

Annual Report 2003

@ 24 August 2004

Vision

To increase the contribution of the fisheries sector in the national economy and to respond effectively to the needs of the Mauritian fishing industry through the provision of highest standard of expertise and professionalism in all its operations particularly in transforming Mauritius into a sea food hub.

Mission

To be the driving force for ensuring the sustainable development and management of fisheries resources, conservation and protection of living aquatic resources and the marine environment in the waters of and of interest to Mauritius for continued socio-economic benefits to stakeholders.

Objectives

In line with Government policy to undertake research and development, to consolidate existing knowledge and generate new ideas in marine resources, technology, marine environment, promote its application in industry, government management, undertake complementary activities to disseminate knowledge, collaborate effectively, assist in the development of a national fisheries policy and enhance the standing of the Albion Fisheries Research Centre and the Fisheries Training and Extension Centre as hubs of excellence.

Foreword

I am very pleased to present the Annual Report of the Ministry of Fisheries for the year 2003. The report contains information on the activities of the Ministry of Fisheries including the Albion Fisheries Research Centre and the Fisheries Protection Service. It covers research in priority fields of fisheries namely marine fisheries, aquaculture and the marine environment. It also reviews other aspects related to fisheries development and management, conservation and protection of living resources and enforcement of fisheries legislation.

The infrastructure for fisheries development, management, enforcement and research has been constantly expanded over the years to cope with the diversity of projects being implemented. The construction works for setting up of the Fisheries Training and Extension Centre started in May 2003 and scheduled to be completed in June 2004.

The Fifth Protocol of the Fishing Agreement between Mauritius and the European Commission was signed in October 2003. Under the agreement, European vessels are allowed to fish in the Mauritius EEZ against payment of a licence fee and a financial compensation.

With a view to deter illegal, unregulated and unreported fishing, a feasibility study for the setting up of a vessel monitoring system was initiated.

Mangrove propagation was effected at Grande Rivière Noire and Petite Habitation. Two swimming zones, one at Pereybere and the other at Flic en Flac were demarcated to provide safety for swimmers.

It is my earnest hope that this annual report provides a better insight of the activities and development of the fisheries sector in Mauritius and serves as a valuable reference to specialised institutions and the general public.

I seize this opportunity to thank all the staff of the Ministry, especially the Chief Fisheries Officer, the Principal Fisheries Officers, the Divisional Scientific Officers and the Controller of the Fisheries Protection Service for the preparation of this report.

I would also like to convey my gratitude to the Minister of Fisheries, Honourable Louis Sylvio Michel for his keen interest and support towards the completion of the report.

A. Freyneau (Mrs)
Permanent Secretary

CONTENTS

Foreword

List of appendices

List of tables

List of figures

Executive Summary

1. FISHERIES RESEARCH

1.1 Coastal (artisanal) fishery

1.1.1 Catch, effort and catch per fisherman day (CFPD)

1.1.2 Monthly landings

1.1.3 Catch by gear

1.1.4 Fishermen

1.1.5 Boats

1.1.6 Price of fish

1.2 Banks fishery

1.2.1 Production of frozen fish

1.2.2 Catch, effort and catch per fisherman day for the Nazareth and Saya de Malha banks

1.2.3 Length frequency distribution of *Lethrinus mahsena*

1.2.4 Management of the shallow water banks fishery

1.2.5 Fishing in the waters of Chagos Archipelago

1.3 St. Brandon inshore fishery

1.3.1 The catch

1.3.2 Sampling of frozen fish from St. Brandon

1.4 The semi-industrial chilled fish fishery

1.5 Deep-water shrimp fishery

1.6 Tuna fishery

1.6.1 Sampling of catch from licensed purse seiners

1.6.1.1 The length frequency distribution of skipjack tuna (*Katsuwonus pelamis*)

1.6.1.2 The length frequency distribution of yellowfin tuna (*Thunnus albacares*)

1.6.1.3 The length frequency distribution of bigeye tuna (*Thunnus obesus*)

1.6.2 Species composition

1.6.3 Reproductive biology of skipjack tuna

1.6.3.1 Gonado-somatic Index (GSI)

1.6.3.2 Spawning season

1.6.3.3 Sex ratio

1.6.3.4 Length at first maturity (L_{M50})

1.6.4 Monitoring of the catch of licensed longliners

1.6.4.1 Species composition of the catch of licensed longliners

1.6.4.2 Spatial distribution of the catch of licensed longliners

1.6.4.3 Sampling of catch of licensed longliners

1.6.5 The Mauritian longline fishery

1.6.6 Trans-shipment by tuna longliners

1.6.7 Supply of tuna to the local canning factory

1.7 Swordfish fishery

- 1.7.1 Length frequency of fish caught

1.8 Ecotoxicology

- 1.8.1 Fish toxicity
- 1.8.2 Harmful marine microalgae

1.9 Harmful marine organisms**1.10 Recruitment of juvenile fish****2. MARINE SCIENCE****2.1 Coastal ecosystem research**

- 2.1.1 Long-term monitoring of the coral reef ecosystem
 - 2.1.1.1 Coral cover at Trou aux Biches
 - 2.1.1.2 Coral cover at Bambous Virieux
- 2.1.2 Coral bleaching
- 2.1.3 Monitoring of ex-sand mining sites
- 2.1.4 Regional coral reef monitoring project
- 2.1.5 Mangrove propagation

2.2 Physical oceanography

- 2.2.1 Study of current patterns
- 2.2.2 Sea surface water temperature

2.3 Coastal environment research

- 2.3.1 Coastal water quality
 - 2.3.1.1 Monitoring of chemical parameters
 - 2.3.1.2 Analysis for trace metals and pesticides
 - 2.3.1.3 Ad-hoc water analysis
 - 2.3.1.4 Other studies

2.4 Coliform bacteria in seawater at public beaches**3. AQUACULTURE****3.1 Plankton culture**

- 3.1.1 Phytoplankton
- 3.1.2 Zooplankton

3.2 Sea bream culture

- 3.2.1 Broodstock
- 3.2.2 Seed production

3.3 Giant tiger prawn culture

- 3.3.1 Broodstock
- 3.3.2 Seed production

3.4 Camaron culture

- 3.4.1 Broodstock
- 3.4.2 Seed production

- 3.4.3 Grow-out of camaron juveniles
- 3.4.4 Sale of camaron juveniles

3.5 Resource propagation

- 3.5.1 Release of seabream fry
- 3.5.2 Release of tiger prawn juveniles

3.6 Berri Rouge culture

- 3.6.1 Broodstock
- 3.6.2 Seed production

3.7 Crayfish culture

3.8 Aquaculture extension service

3.9 Aquaculture production

4. MARINE PARKS AND RESERVES SERVICE

4.1 Blue Bay Marine Park

- 4.1.1 Management of Blue Bay Marine Park
- 4.1.2 Coral reef ecosystem monitoring at Blue Bay Marine Park

4.2 Zoning of the Balaclava Marine Park

4.3 Survey of undersea walk sites

4.4 Bathymetry mapping and production of a resource atlas for the lagoons of Mauritius and Rodrigues

4.5 Demarcation of swimming zones at the Pereybere and Flic en Flac beaches

4.6 Environmental Impact Assessment (EIA)

5. FISHERIES DEVELOPMENT AND EXTENSION

5.1 Fish Aggregating Devices

- 5.1.1 FAD development
- 5.1.2 Training
- 5.1.3 FAD fishery monitoring
- 5.1.4 Studies on the FAD fishery
- 5.1.5 Fish landings from the FAD fishery
- 5.1.6 FAD regulations
- 5.1.7 Research boats

6. FISHERIES MANAGEMENT

6.1 Licensing of fishing vessels

- 6.1.1 Licensing of foreign fishing vessels
- 6.1.2 Licensing of Mauritian fishing vessels

6.2 Monitoring of fishing vessels

- 6.2.1 Monitoring of local fishing vessels/boats
- 6.2.2 Monitoring of foreign fishing vessels calling at Port Louis
- 6.2.3 Monitoring of patagonian toothfish vessels
- 6.2.4 Monitoring of deep-sea trawlers calling at Port Louis

6.3 Import and export of fish and fish products and fish processing

- 6.3.1 Import of fish and fish products
 - 6.3.1.1 Chilled seafood
 - 6.3.1.2 Chilled processed seafood
 - 6.3.1.3 Frozen seafood
 - 6.3.1.4 Frozen processed seafood
 - 6.3.1.5 Dried seafood
 - 6.3.1.6 Smoked seafood
 - 6.3.1.7 Canned seafood
 - 6.3.1.8 Live crustaceans
 - 6.3.1.9 Live ornamental fish
 - 6.3.1.10 Fish meal
- 6.3.2 Export of fish and fish products
 - 6.3.2.1 Export of chilled fish
 - 6.3.2.2 Export of ornamental fish
- 6.3.3 Fish processing
 - 6.3.3.1 Canned tuna
 - 6.3.3.2 Salted fish
 - 6.3.3.3 Fish meal production

6.4 Fish production, consumption and trade balance

- 6.4.1 Total fish production
- 6.4.2 Per capita consumption of fish
- 6.4.3 Trade balance in relation to total imports and exports

7. FISHERIES PLANNING**7.1 Fishing Agreement with the European Union****7.2 Fishing Agreement with Japan****7.3 Southern African Development Community (SADC)****7.4 Food and Agricultural Organisation (FAO)/ Technical Assistance Programme****7.5 Technical Assistance from Kuwait Fund for Arab Economic Development****7.6 Committee on World Food Security****7.7 South West Indian Ocean Fisheries Commission****7.8 Seafood Hub****7.9 Fish quality assurance****7.10 Vessel Monitoring System (VMS)**

7.11 World Trade Organisation (WTO)**8. FISHERIES PROTECTION SERVICE****8.1 Registration of artisanal fishers****8.2 Registration of boats****8.3 Licences and permits****8.4 Illegal fishing****8.5 Allowances to artisanal fishers****8.6 Incentives to registered fishers****8.7 Buy-back scheme for nets****8.8 Banks fishermen****9. MISCELLANEOUS****9.1 Rodrigues Pesticides Monitoring Project****9.2 Environmental standards****9.3 Oceanographic cruises****9.4 Attachments****9.5 Construction of slipway at Baie du Tombeau****9.6 Conversion of fish landing station into fisheries post at Baie du Tombeau****9.7 Fisheries newsletter****9.8 Visits****9.9 Sales of publications****9.10 Internet and email****9.11 Information service****9.12 New library holdings****9.13 Website of the Ministry****9.14 ODINAFRICA II project****9.15 Open day at the Centre**

9.16 Fisheries Training and Extension Centre

9.17 Distribution of safety equipment

9.18 First National Ocean Science Forum

9.19 Launching of patrol boats

9.20 Staff departure

LIST OF APPENDICES

1. Organigram of the Ministry of Fisheries
2. Organigram of the technical services
3. Technical services staff activities
4. List of staff and qualifications
5. List of projects and services
6. Organigram of the Fisheries Protection Service
7. Meetings, workshops, seminars and courses attended by officers
8. Details of fishing vessels calling at Port Louis
9. Sale of publications

LIST OF TABLES

- 1.1 Catch, fishermen-days and catch per fisherman day
- 1.2 Monthly estimates of catch with value, effort and catch per fisherman day
- 1.3 Annual catch (kg) by gear
- 1.4 Number of active fishermen by gear-type
- 1.5 Number of active fishing boats
- 1.6 Yearly average retail price of fresh fish
- 1.7 Particulars of the fishing fleet
- 1.8 Annual catch (t) of frozen fish by bank
- 1.9 Fishing effort and catch from the banks
- 1.10 Catch, Effort (fisherman days) and CPFD in the fishery
- 1.11 Catch by season
- 1.12 Details of fishing trips to the Chagos Archipelago
- 1.13 Particulars of vessels operating in the inshore fishery
- 1.14 St. Brandon inshore fishery production (t)
- 1.15 Particulars of vessels operating in the semi-industrial chilled fish fishery
- 1.16 Catch (kg) by species and fishing area
- 1.17 Chilled fish production (t)
- 1.18 Catch and effort by fishing area
- 1.19 Sampling of chilled fish from the different banks
- 1.20 Species composition of the purse seiners catch (%)
- 1.21 Species composition of the catch of licensed longliners
- 1.22 Species composition of fish trans-shipped
- 1.23 Catch composition of the local swordfish fishing vessels (kg)
- 1.24 Particulars of toxic fish specimens
- 1.25 Density of dinoflagellates at Albion, Trou aux Biches, Blue Bay, Le Morne and Trou d'Eau Douce (cells/g of macroalga)
- 1.26 Preliminary results of survey on harmful marine organisms
- 1.27 Total fish individuals, families and species collected at the sampling sites
- 2.1 Percentage cover of substrate at monitoring stations
- 2.2 Abundance of fish, sea urchins and sea cucumbers
- 2.3 Results of water analyses (chemical)
- 2.4 Comparative results for trace metals
- 2.5 Results of coliform analysis at the monitoring sites
- 3.1 Production of seabream fingerlings
- 3.2 Production of *P. monodon* post larvae
- 3.3 Release of seabream fry
- 3.4 Release of tiger prawn juveniles

- 3.5 Number and types of berri rouge fingerlings produced/distributed
- 4.1 Number of applications received, processed and permits issued
- 4.2 Percentage of substrate cover at stations 2 and 3
- 4.3 Summary of observations at undersea walk sites
- 5.1 List of FADs as at December 2003
- 5.2 Catch by species
- 6.1 Number of licences issued by nationality
- 6.2 Number of licences issued to foreign fishing vessels by gear
- 6.3 Licensed Mauritian vessels by category
- 6.4 Details of calls of foreign vessels
- 6.5 Nationalities of vessels calling at Port Louis
- 6.6 Number of vessels calling at Port Louis over the last five years
- 6.7 Patagonian toothfish trans-shipment over the last five years (t)
- 6.8 Calls of trawlers since 2000
- 6.9 Import of chilled seafood (t)
- 6.10 Import of frozen seafood (t)
- 6.11 Import of dried seafood (t)
- 6.12 Import of canned fish (t)
- 6.13 Production of canned tuna and its by-products (t)
- 6.14 Export and local sales of canned tuna and pet food (t)
- 6.15 Import, production and sale of salted fish (t)
- 6.16 Production of fish meal (t)
- 6.17 Fish production in tonnes (fresh-weight equivalent)
- 6.18 Per capita consumption of fish (kg)
- 6.19 Import and export of fish and fish products and trade balance
- 7.1 Some essential components of the fisheries protocol
- 8.1 Categories of artisanal fishers
- 8.2 Number of registered boats
- 8.3 Number of licences and permits
- 8.4 Convicted cases
- 8.5(a) Bad weather allowance
- 8.5(b) Close season allowance
- 8.5(c) Sick leave allowance
- 8.6 Scholarship allowance
- 8.7 Surrender of nets in Mauritius
- 9.1 Visits to AFRC

LIST OF FIGURES

- 1.1 Fisherman days and total catch
- 1.2 Length frequency of *Lethrinus mahsena* from the Nazareth bank
- 1.3 Length frequency of *Lethrinus mahsena* from the Saya de Malha bank
- 1.4 Length frequency distribution of skipjack tuna
- 1.5 Length frequency distribution of yellowfin tuna
- 1.6 Length frequency distribution of bigeye tuna
- 1.7 Gonado-Somatic Index (GSI) of skipjack tuna
- 1.8 Length at first maturity of skipjack tuna
- 1.9 Catch distribution of licensed longliners
- 1.10 Length frequency distribution of albacore tuna
- 1.11 Catch composition of Mauritian longliners
- 1.12 Species composition of the catches
- 1.13 Length frequency distribution of swordfish

- 1.14 Length frequency distribution of albacore tuna
- 1.15 Length frequency distribution of yellowfin tuna
- 1.16a Percentage distribution of the five most dominant fish families at Albion
- 1.16b Percentage distribution of the five most dominant fish families at Tamarin
- 1.16c Percentage distribution of the five most dominant fish families at Trou d'Eau Douce
- 2.1 Percentage coral cover Trou aux Biches
- 2.2 Percentage coral cover at Bambous Virieux
- 2.3 Completely bleached tabular corals
- 2.4 Recovery of bleached corals
- 2.5 Mangrove plantation at Grande Rivière Noire
- 2.6 Schematic movements of drogues in the lagoon at Baie du Tombeau
- 2.7 Average monthly sea surface water temperature
- 3.1 Growth of camaron
- 6.1 Details of imports
- 6.2 Types of seafood imported (t)
- 6.3 Varieties of seafood
- 6.4 Import of fish and fish products by country of origin
- 6.5 Import of frozen fish

Executive Summary

The total production of fresh fish amounted to 1 166 tonnes with an average catch of 4.3 kg per fisherman day. The production of fresh fish thus decreased by 10.5% with a decrease of 9.1% in catch effort from 2002 to 2003. However, the number of fishing boats and the number of active fishermen had increased by 3.2% and 2.9% respectively in the same period.

A total of 3 500 tonnes of frozen fish comprising mainly lethriniidae (capitaine, berry and kaya) was landed from the fishing banks which included 407 tonnes from Saint Brandon. The production of frozen fish involved 9 fishing vessels operating on the Saya de Malha, Nazareth and Chagos banks and around Albatross and Saint Brandon. Twelve vessels were involved in the semi-industrial chilled fishery and they operated mainly around Saint Brandon and Albatross and on the Hawkins banks landing 234 tonnes of chilled fish.

The production of seabream fingerlings and marine shrimp juveniles for stock enhancement of the lagoon was continued. Some 292 000 seabream fingerlings were released at Ferney, Tamarin and Albion, while 45 650 juveniles of the tiger prawn were released at Grand Sable, Petit Sable and Bambous Virieux representing more than the double of the amount that was released the previous year. Potential fish farmers received assistance on aquaculture techniques and advice on pond construction.

The long term monitoring of the coral reef ecosystem and water quality was continued at the established sites around the island. 41 300 propagules were planted over an area of about 24 000 m² under the mangrove propagation programme.

During the year, some 105 000 persons visited the Blue Bay Marine Park. The visitors included school children, students from secondary schools and the University of Mauritius as well as foreigners. Awareness campaigns to sensitise the users and visitors of the marine parks on the need to conserve and preserve the marine ecosystem and their resources were continued. A documentary film on the Blue Bay Marine Park was produced in collaboration with the national television network and was broadcasted for public viewing. The tendering process for the zoning of the Balaclava Marine Park as well as the demarcation of the swimming zones at Pereybere and Flic en Flac were initiated.

In all, 21 FADs were active during the year around the island. The major species caught by artisanal fishermen were germon and thon jaune; other species included dorade, becune and sharks.

During the year, 1 529 permits were issued for import of fish and fish products. Imports for direct consumption amounted to 9 402 tonnes, representing 16% of the total imports. 47 938 tonnes of raw material were imported for the tuna cannery and 1 105 tonnes of barracouta were imported for the production of salted snoek.

One hundred and ninety-six fishing licences were issued to foreign fishing vessels to operate in Mauritius waters while 31 licensed Mauritian vessels were also involved in fishing activities. During the year, a total of 511 calls were effected by fishing vessels at Port Louis harbour for the purpose of trans-shipment, bunkering, dry-docking, stocking of provisions and changing of crew.

On the occasion of the International Day of Fishermen, an Open day was held at the Albion Fisheries Research Centre on 29 and 30 November. Visitors were allowed access to all facilities, including laboratories. Various fish products were put on sale at reduced prices by private companies on that special occasion. The open day proved to be very successful and around 7 000 people visited the centre.

1 FISHERIES RESEARCH

1.1 Coastal (artisanal) fishery

The artisanal fishery comprises fishing activities inside the lagoon and off-lagoon in the vicinity of the outer reef. The fishing implements utilised are basket traps, hooks and lines, harpoons, large nets and gill nets. Boats are mainly propelled by outboard motors. Some boats use oars and sails or wooden poles.

In 2003, a decrease of 10.5% in fish production was noted while the effort decreased by 9.1%. However, the number of fishing boats increased by 3.2% and the number of active fishermen increased by 2.9%. The average catch per fisherman day remained at 4.3 kg as in 2002. All fish caught in the artisanal fishery is marketed fresh.

1.1.1 Catch, effort and catch per fisherman day (CPFD)

Total fish production was 1 166 tonnes. Off-lagoon production decreased by 136 tonnes probably on account of a decrease in fishing effort. Catch estimates, fisherman days and catch per fisherman day for the past five years are presented in table 1.1 and figure 1.1.

Table 1.1: Catch, fisherman days and catch per fisherman day

Year	Catch (t)			Fisherman days			CPFD (kg)		
	L	OL	Total	L	OL	Total	L	OL	M
1999	811	414	1 225	170 612	70 107	240 719	4.8	5.9	5.3
2000	702	658	1 360	147 649	74 973	222 622	4.8	8.8	6.1
2001	579	496	1 075	144 927	93 744	238 671	4.0	5.3	4.5
2002	704	598	1 302	192 116	108 708	300 824	3.7	5.5	4.3
2003	704	462	1 166	189 988	83 362	273 350	3.7	5.5	4.3

L=lagoon, OL= off-lagoon, M= mean, CPFD= catch per fisherman day

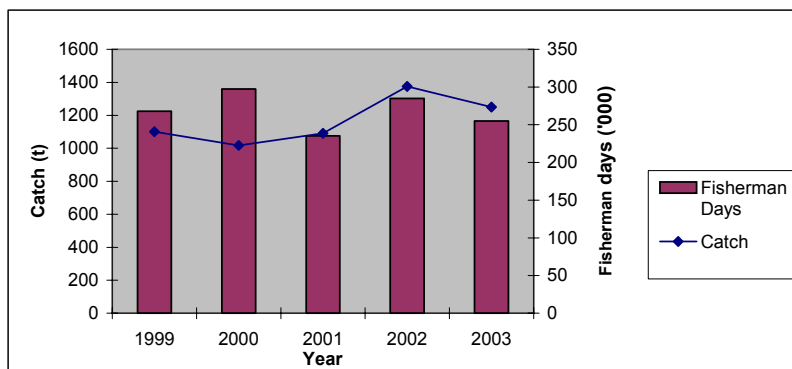


Figure 1.1: Fisherman days and total catch

1.1.2 Monthly landings

The open season for the net fishery is from March to September during which the catch from the lagoon is generally higher compared to the other months. The catch during the close season amounted to 449 tonnes representing 38.5% of the annual production, while the catch for the open season of the net fishery was 717 tonnes representing 61.5% of the total. The monthly production of fish in the lagoon and off-lagoon, value of catch, effort and catch per fisherman day are presented in table 1.2

Table 1.2: Monthly estimates of catch with value, effort and catch per fisherman day

Month	Catch (t)			Value (MR)	Fman days	CPFD (kg)		
	L	OL	Total			L	OL	Mean
January	40	20	60	6.2	17 717	3.1	4.1	3.4
February	28	41	69	6.9	14 745	2.9	7.9	4.7
March	60	41	101	10.9	23 960	3.8	5.0	4.2
April	81	45	126	12.7	26 761	4.3	5.7	4.7
May	61	39	100	9.7	24 623	3.6	5.4	4.1
June	80	34	114	10.9	25 494	4.3	4.9	4.5
July	52	19	72	7.0	21 692	3.0	4.3	3.3
August	66	28	94	8.7	22 195	4.0	4.9	4.2
September	71	41	112	11.1	27 832	3.7	4.6	4.0
October	54	55	109	11.3	25 809	3.3	5.9	4.2
November	51	47	98	9.6	20 464	3.7	6.9	4.8
December	60	52	113	11.5	22 058	4.1	6.8	5.1
TOTAL	704	462	1 166	116.5	273 350			

MR = million rupees; L=lagoon; OL= off-lagoon; Fman= fisherman days

1.1.3 Catch by gear

Nineteen large nets and six gill nets were operational during the year. Other gear used were basket traps, hooks and lines, harpoons and a combination of basket traps and hooks and lines. The catch by fishing gear is presented in table 1.3.

Table 1.3: Annual catch (kg) by gear

Year	Line	BT	BTL	LN	GN	H/CN	Total
1999	339 064	281 992	155 998	294 680	16 030	137 084	1 224 848
2000	503 170	404 933	83 284	230 719	12 833	125 069	1 360 008
2001	368 434	357 500	59 134	172 931	11 376	105 904	1 075 279
2002	429 289	450 829	91 787	183 405	25 271	121 095	1 301 676
2003	373 439	492 561	17 539	160 636	13 585	108 103	1 165 863

BT = basket trap; BT/L = basket trap and line; LN = large net; GN = gill net; H = harpoon, CN = cast net (cast net was banned as from January 2000)

1.1.4 Fishermen

The number of active fishermen was 2 086, representing an increase of 58 active fishermen as compared to 2002. The number of active fishermen for the past five years is presented in table 1.4.

Table 1.4: Number of active fishermen by gear-type

Year	BT	Line/H	BT/L	LN	GN	CN	Total
1999	256	523	609	270	27	31	1 716
2000	286	642	559	226	28	0	1 741
2001	519	678	610	180	27	0	2 114
2002	501	734	600	165	28	0	2 028
2003	473	749	670	177	17	0	2 086

BT = basket trap; BT/L = basket trap and line; LN = large net; GN = gill net; CN = cast net, H=harpoon

1.1.5 Boats

The number of active fishing boats was 1 300 indicating an increase of 3.2% over the previous year. The number of active fishing boats with mode of propulsion is presented in table 1.5. The number of boats using outboard motors increased by 3.4% compared to the previous year. The engine capacity of the motors used by the artisanal fishermen ranged from 8 to 25 Hp.

Table 1.5: Number of active fishing boats

Year	Oars and sails	Outboard motors	Inboard motors	Total
1999	120	793	29	942
2000	83	856	32	971
2001	117	1 015	36	1 168
2002	103	1 122	35	1 260
2003	95	1 160	45	1 300

1.1.6 Price of fish

Fresh fish is marketed at the fish landing stations, in markets and supermarkets and the price differs from one place to another. The average retail price of fish is shown in table 1.6.

Table 1.6: Yearly average retail price of fresh fish

F i s h	Price – Rs / kg				
	1999	2000	2001	2002	2003
Homard	370	415	415	475	480
Crabe & crevette	270	260	260	295	285
Vielle rouge	180	185	185	185	180
Vacoas, sacré chien	135	140	140	150	150
Capitaine	125	135	135	145	140
Dame berri	110	120	120	135	130
Octopus	90	90	90	100	100
Carangue	85	95	95	110	100
Cordonnier	80	80	80	85	90
Rouget, tuna	75	80	80	80	85
Mullet voilé	65	70	70	75	80
Bordemar	75	80	80	80	85
Licorne	75	80	80	95	95
Cateau	60	65	65	70	75
Shark	25	25	30	35	55
Other fish	45	45	45	45	40

1.2 Banks fishery

This fishery is carried out in the shallow waters of the Saya de Malha, Nazareth and Chagos Archipelago banks and north of Albatross (Saint Brandon). Fish are caught, gutted and blast frozen at sea. Nine vessels were engaged in that fishing activity and they effected 31 trips. FV Quo Vadis joined in October 2003. Table 1.7 gives the particulars of the fleet.

Table 1.7: Particulars of the fishing fleet

SN	Vessel	LOA	GRT	Fish hold (t)	Crew	Frigo Boys	Fishermen	Joined in	Fishery
1	Talbot III	50	299	200	12	12	66	1986	SWB
2	Talbot IV	44	317	176	16	10	57	1989	SWB
3	Noor Star 2	51	300	180	18	11	54	1992	SWB
4	Hoi Siong 2	54	388	180	14	19	72	1993	SWB
5	Le Gentilly	50	299	160	20	12	65	1993	SWB
6	Shandrani	55	398	197	15	16	60	1994	SWB
7	Hoi Siong 5	45	315	180	11	18	54	1996	SWB
8	Shandrani 2	42	449	130	10	15	45	2002	SWB
9	Quo Vadis	12	27	4	NA	NA	6	2003	DOF

SWB-Shallow water banks; DOF-Drop off fishery; NA-Not applicable

1.2.1 Production of frozen fish

A total of 3 094 tonnes of frozen fish comprising mainly lehrinidae species was landed. The annual catch for the past years from the different banks are given in table 1.8. The fishing effort is presented in table 1.9.

Table 1.8: Annual catch (t) of frozen fish by bank

Year	No. of vessels	Saya de Malha	Nazareth	St. Brandon	Chagos	North of Albatross	Total catch
1999	13	2 107	1 121	341	127	226	3 922
2000	12	2 099	1 080	267	312	141	3 899
2001	11	1 283	1 366	332	228	202	3 411
2002	10	2 090	918	nil	223	55	3 286
2003	9	2 354	468	nil	235	37	3 094

Table 1.9: Fishing effort and catch from the banks

SN	Bank	Fishing days	Bad weather days	Effort (Fisherman days)	Catch per fisherman day (kg)	Catch (t)	% Total catch
1	Saya de Malha	548	160	29 371	80.1	2 354	76.1
2	Nazareth	114	33	6 426	72.9	468	15.1
3	Chagos	77	40	4 068	57.7	235	7.6
4	Albatross	15	1	687	54.3	37	1.2
	Total	754	234	40 552	76.3	3 094	100

1.2.2 Catch, effort and catch per fisherman day for the Nazareth and Saya de Malha banks

The catch, effort and catch per fisherman day for the Nazareth and Saya de Malha banks are given in table 1.10.

Table 1.10: Catch, Effort (fisherman days) and CPFID in the fishery

Year	Nazareth bank			Saya de Malha bank		
	Effort	Catch (t)	CPFID (kg)	Effort	Catch (t)	CPFID (kg)
1999	14 712	1 121	76.2	30 073	2 107	70.0
2000	11 938	1 080	90.5	26 988	2 099	77.0
2001	13 773	1 359	98.8	10 340	1 053	101.0
2002	9 837	918	93.3	25 083	2 090	83.3
2003	6 426	468	72.9	29 371	2 354	80.1

The catch per fisherman day (CPFID) was 72.9 kg and 80.1 kg on the Nazareth and Saya de Malha banks respectively.

1.2.3 Length frequency distribution of *Lethrinus mahsena*

Collection of data on length frequency was continued for *Lethrinus mahsena*, which is the main species from the banks fishery. The number of fish sampled from the Nazareth and Saya de Malha banks were 430 and 4 170 and their length ranged between 290 – 540 mm and 250 – 550 mm respectively. The length frequency distributions are shown in figures 1.2 and 1.3 respectively.

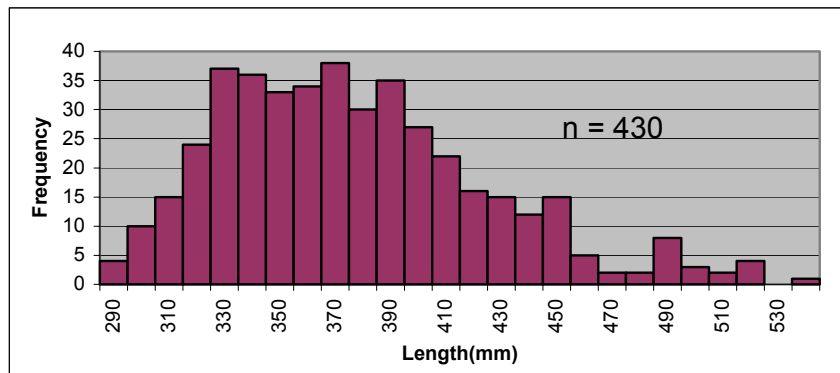


Figure 1.2: Length frequency of *Lethrinus mahsena* from the Nazareth Bank

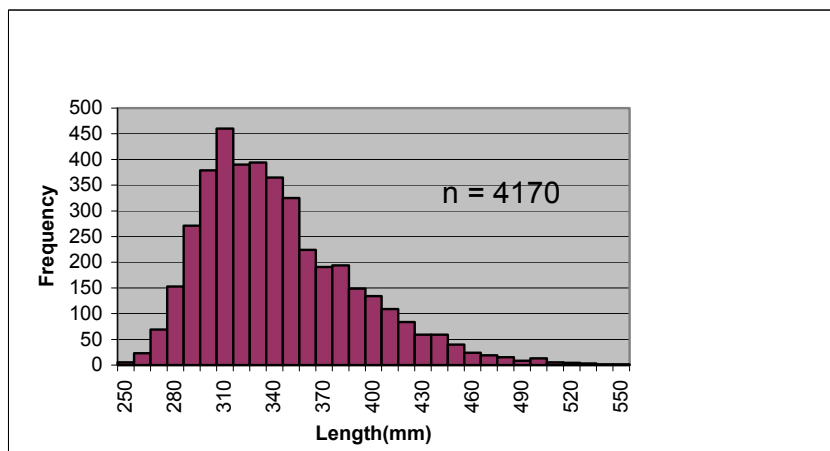


Figure 1.3: Length frequency of *Lethrinus mahsena* from the Saya de Malha Bank

1.2.4 Management of the shallow water banks fishery

For the fishing season 2002 - 2003, no quota was allocated. The catch from the Saya de Malha, Nazareth and Albatross banks was 2 860 tonnes. The utilisation of the quota during the previous years and the seasonal catch are shown in table 1.11.

Table 1.11: Catch by season

Fishing Season	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003
Quota allocated (t)	4 073	4 073	3 768	N/A	N/A
Catch (t)	3 454	3 952	2 611	2 996	2 860
Balance (t)	619	121	1 157	---	---
% Quota used	85	97	69.3	---	---

N/A – Not allocated

1.2.5 Fishing in the waters of the Chagos Archipelago

During the year, two trips were effected to the Chagos Archipelago by two different vessels. Details on the catch and effort for the past five years are given in table 1.12.

Table 1.12: Details of fishing trips to the Chagos Archipelago

Year	No. of trips	No. of vessels	Fishing days	Bad weather days	Catch (t)	Fisherman days	CPFD (kg)
1999	2	1	47	14	127	2 218	57.3
2000	2	2	81	21	312	4 176	74.7
2001	5	3	62	12	191	3 246	58.8
2002	2	2	73	35	223	3 937	56.6
2003	2	2	77	40	235	4 068	57.7

1.3 St. Brandon inshore fishery

Two vessels, namely Eliza and Pasifoo were licensed to operate in this fishery. Their particulars are presented in table 1.13. The vessels Eliza and Pasifoo were authorised to chill two tonnes and one tonne of fish per trip respectively. However, during the year Eliza did not carry out any fishing activity. It stayed in St. Brandon as a storage vessel; the stored catch was trans-shipped to Pasifoo and Le Gentilly.

Table 1.13: Particulars of vessels operating in the inshore fishery

Vessel	LOA (m)	GRT (t)	Fish hold (t)	Crew	Joined in
Pasifoo	22	49	15	5	1991
Eliza	31	188	40	10	1995

1.3.1 The catch

The catch from St. Brandon comprised mainly frozen fish, octopus and lobster and salted fish. No chilled fish was landed. The different products landed from St. Brandon are presented in table 1.14.

Table 1.14: St. Brandon inshore fishery production (t)

Type	1999	2000	2001	2002	2003
Frozen fish	341.0	242.0	269.7	307.7	407.1
Chilled fish	30.9	19.9	4.0	0	0
Salted fish	67.0	82.5	73.8	55.7	40.1
Lobster	2.9	1.9	3.0	2.4	0.5
Octopus	10.7	9.6	8.8	8.8	7.5
Total	452.5	355.9	359.3	374.6	455.2

1.3.2 Sampling of frozen fish from St. Brandon

Sampling of the two main species *L. mahsena* and *L. nebulosus* was carried out on board Pasifoo and Le Gentilly during unloading. A total of 602 *L. mahsena* and 370 *L. nebulosus* were measured. Their length varied from 210 to 520 mm and from 220 to 480 mm respectively.

1.4 The semi-industrial chilled fish fishery

Medium-sized vessels with fish hold at up to a maximum capacity of 15 tonnes operated mainly on the St Brandon, Albatross and Hawkins banks. The fishing trips were of 12-day duration and the catch was kept chilled. The twelve vessels involved in the fishery performed 148 trips and landed 234 tonnes of chilled fish. Particulars of the vessels are given in table 1.15 and the species composition of the catch by fishing area is shown in table 1.16. The annual production of chilled fish for the past five years is presented in table 1.17.

Table 1.15: Particulars of vessels operating in the semi-industrial chilled fish fishery

SN	Vessel	LOA (m)	GRT (t)	Fish hold (t)	Crew	No of fishermen	Joined in
1	La Derive	17	58.0	4.0	2	10	1995
2	King Fish 1	17	14.5	5.5	2	10	1996
3	King Fish II	21	14.5	10.0	4	11	1998
4	Coryphaena	12	8.5	2.5	2	4	1999
5	Vimaya	22	49.0	15.0	2	10	2000
6	Kishan	12	15.0	8.0	2	4	2001
7	King Fish IV	15	24.0	6.0	2	4	2002
8	Roshan	14	24.8	7.0	2	4	2002
9	Dai Fah 1	17	14.0	14.0	2	10	2002
10	Faki 1	15	10.0	4.0	4	7	2003
11	Jackson 1 (ex- Anouska)	16	25.0	15.0	2	8	2003
12	Quo Vadis 1	12	26.94	4.0	2	4	2003

Table 1.16: Catch (kg) by species and fishing area

Bank	Lethrinids	Snappers	Groupers	Tuna and others	Total
Albatross	112 117	7 953	5 952	8 641	134 663
St Brandon	37 393	350	9 957	7 720	55 420
Soudan	1 6 313	1 762	1 936	328	20 339
Hawkins	13 612	3 214	574	1 008	18 408
Sphyrna	0	47	0	40	87
Tomy	0	114	0	0	114
Small northern banks	1 688	0	173	0	1 861
North Round Island	595	414	94	112	1 215
Saya de Malha	0	600	400	0	1 000
Nazareth	0	500	700	0	1 200
Total	181 718	14 954	19 786	17 849	234 307
% Catch	77.6	6.4	8.4	7.6	100

Table 1.17: Chilled fish production (t)

Year	Catch
1999	141.0
2000	165.0
2001	184.0
2002	204.1
2003	234.3

The catch and effort in the different fishing areas are presented in table 1.18. The average catch per fisherman- day was 45.6 kg.

Table 1.18: Catch and effort by fishing area

Bank	Catch (t)	Fishing days	Fisherman days	CPFD (kg)
St Brandon	55.4	128	886	62.5
Albatross	134.6	405	3 047	44.1
Soudan	20.3	106	590	34.4
Hawkins	18.4	37	360	51.1
Saya de Malha	1.0	4	20	50.0
Nazareth	1.2	2	12	100.0
Other banks	3.5	38	221	15.8
Total	234.4	720	5 136	

Fish from different banks was sampled on board fishing vessels. Table 1.19 gives details of the sampling exercises.

Table 1.19 Sampling of chilled fish from the different banks

Species sampled	Number	Length range (mm)	Weight range(g)	Bank
<i>L. mahsena</i>	841	270 - 680	310 - 4250	St Brandon
<i>L. nebulosus</i>	433	290 - 680	340 - 4050	St Brandon
<i>L. rubrioperculatus</i>	106	260 - 420	250 - 950	Soudan
<i>L. nebulosus</i>	101	380 - 680	770 - 4350	Albatross

1.5 Deep water shrimp fishery

Fishing vessels Aleisha Lea and Coryphaena were active in the deep-water shrimp fishery from January to May. Fishing activities took place mainly in the North West and North East of Mauritius. Aleisha Lea effected 35 trips and Coryphaena 10 trips and they landed 13 552 kg of shrimps.

1.6 Tuna fisheries

Tuna fisheries are monitored through the acquisition, processing and analysis of fishing and biological data obtained from local and licensed vessels which call at Port Louis.

1.6.1 Sampling of catch from licensed purse seiners

Length frequency data were obtained from the catches of licensed purse seiners. A total of 7 162 tuna comprising 4 694 skipjack, 1 788 yellowfin and 679 bigeye was sampled.

1.6.1.1 The length frequency distribution of skipjack tuna (*Katsuwonus pelamis*)

The length frequency distribution of skipjack tuna is shown in figure 1.4. The length of the fish ranged from 38 to 72 cm with the majority centering at around 50 cm.

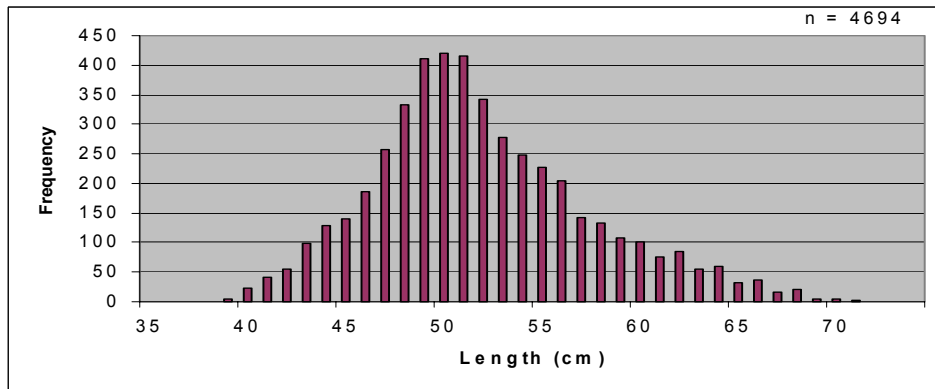


Figure 1.4: Length frequency distribution of skipjack tuna

1.6.1.2 The length frequency distribution of yellowfin tuna (*Thunnus albacares*)

The length frequency distribution of yellowfin tuna is presented in figure 1.5. The fish had a length range from 44 to 130 cm. Most of the fish sampled was below one metre in length representing fish which had not reached sexual maturity. Yellowfin tuna caught by purse seiners comprised mostly juvenile fish which is typical of catch made on log schools.

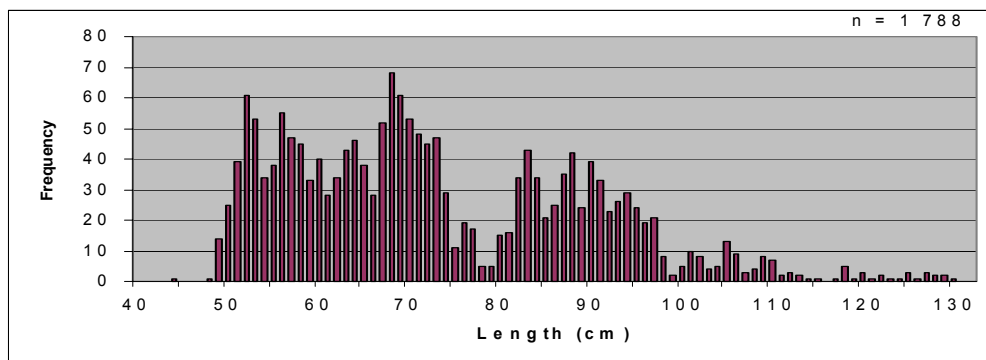


Figure 1.5: Length frequency distribution of yellowfin tuna

1.6.1.3 The length frequency distribution of bigeye tuna (*Thunnus obesus*)

The length of the bigeye tuna ranged from 49 to 112 cm as presented in figure 1.6. Most of the catch comprised juvenile fish as length at first maturity is over 110 cm. The bigeye tuna caught by the purse seiners was mostly juvenile fish, typical of catch made on log schools.

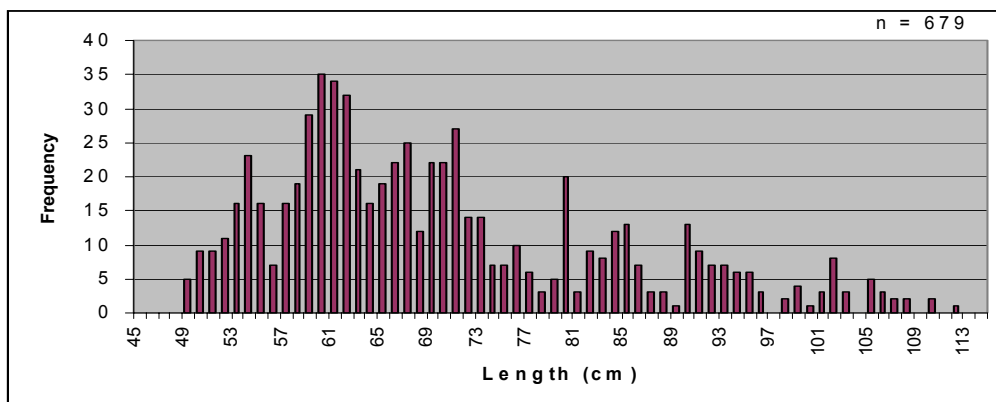


Figure 1.6: Length frequency distribution of bigeye tuna

1.6.2 Species composition

The species composition of the purse seine catch unloaded in Mauritius for the past 5 years is presented in table 1.20. The catch was composed of 68% skipjack, 25% yellowfin, 6% bigeye and 1% miscellaneous fish.

Table 1.20: Species composition of purse seiners catch (%)

Year	Species			
	Skipjack	Yellowfin	Bigeye	Miscellaneous
1999	71	28	1	-
2000	62	26	12	-
2001	70	20	10	-
2002	60	32	7	1
2003	68	25	6	1

1.6.3 Reproductive biology of skipjack tuna

Samples for the studies on reproductive biology of skipjack tuna were obtained at the local cannery. Gonads and liver from 441 skipjack tuna were removed for determining maturity stage, spawning season, reproductive index, sex ratio, seasonal sexual variation and length at first maturity.

1.6.3.1 Gonado-Somatic Index (GSI)

The GSI for both males and females was maximum during February, May and September and minimum during January, July and November-December. The monthly variations of the GSI are presented in figure 1.7, showing three peaks of intense sexual activity and spawning. The reproductive cycles of the males and females were synchronous.

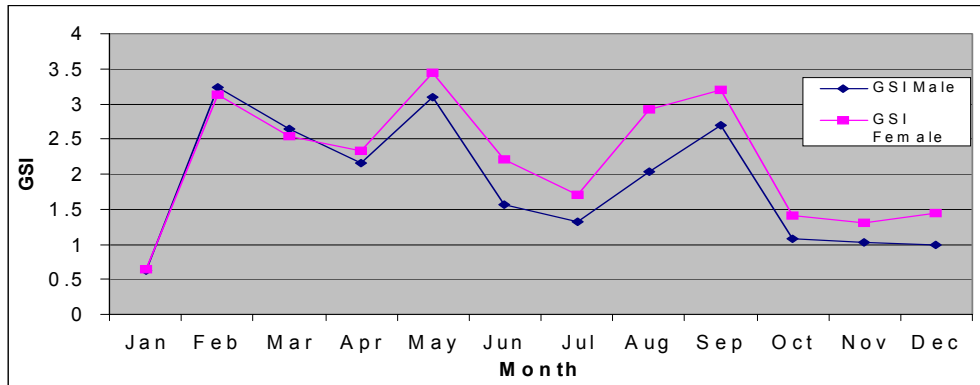


Figure 1.7: Gonado-Somatic Index (GSI) of skipjack tuna

1.6.3.2 Spawning period

The skipjack tuna spawned throughout the year with certain periods of intense sexual activity. This is shown by the fact that more than 70 % of females had ovaries in the terminal stage of maturation at any time of the year.

1.6.3.3 Sex ratio

The sex ratio calculated on an annual basis was 1:1.1, showing that males and females were present in almost equal proportions. However, during the month of March and October, a predominance of females was noted.

1.6.3.4 Length at first maturity (Lm_{50})

Length at first maturity is defined as the length at which 50% of the fish population has attained sexual maturity and was calculated for each size class starting from 40 cm as shown in figure 1.8. Lm_{50} for males and females was found to be at 44 cm and 42cm respectively.

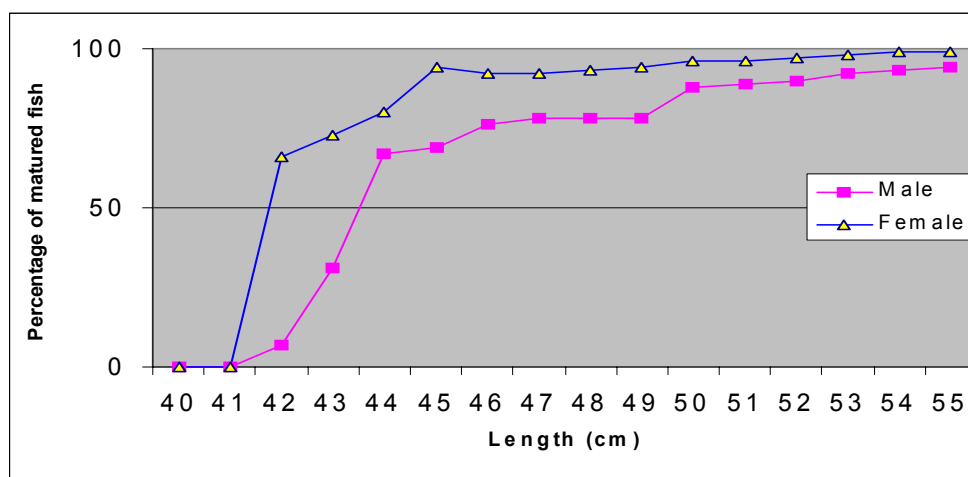


Figure 1.8: Length at first maturity of skipjack tuna

1.6.4 Monitoring of the catch of licensed longliners

Logbook returns were collected from licensed vessels or from their agents. Such vessels transhipped 8 529 tonnes of tuna and tuna-like species which included 3 936 tonnes caught by licensed European long liners and 932 tonnes caught by three Mauritian flagged vessels. In all 243 logbook returns were received from the licensed vessels, of which only 108 were considered for processing as the remaining contained inconsistencies. The catch made in the Mauritian EEZ based on the consistent logbooks amounted to 2 270 tonnes.

1.6.4.1 Species composition of the catch of licensed longliners

The species composition of the catch of the licensed longliners is shown in table 1.21. Albacore tuna which is the target species, constituted 39.7% of the catch.

Table 1.21: Species composition of the catch of licensed longliners

SN	Scientific Name	Species	Catch (t)	%
1	<i>Thunnus alalunga</i>	Albacore	3 392.0	39.7
2	<i>Thunnus albacares</i>	Yellowfin	691.4	8.1
3	<i>Thunnus obesus</i>	Bigeye	228.9	2.7
4	<i>Thunnus maccoyii</i>	Bluefin	26.0	0.3
5	<i>Katsuwonus pelamis</i>	Skipjack	24.7	0.3
6	<i>Xyphias gladius</i>	Swordfish	2 075.0	24.4
7	<i>Makaira</i> spp.	Marlin	103.0	1.2
8	Various species	Shark	1 641.0	19.2
9	Others		347.0	4.1
		Total	8 529.0	100.0

1.6.4.2 Spatial distribution of the catch of licensed longliners

The fishing area of the licensed longliners was spread widely in the Western Indian Ocean between 4° N and 35° S and 41° E and 90° E as depicted in figure 1.9.

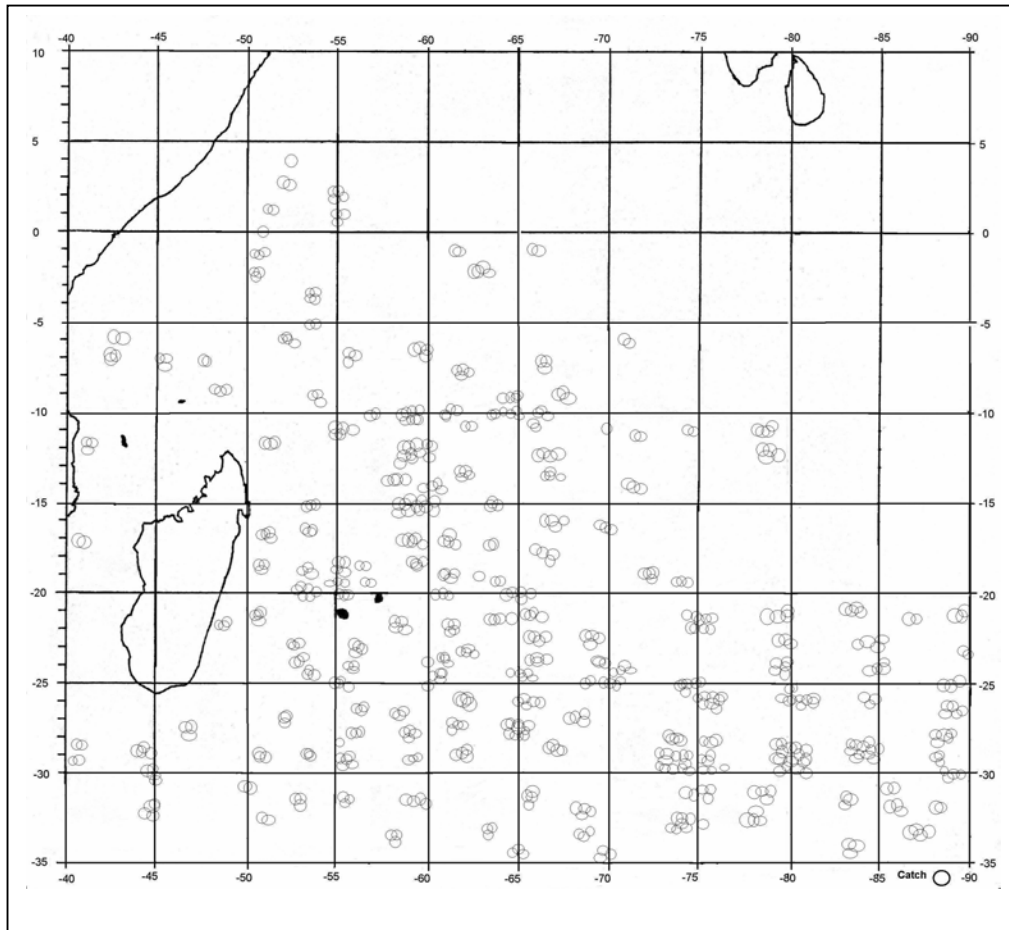


Figure 1.9: Catch distribution of licensed longliners

1.6.4.3 Sampling of catch of licensed longliners

Length frequency data of the albacore tuna were obtained during regular samplings carried out on the catch of licensed longliners. A total of 2 461 albacore tuna was sampled. The length frequency distribution is shown in figure 1.10. The length varied from 67 to 118 cm. The major part of the catch comprised fish in the range of 95 to 110 cm.

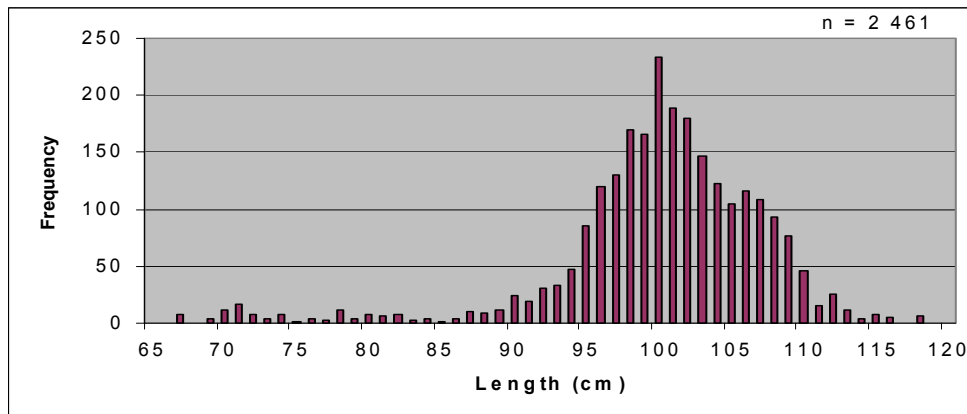


Figure 1.10: Length frequency distribution of albacore tuna

1.6.5 The Mauritian longline fishery

Three vessels operating under the Mauritian flag were actively engaged in the fishery. They undertook eight fishing trips unloading a total of 932 tonnes of fish. The species composition of the landings is shown in figure 1.11. The majority of the catch was composed of swordfish (63%) which was the target species of these vessels. The catch per unit effort was 1.2 kg per hook. The fishing area was spread between latitudes 11° S and 36° S and longitudes 59° E and 86° E.

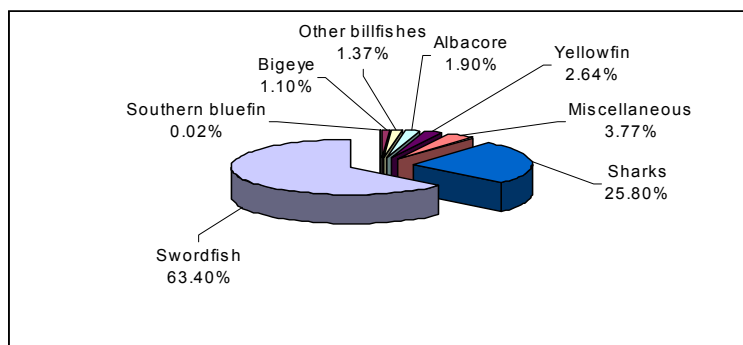


Figure 1.11: Catch composition of Mauritian longliners

1.6.6 Trans-shipment by tuna longliners

A total of 12 464 tonnes of tuna and tuna-like species was trans-shipped at Port Louis by licensed and non-licensed longliners which effected 202 calls. The species composition of the fish trans-shipped is shown in table 1.22. Albacore tuna constituted half of the total quantity of fish trans-shipped.

Table 1.22: Species composition of fish trans-shipped

Year		Albacore	Yellowfin	Bigeye	Skipjack	Swordfish	Bluefin	Marlin	Sailfish	Shark	Misc.	Total
1999	(t)	15 070	1 508	472	3	295	5	401	125	-	558	18 437
	%	81.7	8.2	2.6	0.02	1.6	0.01	2.2	0.7	-	3.02	100
2000	(t)	12 846	835	780	33	355	-	238	22	-	474	15 583
	%	82.5	5.4	5.0	0.2	2.3	-	1.5	0.1	-	3.0	100
2001	(t)	13 595	898	880	-	274	-	319	25	-	336	16 327
	%	83.3	5.5	5.4		1.7	-	1.9	0.2	-	2.0	100
2002	(t)	13 584	2 505	528	-	228	-	267	20	-	315	17 447
	%	77.9	14.4	3.0	-	1.3	-	1.5	0.1	-	1.8	100
2003	(t)	6 225	1 280	415	25	2 126	34	187	59	1 657	456	12 464
	%	50	10.3	3.3	0.2	17	0.3	1.5	0.5	13.2	3.7	100

1.6.7 Supply of tuna to the local canning factory

The cannery received 47 748 tonnes of round tuna fished by European purse seiners operating in the Western Indian Ocean. A total of 30 523 tonnes of canned tuna, 3 441 tonnes of pet food and 5 189 tonnes of fishmeal were produced. The total export value was approximately 2.1 billion rupees. A total of 643 tonnes of canned tuna, 183 tonnes of pet food and 5 189 tonnes of fishmeal for a total value of 86 million rupees were sold on the local market.

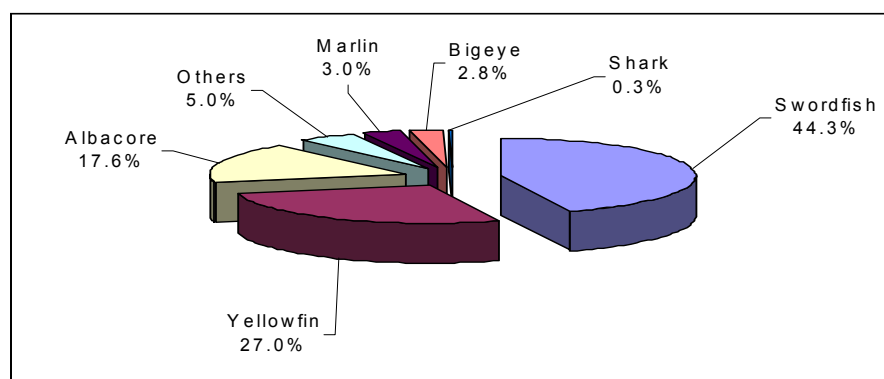
1.7 Swordfish fishery

The swordfish is yet another pelagic resource which is being exploited since 1999. The catch composition of the local vessels from 2000 to 2003 is shown in table 1.23.

Table 1.23: Catch composition of the local swordfish fishing vessels (kg)

Year	Yellowfin	Bigeye	Albacore	Swordfish	Marlin	Shark	Misc.	Total
2000	2 368	945	2 375	10 021	805	-	5 398	21 912
2001	24 061	5 098	17 754	33 919	2 483	-	4 042	87 357
2002	5 288	2 152	7 242	26 248	1 162	220	4 108	46 492
2003	21 395	2 190	14 003	35 123	2 413	228	3 986	79 338

Three local vessels were involved in the fishery during 2003. They effected seventy six trips and landed 79.3 tonnes of fish. The species composition of the catch is shown in figure 1.12. Swordfish constituted 44.3% of the catch. The fishing area was spread around Mauritius, between latitudes 19°S and 21°S and longitude 56°E and 58°E.

**Figure 1.12: Species composition of the catches**

1.7.1 Length frequency distribution of fish caught

The catch of the local vessels were sampled during landings. The length frequency distribution is shown in figures 1.13 to 1.15. The length of the swordfish measured from the base of the pectoral fin to the caudal end ranged from 55 to 194 cm. The majority of the fish was between 64 and 130 cm.

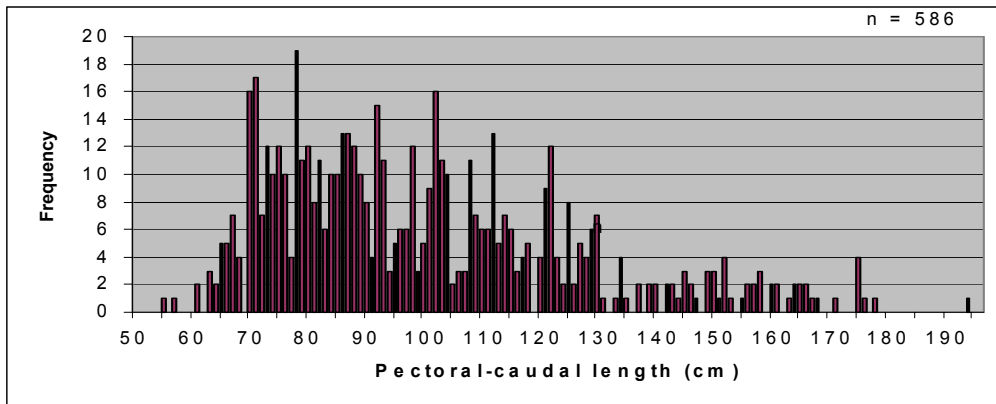


Figure 1.13: Length frequency distribution of swordfish

The albacore tuna had a length range from 72 to 142 cm while the yellowfin tuna was between 77 and 173 cm. The yellowfin and albacore tunas caught in this fishery were mostly fish which had attained sexual maturity, typical of the longline fishery.

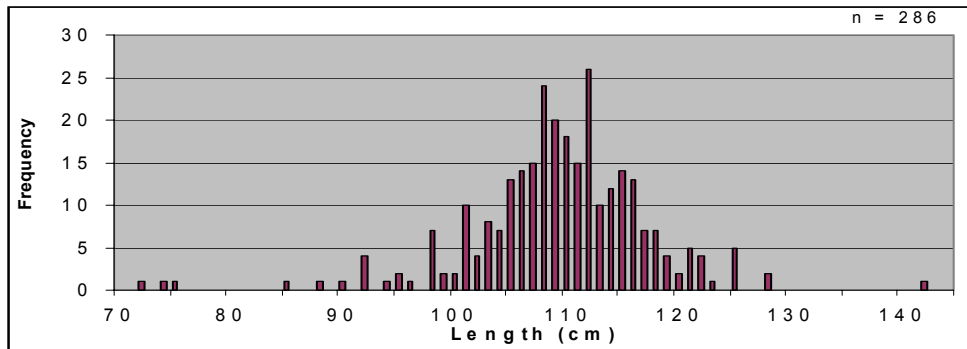


Figure 1.14: Length frequency distribution of albacore tuna

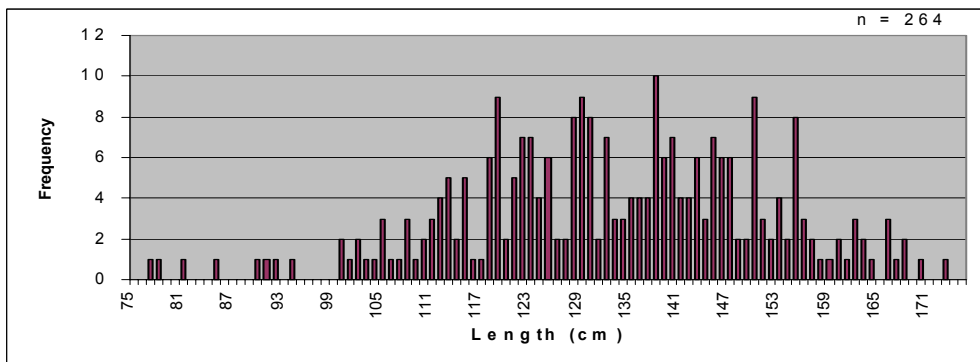


Figure 1.15: Length frequency distribution of yellowfin tuna

1.8 Ecotoxicology

1.8.1 Fish toxicity

Toxicity tests for the presence of ciguatoxin in fish specimens were continued from both the lagoon of Mauritius and Rodrigues. Three fish specimens, two vieille cuisinier (*Cephalopholis argus*) fished from Mauritius and one cheval de bois (*Amyperodon leucogrammicus*) from Rodrigues were found to be toxic. The particulars of the toxic specimens are given in table 1.24.

Table 1.24: Particulars of toxic fish specimens

Common name	Scientific name	Length (cm)	Weight(g)	Origin	Results
Vieille Cuisinier	<i>Cephalopholis argus</i>	24.5	300	Grand Baie,	slightly toxic
Vieille Cuisinier	<i>Cephalopholis argus</i>	24.6	300	Mauritius	highly toxic
Cheval de bois	<i>Amyperodon leucogrammicus</i>	47.0	1500	Rodrigues	highly toxic

1.8.2 Harmful marine microalgae

Sampling of harmful marine microalgae was continued at the established sites: Albion and Trou aux Biches. The monitoring exercise was extended to three additional sites, namely, Le Morne, Blue Bay and Trou d'Eau Douce. The distribution of microalgae was sporadic for most of the year. The density of *Gambierdiscus toxicus* was sparse at all sites while *Ostreopsis* spp., *Prorocentrum* spp., *Coolia* sp. and *Amphidinium* spp. could be observed at most stations. *Ostreopsis* spp. and *Prorocentrum* spp. appeared in large numbers during November and December at Le Morne and Blue Bay. The dinoflagellates *Sinophysis* sp. and *Protoperidinium quinquecorne* were observed for the first time at the monitoring sites. *Sinophysis* sp. was present in the samples from Trou aux Biches and Le Morne in November and in that from Blue Bay in December. Both *Sinophysis* sp. and *Protoperidinium quinquecorne* were observed in the samples from Trou d'Eau Douce in December. The occurrence of the dinoflagellates at the sampling sites is shown in table 1.25.

Table 1.25: Density of dinoflagellates at Albion, Trou aux Biches, Blue Bay, Le Morne and Trou d'Eau Douce (cells/g of macroalga)

Species	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gt	-	-	-	2 tb	-	-	11 m	-	-	1 a	8 bb	1 tb 11 bb
Os	-	2 bb	1tb	-	2 tb 1 a 15 m	5 tb 4 a 3 bb	8 m	1 tb 7 m	2 a 7 m	1 tb 6 a 2 bb	5 tb 3 a 18 m	28 m 19 bb 2 tdd
Pro	-	3 bb	1tb	28 tb	1 tb 1 a 10 m	3 tb	-	1 tb 4 tb	3 a 4 m	2 tb 4 a 18 bb	8 tb 21 m 19 bb	1 tb 18 m 13 bb 13 tdd
Co	-	-	-	1 bb	-	-	5 m	3 tb	-	2 tb 3 a	5 bb	5 bb
Am	-	2 bb		-	1 tb 7 bb 12 m	10 bb 5 tdd	-	5 tb	1 a 1 m	25 tb	12 tb 1 m	1 bb
Sn	-	-	-	-	-	-	-	-	-	-	1 tb 4 m	1 bb 3 tdd
Pq	-	-	-	-	-	-	-	-	-	-		3 tdd

Gt: *Gambierdiscus toxicus*, Os: *Ostreopsis* spp., Pro: *Prorocentrum* spp., Co: *Coolia* sp., Am: *Amphidinium* spp, Sn: *Sinophysis* sp, Pq: *Protoperidinium quinquecorne* , tb : Trou aux Biches, a: Albion, bb: Blue Bay, m : Le Morne, tdd: Trou d'Eau Douce

1.9 Harmful marine organisms

Some potentially dangerous marine organisms most likely to be encountered in our waters include stonefish, scorpionfish, lionfish - collectively known as laffes, sea urchins, pinnae and cone shells. These organisms cause harm only when disturbed as they are equipped with mechanisms of self-defence for survival and for protection against predators.

A two-year survey on the distribution of stonefish and other harmful marine organisms was started in August by the AFRC and other collaborative institutions. Eight popular beaches, namely, Trou aux Biches, Le Morne, Albion, Flic en Flac, Mon Choisy, Le Bouchon, Blue Bay and Péreybère were selected for the survey which was carried out along established transect lines. Results showed the presence of stonefish (laffe laboue) and lionfish (laffe volant) at all the sites except at Péreybère. Sea

urchins were abundant at certain places, namely, Trou aux Biches and Flic en Flac. Preliminary findings of the two surveys carried out during the year are shown in table 1.26.

Table 1.26: Preliminary results of survey on harmful marine organisms

Site	Laffe corail		Laffe laboue		Laffe volant		Cone		Sea urchin	
	Aug	Dec	Aug	Dec	Aug	Dec	Aug	Dec	Aug	Dec
Péreybère	-	-	-	-	-	-	-	-	7	11
Mon choisy	-	-	-	-	3	-	-	-	-	15
Flic en Flac	-	3	2	-	3	3	5	-	1 305	1 280
Albion	-		-		7		38		713	
Le Bouchon	-		5				1		450	
Blue Bay	-		-		3		8		108	
Trou aux Biches	-		-		3		-		12 224	
Le Morne	-		3		7		-		3 321	

1.10 Recruitment of juvenile fish

Studies on the recruitment of juvenile fish were continued at the established sites of Albion, Tamarin and Trou d'Eau Douce. A total of 8 666 juvenile fish was collected and identified. Table 1.27 gives the total number of fish collected, number of families and number of species identified at the sampling sites.

Table 1.27: Total fish individuals, families and species collected at the sampling sites

Location	No of individuals	No of families	No of species
Albion	1 302	36	76
Tamarin	2 302	22	47
Trou d'Eau Douce	5 062	26	70

The percentage distribution of the five dominant fish families at Albion, Tamarin and Trou d'Eau Douce are given in figures 1.16a, b and c.

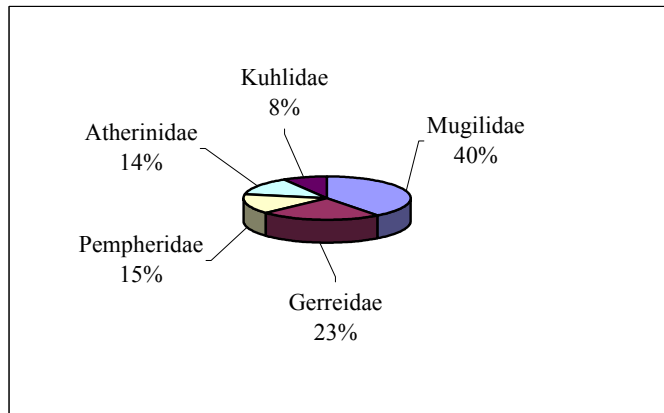


Fig 1.16a: Percentage distribution of the five most dominant fish families at Albion

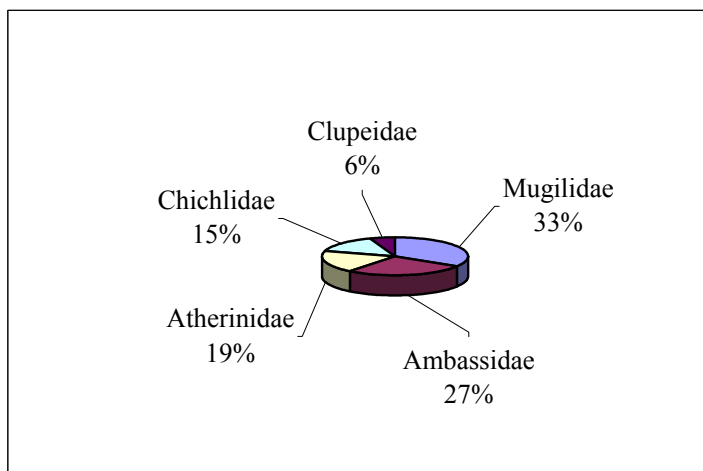


Fig 1.16b: Percentage distribution of the five most dominant fish families at Tamarin

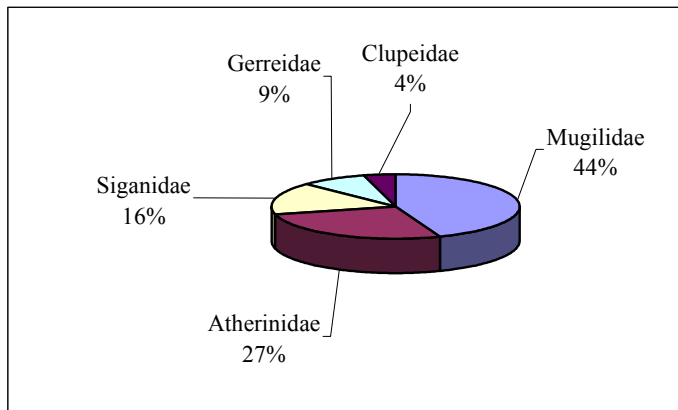


Fig 1.16c: Percentage distribution of the five most dominant fish families at Trou d'Eau Douce

2. MARINE SCIENCE

2.1 Coastal ecosystem research

2.1.1 Long-term monitoring of coral reef ecosystem

Long-term monitoring of coral reefs was continued at the established stations at Albion, Pointe aux Sables, Trou aux Biches, Anse la Raie, Poudre d'Or, Trou d'Eau Douce, Bambous Virieux, Bel Ombre, Baie du Tombeau and Ile aux Benitiers. Data on substrate cover were collected at each station using the Line Intercept Transect (LIT) Method. The data was processed by ARMDDES and CO.RE.MO softwares; the results obtained are shown in tables 2.1. The abundance of fish, sea urchins and sea cucumbers at the stations is presented in table 2.2.

Table 2.1: Percentage cover of substrate at monitoring stations

Site	Year	Coral	Algae	Abiotic	Other
Baie du Tombeau back reef	2002	48	8	44	N/O
	2003	55	9	35	1
Le Goulet fore reef	2002	53	9	38	N/O
	2003	62	6	32	N/O
Ile aux Benitiers fore reef	2002	39	1	55	5
	2003	35	3	58	4
Ile aux Benitiers back reef	2002	72	2	26	N/O
	2003	49	26	23	2
Ile aux Benitiers shore reef	2002	31	6	63	N/O
	2003	24	4	72	N/O
Bel Ombre back reef	2002	37	19	44	N/O
	2003	44	35	20	1
Bel Ombre shore reef	2002	45	14	41	N/O
	2003	64	5	31	N/O
Bambous Virieux back reef	2002	57	8	35	N/O
	2003	61	9	30	N/O
Bambous Virieux shore reef	2002	33	20	47	N/O
	2003	33	35	32	N/O
Trou d'Eau Douce back reef	2002	32	12	56	N/O
	2003	45	23	31	1
Trou d'Eau Douce shore reef	2002	64	11	21	4
	2003	70	0	30	N/O
Poudre d'Or (Site I) back reef	2002	52	15	33	N/O
	2003	58	18	24	N/O
Poudre d'Or (Site II) back reef	2002	66	1	33	N/O
	2003	56	1	41	2
Anse La Raie back reef	2002	50	24	26	N/O
	2003	67	24	9	N/O
Anse La Raie shore reef	2002	71	21	8	N/O
	2003	77	16	7	N/O
Trou aux Biches fore reef	2002	48	6	45	1
	2003	36	5	58	1
Trou aux Biches back reef	2002	40	6	54	N/O
	2003	37	7	56	N/O
Pointe aux Sables fore reef	2002	29	N/O	71	N/O
	2003	15	N/O	85	N/O
Pointe aux Sables back reef	2002	34	N/O	65	1
	2003	32	1	65	2
Albion fore reef	2002	35	12	51	2
	2003	30	0	67	3
Albion back reef	2002	53	18	29	N/O
	2003	54	6	40	N/O

N/O: not observed

Table 2.2: Abundance of fish, sea urchins and sea cucumbers

Site	Station	Pomacentridae	Chaetodontidae	Acanthuridae	Labridae	Scaridae	Sea urchin	Sea cucumber
Baie du Tombeau	back reef	XXXX	XXXX	N/O	N/O	N/O	N/O	N/O
Le Goulet	backreef	N/O	N/O	N/O	N/O	N/O	N/O	N/O
Ile aux Benitiers	fore reef	X	X	XX	X	X	862	N/O
Ile aux Benitiers	back reef	XXXX	XXXX	XX	N/O	X	1	4
Ile aux Benitiers	shore reef	XXX	XXX	XX	XX	X	3	1
Bel Ombre	back reef	XXX	XXX	XX	X	XX	N/O	23
Bel Ombre	shore reef	XXX	XXX	XX	X	XX	N/O	23
Bambous Virieux	back reef	XXXX	XXXX	X	X	X	188	16
Bambous Virieux	shore reef	XXX	XXX	XX	X	XX	N/O	N/O
Trou d'Eau Douce	back reef	XXXX	XXXX	X	N/O	X	47	6
Trou d'Eau Douce	shore reef	XXX	XXX	XX	X	X	N/O	N/O
Poudre d'Or I	back reef	XXXX	XXXX	X	N/O	N/O	N/O	N/O
Poudre d'Or II	back reef	XXXX	XXXX	N/O	X	N/O	125	4
Anse la Raie	back reef	N/O	N/O	N/O	N/O	N/O	N/O	N/O
Anse la Raie	shore reef	XXXX	XXXX	N/O	N/O	N/O	N/O	N/O
Trou aux Biches	fore reef	XXX	XXX	XXX	X	XX	523	N/O
Trou aux Biches	back reef	XXXX	XXXX	XX	XX	X	N/O	N/O
Pointe aux Sables	fore reef	XX	XX	XX	X	X	609	N/O
Pointe aux Sables	back reef	XX	XX	N/O	X	XX	171	N/O
Albion	fore reef	XX	XX	XX	X	X	609	N/O
Albion	back reef	XXXX	XXXX	N/O	X	N/O	52	12

Legend :

- X - 0-10**
- XX- 10-50**
- XXX- 50-100**
- XXXX- > 100**
- N/O-not observed**

2.1.1.1 Coral cover at Trou aux Biches

The percentage coral cover at Trou aux Biches for the period 1998 to 2003 is shown in figure 2.1 with the exception of data for 2001, which are not available.

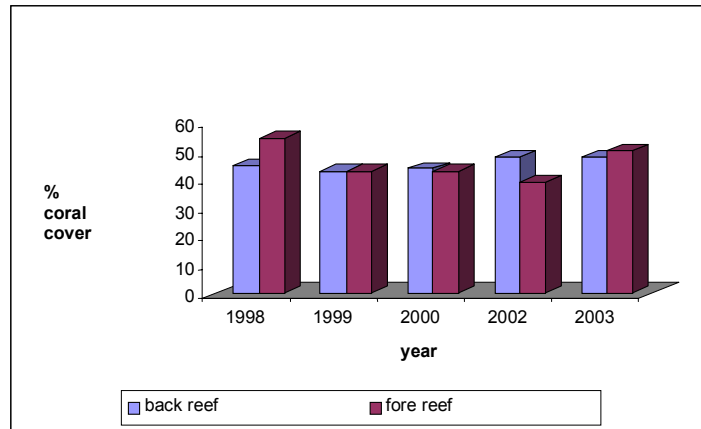


Figure 2.1: Percentage coral cover at Trou aux Biches

The percentage coral cover in the back reef varied between 43 and 48 % while that for the fore reef varied between 39 and 55%.

2.1.1.2 Coral cover at Bambous Virieux

The percentage coral cover at Bambous Virieux for the period 1998 to 2003 is shown in figure 2.2. As previously the data for 2001 are missing.

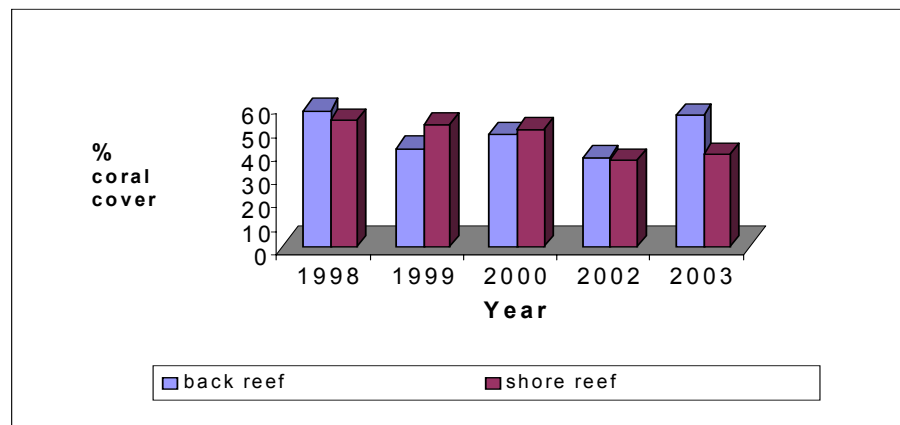


Figure 2.2: Percentage coral cover at Bambous Virieux

The percentage coral cover in the back reef varied between 38 and 58% while that for the shore reef varied between 39 and 54%.

2.1.2 Coral bleaching

The reefs in Mauritius suffered sporadic coral bleaching in 2003 after the global coral bleaching event of 1998. Coral bleaching was observed in the lagoonal patch reefs, reef flats and reef slopes. Surveys were carried out at four sites, namely Ile aux Benitiers, Belle Mare, Poudre d'Or and Albion and the percentages of completely bleached corals at these sites were 56%, 11%, 22% and 2% while that of partially bleached corals were 8%, 27%, 17% and 16% respectively. Branching and tabular corals were mostly affected in the back reef while massive corals were affected in the fore reef. Bleaching of corals was observed by late February. By June, 95% of the bleached corals had recovered, 2% were recovering and 3% had died. Figure 2.3 illustrates completely bleached tabular corals while figure 2.4 shows corals in a state of recovery.



Figure 2.3: Completely bleached tabular corals



Figure 2.4: Recovery of bleached corals

2.1.3 Monitoring of ex-sand mining sites

Following the banning of sand mining activity in October 2001, the four sites namely Grand Gaube, Poudre d'Or, Mahebourg and GRSE were monitored every six months to observe the condition of the seabed and the recolonisation of the areas by marine organisms. Observations showed that the marine ecosystem was steadily recovering.

2.1.4 Regional coral reef monitoring project

Various activities were undertaken under the regional coral reef monitoring project. A national report 2003 which included the data from Mauritius and Rodrigues was prepared and submitted to the regional network for inclusion into the Global Coral Reef Monitoring Network. Under the training component of the project, nine officers from AFRC, Ministry of Environment and National Development Unit and Mauritius Oceanography Institute (MOI) benefited from diving courses in open water, advanced open water, rescue diving and Medic First Aid.

A training workshop on the analytical software, COREMO II, was organised at AFRC in December and was attended by officers of the AFRC, MOI, Department of Environment, the Fisheries Research and Training Unit and NGO's (Mauritius Marine Conservation Society / Mauritius Scuba Diving Association, Atlantis Diving Centre and Shoals Rodrigues).

2.1.5 Mangrove propagation

Mangrove propagation was carried out in the western region on the mudflat at Grande Rivière Noire where 41 300 mangrove propagules were planted over an area of about 25 000m². Some 10 000 propagules were planted to replace mangroves destroyed in October 2002 at Petite Habitation. Figure 2.5 shows the mangrove plantation at Grande Rivière Noire.



Figure 2.5: Mangrove plantation at Grande Rivière Noire

2.2 Physical oceanography

2.2.1 Study of current patterns

A study on water currents in the lagoon of Poudre d'Or was carried out. Another study was carried out at Baie du Tombeau. Sets of drogues were deployed in the lagoons at different tides. The positions of the drogues were recorded with the help of a GPS. The pattern of movement of drogues at Baie du Tombeau is shown in figure 2.6.

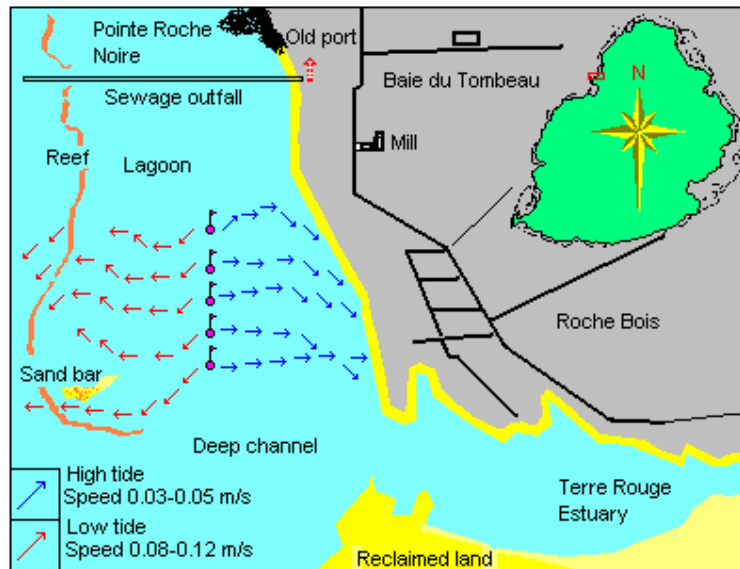


Figure 2.6: Schematic movements of drogues in the lagoon at Baie du Tombeau

At flood tide, the drogues moved with a speed ranging from 0.03 to 0.05 m/s in a southeasterly direction while at ebb tide, the drogues moved with a speed ranging from 0.08 to 0.12 m/s in a general westerly direction.

2.2.2 Sea surface water temperature

Sea surface water temperatures were recorded thrice daily at 07 00, 13 00 and 17 30 hours near the shore at all fisheries posts around the island. The sites in the north were at Poudre d'Or, Trou aux Biches and Baie du Tombeau, in the south at Baie du Cap, Mahébourg and Riambel, in the east at Poste la Fayette, Grand River South East and Trou d'Eau Douce and in the west at La Preneuse and Case Noyale.

The average monthly temperature varied from 20.3 °C in winter to 29.6°C in summer as shown in figure 2.7. The highest temperature was recorded in the northern region in January and February. The lowest temperature was recorded in the southern region in August.

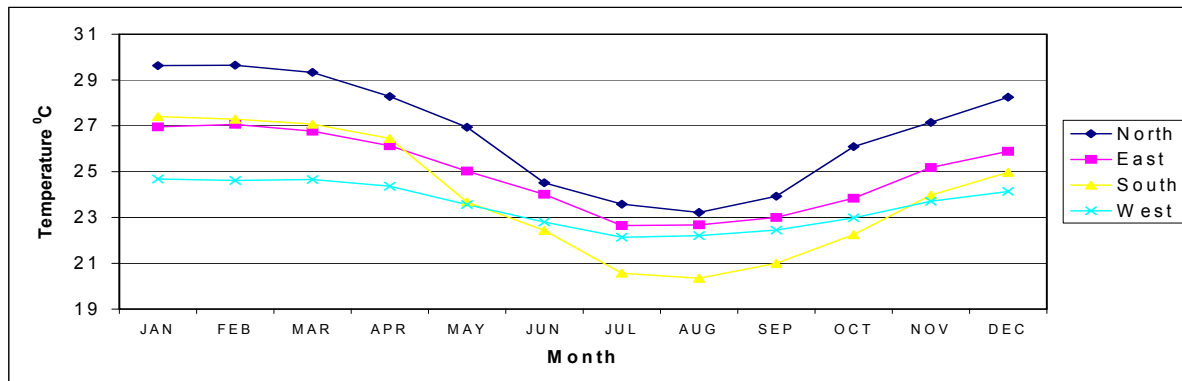


Figure 2.7: Average monthly sea surface water temperature

2.3 Coastal Environment Research

2.3.1 Coastal water quality

The long-term monitoring for the quality of coastal and lagoonal waters around the island was continued under the Coastal Environment Research Project.

2.3.1.1 Monitoring of chemical parameters

Sampling was carried out on a quarterly basis at the fourteen established sites around the island, namely: Ile aux Bénitiers, Bel Ombre, Bambous Virieux, Trou d'Eau Douce, Anse la Raie, Trou aux Biches, Pointe aux Sables, Bain des Dames, Grand Baie, Baie du Tombeau, Harbour, Poudre d'Or, Balaclava and Blue Bay. Water samples were collected from different stations at these sites for analysis. The sea state, weather conditions and temperature were recorded in the field, while chemical parameters were measured and determined in the laboratory. Chemical oxygen demand (COD), nitrate-nitrogen (NO_3^- -N) and phosphate (PO_4^{3-}) determined in the water samples are shown in table 2.3.

Table 2.3: Results of water analyses (chemical)

Site	Year	Nitrate-Nitrogen (mg/l)	Phosphate (mg/l)	Chemical Oxygen Demand (mg/l)
Ile aux Benitiers	2001	<0.1 - 0.1	0.01 - 0.03	0.2 - 0.8
	2002	<0.1	<0.01 - 0.03	0.1 - 0.5
	2003	<0.1	<0.01 - 0.02	0.1 - 0.5
Bel Ombre	2001	<0.1	<0.01 - 0.04	<0.1 - 0.3
	2002	<0.1	<0.01 - 0.05	0.1 - 0.9
	2003	<0.1	<0.01 - 0.08	0.1 - 1.5
Bambous Virieux	2001	<0.1 - 0.1	0.02 - 0.03	0.1 - 0.2
	2002	<0.1	0.01 - 0.02	0.1 - 0.5
	2003	<0.1	0.01 - 0.03	0.2 - 0.9
Trou d'Eau Douce	2001	<0.1	<0.01 - 0.02	0.1 - 0.7
	2002	<0.1	<0.01 - 0.06	0.1 - 0.8
	2003	<0.1	0.01 - 0.03	0.1 - 0.5
Anse la Raie	2001	<0.1	<0.01 - 0.03	0.1 - 0.4
	2002	<0.1	0.01 - 0.04	0.2 - 0.5
	2003	<0.1	<0.01 - 0.01	0.2 - 0.4
Trou aux Biches	2001	<0.1	<0.01 - 0.04	<0.1 - 0.5
	2002	<0.1	<0.01 - 0.05	0.2 - 0.7
	2003	<0.1	<0.01 - 0.01	0.2 - 0.8
Pointe aux Sables	2001	<0.1 - 0.1	<0.01 - 0.11	0.1 - 1.4
	2002	<0.1 - 0.2	<0.01 - 0.10	<0.1 - 1.7
	2003	<0.1 - 0.1	<0.01 - 0.08	0.1 - 1.4
Bain des Dames	2001	<0.1 - 0.1	<0.01 - 0.35	0.1 - 4.6
	2002	<0.1	0.01 - 0.11	0.2 - 3.5
	2003	<0.1	<0.01 - 0.08	<0.1 - 1.2
Grand Baie	2001	<0.1	<0.01 - 0.04	<0.1 - 1.0
	2002	<0.1	<0.01 - 0.04	0.1 - 1.1
	2003	<0.1	<0.01	0.1 - 1.8
Baie du Tombeau	2001	<0.1 - 0.3	<0.01 - 0.25	0.3 - 2.2
	2002	<0.1 - 0.1	<0.01 - 0.25	0.1 - 1.5
	2003	<0.1 - 0.1	<0.01 - 0.20	0.1 - 3.3
Harbour	2001	<0.1 - 1.1	<0.01 - 0.24	0.2 - 1.4
	2002	<0.1	<0.01 - 0.18	0.1 - 0.6
	2003	<0.1 - 0.2	<0.01 - 1.01	0.1 - 2.0
Poudre d'Or	2001	<0.1 - 1.0	<0.01 - 0.24	<0.1 - 18.0
	2002	<0.1 - 0.3	<0.01 - 0.25	0.2 - 13.8
	2003	<0.1 - 1.0	<0.01 - 0.20	0.1 - 6.9
Balaclava	2001	<0.1	0.02 - 0.04	<0.1 - 1.0
	2002	<0.1	<0.01 - 0.04	0.1 - 0.7
	2003	<0.1	0.01 - 0.04	0.1 - 1.3
Blue Bay	2001	<0.1	<0.01 - 0.04	<0.1 - 1.0
	2002	<0.1	<0.01 - 0.05	0.1 - 0.4
	2003	<0.1	<0.01 - 0.03	0.1 - 0.6

The results of water quality analyses between 2001 and 2003 were generally within the *Guidelines for Coastal Water Quality Requirements for various categories Govt. Notice No. 620 of 1999 (CWQG)* at most of the sites. In 2003, the level of nitrate was less than 0.1 mg/l while that of phosphate ranged from <0.01 to 0.08 mg and COD values were less than 1.8 mg/l at most of the sites. However, in the Port Louis region (Pointe aux Sables, Bain des Dames and Baie du Tombeau)

phosphate values exceeded the guideline limit at stations near the sewer outfalls and at stations having influx of freshwater. In the Port Louis harbour, high values of phosphate were also recorded. At one station in Poudre d'Or, the *CWQG* limits were exceeded for phosphate, nitrate and COD.

2.3.1.2 Analysis for trace metals and pesticides

Water samples were collected near river mouths at Grand River North West, Pointe Roches Noires, Grand River South East, Mahebourg, l'Escalier, Baie du Cap, Tamarin and Rivière Lataniers to determine the levels of five trace metals, namely: copper, zinc, lead, cadmium and mercury. Water analyses for levels of the pesticides, atrazin, diuron and hexazinone, were carried out from the same sites.

The trace metals, copper, lead, cadmium and mercury were not detected in the water samples. Traces of zinc, below the *CWQG* limit were detected in one sample from Rivière Lataniers. No pesticide was detected in the water samples analysed. The results of comparative analyses are given in table 2.4.

Table 2.4: Comparative results for trace metals

Site	Year	Cadmium (mg/l)	Copper (mg/l)	Lead (mg/l)	Zinc (mg/l)	Mercury (µg/l)
Grand River	2001	<DL	<DL	<DL	<DL	<DL
	2002	<DL	<DL	<DL	<DL	<DL
	2003	<DL	<DL	<DL	<DL	<DL
Pointe Roches Noires	2001	<DL	<DL	<DL	<DL	<DL
	2002	<DL	<DL	<DL	<DL	<DL
	2003	<DL	<DL	<DL	<DL	<DL
Grand River South East	2001	<DL	<DL	<DL	<DL	<DL
	2002	<DL	<DL	<DL	<DL	<DL
	2003	<DL	<DL	<DL	<DL	<DL
Mahébourg	2001	<DL	<DL	<DL	<DL	<DL - 0.03
	2002	<DL	<DL	<DL	<DL	<DL
	2003	<DL	<DL	<DL	<DL	<DL
L'Escalier	2001	<DL	<DL	<DL	<DL	<DL
	2002	<DL	<DL	<DL	<DL	<DL - 0.03
	2003	<DL	<DL	<DL	<DL	<DL
Baie du Cap	2001	<DL	<DL	<DL	<DL	<DL - 0.02
	2002	<DL	<DL	<DL	<DL	<DL - 0.03
	2003	<DL	<DL	<DL	<DL	<DL
Tamarin	2001	<DL	<DL	<DL	<DL	<DL
	2002	<DL	<DL	<DL	<DL	<DL
	2003	<DL	<DL	<DL	<DL	<DL
River Lataniers	2003	<DL	<DL	<DL	0.006	<DL
Detection Limit (DL)		0.002	0.01	0.05	0.005	0.02

2.3.1.3 Ad hoc water analyses

In addition to monitoring water quality at the 14 established sites, water samples were also collected in connection with cases of alleged pollution and fish mortality. Fish mortality were reported at Belle Mare, Albion and St Felix in the month of January, May and December respectively. The fish mortality at Albion was due to the immersion of a leaking cylinder containing chlorine into the Belle Eau river. In the other cases the cause of mortality was difficult to establish as samples were collected many hours after the mortality event.

2.3.1.4 Other studies

Water quality studies were also carried out in relation to specific issues pertaining to the marine environment and coastal development projects. The monitoring of water quality was conducted at Ferme Marine de Mahebourg for aquaculture in cages and at Grand Gaube, for a proposed public beach.

2.4 Coliform bacteria in seawater at public beaches

The monthly monitoring of the level of total coliform (TC) and faecal coliform (FC) in seawater was continued at the established stations of each selected public beach, namely; Flic en Flac (5 stations), Albion (1 station), Pointe aux Sables (4 stations), Trou aux Biches (2 stations), Mon Choisy (4 stations), Le Goulet (1 station), Grand Baie (five stations) and Blue Bay (3 stations). Blue Bay (3 stations) and Balaclava (4 stations) marine parks were sampled twice during the year.

Results of analyses show that the levels of TC and FC at the selected beaches and the two marine parks were within the CWQG limits for primary contact (TC \leq 1000 colonies/100ml and FC \leq 200 colonies/100ml) except at stations 1 and 2 of Pointe aux Sables where higher levels of TC and FC were recorded. Mean values for the level of TC and FC at most of the monitored public beaches are comparable to mean values obtained in the previous two years as shown in table 2.5.

Table 2.5: Results of coliform analysis at the monitoring sites

Beach	Station	Average colony count per 100ml					
		2001		2002		2003	
		TC	FC	TC	FC	TC	FC
Flic en Flac	1	84	22	58	11	49	10
	2	23	7	27	11	19	8
	3	10	2	34	10	14	6
	4	34	8	27	15	25	9
	5	51	21	114	26	21	9
Trou aux Biches	1	225	141	52	18	30	7
	2	43	10	17	15	33	5
Mon Choisy	1	88	27	21	14	24	4
	2	53	21	71	42	40	4
	3	36	29	21	15	22	7
	4	58	36	16	7	70	17
Blue Bay	1	11	2	104	60	40	11
	2	12	2	31	13	41	9
	3*	-	-	49	42	30	8
Albion	1	419	77	134	35	38	23
Pointe aux Sables	1	382	150	534	197	921	542
	2	252	94	166	109	11 745	7 452
	3	590	153	57	39	35	11
	4	50	12	107	50	207	30
Grand Baie	1*	-	-	7	5	41	16
	2*	-	-	10	4	41	17
	3*	-	-	6	3	13	6
	4*	-	-	8	3	25	11
	5*	-	-	-	-	22	10
Le Goulet	1	115	60	41	16	146	42
Blue Bay Marine Park	1	ND	ND	ND	ND	ND	ND
	2	4	1	1	1	ND	ND
	4	1	ND	4	2	4	2
Balaclava Marine Park	2	ND	ND	ND	ND	7	2
	3	ND	ND	ND	ND	ND	ND
	4	1	ND	2	1	ND	ND
	6	2	ND	4	2	29	7

(*): New monitoring station

ND: not detected

Note: *CWQG*: TC \leq 1000 colonies/100ml, FC \leq 200 colonies/100ml.

3. AQUACULTURE

Seed production of the giant tiger prawn (*Penaeus monodon*), the silver sea bream (*Rhabdosargus sarba*), berri rouge (*Oreochromis* sp.) and the crayfish (*Cherax quadricarinatus*) was pursued. Seed production of the giant freshwater prawn (*Macrobrachium rosenbergii*) and berri rouge of the Saint Petersburg variety was also undertaken.

3.1 Plankton culture

3.1.1 Phytoplankton

Effort was geared towards the production of an adequate quantity of good quality live feed for the larval rearing of the silver sea bream and the giant tiger prawn. Pure cultures of three phytoplankton species, namely: *Nannochloropsis* sp., *Tetraselmis* sp. and *Chaetoceros calcitrans*, were maintained in the phytoplankton room. Mass production of *Nannochloropsis* sp. was undertaken throughout the year to provide food for the culture of rotifers. During the peak production of *Nannochloropsis* sp., a maximum of 165 m³ of phytoplankton rich water was reached with an average cell density of 2.0 x 10⁶ microalgae per ml.

3.1.2 Zooplankton

Rotifers, *Brachionus rotundiformis*, were produced to feed fish larvae using the batch culture technique. To enhance the production of rotifers, baker's yeast was added to the rotifer tanks at the rate of 0.3 to 0.7 g/million rotifers, as a supplement, whenever it was not possible to provide high cell densities of microalgae. During the peak production of rotifers, a maximum of 3.0 billion rotifer individuals was produced per day in culture tanks totalling a volume of 27 m³. In winter, heaters were immersed in the rotifer culture tanks to maintain an optimum temperature range of 27-30°C.

3.2 Sea bream culture

3.2.1 Broodstock

In May, thirty brooders from an outdoor pond at AFRC were transferred to the hatchery in a concrete tank of 50 m³ capacity having a continuous flow of water. These fish were put on a daily diet of fresh mussels and freshly prepared moist pellets. The pellets comprised a mixture of frozen fish, fishmeal, vitamin premix, mineral premix and wheat gluten. As a precautionary measure against infection, the broodstock was immersed in a copper sulphate solution of 0.28 ppm for four hours on a fortnightly basis. Spawning started at the beginning of June and continued till the first week of

September. The average water temperature in the broodstock tank was 22.5°C. The total number of eggs obtained was 20.2 million, of which 7 million showed good buoyancy. Due to the limited hatchery capacity, only 1.5 million was retained for seed production and the remaining released in the lagoon at Albion.

3.2.2 Seed production

A total of 1.2 million hatched-out larvae of sea bream was stocked in two concrete tanks of 20 m³ capacity each in the month of June. During the rearing period, the average water temperature was 22.5°C and the average pH was 7.5. The fish larvae were fed on live rotifers and brine shrimp nauplii (*Artemia salina*). The diet of the larvae was supplemented with formulated feed from overseas. As a preventive measure against infection by *Oodinium* sp., copper sulphate at a dosage of 0.5 ppm was applied daily after the tenth day of rearing. After a culture period of 60 days, a total of 292 000 seabream fingerlings, with a mean body length of 3.0 cm and of average weight 0.2 g was obtained. This represented a survival rate of 24.4%. The annual seed production for the past five years is presented in table 3.1.

Table 3.1: Production of seabream fingerlings

Year	No of fingerlings
1999	93 140
2000	152 474
2001	181 610
2002	338 200
2003	292 000
Total	1 057 424

3.3 Giant tiger prawn culture

3.3.1 Broodstock

Fifteen female and nine male adult giant tiger prawns were collected from Bambous Virieux barachois in November and December 2002. The females were subjected to unilateral eyestalk ablation to induce maturation and spawning. The broodstock was maintained in the dark in conical fibreglass tanks at a water temperature ranging between 28 °C and 30 °C with a salinity of 35 ppt. They were fed on chopped frozen mussels, fresh bloodworms and maturation pellets.

3.3.2 Seed production

The ablated females matured and spawned after ten days producing 251 000 nauplii. Larval rearing was carried out in tanks of 10 m³ capacity for primary seed production. The larvae were fed on phytoplankton (*Chaetoceros* sp.), rotifer (*Brachionus rotundiformis*), brine shrimp nauplii (*Artemia salina*) and formulated feed from overseas. After fifteen days of primary seed production, a total of 82 000 three-day-old post-larvae (PL-3) was obtained. Oxytetracycline (antibiotic) and Treflan (fungicide) were added as prophylactic treatment during the seed production. The survival from nauplii to PL3 was 27.4%. The post-larvae were reared in a tank of 20m³ capacity for secondary seed production and they were fed on brine shrimp nauplii and imported artificial feed. After 30 days of secondary seed culture, 61 700 post-larvae (PL-33) were produced and reared in three nursery ponds. The juveniles were fed on the locally produced shrimp pellets thrice daily. After a culture period of 120 days, 45 650 juvenile shrimps were produced. The annual seed production for the past five years is presented in table 3.2.

Table: 3.2: Production of *P. monodon* post larvae

Year	Quantity (unit)
1999	26 858
2000	108 970
2001	232 000
2002	204 100
2003	61 700

3.4 Camaron culture

3.4.1 Broodstock

A broodstock of camaron was acquired from Ferney Aquaculture Limited in December 2002. The brooders were kept in an earthen pond at the La Ferme Fish Farm (LFFF). The adult camaron were fed on camaron pellets at 1% biomass daily.

A total of 97 berried females, out of which 81 were obtained from the Medine Sugar Estate and 16 from La Ferme Fish Farm, was maintained in two fibreglass tanks of 2 m³ capacity in the dark at an ambient water temperature of 27°C. They were fed once daily on chopped frozen mussels and fish at 1% body weight.

3.4.2 Seed production

Camaron seed production is undertaken from September to April when the average water temperature is 27°C. Two larval rearing cycles were carried out from January to April and from October to December. A total of 1 006 000 larvae was stocked in fibreglass and polycarbonate tanks of 0.5 to

3 m³ capacity in clear brackish water at 12 ppt salinity. The camaron larvae were fed daily on brine shrimp nauplii, minced and sieved frozen bonito and octopus. The larval stage index was closely monitored and post-larvae of stage-12 were obtained after a culture period ranging between 27 and 57 days. The salinity of the culture medium was gradually brought down to zero. A total of 120 000 camaron juveniles was produced.

3.4.3 Grow-out of camaron juveniles

Camaron juveniles from the AFRC hatchery were stocked in two ponds of 1 000 and 2 000 m² each at La Ferme Fish Farm in order to build up a fresh broodstock. The smaller pond was stocked with 25 000 juveniles and the other with 42 700 juveniles. The juveniles were fed on camaron crumbles during the first month and subsequently on camaron pellets twice daily. At 270 days, the juveniles had grown from 0.02 to 25.2 g in weight and from 2.8 to 98.8 mm in length as presented in figure 3.1.

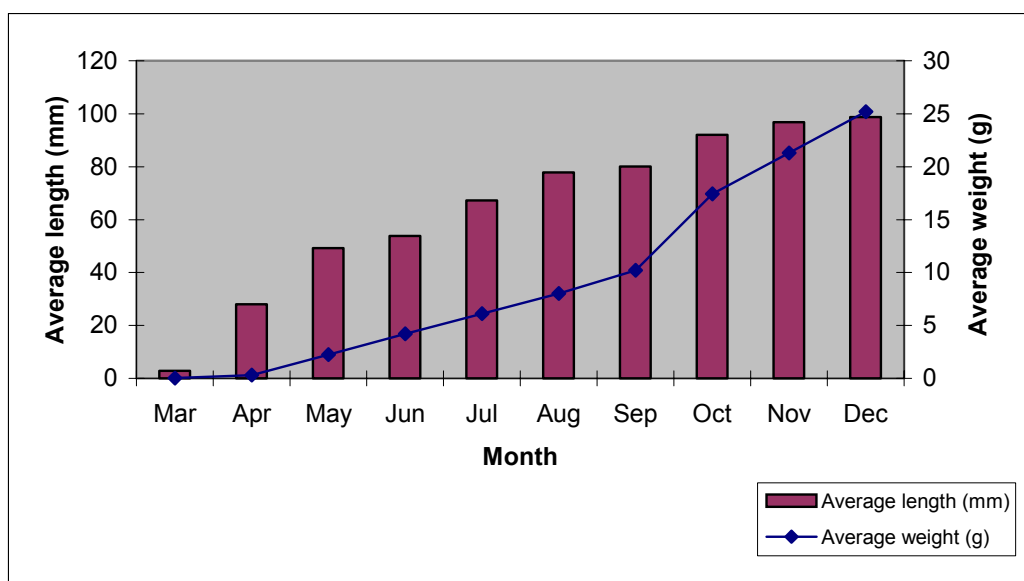


Figure 3.1: Growth of camaron

3.4.4 Sale of camaron juveniles

Camaron juveniles were sold as a priority to small farmers. The price was set at Rs. 1.25/ unit. A total of 52 300 juveniles was sold for a sum of Rs 65 375.

3.5 Resource propagation

3.5.1 Release of seabream fry

A total of 292 000 seabream fry was released in the lagoon at three sites, namely, Ferney, Tamarin and Albion. The selected sites located near large estuarine systems, are suitable habitats for small size sea breams. Release of sea bream fry for the last three years is presented in table 3.3

Table 3.3: Release of seabream fry

Site	Number		
	2001	2002	2003
Ferney	-	153 900	100 000
Tamarin	-	24 300	85 000
Albion	1 175	105 000	107 000
Total	1 175	283 200	292 000

3.5.2 Release of the tiger prawn juveniles

A resource propagation programme for stocking of shrimp juveniles was started in August 1997 in the lagoon at Grand Sable and Bambous Virieux. In all 45 650 tiger prawn juveniles with body weight ranging from 8 to 10 g were released in the lagoon as presented in the table 3.4

Table 3.4: Release of tiger prawn juveniles

Site	Number				
	1999	2000	2001	2002	2003
Grand Sable	-	-	10 000	10 000	18 650
Petit Sable	-	-	-	5 000	12 000
Bambous Virieux	14 500	15 000	10 000	5 000	15 000
Total	14 500	15 000	20 000	20 000	45 650

3.6 Berri Rouge culture

3.6.1 Broodstock

The broodstock consisted of 600 selected breeders from the berri rouge introduced from Malaysia in August 2001 and 150-berri rouge of the Saint Petersburg variety obtained in December 2002. Signs of discoloration were observed in a large number of offsprings from the Malaysian stock. The fish of both varieties were maintained in two separate ponds of 500 m² and were fed twice daily on locally manufactured dry pellets at 1% body weight.

3.6.2 Seed Production

All male fry were produced by the sex-reversal method and by visual selection. The sex reversal treatment consisted of providing micro-granulated feed (1 000 g) mixed with 0.07 g male hormone (testosterone) dissolved in 700ml absolute alcohol, over a continuous period of 28 days three times daily. 43 154 sex-reversed fry were produced.

Fry exceeding 0.5 cm body length were cultured to an average body weight of 30 g and were sexed visually to prevent in-breeding. A total of 27 318 fingerlings was visually sexed. The overall production of berri rouge fingerlings was in relation to demand from farmers and is presented in table 3.5.

Table 3.5: Number and types of berri rouge fingerlings produced/distributed

Year	Malaysian strain			St. Peterburg strain	Total (unit)
	Sex reversed	Visually sexed	Acclimatised to seawater	Kept at LFFF	
1999	17 619	6 449	2 025	-	26 093
2000	12 940	9 630	3 500	-	26 070
2001	13 000	5 795	Nil	-	18 795
2002	16 735	14 750	Nil	-	31 485
2003	43 154	27 318	6 414	8 586	85 472

A total of 70 472 male fingerlings was sold to fish farmers at a unit price of Rs. 1.25, for a sum of Rs. 88 090. Incidentally, 1.35 tonnes of berri rouge were harvested from ponds and sold at Rs. 30 per kilogram for a sum of Rs. 40 500.

A total of 6 414 berri rouge fingerlings was acclimatized to full strength seawater. A survival rate of 46.7 % was obtained. In November, 3 000 berri rouge fingerlings of weight ranging between 2.9 and 6.2 g were stocked in three grow out ponds at stocking densities of 1,2 and 3 m². They were fed on red snapper pellets at 5 % body weight daily.

3.7 Crayfish culture

A broodstock of 150 females and 50 males of freshwater crayfish was kept at the La Ferme Fish Farm in an earthen pond of 500 m². They were fed on camaron pellets, chopped frozen tilapia and dried grass throughout the year at 1% body weight once daily. The broodstock was maintained to produce juveniles, which were reared in two ponds. The young adults were sold as breeders to farmers, in sets of one male and three females at Rs. 100, while harvest size crayfish were sold at Rs. 180 per kilogram. Forty-two sets of crayfish were sold to fish farmers and 31 kg of adult crayfish were harvested and sold.

3.8 Aquaculture extension service

The extension service provided technical advice to fish farmers. Site visits were effected to assist fish farmers on pond construction and aquaculture techniques. Some 263 persons called at AFRC and La Ferme Fish Farm with a view to obtain information on fish culture. Three students from the University of Mauritius were given short-term training in aquaculture at AFRC and LFFF.

3.9 Aquaculture production

The aquaculture production was 26.0 tonnes comprising 15.5 tonnes of berri rouge, 10.0 tonnes of freshwater prawn and 0.5 tonne of crayfish. One tonne of marine fish and 1.5 tonnes of mangrove crab together with 65 746 units of oyster were also harvested from different barachois. The sale value was over Rs 5.6 million.

4. MARINE PARKS AND RESERVES

4.1 Blue Bay Marine Park

4.1.1 Management of Blue Bay Marine Park

The park was delimited into different zones to control permissible activities. These zones namely, multiple use zone, strict conservation zone A, strict conservation zone B, traffic lane, ski lane and mooring zones were demarcated with appropriate buoys to control permissible activities. The buoys were inspected regularly by a diving team for maintenance purposes. Designated areas for fishing with pole and line from the shoreline were demarcated with signposts.

Different users of the park submitted 110 applications for permits. All the applications received were processed and 84 permits were issued against payment of Rs 2400 as permit fees as shown in table 4.1.

Table 4.1: Number of applications received, processed and permits issued

Type of permit	No received and processed	No. issued
Boat/vessel	33	27
Basket trap	26	21
Line fishing	47	36
Commercial activities	4	Nil
Total	110	84

Daily patrols were carried out both at sea and on shore. Eleven illegally placed basket traps were removed and secured at the station. Awareness campaigns to sensitise users and visitors of the park on the need for the conservation and preservation of the marine ecosystem and the resources therein was ongoing. Pamphlets on the park were also distributed. Visitors to the park included children from pre-primary schools, students from schools, colleges, the University of Mauritius and foreigners. Twelve boat operators were actively involved in glass-bottom boating, snorkelling and diving activities in the park. During the year about 105 000 persons comprising tourists and the public visited the park.

4.1.2 Coral reef ecosystem monitoring at Blue Bay Marine Park

Monitoring was carried out at two established stations. Data were collected at each station on the seabottom substrate in terms of corals, macroalgae, marine invertebrates and fish. Results on the percentage of substrate cover are shown in table 4.2

Table 4.2: Percentage of substrate cover at stations 2 and 3

Life form categories	Station 2	Station 3
Acropora branching	0	25.2
Acropora digitate	3.5	11.0
Acropora tabular	60.0	47.3
Coral foliose	9.0	4.0
Coral submassive	17.2	0.5
Mushroom coral	0.3	2.0
Total live coral cover	90.0	90.0
Sand & Rubble	2.3	2.0
Dead coral	4.7	7.0
Macroalgae	3.0	1.0

Live coral cover was high at both the stations. The live corals were in a very good health. Table corals were the dominant species in the park.

4.2 Zoning of the Balaclava Marine Park

The tender document for the installation of buoys and floats to demarcate the park boundaries, multiple use zone, conservation zone, traffic lane, ski lanes, swimming and mooring zones was reviewed for subsequent submission to the Central Tender Board.

The core staff for the enforcement of the Marine Protected Areas (MPAs) regulations at the Balaclava Marine Park carried out daily patrols both at sea and on shore. The officers were also involved in conducting meetings with fishers, hoteliers, boat operators and the public at large in connection with the zoning plan of the park. They also sensitised the park users on the need to protect and conserve the marine flora and fauna.

4.3 Survey of undersea walk sites

Undersea walk is an activity involving walking on the sea-floor using a water-tight helmet supplied with a continuous air flow. There are seven approved sites in the lagoon around Mauritius where undersea walk activities are undertaken. Underwater surveys were carried out at each site and a summary of observations is presented at table 4.3.

Table 4.3: Summary of observations at undersea walk sites

Site	Coral	Fish	Seagrass/ macroalgae	Marine invertebrates
Grand Bay I	Branching, massive and soft corals: 10-15 % Soft corals dominant	Lalo, damsel, chirurgien, cateau, trompette, rouget	Nil	Synapta, sea urchins, sea cucumbers
Grand Bay II	Branching, massive and solitary and sub-massive: 10-15 % Branching dominant	Lalo, damsel, chirurgien, cateau, trompette, rouget, pavillon, coffre, coupe couillon	Nil	Synapta, giant clam (<i>Tridacna sp.</i>), sea urchins, sea cucumbers, crown of thorns starfish.
Mon Choisy I	Massive, branching, sub-massive, encrusting and soft corals: 15 – 20 % Massive dominant	Lalo, damsel, chirurgien, cateau, trompette, rouget pavillon, coffre, coupe couillon, mullet	Seagrass: <i>Halophila ovalis</i> Macroalgae: <i>Padina sp.</i> , <i>Caulerpa sp.</i>	Synapta, giant clam (<i>Tridacna sp.</i>), sea urchin, sea cucumbers, sponges
Mon Choisy II	Massive, branching, sub-massive, solitary, encrusting and soft corals: 10 - 15 % Branching dominant	Lalo, damsel, chirurgien, pavillon	Nil	Sea urchin, sea cucumbers, sponges
Belle Mare I	Branching, tabular, massive, sub-massive, solitary corals: 70 - 75 % Branching dominant	Damsel, vieille, lalo, pavillon, mullet, chirurgien, trompette	Seagrass: <i>Halophila ovalis</i> , <i>Halodule uninervis</i> . Macroalgae: <i>Padina sp.</i> , <i>Gracillaria sp.</i>	Sea urchin, sea cucumbers, giant clam, synapta, bivalves
Belle Mare II	Branching, tabular, massive, sub-massive, solitary corals: 35 - 40 % Branching dominant	Vieille, pavillon, lalo, mullet, chirurgien, trompette	Seagrass: <i>Halophila ovalis</i> , <i>Halodule uninervis</i> Macroalgae: <i>Padina sp.</i> , <i>Gracillaria sp.</i> , turf algae	Sea urchin, sea cucumbers, giant clam, synapta, bivalves
Belle Mare III	Branching, tabular, massive, sub-massive, solitary corals: 65 - 70 % Branching dominant	Damsel, vieille, pavillon, lalo, mullet, chirurgien, trompette	Seagrass: <i>Halophila ovalis</i> , <i>Halodule uninervis</i> Macroalgae: <i>Padina sp.</i> , <i>Gracillaria sp.</i> , turf algae	Sea urchin, sea cucumbers, giant clam, synapta, bivalves

Results from the surveys indicate that the marine ecosystem at sites in the East (Belle-Mare) are still in a fairly good condition whilst at the sites in the North (Choisy and Grand-Bay), there are distinct signs of ecological degradation.

4.4 Bathymetry mapping and production of a resource atlas for the lagoons of Mauritius and Rodrigues

The tender document for the project was approved by the Central Tender Board. The tender was floated and two firms from Canada bid for the project. After having carried out the technical and financial assessment of the project from the bidders, the contract was awarded to Borstad Associates Ltd.

4.5 Demarcation of swimming zones at the Pereybère and Flic-en-Flac beaches

Two swimming zones, one at Pereybère and one at Flic-en-Flac were demarcated to provide safety for swimmers. Neither boating nor fishing is allowed within a swimming zone. Yellow coloured buoys and floats were used to delimit the zones.

4.6 Environmental Impact Assessment (EIA)

Sixty-one EIA applications for coastal projects were examined and the recommendations were forwarded to the Department of Environment. The following proposed projects involved major coastal development works such as construction of breakwaters, dredging of the lagoon and upgrading of beach:

- Hotel project for Mauriplage Beach Resort Co. Ltd. at Wolmar, Flic en Flac;
- Construction of golf resort for Medine Sugar Estate at Wolmar, Flic en Flac;
- Construction of hotel and golf resort for MTTB at Bel Ombre;
- Construction of hotel for Pristine Ltd. at Bel Ombre;
- Upgrading of beach for Le Canonnier Hotel at Pointe aux Canonniers;
- Construction of hotel for Salt Lake Resorts Ltd. at Bel Ombre and
- Construction of hotel for Club Mediteranée at Albion.

The Ministry of Fisheries facilitated consultative meetings between promoters and fishers in connection with coastal area development projects. Each promoter was required to present his

project which was followed by questions and answers. Consultative meetings were held for the following projects:

- Bay Side Village and Residential Development by Medine Sugar Estate Co. Ltd;
- Wolmar Golf Resort by Medine Sugar Estate Co. Ltd;
- Mamet Golf Resort by Medine Sugar Estate Co. Ltd;
- Hotel project at Bel Ombre by Salt Lake Resort Co. Ltd;
- Beach Resort at Bel Ombre by Temsa Co. Ltd;
- Construction of a resort at Albion by Club Mediteranee;
- Upgrading of beach for Le Canonnier Hotel at Pointe aux Canonniers;
- South West Coast optical fibre crossing at Maconde by Mauritius Telecoms;
- Waterfront at Grand River South East by State Property Development Co Ltd; and
- Sewage outfall at Montagne Jacquot by Wastewater Management Authority.

5. FISHERIES DEVELOPMENT AND EXTENSION

5.1 Fish Aggregating Devices

The Fish Aggregating Devices (FAD) Fishery Development Sub-programme of the IFAD/UNOPS Rural Diversification Programme, initiated in 2000, was continued.

5.1.1 FAD development

The FADs around the island were regularly verified, repaired and lost ones replaced. Three FADs were replaced. In all 21 FADs were active at the end of the year and they are listed in table 5.1.

Materials for 36 FADs comprising polyamide and polypropylene ropes, plastic floats, radar reflectors, shackles, thimbles, swivels, chains, spacers, strap-bands and threads were purchased from overseas.

Table 5.1: List of FADs as at December 2003

SN	Name	Mooring depth (m)	Distance from coast (nm)	Latitude-S	Longitude-E
1.	Albion	1 350	2.5	20° 09' 28	57° 23' 32
2.	Blue Bay	1 000	2.4	20° 29' 11	57° 43' 54
3.	Flat Island	740	9.5	19° 49' 14	57° 34' 44
4.	Flic-en-Flac	1 200	2.5	20° 15' 99	57° 19' 39
5.	Grand Carreau	260	8.2	20° 21' 61	57° 55' 31
6.	La Preneuse	2 300	5.2	20° 17' 69	57° 16' 06
7.	Medine I	2 500	5.5	20° 12' 38	57° 17' 35
8.	Passe Danoise	925	5.2	20° 22' 04	57° 52' 34
9.	Passe Danoise II	450	5.3	20° 22' 08	57° 50' 75
10.	Port Louis II	3 500	10.0	20° 05' 14	57° 16' 09
11.	Poste de Flacq	800	3.2	20° 07' 69	57° 48' 87
12.	Pte aux Caves	2 600	4.9	20° 10' 08	57° 19' 61
13.	Rivière Noire II	490	2.8	20° 21' 58	57° 19' 28
14.	Rivière Noire I	1 000	4.6	20° 23' 07	57° 16' 95
15.	Roches Noires	780	5.4	20° 02' 58	57° 48' 88
16.	Souillac	1 100	2.3	20° 33' 81	57° 31' 24
17.	T. d'Eau Douce	1 000	3.1	20° 13' 78	57° 51' 54
18.	Tamarin	450	2.2	20° 19' 99	57° 19' 58
19.	Tombeau Bay	1 050	2.7	20° 04' 40	57° 27' 88
20.	Trou aux Biches I	1 900	4.8	19° 59' 73	57° 27' 93
21.	Trou aux Biches II	2 400	7.0	20° 01' 66	57° 24' 07

5.1.2 Training

One batch of 21 registered fishermen was trained in the FAD fishery. During sensitization meetings, 65 fishers expressed their wish to join the training programme which will be held during the following year.

5.1.3 FAD fishery monitoring

Fisheries Protection Officers from Mauritius and from Rodrigues followed a Coxswain and a Marine Engine Driver Grade III training programme at the Sea Training School, to enable them to monitor

fishing activities around FADs. The training started in August and was completed in December.

5.1.4 Studies on the FAD fishery

To constitute the baseline for future monitoring and evaluation of the FAD fishery, a study entitled “Prior Assessment of Marine Waters around Mauritius and Rodrigues in relation to the Fish Aggregating Devices (FADs) Fishery Development” was carried out by a team of consultants. A report was submitted in December.

The Terms of Reference (TOR) for the consultancy services for the study on fish handling, preservation and marketing in Mauritius and Rodrigues was prepared and submitted to United Nations Office for Project Services (UNOPS) for clearance prior to the preparation of tender documents.

5.1.5 Fish landings from the FAD fishery

Data collection on the FAD fishery by six enumerators was undertaken at eight selected fish landing stations around the island, namely Trou aux Biches, Baie du Tombeau, Roche Bois, Trou Fanfaron, Pointe aux Sables, Tamarin, La Preneuse and Black River. Landings by species from FADs are presented in table 5.2. The main species caught around FADs was albacore tuna.

Table 5.2: Catch by species

Common name	Scientific name	Catch (kg)
Germon	<i>Thunnus alalunga</i>	60 247
Thon jaune	<i>Thunnus albacares</i>	29 794
Dorade	<i>Coryphaena hippurus</i>	4 629
Becune	<i>Acanthocybium solandri</i>	1 488
Shark	<i>Carcharhinus sp.</i>	197
Others		4 541
Total		100 896

5.1.6 FAD regulations

Regulations were drafted for the control of fishing activities around FADs.

5.1.7 Research boats

The research boats, "Sphyrna II" and "Maustral", carried out a total of 53 sea trips related to the FAD fishery and training of fishermen. In December, a wave rider buoy was set off Blue Bay for the Meteorological Services by Sphyrna II. Both boats went for dry-docking and repairs in October/November. The two life rafts on board Sphyrna II were serviced.

6. FISHERIES MANAGEMENT

The Fisheries Management Division is responsible for the management of fisheries resources in the waters of Mauritius and monitors the activities of Mauritian vessels in the high seas through the licensing of fishing vessels.

6.1 Licensing of fishing vessels

6.1.1 Licensing of foreign fishing vessels

Fishing licences were issued to 196 foreign fishing vessels to operate in the Exclusive Economic Zone of Mauritius. Out of these, 78 licences were issued to vessels of the European Union under a fishing agreement between Mauritius and the European Union and 11 were issued to Japanese longliners under the fishing agreement between Mauritius and the Japan Tuna Fisheries Co-operative Associations. The licence fee for foreign tuna fishing vessels outside the purview of the above agreements was US \$ 6000 for a period of 90 days and US \$ 2000 for any additional 30 days or part thereof. Licence fees collected during 2003 amounted to Rs 30.6 million. Details of licences issued are shown in table 6.1 and the number of foreign fishing licences issued since 2000 are summarized in table 6.2.

Table 6.1 Number of licences issued by nationality

Type of vessel	Nationality	Number
Longliner	Taiwan	74
	Japan	28
	Mauritius (foreign owned)	3
	Belize	3
	China	1
	Korea	4
	Philippines	1
	Seychelles	1
	Thailand	2
	France	13
	Spain	21
	Portugal	5
Purse Seiner	France	14
	Spain	24
	Italy	1
Handline	France	1

Table 6.2: Number of licences issued to foreign fishing vessels by gear

Year	Longliner	Purse seiner	Hand liner	Trawler	Total
2000	54	28	3	0	85
2001	138	32	0	2	172
2002	182	34	1	0	217
2003	156	39	1	0	196

6.1.2 Licensing of Mauritian vessels

There were 31 licensed vessels involved in different types of fishing activities. Table 6.3 shows the number of licenced vessels by category.

Table 6.3: Licensed Mauritian vessels by category

Category	Number
Banks fishery	9
Demersal chilled fish fishery	14
Surface longline (swordfish)	3
Shrimp fishery	2
Fish carriers from St Brandon	2
Trawler (High seas outside EEZ)	1
Banks drop-off fishery	1

6.2 Monitoring of fishing vessels

6.2.1 Monitoring of local vessels/boats

Licensed boats/ vessels have to obtain clearances for their fishing trips and have to be inspected upon their return to port. Fishing logbooks are verified and collected and the quality of the fish is assessed for fitness for human consumption prior to unloading. The number of clearances given to boats/vessels to proceed on fishing trips amounted to 291.

6.2.2 Monitoring of foreign fishing vessels calling at Port Louis

Most of the foreign fishing vessels call at Port Louis for the purpose of trans-shipment of their catch while some call for bunkering, provisions, dry docking, repairs and change of crew. All foreign fishing vessels are required to provide information on their fishing activities by filling in a trans-shipment data sheet. These vessels made 511 calls and the details are presented in tables 6.4 and 6.5.

Table 6.4: Details of calls of foreign vessels

Type of vessel	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Reefer	0	2	5	1	3	5	7	1	7	4	4	3	42
Squid vessel	3	0	0	0	0	0	0	0	0	0	0	1	4
Tuna longliner	27	43	32	17	21	43	22	31	53	41	25	37	392
Trawler	4	2	2	0	1	2	2	2	1	2	1	1	20
Patagonian toothfish	5	6	1	2	4	8	3	8	3	4	5	2	51
Purse seiner	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	39	53	40	20	29	58	34	42	64	51	37	44	511

Table 6.5: Nationalities of vessels calling at Port Louis

Type of vessel	Nationality	Number
Reefer	Taiwan	8
	Mauritius	12
	Bahamas	1
	Panama	19
	Japan	1
	St Vincent and Grenadines	1
Squid vessel	Taiwan	4
Tuna longliner	Taiwan	235
	Spain	28
	Honduras	2
	Seychelles	16
	Indonesia	1
	Portugal	6
	Eq. Guinea	2
	Togo	2
	Bolivia	4
	Belize	10
	France	6
	Japan	55
	Thailand	1
	Sri Lanka	6
	Senegal	1
	Philippines	3
	Ghana	1
	Georgia	1
	Korea	3
	Uruguay	1
Mauritius (foreign owned)	8	
Trawler	Mauritius (foreign owned)	3
	Cook Island	6
	Belize	1
	Madagascar	4
	France	1
	Australia	3
	Russia	1
	Cyprus	1
Patagonian toothfish vessel	Uruguay	15
	Seychelles	3
	Korea	11
	Australia	4
	Eq. Guinea	3
	France	12
	Belize	1
	Netherlands Antilles	1
	Togo	1
Purse seiner	France	1
	Spain	1

The number of foreign fishing vessels calling at Port Louis over the last five years is given in table 6.6

Table 6.6: Number of vessels calling at Port Louis over the last five years

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1999	30	40	53	46	94	38	47	38	105	59	36	50	636
2000	26	47	45	58	78	54	51	60	88	86	48	57	698
2001	41	47	55	57	81	54	50	51	89	69	41	61	696
2002	51	38	32	30	72	27	46	34	104	38	37	46	555
2003	39	53	40	20	29	58	34	42	64	51	37	44	511

A decline in the number of calls in 2003 was probably due to the SARS epidemic that affected certain South East Asian countries.

6.2.3 Monitoring of patagonian toothfish vessels

Mauritius is working in close cooperation with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) to prevent illegal fishing of patagonian toothfish. Patagonian toothfish vessels calling at Port Louis are invariably subjected to rigorous inspection procedures. Those calling for trans-shipment are required to produce the ‘Dissostichus Catch Document’ which is validated by a fisheries inspector from the flag country at Port Louis.

Patagonian toothfish vessels made 51 calls of which 14 were for trans-shipment and 37 for other purposes such as bunkering, provisions and change of crew. A total of 2 879 tonnes of toothfish was trans-shipped. Trans-shipment of patagonian toothfish decreased considerably during the year. Details of trans-shipment for the past five years are presented in table 6.7.

Table 6.7: Patagonian toothfish trans-shipment over the last five years (t)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1999	1 021	736	30	420	300	90	678	125	655	561	446	839	5 901
2000	718	2 088	235	766	745	942	1 661	1 410	204	1 235	499	173	10 676
2001	912	499	490	1 693	248	192	1 325	1 176	547	1 134	726	1 079	10 021
2002	0	122	980	289	739	1 153	1 232	0	1 184	221	0	0	5 920
2003	753	235	0	99	71	246	1 174	195	0	0	106	0	2 879

6.2.4 Monitoring of deep-sea trawlers calling at Port Louis

A total of 22 calls were made by 14 trawlers including “Anouma,” a Mauritian owned trawler and “Bel Ocean II” and “Kerguelen de Tremarec” of Mauritius registry. In all 2 581 tonnes of deep-sea demersal fishes were trans-shipped at Port Louis for export and 175 tonnes were landed for the local

market. The main species of fish were butter fish, boar fish, alfonsino, cardinal, orange roughy, blue nose and spiky dory. Details of calls for the past four years are given in table 6.8.

Table 6.8: Calls of trawlers since 2000

Year	No. of calls	Qty trans-shipped (t)	Qty landed for local market (t)
2000	49	13 764	0
2001	48	8 758	0
2002	22	3 746	428
2003	22	2 581	175

6.3 Import and export of fish and fish products and fish processing

6.3.1 Import of fish and fish products

During the year, 1 529 permits were issued for the import of fish and fish products, including 18 permits for the import of fish samples and fish bait. The fee payable for an import permit is Rs. 2 000 per consignment whereas it is Rs. 500 for the import of a fish sample or fish bait. Proceeds from such permits amounted to Rs. 3 067 000.

Random samples were collected from imported seafood at ports of entry and forwarded to the Veterinary Services Laboratory of the Ministry of Agriculture, Food Technology and Natural Resources for bacteriological analysis. A total of 130 samples was analysed and the results were found to be within established norms.

The import of fish and fish products for direct consumption amounted to 9 402 tonnes representing about 16 % of the total imports for the year. 47 748 tonnes of raw material were imported for the tuna cannery and 1 105 tonnes of frozen barracouta imported for the production of salted snoek. Tuna for the cannery was obtained from French and Spanish vessels trans-shipping in the Seychelles. The barracouta was imported from Namibia and New Zealand. Details of imports are shown in figure 6.1.

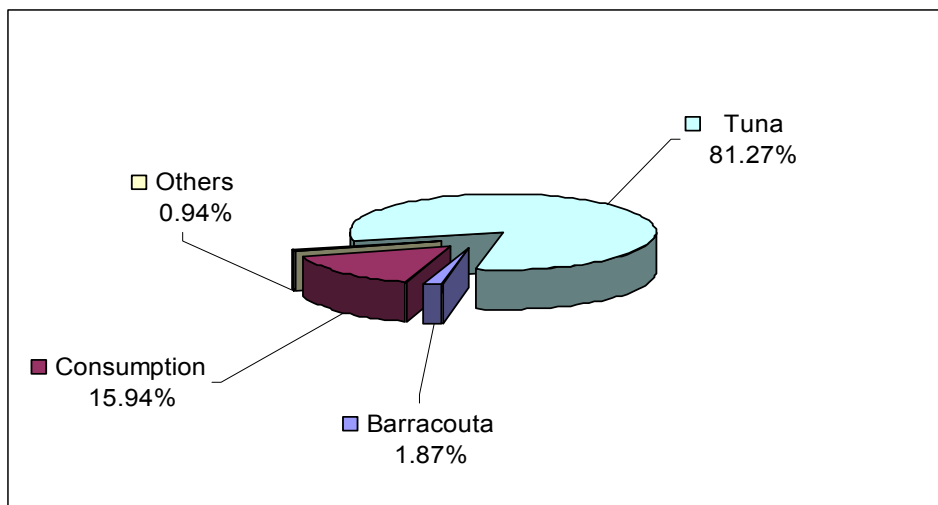


Figure 6.1: Details of import

Details of fish and fish products imported for consumption are presented according to the type and variety of seafood as shown in figures 6.2 and 6.3 respectively. Frozen and canned seafood ranked the highest in import whilst processed fish products, smoked, chilled and live fish were imported in smaller quantities.

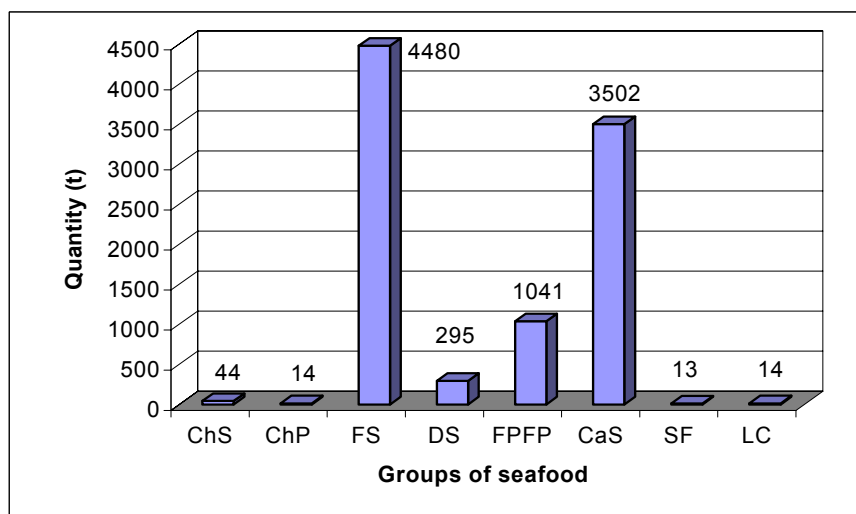


Figure 6.2: Types of seafood imported (t)

ChS: chilled seafood, ChP: chilled processed seafood, FS: frozen seafood, DS: dried seafood, FFPF: frozen processed fish products, CaS: canned seafood, SF: smoked fish, LC: live crustacean.

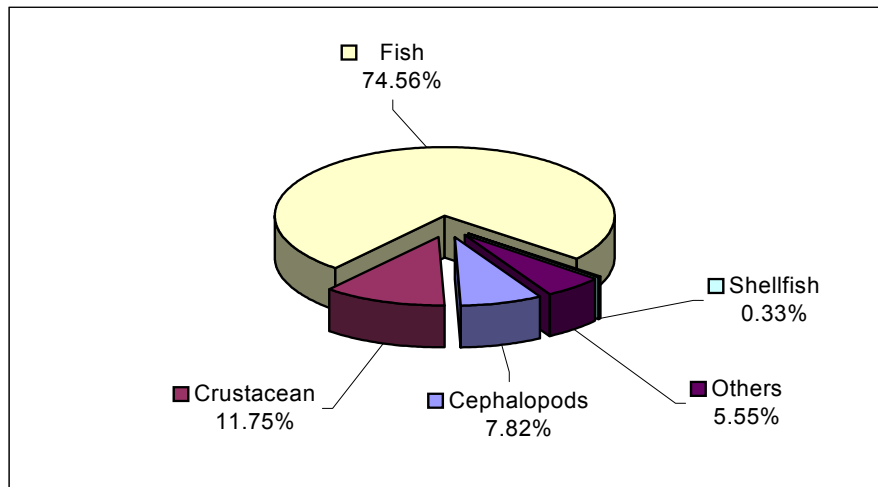


Figure 6.3: Varieties of seafood

Details on import of fishery products for consumption by country of origin are presented in figure 6.4

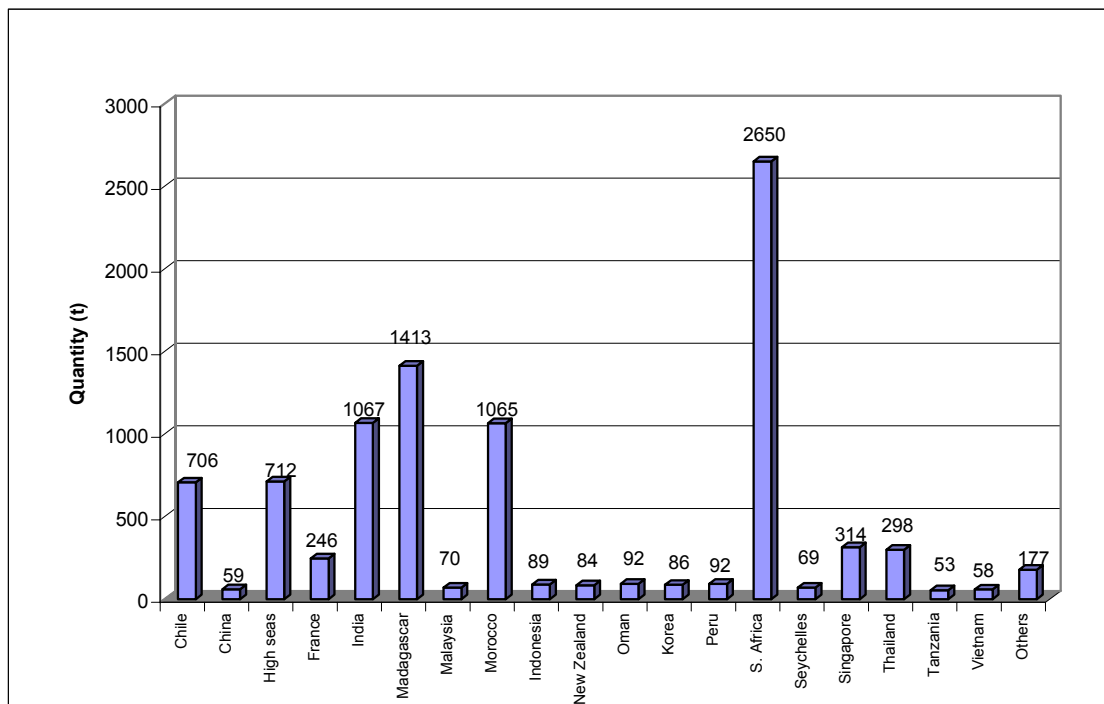


Figure 6.4: Import of fish and fish products by country of origin

6.3.1.1 Chilled seafood

Chilled seafood was mainly imported from India, Belgium, France and Seychelles. The finfish imported comprised salmon, capitaine, sole, trout, vacoas and sacrechien; the crustaceans comprised giant freshwater prawns (rosenbergii), shrimps and lobsters; cephalopods and shellfish comprised squid, oyster, mussel, clams and scallop. Import of chilled seafood amounted to 44 tonnes. Details of the import of chilled seafood are shown in table 6.9.

Table 6.9: Import of chilled seafood (t)

Product Year	Fish	Crustacean	Shellfish	Squid	Total
1999	14	58	3	7	82
2000	28	56	3	5	92
2001	16	28	3	1	48
2002	21	27	5	3	56
2003	21	14	8	1	44

6.3.1.2 Chilled processed seafood

Chilled processed seafood are fishery products that have undergone a certain amount of preparation and processing. These products included “roll mop”, “rape de mer”, “terrines de poisson”, “jambon de mer”, “batonnet de crabe”, “oeuf de lompe”, fish sticks, fish cakes and “crevette rose” which were imported from France, UK and Germany. Imports for the year amounted to 14 tonnes.

6.3.1.3 Frozen seafood

Imported frozen seafood for direct consumption amounted to 4 480 tonnes . These products were imported mainly from India, Oman, Madagascar, South Africa, New Zealand, Vietnam, Tanzania, Australia, France, Mauritius Free Port and fishing vessels calling at Port-Louis. Details of import for the past five years are presented in table 6.10.

Table 6.10 Import of frozen seafood (t)

Product Year	Fish	Crustacean	Cephalopod	Shellfish	Total
1999	3 088	638	669	5	4 400
2000	3 809	803	1 003	17	5 632
2001	2 879	1 075	1 013	24	4 991
2002	2 141	819	1 005	19	3 984
2003	2 690	991	776	23	4 480

The species composition of frozen fish imported is shown in figure 6.5. Finfish commonly imported were capitaine, boarfish, cateau, marlin, oil fish, sail fish, sea bream and tuna. By-catch from tuna longline fishing vessels purchased by the Mauritius Fishermen Cooperatives Federation (MFCF) Ltd comprised tuna, oil fish, sailfish, moonfish, marlin, becune and dorade.

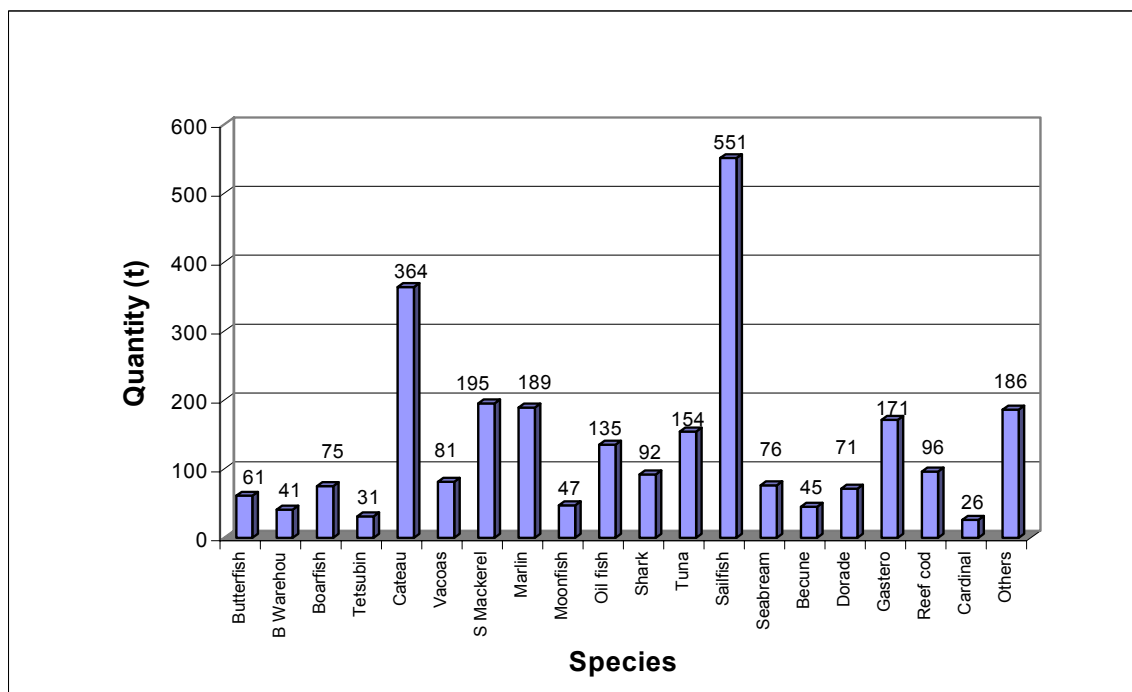


Figure 6.5: Import of frozen fish

6.3.1.4 Frozen processed seafood

Frozen processed seafood was imported from South Africa, China, Singapore, Thailand and France. It included fish fingers, fish cakes, fish fillets, fish ball and other breaded products. The total import amounted to 1 041 tonnes compared to 1 585 tonnes in 2002, representing a decrease of 34 %.

6.3.1.5 Dried seafood

Dried fish and fishery products were imported from India, China, and Singapore. The total import for the year amounted to 295 tonnes. Details are presented in table 6.11.

Table 6.11: Import of dried seafood (t)

Product Year	Fish	Bombay duck	Squid, cuttlefish	Octopus	Prawn	Others	Total
1999	1	314	2	38	94	2	451
2000	1	157	0	50	119	0	327
2001	5	178	1	27	91	2	304
2002	2	154	1	38	105	0	300
2003	4	157	1	0	132	1	295

6.3.1.6 Smoked seafood

Smoked fish and fish products, amounting to 13 tonnes in all, were imported from France and Australia for the supermarkets, hotels and restaurants. Smoked fish comprised “hareng”, trout, salmon, haddock and mackerel.

6.3.1.7 Canned seafood

Canned fish and fish products such as sardines, pilchards, mackerels and tunas were imported from Morocco, Chile, Peru, South Africa, Thailand, China, France and the UK. With the exception of tuna, these products are not produced locally. Morocco was the main country for the supply of canned sardines while Chile and South Africa were the main suppliers of canned pilchards. A total

of 3 502 tonnes of canned seafood was imported during the year. Details on canned seafood imported for the past five years are presented in table 6.12.

Table 6.12: Import of canned fish (t)

Product Year	Sardines	Pilchards	Mackerel	Tuna	Others	Total
1999	810	1 231	535	1	6	2 583
2000	1 042	1 755	708	30	15	3 550
2001	1 126	1 302	606	16	30	3 080
2002	1 115	1 490	679	31	11	3 326
2003	1 073	1 360	742	243	84	3 502

(others: anchovy, dace, hareng and salmon)

6.3.1.8 Live crustaceans

Live crab and lobster were imported from India, South Africa, Australia and Madagascar and amounted to 13.7 tonnes.

6.3.1.9 Live ornamental fish

A total of 408 956 units of live fresh water ornamental fishes were imported from Singapore, Malaysia and Hong Kong. Common aquarium fish include gold fish, tetra, guppies, mollies, cichlids and terrapins.

6.3.1.10 Fish meal

A total of 501 tonnes of dried fish meal was imported from South Africa for the manufacture of animal feed.

6.3.2 Export of fish and fish products

6.3.2.1 Export of chilled fish

A quota of 36 tonnes was set for export of chilled fish to Reunion. Three companies have approved status for such exports. The total export amounted to 25 tonnes and consisted of vieille rouge (*Epinephelus fasciatus*), croissant queue blanc (*Variola albimarginata*), vieille laboue (*Epinephelus morrhua*) and sacréchien (*Pristipomoides filamentosus* and *Etelis carbunculus*).

6.3.2.2 Export of ornamental fish

Two companies exported live ornamental marine fish to Japan, Reunion, USA, Seychelles, Hong Kong, UK, Germany, and France. A total of 4 098 units of marine fish were exported.

6.3.3 Fish processing

6.3.3.1 Canned tuna

The local cannery processed 46 626 tonnes of raw materials. The amount of canned tuna and by-products produced is shown in table 6.13.

Table 6.13: Production of canned tuna and its by-products (t)

Product \ Year	1999	2000	2001	2002	2003
Canned tuna	12 651	18 263	26 012	28 873	30 523
Pet food	2 593	1 910	2 570	3 204	3 441
Total	15 244	20 173	28 582	32 077	33 964

Most of the canned tuna is exported to the European countries. About 643 tonnes of canned tuna were put for sale on the local market. Export and local sale of the produce for the past five years is presented in table 6.14.

Table 6.14: Export and local sale of canned tuna and pet food (t)

Product \ Year	1999		2000		2001		2002		2003	
	Local	Export	Local	Export	Local	Export	Local	Export	Local	Export
Canned tuna	1 081	11 753	936	17 713	976	25 797	1 083	27 411	643	30 787
Pet food	139	2 216	126	2 074	167	2 482	179	2 951	183	3 301
Total	1 220	13 969	1 062	19 787	1 143	28 279	1 262	30 362	826	34 088

6.3.3.2 Salted fish

Two companies are engaged in the production of salted snoek from frozen barracouta (*Thyrsites atun*). The amount produced was 717 tonnes. Details of the import of raw materials, production of snoek and their sale for the past five years are presented in table 6.15.

Table 6.15: Import, production and sale of salted fish (t)

Year	1999	2000	2001	2002	2003
Import of barracouta	1 455	1 229	1 223	1 115	1 105
Production of snoek	779	787	841	770	717
Local sale of snoek	664	747	761	710	632

6.3.3.3 Fish meal production

One company was involved in fish meal production. The raw materials consisting of parts of the fish that are not used in the canning process are obtained from the tuna cannery. In addition some trash fish were imported from South Africa. All fish meal produced by the company was used in the manufacture of livestock feeds. A total of 5 189 tonnes of fish meal was produced and details of production production for the last five years are given in table 6.16.

Table 6.16: Production of fish meal (t)

Year	1999	2000	2001	2002	2003
Production	2 551	3 300	4 143	5 114	5 189

6.4 Fish production, consumption and trade balance

6.4.1 Total fish production

A decrease of the total fish production from the artisanal fishery, the shallow water banks fishery and the demersal trawlers was noted in 2003. The total annual fish production by different fisheries is given in table 6.17.

Table 6.17: Fish production in tonnes (fresh-weight equivalent)

Sector	Type	1999	2000	2001	2002	2003
Artisanal fishery						
Mauritius	Fresh	1 225	1 360	1 075	1 302	1 166
Rodrigues	Fresh	1 500	1 500	1 937	1 404	1 664
Agalega	Fresh	30	30	30	30	30
Sports fishery	Fresh	650	650	650	650	650
Amateur fishery	Fresh	300	300	300	300	300
Barachois	Fresh	10	5	6	7	6
Ponds (prawn and fish)	Fresh	71	82	52	39	27
Sub-total		3 786	3 927	4 050	3 732	3 843
Offshore demersal fishery:						
Shallow water banks	Frozen	4 297	4 303	3 366	3 943	3 713
Banks deep water snappers	Frozen	0	55	329	5	---
St Brandon inshore	Frozen	423	332	409	380	498
	Salted	134	165	148	111	80
Semi-industrial chilled fish	Chilled	172	185	188	204	234
Tuna fishery	Frozen	3 304	417	0	219	1 118
Sword fish fishery	Chilled	---	21	87	45	111
Demersal trawlers	Frozen	---	---	2 184	2 113	1 806
Sub-total		8 330	5 478	6 711	7 020	7 560
Total		12 116	9 405	10 761	10 752	11 403

6.4.2 Per capita consumption of fish

Per capita consumption of fish has shown a gradual increase up to 2000 when it was 23.3 kg. It has decreased during the past years and stood at 18.7 kg in 2003. The annual per capita consumption of fish for recent years is given in table 6.18.

Table 6.18: Per capita consumption of fish (kg)

Year	Quantity
1999	20.6
2000	23.3
2001	19.9
2002	20.0
2003	18.7

6.4.3 Trade balance in relation to total imports and exports

The import and export of fish and fish products and trade balance are given in table 6.19. It is observed that in 2003 a positive value of 618.3 million rupees is noted. This was due to an increase in the exported value.

Table 6.19: Import and export of fish and fish products and trade balance

Year	Import		Export		Balance
	Qty (t)	Value (MR)	Qty (t)	Value (MR)	Value (MR)
1999	30 339	793.1	15 206	971.2	178.1
2000	42 146	1057.9	18 151	961.5	-96.4
2001	52 050	1754.3	27 381	1 840.8	86.5
2002	63 032	3984.7	49 560	4081.0	249.0*
2003	62 323	2560.1	48 719	3 178.4	618.3*

* Data for 2002 and 2003 include operations carried out in the Free Port
MR – Million rupees

7. FISHERIES PLANNING

7.1 Fishing Agreement with the European Union

The Fifth Protocol of the fishing agreement between Mauritius and the European Union was negotiated and agreed in September 2003. It defines the fishing possibilities, licence fees and financial compensation for the period 03 December 2003 to 02 December 2007. The fourth protocol ending on 02 December 2002 was exceptionally extended on a pro-rata basis for a period of one year till 02 December 2003. Table 7.1 shows some of the essential components of the fourth protocol compared to the fifth protocol.

Table 7.1: Some essential components of the fisheries protocol

SN	Essential components	Fourth protocol (1999 – 2002)	Fifth protocol (2003 – 2007)
1	Fishing possibilities	Number of tuna seiners	43
		Number of surface longliners	40
		vessels fishing by line	average 25 GRT/month
2	Licence fee	Tuna seiner	1 750 €
		Longliner (>150GRT)	1 375 €
		Longliner (<150GRT)	1 000 €
		Vessel fishing by line	80 €/GRT
3	Financial compensation	Catch on which compensation is based	5 500 t
		Total financial compensation	618 750 €
		Scientific and technical programmes	543 750 €
		Study grants and practical training	75 000 €
		Overall financial compensation	1 237 500 €

GRT: Gross Registered Tonnage

7.2 Fishing Agreement with Japan

The Fishing Agreement between Mauritius and the Federation of Japan Tuna Fisheries Cooperative Associations expired in November 2003. Under this agreement, 11 licences, valid for a period of one year were issued.

7.3 Southern African Development Community (SADC)

The Regional Indicative Strategic Development Plan of SADC which provides for guiding principles and orientations for the sustainable management and development of the fisheries sector for the next 10 to 15 years was finalised during the year. The three key areas highlighted were:

- Regional Fisheries Information System,
- Regional Fisheries Training,
- Aquaculture for Local Community Development

7.4 Food and Agricultural Organisation (FAO) / Technical Assistance Programme

A study for the evaluation of the fisheries potential and the development of a management plan for the sustainable exploitation of the fishery resources in St. Brandon was approved by the FAO. The FAO deputed a Senior Fisheries Officer of the Marine Resource Service to Mauritius in October 2003 to discuss project details.

7.5 Technical Assistance from Kuwait Fund for Arab Economic Development

A request was made to the Kuwaiti Authorities for Technical Assistance to carry out feasibility studies in the following:

- (i) Development of a longline fishery for the Republic of Mauritius, and
- (ii) Oyster and pearl culture

7.6 Committee on World Food Security

The FAO commissioned a study on Food Security in Mauritius and Rodrigues. Inputs on the contribution of fish to food security were provided.

7.7 South West Indian Ocean Fisheries Commission

The Second Intergovernmental Consultation held in 2002 recommended the establishment of a regional fishery body under the FAO to address issues related to management and development of non-tuna resources in the South West Indian Ocean. The process was ongoing.

7.8 Seafood Hub

A joint public/private sector initiative on the seafood hub was initiated. The seafood hub will be an efficient and attractive environment for the supply of value added processes and services related to the sourcing and marketing of seafood products.

7.9 Fish quality assurance

A Technical Cooperation Agreement establishing norms for the inspection and certification of fish and fish products between the Ministry of Fisheries and the South African Bureau of Standards was under preparation. The agreement would enable access of Mauritian fish and fishery products to South Africa.

7.10 Vessel Monitoring System (VMS)

A feasibility study for the setting up of a VMS was carried out by consultants of the firm Navigis s.a.r.l.

7.11 World Trade Organisation (WTO)

The Ministry of Fisheries has taken position on issues pertaining to fisheries as listed below:

- The Rules of Origin as framed out in the Cotonou Agreement have been revisited and proposals with a view to making them less stringent and more development oriented for the negotiation of the Economic Partnership Agreement were submitted to the European Commission in Brussels.
- The short- term strategy of the Commonwealth Secretariat on the implication of WTO Rules on subsidies and countervailing measures for the ACP/EU fisheries negotiations was agreed upon.
- The Commonwealth Secretariat conducted a study on “Trade Impact Assessment on ACP Canned Tuna” for Mauritius following the WTO decision of a Tariff Rate Quota of 25 000 tonnes of canned tuna to Thailand, Philippines and Indonesia at 12% rate duty instead of the existing 24% Most Favoured Nation rate.
- The short-term strategy of the Commonwealth Secretariat on policies which need to be put in place to minimise adverse effects of the WTO decisions on ACP canning states was supported.

8. FISHERIES PROTECTION SERVICE

Twelve fisheries posts were operational around Mauritius. Staff of the service attached to former fisheries posts at Grand Gaube and Pointe Aux Sables operated from Poudre d'Or and Port Louis Fisheries Posts respectively. In addition, enforcement duties were also carried out by flying squads.

8.1 Registration of artisanal fishers

The total number of registered artisanal fishers in 2003 was 2 383 compared to 2 445 in 2002. During the year 56 fishers were deregistered. Details of registered fishers by category and region are presented at table 8.1.

Table 8.1: Categories of artisanal fishers

District	Net	Basket trap	Line	Basket trap & line	Others	Total
Port Louis	0	3	68	48	0	119
Pamplemousses	6	14	166	181	1	368
Riviere du Rempart	33	37	72	302	0	444
Flacq	43	13	38	199	31	324
Grand Port	37	23	55	417	2	534
Savanne	9	10	35	137	5	196
Black River	59	19	111	190	19	398
Total	187	119	545	1 474	58	2 383

8.2 Registration of boats

The number of registered boats as at 31 December is shown in table 8.2. During the year 205 new boats were registered and revenue collected amounted to Rs 5 125. The registration fee per boat is Rs 25.

Table 8.2: Number of registered boats

District	Artisanal fishing	Sand carrier	Pleasure boat	Big game	Total
Port Louis	180	0	89	0	269
Pamplemousses	334	0	594	25	953
Riviere du Rempart	402	53	261	0	716
Flacq	406	9	122	2	539
Grand-Port	538	48	388	1	975
Savanne	101	0	46	1	148
Black-River	352	0	470	21	843
TOTAL	2 313	110	1 970	50	4 443

8.3 Licences and permits

The number of different types of licences and permits active as at December is presented in table 8.3.

Table 8.3: Number of licences and permits

District	Licences			Permit
	Large -Net	Gill-Net	Fishmonger	Bait-Gear
Port Louis	0	0	189	29
Pamplemousses	1	0	101	49
Riviere du Rempart	4	0	102	11
Flacq	4	1	84	33
Grand Port	3	2	143	75
Savanne	1	1	19	22
Black-River	6	2	133	50
Total	19	6	771	269

The quarterly licence fees for large net and gill net were Rs 50 and Rs 25 respectively. The annual fishmonger's licence fee was Rs 200 for individuals and Rs 1 000 for companies. No fee was charged against the issue of a bait gear permit.

8.4 Illegal fishing

The Fisheries Protection Service ensures compliance with the fisheries legislation. Enforcement is effected through patrols at sea and on land and is followed by legal proceedings. The number of convicted cases is presented in table 8.4.

Table 8.4: Convicted cases

Year	Underwater fishing	Net fishing	Others	Fines paid (Rs)	Length of net seized (m)
1999	19	40	43	69 400	6 438
2000	63	96	105	183 050	4 103
2001	10	9	24	138 500	2 064
2002	59	87	80	105 000	2 396
2003	12	16	47	54 200	5 570

8.5 Allowances to artisanal fishers

Registered artisanal fishers were paid an allowance for bad weather days on a monthly basis. A bad weather day for fishing is determined by the Meteorological Services. Details of payment are presented in table 8.5 (a).

Table 8.5 (a): Bad weather allowance

Year	No. of days	Rate (Rs)	Beneficiaries	Total (Rs)
1999	101	90	1 884 – 2 225	21 566 340
2000	119	95-105	2 027 – 2 256	25 365 295
2001	111	105-115	1 946 – 2 272	26 598 135
2002	142	115-125	2 118 – 2 319	38 569 430
2003	114	125-130	2 121 – 2 363	32 809 255

Large and gill nets are not allowed to operate during the close season in January, February, October, November and December. During that period net fishers were paid an allowance as presented in table 8.5 (b).

Table 8.5 (b): Close season allowance

Year	No. of days	Rate (Rs)	Beneficiaries	Total (Rs)
1999	113	90	248 - 289	2 680 180
2000	129	95-105	249 - 209	2 924 850
2001	119	105-115	208 - 190	2 595 691
2002	122	115-125	189 - 184	2 730 100
2003	123	125-130	179 - 184	2 849 250

A registered fisher is entitled to a sick leave allowance when admitted to a hospital or clinic for at least 14 days. Such allowance paid is presented in table 8.5 (c).

Table 8.5 (c): Sick leave allowance

Year	Rate (Rs)	Beneficiaries	Total (Rs)
2000	90-105	3	2 800
2001	105-115	Nil	Nil
2002	115-125	2	3 220
2003	125-115	4	7 210

8.6 Incentives to registered fishers

The Fishermen Welfare Fund disbursed an amount of Rs 877 500 as scholarship allowance to children of registered artisanal fishers, details of which are shown in table 8.6.

Table 8.6: Scholarship allowance

Education Level	Beneficiaries	Amount (Rs)
Certificate of Primary Education	124	558 000
School Certificate	18	166 500
Higher School Certificate	9	153 000
TOTAL	151	877 500

Duty concessions on outboard motors were granted to 102 fishers of which 91 were for main outboard motors and 17 for spare outboard motors. Every registered artisanal fisherman is entitled to one main outboard motor every three years and one spare outboard motor every five years.

Since the creation of the Small Fishermen Loan Scheme in April 1998, the Development Bank of Mauritius lent a total sum of Rs 51 601 305 to 552 fishers at an interest rate of 3% per annum.

8.7 Buy-back scheme for nets

The implementation of the buy-back scheme for the reduction of net fishing was pursued. Details for the last five year are presented in table 8.7.

Table 8.7: Surrender of net in Mauritius

Year	Fishermen compensated	No. of nets surrendered	Compensation paid to fishermen	Compensation paid to net owners	Total amount paid (Rs)
1999	35	2	925 000	460 000	1 385 000
2000	62	1	2 300 000	0	2 300 000
2001	18	0	575 000	0	575 000
2002	20	1	800 000	230 000	1 030 000
2003	2	0	100 000	0	100 000
Total	137	4	4 700 000	690 00	5 390 000

The number of active net fishermen was 187; they operated 19 large nets and 6 gill nets.

8.8 Banks fishermen

A total of 1 124 fishermen were registered as at December 2003. However, only 401 fishermen, including frigo-boys, went on fishing trips during the year. As to date, 848 fishermen have followed the bank fisherman training course on the banks fishery at the Sea Training School.

9. MISCELLANEOUS

9.1 Rodrigues Pesticides Monitoring Project

Two officers went to Rodrigues from 24 September to 02 October to finalise the choice of pesticide monitoring sites and to complete the training of the staff of the Fisheries Research and Training Unit (FRTU) in the pre-treatment of samples for pesticide analysis.

9.2 Environmental standards

The AFRC, which forms part of the Standards Committee under the Ministry of Environment, contributed in the review and finalisation of the Environment Protection (Effluent Discharge Permit) Regulations 2003 under the Environment Protection Act. Those regulations are for the control of discharge of effluents by industries.

9.3 Oceanographic cruises

Three officers participated in a research expedition as observers on board the *R/V Odyssey* from 01 November to 07 December. The objectives of the expedition were to perform biopsies on sperm whales for analysis and collect baseline data on the levels and distribution of contaminants in top level predators such as whales and predatory fishes.

9.4 Attachments

Four students from the University of Mauritius were on attachment to the centre for 6 weeks under the Student Work Experience Programme (SWEP).

One graduate was attached to the centre under the work experience scheme set up by the Ministry of Finance, which allows acquisition of hands-on experience in various fields.

9.5 Construction of slipway at Baie du Tombeau

The construction of a slipway at a cost of Rs. 1 595 000 at Baie du Tombeau started in September. It was completed in December under the supervision of the Ministry of Public Infrastructure, Land Transport and Shipping.

9.6 Conversion of fish landing station into Fisheries Post at Baie du Tombeau

The conversion of the fish landing station at Baie du Tombeau into a Fisheries Post started in January. It was completed in May. The cost of the project was Rs. 287 992.

9.7 Fisheries newsletter

The sixth issue of the Fisheries Newsletter was distributed in April.

9.8 Visits

The Minister of Fisheries of Sri Lanka Hon. Mahindra Wijesekara and his delegation visited the AFRC on 14 July. He showed keen interest in the work of the centre and looked forward to closer collaboration between the fisheries departments of Sri Lanka and Mauritius.

The documentation unit organised and coordinated visits for 5 894 persons at the centre. The majority of the visitors were students from primary and secondary schools. Table 9.1 shows the number of visitors by type of institution.

Table 9.1: Visits to AFRC

Institutions	Number
Pre-primary schools	390
Primary schools	2 084
Secondary schools	1 645
Social organisations/welfare centres	1 128
Pre-vocational institutions	388
Governmental/parastatal organisations	78
Others (tourists, private firms, UOM students)	181
Total	5 894

9.9 Sales of publications

Sales of publications published by the Ministry of Fisheries including maps, posters, guides and charts generated a sum of Rs. 97 245. (See Appendix 9 for list of publications on sale).

9.10 Internet and e-mail

Internet facilities were provided to all staff so as to keep them abreast of new developments in their field of interest. E-mail services which remained centralised in the library, continued to offer timely services to officers.

9.11 Information service

The Documentation Unit welcomed and extended its help to members of the public looking for information on fisheries and marine affairs. Most of them were university students, consultants or stakeholders in the marine sector.

9.12 New library holdings

An acquisition list was produced on a monthly basis and circulated among all staff to make them aware of new reading and reference materials available in the library.

9.13 Website of the Ministry

The website of the Ministry of Fisheries was constantly updated. Information was gathered from different divisions and submitted to the webmaster at the Central Information Service Division (CISD) to reflect new changes.

9.14 ODINAFRICA II project

The Ocean Data and Information Network for Africa (ODINAFRICA) is a data and information project working towards establishing a lasting network of marine and aquatic institutes in Africa. The National Oceanographic Data Centre (NODC) created under the above project held several meetings to coordinate activities of the project. A workshop on the theme “The Way Forward” was organised in February to identify potential user requirements. On that occasion, the documentation

unit made a presentation on Marine Information Services. Our library holding was updated on a regular basis using the Inmagic/DBtextWorks software.

9.15 Open Day at the Centre

On the occasion of the International Day of Fishermen, an open day was held at the centre on 29 and 30 November. Visitors were given free access to all facilities, including hatcheries and laboratories. There were continuous film shows in the conference hall and coral viewing in the lagoon adjacent to the center. The visitors, who were estimated at over 7 000 persons, also had the opportunity to buy certain fish products at promotional prices.

9.16 Fisheries Training and Extension Centre

Further to the exchange of notes between the Government of Mauritius and that of Japan for the construction of a Fisheries Training and Extension Centre at Pointe aux Sables, the Foundation Stone of the Centre was laid by the Hon. S. Michel, Minister of Fisheries and His Excellency, Mr. Seigi Hinata, Ambassador of Japan, on 07 April. Construction works started in May and scheduled to be completed in June 2004.

9.17 Distribution of safety equipment

The Ministry made free distributions of safety equipment to registered fishers around the island in September and October. The equipment consisted of a life buoy, a radar reflector, a hand flare and a tarpaulin.

9.18 First National Ocean Science Forum

The First National Ocean Science Forum was held on 18 and 19 July at the University of Mauritius by the Mauritius Oceanography Institute with the following purpose:

- ♣ Communicate new marine research and ocean development activities in the country
- ♣ Offer a platform for multidisciplinary discussion
- ♣ Inculcate increasing understanding and public appreciation of the ocean
- ♣ Make ocean research visible, accountable and usable

Papers presented by officers from the Centre were as follows:

- ♣ Coral bleaching in Mauritius, by M.S. Koonjul, V. Mangar and J.P.Luchmun
- ♣ Distribution of juvenile fish at Tamarin and Albion – A preliminary survey, by M. Ramchurn, H. Ida, N. Satoh and M. Hurbungs
- ♣ An assessment of deep-water shrimp (*Heterocarpus*) resource in Mauritius, by V. Soondron and A. Venkatasami.
- ♣ Stomach contents analysis of some carnivorous fishes from various barachois in Mauritius, by V. Munbodhe, S. Leckraz, J.I. Mosaheb and H. Terashima
- ♣ Long-term monitoring of coliform bacteria at selected beaches, by Y. Basant Rai, R. Mokool and S. Conhye

9.19 Launching of patrol boats

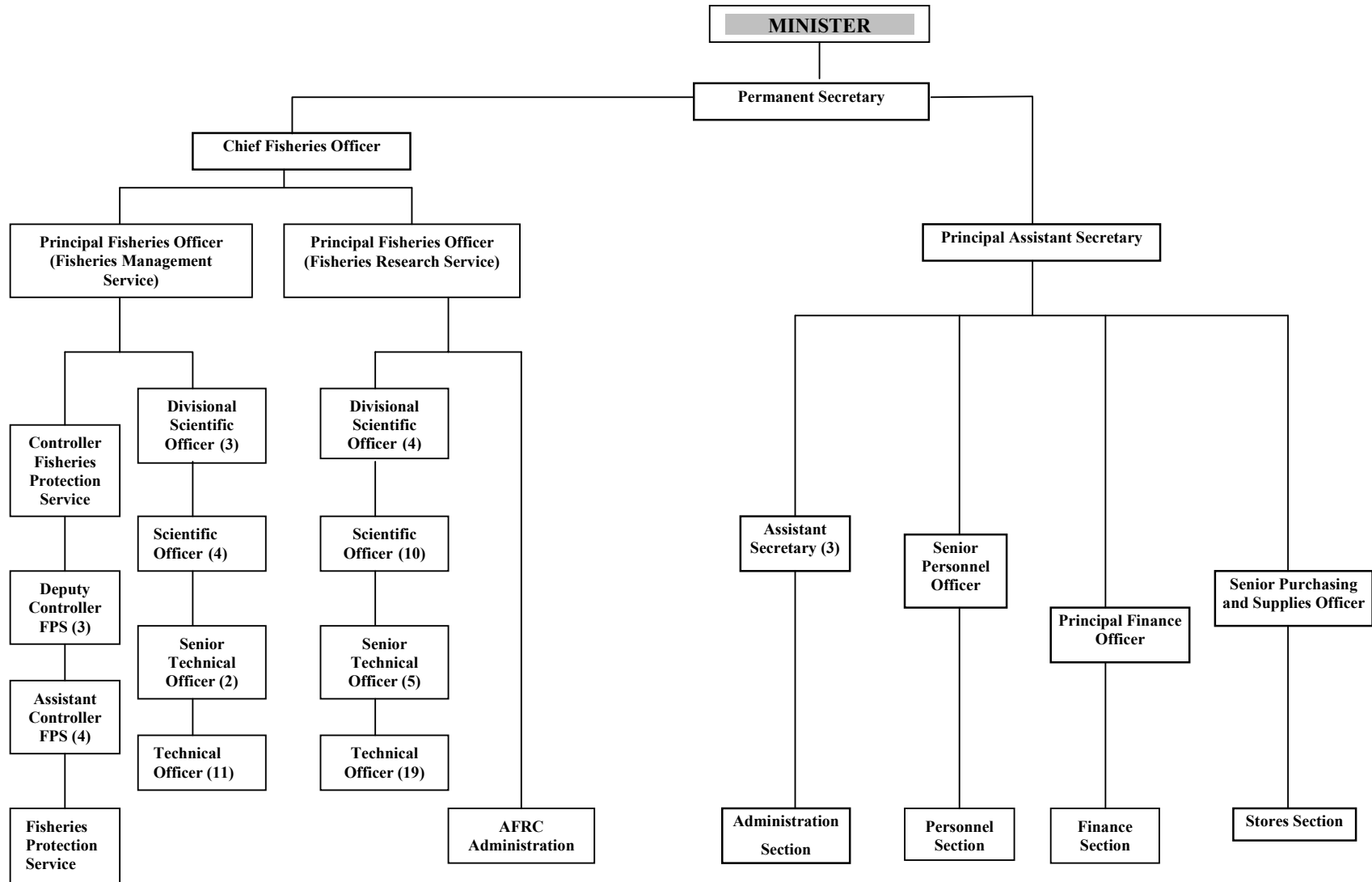
Two patrol boats, namely the FPS I and the FPS II, were launched by Hon. Minister S. Michel on 16 January. The boats were donated under the IFAD project for the control and monitoring of fishing activities around FADs.

9.20 Staff departure

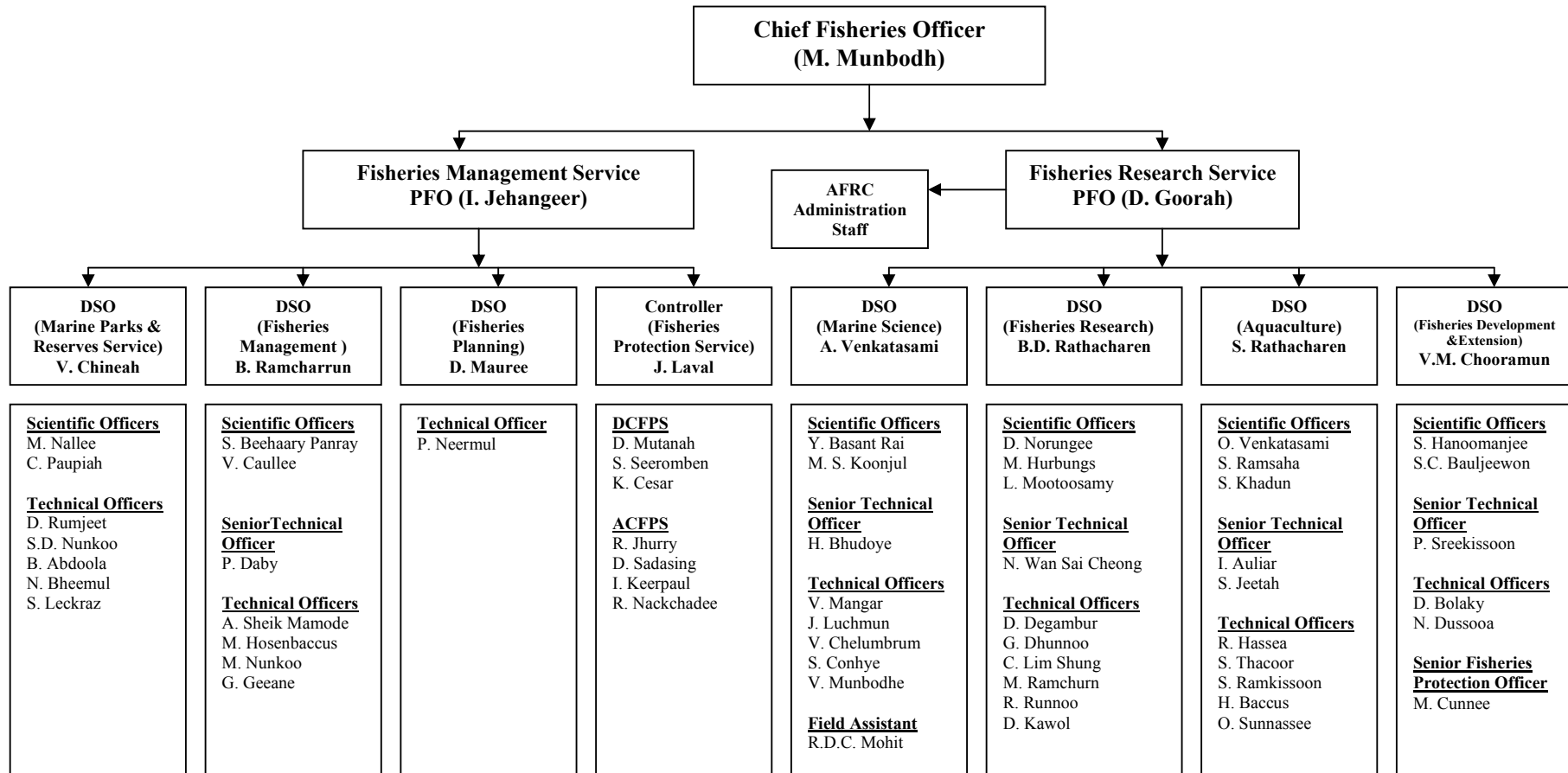
Mr. T. Yokokawa, Japanese expert attached to the centre for the last two years, departed at the expiry of his contract in September. He worked as Fisheries Planner for the Ministry.

Mr. J. Mosaheb, advisor, left after having worked for almost eight years at the Centre.

Appendix 1: Organigram of the Ministry of Fisheries

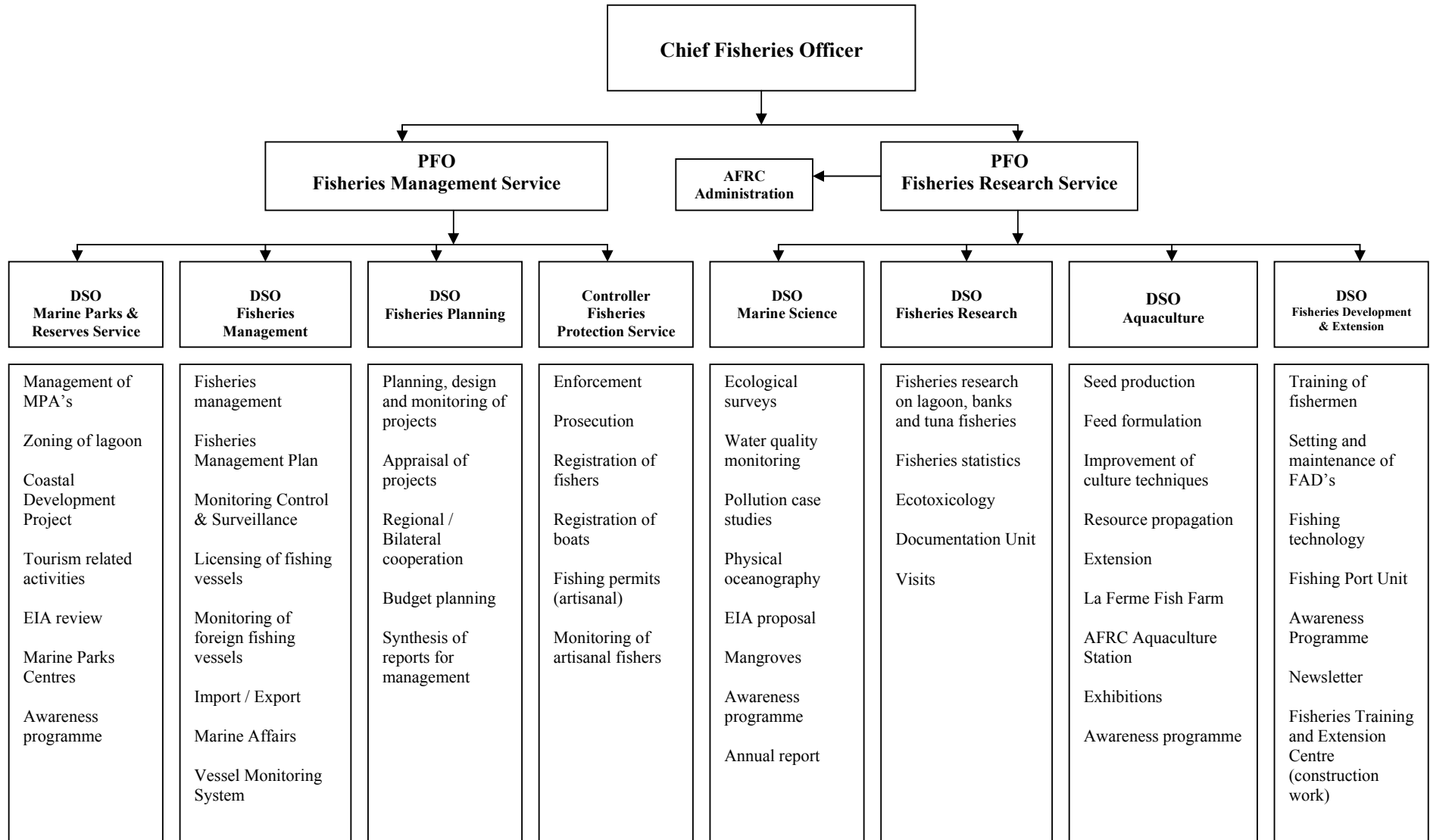


Appendix 2: Organigram of the technical services



PFO: Principal Fisheries Officer
 DSO: Divisional Scientific Officer
 CFPO: Chief Fisheries Protection Officer
 DCFPS: Deputy Controller, Fisheries Protection Service
 ACFPS: Assistant Controller, Fisheries Protection Service
 TO: Technical Officer
 FA: Field Assistant

Appendix 3: Technical services staff activities



Appendix 4: List of staff and qualifications

Name	Title	Qualifications
M. Munbodh	CFO	B.Sc. Joint (Hons) Botany and Zoology (UK), M.S. Marine Resources Management (USA)
M.I. Jehangeer	PFO	B.Sc. (Hons) Botany and Zoology (E. Africa), Diploma in Education (E. Africa), Master of Marine Affairs (USA)
D. Goorah	PFO	B.Sc. (Hons) Zoology, M.Sc. Zoology - Specialised in Fish Biology (India)
V. Chineah	DSO	B.Sc. (Hons) Microbiology, Chemistry and Zoology (India)
A. Venkatasami	DSO	M.Sc. Engineer in Mechanics - Specialised in Industrial Fishing; Deep-sea Navigator (USSR)
B. Ramcharrun	DSO	M.Sc. Engineering - Specialised in Fish Technology (USSR), Post Graduate Diploma in Fish and Fishing Technology (Norway)
D. Gangapersad	DSO	M.Sc. Ichthyology and Fish Culture (USSR)
B.D. Rathacharen	DSO	M.Sc. Engineering, - Specialised in Fish Technology (USSR)
S. Rathacharen (Mrs.)	DSO	M.Sc. (Hons) Engineering - Specialised in Ichthyology and Fish Culture (USSR)
D. Mauree	DSO	M.Sc. Economics - Specialization in Economics and Industrial Planning of Food Products (Fisheries) - (USSR), M.Sc. Fisheries Policy and Planning (UK)
V.M. Chooramun	Ag. DSO	M.Sc. Engineering - Specialization in Fish Technology (USSR)
M. Nallee	SO	M.Sc. Economics and Industrial Planning of Food Products (Fisheries) - (USSR)
S. Soondron	SO	Bachelor of Fisheries Science (India), M.Sc. Fisheries Science (UK)
Y. Basant Rai (Mrs.)	SO	B.Sc. (Hons) Zoology, M.Sc. Zoology – Specialised in Cell Biology (India)
D. Norungee	SO	B.Sc. (Chemistry, Botany and Zoology), M.Sc. Zoology - Specialised in Entomology and Fishery Biology (India)
S. Hanoomanjee	SO	B.Sc. (Hons) Zoology (India), M.Sc. Nematology (UK) DIC, Diploma of the Imperial College (UK)
M.D. Hurbungs (Mrs.)	SO	B.Sc. (Hons) Zoology, M.Sc. Zoology – Specialised in Fisheries and Limnology (India)
O. Venkatasami (Mrs.)	SO	M.Sc. Engineering - Specialised in Technology of Fish Products (USSR).
S.P. Beeharry Panray	SO	B.Sc. (General) Chemistry, Botany and Zoology, M.Sc. Zoology - Specialised in Fish and Fisheries Science (India), Trainers Course in Vocational Training (Mauritius)
S. Ramsaha	SO	B.Sc. (General) Chemistry, Botany and Zoology, M.Sc. Zoology (India), P.G.C.E Agriculture (Mauritius)

S.C. Bauljeewon	SO	B.Sc. (General) Botany, Zoology and Chemistry, M.Sc. Zoology – Specialised in Aquatic Biology and Fisheries (India)
S. Khadun	SO	B.Sc. (General) Chemistry, Zoology and Botany, M.Sc. Zoology (India)
V. Caullee	SO	B.Sc. Chemistry, Botany and Zoology, M.Sc. Zoology (India)
C.N. Paupiah	SO	B.Sc. (Hons) Zoology (India), M.Sc Applied Marine Science (UK)
M.S. Koonjul (Mrs.)	SO	B.Sc. (Hons) Zoology, M.Sc. Marine Zoology (India)
R. Moothien Pillay (Mrs.)	SO	B.Sc. Zoology (India), Postgraduate Diploma in Tropical Marine Ecology and Fisheries Biology (Australia)
L.L. Mootoosamy	SO	B.Sc. Zoology (India); Certificate in Animal Production (Mauritius)
Y.T.N. Wan Sai Cheong	STO	Diploma in Agriculture, Fisheries and Natural Resources. (Mauritius)
P. Daby	STO	Diploma in Agriculture, Fisheries and Natural Resources. (Mauritius)
I. Auliar (Mrs.)	STO	B.Sc. (Hons) Zoology (India), Postgraduate Diploma in Tropical Marine Ecology and Fisheries Biology (Australia)
P.S. Sreekeessoon	STO	B.Sc. (Hons) Zoology (India)
S. Jeetah	STO	B.Sc. (Hons) Zoology (India)
H. Bhudoye	STO	B.Sc (Hons) Zoology (India)
P. Neermul	STO	B.Sc. (General) Botany, Chemistry and Zoology (India)
A. Sheik Mamode	TO	B.Sc. Zoology (India)
D. Rumjeet	TO	B.Sc. Zoology (India)
V. Mangar	TO	B.Sc. Zoology (India)
M.R. Hossen Baccus	TO	B.Sc. (Hons) Zoology (India)
D. Degambur	TO	M.Sc. Biology, Specialised in Aquatic Bioresources, Ichthyology and Aquaculture (USSR)
J. P. Luchmun	TO	B.Sc. (Hons) Botany, M.Sc. (Hons) Botany (India)
G. Dhunnoo	TO	B.Sc. (General) Zoology, Botany and Chemistry (India), Certificate in Animal Production (Mauritius)
D. Bolaky	TO	B.Sc. (General) Chemistry, Zoology, Botany, B.Ed. (Education) Post Graduate Diploma in Personnel Management and Industrial Relation (India)
S.D. Nunkoo (Mrs.)	TO	B.Sc. (General) Botany, Chemistry and Zoology (India)
B.I.A.M. Abdoola	TO	B.Sc. (General) Chemistry, Botany and Zoology (India)
M. Nunkoo	TO	B.Sc. (General) Botany, Zoology, Chemistry (India)
D. Kulputeea	TO	B.Sc. (General) Zoology, Chemistry and Botany (India)
S.D. Thacoor (Mrs.)	TO	B.Sc. (Hons) Botany (India.)

R. Hassea	TO	B.Sc. (General) Zoology, Chemistry and Botany (India)
S. Ramkissoon	TO	B.Sc. (General) Chemistry, Botany and Zoology (India)
H. Baccus	TO	B.Sc. (General) Chemistry, Botany and Zoology (India)
N. Dussooa	TO	Diploma in Fisheries (Mauritius)
N. Bheemul	TO	Diploma in Fisheries (Mauritius)
O. Sunassee	TO	Diploma in Fisheries (Mauritius)
C. Lim Shung (Mrs)	TO	Diploma in Fisheries (Mauritius)
S. Conhye	TO	Diploma in Fisheries (Mauritius)
M. Ramchurn	TO	Diploma in Fisheries (Mauritius)
V. Chelumbrun (Mrs)	TO	Diploma in Fisheries (Mauritius)
R. Runnoo	TO	Diploma in Fisheries (Mauritius)
S.K. Leckraz	TO	B.Sc. Zoology (India)
G. Geeane	TO	Diploma in Fisheries (Mauritius)
M.B. Codabaccus	TO	Diploma in Fisheries (Mauritius)
R. Mokool (Mrs)	TO	B.Sc. (Hons) Biology (Mauritius)
D. Kawol	TO	Diploma in Fisheries (Mauritius)
V. Munbodhe	TO	Diploma in Fisheries (Mauritius), Bachelor of Applied Science (Environmental Science) (Australia)
R.D.C. Mohit	FA	B.Sc. Natural Resources (Fisheries & Marine Sciences) (Namibia)

Appendix 5: List of projects and services

Fisheries Research

Projects/services	Objective(s)	Main activities
Coastal fisheries	<ul style="list-style-type: none"> ◆ Maintain and update records of fishery statistics for estimation of fish landings and for coastal fishery management. 	<ul style="list-style-type: none"> ● Prepare sample survey programme. ● Collect and analyse data on coastal fish landings. ● Perform checks on landing stations. ● Collect and compile fishery statistics. ● Produce statistical bulletins.
Banks fisheries	<ul style="list-style-type: none"> ◆ Maintain and update records of data on offshore demersal fishery for estimation of yields and for provision of advice on their management. 	<ul style="list-style-type: none"> ● Collect, process and analyse log book data. ● Monitoring of fishing licenses, quotas and fish landings. ● Establish fishing quota. ● Advise fishing operators. ● Keep register of demersal fishing vessels.
Pelagic fisheries	<ul style="list-style-type: none"> ◆ Provide scientific basis for the management of tuna and bill fish. 	<ul style="list-style-type: none"> ● Collect, process and analyse tuna and sword fish data in relation to the study of stock structure, spatial distribution, migration, catch rates and biology. ● Maintain and update records of licensed tuna vessels. ● Data exchange with IOTC.
Ecotoxicology	<ul style="list-style-type: none"> ◆ Screen toxic fish. ◆ Monitor toxic fish and harmful microalgae. 	<ul style="list-style-type: none"> ● Bioassay toxicity tests with mouse; ● Collection of microalgal samples; ● Microscopic examination of microalgae.
St Brandon inshore fishery and semi-industrial chilled fish fishery	<ul style="list-style-type: none"> ◆ Determine growth parameter estimates for fish at St Brandon, Albatross, Soudan, Hawkins and small northern banks. ◆ Monitor catch and efforts of the St Brandon inshore and semi-industrial chilled fish fishery, Albatross, Soudan, Hawkins and small northern banks. ◆ Analyse data for fishery management 	<ul style="list-style-type: none"> ● Effect sampling programmes for Length/weight frequency data analysis. ● Collect, check, analyse and compile data from logbooks. ● Data entry of catch, effort, fishing positions, species, fishing days and estimate of catch per fisherman day.

Marine Science

Projects/services	Objective(s)	Main activities
Coastal Ecosystem Research	<ul style="list-style-type: none"> ◆ Monitor the coastal ecosystem. 	<ul style="list-style-type: none"> • Collect field data on substrate cover (coral, seagrass, algae, etc.). • Monitor coral spawning, coral bleaching and coral recruitment and growth, fish census and invertebrate counts. • Processing and analysis of data. • Monitor abundance of stonefish.
Coastal Environment Research	<ul style="list-style-type: none"> ◆ Monitor water quality in coastal waters. ◆ Monitor coliform bacteria at selected public beaches. 	<ul style="list-style-type: none"> • Collect water samples at sea. • Record physical parameters. • Perform chemical analysis of water. • Perform tests for coliform bacteria. • Advise on suitability of beach water for users.
Monitoring of pesticides and trace metals	<ul style="list-style-type: none"> ◆ Establish baseline on pesticides and trace metals in coastal waters. 	<ul style="list-style-type: none"> • Collect water samples in estuaries. • Record physical parameters. • Analyse water samples
Physical Oceanography	<ul style="list-style-type: none"> ◆ Study current patterns & bathymetry in the lagoon. 	<ul style="list-style-type: none"> • Collection and analysis of data on coastal waters (current patterns, depth and temperature).
Monitoring of ex-sand mining sites	<ul style="list-style-type: none"> ◆ Study impact of banning of sand mining in the lagoon 	<ul style="list-style-type: none"> • Perform underwater surveys on bottom substrate. • Estimate rate of colonisation of biota. • Perform fish census.
Mangrove propagation	<ul style="list-style-type: none"> ◆ Reafforestation of coastal areas. 	<ul style="list-style-type: none"> • Identification of potential sites. • Collection of ripe mangrove propagules. • Plantation of propagules. • Monitoring of growth & survival of mangrove seedlings.
EIA proposal	<ul style="list-style-type: none"> ◆ Prepare EIA proposals for development projects of the ministry. 	<ul style="list-style-type: none"> • Perform ecological surveys at proposed sites. • Assess & evaluate impacts • Conceive mitigating measures. • Monitor implementation of project.
Lagoon watch programme	<ul style="list-style-type: none"> ◆ Monitor sea surface temperature in the lagoon 	<ul style="list-style-type: none"> • Collect daily sea surface temperature at selected sites. • Analysis of temperature data.

Aquaculture

Projects/services	Objective(s)	Main activities
Shrimp maturation, seed production	<ul style="list-style-type: none"> ◆ Produce shrimp juveniles for resource propagation. ◆ Live feed production 	<ul style="list-style-type: none"> • Carry out maturation and induced spawning. • Spawning of <i>P. monodon</i> in captivity and larval rearing • Production of live feeds (<i>Brachionus</i> sp., <i>Nannochloropsis</i> sp., and <i>Chaetoceros</i> sp.). • Maintain pure strains of the three phytoplankton. • Release of hatchery reared juveniles in the lagoon.
Seabream seed production	<ul style="list-style-type: none"> ◆ Improve larval rearing techniques for the production of fingerlings for resource propagation. 	<ul style="list-style-type: none"> • Maintain and rear broodstock. • Hatchery operation and management. • Larval rearing of fish. • Release of hatchery reared juveniles in the lagoon.
Pond management and extension service	<ul style="list-style-type: none"> ◆ Grow-out of marine shrimp and sea bream for distribution and resource propagation. 	<ul style="list-style-type: none"> • Management of ponds. • Extension service to barachois farmers. • Release of fish and shrimp in the lagoon and follow-up activities.
Freshwater fish culture	<ul style="list-style-type: none"> ◆ Production and grow-out of berri rouge and crayfish. ◆ Provide extension service for freshwater aquaculture development. ◆ Produce seed for berri rouge/crayfish in sufficient quantity to service farmers. 	<p><u>Crayfish</u></p> <ul style="list-style-type: none"> • Rearing of broodstock. <p><u>Berri rouge</u></p> <ul style="list-style-type: none"> • Sex reversal treatment for production of all-male fingerlings. • Visual selection of advanced fingerlings. • Pond management. • Sale of seeds. <p><u>Extension service</u></p> <ul style="list-style-type: none"> • Advise fish farmers in freshwater aquaculture. • Site visits and stocking of ponds. • Exhibitions.
Seaweed culture	<ul style="list-style-type: none"> ◆ 2-years pilot phase 	<ul style="list-style-type: none"> • Preparation of terms of reference for consultancy services.
Freshwater prawn culture	<ul style="list-style-type: none"> ◆ Build-up a broodstock 	<ul style="list-style-type: none"> • Rehabilitate camaron hatchery

		• Broodstock management
--	--	-------------------------

Marine Parks and Reserves Services

Projects/services	Objectives	Main activities
Establishment of Marine Parks	<ul style="list-style-type: none"> ◆ Construction and setting up of the Blue Bay and Balaclava Marine Park Centres. ◆ Zoning of marine parks. ◆ Management of marine parks. 	<ul style="list-style-type: none"> • Co-ordination with project consultants for the construction of marine park centres. • Management of marine parks. • Delimit the different zones in the marine parks. • Monitor & maintain buoys & floats. • Enforcement of MPA regulations. • Issue of MPA permits. • Awareness of MPA's
Environment Impact Assessment (EIA)	<ul style="list-style-type: none"> ◆ Review of EIA applications 	<ul style="list-style-type: none"> • Effect site visits and surveys; • Make recommendations on EIA applications.
Bathymetry mapping	<ul style="list-style-type: none"> ◆ Production of digital maps on CD for the bathymetry of the lagoon. 	<ul style="list-style-type: none"> • Processing of available data of the CASI imagery to produce bathymetry maps of the lagoon.
Zoning of lagoon for swimming zones	<ul style="list-style-type: none"> ◆ To delimit swimming zones in the lagoon at public beaches. 	<ul style="list-style-type: none"> • Underwater surveys of swimming zones. • Prepare technical specifications and tender documents for demarcation of swimming zones. • Monitor installation of demarcation buoys and floats in the lagoon

Fisheries Planning

Projects/services	Objective(s)	Main activities
Project proposals	<ul style="list-style-type: none"> ◆ Formulate new projects 	<ul style="list-style-type: none"> • Identify needs for fisheries sector. • Prepare project write-up.
Regional/bilateral cooperation	<ul style="list-style-type: none"> ◆ Coordinate matters related to regional/bilateral issues. 	<ul style="list-style-type: none"> • Follow-up on projects. • Assist evolving of fisheries policy with respect to EU, WTO, SADC, COMESA, IOR-ARC

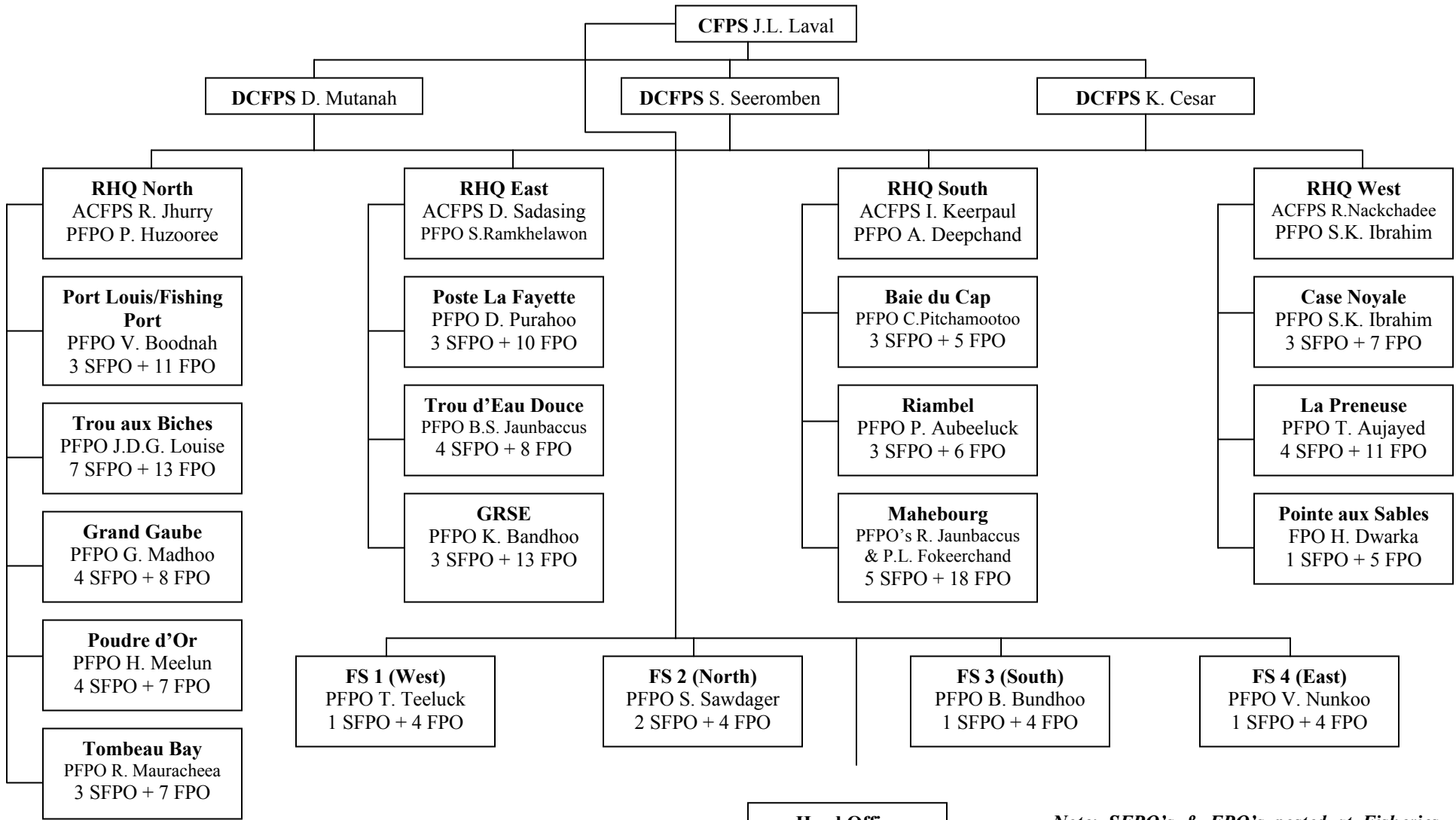
Fisheries Development and Extension

Projects/services	Objective(s)	Main activities
FAD fishery development	◆ Develop, support and maintain a FAD fishery	<ul style="list-style-type: none"> • Set and maintain FADs. • Operate and manage research vessels. • Demonstrate fishing techniques. • Monitor FAD fishery.
Fishermen training	◆ Enhance fishers' skills and knowledge in exploiting fish resources around FADs	<ul style="list-style-type: none"> • Sensitization meetings with fishers • Training of fishers • Conduct practical sessions at sea
Off-lagoon fishery development	◆ Promote and support the development of off-lagoon fishery	<ul style="list-style-type: none"> • Demonstrate fishing techniques for the following fishery: <ul style="list-style-type: none"> } Swordfish fishery } Deepwater shrimp fishery } Chilled fish fishery • Demonstrate and advise on handling and preservation of catch.
Fisheries Training and Extension Centre	◆ Establish the Fisheries Training and Extension Centre.	<ul style="list-style-type: none"> • Coordinate the project for the construction of the Fisheries Training and Extension Centre.
Newsletter	◆ Create awareness on fisheries activities and marine environment.	<ul style="list-style-type: none"> • Produce a fisheries newsletter.

Fisheries Management

Projects/services	Objective(s)	Main activities
Licensing of fishing vessels	◆ Control of fishing activities.	<ul style="list-style-type: none"> • Issue licences to fishing vessels. • Allocation and monitoring of catch quota. • Collect fishing data.
Monitoring of fishing vessels	◆ Ensure compliance with fishing licence.	<ul style="list-style-type: none"> • Collect fishing log books. • Record movement of vessels. • Clearance for departures and arrivals. • Check safety equipment. • Monitor transshipment activities.
Fish imports and exports	◆ Control import and export of fish and fish products.	<ul style="list-style-type: none"> • Process and issue import permits. • Inspect imported products. • Follow up on fish trade issues. • Advise importers/exporters/fish sellers on quality norms. • Monitor fish supply on the local market

Appendix 6: Organigram of the Fisheries Protection Service



- 1 **CFPS** Controller, Fisheries Protection Service
- 3 **DCFPS** Deputy Controller, Fisheries Protection Service
- 4 **ACFPS** Assistant Controller, Fisheries Protection Service
- 4 **LO** Liason Officer
- 25 **PFPO** Principal Fisheries Protection Officer
- 57 **SFPO** Senior Fisheries Protection Officer
- 158 **FPO** Fisheries Protection Officer
- 4 **RHQ** Regional Head Quarters
- 4 **FS** Flying Squad

Note: SFPO's & FPO's posted at Fisheries Posts work on shift system of 24/48
24 hours on duty
48 hours off duty

AFRC (Enumerators)
1 SFPO + 4 FPO

AFRC (Diving Team)
PFPO's
D.P.Ramgoolam & P. Rowjee
1 SFPO + 4 FPO

AFRC (Marine Parks)
2 FPO

AFRC (Fishing Port)
1 SFPO

Appendix 7: Meetings, workshops, seminars and courses attended by officers

Subject	Venue	Date	Officer
1 st Meeting of the Signatory States of the MoU on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South East Asia	Bangkok, Thailand	22 – 24 Jan	Mr. A. Venkatasami
SADC Regional Monitoring, Control & Surveillance (MCS) Workshop	Johannesburg, South Africa	28 – 31 Jan	Mr. M. Munbodh
Training Course in the Use of Fish Stock Assessment Softwares	University of Nairobi, Kenya	10 – 15 Feb	Mr. G. Dhunnoo
25 th Session of the FAO Committee on Fisheries	Rome, Italy	24 – 28 Feb	Mr. D Mauree
Workshop of the National Oceanographic Data Centre (NODC)	La Pirogue Hotel, Mauritius	27 – 28 Feb	Mrs. C. Lim Shung
Geo-Spatial Information System for Lagoon Vulnerability Mapping. Lagoon Biotope Survey South East of Mauritius	Blue Lagoon Beach Hotel, Blue Bay, Mauritius	10 – 19 Mar	Mr. V. Mangar
Final Conference of Zooplankton Project of the Mascarene Plateau	Cap Ternay, Seychelles	01 – 03 Apr	Mrs. M. Hurbungs
Workshop of the Coral Reef Monitoring Network	Seychelles	06 – 13 Apr	Mrs. M. Koonjul
ACP-EU Fisheries Relations – Joint Commonwealth Secretariat-CTA Meeting	Brussels, Belgium	07 – 09 Apr	Mr. D Mauree
Training on Conservation and Sustainable Management of Coral Reefs	Japan	27 May – 17 Aug	Mr. S. Leckraz
Regional Environmental Programme on Vulnerability Mapping of Coastal Zones	Mitsamihouli, Comores	10 – 16 Jun	Mr. V. Mangar
Technical Committee Meeting on Fisheries (SADC)	Gaborone, Botswana	19 – 20 Jun	Mr. M. Munbodh
Training Course on Coastal Fisheries Management	Japan	18 Jul – 23 Aug	Mr. M. Nunkoo
COFI Sub-Committee on Aquaculture	Trondheim, Norway	06 – 11 Aug	Mr. D. Goorah
Workshop on the South West Indian Ocean Fishery Project	Mombasa, Kenya	26 – 28 Aug	Mr. S.C. Bauljeewon
1 st Course on Marine Resources Survey (Afro-Japanese Institute of Ocean Sciences and Technologies)	Tunis, Tunisia	01 – 06 Sep	Mr. B.D. Rathacharen

Training Course in Marine Information Management	Brussels, Belgium	01 – 10 Sep	Mrs. C. Lim Shung
Planning Meeting for ODINAFRICA	Brussels, Belgium	08 – 09 Sep	Mr. D. Goorah
ACP FISH II Consultative Workshop	Nairobi, Kenya	08 – 09 Sep	Mr. S. Beeharry Panray
Fisheries Training on Quality Management of Fish Handling and Processing	United Nations University, Iceland	01 Sep 2003 – 26 Feb 2004	Mr. P. Daby
Regional VMS Workshop for countries of the South West Indian Ocean	Mahé, Seychelles	30 Sep – 03 Oct	Mr. B. Ramcharrun
3 rd Western Indian Ocean Marine Science Association (WIOMSA) Scientific Symposium	Maputo, Mozambique	14 – 19 Oct	Mr. J.P. Luchmun
Working Visit	Namibia	20 – 31 Oct	Mrs. A. Freyneau Mr. M. Munbodh Mr. D. Mauree Mr. A. Kaderbatchia
Training Course on Fish Farming	Egypt	01 Oct – 15 Dec	Mr. S. Ramsaha
22 nd Meeting of the Commission for the Conservation of the Antarctic Marine Living Resources (CCAMLR)	Hobart, Australia	27 Oct – 07 Nov	Mr. I. Jehangeer
Symposium on Agriculture	Réduit, Mauritius	29 – 31 Oct	Mrs. S. Ramkissoon
Regional Workshop on Marine Protected Areas	Madagascar	03 – 05 Nov	Mr. D. Ramjeet
Workshop on e-Government	Labourdonnais Hotel	11 Nov	Mrs. C. Lim Shung
FAO Regional Workshop on the Elaboration of National Plans of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing.	Kariba, Zimbabwe	24 – 28 Nov	Mr. I. Jehangeer Mr. B. Ramcharrun
Management of Small Scale Deep Sea Fisheries	University of Otago, New Zealand	27 – 29 Nov	Mr. A. Sheik Mamode
Training Course on Water Resources Management (Bio-Geochemistry and Monitoring of Water Quality)	University of Mauritius	01 – 12 Dec	Mr. H. Bhudoye
Formations / Investigations des Peuplements des Poissons et de Macro Crustacées d'Eau Douce des Mascareignes	Domaine les Pailles, Mauritius	02 – 06 Dec	Mrs. I. Auliar Mr. D. Degambur
8 th Session of the Indian Ocean Tuna Commission (IOTC)	Victoria, Seychelles	08 – 12 Dec	Mr. I. Jehangeer
COREMO II Workshop	AFRC	08 – 12 Dec	Mrs. M. Koonjul Mr. V. Mangar Mr. J.P. Luchmun

Appendix 8: Details of fishing vessels calling at Port Louis

Vessels	Flag	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Reefers		0	2	5	1	3	5	7	1	7	4	4	3	42	
Sub total		0	2	5	1	3	5	7	1	7	4	4	3	42	
Tuna longliners	Taiwan	14	24	16	9	13	32	11	22	38	24	13	19	235	
	Japan	5	10	7	1	2	0	2	2	5	6	4	11	55	
	E. Guinea	1	0	0	1	0	0	0	0	0	0	0	0	2	
	Honduras	1	1	0	0	0	0	0	0	0	0	0	0	2	
	Spain	1	1	5	2	0	2	5	1	2	1	7	1	28	
	Togo	1	0	0	0	0	0	0	0	0	0	0	0	2	
	Korea	0	0	0	0	0	0	0	0	0	0	2	1	0	3
	Portugal	1	1	0	0	0	1	0	1	0	0	0	0	2	6
	Seychelles	1	3	1	0	0	2	1	0	5	2	0	0	1	16
	Indonesia	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	Mauritius	1	1	0	1	1	0	0	0	1	1	2	0	0	8
	Uruguay	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Belize	0	1	0	2	0	3	0	0	0	0	2	0	1	9
	Thailand	0	0	0	0	0	0	0	0	0	0	1	0	0	1
	France	0	1	1	1	2	0	0	0	0	1	0	0	0	6
	Bolivia	0	0	2	0	0	0	0	1	0	0	1	0	0	4
	Sri Lanka	0	0	0	0	2	2	0	2	0	0	0	0	0	6
	Philippines	0	0	0	0	1	1	1	0	1	0	0	0	0	4
	Senegal	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	Ghana	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Georgia	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
Sub total		27	43	32	17	21	43	22	31	53	41	25	37	392	
Squids	Taiwan	3	0	0	0	0	0	0	0	0	0	0	1	4	
Sub total		3	0	0	0	0	0	0	0	0	0	0	1	4	
Trawlers	Mauritius	1	1	1	0	0	0	0	1	0	0	0	0	4	
	Cooks Island	0	0	1	0	0	1	0	1	0	1	1	1	6	
	Belize	0	0	0	0	1	0	0	0	0	0	0	0	1	
	Madagascar	3	0	0	0	0	1	0	0	0	0	0	0	4	
	France	0	1	0	0	0	0	0	0	0	0	0	0	1	
	Australia	0	0	0	0	0	0	2	0	1	0	0	0	3	
	Russia	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Cyprus	0	1	0	0	0	0	0	0	0	0	0	0	1	
Sub total		4	3	2	0	1	2	2	2	1	2	1	1	21	
Purse Seiners	France	0	0	0	0	0	0	0	0	0	0	1	0	1	
	Spain	0	0	0	0	0	0	0	0	0	0	1	0	1	
Sub total		0	0	0	0	0	0	0	0	0	0	2	0	2	
Patagonian Toothfish	Uruguay	2	2	0	0	1	3	0	2	1	1	1	2	15	
	Seychelles	1	1	1	0	0	0	0	0	0	0	0	0	3	
	Korea	2	0	0	1	0	3	0	2	0	2	1	0	11	
	Australia	0	0	0	1	0	0	2	0	1	0	0	0	4	
	E. Guinea	0	0	0	0	1	1	1	0	0	0	0	0	3	
	France	0	3	0	0	1	1	2	1	1	3	0	0	12	
	Belize	0	0	0	0	1	0	0	0	0	0	0	0	1	
	Netherlands	0	0	0	0	0	0	0	1	0	0	0	0	1	
Togo	0	0	0	0	0	0	0	0	1	0	0	0	1		
Sub total		5	6	1	2	4	8	5	7	3	6	2	2	51	
Total		39	54	40	20	29	58	34	42	64	51	37	44	512	

