

Fisheries Division Annual Report 2004



Fisheries Training and Extension Centre – Pointe aux Sables

MINISTRY OF AGRO-INDUSTRY & FISHERIES

Fisheries Division

Annual Report 2004

**Ministry of Agro Industry & Fisheries
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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 maritime zones of Mauritius for continued socio-economic benefits to stakeholders.

Objectives

To carry out research for the sustainable development and management of fisheries resources, protect fishery resources and marine ecosystems, conserve marine biodiversity, train fishers, increase awareness among the public in general on fisheries management and conservation of marine living resources, maintain an adequate supply of fish for the population, give the necessary support for the development of the seafood hub and strengthen regional and international cooperation in fisheries.

Foreword

It gives me much pleasure to present the Annual Report of the Fisheries Division of the Ministry of Agro-Industry and Fisheries for the year 2004. The report gives an overview of the activities within the Fisheries sector including those of the Albion Fisheries Research Centre (AFRC).

One can witness the radical transformation of the fishing industry with the buoyant activities in the Port and Free Port areas where transshipment and fish processing activities are gathering momentum and Port Louis is also being transformed into an important tuna port in the region. This is in line with the philosophy of Government in transforming Mauritius into a seafood hub with focus on an attractive business platform for value added seafood.

The inauguration of the Fisheries Training and Extension centre (FiTEC) on 30 September 2004 is another landmark in the development of the Fisheries sector in Mauritius. It comes at the most opportune time where emphasis on training and capacity building is of high pertinence in all sectors of our economy. Fisheries is no exception to that rule. Our fishers are thus exposed to the theoretical modules at the FiTEC and ultimately undergo practical training onboard our research vessels.

With a view to deter illegal, unregulated and unreported (IUU) fishing, a Vessel Monitoring System is now operational at AFRC. The accession of Mauritius to the convention of the CCAMLR bears testimony to its desire to combat IUU.

The management of the Fisheries sector has been carried out efficiently and research officers have benefited from training programme under bilateral and international cooperation.

I am privileged to be associated with the release of this report in as much as this publication comes at an opportune time where Government's policy is focussed on making Fisheries one of the pillars of the economy. I am confident that the Fisheries Division is prepared to meet this challenge.

I would like to take this opportunity to thank all the staff of the Fisheries Division of the Ministry of Agro-Industry and Fisheries for their contribution in the preparation of this report.

07 April 2006

**Mrs. N. Boodhoo
Permanent Secretary
Ministry of Agro-Industry & Fisheries
(Fisheries Division)**

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Executive Summary

The total fresh fish production was 1 043 tonnes with an average catch of 4.2 kg per fisherman day. The number of fishing boats and the number of active fishermen increased by 46% and 8.1% respectively as compared to 2003.

A total of 2 679 tonnes of frozen fish comprising mainly *lethrinidae* (capitaine, dame berri and kaya) was landed from the fishing banks. Eleven vessels which were involved in the semi-industrial chilled fishery operated mainly around the Saya de Malha, Nazareth, Albatross, Soudan, Chagos and Hawkins banks and landed 179 tonnes of chilled fish.

The long term monitoring of the coral reef ecosystem and water quality was continued at the established sites around the island. Belle Mare was selected as an additional monitoring site. The four ex-sand mining sites were monitored every six months till March 2004. The substrate at these sites was being recolonised gradually by marine flora and fauna. Mangrove propagation was carried out at Pointe Brochus, Anse Petit Sable and Petite Habitation where a total of 24 000 propagules were planted.

A total of 225 400 sea bream fries were released for stock enhancement in the lagoon of Albion and Trou d'Eau Douce. Trials on two species of sea cucumbers were undertaken for sexual and asexual reproduction. The acclimatisation of the marine shrimp to fresh water was underway. The extension service provided advice on aquaculture techniques to fish farmers.

A Fisheries Training and Extension Centre (FiTEC) was constructed at Pointe aux Sables. It will be a tool to enhance the skill and knowledge of fishers to operate in the outer lagoon fisheries. 17 fishers from the region of Baie du Cap/St. Martin were trained on the FAD fishery prior to the opening of the Centre.

A Unified Enforcement Unit was set up to enforce the Marine Protected Areas regulations at Blue Bay. It provides 24 hours surveillance to control activities in the park. During the year, 280 permits were issued to different users of the park. A visitor's centre was inaugurated at the Blue Bay Marine Park to celebrate the World Environment Day. The tender document for the zoning of Balaclava Marine Park was finalised.

12 FADs were active during the year around the island from where 256 tonnes of fish were caught by artisanal fishermen comprising mainly germon, thon jaune and other associated species.

During the year 216 fishing licences were issued to foreign fishing vessels to operate in Mauritius waters while 23 licensed Mauritian vessels were also involved in different fishing activities. A total of 512 fishing vessels called at Port Louis for transshipment, bunkering, dry-docking, provisions and changing of crew.

Mauritius became a party to the Convention of the Conservation of Antarctic Marine Living Resources (CCAMLR) on 2 October 2004.

With regards to the Seafood Hub, a One Stop Shop service was set up at the Trade and Marketing Centre (TMC) in the freeport to facilitate administrative procedures for unloading/loading/export of fish and fish products.

1. FISHERIES RESEARCH

1.1 Coastal (artisanal) fishery

Fresh fish is landed along the coast of Mauritius at 61 fish landing stations by the artisanal fishery, which is practised inside the lagoon and in the vicinity of the outer reef. The gears used are basket traps, hooks and lines, harpoons, large nets and gill nets. The boats are mainly propelled by outboard motors; however, some use oars and sails or wooden poles. A decrease of 10.5% in the fresh fish production was noted as compared to 2003. The average catch per fisherman day was 4.2 kg.

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

Total fresh fish production was 1 043 tonnes. Outer reef production decreased by 118 tonnes due to a decrease in fishing effort. Catch, fisherman days and catch per fisherman day (CPFD) for the period 2000-2004 are presented in table 1.1.

Table 1.1: Catch, fisherman days and CPFD

| Year | Catch (t) | | | Fisherman days | | | CPFD (kg) | | |
|------|-----------|-----|-------|----------------|---------|---------|-----------|-----|-----|
| | L | OL | Total | L | OL | Total | L | OL | M |
| 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 |
| 2004 | 699 | 344 | 1 043 | 195 087 | 68 516 | 263 603 | 3.6 | 5.0 | 4.2 |

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

1.1.2 Monthly landings

The open season for the net fishery in the lagoon is from March to September during which the catch is generally higher compared to the other months. The catch during the close season amounted to 396 tonnes representing 38% of the annual production of 1 043 tonnes. The monthly production of fresh 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) | Fisherman days | CPFD(kg) | | |
|--------------|------------|------------|--------------|--------------|----------------|----------|-----|------|
| | L | OL | Total | | | L | OL | Mean |
| January | 39 | 31 | 70 | 7.1 | 15 457 | 3.8 | 6.2 | 4.5 |
| February | 35 | 27 | 62 | 6.4 | 16 346 | 3.2 | 4.9 | 3.8 |
| March | 78 | 20 | 98 | 9.9 | 20 589 | 4.7 | 4.9 | 4.8 |
| April | 57 | 28 | 86 | 8.8 | 17 877 | 4.3 | 6.1 | 4.8 |
| May | 70 | 40 | 109 | 10.5 | 21 419 | 4.1 | 9.0 | 5.1 |
| June | 63 | 18 | 81 | 8.7 | 21 452 | 3.6 | 4.9 | 3.8 |
| July | 77 | 24 | 101 | 9.4 | 27 002 | 3.7 | 4.1 | 4.7 |
| August | 60 | 22 | 82 | 9.0 | 26 460 | 2.9 | 3.7 | 3.1 |
| September | 68 | 22 | 90 | 9.5 | 25 797 | 3.4 | 3.9 | 3.5 |
| October | 52 | 45 | 96 | 11.0 | 28 019 | 2.7 | 5.0 | 3.4 |
| November | 41 | 36 | 77 | 8.3 | 21 506 | 3.2 | 4.2 | 3.6 |
| December | 58 | 32 | 90 | 10.4 | 21 679 | 3.8 | 4.9 | 4.2 |
| Total | 699 | 344 | 1 043 | 109.0 | 263 603 | | | |

MR = million rupees; L=lagoon; OL= off-lagoon

1.1.3 Catch by gear

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

Table 1.3: Annual catch (kg) by gear

| Year | Line | BT | BTL | LN | GN | H/OF | Total |
|------|---------|---------|--------|---------|--------|---------|------------------|
| 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 |
| 2004 | 285 832 | 425 327 | 54 874 | 168 069 | 11 300 | 97 402 | 1 042 804 |

BT = basket trap; BT/L = basket trap and line; LN = large net; GN = gill net; H = harpoon, OF= On foot

1.1.4 Fishermen

Out of 2 307 registered fishermen, only 2 256 were active. The number of active fishermen by gear type for the past five years is presented in table 1.4.

Table 1.4: Number of active fishermen by gear type

| Year | BT | L/H/OF | BT/L | LN | GN | Total |
|-------------|-----------|---------------|-------------|-----------|-----------|--------------|
| 2000 | 286 | 642 | 559 | 226 | 28 | 1 741 |
| 2001 | 519 | 678 | 610 | 180 | 27 | 2 114 |
| 2002 | 501 | 734 | 600 | 165 | 28 | 2 028 |
| 2003 | 473 | 749 | 670 | 177 | 17 | 2 086 |
| 2004 | 445 | 896 | 736 | 159 | 20 | 2 256 |

BT = basket trap; L/H/OF= line, harpoon, on foot; BT/L = basket trap and line; LN = large net; GN = gill net

1.1.5 Boats

The number of active fishing boats was 1 898 indicating an increase of 31.5% while the number of boats using outboard motors increased by 28.8% as compared to the previous year. The engine capacity of the motors used by the artisanal fishermen ranged from 8 to 25 Hp. The number of active fishing boats with mode of propulsion is presented in table 1.5.

Table 1.5: Number of active fishing boats

| Year | Oars and sails | Outboard motors | Inboard motors | Total |
|-------------|-----------------------|------------------------|-----------------------|--------------|
| 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 |
| 2004 | 110 | 1 630 | 158 | 1 898 |

1.16 Price of fish

The average retail price of fresh fish is shown in table 1.6. As can be observed, the retail price of almost all the different categories of fish has increased slightly.

Table 1.6: Yearly average retail price of fresh fish (Rs/kg)

| Fish | 2000 | 2001 | 2002 | 2003 | 2004 |
|---------------------|------|------|------|------|------|
| Homard | 415 | 475 | 475 | 480 | 495 |
| Crabe & crevette | 260 | 270 | 295 | 285 | 275 |
| Vieille rouge | 185 | 180 | 185 | 180 | 190 |
| Vacoas, sacré chien | 140 | 145 | 150 | 150 | 160 |
| Capitaine | 135 | 140 | 145 | 140 | 155 |
| Dame berri | 120 | 130 | 135 | 130 | 140 |
| Octopus | 90 | 100 | 100 | 100 | 105 |
| Carangue | 95 | 100 | 110 | 100 | 115 |
| Cordonnier | 80 | 85 | 85 | 90 | 100 |
| Rouget, tuna | 80 | 80 | 80 | 85 | 90 |
| Mullet voilé | 70 | 75 | 75 | 80 | 85 |
| Bordemar | 80 | 80 | 80 | 85 | 100 |
| Licorne | 80 | 85 | 95 | 95 | 100 |
| Cateau | 65 | 65 | 70 | 75 | 75 |
| Shark | 25 | 35 | 35 | 55 | 45 |
| Other fish | 45 | 45 | 45 | 40 | 55 |

1.2 Banks fishery

Eight vessels were engaged in fishing activities in the shallow waters of the Saya de Malha, Nazareth and Albatross banks and the Chagos Archipelago, effecting 29 trips. Table 1.7 gives the particulars of the fleet.

Table 1.7: Particulars of the fishing fleet

| Vessel | LOA | GRT | Hold (t) | Crew | Fishers | Joined |
|-----------------------|-----|-----|----------|------|---------|--------|
| Talbot III | 50 | 300 | 200 | 29 | 53 | 1986 |
| Talbot IV | 44 | 317 | 176 | 28 | 57 | 1989 |
| Noor Star 2 | 51 | 300 | 200 | 18 | 54 | 1992 |
| Hoi Siong 2 | 54 | 388 | 240 | 20 | 60 | 1993 |
| LeGentilly (l'Espoir) | 50 | 299 | 400 | 33 | 65 | 1993 |
| Shandrani | 55 | 398 | 300 | 35 | 60 | 1994 |
| Hoi Siong 5 | 45 | 315 | 180 | 20 | 72 | 1996 |
| Shandrani 2 | 42 | 449 | 130 | 30 | 45 | 2002 |

LOA: Length overall; GRT: Gross registered tonnage

1.2.1 Production of frozen fish

A total of 2 679 tonnes of frozen fish comprising mainly lehrinidae species was landed. The annual catch from the different areas are given in table 1.8 and shows a decrease over the past years. The fishing effort is presented in table 1.9.

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

| Year | No. of vessels | Saya de Malha | Nazareth | St. Brandon | Chagos | Albatross | Total catch |
|------|----------------|---------------|----------|-------------|--------|-----------|--------------|
| 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 |
| 2004 | 8 | 1 686 | 855 | nil | 117 | 21 | 2 679 |

Table 1.9: Fishing effort and catch from the fishing areas

| Fishing areas | Fishing days | Bad weather days | Effort (Fisherman days) | Catch (t) | Catch per fisherman day (kg) | % Total catch |
|---------------|--------------|------------------|-------------------------|--------------|------------------------------|---------------|
| Saya de Malha | 474 | 183 | 23 729 | 1 686 | 71.0 | 62.9 |
| Nazareth | 206 | 65 | 10 154 | 855 | 84.2 | 31.9 |
| Chagos | 34 | 26 | 1 761 | 117 | 66.4 | 4.4 |
| Albatross | 11 | 2 | 541 | 21 | 39.4 | 0.8 |
| Total | 725 | 276 | 36 185 | 2 679 | 74.0 (av) | |

1.2.2 Catch and effort data from the Nazareth and Saya de Malha banks

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

Table 1.10: Catch (t), Effort (fisherman days) and CPF (kg) in the fishery

| Year | Nazareth bank | | | Saya de Malha bank | | |
|------|---------------|-------|------|--------------------|-------|-------|
| | Effort | Catch | CPF | Effort | Catch | CPF |
| 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 |
| 2004 | 10 154 | 855 | 84.2 | 23 729 | 1 686 | 71.0 |

The catch per fisherman day (CPF) for the year was 84.2 kg and 71.0 kg on Nazareth and Saya de Malha banks respectively.

1.2.3 Length frequency distribution of *Lethrinus mahsena*

Length frequency data for *Lethrinus mahsena* were collected. The number of fish sampled from Nazareth and Saya de Malha banks were 379 and 4 257 respectively and their length ranged between 270–550 mm and 200–630 mm. The length frequency distributions are shown in figures 1.1 and 1.2.

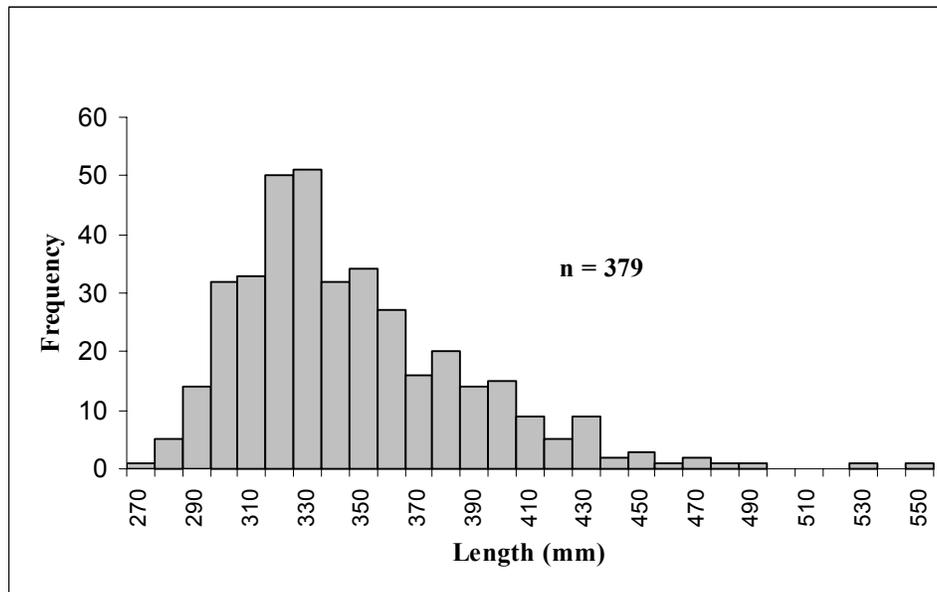


Figure 1.1: Length frequency of *Lethrinus mahsena* from the Nazareth bank

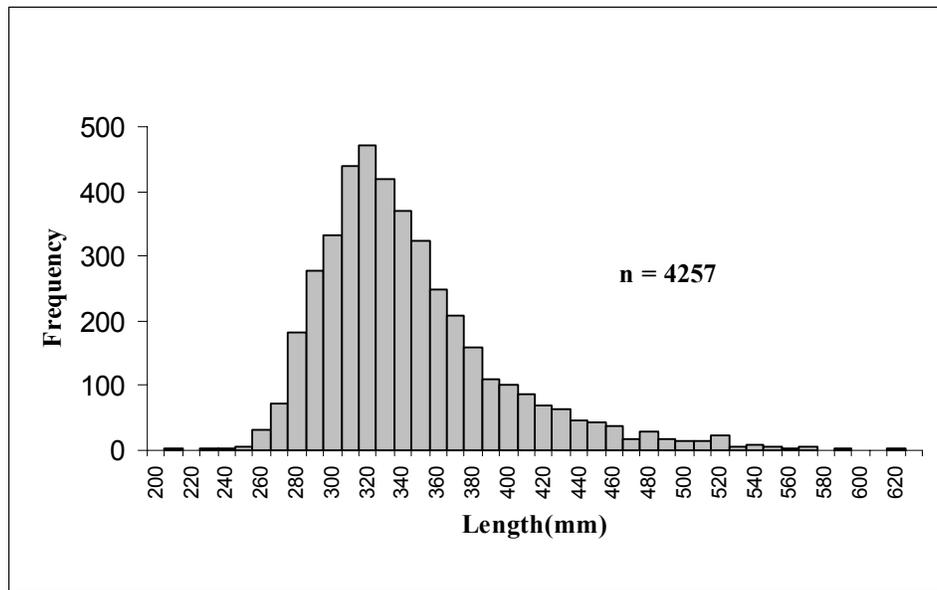


Figure 1.2: Length frequency of *Lethrinus mahsena* from the Saya de Malha bank

1.2.4 Management of the shallow water banks fishery

No quota was allocated for the year as the catch during the fishing season 2002/2003 was below the Total Allowable Catch (TAC) of 3 768 tonnes. The catch from the Saya de Malha, Nazareth and Albatross banks was 2 931 tonnes. The utilisation of the quota during the previous years and the amount of the catch are shown in table 1.11.

Table 1.11: Quota allocated and catch by season

| Fishing Season | 1999/2000 | 2000/2001 | 2001/2002 | 2002/2003 | 2003/2004 |
|-----------------------|------------------|------------------|------------------|------------------|------------------|
| Quota allocated (t) | 4 073 | 3 768 | N/A | N/A | N/A |
| Catch (t) | 3 952 | 2 611 | 2 996 | 2 860 | 2 931 |
| Balance (t) | 121 | 1 157 | --- | --- | --- |
| % Quota used | 97 | 69.3 | --- | --- | --- |

N/A – Not allocated

1.2.5 Fishing in the waters of the Chagos Archipelago

During the year, two fishing trips were effected to the Chagos Archipelago. Details on the catch and effort for the past years are given in table 1.12. A decrease in the catch with a corresponding reduction in effort was observed.

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) |
|-------------|---------------------|-----------------------|---------------------|-------------------------|------------------|-----------------------|------------------|
| 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 |
| 2004 | 2 | 2 | 34 | 26 | 117 | 1 761 | 66.4 |

1.3 St. Brandon fishery

Two vessels, namely La Derive and Eliza (ex Aleisha Lea) were licensed to transport fish caught by fishers based at St. Brandon. FV La Derive made 28 trips and landed 91 142 kg of fish while FV Eliza made 11 trips and landed 43 118 kg of fish. FV Le Gentilly which was active in the banks fishery made three trips to St. Brandon and landed 115 627 kg of frozen fish. FV St. Mathilde which is active in the chilled fish fishery was hired once and transported 5 000 kg of salted fish.

1.3.1 St Brandon inshore fishery

The catch from the St. Brandon inshore fishery comprised mainly frozen fish, chilled fish, lobster and salted fish. The different products landed from St. Brandon are presented in table 1.13. A total of 254 887 kg of fish comprising 115 627 kg of frozen fish, 102 834 kg of chilled fish, 34 100 kg of salted fish and 2 326 kg of lobster was unloaded at Port-Louis during 2004.

Table 1.13: St. Brandon inshore fishery production (tonnes)

| Fishing Vessels | Frozen fish | Chilled fish | Salted fish | Lobster | Total |
|-----------------|--------------|--------------|-------------|------------|--------------|
| La Derive | nil | 80.5 | 10.1 | 0.5 | 91.1 |
| Eliza | nil | 22.3 | 19.0 | 1.8 | 43.1 |
| Le Gentilly | 115.6 | nil | nil | nil | 115.6 |
| St. Mathilde | nil | nil | 5.0 | nil | 5.0 |
| Total | 115.6 | 102.8 | 34.1 | 2.3 | 254.8 |

1.3.2 Sampling of chilled fish

Sampling of the two main species *Lethrinus mahsena* and *Lethrinus nebulosus* was carried out during unloading of vessels from St. Brandon. Length-weight data on 451 *L. mahsena* and 550 *L. nebulosus* were collected. The lengths varied from 290 to 520 mm and from 280 to 600 mm respectively while the weight ranged between 400 and 2 750g and 350 and 2 900g. Figures 1.3 and 1.4 show the length-weight relationship of the two species of fish.

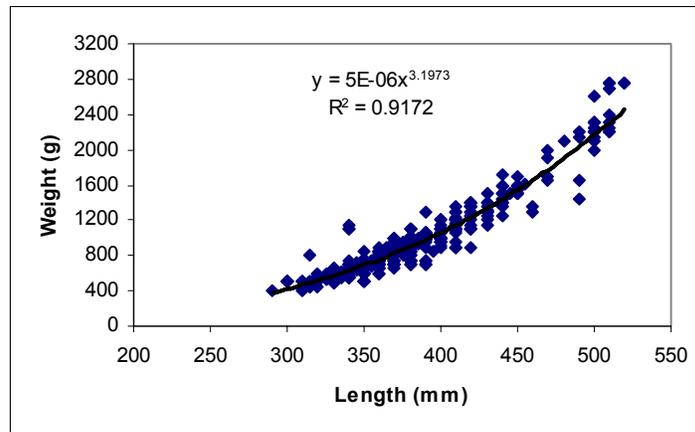


Figure 1.3: Length-weight relationship for *L. mahsena*

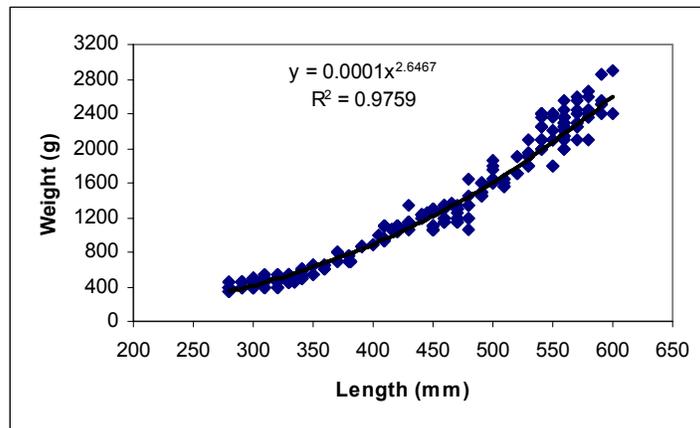


Figure 1.4: Length-weight relationship for *L. nebulosus*

1.3.3 Stock Assessment and Fisheries Management of the St Brandon Plateau and Associated Banks Fisheries

A study on the Stock Assessment and Fishery Management of the St. Brandon Plateau and associated Banks Fisheries is underway with assistance from FAO which is providing funds to the tune of USD \$ 340 000 over a two year period as from March 2004 to February 2006. The study aims at evaluating the fisheries potential and the development of a management plan for the sustainable exploitation of the resources in St. Brandon and associated banks.

1.4 The semi-industrial chilled fish fishery

Medium-sized vessels with fish holds up to a maximum capacity of 15 tonnes operated on the Saya de Malha, Albatross, Soudan, Nazareth, Chagos and Hawkins banks. The eleven vessels involved in the fishery performed 108 trips of an average duration of 12 days and landed 179.1 tonnes of chilled fish. Particulars of the vessels are given in table 1.14 and the species composition of the catch by fishing area in table 1.15. The annual production of chilled fish from St. Brandon and the semi-industrial chilled fish fishery for the past years is presented in table 1.16.

Table 1.14: Particulars of vessels operating in the semi-industrial chilled fish fishery

| Vessel | LOA (m) | GRT (t) | Fish hold (t) | Crew | No of fishermen | Joined in |
|--------------|---------|---------|---------------|------|-----------------|-----------|
| King Fish I | 17.0 | 14.5 | 5.5 | 2 | 10 | 1996 |
| King Fish II | 21.0 | 14.5 | 10.0 | 4 | 11 | 1998 |
| Coryphaena | 12.0 | 8.5 | 2.5 | 2 | 4 | 1999 |
| Vimaya | 22.0 | 49.0 | 15.0 | 2 | 10 | 2000 |
| Kishan | 12.0 | 15.0 | 8.0 | 2 | 4 | 2001 |
| King Fish IV | 15.0 | 24.0 | 6.0 | 2 | 4 | 2002 |
| Sea Quest | 19.8 | 59.0 | 20.0 | 8 | 7 | 2004 |
| St. Mathilde | 14.1 | 45.2 | 9.0 | 2 | 4 | 2004 |
| Jackson 1* | 16.0 | 25.0 | 15.0 | 2 | 8 | 2003 |
| Quo Vadis 1 | 12.0 | 26.9 | 4.0 | 2 | 4 | 2003 |
| King Fish V | 15.1 | 14.8 | 5.8 | 2 | 8 | 2004 |

*ex-Anouska

Table 1.15: Catch (kg) by species and fishing area

| Fishing area | Lethrinids | Snappers | Groupers | Tuna and others | Total |
|---------------|----------------|---------------|---------------|-----------------|----------------|
| Albatross | 69 538 | 15 383 | 6 916 | 4 425 | 96 262 |
| Soudan | 30 232 | 2 325 | 3 157 | 791 | 36 505 |
| Hawkins | 505 | 2 595 | 224 | 2 696 | 6 020 |
| Chagos | 0 | 6 056 | 1 242 | 0 | 7 298 |
| Saya de Malha | 0 | 4 954 | 704 | 1 524 | 7 182 |
| Nazareth | 21 771 | 1 850 | 964 | 1 272 | 25 857 |
| Total | 122 046 | 33 163 | 13 207 | 10 708 | 179 124 |

Table 1.16: Total chilled fish production from St. Brandon and other banks

| Year | 2000 | 2001 | 2002 | 2003 | 2004 |
|------------------|-------|-------|-------|-------|-------|
| Catch (t) | 165.0 | 184.0 | 204.1 | 234.3 | 284.3 |

The catch, fishing days, effort (fisherman days) and catch per fisherman day (CPFD) in the different fishing areas are presented in table 1.17.

Table 1.17: Chilled catch, effort and CPFD by fishing area

| Fishing area | Catch (kg) | Fishing days | Fisherman days | CPFD (kg) |
|---------------------|-------------------|---------------------|-----------------------|------------------|
| Albatross | 96 262 | 274 | 2 042 | 48.3 |
| Soudan | 36 505 | 154 | 805 | 45.3 |
| Hawkins | 6 020 | 24 | 131 | 46.0 |
| Saya de Malha | 7 182 | 22 | 144 | 49.9 |
| Nazareth | 25 857 | 46 | 329 | 78.6 |
| Chagos | 7 298 | 25 | 150 | 48.7 |

Table 1.18 gives the particulars of the sampling carried out on fish obtained from different banks.

Table 1.18: Sampling of chilled fish

| Bank | Species sampled | Number | Length range (mm) | Weight range(g) |
|-------------|----------------------------|---------------|--------------------------|------------------------|
| Albatross | <i>L. mahsena</i> | 980 | 240 - 660 | 250 - 5 050 |
| | <i>L. rubrioperculatus</i> | 66 | 290 - 540 | 450 - 2 200 |
| | <i>L. nebulosus</i> | 180 | 370 - 670 | 700 - 4 000 |
| Soudan | <i>L. mahsena</i> | 240 | 300 - 590 | 400 - 3 500 |
| | <i>L. rubrioperculatus</i> | 144 | 280 - 590 | 340 - 2 300 |
| | <i>L. nebulosus</i> | 44 | 350 - 680 | 620 - 3 800 |

1.5 Tuna fisheries

Tuna fisheries are monitored through the collection, processing and analysis of fishing and biological data obtained from local and licensed foreign vessels.

1.5.1 Sampling of catch from licensed purse seiners

Length frequency data were obtained from the catches of licensed purse seiners. A total of 5 169 tuna comprising 3 890 skipjack, 909 yellowfin and 370 bigeye was sampled.

1.5.1.1 Length frequency distribution of skipjack tuna (*Katsuwonus pelamis*)

The length frequency distribution of skipjack tuna is shown in figure 1.5. The length of the fish ranged between 30 and 78 cm with a mode at around 50 cm.

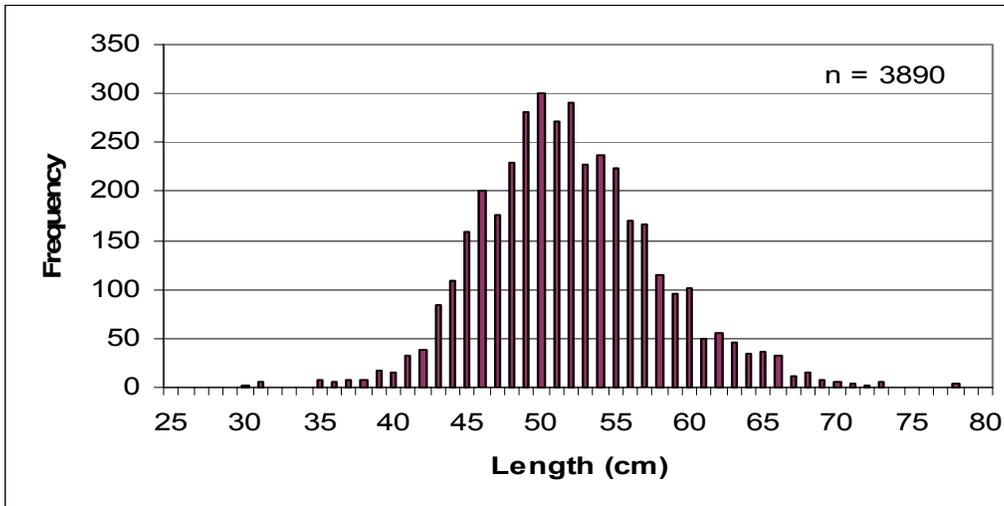


Figure 1.5: Length frequency distribution of skipjack tuna

1.5.1.2 Length frequency distribution of yellowfin tuna (*Thunnus albacares*)

The length frequency distribution of yellowfin tuna is presented in figure 1.6. The fish had a length range between 39 and 150 cm. Most of the fish sampled was below 75 cm in length, representing fish that had not reached sexual maturity. Yellowfin tuna caught by purse seiners comprised mostly juvenile fish which is typical of catches made on log schools.

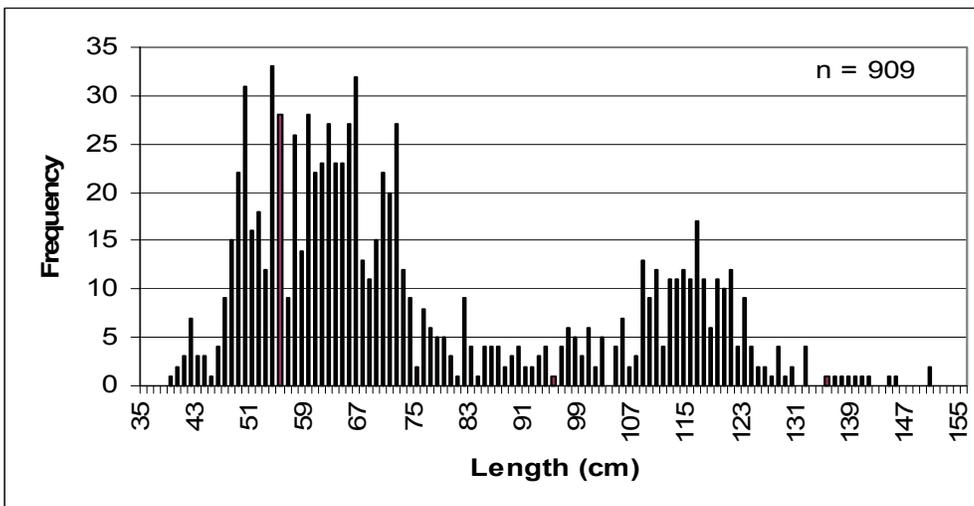


Figure 1.6: Length frequency distribution of yellowfin tuna

1.5.1.3 Length frequency distribution of bigeye tuna (*Thunnus obesus*)

The lengths of the bigeye tuna ranged between 41 and 133 cm and the length frequency distribution is presented in figure 1.7. The bigeye tuna caught by the purse seiners was mostly juvenile fish, typical of catches made on log schools.

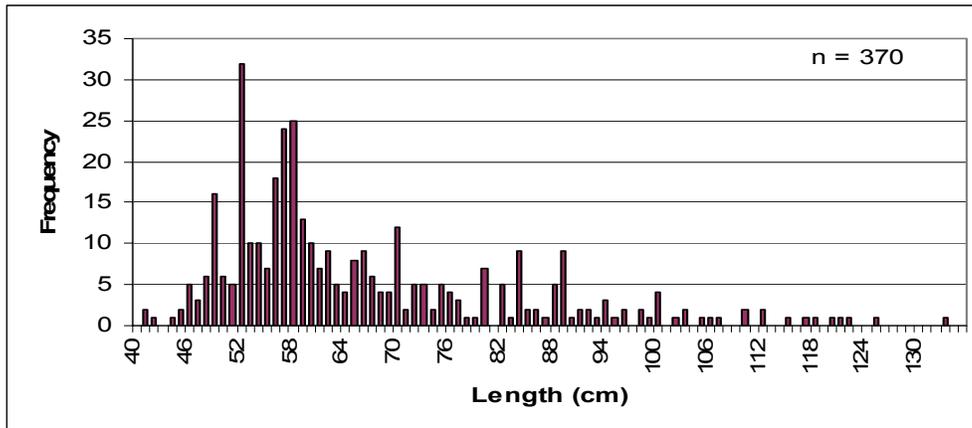


Figure 1.7: Length frequency distribution of bigeye tuna

1.5.2 Species composition

The catch was composed of 60% skipjack, 31% yellowfin, 8% bigeye and 1% miscellaneous fish. The species composition of the purse seine catch unloaded in Mauritius for the past 5 years is presented in table 1.19.

Table 1.19: Species composition of purse seine catches for the past 5 years

| Year | Species (%) | | | |
|------|-------------|-----------|--------|---------------|
| | Skipjack | Yellowfin | Bigeye | Miscellaneous |
| 2000 | 62 | 26 | 12 | - |
| 2001 | 70 | 20 | 10 | - |
| 2002 | 60 | 32 | 7 | 1 |
| 2003 | 68 | 25 | 6 | 1 |
| 2004 | 60 | 31 | 8 | 1 |

1.5.3 Reproductive biology of skipjack tuna

Samples for the study on reproductive biology of skipjack tuna were obtained at the local cannery. Gonad and liver from 194 skipjack tuna were removed for determining maturity

stage, spawning period, reproductive index, sex ratio, seasonal sexual variation and length at first maturity.

1.5.3.1 Gonado-Somatic Index (GSI)

The GSI for both males and females was maximum during March, May and September and minimum during January, April, June, July and October. The monthly variations of the GSI are presented in figure 1.8, showing three peaks of intense sexual activity and spawning. The reproductive cycles of the males and females were synchronous as observed in previous years.

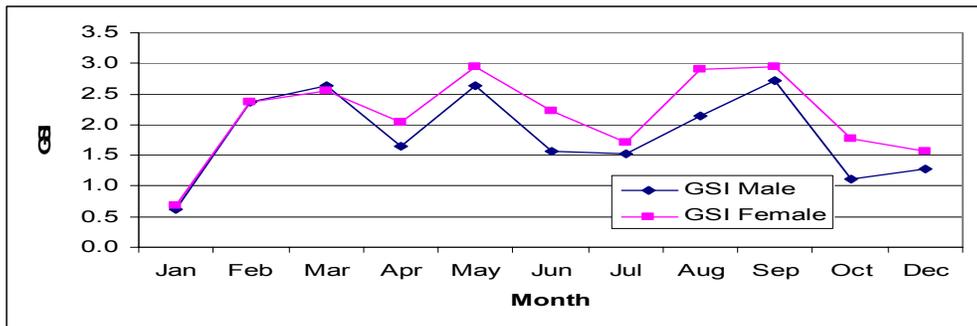


Figure 1.8: Gonado-Somatic Index (GSI) of skipjack tuna

1.5.3.2 Spawning period

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

1.5.3.3 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 April and December, a predominance of males was noted.

1.5.3.4 Length at first maturity (L_{m50})

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 42 cm as shown in figure 1.9. L_{m50} for males and females was found to be at 45 cm and 43 cm respectively.

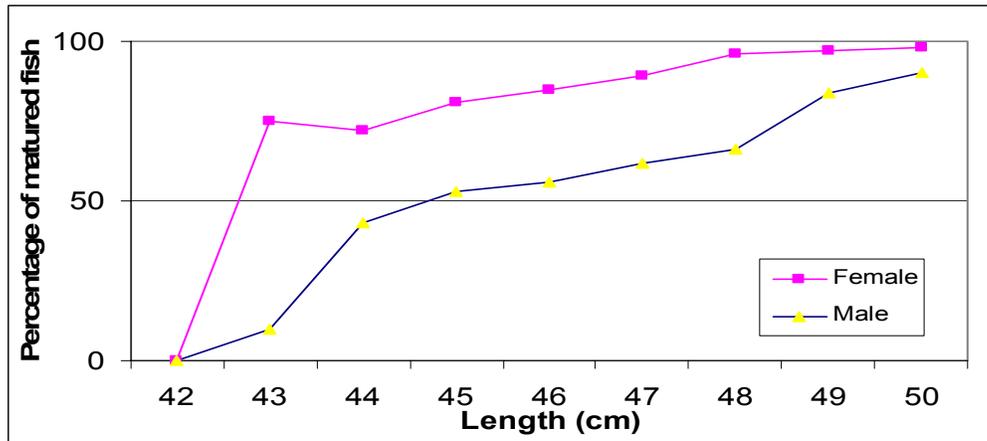


Figure 1.9: Length at first maturity of skipjack tuna

1.5.4 Monitoring of the catch of licensed longliners

Log returns were collected for licensed vessels. Such vessels transshipped 12 117 tonnes of tuna and tuna-like species, including 2 842 tonnes caught by licensed European longliners and 1 117 tonnes caught by three Mauritian flagged vessels. In all 196 log returns were received, of which 161 were considered for processing; the remaining contained inconsistencies. Catch made in the Mauritian EEZ based on correct returns amounted to 4 292 tonnes.

1.5.4.1 Species composition of the catch of licensed longliners

The major part of the catch was composed of yellowfin, albacore, shark and swordfish, which were the target species of the local and EU surface longliners. The species composition of the catch of the licensed foreign longliners is shown in table 1.20.

Table 1.20: Species composition of the catch of licensed foreign longliners

| Scientific name | Species | Catch (t) | % |
|---------------------------|-----------|-----------------|---------------|
| <i>Thunnus maccoyii</i> | bluefin | 0.3 | - |
| <i>Thunnus albacares</i> | yellowfin | 3 821.1 | 31.53 |
| <i>Thunnus obesus</i> | bigeye | 1 174.0 | 14.64 |
| <i>Thunnus alalunga</i> | albacore | 2 825.8 | 23.33 |
| <i>Xyphias gladius</i> | swordfish | 1 294.5 | 10.68 |
| <i>Katsuwonus pelamis</i> | skipjack | 1.9 | 0.02 |
| Other billfishes | billfish | 153.2 | 1.26 |
| Various species | shark | 1 922.8 | 15.87 |
| | others | 323.7 | 2.67 |
| Total | | 12 117.3 | 100.00 |

1.5.4.2 Spatial distribution of the catch of licensed longliners

The fishing area of the licensed longliners was spread widely in the Western Indian Ocean between 8° N and 33° S and 40° E and 107° E as depicted in figure 1.10.

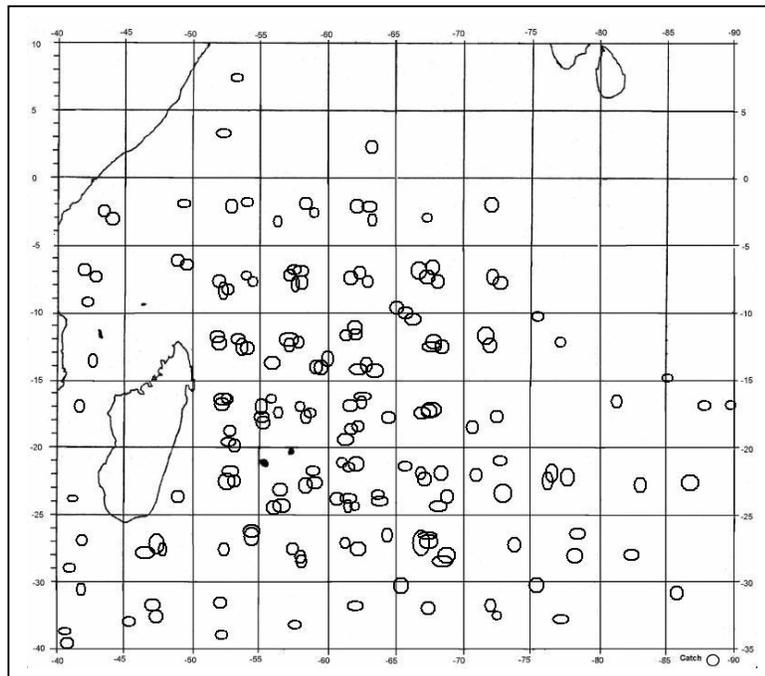


Figure 1.10: Catch distribution of licensed longliners

1.5.4.3 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 992 albacore tuna was sampled. The length frequency distribution is shown in figure 1.11. The length varied from 66 to 148 cm and the major part of the catch comprised fish in the range of 84 to 110 cm.

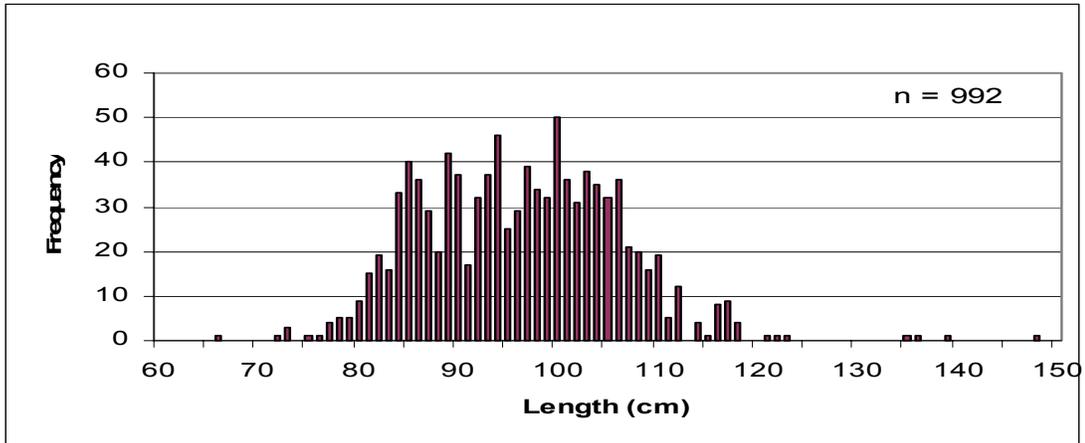


Figure 1.11: Length frequency distribution of albacore tuna

1.5.5 The Mauritian longline fishery

Three vessels operating under the Mauritian flag were actively engaged in the fishery. They undertook 10 fishing trips, unloading a total of 1 117 tonnes of fish. The species composition of the landings is shown in figure 1.12. Most of the catch composed of swordfish (60.4%), the target species of the vessels. The catch per unit effort was 1.2 kg per hook. The fishing area was spread between latitudes 19° S and 34° S and longitudes 41° E and 100° E.

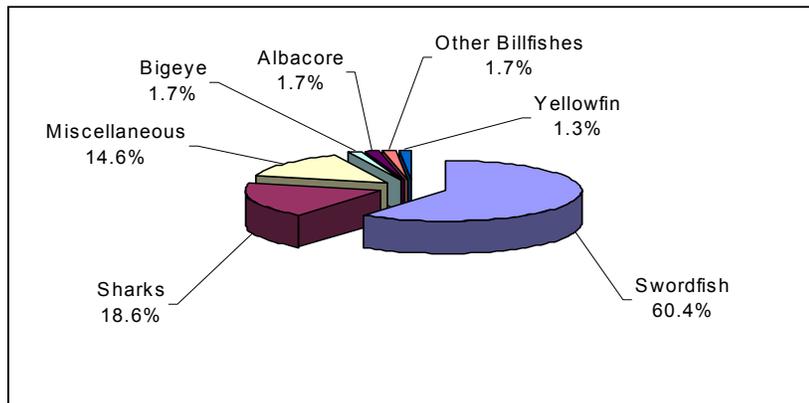


Figure 1.12: Catch composition of Mauritian longliners

1.5.6 Transshipment by tuna longliners

A total of 14 255 tonnes of tuna and tuna-like species was transshipped at Port Louis by licensed and non-licensed longliners which effected 256 calls. The species composition of the fish transshipped is shown in table 1.21. Albacore tuna constituted 32.5% of the total quantity transshipped.

Table 1.21: Species composition of fish transshipped

| Year | | Albacore | Yellowfin | Bigeye | Skipjack | Swordfish | Bluefin | Marlin | Sailfish | Shark | Misc. | Total |
|------|--------|----------|-----------|--------|----------|-----------|---------|--------|----------|-------|-------|--------|
| 2000 | Tonnes | 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 | Tonnes | 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 | Tonnes | 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 | Tonnes | 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 |
| 2004 | Tonnes | 4 632.8 | 4 110 | 1 361 | 3.4 | 1 595.2 | 0.4 | 172.3 | 5.6 | 2 022 | 352.3 | 14 255 |
| | % | 32.5 | 28.83 | 9.54 | 0.024 | 11.2 | 0.003 | 1.2 | 0.04 | 14.19 | 2.473 | 100 |

1.5.7 Production of the local tuna canning factory

The local cannery received 47 705 tonnes of round tuna fished by european purse seiners operating in the Western Indian Ocean. A total of 34 248 tonnes of canned tuna, 3 331 tonnes of pet food and 5 254 tonnes of fishmeal were produced. The total export value was approximately 2.2 billion rupees. A total of 1 005 tonnes of canned tuna, 231 tonnes of pet food and 5 254 tonnes of fishmeal, worth 80.5 million rupees was sold on the local market.

1.6 Swordfish fishery

Five local vessels were involved in the fishery during 2004. They effected 70 trips and landed 97.2 tonnes of fish. Swordfish constituted 53.3 % of the catch. The fishing area was spread around Mauritius, between latitudes 14⁰S and 25⁰S and longitudes 51⁰E and 65⁰E. The catch composition of the local vessels from 2000 to 2004 is shown in table 1.22 and the details for 2004 are presented in figure 1.13.

Table 1.22: Catch composition of the local swordfish fishing vessels (kg)

| Year | Swordfish | Yellowfin | Bigeeye | Albacore | Marlin | Shark | Misc. | Total |
|------|-----------|-----------|---------|----------|--------|-------|-------|--------|
| 2000 | 10 021 | 2 368 | 945 | 2 375 | 805 | - | 5 398 | 21 912 |
| 2001 | 33 919 | 24 061 | 5 098 | 17 754 | 2 483 | - | 4 042 | 87 357 |
| 2002 | 26 248 | 5 288 | 2 152 | 7 242 | 1 162 | 220 | 4 108 | 46 492 |
| 2003 | 35 123 | 21 395 | 2 190 | 14 003 | 2 413 | 228 | 3 986 | 79 338 |
| 2004 | 51 844 | 12 597 | 4 412 | 19 864 | 2 236 | 538 | 5 876 | 97 187 |

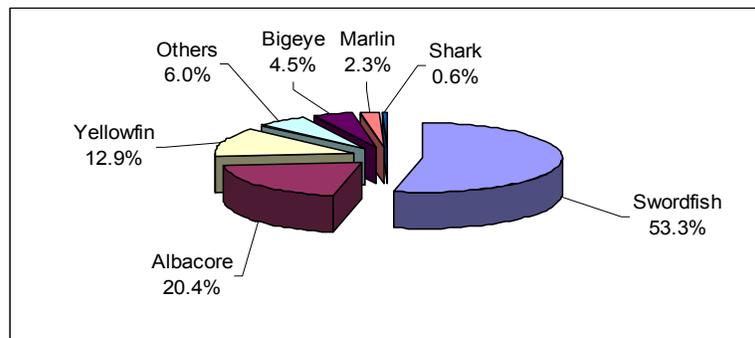


Figure 1.13: Species composition of the catches

1.6.1 Length frequency distribution of swordfish

Length frequency data were collected during the landings of the local vessels. The length frequency distribution is shown in figure 1.14. The length of the swordfish measured from the base of the pectoral fin to the caudal end ranged between 50 and 200 cm, with the majority between 70 and 108 cm.

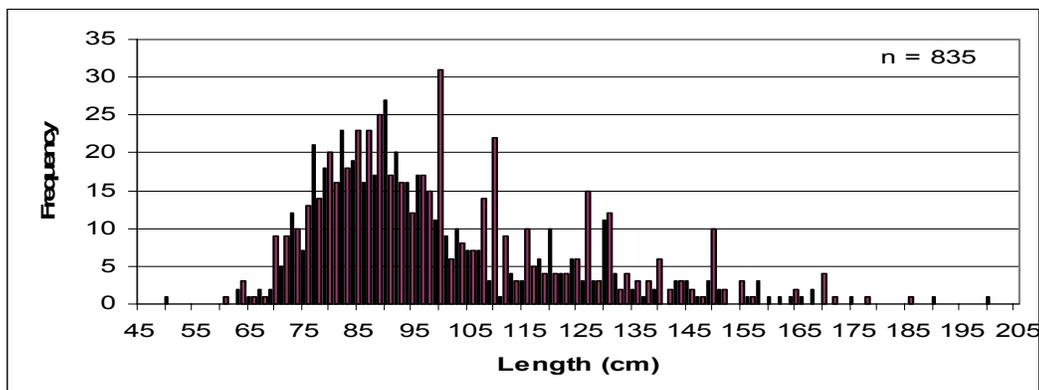


Figure 1.14: Length frequency distribution of swordfish

1.7 Ecotoxicology

1.7.1 Fish toxicity

Toxicity tests for the presence of ciguatoxin were continued on fish specimens from the waters of Mauritius. Moreover, samples of fish which caused poisoning were also received from the public for testing. Five fish specimens were found toxic and their particulars are given in table 1.23.

Table 1.23: Particulars of toxic fish specimens

| Common name | Scientific name | Length (cm) | Weight (g) | Origin | Results |
|-----------------------|----------------------------------|-------------|------------|-------------|------------------|
| Cheval de bois | <i>Anyperodon leucogrammicus</i> | 47 | 1 300 | Rodrigues | Highly toxic |
| Cheval de bois | <i>Anyperodon leucogrammicus</i> | 50 | 800 | | Highly toxic |
| Croissant queue jaune | <i>Variola louti</i> | 72 | 3 150 | | Highly toxic |
| Carangue | <i>Caranx sp.</i> | 64 | 4 200 | Sudan banks | Moderately toxic |
| Babonne | <i>Plectropomus sp.</i> | 48 | 1 550 | | Slightly toxic |

1.7.2 Harmful marine microalgae

Sampling of harmful marine microalgae was continued at the established sites. *Gambierdiscus toxicus* was only observed and in low numbers at Blue Bay in March, April and October and at Albion in June and October. *Ostreopsis* spp., and *Prorocentrum* spp., were observed at most sites except at Trou d'Eau Douce. The high density of *Prorocentrum* spp. at Albion in May and at Blue Bay in November indicated a mild localised bloom of the genus. *Sinophysis* sp. was most abundant in the samples from Blue Bay where it was

observed from August to December. The overall distribution of dinoflagellates at Trou d'Eau Douce was poor. The occurrence of the dinoflagellates at the sampling sites is shown in table 1.24.

Table 1.24: Density of dinoflagellates at Albion, Trou aux Biches, Blue Bay, Le Morne and Trou d'Eau Douce (cells/g of macroalga)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|---------------------|---------------------|-------------------------------------|---------------------|-------------------------|-----------------------------|----------------------|----------------------|------------------------------|----------------------|--------------------------------|----------------------|
| Gt | - | - | 2 bb | 1 bb | - | 11 a | - | - | - | 8 a 2 bb | - | - |
| Os | 1 tb 1 bb | 1 tb 9 bb | 7 tb 3 a 4 m 1 bb 1 tdd | 5 tb 1 a 3 bb | 2 tb 6 a 21 bb | 1 tb 1 a 2 m 33 bb | 3 tb 2 bb | 1 a 7 m 1 bb | 2 tb 1 a 2 m 2 bb | 5 m 1 bb | 7 tb 15 a 6 m 5 bb | 1 a 10 m 15 bb |
| Pro | 2 bb 1 tdd | 3 tb 2 a 2 bb | 5 tb 1 a 3 m 7 bb | 2 tb 2 a 2 bb | 75 tb >100 a 3 bb | 1 tb 11 a 2 m 2 bb | 28 a 9 m 38 bb | 17 a 9 m 92 bb | 5 tb 14 a 2 m 75 bb | 2 a 20 m 36 bb | 2 tb 5 a 17 m >100 bb | 4 a 10 m 25 bb |
| Co | 1 tb 16 bb | 1 tb 1 a 7 bb | 2 a 3 m | 2 tb | - | 6 a 2 m | 1 bb | 1 m | 1 m | 5 a | 1 a 1 bb | - |
| Am | 2 tb 4 m 2 bb | - | 5 tb 3 m 1 bb | - | 1 tb | 1 a | 1 bb | 1 a 1 m 1 bb | 1 bb | 1 bb | 1 tb 1 m 1 bb | 1 tb 1 m 1 bb |
| Sn | 2 bb | - | - | - | 1 tb 1 a | 1 a | - | 1 a 1 m 2 bb | 5 a 12 bb | 2 m 1 bb | 1 tb 1 a 14 m 10 bb | 4 m 5 bb |

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

1.8 Harmful marine organisms

Surveys on the occurrence of harmful marine organisms (stonefish, cones, etc.) were carried out at six selected public beaches, namely Albion, Flic en Flac, Mon Choisy, Le Bouchon, Blue Bay and Péreybère along established transect lines at quarterly intervals during the year. Results of the surveys are shown in table 1.25.

Table 1.25: Results of survey on harmful marine organisms

| Site | Area (m ²) | No. of transects | Laffe corail | Laffe laboue | Laffe volant | Cone | Sea urchin | Pinna |
|--------------|------------------------|------------------|--------------|--------------|--------------|------|------------|-------|
| Péreybère | 10 000 | 2 | - | - | - | - | 115 | - |
| Mon Choisy | 200 000 | 10 | - | - | - | - | 67 | - |
| Flic en Flac | 300 000 | 15 | 5 | - | 8 | - | 5 297 | - |
| Albion | 100 000 | 5 | - | 2 | 2 | 57 | 1 180 | - |
| Le Bouchon | 150 000 | 7 | - | 4 | - | 44 | 370 | 45 |
| Blue Bay | 50 000 | 2 | - | - | 1 | 8 | 68 | - |

1.9 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. From January to July some 1 870 juvenile fish were collected and identified. Details are given in table 1.26.

Table 1.26: Number of fish individuals, families and species collected

| Site | No of individuals | No of families | No of species |
|------------------|-------------------|----------------|---------------|
| Albion | 270 | 16 | 23 |
| Tamarin | 290 | 12 | 19 |
| Trou d'Eau Douce | 1 310 | 22 | 41 |

During the three-year study on juvenile fishes, which started in August 2001 some 14 841 fish larvae and juveniles belonging to 56 families were collected and identified from Tamarin, Albion and Trou d'Eau Douce. Species diversity and the abundance of juveniles show that the nearshore habitats are nursery grounds for many species, some being economically important. These areas provide refuge from predation and shelter and reflect the importance of each particular habitat.

1.10 Study on the biology of Mullidae (rougets) and Scaridae (cateaux)

Preliminary studies on the biology of Mullidae and Scaridae, two important commercial fishes, started in March. The aim of the project was to gather biological data on these two fish species to determine the length-weight relationship, age and growth parameters, maturity and fecundity, spawning season, feeding habits and the standing stock in coastal waters.

Rougets and cateaux were sampled at Grand Gaube, Poudre d'Or, Pointe aux Piments, Camps des Pêcheurs, Mahebourg, La Gaulette and Le Morne. 1 681 rougets and 579 cateaux were sampled for length and weight data. Table 1.27 gives the particulars of fish sampled. 96 fish specimens were identified to species level and dissected for the determination of maturity stage.

Table 1.27: Particulars of fish sampled

| Scaridae | No. | Length (mm) | Weight (g) |
|--------------------------------|------------|--------------------|-------------------|
| <i>Scarus ghobban</i> | 96 | 145 - 520 | 50 - 3200 |
| <i>Scarus psittacus</i> | 59 | 160 - 430 | 80 - 1450 |
| <i>Scarus russelii</i> | 48 | 190 - 390 | 40 - 1150 |
| <i>Scarus sordidus</i> | 14 | 230 - 290 | 260 - 590 |
| <i>Scarus globiceps</i> | 8 | 220 - 360 | 230 - 1100 |
| <i>Leptoscarus vaigiensis</i> | 347 | 155 - 330 | 70 - 650 |
| <i>Calatomus carolinus</i> | 6 | 158 - 270 | 80 - 500 |
| <i>Hipposcarus harid</i> | 1 | 313 | 560 |
| Mullidae | | | |
| <i>Mulloides flavolineatus</i> | 1 367 | 185 - 380 | 70 - 590 |
| <i>Mulloides vanicolensis</i> | 52 | 220 - 365 | 90 - 390 |
| <i>Parupeneus barberinus</i> | 214 | 180 - 340 | 70 - 480 |
| <i>Parupeneus cyclostomus</i> | 10 | 205 - 330 | 100 - 480 |
| <i>Parupeneus macronema</i> | 6 | 170 - 235 | 70 - 150 |
| <i>Parupeneus bifasciatus</i> | 3 | 173 - 305 | 75 - 400 |
| <i>Upeneus vittatus</i> | 29 | 220 - 320 | 130 - 460 |

2. MARINE SCIENCE

2.1 Coastal ecosystem research

2.1.1 Long-term monitoring of coral reef ecosystem

The long-term programme for the monitoring of coral reefs was continued at the established sites:- Albion, Pointe aux Sables, Trou aux Biches, Anse la Raie, Poudre d'Or, Trou d'Eau Douce, Bambous Virieux, Bel Ombre, Baie du Tombeau, Le Goulet and Ile aux Benitiers. Additional permanent monitoring stations were established in November at Belle Mare. Data for substrate cover were collected at each station using the Line Intercept Transect (LIT) method. The data were processed using the COREMO (Coral Reef Monitoring) software to obtain the percentage cover of the substrate; the results are shown in table 2.1. The abundance of fish, sea urchins and sea cucumbers at the stations is presented in table 2.2. Figure 2.1 depicts a typical table coral.

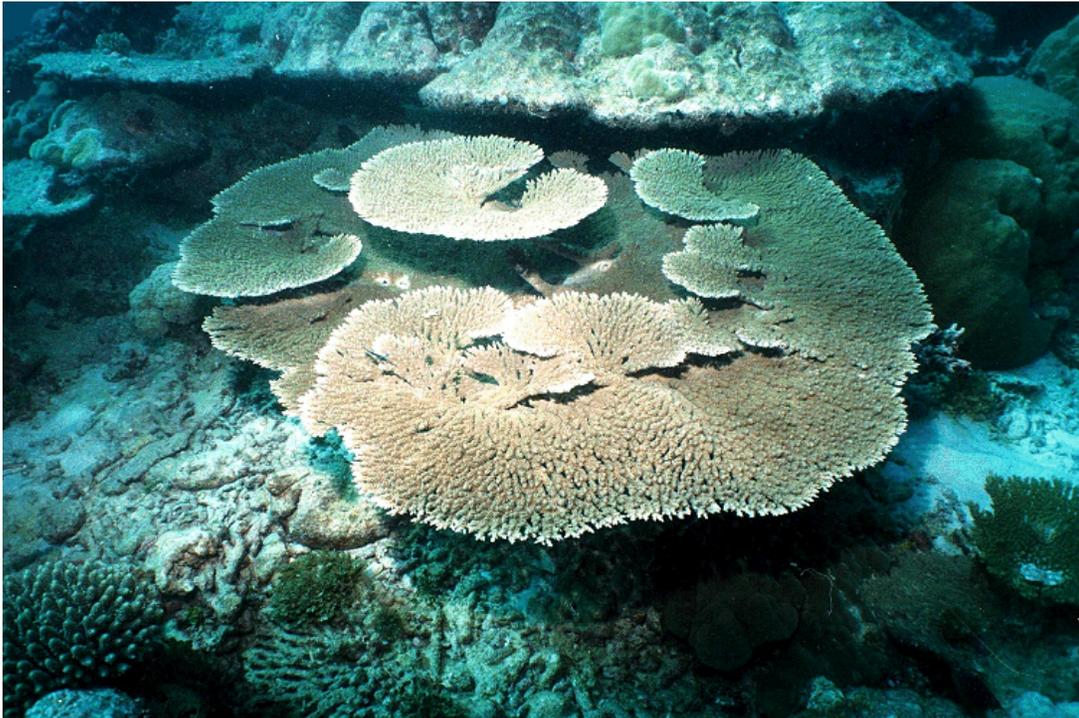


Figure 2.1: *Acropora cytherea*

Table 2.1: Percentage cover of substrate at monitoring stations

| Site | Stations | Year | Coral | Algae | Abiotic | Others |
|-----------------------|------------|------|-------|-------|---------|--------|
| Baie du Tombeau | back reef | 2003 | 55 | 9 | 35 | 1 |
| | | 2004 | 58 | 7 | 35 | N.O |
| Le Goulet | fore reef | 2003 | 62 | 6 | 32 | N.O |
| | | 2004 | 74 | 2 | 21 | 3 |
| Ile aux Benitiers | fore reef | 2003 | 35 | 3 | 58 | 4 |
| | | 2004 | 23 | 1 | 72 | 4 |
| | back reef | 2003 | 49 | 26 | 23 | 2 |
| | | 2004 | 22 | 13 | 65 | N.O |
| | shore reef | 2003 | 24 | 4 | 72 | N.O |
| | | 2004 | 18 | 8 | 74 | N.O |
| Bel Ombre | back reef | 2003 | 44 | 35 | 20 | 1 |
| | | 2004 | 51 | 28 | 30 | 1 |
| | shore reef | 2003 | 64 | 5 | 31 | N.O |
| | | 2004 | 52 | 8 | 40 | N.O |
| Bambous Virieux | back reef | 2003 | 61 | 9 | 30 | N.O |
| | | 2004 | 56 | 10 | 34 | N.O |
| | shore reef | 2003 | 33 | 35 | 32 | N.O |
| | | 2004 | 35 | 40 | 25 | N.O |
| Trou d'Eau Douce | back reef | 2003 | 45 | 23 | 31 | 1 |
| | | 2004 | 37 | 27 | 36 | N.O |
| | shore reef | 2003 | 70 | 0 | 30 | N.O |
| | | 2004 | 60 | 2 | 38 | N.O |
| Anse la Raie | back reef | 2003 | 67 | 24 | 9 | N.O |
| | | 2004 | 59 | 27 | 14 | N.O |
| | shore reef | 2003 | 77 | 16 | 7 | N.O |
| | | 2004 | 71 | 13 | 6 | N.O |
| Trou aux Biches | fore reef | 2003 | 36 | 5 | 58 | 1 |
| | | 2004 | 33 | 5 | 60 | 2 |
| | back reef | 2003 | 37 | 7 | 56 | N.O |
| | | 2004 | 37 | 7 | 56 | N.O |
| Pointe aux Sables | fore reef | 2003 | 15 | N.O | 85 | N.O |
| | | 2004 | 15 | 1 | 84 | N.O |
| | back reef | 2003 | 32 | 1 | 65 | 2 |
| | | 2004 | 39 | 6 | 53 | 2 |
| Albion | fore reef | 2003 | 30 | N.O | 67 | 3 |
| | | 2004 | 30 | 4 | 64 | 2 |
| | back reef | 2003 | 54 | 6 | 40 | N.O |
| | | 2004 | 22 | 36 | 42 | N.O |
| Poudre d'Or (site 1) | back reef | 2003 | 58 | 18 | 24 | N.O |
| | | 2004 | 57 | 30 | 13 | N.O |
| Poudre d'Or (site II) | back reef | 2003 | 56 | 1 | 41 | 2 |
| | | 2004 | 30 | 12 | 58 | N.O |
| Belle Mare* | site I | 2004 | 53 | 9 | 39 | N.O |
| | site II | 2004 | 50 | 9 | 42 | N.O |

N.O: Not observed

* Started as from 2004

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

| Site | Station | Year | Pomacentridae & Chaetodontidae | Acanthuridae | Labridae | Scaridae | Sea Cucumber | Sea Urchins |
|-----------------------|------------|------|--------------------------------|--------------|----------|----------|--------------|-------------|
| Baie du Tombeau | back reef | 2003 | XXXX | XX | X | X | X | N/O |
| | | 2004 | XXXX | X | N/O | N/O | N/O | N/O |
| Le Goulet | fore reef | 2003 | XXXX | XX | XX | X | XXX | X |
| | | 2004 | XXXX | XX | X | N/O | XX | N/O |
| Ile aux Benitiers | fore reef | 2003 | X | XX | XX | XX | N/O | XXXX |
| | | 2004 | X | XX | X | XX | N/O | XXXX |
| | back reef | 2003 | XXXX | XX | XX | XX | N/O | N/O |
| | | 2004 | XXXX | XX | XX | XXX | N/O | N/O |
| | shore reef | 2003 | XX | XX | XXX | XXX | X | X |
| | | 2004 | XXX | XX | XX | XXX | X | X |
| Bel Ombre | back reef | 2003 | XXXX | N/O | XX | XX | XX | XXX |
| | | 2004 | XXXX | N/O | X | X | XX | XXX |
| | shore reef | 2003 | XX | XX | XX | XX | XX | XX |
| | | 2004 | XXXX | XX | XX | XX | XX | X |
| Bambous Virieux | back reef | 2003 | XXXX | X | X | N/O | N/O | XXXX |
| | | 2004 | XXXX | N/O | X | N/O | XX | XXXX |
| | shore reef | 2003 | XXX | XX | X | XX | N/O | N/O |
| | | 2004 | XXX | XXX | XX | XXX | N/O | N/O |
| Trou d'Eau Douce | back reef | 2003 | XXXX | XX | XX | XX | N/O | XX |
| | | 2004 | XXXX | XXX | X | N/O | N/O | X |
| | shore reef | 2003 | XXX | XX | XX | N/O | X | N/O |
| | | 2004 | XXX | XX | N/O | N/O | N/O | N/O |
| Anse la Raie | back reef | 2003 | XXXX | X | X | X | N/O | X |
| | | 2004 | XXXX | X | X | N/O | N/O | N/O |
| | shore reef | 2003 | XXXX | XX | N/O | N/O | N/O | N/O |
| | | 2004 | XXXX | X | N/O | N/O | N/O | N/O |
| Trou aux Biches | fore reef | 2003 | XX | XXX | N/O | XX | N/O | N/O |
| | | 2004 | XX | XXX | N/O | X | N/O | N/O |
| | back reef | 2003 | XXXX | XX | XX | XX | X | X |
| | | 2004 | XXXX | XXX | X | X | X | X |
| Pointe aux Sables | fore reef | 2003 | XX | XX | XX | X | N/O | XXXX |
| | | 2004 | X | XX | N/O | N/O | N/O | XXXX |
| | back reef | 2003 | XXX | N/O | XX | XX | N/O | XXXX |
| | | 2004 | XX | N/O | XX | XX | N/O | XXXX |
| Albion | fore reef | 2003 | XX | XX | XX | XX | N/O | XXXX |
| | | 2004 | X | XX | X | XX | N/O | XXXX |
| | back reef | 2003 | XXXX | N/O | X | XX | N/O | XXX |
| | | 2004 | XXXX | N/O | X | XX | XX | XXX |
| Poudre d'Or (Site I) | back reef | 2003 | XXXX | X | XX | XX | N/O | N/O |
| | | 2004 | XXXX | X | X | X | N/O | N/O |
| Poudre d'Or (Site II) | back reef | 2003 | XXXX | X | X | N/O | X | XXXX |
| | | 2004 | XXXX | X | N/O | N/O | N/O | XXXX |

Legend: N/O – Not observed, X – 0-10, XX- 10-50, XXX – 50-100, XXXX - >100

From table 2.2 it is observed that the dominant fish families at most of the stations were *Pomacentridae* (damsel fish) and *Chaetodontidae* (butterfly fish), figure 2.2. The abundance of these species indicates that the coral reefs are healthy. Sea urchin populations were noted at stations where the coral reefs were degraded; sea cucumbers were found mainly in sandy areas. The dominant coral and fish species found at the monitoring sites are given in table 2.3.



Figure 2.2: *Chaetodon trifasciatus* (Butterfly fish)

Table 2.3: Dominant coral and fish species

| Sites | Dominant coral species | Dominant fish species |
|-------------------|---|---|
| Albion | <i>Acropora formosa</i> , <i>A. nobilis</i> , <i>A. austera</i> , <i>Porites lutea</i> | <i>Stegastes lividus</i> , <i>Dascyllus aruanus</i> , <i>Stegastes nigricans</i> , <i>Parupeneus barberinus</i> , <i>Siganus sutor</i> , <i>Halichoeres hortulanus</i> |
| Pointe aux Sables | <i>Galaxea fascicularis</i> , <i>Porites lutea</i> , <i>A. digitifera</i> , <i>A. formosa</i> , | <i>Ctenochaetus striatus</i> , <i>Stegastes limbatus</i> , <i>Scarus ghobban</i> , <i>Parupeneus barberinus</i> |
| Baie du Tombeau | <i>Galaxea fascicularis</i> , <i>A. formosa</i> , <i>A. austera</i> , <i>Montipora aequituberculata</i> , <i>Pavona decussata</i> , <i>Pavona cactus</i> , <i>Porites lutea</i> | <i>Stegastes lividus</i> , <i>Dascyllus aruanus</i> , <i>Chromis viridis</i> , <i>Scarus ghobban</i> |
| Trou aux Biches | <i>Acropora formosa</i> , <i>A. cytherea</i> , <i>A. hyacinths</i> , <i>Porites australiensis</i> , <i>Porites lutea</i> | <i>Stegastes lividus</i> , <i>Thalassoma hardwicke</i> , <i>Chromis viridis</i> , <i>Ctenochaetus striatus</i> , <i>Dascyllus aruanus</i> |
| Anse la Raie | <i>Montipora aequituberculata</i> , <i>Acropora formosa</i> , <i>Porites lutea</i> , <i>Pavona cactus</i> , <i>Pocillopora damicornis</i> | <i>Dascyllus aruanus</i> , <i>Stegastes lividus</i> , <i>Stegastes limbatus</i> , <i>Stegastes nigricans</i> |
| Poudre d'Or | <i>Millepora</i> sp, <i>Acropora formosa</i> , <i>Acropora cytheres</i> , <i>Pocillopora damicornis</i> , <i>Fungia repanda</i> , <i>Acropora aculeus</i> | <i>Scarus ghobban</i> , <i>Dascyllus aruanus</i> , <i>Chromis viridis</i> , <i>Ctenochaetus striatus</i> , <i>Stegastes nigricans</i> |
| Belle Mare | <i>Acropora formosa</i> , <i>A. nobilis</i> , <i>A. hyacinthus</i> | <i>Stegastes limbatus</i> , <i>Dascyllus aruanus</i> , <i>Scarus ghobban</i> , <i>Ctenochaetus striatus</i> , <i>Stegastes lividus</i> |
| Trou d'Eau Douce | <i>Montipora aequituberculata</i> ., <i>Pocillopora verrucosa</i> , <i>Fungia danai</i> , <i>Herpolitha limax</i> , <i>Acropora formosa</i> , <i>Pocillopora damicornis</i> , <i>Porites rus</i> . | <i>Stegastes lividus</i> , <i>Stegastes limbatus</i> , <i>Thalassoma hardwicke</i> ., <i>Dascyllus aruanus</i> , <i>Ctenochaetus striatus</i> |
| Bambous Virieux | <i>Acropora formosa</i> , <i>Pavona cactus</i> , <i>Pavona decussata</i> , <i>Porites lutea</i> , <i>Porites australiensis</i> | <i>Stegastes lividus</i> , <i>Stegastes limbatus</i> , <i>Dascyllus aruanus</i> |
| Bel Ombre | <i>Pavona decussata</i> , <i>Pavona cactus</i> , <i>Porites lutea</i> ., <i>Fungia repanda</i> , <i>Acropora formosa</i> , <i>Pocillopora damicornis</i> | <i>Ctenochaetus striatus</i> , <i>Chrysiptera annulata</i> , <i>Dascyllus aruanus</i> , <i>Stegastes limbatus</i> , <i>Stegastes lividus</i> , <i>Zanclus cornutus</i> |
| Ile aux Benitiers | <i>Acropora cytherea</i> , <i>Acropora frmosa</i> , <i>Acropora nobilis</i> , <i>A. intermedia</i> , <i>A. nasuta</i> , <i>A. austera</i> , <i>Pavona cactus</i> , <i>Fungia</i> sp., <i>Pocillopora damicornis</i> | <i>Stegastes lividus</i> , <i>Chrysiptera annulata</i> , <i>Stegastes limbatus</i> , <i>Siganus sutor</i> , <i>Scarus ghobban</i> , <i>Ctenochaetus striatus</i> , <i>Thalassoma trilobatum</i> , <i>Stegastes nigricans</i> , <i>Dascyllus aruanus</i> , <i>Stegastes limbatus</i> , <i>Zanclus cornutus</i> |

2.1.2 Coral bleaching

Sporadic coral bleaching was observed around Mauritius in 2004. Surveys were carried out in March, May and July, at the same two stations in Belle Mare, where bleaching was previously studied in 2003. The main cause for the coral bleaching, among other factors, may be attributed to the natural rise in sea surface temperature (SST) during the warmest months. The recuperation of the corals was observed with the gradual decrease in the sea surface temperature. The percentage of bleaching at the two stations during the months studied are shown in figures 2.3 and 2.4. At figure 2.5 are pictures of bleached and dead corals.

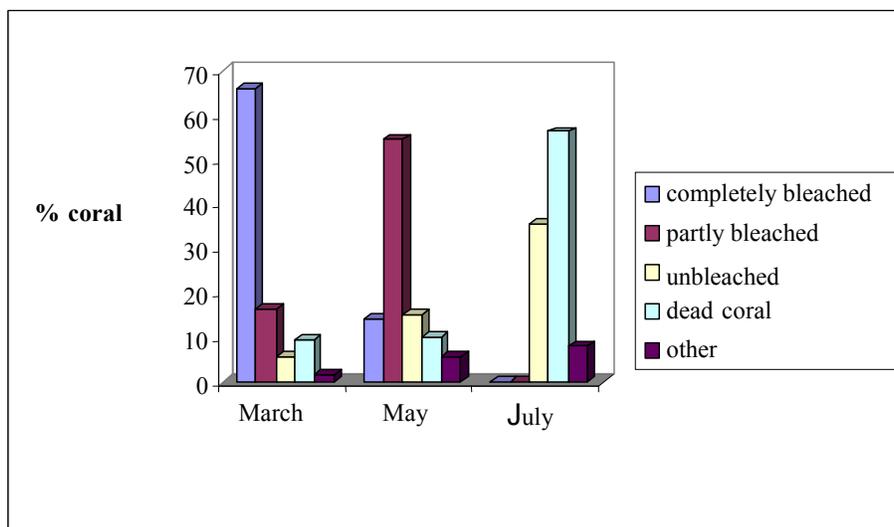


Figure 2.3: Percentage of bleaching at station 1

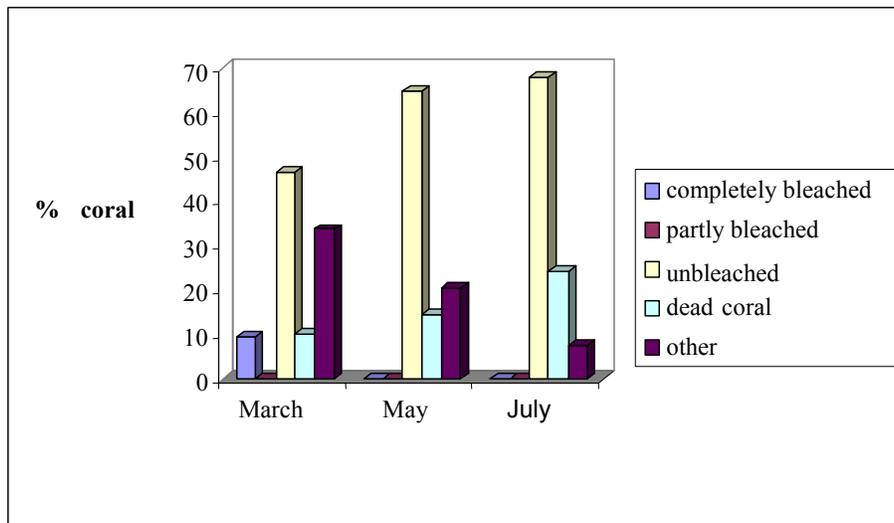


Figure 2.4: Percentage of bleaching at station 2

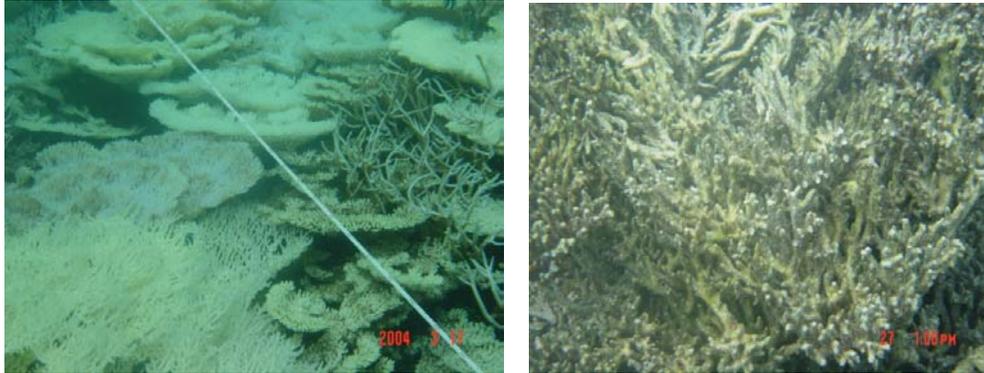


Figure 2.5: Bleached and dead corals

2.1.3 Monitoring of ex-sand mining sites

Sand mining was banned in October 2001 and four sites, namely Grand Gaube, Poudre d'Or, Mahebourg and GRSE were monitored every six months till March 2004 to observe the condition of the seabed and the recolonisation rate by marine flora and fauna. The LIT method was used to collect data on the substrate cover at the established monitoring stations. It was observed that the substrate was being recolonised gradually and that there was a general improvement in the ecosystem. Figures 2.6 and 2.7 illustrate recolonisation by algae and seagrass.



Figure 2.6: Seagrass bed (*Halophila ovalis*) at Grand Gaube



Figure 2.7: Patches of *Thalassodendron ciliatum* at Poudre d'Or

2.1.4 Eradication of crown of thorns starfish (COTs) in the lagoon

Timely intervention can save coral reefs from destruction due to outbreak of COTs. Coral reef patches in the lagoon at two sites: Ile aux Benitiers and Trou d'Eau Douce were infested with COTs and were cleaned using dry acid injection (sodium hydrogen sulphate solution) *in situ*. At Ile aux Benitiers, 50 adult COTs (diameter >40cm) and at Trou d'Eau Douce, 30 juvenile COTs (< 40cm) were killed. Figure 2.8 show an adult COT feeding on live corals.



Figure 2.8: Adult COT feeding on live corals

2.1.5 Regional Coral Reef Monitoring Project (RCRMP)

The RCRMP falls under the aegis of the *Commission de l'Océan Indien* (COI) with the participation of the five member countries. In 2004, many activities were undertaken under the project. Data on the status of coral reefs were collected at six sites, namely Albion, Bambous Virieux, Trou aux Biches, Anse la Raie, Blue Bay and Ile aux Benitiers to the species level and analysed using the COREMO software. The data collected were published in the *Status of Coral Reefs of the World 2004* by the Global Coral Reef Monitoring Network.

A Reef Check workshop was held in Tulear, Madagascar, in June 2004. Participants benefited from a simpler technique for data collection with respect to coral reefs. A Mauritian NGO was initiated on coral reef monitoring using the reef check method at three dive sites at Trou aux Biches.

Under the training component of the project, officers from the Albion Fisheries Research Centre (AFRC) benefited from diving courses; four completed the open water diving course and six were certified in the advanced open water diving course.

Officers of the AFRC gave talks on the importance of the marine environment at fourteen primary schools. A pamphlet on coral reefs was also produced for distribution to the general public.

2.1.6 Mangrove propagation

The mangrove propagation programme was carried out in the eastern region at Pointe Brochus and Anse Petit Sable, where 6 000 and 8 000 mangrove propagules were planted respectively, covering a total area of 7 000 m². At Petite Habitation, 10 000 propagules were replanted in replacement of seedlings uprooted by vandals in January 2004. Table 2.4 gives details of propagules planted at each site.

Table 2.4: Number of propagules planted

| Site | Area m ² | Number planted |
|-------------------|---------------------|----------------|
| Pointe Brochus | 4 000 | 6 000 |
| Anse Petit Sable | 3 000 | 8 000 |
| Petite Habitation | 5 000 | 10 000 |
| Total | 12 000 | 24 000 |

About 7 000 mangroves plants of an average height of 2 m were illegally cut at Bambous Virieux in October 2004. However, the plants were generating new shoots.

2.2 Study of current patterns in the lagoon

The objective of the study was to understand the movement of water into, through and out of the lagoon. Water current determined at various sites is presented in table 2.5.

Table 2.5: Results of current studies

| Site | Tide | Speed m/s | | Direction |
|-----------------|-------|-----------|---------|----------------|
| | | Minimum | Maximum | |
| Case Noyale | flood | 0.12 | 0.15 | North westerly |
| Le Morne | flood | 0.03 | 0.15 | Northerly |
| | ebb | 0.03 | 0.05 | Southerly |
| Baie du Tombeau | flood | 0.02 | 0.07 | Northerly |
| | ebb | 0.02 | 0.07 | Southerly |
| Bel Ombre | flood | 0.20 | 0.34 | South-westerly |

2.3 Coastal development projects

Various fisheries coastal development projects were initiated and implemented as listed in table 2.6.

Table 2.6: Status of projects

| Name of Projects | Site | Status |
|---|-------------------------|---------------|
| Construction of fish landing station, reprofiling | La Preneuse | Completed |
| Dredging of boat passage | La Preneuse | Completed |
| Dredging of la Passe Vacoas | Trou d'Eau Douce | Completed |
| Construction of fish landing station | Mer Rouge (Roches Bois) | Completed |
| Demolition of hatchery complex | Trou d'Eau Douce | Completed |
| Construction of slipway and platform | Grand Sable | EIA submitted |
| Construction of fish landing station | Calodyne | EIA submitted |
| Dredging of boat passage | Le Morne | Completed |
| Construction of steps | Bambous Virieux | EIA submitted |
| Dredging of boat passage | Case Noyale | EIA submitted |
| Construction of slipway | Quatre Soeurs | Completed |
| Additional work – slipway | Baie du Tombeau | Completed |
| Construction of fish landing station | Roche Bois | Completed |

2.4 Coastal environment research

2.4.1 Coastal water quality

The long-term monitoring for the quality of coastal waters around the island was continued

under the Coastal Environment Research Project.

2.4.1.1 Monitoring of chemical parameters

Water quality was monitored at established stations of the fourteen sites around the island. Water samples were collected on a quarterly basis at Ile aux Bénitiers, Bel Ombre, Bambous Virieux, Trou d'Eau Douce, Anse la Raie and Trou aux Biches. Sites at Grand Baie, Blue Bay and Balaclava were sampled thrice during the year, while those at Pointe aux Sables, Bain des Dames and Baie du Tombeau were sampled every two months. Water samples were collected in the Port Louis harbour on a quarterly basis and at Poudre d'Or on a monthly basis.

2.4.1.2 Data collected and results of analysis

The sea state, weather conditions and water temperature were recorded *in situ*, while chemical parameters were determined in the laboratory. Chemical oxygen demand (COD), nitrate-nitrogen (NO_3^- -N) and phosphate (PO_4^{3-}) levels in the water samples are shown in table 2.7.

Table 2.7: Results of water analyses

| Site | Year | Nitrate-Nitrogen (mg/l) | Phosphate (mg/l) | Chemical Oxygen Demand (mg/l) |
|-------------------|------|-------------------------|------------------|-------------------------------|
| Ile aux Benitiers | 2002 | <0.1 | <0.01 - 0.03 | 0.1 - 0.5 |
| | 2003 | <0.1 | <0.01 - 0.02 | 0.1 - 0.5 |
| | 2004 | <0.1 | 0.01 - 0.02 | 0.1 - 0.8 |
| Bel Ombre | 2002 | <0.1 | <0.01 - 0.05 | 0.1 - 0.9 |
| | 2003 | <0.1 | <0.01 - 0.08 | 0.1 - 1.5 |
| | 2004 | <0.1 | <0.01 - 0.05 | 0.1 - 0.8 |
| Bambous Virieux | 2002 | <0.1 | 0.01 - 0.02 | 0.1 - 0.5 |
| | 2003 | <0.1 | 0.01 - 0.03 | 0.2 - 0.9 |
| | 2004 | <0.1 | <0.01 - 0.04 | 0.1 - 1.6 |
| Trou d'Eau Douce | 2002 | <0.1 | <0.01 - 0.06 | 0.1 - 0.8 |
| | 2003 | <0.1 | 0.01 - 0.03 | 0.1 - 0.5 |
| | 2004 | <0.1 | 0.01 - 0.06 | 0.1 - 0.2 |
| Anse la Raie | 2002 | <0.1 | 0.01 - 0.04 | 0.2 - 0.5 |
| | 2003 | <0.1 | <0.01 - 0.01 | 0.2 - 0.4 |
| | 2004 | <0.1 | <0.01 - 0.05 | 0.1 - 0.5 |
| Trou aux Biches | 2002 | <0.1 | <0.01 - 0.05 | 0.2 - 0.7 |
| | 2003 | <0.1 | <0.01 - 0.01 | 0.2 - 0.8 |
| | 2004 | <0.1 | <0.01 - 0.04 | 0.1 - 0.8 |
| Pointe aux Sables | 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 |
| | 2004 | <0.1 - 0.1 | <0.01 - 0.05 | 0.1 - 0.8 |
| Bain des Dames | 2002 | <0.1 | 0.01 - 0.11 | 0.2 - 3.5 |
| | 2003 | <0.1 | <0.01 - 0.08 | <0.1 - 1.2 |
| | 2004 | <0.1 | 0.01 - 0.08 | 0.1 - 2.0 |
| Grand Baie | 2002 | <0.1 | <0.01 - 0.04 | 0.1 - 1.1 |
| | 2003 | <0.1 | <0.01 | 0.1 - 1.8 |
| | 2004 | <0.1 | <0.01-0.07 | <0.1 - 1.4 |
| Baie du Tombeau | 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 |
| | 2004 | <0.1 | <0.01 - 0.16 | <0.1 - 1.6 |
| Harbour | 2002 | <0.1 | <0.01 - 0.18 | 0.1 - 0.6 |
| | 2003 | <0.1 - 0.2 | <0.01 - 1.01 | 0.1 - 2.0 |
| | 2004 | <0.1 | <0.01 - 0.08 | 0.1 - 0.9 |
| Poudre d'Or | 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 |
| | 2004 | <0.1 | 0.01 - 0.08 | 0.1 - 8.8 |
| Balaclava | 2002 | <0.1 | <0.01 - 0.04 | 0.1 - 0.7 |
| | 2003 | <0.1 | 0.01 - 0.04 | 0.1 - 1.3 |
| | 2004 | <0.1 | 0.01 - 0.05 | 0.1 - 0.6 |
| Blue Bay | 2002 | <0.1 | <0.01 - 0.05 | 0.1 - 0.4 |
| | 2003 | <0.1 | <0.01 - 0.03 | 0.1 - 0.6 |
| | 2004 | <0.1 | 0.01-0.10 | <0.1 - 0.4 |

The results of water quality analyses were generally within the *Guidelines for Coastal Water Quality Requirements for various categories Govt. Notice No. 620 of 1999 (CWQG)*. The levels of nitrate ranged from <0.1 to 0.1 mg/l while those of phosphate was from <0.01 to 0.08 mg/l; COD values were less than 1.8 mg/l at most of the sites. Due to the influx of fresh water, phosphate values at one station at Blue Bay and two stations at Baie du Tombeau exceeded the guideline limit. Similarly, at one station in Poudre d'Or, the *CWQG* limits were exceeded for

phosphate and COD.

2.4.1.3 Analysis for trace metals and pesticides

Water samples were taken from 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 and the levels of three pesticides, atrazin, diuron and hexazinone. Due to the breakdown of the Atomic Absorption Spectrometer (AAS), analysis for only copper, zinc and lead was carried out.

Trace metals zinc, copper and lead were not detected in the water samples at any of the monitored sites. The comparative results of analyses are given in table 2.8.

Table 2.8: Comparative results for trace metals

| Site | Year | Cadmium (mg/l) | Copper (mg/l) | Lead (mg/l) | Zinc (mg/l) | Mercury (µg/l) |
|-----------------------------|------|----------------|---------------|-------------|--------------|----------------|
| Grand River North West | 2002 | <DL | <DL | <DL | <DL | <DL |
| | 2003 | <DL | <DL | <DL | <DL | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| Pointe Roches Noires | 2002 | <DL | <DL | <DL | <DL | <DL |
| | 2003 | <DL | <DL | <DL | <DL | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| Grand River South East | 2002 | <DL | <DL | <DL | <DL | <DL |
| | 2003 | <DL | <DL | <DL | <DL | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| Mahebourg | 2002 | <DL | <DL | <DL | <DL | <DL |
| | 2003 | <DL | <DL | <DL | <DL | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| l'Escalier | 2002 | <DL | <DL | <DL | <DL | <DL - 0.03 |
| | 2003 | <DL | <DL | <DL | <DL | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| Baie du Cap | 2002 | <DL | <DL | <DL | <DL | <DL - 0.03 |
| | 2003 | <DL | <DL | <DL | <DL | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| Tamarin | 2002 | <DL | <DL | <DL | <DL | <DL |
| | 2003 | <DL | <DL | <DL | <DL | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| River Lataniers | 2003 | <DL | <DL | <DL | 0.006 | <DL |
| | 2004 | - | <DL | <DL | <DL | - |
| Detection Limit (DL) | | 0.002 | 0.01 | 0.05 | 0.005 | 0.02 |

Pesticides atrazine, diuron and hexazinone were also not detected in the water samples.

2.4.1.4 *Ad hoc* water analyses and fish mortality

Fifteen analyses were carried out on samples of water related to cases of alleged pollution, aquaculture purposes and cases of fish mortality. Results showed that all the physico-chemical parameters were within the *Coastal Water Quality Guidelines* limits.

Water quality analyses were carried out on water samples collected at Grand Gaube, Grand Baie and Le Bouchon in connection with coastal development projects and at the aquaculture farm at Pointe aux Feuilles. The results were within the *CWQG* limits except at one station at Le Bouchon, which was influenced by fresh water.

A four-month study was undertaken jointly by the Albion Fisheries Research Centre, the Ministry of Environment, the Central Water Authority and the Waste Water Management Authority to investigate the effect of the pig breeding activities at Bassin Requin Cooperative Pig Farm on the ground water in the vicinity. The Ministry was assigned the responsibility of monitoring the lagoonal water quality in the vicinity of the Belle Mare Plage Hotel. Water samples were collected at high and low tides at three stations for the analysis of physico-chemical parameters and coliform bacteria (total and faecal). Parameters were within the *CWQG* limits (recreation) at all the stations.

2.5 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 the fisheries posts around the island and at Albion. The average monthly temperature varied from 20.8°C in winter to 29.0°C in summer as shown in figure 2.9. The highest temperature was recorded in the northern region in February and March. The lowest temperature was recorded in the southern region in July.

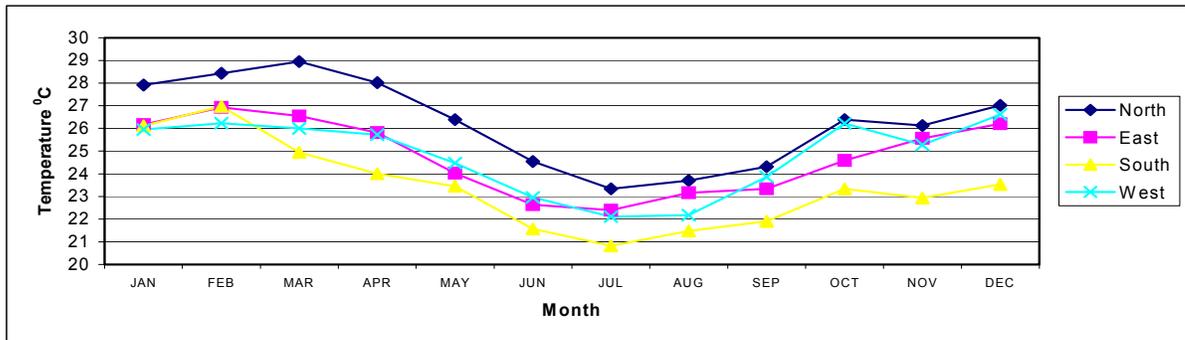


Figure 2.9: Average monthly sea surface water temperature

2.6 Monitoring of coliform bacteria at public beaches

The monitoring of the levels of total coliform (TC) and faecal coliform (FC) in seawater continued each month at the established stations of each selected public beach, namely Flic en Flac, Albion, Pointe aux Sables, Trou aux Biches, Mon Choisy, Le Goulet, Grand Baie and Blue Bay. The Blue Bay and BalACLava Marine Parks were sampled twice during the year.

Results of water analyses showed 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<1000 colonies/100ml and FC<200 colonies/100ml) except at two stations at 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 2.9. However, the mean value at one of the stations at Pointe aux Sables improved in 2004.

Table 2.9: Results of coliform analysis at the monitoring sites

| Beach | Station No. | Average colony count per 100ml | | | | | |
|-----------------------|-------------|--------------------------------|-----|--------|-------|------|-----|
| | | 2002 | | 2003 | | 2004 | |
| | | TC | FC | TC | FC | TC | FC |
| Flic en Flac | 1 | 58 | 11 | 49 | 10 | 25 | 9 |
| | 2 | 27 | 11 | 19 | 8 | 23 | 4 |
| | 3 | 34 | 10 | 14 | 6 | 17 | 8 |
| | 4 | 27 | 15 | 25 | 9 | 37 | 10 |
| | 5 | 114 | 26 | 21 | 9 | 44 | 12 |
| Trou aux Biches | 1 | 52 | 18 | 30 | 7 | 19 | 4 |
| | 2 | 17 | 15 | 33 | 5 | 44 | 6 |
| Mon Choisy | 1 | 21 | 14 | 24 | 4 | 15 | 3 |
| | 2 | 71 | 42 | 40 | 4 | 26 | 4 |
| | 3 | 21 | 15 | 22 | 7 | 23 | 3 |
| | 4 | 16 | 7 | 70 | 17 | 10 | 2 |
| Blue Bay | 1 | 104 | 60 | 40 | 11 | 17 | 2 |
| | 2 | 31 | 13 | 41 | 9 | 38 | 8 |
| | 3* | 49 | 42 | 30 | 8 | 31 | 11 |
| Albion | 1 | 134 | 35 | 38 | 23 | 34 | 6 |
| Pointe aux Sables | 1 | 534 | 197 | 921 | 542 | 834 | 150 |
| | 2 | 166 | 109 | 11 745 | 7 452 | 302 | 90 |
| | 3 | 57 | 39 | 35 | 11 | 71 | 25 |
| | 4 | 107 | 50 | 207 | 30 | 244 | 56 |
| Grand Baie | 1* | 7 | 5 | 41 | 16 | 14 | 3 |
| | 2* | 10 | 4 | 41 | 17 | 16 | 4 |
| | 3* | 6 | 3 | 13 | 6 | 29 | 7 |
| | 4* | 8 | 3 | 25 | 11 | 127 | 25 |
| | 5* | - | - | 22 | 10 | 110 | 21 |
| Le Goulet | 1 | 41 | 16 | 146 | 42 | 5 | 1 |
| Blue Bay Marine Park | 1 | ND | ND | ND | ND | 2 | ND |
| | 2 | 1 | 1 | ND | ND | 3 | 1 |
| | 4 | 4 | 2 | 4 | 2 | 5 | ND |
| Balaclava Marine Park | 2 | ND | ND | 7 | 2 | ND | ND |
| | 3 | ND | ND | ND | ND | ND | ND |
| | 4 | 2 | 1 | ND | ND | ND | ND |
| | 6 | 4 | 2 | 29 | 7 | 7 | 1 |

(*): New monitoring station; **ND**: Not Detected

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

3. AQUACULTURE

Seed production of the silver sea bream, *Rhabdosargus sarba*, berri rouge, *Oreochromis* sp. of both the Malaysian and the St. Petersburg varieties and the giant freshwater prawn, *Macrobrachium rosenbergii* was undertaken. Seed production of the giant tiger prawn, *Penaeus monodon*, using low cost technology was initiated. Acclimatisation of the shrimp juveniles was attempted with a view to providing a potential candidate with a high growth rate to farmers having freshwater ponds. Trials for sexual and asexual reproduction of the two species of the sea cucumbers, *Holothuria atra* and *Bohadschia marmorata* were carried out. Fingerlings of berri rouge and juveniles of *Macrobrachium rosenbergii* were distributed to fish farmers. Stock enhancement of the lagoon was pursued with the release of silver sea bream fingerlings.

3.1 Plankton culture

3.1.1 Phytoplankton

The production of an adequate quantity of good quality live feed was maintained for the larval rearing of the silver sea bream, the giant tiger prawn, the sea cucumber and the freshwater prawn. Pure cultures of four strains of phytoplankton species namely *Nannochloropsis* sp., *Tetraselmis* sp., *Chaetoceros calcitrans* and *Isochrysis galbana* were maintained in the phytoplankton room. The *Isochrysis galbana* introduced from India was cultured for feeding sea cucumber larvae. Mass production of *Nannochloropsis* sp. was undertaken throughout the year to provide food for the culture of rotifers and as a water conditioner for the larval rearing of sea bream, while the *Chaetoceros calcitrans* was produced for feeding the penaeid shrimp larvae. During the peak production of *Nannochloropsis* sp., a maximum of 163 m³ of phytoplankton rich water was attained with an average cell density of 1.9 x 10⁶ microalgae per millilitre.

3.1.2 Zooplankton

The batch culture technique was used to produce rotifers, *Brachionus rotundiformis*, for the feeding of sea bream larvae. In winter, heaters were placed in the rotifer culture tanks to keep an optimum temperature range of 27 to 30°C. Baker's yeast was added to the rotifer tanks at the rate of 0.3 to 0.5 g/million rotifers, as a supplement whenever it was not possible to

provide high cell densities of microalgae. During the peak production of rotifers, up to 2 billion rotifers individuals were produced per day in culture tanks totalling 25m³ in volume.

3.2 Sea bream culture

3.2.1 Broodstock

In June, when the temperature was favourable for spawning of the silver sea bream, thirty two adults were collected from an outdoor pond at the Albion Fisheries Research Centre and stocked in a concrete tank of 50 m³ capacity having a continuous flow of water. As a preventive measure against ecto-parasites, the fish was disinfected in 25ppm Sodium Nifurstyrenate (NFS-Na), followed by a freshwater dip for a few minutes. The fish of body weight ranging from 0.7 to 1.9 kilograms were fed daily on fresh mussels and freshly prepared moist pellets at 10% biomass. The average water temperature during the seed production cycle was 22°C.

3.2.2 Seed production

Spawning started at the beginning of June and continued till the end of the month. The total number of eggs obtained was 5.5 million, out of which 1.8 million showed good buoyancy. A total of 800 000 larvae of sea bream hatched out and was stocked in nine tanks of capacity ranging between 0.5 and 20 tonnes. During the rearing period, the average water temperature was 22°C and the average pH was 7.5. The fish larvae were fed on live rotifers and brine shrimp nauplii. The diet of the larvae was supplemented with imported weaning feed. To combat infection by *Oodinium* sp., copper sulphate at a dosage of 0.5 ppm was applied daily as from the tenth day of rearing. After a culture period of 60 to 70 days, 255 400 sea bream fingerlings were obtained; the body length ranged from 2 to 3 centimetres and the body weight from 0.15 to 0.3 gram, representing a survival rate of 32%. The annual seed production for the past five years is presented in table 3.1.

Table 3.1: Production of sea bream fingerlings

| Year | No. of fingerlings |
|-------------|---------------------------|
| 2000 | 152 474 |
| 2001 | 181 610 |
| 2002 | 338 200 |
| 2003 | 292 000 |
| 2004 | 255 400 |

3.3 Camaron culture

3.3.1 Broodstock

A broodstock of 389 berried camaron females was set up: 271 were obtained from Riche en Eau Sugar Estate, 103 from the Medine Sugar Estate and 15 from the La Ferme Fish Farm. They were conditioned and maintained in one rectangular fiberglass tank and one circular polycarbonate tank in the dark at an ambient water temperature of 27°C. The berried females were fed once daily on chopped frozen mussels and fish at 10% body weight.

3.3.2 Seed production

Two seed production cycles were carried out between September and April when the average water temperature was 27°C. Some 3 000 000 larvae were obtained and stocked in fiberglass and polycarbonate tanks of 0.5 to 3 m³ capacity in clear brackish water at 12 ppt. The camaron larvae were fed daily on brine shrimp nauplii, minced and sieved frozen bonito and octopus. The larval stage index was closely monitored. Post-larvae were obtained after a culture period ranging between 30 to 57 days, after which they were acclimated to freshwater. A total of 656 200 camaron juveniles was produced with a survival rate of 23%. 165 000 hatchery-produced camaron juveniles of mean body weight 0.08 gram were stocked at the La Ferme Fish Farm. The juveniles were fed on camaron crumbles once daily during the first month and subsequently twice daily on camaron pellets. The growth of the camaron from March to December 2004 is shown in figure 3.1.

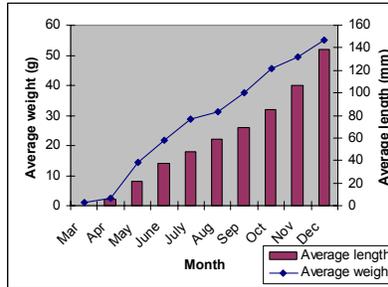


Figure 3.1: Growth of camaron

3.3.3 Sale of camaron

A total of 491 200 camaron juveniles were sold to 14 camaron farmers and 427 kilograms of marketable size camaron was harvested. Camaron juveniles were sold at the rate of Rs. 1.25 per unit and adult camaron was sold at Rs. 325 per kilogram. Proceeds of sale amounted to Rs. 752 775.

3.3.4 Building-up of a broodstock at the La Ferme Fish Farm

After culling exercises, 5 485 camarons of average body weight 27 grams were selected and reared in two 500 m² earthen ponds at the La Ferme Fish Farm to constitute a broodstock for future seed production cycles. The adult camaron was fed on camaron pellets daily at 1% biomass. The broodstock ponds were flushed continuously to avoid oxygen depletion. Excess *Hydrilla* sp., *Elodea* sp. and other filamentous algae were removed manually and water quality was monitored.

3.4 Resource propagation

3.4.1 Release of sea bream fry

A total of 255 400 sea bream fry was released in the lagoon at two sites, namely Albion and Trou d'Eau Douce. The sites are located near large estuarine systems, suitable habitats for small size sea breams. The number of sea bream fry released during the last three years is presented in table 3.2.

Table 3.2: Number of sea bream fry released

| Site | Year | | |
|------------------|----------------|----------------|----------------|
| | 2002 | 2003 | 2004 |
| Ferney | 155 900 | 100 000 | - |
| Tamarin | 24 300 | 85 000 | - |
| Albion | 105 000 | 107 000 | 122 000 |
| Trou d'Eau Douce | 53 000 | - | 133 400 |
| Total | 338 200 | 292 000 | 255 400 |

3.5 Berri Rouge culture

3.5.1 Broodstock

The broodstock consisted of 2 400 selected breeders introduced from Malaysia in August 2001 and 600 from Israel. The two fish varieties were maintained in separate ponds and fed daily on dry pellets at 1% body weight.

3.5.2 Seed production

Reproduction of the berri rouge of both the Malaysian and the Israeli varieties occurred in the ponds from October to April. All-male fry were produced by the sex reversal method and visual selection. The sex reversal treatment consisted of providing micro-granulated feed (1 000 grams) mixed with 0.07 gram male hormone (testosterone) dissolved in 700 millilitres absolute alcohol over a continuous period of 28 days three times daily. A total of 8 000 sex reversed fry was produced. Fry exceeding 0.5 centimetre body length were cultured to an average body weight of 30 grams and were sexed visually to prevent in-breeding. A total of 20 977 fingerlings was visually sexed to meet the demand of farmers. The number and type of berri rouge fingerlings produced is presented in table 3.3.

Table 3.3: Number and types of berri rouge fingerlings produced

| Year | Malaysian strain | | | Israeli strain Kept at LFFF | Total (unit) |
|------|------------------|----------------|--------------------------|--------------------------------|--------------|
| | sex reversed | visually sexed | acclimatised to seawater | | |
| 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 |
| 2004 | 8 000 | 20 977 | Nil | 9 780 | 38 757 |

A total of 20 055 male fingerlings was sold to 286 farmers at a unit price of Rs 1.25, for a sum of Rs 25 068. Moreover, incidentally 258.8 kilograms of berri rouge were harvested from ponds and sold for a sum of Rs 7 764.

3.6 Crayfish culture

A broodstock of crayfish was kept at the La Ferme Fish Farm in an earthen pond of 500m². A diet comprising camaron pellets, chopped frozen tilapia and dried grass was given to the crayfish at 1% body weight once daily throughout the year. The broodstock was maintained to produce juveniles. However, seed production for crayfish, *Cherax quadricarinatus*, was discontinued in view of the very low demand from farmers.

3.7 Sea cucumber culture

3.7.1 Broodstock

In August a broodstock of 51 sea cucumbers, *Holothuria atra*, was collected at Le Morne. The adult sea cucumber weighed between 68 and 245 grams and had body lengths ranging from 10.2 to 24.7 centimetres. From August to November, 140 *Bohadschia marmorata* were obtained from the lagoon of Le Morne and Albion. The broodstock of *B. marmorata* weighed between 70.5 and 192 grams and had body lengths ranging between 9.5 to 15 centimetres. Both species were maintained in six 0.5 m³ outdoor polycarbonate tanks at a water temperature ranging between 22 and 30°C and at a salinity of 36 ppt. The tanks were embedded with a layer of 15 centimetre of sand. Water was exchanged at the rate of 70% of volume once in two days. The sea cucumbers were fed once daily at 10% biomass on seaweed paste comprising mainly *Ulva* sp., *Hypnea* sp., *Chaetomorpha* sp. and *Gracillaria* sp..

3.7.2 Seed production

3.7.2.1 Sexual reproduction

Induced spawning of both *B. marmorata* and *H. atra* was carried out using the two methodologies; thermal stimulation and drying followed by spraying a powerful jet of seawater (figure 3.2). Eighteen specimens of *B. marmorata* and six specimens of *H. atra* were induced to spawn by thermal stimulation with a temperature difference of $\pm 5^{\circ}\text{C}$ at 25°C. Three females of *B. marmorata* released a total of 900 000 eggs. A fourth female partially spawned releasing 40 000 eggs. However, the eggs could not hatch out since the male sea cucumbers did not respond to the thermal stimulation. *B. marmorata* did not react to the use of drying followed by spraying of a powerful jet of sea water as a method for induced spawning. *H. atra* did not respond to any of the two methodologies of induced spawning.



Figure 3.2: Drying and spraying technique for induced spawning

3.7.2.2 Asexual reproduction

Asexual reproduction of both *B. marmorata* and *H. atra* was carried out by the cutting method as shown in figure 3.3. Four *B. marmorata* and six *H. atra* were cut into two pieces each. All the cut pieces regenerated fully and showed an increase in weight at the end of 51 days of culture. A greater increase in average body length was noted in *H. atra* which was 5.4 centimetres as compared to *B. marmorata* which was 1.5 centimetres. The average increase in weight of *B. marmorata* was slightly more than *H. atra*; 26 grams and 24 grams respectively.



Figure 3.3: Asexual reproduction

3.8 Marine shrimp culture

3.8.1 Broodstock

One female and six male giant tiger prawns, *Penaeus monodon*, and thirty female and six male of *Metapenaeus monoceros* were collected from Bambous Virieux in October. The broodstock of each species was kept in separate conical fibre glass tanks at water temperatures ranging between 24.5 and 28°C and at salinities ranging between 33.3 and 35.2 ppt. The breeders were fed daily on chopped frozen mussels, squid, beef liver and oligochaete worms at 12 to 15% biomass. The females were subjected to unilateral eyestalk ablation using an electric cautery to induce maturation and spawning.

3.8.2 Seed production

Seven females of *M. monoceros* matured and spawned producing 87 500 nauplii. Larval rearing was carried out in tanks of 3m³ capacity using the low cost technology which consisted mainly of feeding the larvae on diatoms, *Chaetoceros calcitrans*, up to the post larval stage. After the one-day-old post larval stage PL1, only a minimum amount of *Artemia salina* nauplii (0.25 individual/ml) was used in addition to artificial feed. The fungicide Treflan, was applied at a dosage of 0.05ppm as prophylactic treatment during the seed production cycle. A total of 44 000 five-day-old post larvae PL5 were obtained. The post larvae were gradually acclimatized to fresh water over a period of five days for onward culture in fresh water ponds. The survival rate of the post larvae during the acclimatisation process was 70 %.

3.9 Aquaculture extension service

The extension service provided technical advice to 361 persons. Site visits were effected to assist fish farmers on pond construction and aquaculture techniques.

3.10 Aquaculture production

The aquaculture production was 361.5 tonnes, details of which are shown in table 3.4. The main production came from the 'Ferme Marine de Mahebourg Lte' which produced 320 tonnes of fresh red drum for the local market and exported 5.4 tonnes to Dubai, South Africa and Switzerland.

Table 3.4: Aquaculture production

| Species | Production (tonnes) |
|---------------------------|---------------------|
| Berri rouge | 16.0 |
| Freshwater prawn | 16.0 |
| Crayfish | 0.3 |
| Marine fish (barachois) | 2.2 |
| Mangrove crab (barachois) | 1.6 |
| Red drum | 325.4 |
| Oyster (barachois) | 85 000 (units) |

4. MARINE PARKS AND RESERVES SERVICE

4.1 Blue Bay Marine Park

4.1.1 Management of the Park

To better manage the park, a Unified Enforcement Unit, headed by a Principal Fisheries Protection Officer (PFPO), was set up to enforce the Marine Protected Areas (MPA) Regulations. The unit comprises officers from the Fisheries Protection Service, the National Coast Guard, the “Police de l’Environnement” and the “Police du Tourisme”. It provides a 24-hour service to control permissible activities in the park. The activities include glass bottom boating, snorkelling, diving, water skiing, swimming and fishing.

Ten fisheries officers, comprising one PFPO, three Senior Fisheries Protection Officers and six Fisheries Protection Officers were posted at the marine park station. Eighteen cases of illegal fishing in the park were prosecuted.

During the year, 280 permits were issued to different users of the park; proceeds from permits amounted to Rs. 237 000; certain categories of activities are exempted from payment of the permit fee. The details of permits issued and fees collected are shown in table 4.1.

Table 4.1: Permits issued and fees collected

| Type of permit | No. issued | Fees (Rs.) |
|--------------------------------------|------------|----------------|
| Boat/vessel | 97 | 50 000 |
| Basket trap (for registered fishers) | 25 | Nil |
| Line fishing | 61 | 5 000 |
| Commercial activities | 9 | 45 000 |
| Recreational | 87 | 87 000 |
| Interference | 1 | 50 000 |
| Total | 280 | 237 000 |

Maintenance work was regularly carried out to ensure that the mooring structures and buoys used for demarcating the different zones were in good state.

4.1.2 Visits/Sensitisation

A Visitors Centre was inaugurated on 5 June 2004 on the occasion of the World Environment Day. Visitors including children from pre-primary schools, students from schools, colleges, the University of Mauritius, visiting scientists, foreign consultants, officers from other Ministries and eminent personalities had the opportunity to visit and discover the exceptional beauty of the coral assemblage of the park from glass bottom boats.

A pamphlet highlighting the objectives and the pristine ecosystem of the park was distributed to visitors. During the year about 109 000 persons visited the park.

4.1.3 Coral ecosystem survey

Surveys were carried out at two established stations to collect data on the sea-bottom substrate in terms of corals, macro algae and fish. Results on the percentage of substrate cover are shown in table 4.2.

Table 4.2: Percentage of substrate cover at stations surveyed

| Life form categories | Station 1 | Station 2 |
|-------------------------------|------------------|------------------|
| Acropora branching | 0.0 | 23.0 |
| Acropora digitate | 4.0 | 11.0 |
| Acropora tabular | 62.0 | 45.5 |
| Coral foliose | 9.5 | 4.5 |
| Coral submassive | 17.5 | 1.0 |
| Mushroom coral | 1.0 | 2.0 |
| Total live coral cover | 94.0 | 87.0 |
| Sand & rubble | 2.0 | 3.0 |
| Dead coral | 3.0 | 9.0 |
| Macroalgae | 1.0 | 1.0 |
| Total | 100.0 | 100.0 |

Live coral cover was high at both the stations and the corals were in a healthy condition. Tabular corals were among the most dominant species in the park. Fish observed comprised mainly the families' chaetodontidae, pomacentridae, acanthuridae, pomacanthidae, labridae and scaridae.

4.2 Balaclava Marine Park

4.2.1 Management of the park

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

Officers of the Fisheries Protection Service responsible for the enforcement of the Marine Protected Areas regulations carried out daily patrols against poaching and other illegal activities. Two cases of illegal fishing were reported.

Meetings with fishers, hoteliers, boat operators and members of the public in connection with the zoning plan of the park were conducted to sensitise the park users on the MPA Regulations and on the need to protect and conserve the marine flora and fauna. Surveys were effected to record the number of boats operating and the activities carried out in the park. 104 boats of all categories were recorded, comprising 91 registered with the Ministry and 13 non-registered. For recreational activities, there were 6 glass bottom boats, 28 pedalo, 46 kayaks, 25 lasers, 5 hobbycats, 40 windsurfs, 3 tuberings, 3 oxoons and 3 parasails.

A Master Plan for the Balaclava region situated south of the Maritime Hotel was being drafted to rationalise the use of the land resources. The proposed development consisted of 4 hotel sites, a Marine Park Centre and aquarium, a golf course, a public beach, a children's amusement park, a commercial centre and a residential development. The plot of land allocated for the construction of the Marine Park Centre vested in the Ministry was reduced from 8 to 4 arpents; the initial 200 metres of sea frontage was reduced to 100 metres.

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

The Borstad Associates Ltd from Canada was awarded the contract for the preparation of the Habitat Resource and the Bathymetry Mapping in the lagoon of Mauritius and Rodrigues. A team from Borstad Associates was in Mauritius from 7 to 21 November to effect the "ground truthing and bottom type" survey to calibrate the preliminary bathymetry and habitat resource maps. About 560 measurements were made at various sites in Mauritius. The team was in Rodrigues from 21 to 27 November, where around 313 measurements were taken.

Preliminary bathymetry maps were produced; the final report with documentation of the final results including the resource atlas is to be submitted by the consultant in May 2005.

4.4 Surveys

4.4.1 Bathymetry

In connection with development works proposed to be undertaken in coastal areas, bathymetric surveys were carried out at the following sites:

- Fort Williams and Grand Gaube concerning the creation of mooring zones for fishers.
- Le Morne and Bel Ombre for the construction of jetties for the Indian Club Resort and the Telfair Hotel respectively.
- Le Bouchon and Bel Ombre for the creation of swimming zones.
- Mon Choisy for the dredging of a channel for the creation of an inland marina in connection with the Mon Choisy Integrated Resort Scheme project.
- Petit Sable and Bambous Virieux for the creation of swimming zones and construction of slipways.

4.4.2 Fireworks

Following requests made by a private company for fireworks display in the lagoon adjacent to hotels for the New Year celebration, underwater surveys were carried out to identify appropriate sites for the shooting of the fireworks. Thirteen sites were thus recommended at Le Cannonier Hotel, Le Mauricia Hotel, Veranda Hotel, Paul & Virginie Hotel, Merville Hotel, Royal Palm Hotel, Trou aux Biches Hotel, Dinarobin Hotel, The Legend Hotel, Le Paradis Hotel, Le Pavillon Hotel, Le Preskil Hotel and Le Victoria Hotel.

4.4.3 Demarcation of swimming zones

Tender documents for the supply and installation of demarcation buoys for the swimming zones at La Cambuse and Mon Choisy was prepared and submitted to the State Law Office for clearance and subsequent submission to the Central Tender Board.

4.5 Environmental Impact Assessment (EIA)

Seventy-seven EIA applications for different projects, including coastal projects, were examined and recommendations forwarded to the Department of Environment. The projects involved the following development works:

- Proposed Rehabilitation of Ile aux Chats lagoon at Beau Champs by Ciel Properties.
- Proposed lagoon works at Wolmar by Mauriplage Beach Resort Ltd.
- Touristic and Industrial Development at Agalega Island.
- Proposed hotel project at Bel Ombre by Nereide Ltd.
- Proposed coastal improvement works at Balaclava by Appavoo Hotels.
- Proposed rehabilitation of Frangipane beach at Trou d'Eau Douce by the One & Only Touessrok Hotel.
- Proposed maintenance dredging of îlot Lievres and îlot Levrettes channels at Trou d'Eau Douce by the One & Only Touessrok Hotel.
- Proposed construction of hotel at Var Brulée Graines, Rodrigues by La Belle Rodriguaise Ltd.
- Proposed Beach Villas – Montagu Ltd.
- Proposed construction of Beach Hotel at Palmar
- Proposed extension of quay & reclamation of land at Port Louis by Froid des Mascareignes.
- Proposed manufacture of chemical fertilizers within the Freeport Zone of Mer Rouge.
- Proposed dredging work in the English Channel, Port Louis harbour by Mauritius Ports Authority.
- Proposed construction of a Nautical Centre at Le Morne.
- Construction of a fishing quay at Lataniers River, Mer Rouge.
- Proposed extension of a waste transfer station at Poudre d'Or by the Ministry of Local Government & SWM.
- Undersea walk at Trou aux Biches by Seaman Ltd.
- Extension works at Hotel Le Palmiste at Trou aux Biches.
- Proposed construction of a fish landing quay and cold rooms by Froid des Mascareignes Ltd.

4.6 Consultative meetings with fishers

The Ministry of Fisheries facilitated consultative meetings between promoters and fishers in connection with coastal area development projects. Consultative meetings were held for the following projects:

- Construction of a resort, golf course and marina by Green Valley at Ferney.
- Construction of a jetty for Indian Club Resort at Le Morne.
- Hotel and new public beach amenities at St Felix.
- Hotel, villas and a golf course at Ile aux Chats.
- Sewage outfall at Montagne Jacquot by the Wastewater Management Authority.
- Placing of a pontoon for water skiing activities at Palmar Beach Resort Hotel.

5. FISHERIES DEVELOPMENT AND EXTENSION

5.1 Fisheries Training and Extension Centre

A Fisheries Training and Extension Centre (FiTEC) was constructed at Pointe aux Sables to provide training to fishers under funds from the Government of Japan. The construction started in April 2003 and ended in July 2004. The FiTEC has as prime objective to enhance the knowledge and skills of fishers to operate in the outer lagoon fishery, ensure safety at sea and create awareness on fisheries management and marine conservation.

The facilities at the FiTEC comprise four fully equipped lecture rooms, a room for audio visual aids, an information and documentation unit, a workshop and a jetty to service research and training boats.

The target groups to be trained at the centre are fishers, new entrants and potential fisheries operators. Ten training courses have been developed to cater for the different needs of the fisheries sector. The courses are:

- F01 - General course for fishers
- F02 - General course for sports & amateur fishers
- F03 - Specialized course in FAD fishery
- F04 - Specialized course in chilled fish fishery
- F05 - Specialized course in sword fish fishery
- F06 - Specialized course in deep water shrimp fishery
- F07 - Specialized course in bank fishery
- F08 - Specialized course in tuna fishery
- F09 - Specialized course in fish marketing and distribution
- F10 - General course in aquaculture

The core course “General course for fishers” is compulsory for all new entrants in fisheries and includes a module in literacy and numeracy. On successful completion of a course the trainee is awarded a certificate. The first training session started on 1 October with a group of 24 trainee fishers from the Grand River South East region with the “General course for fishers”.

Prior to the opening of the FiTEC 17 fishers from the region of Baie du Cap/St. Martin were trained on the FAD fishery.

5.2 Fish Aggregating Devices

The development of the Fish Aggregating Device (FAD) fishery was continued under the IFAD/UNOPS Rural Diversification Programme.

5.2.1 FAD development

Thirty-four sea trips were carried out by the research boats, “Shpyrna II and Maustral” for the verification and maintenance of existing FADs. Five FADs were replaced and a new one was set at Baie du Cap. As at the end of December 12 FADs were active. Table 5.1 shows particulars of the FADs.

Table 5.1: List of FADs

| Name | Mooring depth (m) | Distance from coast (nm) | Latitude-S | Longitude-E |
|-------------------|-------------------|--------------------------|------------|-------------|
| Albion | 1 352 | 2.5 | 20° 09' 28 | 57° 23' 32 |
| Flat Island | 740 | 9.5 | 19° 49' 14 | 57° 34' 44 |
| Flic-en-Flac | 1 200 | 2.5 | 20° 15' 99 | 57° 19' 39 |
| La Preneuse | 2 300 | 5.2 | 20° 17' 69 | 57° 16' 06 |
| Medine I | 2 500 | 5.5 | 20° 12' 38 | 57° 17' 35 |
| Passe Danoise II | 450 | 5.3 | 20° 22' 08 | 57° 50' 75 |
| Pte aux Caves | 2 600 | 4.9 | 20° 10' 08 | 57° 19' 61 |
| Rivière Noire II | 490 | 2.8 | 20° 21' 58 | 57° 19' 28 |
| Rivière Noire I | 1 000 | 4.6 | 20° 23' 07 | 57° 16' 95 |
| Tamarin | 450 | 2.2 | 20° 19' 99 | 57° 19' 58 |
| Tombeau Bay | 1 050 | 2.7 | 20° 04' 40 | 57° 27' 88 |
| Trou aux Biches I | 1 900 | 4.8 | 19° 59' 73 | 57° 27' 93 |

5.2.2 FAD fishery monitoring

5.2.2.1 Data collection – fish landings from the FAD fishery

The number of enumerators was increased from six to seven for the collection of data at eight selected fish landing stations, namely Trou aux Biches/Pointe aux Piments, Baie du Tombeau, Roche Bois, Bains des Dames, Pointe aux Sables, Tamarin, La Preneuse and Black River. Fish landings from FADs by species are given in table 5.2.

Table 5.2: Fish landings from FADs

| Common name | Scientific name | Catch (kg) |
|--------------------|-------------------------------|-------------------|
| Germon | <i>Thunnus alalunga</i> | 203 507 |
| Thon jaune | <i>Thunnus albacares</i> | 38 686 |
| Dorade | <i>Coryphaena hippurus</i> | 4 800 |
| Becune | <i>Acanthocybium solandri</i> | 1 098 |
| Sharks | <i>Carcharhinus</i> sp. | 514 |
| Others | bonito, etc. | 7 057 |
| Total | | 255 662 |

5.2.2.2 Monitoring of fishing activities

A monitoring unit based at Pointe aux Sables was set up in December to undertake monitoring of FAD fishing activities. The unit comprised eight Fisheries Protection Service officers who used the two patrol boats (FPS 1 and FPS 2) for their activities.

5.2.3 FAD regulations

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

6. FISHERIES MANAGEMENT

6.1 Licensing of foreign fishing vessels

Licensing of foreign vessels started in 1991 with a view to regulate and monitor the activities of foreign fishing vessels operating in the EEZ of Mauritius. At present, licences are issued to vessels involved in longline, purse seine and hand line fishing. The licence fees for longline fishing vessels are US \$ 6 000 for an initial period of 90 days and US \$ 2 000 for any additional periods of 30 days.

Under the Fishing Agreement with the European Union 34 licences were issued to purse seiners, 37 to longliners and one to a hand-line fishing vessel. Six licences were issued to Japanese longline fishing vessels under a Fishing Agreement with the Federation of Japan Tuna Fisheries Co-operative Associations (JTFCFA). In addition 138 licences were issued to individual foreign vessels. Extensions of licences were granted to 121 vessels during that same period. Licence fees obtained from non-EU vessels amounted to US \$ 1 168 000 and from EU vessels an amount of Euros 119 131 was received.

Details of licences issued are shown in table 6.1. Licences issued since 2000 are summarized in table 6.2.

Table 6.1: Number of licences issued by nationality

| Category | Nationality | No. issued |
|---|---------------------------|------------|
| Non-EU longliners | Belize | 3 |
| | China | 1 |
| | Georgia | 1 |
| | Indonesia | 6 |
| | Japan | 18 |
| | Mauritius (foreign owned) | 3 |
| | Panama | 1 |
| | Seychelles | 2 |
| | Taiwan | 101 |
| | Thailand | 2 |
| EU longliners | France | 17 |
| | Spain | 17 |
| | Portugal | 3 |
| EU Purse seiners | Spain | 18 |
| | France | 15 |
| | Italy | 1 |
| EU Handliners | France | 1 |
| Longliners licensed under fishing agreement with JTFCFA | Japan | 6 |

Table 6.2: Licences issued by gear since 2000

| Year | Longliner | Purse seiner | Handline | 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 |
| 2004 | 181 | 34 | 1 | 0 | 216 |

6.1.1 Licensing of Mauritian vessels

Twenty-nine vessels were licensed to operate in different categories of fishery as shown in table 6.3. One bank fishing vessel left the fishery during the course of the year.

Table 6.3: Number of licensed vessels by category

| Category | Number |
|--|---------------|
| Banks fishery | 8 |
| Demersal chilled fish fishery | 11 |
| Surface longlining (swordfish fishery) | 5 |
| Fish carriers from St Brandon | 2 |
| Trawler (High seas outside EEZ) | 1 |
| Banks drop-off fishery | 2 |

6.2 Monitoring of fishing vessels

6.2.1 Monitoring of local vessels

The activities of local fishing vessels are closely monitored. All vessels operating in the chilled-fish fishery have to obtain a clearance from the Ministry before leaving for a fishing trip, prior to which it is ascertained that the vessel is in possession of a valid Hull and Machinery Certificate and Safety Equipment Certificate issued by the Directorate of Shipping. It is also ensured that the vessel and crew/fishermen have appropriate insurance covers. During the course of the year 233 such clearances were issued. The clearance to bank fishing vessels is issued by the Directorate of Shipping; however, Fisheries Officers inspect all the safety equipment.

On return of a fishing vessel from its fishing trip inspection is carried out to check the quality of the fish and the logbooks are collected following which authorization for unloading is granted.

6.2.2 Monitoring of foreign fishing vessels calling at Port Louis

All foreign fishing vessels calling at Port Louis are boarded by Fisheries Officers and are required to provide information on their fishing activities by filling in a transshipment data sheet. During the year, 512 fishing vessels called at Port Louis for transshipment, bunkering, change of crew, provisions and repairs. Table 6.4 gives details of the different categories of vessels having called at Port Louis during the year.

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 |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Reefers | 4 | 1 | 1 | 2 | 4 | 1 | 3 | 5 | 3 | 3 | 3 | 3 | 33 |
| Squid vessels | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| Tuna Long liners | 37 | 31 | 28 | 12 | 32 | 58 | 26 | 22 | 58 | 55 | 36 | 35 | 430 |
| Trawlers | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 8 | 0 | 1 | 1 | 20 |
| Toothfish | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 4 | 0 | 0 | 1 | 24 |
| Others (Purse Seiners) | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| Total | 45 | 35 | 33 | 18 | 42 | 63 | 33 | 31 | 73 | 59 | 40 | 40 | 512 |

The nationalities of the vessels are given in table 6.5

Table 6.5: The nationalities of the vessels which called at Port Louis

| Type of vessel | Nationality | Number of calls |
|------------------------------|---------------------------|-----------------|
| Reefer | Mauritius | 12 |
| | Panama | 11 |
| | Taiwan | 7 |
| | Korea | 2 |
| | Holland | 1 |
| Squid | Taiwan | 2 |
| | China | 1 |
| Tuna long liners | Mauritius(Foreign Owned) | 12 |
| | Taiwan | 276 |
| | Spain | 26 |
| | Indonesia | 12 |
| | Japan | 49 |
| | Togo | 7 |
| | Uruguay | 2 |
| | Portugal | 3 |
| | Georgia | 1 |
| | Seychelles | 11 |
| | Belize | 9 |
| | E. Guinea | 4 |
| | Thailand | 4 |
| | China | 4 |
| | France | 3 |
| | Korea | 1 |
| | Malagassy | 2 |
| | British | 2 |
| | Panama | 1 |
| | Philippines | 1 |
| Trawlers | Mauritius(Foreign Owned) | 4 |
| | Cook Island | 6 |
| | Madagascar | 1 |
| | Australia | 4 |
| | Namibia | 2 |
| | France | 1 |
| | India | 2 |
| Patagonian toothfish vessels | France | 14 |
| | Uruguay | 1 |
| | Australia | 6 |
| | Uruguay | 1 |
| | Togo | 2 |
| Purse seiners | France | 2 |

Table 6.6 gives the number of foreign fishing vessels having called at Port Louis over the last five years.

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

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|
| 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 |
| 2004 | 45 | 35 | 33 | 18 | 42 | 63 | 33 | 31 | 73 | 59 | 40 | 40 | 512 |

6.2.3 Monitoring of patagonian toothfish fishing vessels

Mauritius became a party to the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) on 2 October 2004. All States party to the Convention are required to implement the CCAMLR conservation measures; these include the Catch Documentation Scheme (CDS) for toothfish, established under Conservation Measure 10-05 (2003). The Contracting Party is required to verify the origin of toothfish imported or exported from its territory and to determine whether the fish harvested in the Convention Area was caught in a manner consistent with the CCAMLR conservation measure.

In this context, toothfish fishing vessels calling at Port Louis were closely monitored. During the year there were 24 calls of toothfish vessels of which six for transshipment. The amount of toothfish transhipped was 1 521 tonnes. Transshipment for the past five years is presented in table 6.7.

Table 6.7: Transshipment of patagonian toothfish

| Year | Qty transhipped (t) |
|-------------|----------------------------|
| 2000 | 10 676 |
| 2001 | 10 021 |
| 2002 | 5 920 |
| 2003 | 2 879 |
| 2004 | 1 521 |

It is noted from table 6.7 that the amount of toothfish transhipped over the last five years has decreased considerably, probably due to the implementation of CCAMLR conservation measures.

6.2.4 Monitoring of deep-sea trawlers calling at Port Louis

During the year, 20 calls were made by 13 trawlers of different nationalities. A total of 3 463 tonnes of deep-sea demersal fishes was transshipped. The main species were alfonsino, cardinal, orange roughy, blue nose and spiky dory, gemfish, ribaldo, black dory, travella, rock cod, ruby fish, icefish and rhino. The amount of fish transshipped by trawlers during the last five years is given at table 6.8.

Table 6.8: Transshipment of trawlers since 2000

| Year | Qty transshipped (t) | Qty for local market (t) |
|-------------|-----------------------------|---------------------------------|
| 2000 | 13 764 | 0 |
| 2001 | 8 758 | 0 |
| 2002 | 3 746 | 428 |
| 2003 | 2 581 | 175 |
| 2004 | 3 463 | 0 |

6.3 Vessel Monitoring System

With a view to monitor the fishing activities and combat illegal, unreported and unregulated (IUU) fishing in the EEZ, it was decided to implement a Vessel Monitoring System (VMS). VMS is a satellite based communication system that transfers data from the vessel to an earth station, which in turn forwards the data to a monitoring centre via a secure public data network. The Fisheries Monitoring Centre is a computerized monitoring station capable of collecting and storing the data, which can be reviewed, analysed and displayed against a background map.

The feasibility study on VMS was completed and the tender was allocated for the setting up of a VMS and a Fisheries Monitoring Centre (FMC) at the Albion Fisheries Research Centre. The system was expected to become operational by March 2005.

6.4 Import and export of fish and fish products and fish processing

6.4.1 Import of fish and fish products

During the year, 1 702 permits were issued for the import of fish and fish products, including 16 permits for the import of fish samples and fish bait. The fee 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. 3 436 000.

Random samples were collected from imported seafood at the ports of entry and forwarded to the Veterinary Services Laboratory for bacteriological analysis. A total of 113 samples was analysed and the results were found to be within established norms.

The quantity of fish and fish products imported for direct consumption amounted to 10 244 tonnes representing 16.5 % of the total fish imports for the year and 50 055 tonnes of raw material for the tuna cannery and 1 183 tonnes of frozen barracouta for the production of salted snoek. The barracouta was obtained from Namibia and New Zealand and tuna for the cannery from French and Spanish vessels transshipping in the Seychelles. Details of imports are shown in figure 6.1.

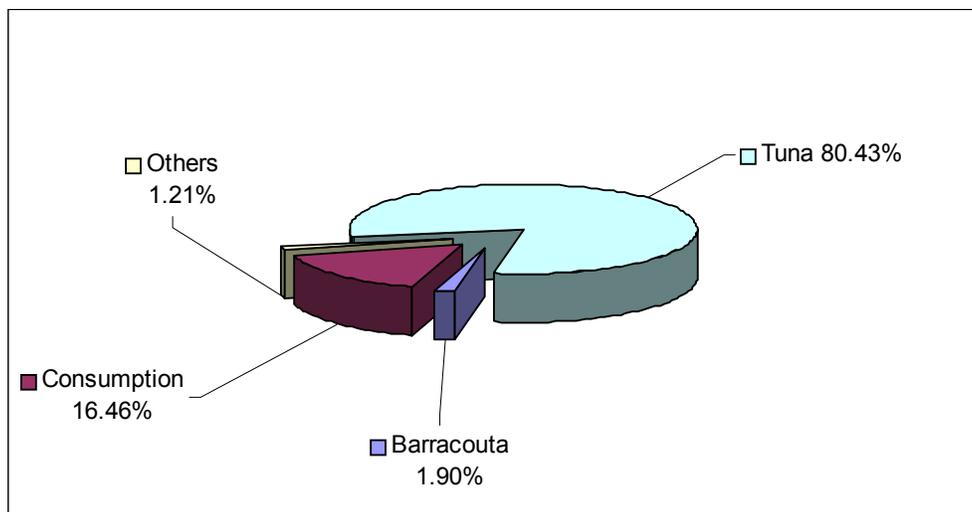


Figure 6.1: Details of total import

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 amounts of import whilst processed fish products, smoked, chilled and live fish were imported in smaller quantities.

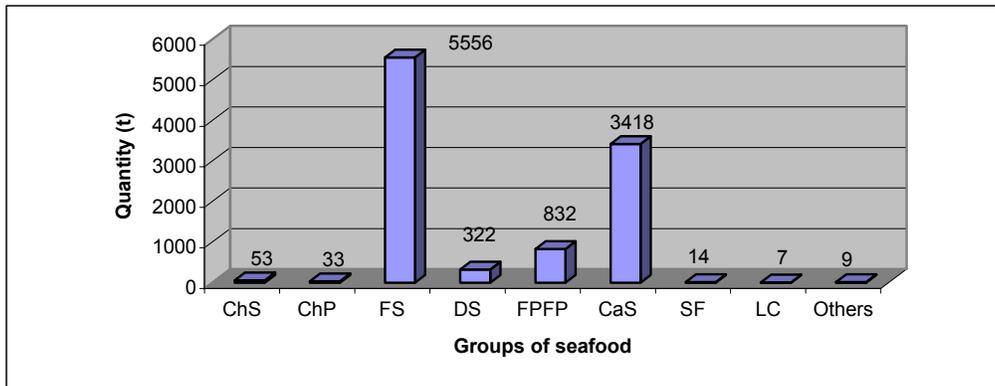


Figure 6.2: Types of seafood imported (t)

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.

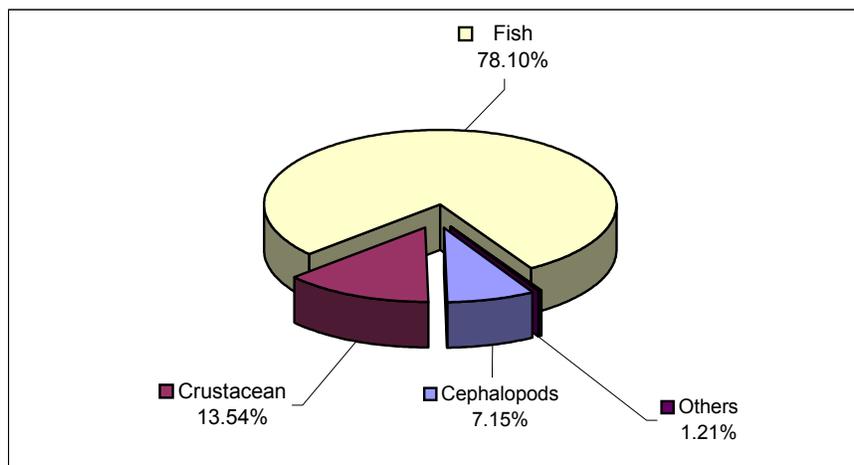


Figure 6.3: Varieties of seafood

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

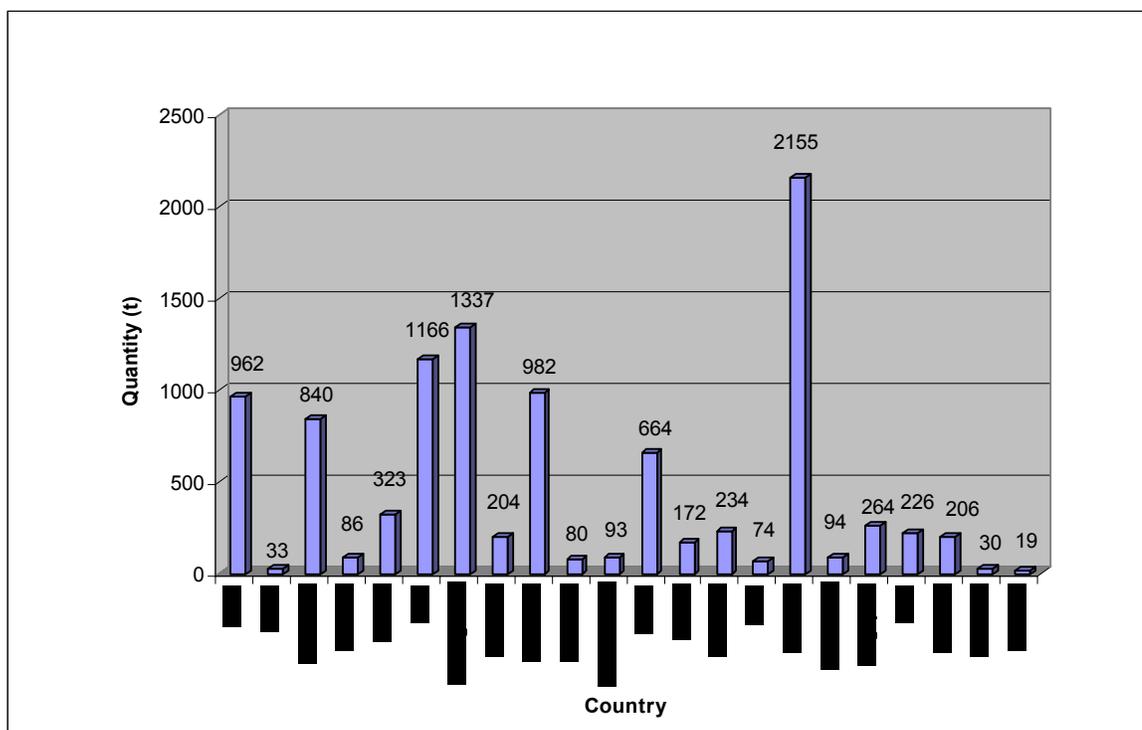


Figure 6.4: Import of fish and fish products by country of origin

6.4.1.1 Chilled seafood

Chilled seafood was mainly imported from India, Dubai, France and Seychelles. The fin fish imported comprised salmon, ‘capitaine’, sole, trout, ‘anchois’, ‘hareng’, ‘vacoas’, ‘sacrechien’, giant freshwater prawn (‘rosenbergii’), shrimp, lobster, crab, squid, oyster, mussel, clam and scallop. Import of chilled seafood amounted to 75 tonnes. Details of the import of chilled seafood are shown in table 6.9.

Table 6.9: Import of chilled seafood (t)

| Year | Fish | Crustacean | Shellfish | Squid | Total |
|------|------|------------|-----------|-------|-----------|
| 2000 | 28 | 56 | 3 | 5 | 92 |
| 2001 | 16 | 28 | 3 | 1 | 48 |
| 2002 | 21 | 27 | 5 | 3 | 56 |
| 2003 | 21 | 14 | 8 | 1 | 44 |
| 2004 | 48 | 27 | 0 | 0 | 75 |

6.4.1.2 Chilled processed seafood

Chilled processed seafood is a fishery product that has undergone a certain amount of preparation and processing. These products included ‘roll mop’, ‘rape de mer’, ‘terrine de poisson’, ‘jambon de mer’, ‘batonnet de crabe’, ‘oeuf de lompe’, ‘morue’, ‘surimi’, mussels, fish sticks, fish cakes and ‘crevette rose’ which were imported from France, UK and Seychelles. Imports for the year amounted to 3 tonnes.

6.4.1.3 Frozen seafood

Imported frozen seafood for direct consumption amounted to 5 556 tonnes. These products were imported mainly from India, Oman, Madagascar, South Africa, New Zealand, Vietnam, Tanzania, Belgium, USA, Indonesia, Thailand, 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)

| Year | Fish | Crustacean | Cephalopod | Shellfish | Total |
|-------------|-------------|-------------------|-------------------|------------------|--------------|
| 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 |
| 2004 | 3 497 | 1 216 | 822 | 21 | 5 556 |

The species composition of imported frozen fish is shown in figure 6.5. Fin fish commonly imported were ‘capitaine’, blue nose, ruby fish, boarfish, ‘cateau’, marlin, oil fish, sail fish, seabream 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’, ‘empereur’, shark and ‘dorade’.

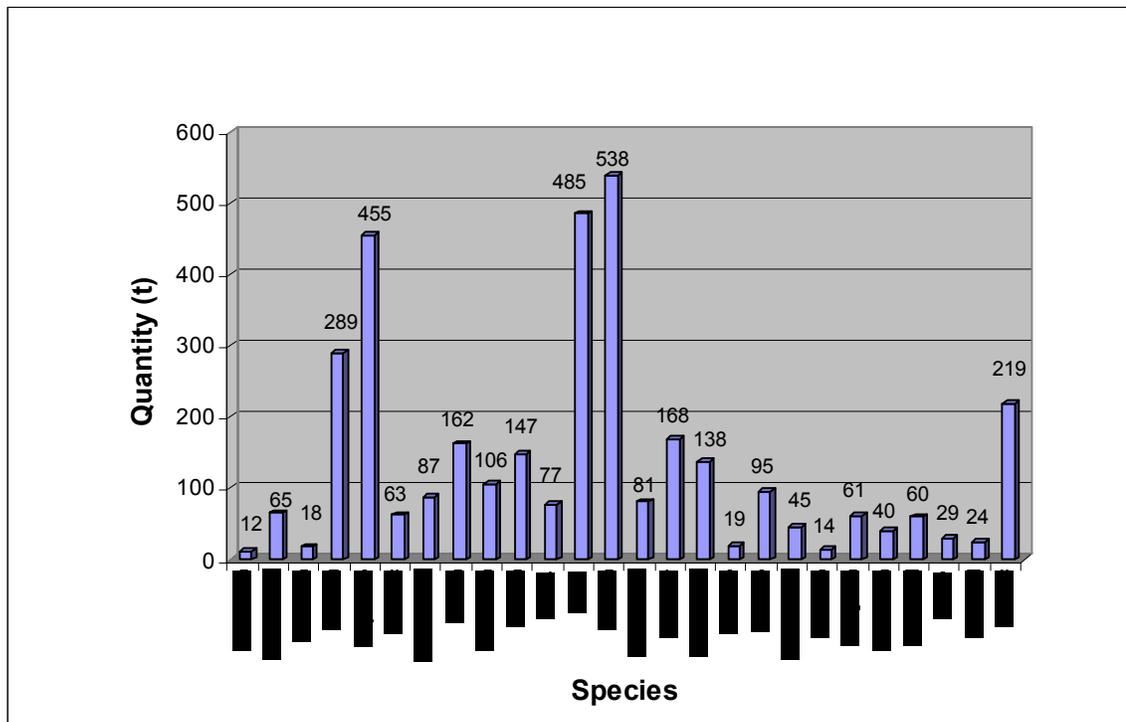


Figure 6.5: Import of frozen fish

6.4.1.4 Frozen processed seafood

Frozen processed seafood was imported from South Africa, China, Malaysia, Indonesia, Singapore, Thailand and France. It included fish fingers, fish cakes, fish fillets, fish ball, fish sticks and other breaded products. The total import amounted to 847 tonnes compared to 1 041 tonnes in 2003.

6.4.1.5 Dried seafood

Dried fish and fish products were imported from India, China, Malaysia, Indonesia and Singapore. The total import for the year amounted to 322 tonnes. Details are presented in table 6.11.

Table 6.11: Import of dried seafood (t)

| Year | Fish | Bombay duck | Squid / cuttlefish | Octopus | Prawn | Others | Total |
|-------------|-------------|--------------------|---------------------------|----------------|--------------|---------------|--------------|
| 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 |
| 2004 | 2 | 189 | 2 | 0 | 127 | 2 | 322 |

6.4.1.6 Smoked seafood

Smoked fish and fish products were imported from France, Denmark, South Africa and Australia for the supermarkets, hotels and restaurants. Smoked fish comprised ‘hareng’, trout, salmon, haddock, surimi, ‘morue’ and mackerel and amounted to 14 tonnes.

6.4.1.7 Canned seafood

Canned fish and fish products such as sardines, pilchards, mackerels, ‘anchois’, ‘foie de morue’, salmon and tunas were imported from Morocco, Chile, Peru, South Africa, Thailand, Indonesia, Malaysia, China, France and 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 3 418 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)

| Year | Sardines | Pilchards | Mackerel | Tuna | Others | Total |
|-------------|-----------------|------------------|-----------------|-------------|---------------|--------------|
| 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 |
| 2004 | 1 022 | 1 102 | 994 | 107 | 193 | 3 418 |

(Others: anchovy, dace, hareng and salmon)

6.4.1.8 Live crustaceans

Live crab and lobster were imported from India, South Africa, France and Madagascar and amounted to 7.38 tonnes.

6.4.1.9 Live ornamental fish

A total of 506 440 units of live fresh water ornamental fishes were imported from Singapore, Malaysia and Thailand. Common aquarium fish include gold fish, tetra, guppies, mollies, cichlids and terrapins.

6.4.1.10 Live fish for farming

The Ferme Marine de Mahebourg Ltd imported 840 000 units of live red drum and cobia fish fry/fingerlings from USA and Mayotte for farming purposes.

6.4.1.11 Fish meal

A total of 625 tonnes of dried fish meal and 14 tonnes of soluble fish protein concentrate were imported from France and South Africa. These products were used in the manufacture of animal feed. A total of 63 tonnes of fish feed was imported for live ornamental fish.

6.4.1.12 Sea shells

A total of 32 570 units of sea shells was imported from Madagascar and Philippines for crafting.

6.4.2 Export of fish and fish products

6.4.2.1 Export of chilled fish

A quota of 41 tonnes was set for export of chilled fish to Reunion. Three companies had approved status. The total export amounted to 27.7 tonnes and consisted of ‘vieille rouge’ (*Epinephelus fasciatus*), ‘croissant queue blanc’ (*Variola albimarginata*), ‘vieille laboue’ (*Epinephelus morrhua*), and ‘sacr chien’ (*Pristipomoides filamentosus*, *Etelis carbunculus*).

6.4.2.2 Export of ornamental fish

Two companies exported live ornamental marine fish to Japan, Reunion, USA, Seychelles, Hong Kong, UK, Germany, and France. Out of the quota of 6 500 units set for 2004, 3 113 units of marine fish were exported.

6.4.3 Fish processing

6.4.3.1 Canned tuna

The local tuna cannery processed 47 705 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)

| Products | 2000 | 2001 | 2002 | 2003 | 2004 |
|-----------------|---------------|---------------|---------------|---------------|---------------|
| Canned tuna | 18 263 | 26 012 | 28 873 | 30 523 | 34 248 |
| Pet food | 1 910 | 2 570 | 3 204 | 3 441 | 3 331 |
| Total | 20 173 | 28 582 | 32 077 | 33 964 | 37 579 |

Most of the canned tuna is exported to European countries. 1 005 tonnes of canned tuna were put for sale on the local market. Local sale and export of the produce for the past five years are presented in table 6.14.

Table 6.14: Local sale and export of canned tuna and pet food (t)

| Product | 2000 | | 2001 | | 2002 | | 2003 | | 2004 | |
|--------------|--------------|---------------|--------------|---------------|--------------|---------------|------------|---------------|--------------|---------------|
| | Local | Export | Local | Export | Local | Export | Local | Export | Local | Export |
| Canned tuna | 936 | 17 713 | 976 | 25 797 | 1 083 | 27 411 | 643 | 30 787 | 1 005 | 30 555 |
| Pet food | 126 | 2 074 | 167 | 2 482 | 179 | 2 951 | 183 | 3 301 | 231 | 3 070 |
| Total | 1 062 | 19 787 | 1 143 | 28 279 | 1 262 | 30 362 | 826 | 34 088 | 1 236 | 33 625 |

6.4.3.2 Salted fish

Two companies engaged in the production of salted snoek from frozen barracouta (*Thyrsites atun*) produced 958 tonnes of the product, out of which 100 tonnes were exported to UK, Reunion and France. Details of the import of raw materials, production of snoek and its sale for the past five years are presented in table 6.15.

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

| Year | 2000 | 2001 | 2002 | 2003 | 2004 |
|----------------------|-------|-------|-------|-------|-------|
| Import of barracouta | 1 229 | 1 223 | 1 115 | 1 105 | 1 183 |
| Production of snoek | 787 | 841 | 770 | 717 | 958 |
| Local sale of snoek | 747 | 761 | 710 | 632 | 672 |

6.4.3.3 Fish meal production

One company was involved in fish meal production from the by-products of the tuna canning factory. 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. The production for the last five years is given in table 6.16.

Table 6.16: Production of fish meal (t)

| Year | 2000 | 2001 | 2002 | 2003 | 2004 |
|------------|-------|-------|-------|-------|-------|
| Production | 3 300 | 4 143 | 5 114 | 5 189 | 5 263 |

6.5 Fish production, consumption and trade balance

6.5.1 Total fish production

A decrease of the total fish production from the artisanal fishery, shallow water banks and demersal trawlers was noted in 2004. The total annual production by different fisheries is given in table 6.17.

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

| Sector | Type | 2000 | 2001 | 2002 | 2003 | 2004 |
|----------------------------------|--------|--------------|---------------|---------------|---------------|---------------|
| Artisanal fishery | | | | | | |
| Mauritius | Fresh | 1 360 | 1 075 | 1 302 | 1 166 | 1 043 |
| Rodrigues | Fresh | 1 500 | 1 937 | 1 404 | 1 664 | 1 500 |
| 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 | 5 | 6 | 7 | 6 | 437 |
| Ponds (prawn & fish) | Fresh | 82 | 52 | 39 | 27 | |
| Sub-total | | 3 927 | 4 050 | 3 732 | 3 843 | 3 960 |
| Offshore demersal fishery | | | | | | |
| Shallow water banks | Frozen | 4 303 | 3 366 | 3 943 | 3 713 | 3 216 |
| Banks deep water snappers | Frozen | 55 | 329 | 5 | -- | 7 |
| St Brandon inshore | Frozen | 332 | 409 | 380 | 498 | 137 |
| | Salted | 165 | 148 | 111 | 80 | 67 |
| Semi-industrial chilled fish | Ice | 185 | 188 | 204 | 234 | 284 |
| Tuna fishery | Frozen | 417 | 0 | 219 | 1 118 | 1 640 |
| Semi-industrial pelagic fish | Ice | 21 | 87 | 45 | 111 | 97 |
| Demersal trawlers | Frozen | --- | 2 184 | 2 113 | 1 806 | 1 595 |
| Sub-total | | 5 478 | 6 711 | 7 020 | 7 560 | 7 043 |
| Grand Total | | 9 405 | 10 761 | 10 752 | 11 403 | 11 003 |

6.5.2 Per capita consumption of fish

Per capita consumption of fish has shown a slight increase in 2004 compared to 2003. The annual per capita consumption of fish over the last five years is given in table 6.18.

Table 6.18: Per capita consumption of fish (kg)

| Year | Quantity |
|------|----------|
| 2000 | 23.3 |
| 2001 | 19.9 |
| 2002 | 20.3 |
| 2003 | 18.7 |
| 2004 | 19.8 |

6.5.3 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. In 2004 a positive trade balance of 188 million rupees was 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) |
| 2000 | 42 146 | 1 057.9 | 18 151 | 961.5 | -96.4 |
| 2001 | 52 050 | 1 754.3 | 27 381 | 1 840.8 | 86.5 |
| 2002 | 63 032 | 3 984.7 | 49 560 | 4 081.0 | 249.0* |
| 2003 | 62 323 | 2 560.1 | 48 719 | 3 178.4 | 618.3* |
| 2004 | 80 943 | 3 170.1 | 54 242 | 3 358.1 | 188.0 |

* Data for 2002 and 2003 include operations carried out in the Free Port

MR – Million rupees

7. FISHERIES PLANNING

7.1 Sea Food Hub

Government jointly with the Private Sector is developing Mauritius into a regional seafood hub. The strategy of the seafood hub is focused on the development of value added fisheries and seafood related sectors including fishing, transshipment, storage and warehousing, light processing (sorting, grading, cleaning, filleting and loining), canning and ancillary services (ship chandling, bunkering, vessel husbandry, ship agency, ship building and repair).

A One Stop Shop service was set up in April at the Trade and Marketing Centre (TMC) in the free port area to facilitate the administrative procedures for loading/unloading/export of fish and fish products.

To promote Mauritius as an ideal location for transshipment, processing and value addition for fish and fish products, the Ministry of Fisheries, the Mauritius Freeport Authority (MFA) and the representatives of the private sector (Mauritius Freeport Development Co. Ltd, Froid des Mascareignes and Princes Tuna (Mauritius) Ltd) participated in the 8th INFOFISH World Tuna Trade Conference and Exhibition held from 03–05 June in Bangkok, Thailand.

7.2 Fishing Agreements

7.2.1 Fishing Agreement with Seychelles

A fishing agreement based on reciprocity and enabling Mauritius flagged fishing vessels to fish in Seychelles waters and Seychelles flagged vessels to fish in Mauritius waters was finalized.

7.2.2 Fishing Agreement with the Federation of Japan Tuna Fisheries Cooperative Associations

Discussions were ongoing for the renewal of the fishing agreement between Mauritius and the Federation of Japan Tuna Fisheries Cooperative Associations which was signed in May 2000.

7.3 Regional and International Cooperation

Mauritius participated in meetings and workshops of the SADC, COMESA, IOC and the IOR-ARC. Officers from the Ministry followed various training courses offered by the SADC.

Officers participated in negotiations with the EU for the development of a Regional Fisheries Framework Agreement and with the World Trade Organisation (WTO) on the rules of origin, market access and subsidies for fisheries.

7.4 Survey on amateur fishers

A survey on amateur fishers operating in the lagoon was carried out with a view to finding ways and means to better managing the fishery. The survey revealed that there were 22 000 persons engaged in such fishing activities on a part time basis.

7.5 Bank fisheries Monitoring Committee

A Monitoring Committee on Bank fisheries was set up to look into the criteria for registration and deregistration of bank fishers. Draft regulations were prepared in this context. A survey was carried out in April/May to find out the number of fishers who were still interested to participate in bank fishing. It revealed that there were only 543 interested. They were all referred for medical tests and 27 completed their medical examinations. The Development Bank of Mauritius would work out a Loan Guarantee Fund for the Bank Fishing Operators for the replacement or upgrading of fishing vessels.

7.6 Loan schemes

Loan schemes were revised in collaboration with the Development Bank of Mauritius to encourage fishers to move away from the heavily exploited lagoon to outer reef areas. The different loan schemes were as follows:

- the loan ceiling of Rs 100 000 was increased to Rs 200 000 in respect of small-scale fishers for the purchase of boats, outboard motors, fishing and safety equipment;
- the loan ceiling available to groups of fishers was increased from Rs 2 m to Rs 3 m for the development of the semi industrial fishing;

- a Loan Guarantee Fund of Rs 10 m was set up to enable fishers to obtain loans for the development of the semi-industrial fishery;
- a special loan scheme amounting to Rs. 5 m was put in place for the setting up of fish and sea food processing plants, including cold room facilities, in view of supporting the development of the sea food hub; and
- a loan amounting to Rs. 50 m for the purchase of fishing vessels was made available.

The Development Bank of Mauritius has shown its willingness to assist the bank fishing operators through the following schemes:

- (a) the loan for replacement of fishing vessels was increased from Rs. 15 m to Rs. 20 m;
- (b) the loan for purchase of fishing vessels was increased from Rs. 15 m to Rs. 30 m;
- (c) a new loan scheme up to a ceiling of Rs. 5 million for upgrading and renovation of existing fishing vessels;
- (d) the interest rate was brought down from 10% to 8% per annum;
- (e) the operators' contribution was reduced from 40% to 30% while that of the DBM was increased from 60% to 70% for all schemes; and
- (f) the repayment period was extended to 10 years including one year moratorium for projects listed at (a) and (b) while the repayment period was up to 5 years including one year moratorium for projects listed at (c).

The DBM had disbursed a sum of Rs. 56.2 m in favour of 536 fishers in the artisanal sector; two companies in the bank fishing sector had obtained loans to the tune of Rs. 30.5 m.

8. FISHERIES PROTECTION SERVICES

The Fisheries Protection Services, headed by the Controller of Fisheries, is the enforcement wing of the Ministry. The service was reorganized with a view to making it more efficient in the enforcement of fisheries legislation. There are thirteen Fisheries Posts, which are operational round the clock.

Two teams of officers operating from the Fisheries Training and Extension Centre at Pointe aux Sables are involved in the monitoring of the FAD fishery. Two teams are also involved in enforcement duties at the marine parks. Officers posted at the Sea Food Hub give clearance for the unloading and departure of fishing vessels.

8.1 Registration of artisanal fishers

The total number of registered artisanal fishers was 2 307 compared to 2 383 in 2003, 76 having been deregistered. Details of registered fishers by category and district are presented at table 8.1.

Table 8.1: Categories of artisanal fishers

| District | Net | Basket Trap | Line | Basket Trap & Line | Harpoon | Total |
|-----------------|------------|-------------|------------|--------------------|-----------|--------------|
| Port Louis | 0 | 20 | 65 | 45 | 0 | 130 |
| Pamplemousses | 6 | 13 | 159 | 173 | 1 | 352 |
| Riv. du Rempart | 33 | 20 | 68 | 294 | 1 | 416 |
| Flacq | 39 | 13 | 37 | 192 | 31 | 312 |
| Grand Port | 37 | 22 | 55 | 412 | 2 | 528 |
| Savanne | 6 | 8 | 31 | 137 | 5 | 187 |
| Black River | 52 | 19 | 107 | 185 | 19 | 382 |
| Total | 173 | 115 | 522 | 1 438 | 59 | 2 307 |

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: Registration of boats

| District | Artisanal fishing | Pleasure boat | Big game | Semi industrial boat | Others | Total |
|-----------------|--------------------------|----------------------|-----------------|-----------------------------|---------------|--------------|
| Port Louis | 162 | 89 | 0 | 0 | 0 | 251 |
| Pamplemousses | 325 | 600 | 3 | 0 | 0 | 928 |
| Riv. du Rempart | 417 | 272 | 1 | 0 | 55 | 745 |
| Flacq | 395 | 237 | 2 | 0 | 28 | 662 |
| Grand-Port | 554 | 434 | 2 | 0 | 46 | 1 036 |
| Savanne | 106 | 53 | 0 | 1 | 0 | 160 |
| Black-River | 367 | 499 | 3 | 0 | 0 | 869 |
| TOTAL | 2 326 | 2 184 | 11 | 1 | 129 | 4 651 |

8.3 Licences

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

Table 8.3: Number of licences

| District | Licence | | | |
|-----------------|------------------|-----------------|-------------------|------------------|
| | Large-Net | Gill-Net | Fishmonger | Bait-Gear |
| Port Louis | 0 | 0 | 139 | 0 |
| Pamplemousses | 1 | 0 | 135 | 50 |
| Riv du Rempart | 4 | 0 | 122 | 13 |
| Flacq | 3 | 1 | 95 | 33 |
| Grand Port | 3 | 2 | 187 | 68 |
| Savanne | 1 | 1 | 44 | 17 |
| Black-River | 6 | 1 | 127 | 40 |
| Total | 18 | 5 | 849 | 221 |

The quarterly licence fee for a large net and gill net was 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 for a bait gear licence.

8.4 Illegal fishing

Enforcement is effected through patrol at sea and on land and contraventions are 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 | Total length of net seized (m) | Fines paid (Rs) |
|------|--------------------|-------------|--------|--------------------------------|-----------------|
| 2000 | 63 | 96 | 105 | 4 103 | 183 050 |
| 2001 | 10 | 9 | 24 | 2 064 | 138 500 |
| 2002 | 59 | 87 | 80 | 2 396 | 105 000 |
| 2003 | 12 | 16 | 47 | 5 570 | 54 200 |
| 2004 | 8 | 14 | 13 | 697 | 87 800 |

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) |
|------|-------------|-----------|---------------|-------------------|
| 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 |
| 2004 | 118 | 130-135 | 2 012 – 2 111 | 34 357 665 |

Large and gill nets are not allowed to operate during the close season. During that period net fishers are paid an allowance, details of which are presented in table 8.5 (b).

Table 8.5 (b): Close season allowance

| Year | No. of days | Rate (Rs) | Beneficiaries | Total (Rs) |
|-------------|--------------------|------------------|----------------------|-------------------|
| 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 |
| 2004 | 121 | 130-135 | 179 | 2 815 670 |

A registered fisher is entitled to a sick leave allowance if 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 | 2 880 |
| 2001 | 105 - 115 | Nil | Nil |
| 2002 | 115 - 125 | 2 | 3 220 |
| 2003 | 125 - 130 | 4 | 7 210 |
| 2004 | 130 - 135 | 3 | 5 670 |

8.6 Incentives to registered fishers

The Fishermen Welfare Fund disbursed an amount of Rs 1 291 840 as scholarship allowance to children of registered fishers, details of which are shown in table 8.6.

Table 8.6: Scholarship allowance

| Education Level | Beneficiaries | Amount (Rs) |
|------------------------|----------------------|--------------------|
| C.P.E | 169 | 760 500 |
| S.C | 28 | 252 000 |
| H.S.C | 13 | 217 500 |
| Vocational | 4 | 18 000 |
| Other related expenses | | 43 840 |
| TOTAL | 214 | 1 291 840 |

Duty concessions for the purchase of outboard motors were granted to 81 fishers, 72 on main outboards and 9 on spare outboards. Since the creation of the Small Fishermen Loan Scheme, the Development Bank of Mauritius has disbursed Rs 26m to registered fishers at an interest rate of 3% per annum. Out of that sum Rs 5.2m was loaned to 5 fishers for industrial fishing.

8.7 Buy-back scheme for nets

Implementation of the buy-back scheme for the reduction of net fishing was pursued and the details are presented in table 8.7.

Table 8.7: Amount paid (Rs)

| Year | Fishers | Nets surrendered | To fishers | To net owners | Total |
|--------------|----------------|-------------------------|-------------------|----------------------|------------------|
| 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 |
| 2004 | 9 | 2 | 250 000 | 325 000 | 575 000 |
| Total | 137 | 4 | 4 950 000 | 1 015 000 | 5 965 000 |

8.8 Reconstruction of Fisheries Posts

The fisheries posts at Grand Gaube and Pointe aux Sables, destroyed during riots in 1999 were reconstructed and provided with modern facilities and were inaugurated in June and August 2004 respectively.

8.9 Computerisation

Computers were provided to fisheries posts at Poste Lafayette, Grand Gaube, Mahebourg and La Preneuse to improve the compilation of data of the Fisheries Protection Service.

8.10 Lataniers Fish Landing Station

In view of tightening security in the port area, the Lataniers Fish Landing Station was deregistered on 12 July. The 23 fishers who were operating at that fish landing station were paid a compensation of Rs 200 000 each by the Mauritius Ports Authority on 06 August and they were relocated to the Bain des Dames fish landing station. They later grouped themselves into an association known as Med Fish Company Limited to operate in the semi-industrial fishery.

9 MISCELLANEOUS

9.1 Second National Ocean Science Forum

The Second National Ocean Science Forum organised by the Mauritius Oceanography Institute was held on 18 and 19 August at the University of Mauritius. Papers presented by officers from the Centre were as follows:

- A survey on the levels of hexazinone, atrazine and diuron in selected river mouths around Mauritius. H. Bhudoye, S. Conhye and V. Chelumbrun (Mrs).
- A comparative study on the distribution of juvenile fish in the lagoons of Trou d'Eau Douce and Albion, Mauritius. M. D. Hurbungs (Mrs) and R. Mokool (Mrs).
- Seasonal abundance of pelagic fish around fish aggregating devices in Mauritius. S. C. Bauljeewon, V. M. Chooramun and N. Dussoa.

9.2 Sale of publications

Total value accrued from the sale of publications including thematic maps, posters, field guides and bathymetric charts amounted to Rs. 62 310 (See Appendix 9 for list of publications on sale).

9.3 Visits to the AFRC

During the year, 12 515 persons visited the center as compared to 5 894 in 2003. Visitors were mainly students from primary and secondary schools. Details of visitors are shown in table 9.1.

Table 9.1: Visits to AFRC

| Institutions | Number of visitors |
|---------------------------------------|---------------------------|
| Primary schools | 5 940 |
| Secondary schools | 3 870 |
| Social organisations/welfare centres | 1 439 |
| Pre-primary schools | 901 |
| Specialised institutions | 185 |
| Pre-vocational institutions | 105 |
| Governmental/parastatal organisations | 60 |
| Others (official delegates) | 15 |
| Total | 12 515 |

In addition to visits, facilities for bibliographic search and documentation were provided to thirty-nine persons having an interest in the field of marine sciences.

9.4 New library holdings

A total of 211 new publications were acquired during 2004. These included magazines, reports, newsletters, textbooks and serials.

9.5 Publications

The seventh issue of the fisheries newsletter and pamphlets on stingers in coastal waters around Mauritius were published and distributed to various stakeholders and institutions. A book entitled, "Ciguatera: its review and status in Mauritius" was also published.

9.6 ODINAFRICA II project

The documentation unit participated actively in the Ocean Data and Information Network for Africa (ODINAFRICA) project, which entered in its third phase in 2004 during which data and information management capacity in the region would be strengthened.

9.7 Accession to the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)

Mauritius acceded to the CCAMLR on 2 October 2004.

9.8 Visit to Australia

In view of the formulation of the Management Plan for St Brandon and the Associated bank, a mission headed by the Permanent Secretary and comprising an officer of the Fisheries Planning Division and a representative of the Banks Fishing Operators Association (BFOA) visited Australia from the 5 to 13 November 2004. The mission took cognizance of the development of the Australian sea food hub with a view to establishing contacts with its stakeholders to promote Mauritius as an ideal destination for value addition and transshipment.

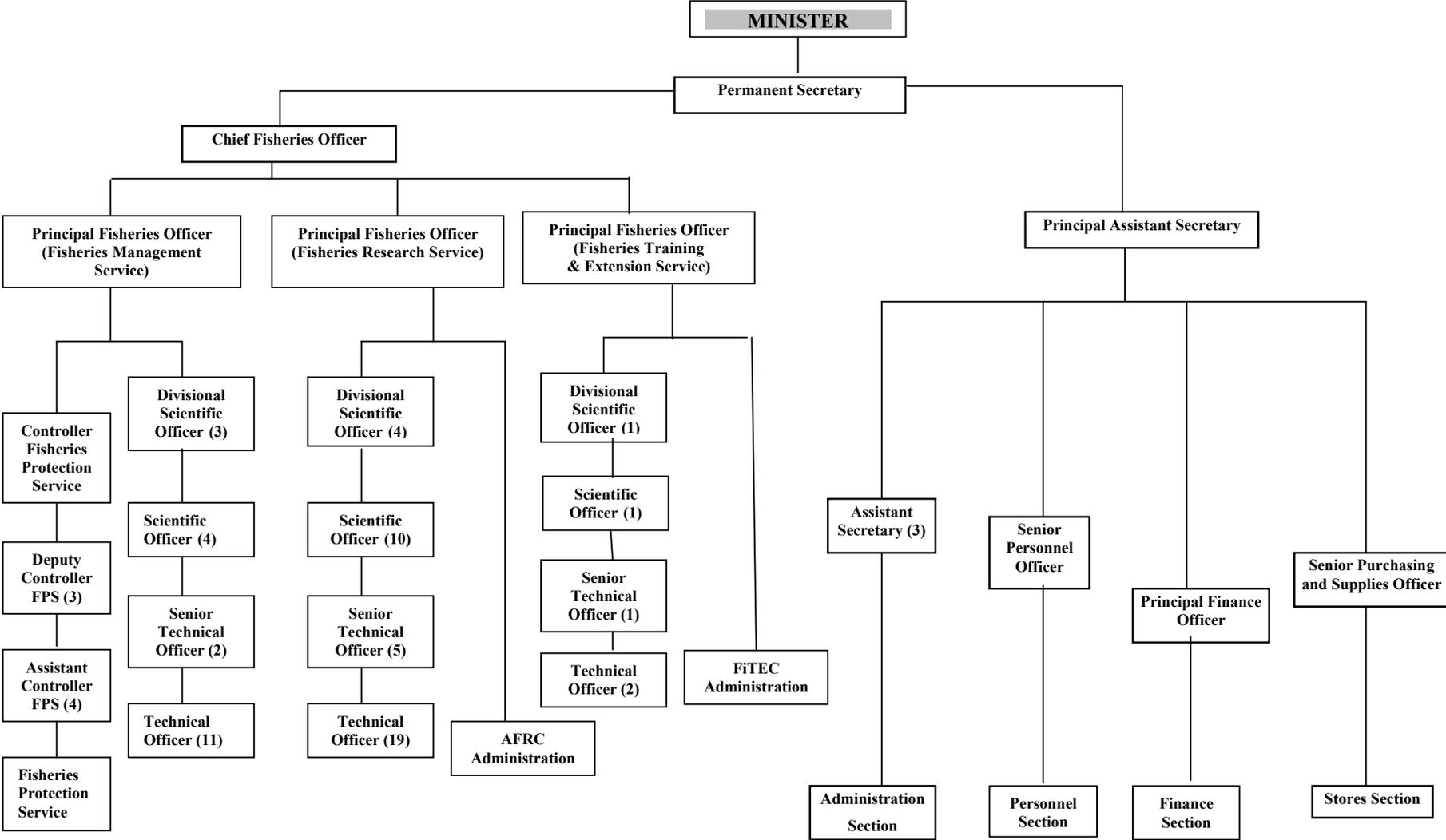
9.9 Distribution of safety equipment

Safety equipment such as hand flares, tarpaulin, life buoys and radar reflectors are now an integral component of fishers' accessories in their operations. The safety equipment were distributed freely to fishers owners of boats in Rodrigues.

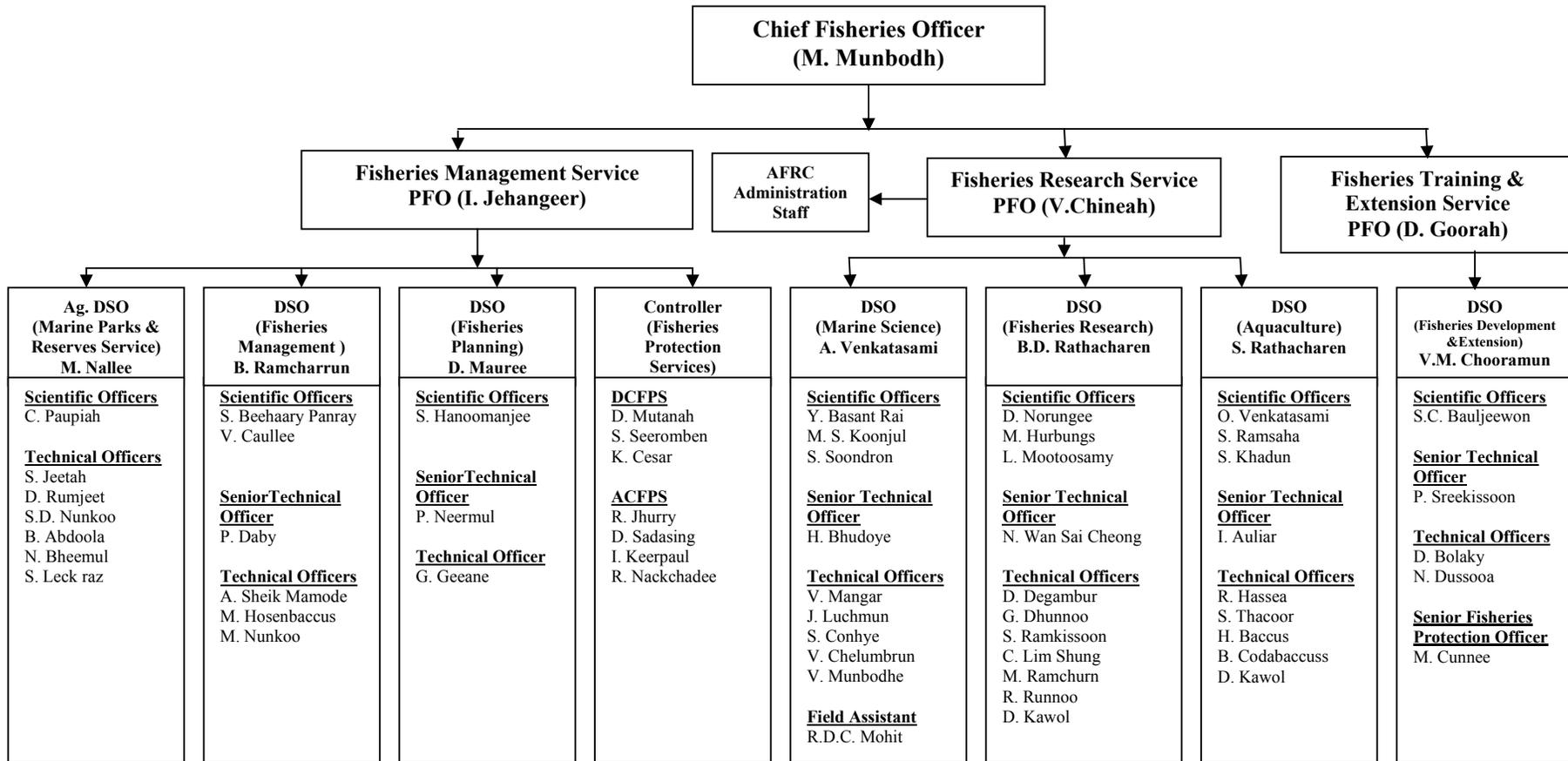
9.10 Obituary

Mr. M. Ramchurn, Technical Officer, passed away on 7 January 2004 at the age of 51 years. He joined the Ministry as Field Assistant in 1977 and was subsequently appointed Technical Officer in 2002. Mr. M. Ramchurn worked mostly in aquaculture, on fish toxicity and a project on juvenile fishes.

Appendix 1: Organigram of the Ministry of Fisheries

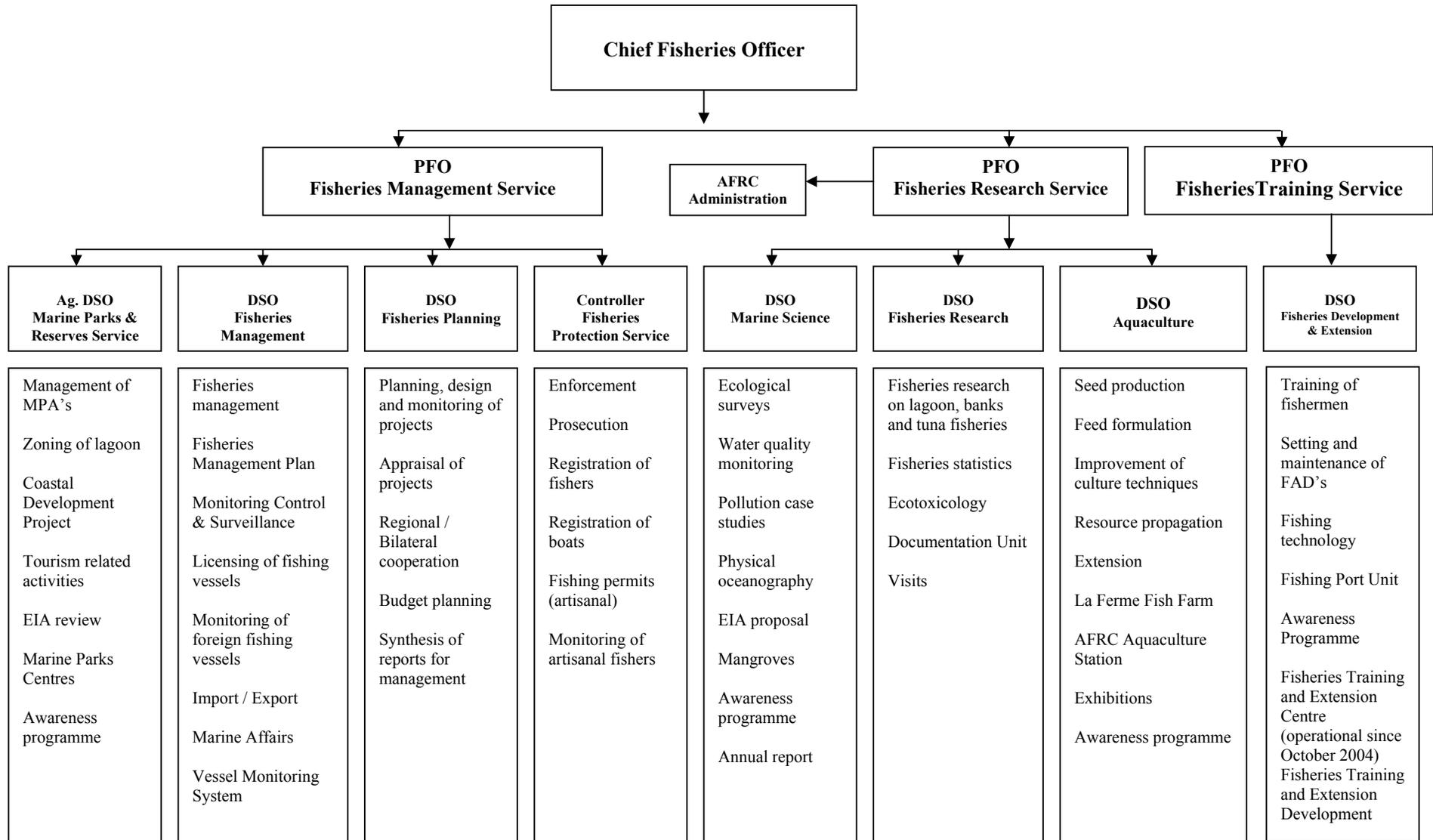


Appendix 2: Organigram of the technical services



PFO: Principal Fisheries Officer
 DSO: Divisional Scientific Officer
 DCFPS: Deputy Controller, Fisheries Protection Service
 ACFPS: Assistant Controller, Fisheries Protection Service

Appendix 3: Technical services staff activities



Appendix 4: 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 billfish. | <ul style="list-style-type: none"> • Collect, process and analyse tuna and swordfish 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. |
| Biostudy | <ul style="list-style-type: none"> ◆ Gather biological information on mullidae and scaridae families. | <ul style="list-style-type: none"> • Collect length-weight data. • Check and analyse gut contents to determine feeding habits. • Check and analyse gonads for maturity and fecundity. |
| Recruitment of fish juveniles | <ul style="list-style-type: none"> ◆ Study juvenile fishes. | <ul style="list-style-type: none"> • Collection of juvenile fishes from lagoons and estuaries. • Identification of juvenile fishes. |

Marine Science

| Projects/services | Objective(s) | Main activities |
|---|--|---|
| Coastal Ecosystem Research | <ul style="list-style-type: none"> ◆ Long-term monitoring of the coastal ecosystem at selected sites. | <ul style="list-style-type: none"> • Collect data on substrate cover (coral, seagrass, algae, fish census and invertebrate counts). • Eradication of COTs. • <i>Ad hoc</i> surveys (stranded mammals, fish mortality, M. Jacquot sewerage project). • Observations on coral bleaching. • Processing and analysis of data. • Submit recommendations on new coastal development projects. |
| Coastal Environment Research | <ul style="list-style-type: none"> ◆ Monitor water quality in coastal waters. ◆ Monitor coliform bacteria at selected beaches. | <ul style="list-style-type: none"> • Collect water samples at sea. • Record physical parameters. • Perform chemical analysis of water. • Investigate on cases of marine pollution and fish mortality. • Perform tests for coliform bacteria. • Advise on suitability of beach water for users. • Advise on formulation of standards and guidelines for wastewater discharge. |
| Monitoring of pesticides and trace metals | <ul style="list-style-type: none"> ◆ Long term monitoring of pesticides and trace metals levels at eight estuaries. | <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 and bathymetry in the lagoon. | <ul style="list-style-type: none"> • Collection of data on the movement of drogues (current followers) and depth in the lagoon. |
| 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 visual census and invertebrate count. |
| 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 and prepare project write ups and preliminary environment report. • Assess & evaluate impacts • Conceive mitigating measures. • Assess and evaluate impacts. • Conceive mitigating measures. • Assist in preparation of tender documents for contractual works. • 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. | <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>Tetraselmis</i> sp., <i>Nannochloropsis</i> sp., <i>Isochrysis galbana</i> sp. and <i>Chaetoceros</i> sp.). • Maintain pure strains of the four phytoplankton. • Release of hatchery reared juveniles in the lagoon. |
| <ul style="list-style-type: none"> • Seed production of marine shrimps in sea water. • Acclimatisation of marine shrimps in fresh water at PL 20. • Rearing / grow out of marine shrimps in ponds. | <ul style="list-style-type: none"> ◆ Production of acclimatised marine shrimps to service fish farmers. ◆ Gradual phasing out of berri rouge. | <ul style="list-style-type: none"> • Acclimatisation of juveniles of two species, namely <i>Penaeus monodon</i> and <i>Metapenaeus monoceros</i>. |
| Larval rearing, asexual reproduction and induced spawning in sea cucumbers. | <ul style="list-style-type: none"> ◆ Seed the lagoon | <ul style="list-style-type: none"> • Maintain and rear broodstock. • Induced spawning by two methodologies: thermal stimulation; drying and spraying of jet of water. • Larval rearing of sea cucumbers. • Stocking of 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 of two strains (Malaysian and Israeli). ◆ Provide extension service for freshwater aquaculture development. ◆ Produce seed for berri rouge in sufficient quantity to service farmers. | <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 / scope of work for the scientific mission to Madagascar for appraisal of the seaweed culture technologies and methodologies. |
| 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"> ◆ Assessment 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 for Mauritius and Rodrigues. | <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. • Financial analysis of projects and reporting. • Oversee project implementation. |
| National / regional / bilateral / multilateral cooperation | <ul style="list-style-type: none"> ◆ Coordinate matters related to regional/bilateral issues. ◆ Cooperation with third countries. ◆ Cooperation with other local institutions. | <ul style="list-style-type: none"> • Follow-up on projects. • Assist evolving of fisheries policies with respect to EU, WTO, SADC, COMESA, NEPAD, IOR-ARC, SWIOFC, and FAO. • Liaison and collaboration with other organisations. |

Fisheries Development and Extension

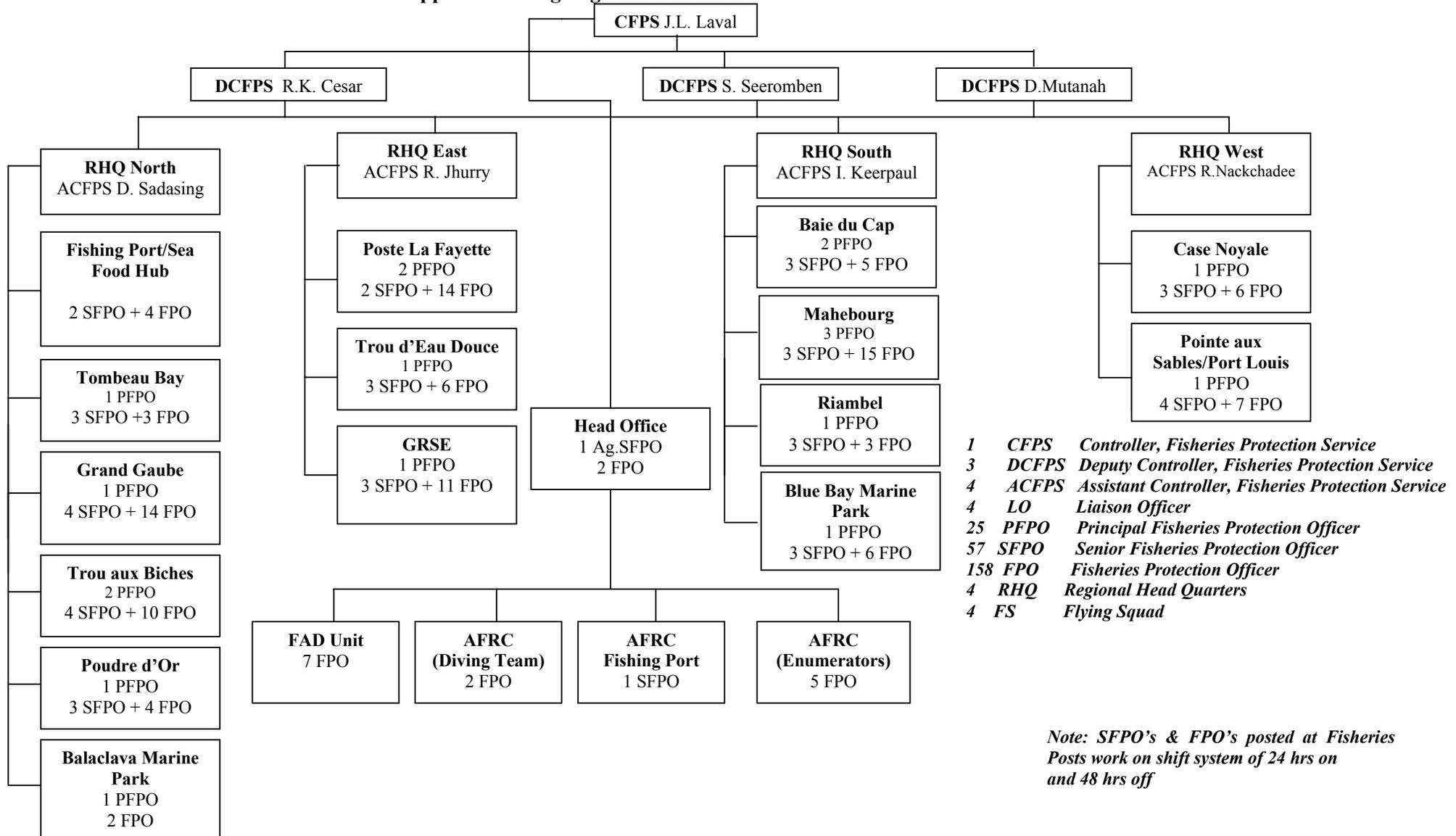
| Projects/services | Objective(s) | Main activities |
|---|--|---|
| FAD fishery development | <ul style="list-style-type: none"> ◆ Develop, support and maintain a FAD fishery | <ul style="list-style-type: none"> • FAD design and construction. • Set and maintain FADs. • Operate and manage research vessels. • Monitor FAD fishery. |
| Fishermen training | <ul style="list-style-type: none"> ◆ Enhance fishers' skills and knowledge in exploiting fish resources around FADs | <ul style="list-style-type: none"> • Sensitization meetings with fishers. • Training of fishers. • Demonstrate fishing techniques. • Conduct practical sessions at sea. |
| Off-lagoon fishery development | <ul style="list-style-type: none"> ◆ 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 | <ul style="list-style-type: none"> ◆ Enhance knowledge and skills of fishers to operate in the off-lagoon area. ◆ Dispense proper training to new entrants for a career in the fishing industry. ◆ Ensure effective fishing techniques. ◆ Provide training for enhanced safety and security at sea. ◆ Create awareness on marine environment protection and conservation. | <ul style="list-style-type: none"> • Training of fishers (General fisher course). • Training of Fisheries Protection Service officers as coxswain and marine engine driver (completed). • Preparation of a programme and course curriculum for the training of mid-management staff of the Fisheries Protection Service. |

Fisheries Management

| Projects/services | Objective(s) | Main activities |
|------------------------------|---|---|
| Licensing of fishing vessels | <ul style="list-style-type: none"> ◆ Monitor movement and operation of fishing vessels. | <ul style="list-style-type: none"> • Collect fishing log book; • Record movement of vessels; • Enforce licence conditions; • Check licences and relevant documents (foreign vessels); • Clearance for departures and arrivals; • Check safety equipment; • Monitor transshipment activities. |
| Licencing of fishing vessels | <ul style="list-style-type: none"> ◆ Provide support for fishery management. | <ul style="list-style-type: none"> • Issue licences to Mauritian and foreign fishing vessels; • Allocation and monitoring of catch quota. |
| Fish imports and exports | <ul style="list-style-type: none"> ◆ Provision of support for 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 |

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| | | <ul style="list-style-type: none"> quality norms; • Monitor fish supply on the local market. |
| Sea Food Hub | <ul style="list-style-type: none"> ◆ Provision of a one stop shop service | <ul style="list-style-type: none"> • Monitoring of all fishing vessels calling at Port Louis; • Issue of landing permits for imported fish and fish products; • Authorisation for export; • Clearance/survey of all bank fishing vessels prior to departure. |

Appendix 5: Organigram of the Fisheries Protection Service



Appendix 6: Meetings, workshops, seminars and courses attended by officers

| Subject | Venue | Date | Officer |
|---|---|--------------|---|
| Scientific mission on geomorphology, bathymetry, geochemistry operations around the island of Crozet and Kerguelen | Marine Dufresne Research vessel | 3 Jan-10 Feb | L. Mootoosamy |
| VMS | SFA, Seychelles | 18-24 Jan | R. Hossen Bacus |
| Vessel monitoring programme | Seychelles | 18-24 Jan | J. L. Laval |
| Attachment course – Policy planning SFA | Seychelles | 19-24 Jan | P. Neermul |
| 23 rd Intergovernmental Consultation on the Establishment of SWIOFC | Kenya | 27-30 Jan | M. Munbodh |
| Regional MCS workshop | Johannesburg, South Africa | 27-30 Jan | S. P. Beeharry |
| Immarsat meeting | Exhibition Centre, Freeport, Port Louis, Mauritius | 25-26 Feb | A. Sheik Mamode |
| IOTC- OFCF Regional Workshop for Strengthening of the data collection and processing systems for Tuna Fisheries in the Indian Ocean | Victoria, Mahé, Seychelles | 1-5 Mar | B. D. Rathacharen Y. T. N. Wan Sai Cheong |
| MoU on the conservation and management of marine turtles and their habitats | Bangkok, Thailand | 16-19 Mar | M. Nallee |
| 3 rd SWIOFP plenary workshop | Mozambique | 24-25 Mar | D. Goorah |
| One-day workshop for the IFAD rural diversification programme – Mid term review exercise | St Pierre Farmer's Service Centre, St Pierre, Mauritius | 31 Mar | V. M. Chooramun S. C. Bauljeewon P. S. Sreekeessoon |
| Awareness workshop on laboratory accreditation | Gold Crest Hotel, Mauritius | 3 Apr | Mrs. Y. Basant Rai H. Bhudoye Mrs. V. Chelumbrun |
| Meeting to prepare ESA Fisheries Framework Agreement | Seychelles | 23-24 Aprl | D. Mauree |
| Regional workshop on marine pollution. Prevention and environmental management in ports of Eastern Africa | Mombasa, Kenya | 26-30Apr | Mrs. Y. Basant Rai |
| Distribution of life saving equipment | Rodrigues | 2-4 May | J. L. Laval |
| Information security seminar – implementation of ISO/IEC 17799 security standards in the Civil Service | Domaine les Pailles, Mauritius | 29 Aprl | D. Goorah |
| Africa environment information network – Regional and national start-up programme | Commission de l'Ocean Indien, Mauritius | 3-5 May | S. Conhye |
| Training on internal audit and laboratory accreditation | Gold Crest Hotel, Mauritius | 12-13 May | Mrs Y. Basant Rai |
| 8 th Info fish world tuna conference and exhibition | Bangkok, Thailand | 3-5 June | M. Munbodh D. Mauree |
| Reef check workshop – Regional coral reef monitoring network | Tuléar, Madagascar | 7-10 June | S. Conhye |

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| Reef check workshop – Regional coral reef monitoring network and Annual focal points meeting | Tuléar, Madagascar | 7-11 June | Mrs. M. S. Koonjul |
| <i>Macrobrachium rosenbergii</i> – Aquaculture management committee | Malaysia | 6-21 June | R. Hassea |
| Meeting to prepare an ESA Fisheries Framework Agreement | Seychelles | 5-6 July | D. Mauree |
| Seminaire regional sur la planification et la mise en oeuvre du developement durable dans les Petits Etats Insulaires Francophones | Mont, Choisy, Mauritius | 5-9 July | S. P. Beeharry |
| Food technology laboratory | University of Mauritius | 7 July | R. Hossen Bacus |
| 4 th Inter Governmental Consultation on the establishment of the South West Indian Ocean | Seychelles | 11-16 July | M. Munbodh |
| Workshop – New merchant shipping bill 2004 | Balaclava, Mauritius | 21 July | S. P. Beeharry |
| Presentation by EPIRB Serpe-ICSM Company on emergency position indication, radio beacon system | Maritim Hotel, Balaclava, Mauritius | 21 July | D. Bolaky N. Dussooa |
| SADC wetland dynamics and integrated management techniques training course | Tanzania | July | Mrs S. Nunkoo |
| 3 rd regional training course in MPA management | Malindi, Kenya | 9-21 Aug | N. Bheemul |
| Half-day workshop on model of organizational performance and customer service culture. | Lecture Theatre, IVTB House, Phoenix, Mauritius | 30 Aug | O. Sunassee |
| Indo Mauritian joint committee on ocean science and technology | India | 06-09 Sept | M. Munbodh |
| SWIOP – South West Indian Ocean Fisheries Programme – 2 nd Science planning workshop | Durban, South Africa | 06-10 Sept | A. Venkatasami B.D. Ratacharen |
| Training in Quality Management System MS ISO 9001:2000. | Mauritius Standards Bureau, Moka., Mauritius | 27 -30 Sept | O. Sunassee |
| Western Indian Ocean Region- Marine turtle workshop | KESCOM Mombasa, Kenya | 16-17 Sept | M. Nallee |
| 13 th conference of the parties to the convention on international trade in endangered species of wild fauna and flora (CITES) | Bangkok, Thailand | 2-14 Oct | I. Jehangeer |
| Warm water fish Production | Egypt | 11 Oct – 22 Dec | Mrs O. Venkatasami |
| Training of trainers programme – Delivery skills for trainers | M/ Civil Service Affairs & Administrative Reforms, Mauritius | 11-15 Oct | D. Goorah |
| Second data and management plan workshop of the South West Indian Ocean Fisheries Programme | Mombasa, Kenya | 14-15 Oct | A. Venkatasami Y. T. N. Wan Sai Cheong |

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|---|--|-----------------|--|
| Workshop on National capacity self-assessment (NCSA)- global environment management | Domaine les Pailles, Mauritius | 20 Oct | S. Conhye |
| Training of trainers programme – Design of training | M/ Civil Service Affairs & Administrative Reforms, Mauritius | 25-29 Oct | D. Goorah |
| Expert consultation on data formats and procedures for MCS | Bergen, Norway | 25-27 Oct | S. P. Beeharry |
| 23 rd meeting of CCAMLR commission | Hobart, Tasmania Australia | 25 Oct – 5 Nov | M. Munbodh B. Ramcharrun |
| Training of trainers programme – Development of training materials | M/ Civil Service Affairs & Administrative Reforms, Mauritius | 3 Nov | D. Goorah |
| Mission to Australia | Australia | 5-13 Nov | D. Mauree Ms. A. Burenchobay |
| Symposium of fish supply and demand | Malawi | 16-17 Nov | S. Hanoomanjee |
| Management of small-scale deep sea fisheries | University of Otago, Dunedin, New Zealand | 27-29Nov | A. Sheik Mamode |
| South West Indian Ocean Fisheries Project – 2 nd Workshop on the Financial and Procurement Plan | Tanzania | 30 Nov – 02 Dec | S. Soondron G. Poule |
| Attachment programme at Seychelles Fishing Authority on experimental fishing with longline techniques to study the capture of tuna in the EEZ of Seychelles | Research boat, l' Amitié, Seychelles | 10-14 Dec | D. Bolaky |
| Training of Fisheries Protection Service Officers on boat handling and equipment to complete the courses of coxswain and marine engine driver grade II | Port Mathurin, Rodrigues | 14-18 Dec | S. C. Bauljeewon, AFRC Capt J. C. Moorghen & M.A. Moorghen – Sea Training School |

Appendix 7: Talks delivered

| Subject | Venue | Date | Officer |
|---------------------------|---|-------------|---------------------|
| Importance of coral reefs | Poudre d'Or Hamlet Govt school | 12 May | V. Mangar |
| Marine Protected Areas | D. Lallah SSS, Curepipe | 12 May | S. Leckraz |
| Importance of coral reefs | Marcel Cabon Govt school | 18 May | H. Bhudoye |
| Importance of coral reefs | Pointe aux Sables Govt school | 21 May | S. Conhye. |
| Importance of coral reefs | Moka Govt school | 17 May | M. S. Koonjul (Mrs) |
| Importance of coral reefs | Black River Govt school | 19 May | J. P. Luchmun |
| Importance of coral reefs | Pointe aux Piments Govt school | 26 May | V. Chelumbrun(Mrs) |
| Importance of coral reefs | Bambous A Govt school | 27 May | R.D. C Mohit |
| MPA Regulations 2001 | Ministry of Environment | 26 May | M. Abdoolah |
| Importance of coral reefs | G.R.N.W Govt school. | 3 June | V. Munbodhe |
| Importance of coral reefs | G.R.S.E Govt school | 4 June | V. Mangar |
| Importance of coral reefs | Cascavelle Govt school | 7 June | H. Bhudoye. |
| Importance of coral reefs | Quatre Soeurs Govt school | 9 June | J. P. Luchmun |
| Importance of coral reefs | Poste de Flacq Govt school | 11 June | V. Chelumbrun(Mrs) |
| Importance of coral reefs | Flic en Flac Govt school | 16 June | R.D. C. Mohit |
| Importance of coral reefs | Case Noyale Govt school | 18 June | S. Conhye |
| Importance of coral reefs | Pamplemousses Botanical Garden (World Food Day) | 5 Dec | V. Mangar |
| Marine Protected Areas | Pamplemousses Botanical Garden (World Food Day) | 5 Dec | D. Rumjeet |

Appendix 8: Sale of publications

| Title | Unit price (Rs.) |
|---|------------------|
| Poissons Commerciaux du Sud-Ouest de l’Ocean Indien (Guide) | 110 |
| Field Guide to Coastal Fishes of Mauritius | 200 |
| Basic Biostatistics for Marine Biologists (Textbook) | 100 |
| Field Guide to Corals of Mauritius | 250 |
| Common Corals of Mauritius (Poster) | 80 |
| Common Coral Reef Fishes of Mauritius (Poster) | 80 |
| Bathymetric Charts: <div style="margin-left: 40px;"> A. Ile Maurice B. Ile Maurice Nord I C. Ile Maurice Nord II D. Banc Soudan E. Banc Hawkins F. Rodrigues Ouest G. Ile Rodrigues </div> | 50 |
| Thematic Maps for coastal areas: <div style="margin-left: 40px;"> – Format A4 – Format A3 – Format 36’’x 44’’ </div> | 55 110 440 |

**Appendix 9: List of Treaties/Conventions and Bilateral Agreements
under the responsibility of the Fisheries Division**

| Name of Treaties/Conventions and Bilateral Agreement | Date signed |
|--|--|
| Agreement between the European Union and Government of Mauritius on fishing in the waters of Mauritius. Last Protocol renewed in December 2003 for a further period of 4 years. | Signed in 1990 |
| FAO Code of Conduct for Responsible Fisheries (1995). | Adopted by FAO in 1995 |
| Agreement for the Establishment of the Indian Ocean Tuna Commission (IOTC) adopted in 1993. | Acceptance date 24 November 1994. Entered into force on 27 March 1996 |
| Agreement for the implementation of provisions of the United Nations Convention on the Law of the Sea (UNCLOS) of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. | Adopted on 1995. Adhered to 25 March 1997. Entered into force as from 11 December 2001. |
| Fishing Agreement between the Republic of Mauritius and the Federation of Japan Tuna Fisheries Cooperative Associations for Fishing in Mauritius waters. | Signed on May 2000. Renewable every year. |
| SADC Fisheries Protocol | Signed on 14 August 2001 |
| Memorandum of Understanding on the Conservation and Management of Marine Turtles and their habitats of the Indian Ocean and South East Asia. | Signed on 13 September 2002 |
| Memorandum of Understanding on Cooperation in the field of Fisheries between Mauritius and Mozambique. | Signed on 29 March 2002 |
| Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. | Deposit of Instrument of Acceptance on 27 March 2003. Came into force on 24 April 2003. |
| Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). | Came into force in 1982. Became a member to the Convention on October 2004. |