalfish	*Cheilodipterus*	*macrodon*	Bemaso
(APOGONODAE)	Five-lined cardinalfish	*Cheilodipterus*	*quinquelineatus*	Bemaso
SPADEFISHES	Teira batfish	*Platax*	*teira*	Dangira
(EPHIPPIDAE)	Circular batfish	*Platax*	*orbicularis*	Filaopapango
SAND TILEFISHES	Striped/Blue blanquillo	*Malacanthus*	*latovittatus*	Unknown
(MALACANTHIDAE)				
DOTTYBACKS	Lighthead dottyback	*Pseudochromis*	*tauberae*	Lemilemy
(PSEUDOCHROMIDAE)				
BIGEYES	Block's bigeye	*Pricanthus*	*blockii*	Unknown
(PRIACANTHIDAE)				
TRUMPETFISHES	Trumpetfish	*Aulostomus*	*chinensis*	Unknown
(AULOSTOMIDAE)				
PIPEFISHES	Network pipefish	*Corythoichthys*	*flavofasciatus*	Unknown
(SYNGNATHIDAE)	Banded pipefish	*Corythoichthys*	*intestinalis*	Unknown
	Unknown	*species*	*sp*	Unknown
SHRIMPFISHES	Shrimpfish	*Aeoliscus*	*strigatus*	Unknown
(CENTRISCIDAE)				
EEL CATFISHES	Striped catfsh	*Plotosus*	*lineatus*	Fiandolo
(PLOTOSIDAE)				
TRUNKFISHES	Spotted trunkfish	*Ostracion*	*meleagris*	Ombalahindriaka
(OSTRACIIDAE)				
DRAGONETS	Starry dragonet	*Synchiropus*	*stellatus*	Unknown
(CALLIONYMIDAE)				
CORNETFISHES	Red cornetfish	*Fistularia*	*petimba*	Tserakantsiva
(FISTULARIIDAE)				
NEEDLEFISHES	Crocodile needlefish	*Tylosurus*	*crocodilus crocodilus*	Tseradava
(BELONIDAE)				
RABBITFISHES	Whitespotted rabbitfish	*Siganus*	*sutur*	Amboramasaka
(SIGANIDAE)				
FLATHEADS	Flathead	*Thysanophrys*	*species*	Unknown

(A) (ii) CLASS OSTEICHTHYES (BONY FISH): PELAGIC SPECIES				
JACKS & TREVALLYS	Club-nosed Trevally	*Carangoides*	*chrysophrys*	Lanora
(CARANGIDAE)	Bluefin Trevally	*Caranx*	*melampygus*	Lanora
	Bigeye Trevally	*Caranx*	*sexfasciatus*	Lanora
	Unknown	*species*	*sp*	Lanora
BARRACUDAS	Picklehandle barracuda	*Sphyraena*	*jello*	Barracuda
(SPHYRAENIDAE)	Blackfin barracuda	*Sphyraena*	*genie*	Barracuda
	Unknown	*species*	*sp*	Barracuda
REMORAS	Sharksucker	*Echeneis*	*naucrates*	Unknown
(ECHENEIDAE)	Unknown	*species*	*sp*	Unknown
MACKEREL	Narrow-banded Spanish Mackerel	*Scomberomorus*	*plurilineatus*	Lamatra
SCOMBRIDAE	(Kingfish)			
(B) CLASS CHONDRICHTHYES (CARTILAGENOUS FISH): SUBCLASS ELASMOBRANCHII				
ELECTRIC RAYS	Marbled electric ray	*Torpedo*	*sinspersici*	Unknown
(TORPEDINIDAE)	Blackspotted electric ray	*Torpedo*	*fuscomaculata*	Unknown
	Unknown	*species*	*sp*	Unknown
GUITARFISHES	Guitarfish	*Rhincobatus*	*diidensis*	Soroboa
(RHINOBATIDAE)				
STINGRAYS	Bluespotted ribbontail ray	*Taeniura*	*lymma*	Fay, Makoba
(DASYATIDAE)				
REQUIEM SHARKS	Blacktip reef shark	*Charcharhinus*	*melanopterus*	Akiho
(CARCHARHINIDAE)	Whitetail reef shark	*Charcharhinus*	*wheeleri*	Akiho
(C) MAMMALS (ORDER CETACEA, SUBORDER ODONTOCETI)				
DOLPHINS	Spinner dolphin	*Stenella*	*longirostris*	
(DELPHINIDAE)	Humpback dolphin	*Sousa*	*chinensis*	
(D) REPTILES (ORDER CHELONIA)				
SEA TURTLES	Green sea turtle	*Chelenia*	*mydas*	Tano
(CELONIIDAE)				
(E) ADDITIONAL PELAGIC FISH SPECIES*				
(i) OSTEICHTHYES				
BILLFISHES	Black Marlin	*Makaira*	*indica*	Ndwaro
(ISTIOPHORIDAE)	Sailfish	*Istiophorus*	*platyperus*	Ndwaro
SWORDFISHES	Swordfish	*Xiphias*	*gladius*	Lamatra
(XIPHIDAE)				
MAKEREL	Kawa Kawa	*Euthynnus*	*affinis*	Lamatra
(SCOMBRIDAE)				