Republic of Mauritius

Ministry of Agro Industry, Food Production and Security

Annual Report 2007

Fisheries Division

Foreword

I am pleased to present the Annual Report of the Fisheries Division for the year 2007. The report highlights the main activities of the Division and the performance of the fisheries sector within the overall economy.

Various activities were conducted to monitor fisheries activities and the marine ecosystem. These are important for the analysis of trends in the fisheries sector. They also enable the formulation of sound management measures for the sustainable development and conservation of the marine living resources.

One of the most important events during the year was the setting up of the Fisherman Investment Trust (FIT). The objectives of FIT are to invest in fisheries and fish processing activities, fish marketing and other related activities having regard to the interest of the fishermen.

The Seafood hub has developed processing and canning capacity in excess of 100 000 tonnes and is currently engaged in a variety of processing activities. The dedicated One-Stop-Shop serviced by Government within the port continues to ensure prompt import and export clearances.

The Ministry has also taken steps to ensure that fish and fish products exported to our main markets are in compliance with the regulations in force in these countries. Financial assistance was obtained from the Hellenic Republic of Greece for the construction of a modern fish auctioning facility in the port area.

As regards regional collaboration, an agreement was signed among nine countries of the South West Indian Ocean region including Mauritius and the World Bank for the implementation of the South West Indian Ocean Fisheries Project which aims at identifying and assessing the fisheries resources in the respective EEZ of the participating countries.

A new Fisheries and Marine Resources Act was enacted. The new legislation provides for the efficient management of our fisheries resources and its harmonisation with international fishery management and conservation measures and more effective implementation of the Monitoring, Control and Surveillance (MCS) activities.

I hope that this Annual Report will constitute a valuable reference to all stakeholders in the fishing industry and I take this opportunity to thank the entire staff of the Fisheries Division for their devotion and commitment in the preparation of this Report.

N. Boodhoo (Mrs.)
Ag. Senior Chief Executive
Ministry of Agro Industry, Food Production and Security

Vision

To be an economic pillar of Mauritius with due regard to sustainability of aquatic resources and social development for the benefit of all stakeholders.

Mission

To provide an enabling environment for the promotion of sustainable development of the Fisheries Sector, to ensure continued economic growth and social development within the framework of good governance.

Objectives

- Establish a conducive environment in which the fishing industry can develop.
- Contribute towards the development of Mauritius in a world class seafood hub and derive optimal benefits from marine living resources.
- Promote and regulate the optimal long-term sustainable utilisation of living marine resources.
- To promote applied research, development and management of aquatic living resources.
- Ensure that all fisheries activities allow for the conservation of vital marine ecosystems.
- Foster the interest of Mauritius within the international fisheries community, including encouraging the international trade of fish commodities within the framework of international law and conventions.
- Provide professional, responsive and customer friendly services.
- Deliver our services efficiently and effectively providing value for money.
- Continuously invest in human resource development.
- To promote the social welfare and status of the fishermen.

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Fish production was 640 tonnes in the artisanal fishery. There were 2 300 fishermen and 1 543 boats in operation during the year.

Case studies on the net fishery were carried out at 6 fish landing stations to collect biological information. A decline in the total catch due to a reduction in fishing effort has been observed.

A total of 2 127 tonnes of frozen fish comprising mainly lethrinids (83.3%) was landed from the fishing banks. Seventeen vessels were involved in the semi-industrial chilled fishery and landed 179 tonnes of chilled fish.

Sea cucumber surveys were carried out in the lagoon at 14 sites in Mauritius and 16 sites in Rodrigues to gather information on the status of the stock. The *Holothuria atra* was observed to be the dominant species in Mauritius. A Total Allowable Catch (TAC) of 550 and 450 tonnes was set for Mauritius and Rodrigues respectively.

The long term monitoring of the coral reef ecosystem and seawater quality were continued at the established sites around the island. No coral bleaching was observed. The results of the water quality analyses were generally within the *Guidelines for Coastal Water Quality Requirements for various categories*. An Action Plan for stranded marine mammals/turtles was prepared.

In line with the recommendations of EU for the export of fish and fisheries products, actions were initiated for the accreditation of the fish toxicity, marine chemistry and marine bacteriology laboratories at AFRC.

Seed production of berri rouge, and the giant freshwater prawn was continued. Breeding and culture of fresh water ornamental fish were pursued. The extension service provided advice on aquaculture techniques to 325 fish farmers. The draft Master Plan for Aquaculture Development in Mauritius was finalised in December.

The monitoring at the two marine parks was continued. 74 new permits were issued to the different users of the Blue Bay Marine Park and 280 permits were renewed against payment. The Fisheries and Marine Resources (Marine Protected Areas) Regulations 2001 were amended to better manage the Marine Protected Areas and protect the marine biodiversity. A permit fee was introduced for access to the Marine Protected Areas.

A total of 1 203 fishermen had benefited from various training courses dispensed at FiTEC. An average of twenty FADs was kept active around the island. Draft regulations were formulated to control fishing activities around FADs and to ensure security and safety measures of the small-scale fishermen.

The fish handling, preservation techniques and marketing systems both in Mauritius and Rodrigues were reviewed. A Code of Practice and a poster on good handling practices were produced.

During the year, 203 fishing licences were issued to foreign fishing vessels to operate in Mauritius waters while 35 licensed Mauritian vessels were involved in different fishing activities. A total of 664 fishing vessels called at Port Louis for transshipment, bunkering, dry-docking, provisions and changing of crew.

Licensed and non-licensed tuna longliners transhipped 23 955 tonnes of tuna and tuna-like species. The amount of toothfish transhipped was 1 915 tonnes.

236 fishing vessels reported to the Fisheries Monitoring Centre comprising 33 local and 203 foreign vessels.

As regards the exportation of fish and fishery products to the EU, four laboratories, namely AFRC, NEL, FTL and MSB were designated to carry out official testing of water, ice and fish and fishery products. The Export of Fish and Fish Products Regulations (No 2) of 2006, was reviewed and amended. Eleven establishments were approved to export fish and fishery products to the EU.

The Fisherman Investment Trust Act was proclaimed in January and a new Fisheries and Marine Resources Act was enacted on 26 December.

Implementation of the buy-back scheme for the reduction of the number of nets operating in the lagoon was continued. Four net fishermen gave up net fishing and were compensated accordingly.

An agreement was signed between nine countries of the South West Indian Ocean to establish the South West Indian Ocean Fisheries Project (SWIOFP), which aims at identifying and assessing the fisheries resources in the respective EEZ of the participating countries.

One marine turtle came on the beach for nesting. Officers of the Fisheries Protection Service kept watch to prevent public interference at the nesting site until hatching.

1. Fisheries Research

1.1 Coastal (artisanal) fishery

Data from the artisanal fishery were collected on a monthly basis at 25 selected fish landing stations to estimate the catch and effort by fish species and gear type. During the year, 4 039 landings were thus recorded. Compared to previous years, a significant decline in fish catch has been noted, which may be attributed to a decrease in fishing effort as a result of bad weather conditions and non reported catches by fishermen.

1.1.1 Catch, effort and catch per fisherman day

The production of fresh fish was estimated at 640 tonnes and comprised 354 tonnes from the lagoon and 286 tonnes from off-lagoon areas. The estimated catch from both the lagoon and off-lagoon had decreased by 225 and 85 tonnes respectively. The decrease represented about 33 % of the overall catch of 2006 and corresponded with the decrease of 32 % in the fisherman-days. The catch per fisherman-day (CPFD) was 4.4 kg. Table 1.1 and figure 1.1 and 1.2 show the catch, number of fisherman-days and CPFD.

Table 1.1: Catch, fisherman-days and CPFD

Year	Catch (t)			Fisherman-days			CPFD (kg)		
	L	OL	Total	L	OL	Total	L	OL	M
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
2005	545	402	947	153 771	77 429	231 200	3.5	5.2	4.1
2006	579	371	950	145 089	68 961	214 050	4.0	5.4	4.4
2007	354	286	640	93 261	51 622	144 883	3.8	5.5	4.4

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

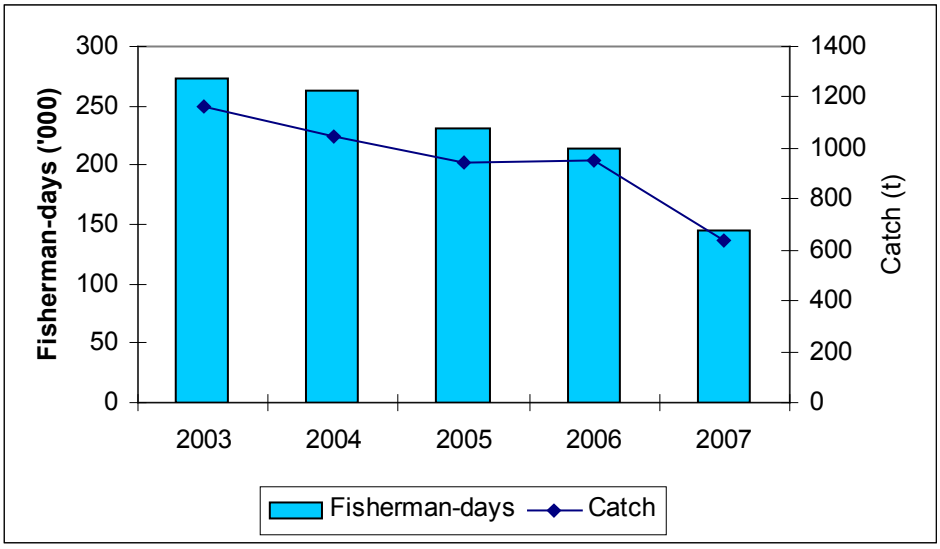


Figure 1.1: Fisherman-days and total catch

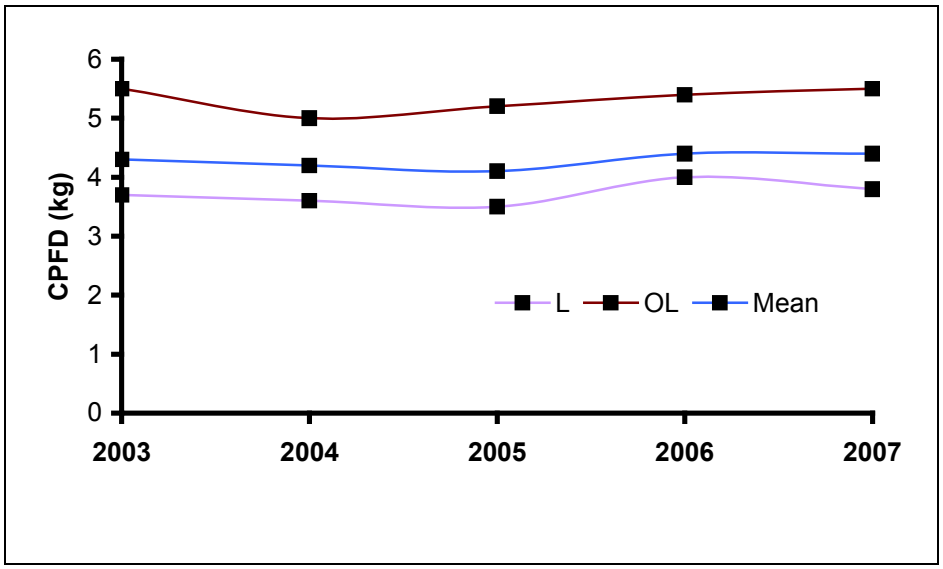


Figure 1.2: Catch per fisherman-day

1.1.2 Monthly landings

The monthly production of fresh fish from the lagoon and off-lagoon, value of catch, effort and CPFD are presented in table 1.2. Peak landings were recorded from March to July.

Table 1.2: Monthly catch with value, effort and CPFD

Month	Catch (t)			Value(MR)	Fisherman days	CPFD (kg)		
	L	OL	Total			L	OL	Mean
January	19	22	41	4.8	10 046	2.9	6.4	4.1
February	14	21	35	3.9	7 250	2.8	9.6	4.8
March	39	29	68	8.2	15 308	3.6	6.2	4.4
April	62	29	91	10.0	16 878	4.9	7.0	5.4
May	47	32	78	10.5	16 275	4.8	5.0	4.8
June	36	24	60	7.7	12 984	4.2	5.5	4.6
July	30	33	63	9.3	12 830	3.6	7.3	4.9
August	17	10	27	3.3	7 844	2.9	5.0	3.5
September	26	11	37	4.9	10 152	3.5	4.1	3.6
October	25	18	43	6.2	9 831	3.9	6.2	4.4
November	18	28	46	6.5	15 782	3.2	2.8	2.9
December	21	29	50	7.6	9 703	3.9	7.0	5.1
Total	**354**	**286**	**640**	**82.9**	**144 883**			

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

1.1.3 Catch by gear

Seventeen large nets and four 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. The decrease in catch by gear as compared to 2006 was more prominent in fishing by line (44%), large net (34%) and gill net (33%).

Table 1.3: Annual catch (kg) by gear

Year	Line	BT	BTL	LN	GN	H/OF	Total
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**
2005	288 818	433 832	16 786	121 521	8 196	78 165	**947 318**
2006	303 675	343 794	19 608	201 122	11 298	70 501	**949 998**
2007	169 963	251 233	16 227	132 656	7 565	62 426	**640 070**

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

1.1.4 Fishermen

A total of 2 078 fishermen were involved in fishing activities. The number of fishermen by gear type for the past five years is presented in table 1.4. A 10 % decrease in the number of active fishermen was noted in 2007 as compared to 2006.

Table 1.4: Number of fishermen by gear type

Year	BT	L/H/OF	BT/L	LN	GN	Total
2003	473	749	670	177	17	**2 086**
2004	445	896	736	159	20	**2 256**
2005	493	789	689	189	14	**2 174**
2006	275	764	1 111	149	13	**2 312**
2007	283	770	876	137	12	**2 078**

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 fishing boats was 1 570 indicating a decrease of 15% as compared to 2006. The engine capacity of the motors used by the artisanal fishermen ranged from 8 to 25 HP. The number of fishing boats with modes of propulsion is presented in table 1.5.

Table 1.5: Number of fishing boats

Year	Oars and sails	Outboard motors	Inboard motors	Total
2003	95	1 160	45	**1 300**
2004	110	1 630	158	**1 898**
2005	212	1 211	51	**1 474**
2006	209	1 604	39	**1 852**
2007	175	1 323	72	**1 570**

1.1.6 Price of fish

The price of fresh fish in 2007 showed a slight increase at consumer level when compared to 2006. Table 1.6 shows the yearly average price of fresh fish.

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

Fish	2003	2004	2005	2006	2007
Homard	480	495	515	550	600
Crabe & crevette	285	275	290	275	320
Vieille rouge	180	190	215	230	255
Vacoas, sacréchien	150	160	160	175	175
Capitaine	140	155	170	170	180
Dame berri	130	140	150	170	170
Octopus	100	105	125	130	135
Carangue	100	115	115	120	130
Cordonnier	90	100	105	115	120
Rouget, tuna	85	90	95	110	115
Mullet voilé	80	85	95	100	105
Bordemar	85	100	95	90	110
Licorne	95	100	115	115	125
Cateau	75	75	70	85	90
Shark	55	45	45	50	50
Other fish	40	55	65	65	75

1.1.7 Study on net fishery

A study to collect biological information related to the net fishery was undertaken between August and September with the participation of a research scientist from the Environment Agency of England and Wales.

Six case studies were undertaken at Tamarin, Mahebourg, Riambel, Baie du Jacotet/Baie du Cap, Grand Gaube and Pointe aux Sables fish landing stations.

The historical data on the net fishery collected for the period 1990-2006 were analysed as regard to catch and CPUE. The data showed that there was a decline in the total catch of the net fishery. This may be attributed to a reduction by 50% in fishing effort from 1998 onwards.

From observations made, it was proposed to continue the study during the 2008 net fishing season with emphasis on species and size composition. It was also proposed to study the spawning period of fish caught by nets.

1.2 Banks fishery

Seven vessels were engaged in fishing activities in the shallow water banks of the Saya de Malha, Nazareth, Albatross and in the Chagos Archipelago. 20 fishing trips were carried out and particulars of the fleet are given in table 1.7.

Table 1.7: Particulars of the fishing fleet

Vessel	LOA (m)	GRT (t)	Hold (t)	Crew	Fishermen	Joined in
Noorstar 2	51	300	200	18	54	1992
Shandrani	55	398	300	35	60	1994
Hoi Siong 5	45	315	180	20	72	1996
Shandrani 2	42	449	130	30	45	2002
Talbot IV*	44	317	176	28	57	1989
Bethu*	55	391	196	17	54	2005
Diego Star*	54	388	190	16	50	2005

LOA: Length overall; GRT: Gross registered tonnage

* under foreign flag

1.2.1 Production of frozen fish

A total of 2 127 tonnes of frozen fish was landed and comprised lethrinids (83.3 %), snappers/groupers (16.0 %) and tuna/others (0.7%). Table 1.8 shows the annual catch from the different fishing areas and figure 1.3 illustrates the trend in catch. Table 1.9 shows the fishing effort and catch from the different banks.

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

Year	No. of vessels	Catch (t)				Total catch
		Saya de Malha	Nazareth	Chagos	Albatross	
2003	9	2 354	468	235	37	**3 094**
2004	8	1 686	855	117	21	**2 679**
2005	7	1 028	578	0	36	**1 642**
2006	10	1 645	777	136	54	**2 612**
2007	7	1 481	506	130	10	**2 127**

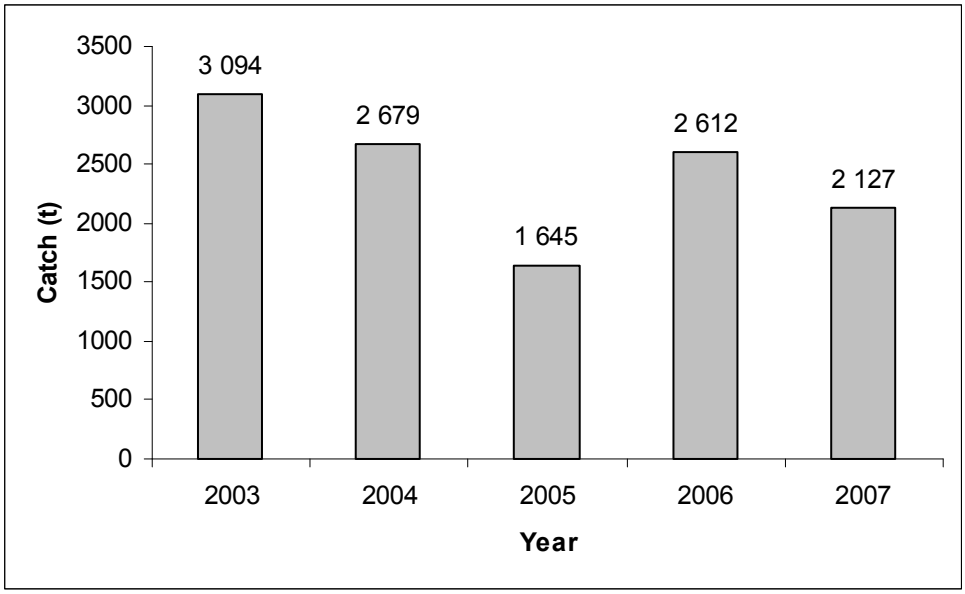


Figure 1.3: Trend in catches

Table 1.9: Fishing effort and catch by the fishing areas

Fishing areas	Fishing days	Bad weather days	Fisherman-days	Catch (t)	Catch per fisherman-day (Kg)	Total catch%
Saya de Malha	419	170	19 473	1 481	76.1	69.6
Nazareth	119	55	5 262	506	95.2	24.0
Chagos	44	6	2 376	130	54.5	6.0
Albatross	4	1	148	10	65.7	0.4
Total	**586**	**232**	**27 259**	**2 127**		**100.0**

1.2.2 Comparative analysis of data from Nazareth and Saya de Malha banks

The effort, catch and CPFD for Nazareth and Saya de Malha banks are given in table 1.10.

Table 1.10: Catch (t), effort (fisherman-days) and CPFD (kg) in the fishery

Year	Nazareth bank			Saya de Malha bank		
	Effort	Catch	CPFD	Effort	Catch	CPFD
2003	6 426	468	72.9	29 371	2 354	80.1
2004	10 154	855	84.2	23 729	1 686	71.0
2005	7 675	578	75.2	12 663	1 028	81.2
2006	9 627	777	80.7	23 233	1 645	70.8
2007	5 262	506	96.2	19 473	1 481	76.1

The CPFD was 96.2 kg on the Nazareth bank compared to 76.1 kg on the Saya de Malha bank. The CPFD from the two banks is shown in figure 1.4.

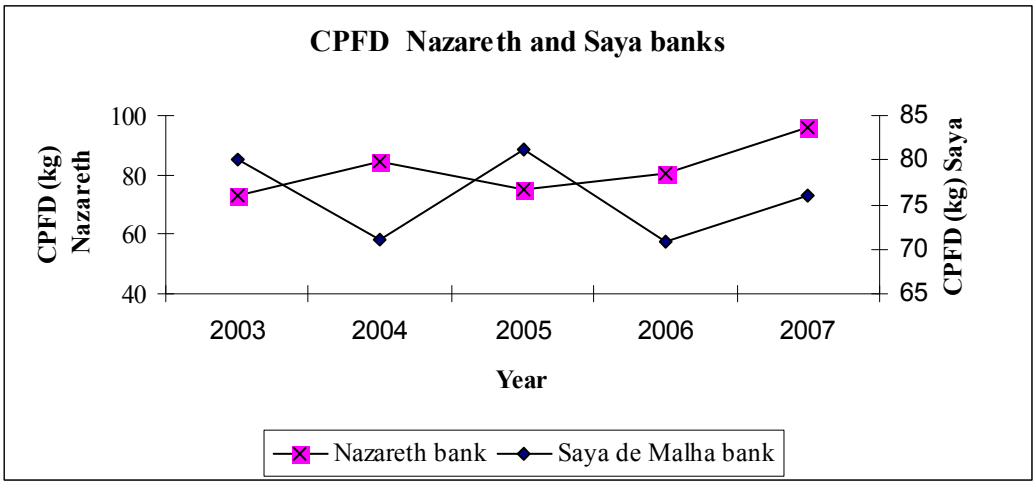


Figure 1.4: CPFD for the Nazareth and the Saya de Malha banks

In 2007 the catch rates on the Saya de Malha and the Nazareth banks were above the mean of the previous five years.

1.2.3 Length frequency distribution of *Lethrinus mahsena*

Length frequency data on samples of the major fish species, i.e *Lethrinus mahsena,* were collected during unloading of fishing vessels. The number of fishes sampled from Nazareth and Saya de Malha banks were 1 511 and 2 634 and the lengths ranged from 230 to 580 mm and 230 to 520 mm respectively. The length frequency distributions are shown in figures 1.5 and 1.6.

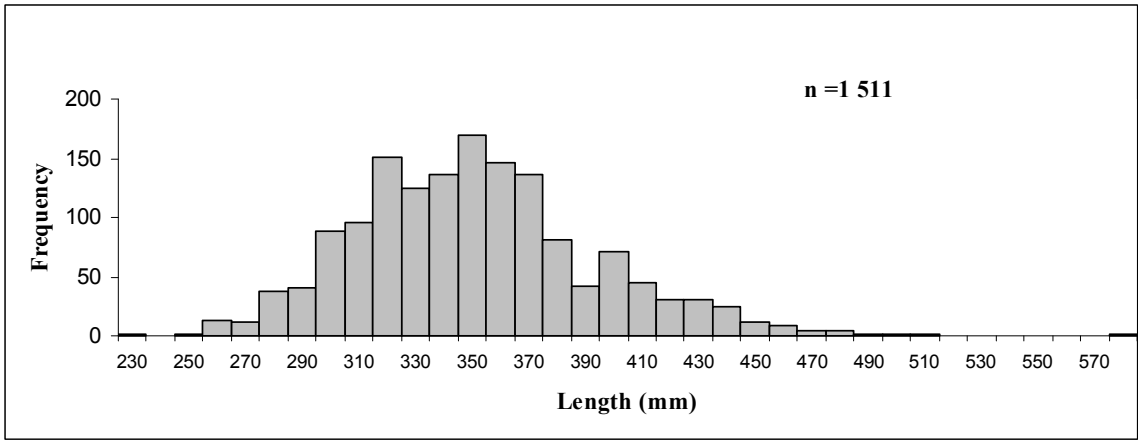


Figure 1.5: Length frequency of *Lethrinus mahsena* from the Nazareth bank

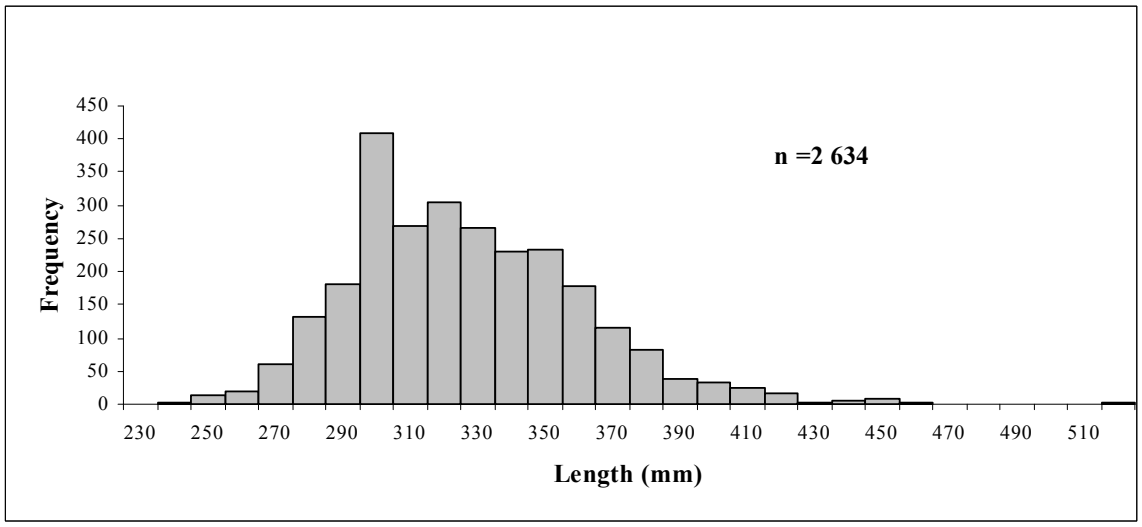


Figure 1.6: Length frequency of *Lethrinus mahsena* from the Saya de Malha bank

1.2.4 Fishing in the waters of the Chagos Archipelago

One fishing vessel fished in the waters of Chagos Archipelago. Details on the catch and effort during the past five years are given in table 1.11.

Table 1.11: Particulars on fishing activities in the waters of Chagos Archipelago

Year	No. of trips	No. of vessels	Fishing days	Bad weather days	Catch (t)	Fisherman -days	CPFD (kg)
2003	2	2	77	40	235	4 068	57.7
2004	2	2	34	26	117	1 761	66.4
2005	nil	nil	nil	nil	nil	nil	nil
2006	1	1	34	10	136	1 802	75.5
2007	1	1	44	6	130	2 376	54.5

1.3 St. Brandon fishery

The catch from the St. Brandon fishery comprised frozen fish, chilled fish, salted fish and octopus. Four vessels, namely La Derive, l'Espoir, Dai Fah 1 and Coryphaena were active in that fishery. The different products landed are presented in table 1.12.

Table 1.12: St. Brandon inshore fishery production (kg)

Vessel	Trips	Frozen fish	Chilled fish	Salted fish	Octopus	Lobster	Total
L'Espoir	1	98 413	-	-	3 593	-	102 006
La Derive	9	-	18 137	16 354	-	-	34 491
Dai Fah 1	1	-	328	-	-	-	328
Coryphaena	3	-	3 400	-	-	-	3 400
Total	**14**	**98 413**	**21 865**	**16 354**	**3 593**	**0**	**140 225**

1.3.1 Sampling of fish from St. Brandon

Sampling of the two main fish species, *Lethrinus mahsena* and *Lethrinus nebulosus* was carried out at the fishing port during unloading of fishing vessels. Length-weight data of 330 units of *L. mahsena* and 241 units of *L. nebulosus* were collected. The lengths varied from 240 to 540mm and from 260 to 450mm respectively while the weight ranged from 290g to 2 950g and from 300g to 1 270g respectively. Table 1.13 shows the length and weight ranges of the fish sampled from the St. Brandon area.

Table 1.13: Length and weight ranges of fish from St. Brandon

Species	No. of fish	Length range (mm)	Weight range (g)
Lethrinus mahsena	330	240 - 540	290 - 2 950
Lethrinus nebulosus	241	260 - 450	300 - 1 270

1.4 The semi-industrial chilled fish fishery

Seventeen semi-industrial vessels operated on the Soudan banks, Albatross, Nazareth and Saya de Malha undertaking 112 trips with an average duration of 12 days each. A total of 171.4 tonnes of chilled fish and 150.5 tonnes of frozen fish were landed. Table 1.14

shows the particulars of the vessels; the species composition of the catch by banks is given in table 1.15.

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 f/men	Joined in
La Derive*	17.0	58.4	9.0	12	nil	1995
King Fish 1	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
King Fish IV (renamed Mahi Mahi as from 2007)	15.0	24.0	6.0	2	4	2002
Roshan	14.0	14.0	7.0	1	5	2002
Dai Fah 1	17.0	14.0	14.0	2	4	2002
Quo Vadis 1	12.0	26.9	4.0	2	4	2003
Sea Quest**	20.0	59.0	20.0	8	7	2004
King Fish VI (renamed Vivano as from 2007)	13.1	11.0	3.5	2	3	2005
l'Espoir**	50.1	299.4	155.6	33	54	2005
Sainte Rita**	34.0	222.0	100.0	7	9	2006
Sea Treasure**	19.9	75.0	35.0	4	14	2007
Albacore**	16.3	14.8	30.0	4	8	2007
Etelis**	33.6	394.0	100.0	8	5	2007

***Carrier boats; **Boats involved in production of frozen and chilled fish**

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

Fishing area	Catch frozen	Catch chilled			Total chilled
		Lethrinids	Snapper/grouper	Tuna and others	
Nazareth	127 772	21 933	75 605	360	97 898
Albatross	7 455	51 813	4 433	172	56 418
Saya de Malha	15 300	3 134	13 526	0	16 660
Soudan	0	315	75	0	390
Total	**150 527**	**77 195**	**93 639**	**532**	**171 366**

The catch, fishing days, effort (fisherman-days) and catch per fisherman-day (CPFD) in the different fishing areas are presented in table 1.16.

Table 1.16: Catch, effort and CPFD in the fishery

Fishing area	Catch (kg)	Fishing days	Fisherman-days	CPFD (kg)
Nazareth	97 898	283	2 226	44.0
Albatross	56 418	233	1 231	45.8
Saya de Malha	16 660	66	470	35.4
Soudan	390	4	19	20.5
Total	**171 366**	**586**	**3 946**	**43.4**

Figure 1.7 shows the trend in catch of the chilled fish fishery over the past five years.

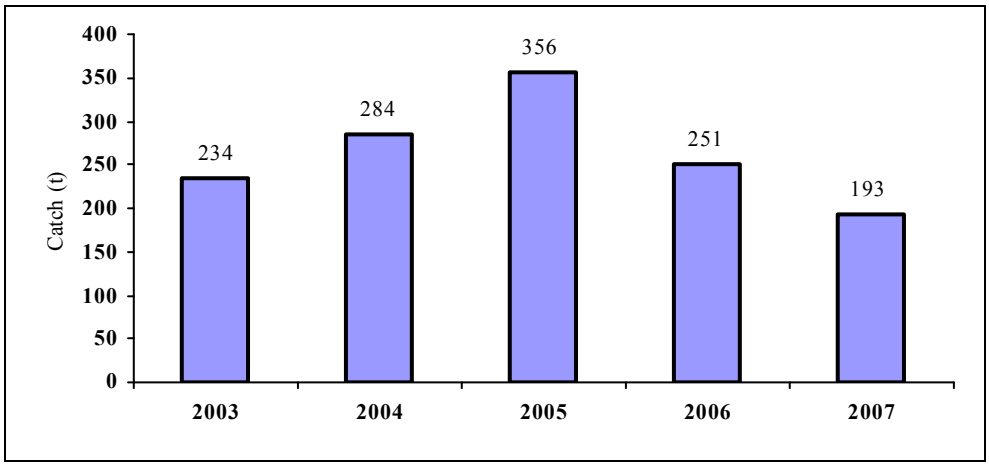


Figure 1.7: Trend in catches from the semi-industrial chilled fish fishery

Sampling of chilled fish was carried out upon arrival of chilled fish vessels and details of the number of fish sampled by species and by bank are presented in table 1.17.

Table 1.17: Details of fish sampled from the different banks

Bank	Species	n	Length range (mm)	Weight range (g)
Albatross	*Lethrinus mahsena*	1 966	240 - 650	250 - 3 500
	Lethrinus nebulosus	39	310 -600	400 - 3 150
	Polysteganus baissaci	23	300 - 420	580 - 1 470
Nazareth	*Lethrinus mahsena*	583	260 - 570	300 - 2 690
	Polysteganus baissaci	1 621	260 - 850	350 - 6 700
	Epinephelus morrhua	187	430 - 820	1 200 - 10 800
	Etelis carbunculus	95	580 - 950	3 400 - 8 000
	Etelis coruscans	74	510 - 980	1 500 - 8 600
	Pristipomoides filamentosus	75	400 - 930	800 - 7 600
Total		**4 663**		

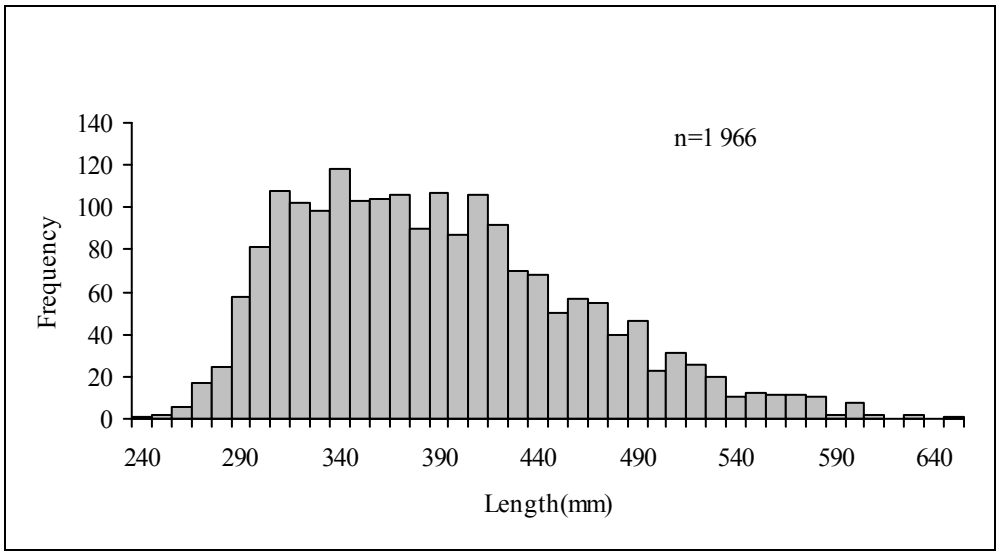


Figure 1.8: Length frequency of *Lethrinus mahsena* from Albatross bank

The total number of fish sampled was 1 966. Most of the *Lethrinus mahsena* sampled had the length range between 310 and 410mm. The highest frequency was observed at 340mm.

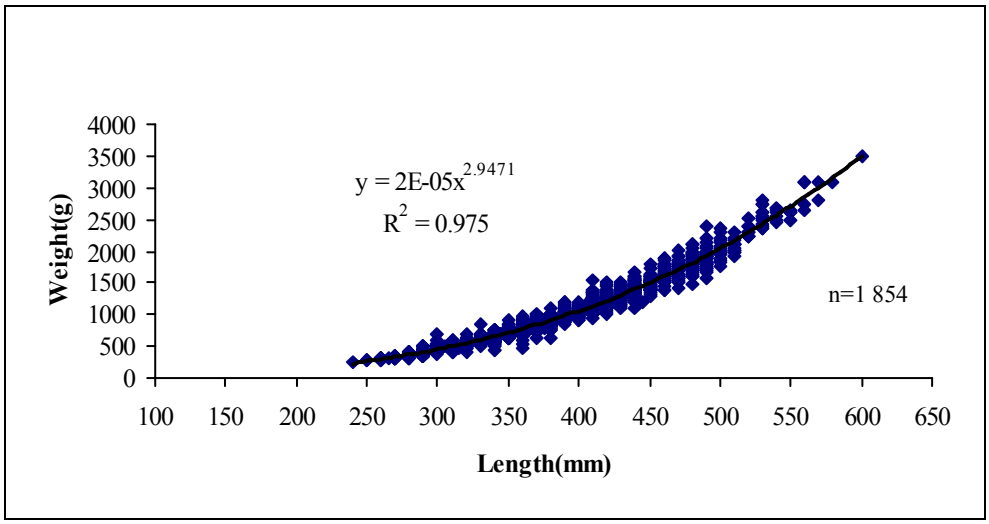


Figure 1.9 Length-weight relationship of *Lethrinus mahsena* from Albatross bank

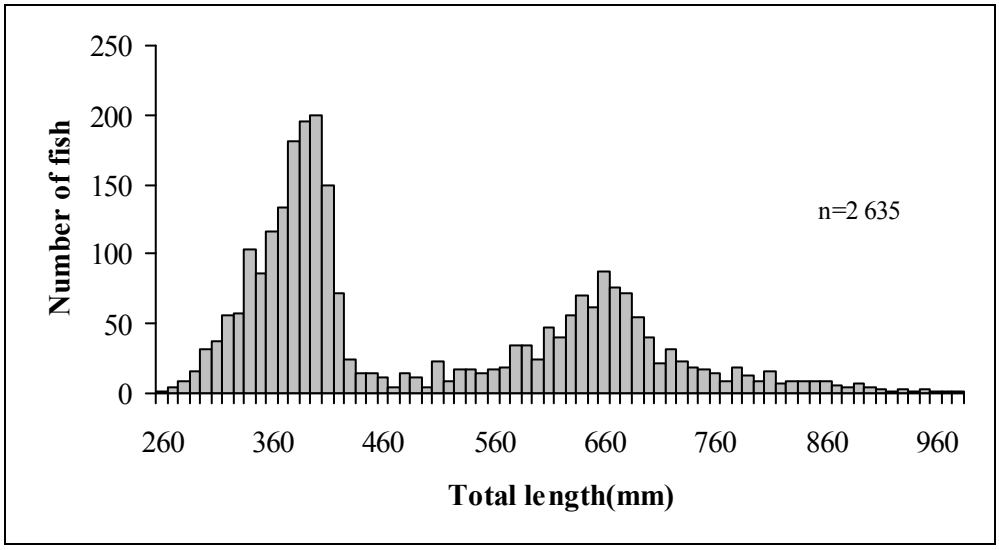


Fig. 1.10: Length frequency of *Polysteganus baissaci* from Nazareth bank

The length frequency distribution of *Polysteganus baissaci* showed two prominent peaks at length range 310-410mm and another one at length range 610-700mm. The highest frequency was observed at 390 mm and 610mm. The existence of the two peaks would be explained upon availability of more data.

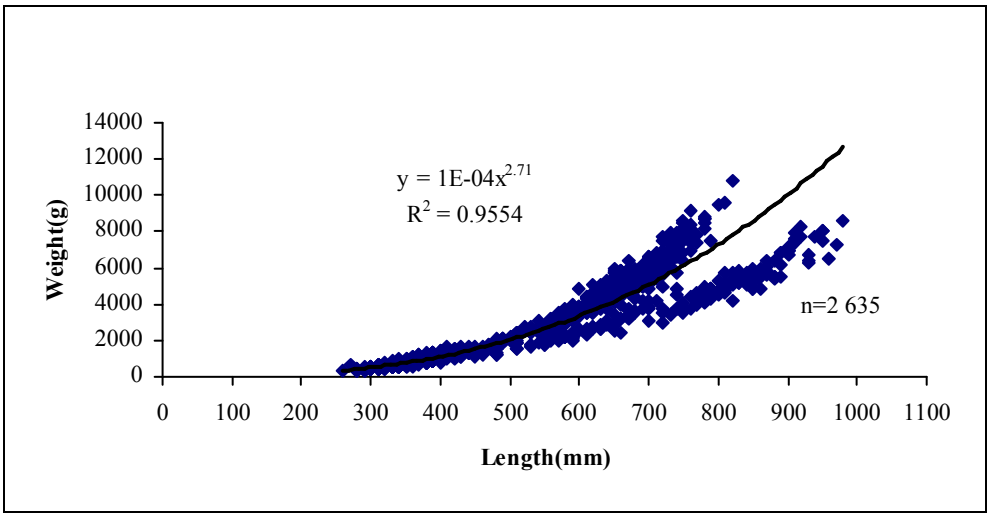


Figure 1.11: Length – weight relationship of *Polysteganus baissaci* from Nazareth bank

1.5 Ecotoxicology

1.5.1 Mongoose bioassay

One fish specimen, identified as bourgeois, *Lutjanus sebae*, was tested through the mongoose bioassay for the presence of ciguatoxin. The fish sample was found to be slightly toxic. The particulars are given in table 1.18.

Table 1.18: Particulars of toxic fish specimens

Common name	Scientific name	Weight (g)	Origin	Results
Bourgeois	*Lutjanus sebae*	6 400	Bank	Slightly toxic

1.5.2 Mouse bioassay

Five fish samples were tested for the presence of ciguatoxin using the mouse bioassay. Five sets of three mice, each mouse weighing between 20 and 22g were used. One sample, *Lutjanus bohar*, commonly known as vara vara, was found to be highly toxic, three samples showed slight toxicity and one was non toxic. Details are shown in table 1.19.

Table 1.19: Results of tests by mouse bioassay

Genus/Species	Mouse bioassay	
	Test 1	Test 2
Lutjanus bohar	Highly toxic	Highly toxic
Plectropomus spp	Slightly toxic	Slightly toxic
Plectropomus spp	Slightly toxic	Slightly toxic
Lutjanus sebae	Slightly toxic	Slightly toxic
Carangoides fulvoguttatus	Non toxic	Non toxic

1.5.3 Harmful marine microalgae

The study of potentially harmful marine microalgae, mainly dinoflagellates which are involved in the production of cigua-toxins in fish, was continued at the four established sites; Albion, Blue Bay, Le Morne and Trou aux Biches. The sites were sampled for the presence and density of harmful marine microalgae.

Species of *Gambierdiscus toxicus* was observed only at Albion and Le Morne. *Prorocentrum lima* and *Ostreopsis* were the main dinoflagellates recorded in higher numbers. Species of *Amphidinium* and *Synophysis* were not observed during the year. Diatoms were present at all the sites in larger numbers than previously observed. The total number of dinoflagellates recorded from the four sampling sites is shown in table 1.20.

Table 1.20: Total number of dinoflagellates recorded (cell count)

Species	Blue Bay	Trou aux Biches	Albion	Le Morne
***Gambierdiscus* sp.**	nil	nil	1	1
***Ostreopsis* sp.**	32	12	70	14
Prorocentrum lima	53	5	13	19
Prorocentrum concavum	3	4	8	4
***Prorocentrum* sp.**	10	7	5	6
***Amphidinium* sp.**	nil	nil	nil	nil
***Synophysis* sp.**	nil	nil	nil	nil
***Coolia* sp.**	nil	4	nil	3

1.6 Identification of fish specimens

Twenty five different fish species were identified from fish specimens brought to AFRC by officers of the Fisheries Protection Service, National Coast Guard and Ministry of Health and Quality of Life and reports submitted.

1.7 Sea cucumber fishery

1.7.1 Survey on sea cucumbers

In January, a survey was carried out at fourteen sites in the lagoon of Mauritius to gather information on the status of the stock of sea cucumbers. The species observed were *Holothuria atra* (lollyfish), *Actinopyga echinites* (brownfish), *Actinopyga mauritiana* (surf red fish), *Bohadschia marmorata* (brown sandfish), *Bohadschia subrubra*, *Stichopus chloronatus* (green fish), S*tichopus ariegates* (curry fish), *Holothuria scabra* (sandfish) and *Holothuria nobilis* (black teatfish). The lollyfish was dominant, representing 60% of the total number of sea cucumber recorded. The average density of sea cucumbers in the lagoon was estimated at 37 000 individuals/km^2.

In July, another survey was conducted at sixteen sites in the lagoon of Rodrigues and the species observed were *Holothuria atra, Holothuria leucospilota, Stichopus chloronotus, Bohadschia marmorata, Holothuria scabra, Holothuria pervicax,* S*tichopus ariegates* and *Actinopyga echinites*. The average density in the surveyed area was calculated at 85 400 individuals/km^2.

17.2 Management measures

Based on the stock size, the Total Allowable Catch (TAC) for Mauritius and Rodrigues were set at 550 tonnes and 450 tonnes respectively. Five operators in Mauritius were authorised to collect, process and export sea cucumbers for a period of nine months. A total of 620 tonnes was collected and 50 tonnes of processed sea cucumbers were exported.

For the rational exploitation of the sea cucumber resources, additional management measures introduced include the prohibition of collection in certain areas, size limits and a close season.

1.8 South West Indian Ocean Fisheries Project (SWIOFP)

The SWIOFP is a regional and multinational project with nine participating countries; namely Comoros, France(Reunion), Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa and Tanzania. The SWIOFP was set up to enable the participating countries to collectively assess and sustainably use the region's common key fisheries resources according to an ecosystem approach. The project to be funded by the World Bank/GEF, Norway and France

has a five-year scientific phase and costs around US$ 25 million. Member countries would contribute in kind.

A series of workshops and meetings were held from 2003 to 2007 for the preparation of the project. SWIOFP implementation would take place in 3 stages. An initial 12 -18 months focused on collection and analysis of relevant existing data and setting up of a regional database. The second phase of 18 – 30 months would involve intensive onboard sampling to collect data identified in the gap analysis. While the third period of 18 – 24 months would focus on data analysis and preparation of a strategic action plan.

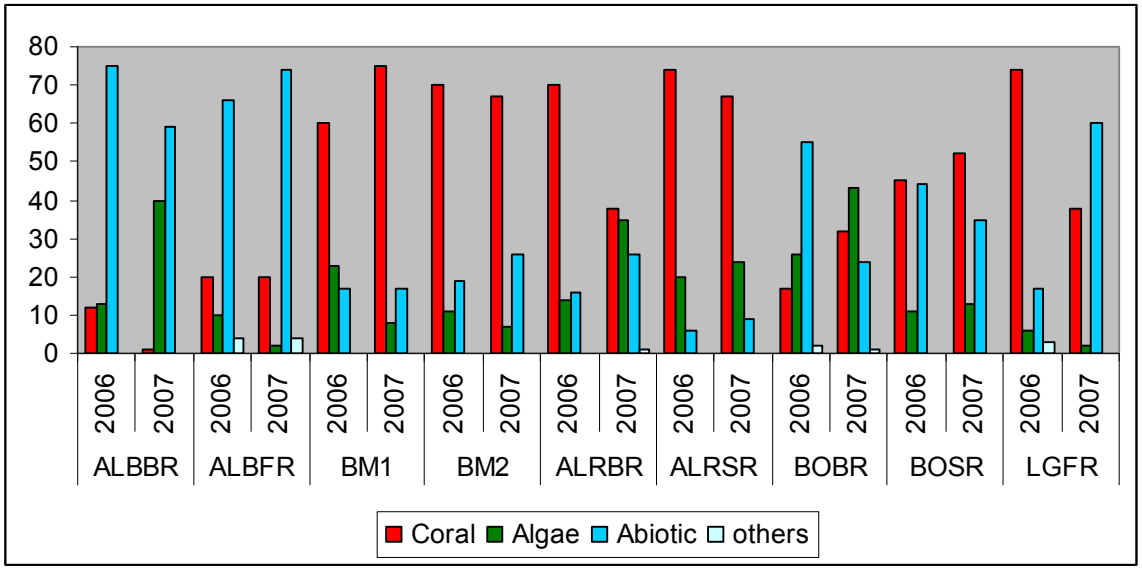
Mauritius will participate in six components namely,(i) data atlas and information technology, (ii) assessment and sustainable use of demersal fishes, (iii) assessment and sustainable use of pelagic fishes, (iv) monitoring of fishing effort and catch, existing values and exploitation conflicts, (v) fisheries impact on non consumptive resources and (vi) strengthening regional and national fisheries management. Mauritius has also been entrusted with the responsibility to co-ordinate activities of the component "fisheries impact on non consumptive resources".

2. MARINE SCIENCE

2.1 Coastal ecosystem research

2.1.1 Long-term monitoring of coral reef ecosystem

The long-term monitoring of coral reefs was continued at the following established sites: Albion, Le Goulet, Anse la Raie, Bel Ombre, Belle Mare, Trou d'Eau Douce, Ile aux Benitiers, Trou aux Biches, Bambous Virieux and Baie du Tombeau. Data on substrate cover were collected using the Line Intercept Transect (LIT) method. Data on coral cover were recorded up to the species level. The data were processed by the CO.RE.MO software and the average percentage cover of substrate is shown in figure 2.1 and table 2.1. The abundance of fish, sea urchins and sea cucumbers is given in table 2.2.



ALBBR – Albion back reef, ALBFR – Albion fore reef, BM1- Belle Mare site 1, BM2 – Belle Mare site2, ALRBR – Anse la Raie back reef, ALRSR – Anse la Raie shore reef, BOBR – Bel Ombre back reef, BOSR – Bel Ombre shore reef, LGFR- Le Goulet fore reef

Figure 2.1: Percentage of substrate cover at monitoring stations

Table 2.1: Average percentage cover of substrate at monitoring stations

Site	Stations	Year	Coral	Algae	Abiotic	Others
Le Goulet	fore reef	2005	74	2	21	3
		2006	74	5	16	3
		2007	38	2	60	*
Baie du Tombeau	back reef	2005	64	2	34	*
		2006	ND	ND	ND	ND
		2007	38	15	47	*
Bel Ombre	back reef	2005	24	42	34	*
		2006	17	24	55	2
		2007	32	43	24	1
	shore reef	2005	48	4	48	*
		2006	45	9	42	*
		2007	52	13	35	*
Anse la Raie	back reef	2005	37	27	36	*
		2006	70	14	15	*
		2007	38	35	26	1
	shore reef	2005	75	5	20	*
		2006	74	20	6	*
		2007	67	24	9	*
Albion	fore reef	2005	27	2	68	3
		2006	20	10	66	4
		2007	20	2	74	4
	back reef	2005	19	22	59	*
		2006	12	13	75	*
		2007	1	40	59	*
Belle Mare (Site I)	back reef	2005	50	36	14	*
		2006	60	23	17	*
		2007	75	8	17	*
Belle Mare (Site II)	back reef	2005	64	4	32	*
		2006	70	11	19	*
		2007	67	7	26	*
Bambous Virieux	back reef	2005	48	14	37	*
		2006	ND	ND	ND	ND
		2007	52	19	29	*
	shore reef	2005	35	49	16	*
		2006	ND	ND	ND	ND
		2007	28	64	8	*
Ile aux Bénitiers	fore reef	2005	26	1	71	2
		2006	ND	ND	ND	ND
		2007	20	12	66	2
	back reef	2005	7	2	92	*
		2006	ND	ND	ND	ND
		2007	6	2	92	*
	Shore reef	2005	15	0	85	*
		2006	ND	ND	ND	ND
		2007	0.5	*	99.5	*
Trou aux Biches	fore reef	2005	28	6	64	2
		2006	ND	ND	ND	ND
		2007	24	19	57	*
	back reef	2005	40	2	58	*
		2006	ND	ND	ND	ND
		2007	45	4	51	*

Others: sponges, crown of thorns, soft corals, giant clams, ND – Not Done, * - Not Observed

During monitoring at Le Goulet in the fore reef of Baie du Tombeau, it was observed that the three permanent transects were covered by rubble due to the cyclone "Gamede". A new permanent station was thus established at the same location and hence the differences in the percentage of coral cover.

At some of the monitoring stations, there was a slight decrease in coral cover and an increase in the abiotic component which may be due to siltation, excessive growth of algae and effect of previous coral bleaching. At other stations, there was a slight increase in coral cover due to absence of bleaching and recruitment of new corals. No coral bleaching was observed at any site during the surveys.

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

SITE	Type of reef	Year	Pomacentridae & Chaetodontidae	Acanthuridae	Labridae	Scaridae	Sea cucumber	Sea urchins
Le Goulet	fore reef	2006	XXXX	X	X	X	X	X
		2007	XXXX	XX	X	X	*	X
Baie du Tombeau	back reef	2007	XXXX	*	*	X	*	*
Bel Ombre	back reef	2006	XXXX	X	XX	XX	*	*
		2007	XXXX	XX	XX	X	X	XX
	shore reef	2006	XX	X	X	X	*	*
		2007	XXXX	XX	X	X	X	X
Anse la Raie	back reef	2006	XXXX	X	X	X	*	*
		2007	XXXX	XX	XX	XX	*	*
	shore reef	2006	XXXX	*	*	*	*	*
		2007	XXXX	XX	X	X	*	*
Trou aux Biches	fore reef	2007	*	*	*	X	*	X
	back reef	2007	XXXX	XXX	X	XX	*	X
Albion	fore reef	2006	XX	XXX	XX	XX	*	XXXX
		2007	X	XX	XX	XX	*	XXXX
	back reef	2006	XXX	*	XX	XX	*	XX
		2007	XXX	*	*	*	XX	XXX
Belle Mare (Site I)	back reef	2006	XXXX	XXX	X	X	*	*
		2007	XXXX	XX	X	*	*	*
Belle Mare (Site II)	back reef	2006	XXXX	XX	X	X	*	XX
		2007	XXXX	XX	*	XX	*	XX
Trou d'Eau Douce	back reef	2007	XXXX	XX	X	*	*	*
	shore reef	2007	XX	*	*	X	*	*
Ile aux Benitiers	back reef	2007	XXXX	XXX	X	X	*	*
	shore reef	2007	X	XX	X	XX	X	XX
	fore reef	2007	X	XXX	XX	*	*	XXX
Bambous Virieux	back reef	2007	XXXX	*	X	X	X	XX
	shore reef	2007	XXXX	XXX	X	XX	*	*

***– Not observed, X – 0-10, XX- 10-50, XXX – 50-100, XXXX - >100**

At most of the monitoring stations, the pomacentridae (damsel fish) and acanthuridae (surgeon fish) were dominant. The species of damsel fish recorded were *Stegastes lividus, Stegastes limbatus, Dascyllus aruanus, Chrysiptera unimaculata* and *Chromis viridis*. The surgeon fish was represented by *Ctenochaetus striatus and Acanthurus xanthopterus.* The chaetodontidae (butterfly fish) and labridae (wrasses) were represented by *Halichoeres hortulanus, Thalassoma hardwicke*, *Thalassoma genivittatum* and *Coris caudimacula.* The balistidae (trigger fish) was the least represented and predators such as fish from the serranidae and lethrinidae were absent.

2.1.2 Other ecological surveys

2.1.2.1 Underwater survey of boat passage at the Fisheries Training and Extension Centre (FiTEC)

After the passage of cyclone "Gamede", an underwater survey of the boat passage was carried out. Observations showed that the passage was filled with sand and rubble.

2.1.2.2 Survey on sea cucumbers

Surveys on sea cucumbers were carried out in the lagoons of Mauritius and Rodrigues to gather information on the status of the stock for management purposes (*re. para 1.7*).

2.1.3 Deployment of a temperature data logger

A temperature data logger was deployed in the back reef of Albion lagoon. During the year, the sea-surface temperature ranged between 21^{o}C and 29^{o}C.

2.1.4 Action plan for stranded marine mammals/turtles

An Action Plan for stranded marine mammals/turtles was prepared after consultations with other Ministries and NGOs. The responsibilities of the various organisations in the implementation process have been defined and a Standing Protocol has been worked out.

2.2 Coastal water quality

2.2.1 Monitoring of chemical parameters

Water quality was monitored in the lagoon at 76 established stations of the nineteen sites around the island. Over 300 samples were analysed in duplicates for chemical oxygen demand (COD), nitrate-nitrogen (NO_3^--N) and phosphate (PO_4^{3-}). The range of values for results of the analyses over the last three years is shown in table 2.3. Temperature, sea state, weather conditions, conductivity and pH were also recorded.

Data in relation to certain sites were submitted to the Ministry of Environment and National Development Unit as part of the contribution to the Western Indian Ocean Land-based Project (WIOLaB).

Table 2.3: Range of values for results of water analyses (2005-2007)

Site	Year	Nitrate-Nitrogen (mg/l)	Phosphate (mg/l)	Chemical Oxygen Demand (mg/l)
Ile aux Benitiers	2005	<0.1	0.01 - 0.04	0.1 - 0.5
	2006	<0.1	<0.01 - 0.02	<0.1 - 0.4
	2007	<0.1	0.01 - 0.03	<0.1 - 1.4
Bel Ombre	2005	<0.1	<0.01 - 0.07	0.1 - 0.9
	2006	<0.1	<0.01 - 0.02	<0.1 - 0.3
	2007	<0.1	<0.01 - 0.06	0.2 - 0.7
Bambous Virieux	2005	<0.1	0.01 - 0.03	0.1 - 1.0
	2006	<0.1	0.01 - 0.04	0.2 - 0.8
	2007	<0.1	<0.01 - 0.01	0.1 - 1.0
Trou d'Eau Douce	2005	<0.1	<0.01 - 0.02	0.2 - 0.9
	2006	<0.1	0.01 - 0.02	0.2 - 1.0
	2007	<0.1	0.01 - 0.02	0.3 - 0.6
Anse la Raie	2005	<0.1	0.01 - 0.03	0.2 - 0.3
	2006	<0.1	0.02 - 0.04	0.2 - 0.5
	2007	<0.1	0.01 - 0.04	0.4 - 0.8
Trou aux Biches	2005	<0.1	<0.01 - 0.05	<0.1 - 0.5
	2006	<0.1	0.01 - 0.08	0.1 - 0.4
	2007	<0.1	<0.01 - 0.04	0.1 - 1.2
Pointe aux Sables	2005	<0.1	0.01 - 0.06	0.1 - 0.8
	2006	<0.1	0.01 - 0.06	0 .2 - 0.6
	2007	<0.1	0.01 - 0.06	0.1 - 0.5
Bain des Dames	2005	<0.1	0.01 - 0.08	<0.1 - 1.3
	2006	<0.1	0.01 - 0.08	<0.1 - 0.6
	2007	<0.1	0.01 - 0.05	0.3 - 1.0
	2005	<0.1	<0.01 - 0.07	<0.1 - 0.6
	2006	<0.1	<0.01 - 0.08	0.1 - 0.7
	2007	<0.1	<0.01 - 0.05	0.1 - 2.7
	2005	<0.1	0.01 - 0.22	0.1 - 1.2
	2006	<0.1	0.01 - 0.05	0.2 - 1.1
	2007	<0.1	<0.01 - 0.08	<0.1 - 1.5
	2005	<0.1	0.01 - 0.08	0.1 - 0.5
	2006	<0.1	0.01 - 0.09	0.1- 0.7
	2007	<0.1	0.03 - 0.09	<0.1 - 1.3
	2005	<0.1	0.01 - 0.08	<0.1 - 1.7
	2006	<0.1	0.01 - 0.07	0. 1 - 1.8
	2007	<0.1	<0.01 - 0.12	<0.1 - 2.2
	2005	<0.1	0.01 - 0.05	0.1 - 0.7
	2006	<0.1	0.01 - 0.04	0.1 - 0.9
	2007	<0.1	0.01 - 0.06	0.4 - 1.2
Blue Bay	2005	<0.1	0.01 - 0.07	<0.1 - 0.6
	2006	<0.1	<0.01 - 0.22	<0.1 - 0.5
	2007	<0.1 - 0.3	0.01 - 0.18	<0.1 - 0.9
Belle Mare	2005	<0.1	0.01 - 0.06	0.1 - 0.8
	2006	<0.1	0.01 - 0.04	0.2 - 1.2
	2007	<0.1	<0.01 - 0.01	0.2 - 1.3
Albion	2006	<0.1	0.01 - 0.02	0.1 - 0.2
	2007	<0.1	<0.01 - 0.05	<0.1 - 0.1
Flic en Flac	2006	<0.1	0.02 - 0.05	0.1 - 0.4
	2007	<0.1	<0.01 - 0.02	<0.1 - 0.1
Palmar	2006	<0.1	0.01 - 0.03	0.1 - 0.4
	2007	<0.1	0.01 - 0.08	0.9 - 2.6

Bird Sanctuary	2006	<0.1	0.01 - 0.15	0.9 - 2.5
	2007	<0.1	0.03 - 0.12	0.8 - 3.8

Note: Detection limit for phosphate – 0.01 mg/l
Detection limit for nitrate-nitrogen – 0.1 mg/l

The levels of nitrate were <0.1 mg/l while those of phosphate ranged between <0.01 to 0.09 mg/l and COD between <0.1 to 3.8 mg/l. The results of the water quality analyses were within the *Guidelines for Coastal Water Quality Requirements for various categories Govt. Notice No. 620 of 1999 (CWQG)* except at one station at Blue Bay, two stations at Terre Rouge Bird Sanctuary and one station at Poudre d'Or where the phosphate level recorded was greater than 0.1 mg/l due to the influx of fresh water.

2.2.2 Analysis for trace metals

Water samples from the high seas in the North-West of the island were analysed in the context of export of fish and fishery products to the European Union. No detectable levels of cadmium, lead and mercury were recorded.

2.2.3 Water analysis and fish mortality at other sites

Samples of seawater and of freshwater were collected for analysis in relation to cases of alleged pollution and fish mortality. Details are given in table 2.4. Results showed that nutrient levels were within the norms.

Table 2.4: Sites of alleged pollution and fish mortality

Date	Site
04 January	Macondé
17 January	Bain Boeufs and Péreybère
09 April	La Prairie
06 May	River Moka
09 May	Grand Gaube (Melville)
21 June	Poste de Flacq
20 December	Riambel

2.2.4 Independent Environmental Audit on wastewater projects

The monitoring of seawater quality at the three major outfalls namely; Pointe Moyenne, Montagne Jacquot and Baie du Tombeau were continued. Results of analyses of water samples were within the norms set under the *Regulation for Effluent Discharge into the Ocean as per GN No 45 of 2003 of the Environment Protection Act 2002* as shown in table 2.5.

Table 2.5: Water quality at the three major outfalls (2006 – 2007)

Site	Year	Nitrate-Nitrogen (mg/l)	Phosphate (mg/l)	Chemical Oxygen Demand (mg/l)
Pointe Moyenne	2006	<0.1	0.01 - 0.05	0.2 - 1.1
	2007	<0.1	<0.01 - 0.09	0.1 - 1.0
Mte Jacquot	2006	<0.1	0.01 - 0.05	0.1 - 1.2
	2007	<0.1	<0.01 - 0.04	0.1 - 1.3
Baie du Tombeau	2006	<0.1	0.01 - 0.08	0.1 - 0.7
	2007	<0.1	<0.01 - 0.05	0.2 - 2.1
CWQG limit (Industrial)		**1.0**	**0.10**	**5.0**
Standards for Effluent Discharge into the Ocean		**-**	**-**	**750.0**

A report on the Independent Environment Audit on Wastewater Projects from November 2006 to October 2007 was prepared in collaboration with the Ministry of Environment & National Development Unit, Ministry of Public Utilities and Ministry of Health and Quality of Life. The report would be presented at the European Union donors meeting in January 2008 for the assessment of environmental and health impacts of waste water projects in Mauritius.

The Montagne Jacquot wastewater treatment plant became operational in January 2007. It consists of a sewage pumping station and a long ocean outfall for the discharge of treated wastewater. Its treatment capacity is 48 000m^3 daily and treats wastewater up to the primary level. The treatment plant removes significant quantities of pollutants from the raw wastewater before its discharge into the sea through the ocean outfall. With the coming into operation of the Montagne Jaquot treatment plant, the outfalls at Pointe aux Sables and Bain des Dames have been closed.

2.2.5 Monitoring of mercury level

The level of mercury in estuaries was monitored at eight sites namely, Rivière Lataniers, Grand River North West, Tamarin, Baie du Cap, l'Escalier, Mahebourg, Grand River South East and Pte Roches Noires. Results of analyses indicated that levels of mercury in the water samples were below the detection limit. Data were submitted twice yearly to the technical committee set up by the Ministry of Environment and National Development Unit for the UNEP Global Mercury Assessment Programme.

2.3 Monitoring of coliform bacteria at public beaches

Monitoring of the levels of total coliform (TC) and faecal coliform (FC) in seawater at selected public beaches was continued at the 10 sites namely, Flic en Flac, Albion, Pointe aux Sables, Trou aux Biches, Mon Choisy, Le Goulet, Grand Baie/La Cuvette, Blue Bay, Péreybere and Belle Mare. The Blue Bay and Balaclava Marine Parks were also sampled once 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). Table 2.6 shows level of TC and FC at the various sites for the last three years.

Table 2.6: Results of coliform analysis at the monitoring sites

Beach	Station No.	Average colony count per 100ml					
		2005		2006		2007	
		TC	FC	TC	FC	TC	FC
Flic en Flac	1	35	13	42	13	23	9
	2	28	10	70	16	36	8
	3	36	13	27	6	20	3
	4	24	11	126	38	42	14
	5	39	12	119	46	62	14
Trou aux Biches	1	45	12	20	6	33	10
	2	17	4	19	7	30	11
Mon Choisy	1	36	10	21	6	35	11
	2	46	15	38	11	27	7
	3	58	13	24	10	24	6
	4	90	19	27	8	32	8
Blue Bay	1	20	7	148	39	14	3
	2	19	5	129	31	20	6
	3*	22	7	56	18	34	8
Albion	1	36	10	163	41	29	9
	2	-	-	558	136	83	24
Pointe aux Sables	1	951	182	61	11	763	148
	2	519	105	21	7	740	146
	3	79	13	30	8	25	7
	4	275	90	26	7	384	80
Grand Baie	1	46	12	49	22	21	5
	2	60	15	54	16	32	10
	3	66	16	34	11	14	4
	4	152	75	385	92	138	37
	5	228	86	499	90	298	67
Le Goulet	1	44	9	80	36	21	7
Belle Mare* ***(as from June 2005)***	1	19	4	66	9	34	8
	2	18	5	56	12	26	7
	3	25	8	92	29	21	6
	4	10	3	25	10	24	6
	5	11	4	67	13	16	4
Peréybere* ***(as from April 2005)***	1	70	25	61	11	27	8
	2	109	37	21	7	43	15
	3	343	134	30	8	126	29
	4	150	49	26	7	164	34
Blue Bay Marine Park	1	0	0	ND	ND	ND	ND
	2	3	0	ND	ND	ND	ND
	4	14	3	32	8	ND	ND
Balaclava Marine Park	2	ND	ND	ND	ND	ND	ND
	3	ND	ND	ND	ND	ND	ND
	4	ND	ND	10	2	ND	ND
	6	ND	ND	ND	ND	ND	ND
Coastal Water Quality Guideline limits (CWQG)	**TC:** 1000 CFU/100ml **FC:** 200 CFU/100ml						

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

Data collected on total and faecal coliforms were provided to the Ministry of Environment and National Development Unit and the Beach Authority for purposes of coastal development projects, public health aspects and issues related to water quality.

2.4 Environment Information System (EIS)

The National Environment Action Plan 2 (NEAP2) has made provision for the setting up of an EIS for the management of information on the environment. It consists of developing a core set of indicators and a computer-based EIS for strategic management of the environment. In order to implement the EIS, the Ministry of Environment & NDU has developed a Memorandum of Understanding (MoU) to be endorsed by the relevant stakeholders for the provision of environmental indicators. The Fisheries Division would provide data on the marine fish biodiversity in the two marine parks, status of corals and mangroves, state of fish stocks and coastal water quality.

2.5 Accreditation of Laboratories

Under the component "Assistance and support to the quality control of laboratories in Mauritius" of the "Strengthening Fishery Production Programme" of the EU, a consultant carried out an audit of the laboratories at the centre. Based on his recommendations, a proposed action plan was prepared for the accreditation of the fish toxicity, marine chemistry and marine bacteriology laboratories. Laboratory personnel were given basic training for accreditation of laboratories against ISO 17025 standard.

3. AQUACULTURE

Seed production of berri rouge, *Oreochromis sp.* of the Malaysian variety and the giant freshwater prawn, *Macrobrachium rosenbergii* was continued. Fingerlings of berri rouge and juveniles of giant freshwater prawn were distributed to fish farmers. Breeding and culture of fresh water ornamental fish, namely, the sailfin molly, *Poecilia latipinna*, platy, *Xiphophorus maculatus* and goldfish, *Carassius auratus* were pursued.

3.1 Plankton culture

3.1.1 Phytoplankton

Pure strains of phytoplankton species *Nannochloropsis* sp., *Tetraselmis* sp. and *Chaetoceros calcitrans* were maintained. Mass production of *Nannochloropsis* sp. was undertaken during the seed production of *Macrobrachium rosenbergii*.

3.1.2 Zooplankton

The rotifer, *Brachionus rotundiformis,* was maintained in 30 litres polycarbonate tanks. *Nannochloropsis* sp. was used to feed the rotifer.

3.2 Camaron culture

3.2.1 Broodstock

A broodstock of camaron spawners was obtained from Medine Sugar Estate (SODIA) for the production cycle. The females were conditioned and maintained in the dark at an ambient water temperature of 28°C. The berried females were fed once daily on chopped frozen mussels.

3.2.2 Seed production

The camaron seed production cycle was undertaken from January to April and from November to December when the average water temperature was 27°C and 28°C respectively. Twenty six rearing cycles were carried out and a total of 1 060 000 larvae was obtained. They were stocked

in fibreglass and polycarbonate tanks of 0.5 to $3m^3$ capacity in green water at a salinity of 12 ppt. The camaron larvae were fed twice daily on brine shrimp nauplii, *Artemia* sp., minced and sieved frozen bonito fish and egg cake. The larval stage index was closely monitored. Stage 12 post-larvae were obtained after a culture period ranging between 25 and 50 days. A total of 405 530 camaron juveniles was produced and sold to 41 farmers at Rs 1.25 per unit. Proceeds of sales amounted to Rs 557 137.50

3.3 Berri rouge culture

3.3.1 Broodstock

The broodstock of 150 berri rouge brought from La Ferme Fish Farm in 2006, was maintained in two concrete ponds of $500m^2$ each. The fish were fed on red snapper pellet. Fresh water was supplied to both ponds by pumping water from the adjacent Bel Eau river. Reproduction occurred naturally in the ponds. A total of 10 777 fingerlings was collected out of which 2 737 were distributed freely to 33 small farmers and 8 040 were sold at Rs 1.25 per unit.

3.4 Breeding and seed production of freshwater ornamental fishes

Breeding and seed production of freshwater ornamental fish namely sailfin molly, *Poecilia latipinna*, platy, *Xiphophorus maculatus* and goldfish, *Carassius auratus* were carried out.

A broodstock of five pairs of sailfin molly was maintained. The fish were fed on artificial feed twice daily and the water was exchanged at 30% weekly. The sailfin molly regularly released young ones and a total of 176 baby sailfin mollies was obtained. The baby fish were fed with boiled egg yolk for a period of 15 days and on artificial feed twice daily afterwards.

In all, 178 goldfish breeders were maintained in two polycarbonate tanks provided with artificial duckweeds and hydrilla plants. The fish were fed with chopped mussel meat and artificial pellets, twice daily. Spawning was induced through thermal shock. The artificial duckweeds and hydrilla plants on which the eggs were attached were transferred to another tank for hatching. The fry were fed on boiled egg yolk as from day 3 after hatching and subsequently on artificial feed twice daily. A total of 2 000 young goldfish was produced.

A broodstock of 10 platy was maintained in a polycarbonate tank. The breeders were fed on artificial feed twice daily; water was exchanged at 30% weekly. 200 young fish were obtained and fed on powdered red snapper pellets for 15 days, followed by ground red snapper pellets twice daily.

3.5 Aquaculture extension

Technical advice was provided to 325 persons. Site visits were undertaken to assist potential farmers in aquaculture practices.

3.6 Introduction of new species

125 tilapia, *Oreochromis mossambicus,* fingerlings obtained from South Africa, were introduced by a private promoter in April. These fingerlings were grown to sexual maturity and kept as broodstock. In August, 420 tilapia *O. niloticus* fry were imported from the United Kingdom by another promoter for culture purposes.

3.7 Aquaculture Master Plan

A two-day workshop on the Potential for Aquaculture Development in Mauritius was held at the centre on 12 and 13 April. The workshop was organised jointly by this Ministry and the Board of Investment to present the draft Master Plan on the development of aquaculture in Mauritius. The recommendations were discussed during the workshop, following which the plan was finalised in December.

3.8 Aquaculture production

The total harvested catch of red drum, silver sea bream and rabbit fish from Ferme Marine de Mahebourg Ltd. was 550 tonnes in 2007. 117.6 tonnes of the catch was for the local market and 37.4 tonnes of chilled red drum was exported to Dubai, South Africa, Switzerland and the USA. One tonne of marine fish and 685 kg of mud crab together with 85 000 units of oysters were harvested from different barachois. The production of freshwater fish was 12.3 tonnes. The production details are shown in table 3.1.

Table 3.1: Aquaculture production (tonnes)

Particulars	Production (tonnes)
Berri rouge	12.3
Freshwater prawn	4.5
Marine fish (barachois)	1.0
Mangrove crab (barachois)	0.7
Red drum, sea bream & rabbit fish (floating cages)	550.0
Total	**568.5**

4. MARINE CONSERVATION

The Marine Conservation Division (MCD) provides services for the long-term protection and conservation of marine biodiversity and the sustainable use of the coastal zone.

4.1 Blue Bay Marine Park (BBMP)

4.1.1 Management

Surveillance over the BBMP was provided daily to control permissible activities therein. The permissible activities in the park were among others, glass bottom boating, snorkelling, diving, water skiing, swimming, non-motorised boating and fishing.

The enforcement officers posted at the Blue Bay Marine Park Patrol and Visitors' Centre recorded 25 cases of picked up illegal fishing implements. These included the securing of fishing gear such as basket traps (9), spear-gun and underwater fishing equipment (4), nets with undersized mesh (4), pole and line (7), and a bundle of fishing line. Six contraventions were also established in connection with illegal fishing.

During the year, 74 new permits were issued to the different users of the park and 280 permits were renewed against payment of Rs. 325 800 as permit fees. The details are shown in table 4.1.

Table 4.1: Number of permits issued and fees collected

Type of permit	First issue	Renewal	Total no. of permits issued	Permit fees (Rs.)
Boat/vessel	31	93	124	100 000
Basket trap	2	15	17	200
Line fishing	29	77	106	17 600
Commercial activities	2	11	13	65 000
Recreational	9	84	93	93 000
Interference	1	nil	1	50 000

Of the 121 permits issued for line fishing and fishing with basket traps, 33 were for registered fishermen and thus not chargeable.

The concept of carrying capacity was integrated into the management system of the park for conservation and sustainability. A limit of 15 was fixed on the number of permits to be issued for

glass bottom boat operators and 150 for persons fishing with poles from the shore in the permissible zones.

Maintenance work was regularly carried out to ensure that the mooring structures and buoys used to demarcate the different zones were in good condition. The missing and damaged conical demarcation buoys of the traffic lane, the ski lane, the mooring, swimming, conservation and strict conservation zones were repaired or replaced.

Visitors to the marine park included the general public, officers from other Ministries and tourists and were provided with information on the marine park.

The Steering Committee set up in 2006 for the management of the Blue Bay Marine Park met on five occasions.

4.1.2 Coral reef ecosystem monitoring at BBMP

The annual monitoring was carried out at the five established stations. Data were collected on the sea-bottom substrate in terms of corals, macro-algae, marine invertebrates and fish. Of the five stations, which were monitored, a high percentage of coral cover was recorded at stations 2 and 3 while the remaining stations composed predominantly of macroalgae, seagrass and sand. Results of the survey on the percentage of substrate cover and fish counts are shown in table 4.2 and 4.3.

Table 4.2: Percentage substrate cover at BBMP

Life form categories	Station 1	Station 2	Station 3	Station 4	Station 5
Acropora branching	0.84	22.83	19.08	0	0
Acropora digitate	9.34	6.33	0	0	0
Acropora tabular	1.59	46.50	45.25	0	0
Coral foliose	0	6.12	8.00	0	0
Coral massive	0	0	2.17	0	0
Coral submassive	0	12.17	2.17	0	0
Mushroom coral	0	0	0	0	0
Total live coral cover	**11.77**	**93.95**	**76.67**	**0**	**0**
Sand	27.37	2.00	5.08	0	10.75
Rock	21.86	0	1.17	0	39.25
Rubble	10.00	0	0.41	0	13.00
Dead coral	17.00	4.05	16.67	0	0
Macroalgae	12.00	0	0	0	37.00
Sea grass	0	0	0	0	0
Zoanthid	0	0	0	0	0

Table corals were the dominant species in the park. Compared to the previous year the percentage of branching corals has slightly increased while that of tabular corals slightly decreased at station 2. The percentage of live coral was still high and in good health at both stations 2 and 3. Station 3 was observed to be colonised by massive corals as well. The dominant fish species comprised mainly those of families acanthuridae, labridae, scaridae, chaetodontidae and pomacentridae.

Table 4.3: Number of fish/100 m^2 at BBMP

Family	Station 1	Station 2	Station 3	Station 4	Station 5
Fast fish					
Acanthuridae	28	276	38	0	0
Aulostomidae	0	0	0	0	0
Balistidae	0	0	0	0	0
Blenniidae	0	0	0	0	0
Chaetodontidae	0	42	24	0	0
Gobidae	0	0	0	0	0
Labridae	18	69	37	0	0
Lethrinidae	0	0	0	0	0
Monacanthidae	0	0	0	0	0
Mugilidae	0	0	0	0	0
Mullidae	0	0	0	0	0
Scaridae	13	37	2	0	0
Serranidae	0	0	0	0	0
Sparidae	0	0	0	0	0
Zanclidae	0	0	30	0	0
Total	**59**	**424**	**131**	**0**	**0**
Sedentary fish					
Plotosidae	0	0	0	0	0
Pomacentridae	12	277	82	0	0
Total	**12**	**277**	**82**	**0**	**0**

4.2 Balaclava Marine Park (BMP)

4.2.1 Management

The core staff of the Fisheries Protection Service posted at the Trou aux Biches Fisheries Post disseminated information on the MPA Regulations and the conservation of the marine ecosystems to fishers, boat operators and the public.

Resource use surveys showed that there were 22 boats for registered fishermen, 4 pleasure crafts, 6 glass bottom boats, 26 pedalos, 44 kayaks, 23 lasers, 5 hobbie cats, 38 windsurfs, 2 parasails and 106 snorkelling sets operating in the park.

4.2.2. Interference permit

An interference permit was issued to Le Meridien Hotel for the demarcation of a swimming zone.

4.2.3 Zoning of BMP

The tender document for the manufacture, supply and installation of demarcation buoys and mooring structures for the BMP was reviewed. The demarcation of the park would be effected after the construction of the BMP Centre.

4.2.4 Coral reef ecosystem monitoring at BMP

The yearly monitoring was carried out at the seven established stations. Results of the survey on the percentage of substrate cover including the different life-form categories as well as the abiotic components are given in table 4.4.

Table 4.4: Percentage substrate cover at BMP

Lifeform categories	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7
Acropora branching	27.6	18.1	0.1	45.8	0.0	22.5	0.0
Acropora digitate	0.0	4.6	0.0	0.0	1.7	0.0	0.0
Acropora tabular	2.4	2.0	0.0	1.8	0.0	0.0	0.0
Coral encrusting	3.5	5.5	7.7	0.0	2.5	0.0	9.7
Coral foliose	0.0	4.6	0.0	0.0	0.0	0.0	0.0
Coral massive	1.8	10.0	27.4	2.8	14.9	1.1	16.5
Coral submassive	1.8	10.0	1.0	1.0	0.7	1.7	4.0
Mushroom coral	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soft coral	0.0	0.0	0.0	0.0	1.2	0.0	0.0
Total live coral cover	**37.1**	**54.8**	**36.2**	**51.4**	**21.0**	**25.3**	**30.2**
Rubble	7.3	3.2	10.2	1.3	2.0	36.3	1.3
Rock	2.5	0.0	18.1	0.0	67.7	4.3	65.0
Sand	0.0	0.0	2.5	0.0	4.2	12.4	0.8
Turf algae	0.9	1.9	0.2	0.3	0.0	0.0	0.0
Macroalgae	3.0	1.3	2.8	3.2	3.1	13.4	1.2
Coralline algae	3.2	1.4	3.5	0.0	0.0	0.0	0.0
Dead coral	46.0	37.4	26.5	43.8	2.0	8.3	1.5

Branching *Acropora* corals were the dominant species in the park while the highest diversity of corals was found at station 2. The coral cover at stations 4 and 6 showed a slight decrease. The fish count per family at the different stations is presented in table 4.5.

Table 4.5: Number of fish/100m^2 at BMP

Family Fast fish	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7
Acanthuridae	472	78	68	245	20	74	56
Chaetodontidae	11	8	0	8	4	0	23
Labridae	4	35	21	79	37	18	32
Scaridae	48	26	33	19	18	17	8
Serranidae	5	26	5	0	3	0	2
Siganidae	0	0	0	0	0	0	4
Total	**540**	**173**	**127**	**351**	**82**	**109**	**125**
Sedentary fish							
Holocentridae	0	0	0	0	0	0	0
Pomacentridae	235	32	>300	136	55	176	28
Total	**235**	**32**	**>300**	**136**	**55**	**176**	**28**

The fish counts show that the families' acanthuridae, labridae and pomacentridae were the most abundant. The pomacentrids, commonly known as damsel fish, are territorial fish and are indicators of a healthy coral ecosystem.

4.3 Firework displays

Sixty-one requests were received for firework displays at 15 sites in the lagoon around the island. Underwater surveys were carried out at the sites in order to identify suitable locations for the placing of barges from which fireworks were shot. Authorisations for the displays were granted subject to a number of conditions.

4.4 Review of Fisheries and Marine Resources (Marine Protected Areas) Regulations 2001

The Fisheries and Marine Resources (Marine Protected Areas) Regulations 2001 were amended to better manage the Marine Protected Areas and to offer better protection to marine biodiversity. Charges for permits in the Marine Protected Areas were introduced such as renewal fees for permanent structures, fees for temporary structures, access fees for boats/vessels, citizens and non-citizens, non-registered fishermen, and boats transporting divers and snorkellers to marine parks. All types of exhibitions, including firework displays, were prohibited in marine parks.

4.5 Coastal zone management activities

Ecological underwater surveys were carried out in the coastal areas in relation to various coastal development projects. The list of surveys carried out is at appendix 7.

4.6 Environmental Impact Assessment (EIA)

Fifty-three EIA applications were assessed and recommendations made to the Department of Environment. Thirty of the EIA applications involved major coastal projects such as hotel development, integrated resort schemes (IRS), beach re-profiling, dredging works, construction of rock revetments and jetties as indicated in appendix 8.

4.8 Undersea walk sites

Ecological underwater surveys were carried out at Grand Bay and Trou aux Biches to assess the impacts of undersea walk activities. The percentage of live coral cover, the fish species and their abundance, GPS positions of the platform, characteristics of the bottom substrate and visibility at each site were recorded.

4.8 Partnerships for Marine Protected Areas of Mauritius and Rodrigues

The Project "Partnerships for Marine Protected Areas in Mauritius and Rodrigues", which started in 2005 was in its third year of implementation.

The technical proposal for the gazetting of the demonstration site "the South East Marine Protected Area (SEMPA) – Rodrigues" under the project was drafted. The document would provide the necessary legal framework for the development and implementation of effective management within the SEMPA.

4.9 Network of Marine Protected Areas of the member countries of the Indian Ocean Commission (IOC)

At the Second Steering Meeting for the Project "Marine Protected Areas Network of the Indian Ocean Commission Countries" held in Madagascar in June, each country was required to submit two to three priority areas for support by the Project Management Unit. The area identified for Mauritius was the Balaclava Marine Park and that for Rodrigues, it was the Rivière Banane Marine Reserve.

5. FISHERIES TRAINING, DEVELOPMENT AND EXTENSION

5.1 Training

Training of fishermen has been ongoing since 1986 with the advent of the "Formation Itinérante de Pêche." The facilities to dispense training have been enhanced with the coming into operation of the Fisheries Training and Extension Centre (FiTEC) in October 2004. The centre has provided training to both registered and aspiring fishermen to fish off-lagoon and around Fish Aggregating Devices (FADs). By the end of 2007, a total of 1 203 fishermen had benefited from various training courses within different projects and programmes. Table 5.1 shows the number of fishermen who followed the different courses.

Table 5.1: Summary of training courses and number of fishermen trained from 1986 to 2007

Training course	Dispensed by	Year	No. of fishermen trained
Training of fishermen	Formation Itinérante de Pêche	1986-1990	150
Deepwater Shrimp Fishing	AFRC	1988-1991	15
Demersal Fishing	AFRC	1992-1994	66
Swordfish Fishing	AFRC	1996-1998	26
FAD Fishery	AFRC	1994-2003	553
	FiTEC	2004-2006	68
General Course for Fishers	FiTEC	2004-2006	173
Off-lagoon FAD fishery	FiTEC	2007	152
Total			**1 203**

5.1.2 Training in the FAD fishery

A training programme was organised subsequent to a Memorandum of Understanding with fishermen. In that context, a list of 208 fishermen operating in the lagoon was obtained for training in off-lagoon FAD fishery. Training courses started in March and ended in November. The course, of a duration of 15 days, was run for seven batches bringing the total number of fishermen trained to 152. The remaining 56 fishermen were either found medically unfit or declined to follow the course.

5.2 FAD fishery

Activities in relation to the development of the Fish Aggregating Device (FAD) fishery under the International Fund for Agricultural Development-IFAD Loan 504: MU-Rural Diversification Programme (RDP) were continued.

5.2.2 FAD deployment and maintenance

Twelve FADs were replaced and a new one was set off Rivière Noire. An average of twenty FADs was kept active around the island. Table 5.2 gives the particulars of the FADs around the island and figure 5.1 illustrates their locations.

One hundred and ten sea trips were effected by the two research boats, "Sphyrna II and Maustral", for training of fishermen and for the deployment, verification and maintenance of FADs.

Table 5.2: Location of FADs

Name	Mooring depth (m)	Distance from coast (nm)	Latitude-°S	Longitude-°E
Pointe aux Cannoniers	730	2.5	19° 57' 76	57° 31' 22
Poudre d'Or II	240	4.2	20° 02' 27	57° 46' 07
Trou d'Eau Douce	980	3.1	20° 13' 851	57° 51' 465
GRSE	380	2.9	20° 15' 435	57° 51' 033
Grand Carreau	252	8.0	20° 21' 418	57° 55' 315
Mahebourg II	400	5.1	20° 26' 516	57° 47' 634
Souillac	1 088	2.2	20° 33' 81	57° 31' 23
Baie du Cap	855	2.7	20° 33' 07	57° 23' 28
Riviere Noire I	1 000	4.6	20° 23' 77	57° 16' 85
Riviere Noire III	3090	9.02	20° 33' 81	57° 31' 23
Tamarin	450	2.2	20° 19' 99	57° 19' 58
La Preneuse	2 300	5.17	20° 17' 73	57° 16' 06
Flic en Flac	1 200	2.5	20° 15' 99	57° 19' 39
Medine	2 500	5.5	20° 12' 25	57° 17' 48
Pointe aux Caves	2 482	4.7	20° 10' 09	57° 19' 61
Albion	1 370	2.5	20° 09' 32	57° 23' 64
Tombeau Bay	1 020	2.7	20° 04' 53	57° 27' 89
Port Louis II	3 500	10.0	20° 05' 14	57° 16' 09
Trou aux Biches II	2 450	6.9	20° 01' 64	57° 24' 05
Trou aux Biches I	2 020	4.6	19° 59' 67	57° 27' 95

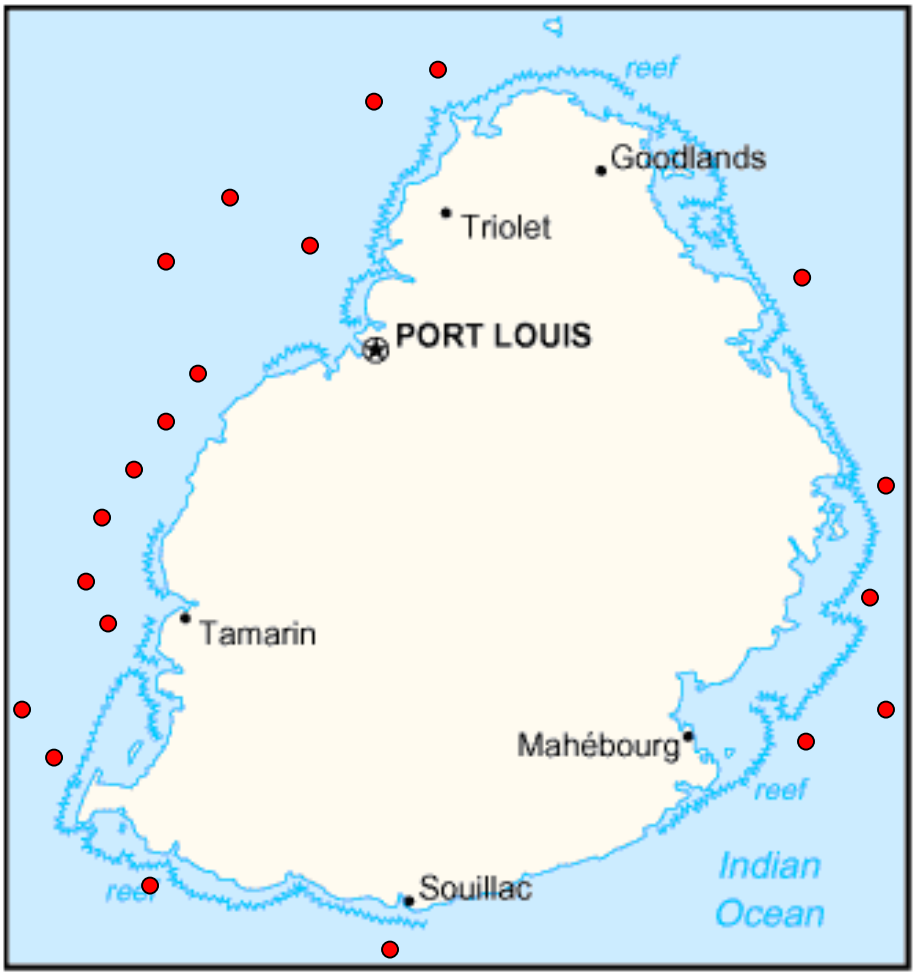


Figure 5.1: FADs around Mauritius

5.2.2 FAD fishery monitoring

From June onwards, daily catch data for the FAD fishery was collected at fish landings stations under the sample based survey system, as recommended by a study "To set up a system of data collection, processing, analysis and monitoring of the FAD fishery." Eighteen sea trips were carried out in the northern and western regions by the two patrol boats, "FPS 1 and FPS 2", to monitor fishing activities around FADs.

5.2.3 Consolidation of control measures

Draft regulations formulated to control fishing activities around FADs and to ensure security and safety measures of the small-scale fishermen were circulated among associations of fishermen

and other stakeholders. The draft regulations were sent to the Attorney General's Office for vetting.

5.4.4 Studies under the IFAD programme

5.4.4.1 Study on fish handling, preservation and marketing in Mauritius and Rodrigues

The objectives of the five-month study which started in February were to assess the prevailing situation of fish handling, preservation techniques and marketing systems in Mauritius and Rodrigues and to propose ways and means to improve the various processes involved to ensure quality assurance and value addition, taking into consideration the socio-economic implications.

It also included a two-day training programme to train institutional personnel for the implementation of quality guidelines and procedures including HACCP in fisheries and a workshop to disseminate information gathered during the study and to present the recommendations. A Code of Practice and a poster on good handling practices were produced (Figure 5.2).

Figure 5.2: Poster on good fish handling practices

5.4.4.2 Study to set up a system of data collection, processing, analysis and monitoring for the FAD fishery

The objectives of the two-month study, which started in February, were to develop appropriate formats for data collection, processing, analysis and monitoring of the FAD fishery, produce a software for data processing and analysis, train staff and propose a structure for data collection. A workshop was held in May to present the new system for collection, processing and analysis of the FAD fishery data and officers were trained to use the software developed.

5.5 Rehabilitation works by the Overseas Fisheries Cooperation Foundation of Japan

The Overseas Fisheries Cooperation Foundation of Japan (OFCF) undertook rehabilitation works at FiTEC from October 2006 to February 2007 under its project "The Rehabilitation of Fisheries Facilities for Fisheries Development in Mauritius". Defective navigation and communication equipment on research boat *Maustral* were replaced. The hydraulic system of winches and line haulers on research boat *Sphyrna II* was reconditioned. Two Emergency Position Indicating Radio Beacons (EPIRB) were fitted on the two boats. An ice making machine was repaired. The workshop at FiTEC was upgraded with the provision of eight outboard motors, one cut-model outboard motor, working tables, standard and special tools. A six-day in-house training course on the maintenance of outboard motors was held in January/February for six trainers of FiTEC and two officers of the Fisheries Protection Service.

5.6 Re- dredging of boat passage at Pointe aux Sables

The boat passage to the jetty of FiTEC was rendered impracticable following the passage of cyclone "Gamede". Procedures were initiated for preparation of the tender documents for its re-opening.

6. FISHERIES MANAGEMENT

6.1 Licensing of fishing vessels

6.1.1 Licensing of foreign fishing vessels

Licensing of foreign fishing vessels to fish in the Mauritius EEZ started in 1991. Licences are issued to foreign longliners, purse seiners and trawlers against payment of the appropriate fees.

There were fishing agreements between Mauritius and the European Community, the Government of Seychelles and the Japan Tuna Fisheries Co-operative Association (JTFCA). Fishing licences are issued under these Agreements. Details of licences issued under these agreements are presented in table 6.1

Table 6.1: Licences issued to foreign vessels under fishing agreements

	Purse seiners		**Longliners**		
Licences issued under fishing agreement	Maximum number of allowable licences	No. of licences issued	Maximum number of allowable licences	No. of licences issued	Total No of licences issued
EC	41	39	49	27	66
Japan	-	-	50	29	29
Seychelles	10	9	20	0	9

Licence fees obtained under the fishing agreements with the EC, JTFCA and Seychelles amounted to Euros 114 850, USD 382 000 and USD 100 000, respectively.

Eighty-five longline licences were also issued to vessels of various nationalities outside the fishing agreements. In addition, 36 extensions of licences were granted to some of these vessels. Three licences were issued to foreign fishing vessels to fish on the banks for demersal species. Licence fees for longliners and bank fishing vessels amounted to USD 608 500 and Rs 30 000, respectively.

The number of foreign fishing licences issued to fishing vessels and their port of registration are given in table 6.2. Table 6.3 shows the number of licences by category for the last five years.

Table 6.2: Licences issued to other foreign fishing vessels

Registration	Longline	Banks fishing
Belize	2	nil
Korea	1	nil
Indonesia	1	nil
Japan	6	nil
Malaysia	4	nil
Taiwan Province of China	71	nil
Madagascar	nil	3
Total	85	3

Table 6.3: Licences issued to foreign vessels by category (2003 – 2007)

Year	Longliner	Purse seiner	Handline	Trawler	Banks	Total
2003	156	39	1	0	0	**196**
2004	181	34	1	0	0	**216**
2005	175	39	0	0	3	**217**
2006	183	43	0	2	3	**231**
2007	141	59	0	0	3	**203**

6.1.2 Licensing of Mauritian fishing boats/vessels

Thirty-five Mauritian fishing vessels/boats were licensed to carry out different types of fishing operations for the production of chilled fish and frozen fish as detailed in table 6.4.

Table 6.4: Number of licensed Mauritian fishing boats/vessels by category

Category	Number
Banks fishery	5
Demersal chilled fish and banks drop-off fishery	18
Surface longlining (swordfish fishery)	8
Fish carriers from St. Brandon	2
Banks drop-off fishery	2

6.2 Monitoring of fishing vessels

6.2.1 Monitoring of local fishing vessels

The movement of local fishing vessels is closely monitored for fishery management purposes. All such vessels require a clearance from the Ministry prior to leaving for a fishing trip. Before the clearance is issued, it is ensured that the vessel holds a seaworthiness certificate, an

appropriate insurance cover, a valid fishing licence and its Vessel Monitoring System (VMS) equipment is functioning.

During the year, 119 clearances were issued to vessels/boats involved in the demersal chilled fish fishery, 92 in the pelagic chilled fish fishery, 9 to carrier vessels operating in St. Brandon and 16 to banks fishing vessels**.**

Upon return of the vessels/boats from the fishing trips, clearances for unloading the catch are issued after inspection of the fish quality and verification of the logbooks.

6.2.2 Monitoring of foreign fishing vessels

During the year, 664 foreign fishing vessels, called at the port for various purposes. 585 called for unloading/transshipment and the remaining called for bunkering, change of crew, provisions and repairs. Table 6.5 gives details of the different categories of vessels having called at the port.

Table 6.5: Details of calls of foreign fishing vessels

Type of vessel	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Reefer	4	5	4	5	6	9	5	7	3	4	4	6	**62**
Squid vessel	3	1	1	0	0	6	5	0	0	0	0	1	**17**
Bottom gill netter	0	0	0	0	0	0	0	0	0	0	1	0	**1**
Tuna longliner	72	35	20	40	37	33	51	32	76	43	42	63	**544**
Trawler	1	0	1	1	1	0	1	0	0	1	1	1	**8**
Patagonian toothfish vessel	2	1	2	0	2	0	3	2	0	1	1	4	**18**
Purse seiner	0	1	1	1	2	2	1	0	0	3	2	0	**13**
Others (lobster, trap)	0	1	0	0	0	0	0	0	0	0	0	0	**1**
Total	**82**	**44**	**29**	**47**	**48**	**50**	**66**	**41**	**79**	**52**	**51**	**75**	**664**

The registration and the number of calls of fishing vessels at Port Louis are given in tables 6.6 and 6.7, respectively.

Table 6.6: Details of fishing vessels calling at Port Louis

Type of vessel	Registration	Number of calls
Reefer	Mauritius	4
	Panama	11
	Taiwan	7
	Netherlands Antilles	8
	Malaysia	12
	Indonesia	14
	Spain	2
	Cambodia	1
Squid vessel	Taiwan	14
	Vanuatu	2
	Cambodia	1
Bottom gill netter	Panama	1
Tuna longliner	Mauritius	5
	Taiwan	249
	Spain	24
	Indonesia	123
	Japan	69
	Portugal	5
	Great Britain	4
	Seychelles	10
	Belize	18
	Oman	2
	Korea	7
	Madagascar	1
	Malaysia	15
	Philippines	4
	Cambodia	1
	Vanuatu	4
	Panama	1
	Thailand	1
	Australia	3
	South Africa	2
	Palau	1
	Micronesia	1
Trawler	Cooks Islands	5
	France	1
	Australia	1
Patagonian toothfish	France	14
	Australia	4
Purse seiner	Spain	1
	France	9
	Italy	1
Other (trap)	France	1
	TOTAL	**664**
Banks fishing vessels (Mauritian vessels with foreign flag)	Madagascar	7

Table 6.7: Calls of fishing vessels at Port Louis

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
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
2005	61	69	55	36	45	68	54	44	83	75	50	66	706
2006	78	86	36	41	59	66	79	59	109	68	44	76	801
2007	82	44	29	47	48	50	66	41	79	52	51	75	664

6.2.3 Monitoring of toothfish fishing vessels

Mauritius acceded to the Convention for Conservation of Antarctic Marine Living Resources (CCAMLR) in 2004. States party to the Convention are required to implement the CCAMLR conservation measures, which include the Catch Documentation Scheme (CDS) for toothfish, established under Conservation Measure 10-05 (2003).

During the year, there were 18 calls of toothfish fishing vessels out of which four called for transshipment. The amount of toothfish transshipped was 1 915 tonnes. The quantities of toothfish transshipped during the past five years are presented in table 6.8.

Table 6.8: Transshipment of toothfish (tonnes)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2003	753	235	0	99	71	246	1 174	195	0	0	106	0	**2 879**
2004	0	68	206	0	493	540	214	0	0	0	0	0	**1 521**
2005	0	0	0	0	0	0	410	0	0	580	0	0	**990**
2006	0	46	0	0	18	0	177	0	0	0	0	0	**241**
2007	0	0	0	0	551	0	213	556	0	0	595	0	**1 915**

6.2.4 Calls and transshipment of deep-sea trawlers

During the year, 7 calls were made by 3 trawlers of different nationalities. A total of 1 826 tonnes of deep-sea demersal fishes were transshipped. The main species were alfonsino, cardinal, orange roughy, blue nose, spiky dory, smooth dory, butter fish, boar fish, and black dory. Details of quantity of fish transshipped are given at table 6.9.

Table 6.9: Transhipment by trawlers (tonnes)

Year	Quantity transhipped
2003	2 581
2004	3 463
2005	4 395
2006	3 883
2007	1 826

6.3 Tuna fisheries

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

6.3.6 Sampling of catch from licensed purse seiners

Length frequency data were obtained from the catches of licensed purse seiners. A total of 2 912 tuna comprising 1 950 skipjack, 635 yellowfin and 327 bigeye were sampled.

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

The length frequency distribution of skipjack tuna is shown in figure 6.1. The length of the fish ranged from 39 to 70 cm with the mode at around 48 cm.

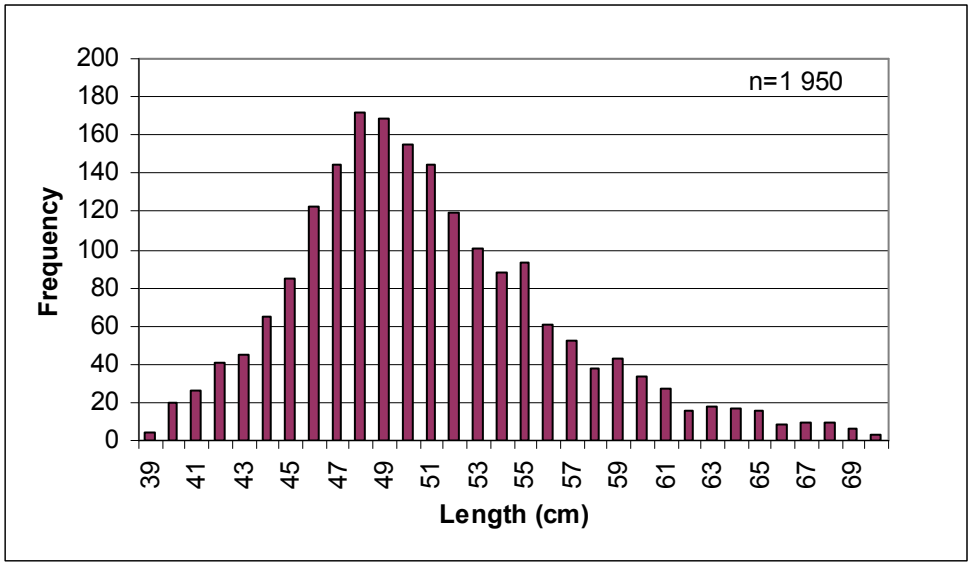


Figure 6.1: Length frequency distribution of skipjack tuna

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

The length frequency distribution of yellowfin tuna is presented in figure 6.2. The length ranged between 49 and 178 cm. Most of the fish sampled were below 100 cm in length representing fish which had not reached sexual maturity. Yellowfin tuna caught by purse seiners comprised mostly juvenile fish which is typical of catch made on schools associated with logs.

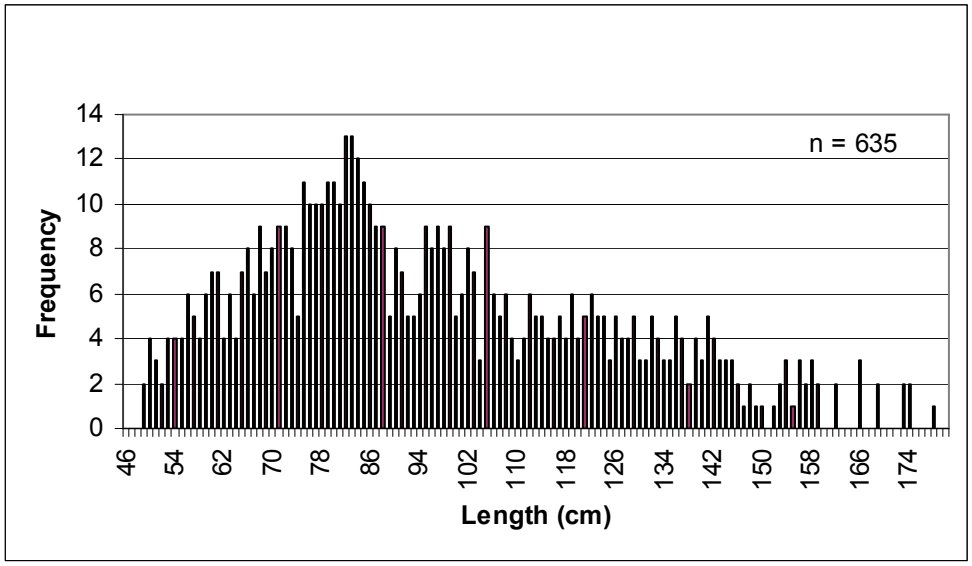


Figure 6.2: Length frequency distribution of yellowfin tuna

The length of the bigeye tuna ranged between 48 and 152 cm and the length frequency distribution is presented in figure 6.3. The bigeye tuna caught by the purse seiners were mostly juvenile fish measuring less than 100 cm, typical of catches made on log schools.

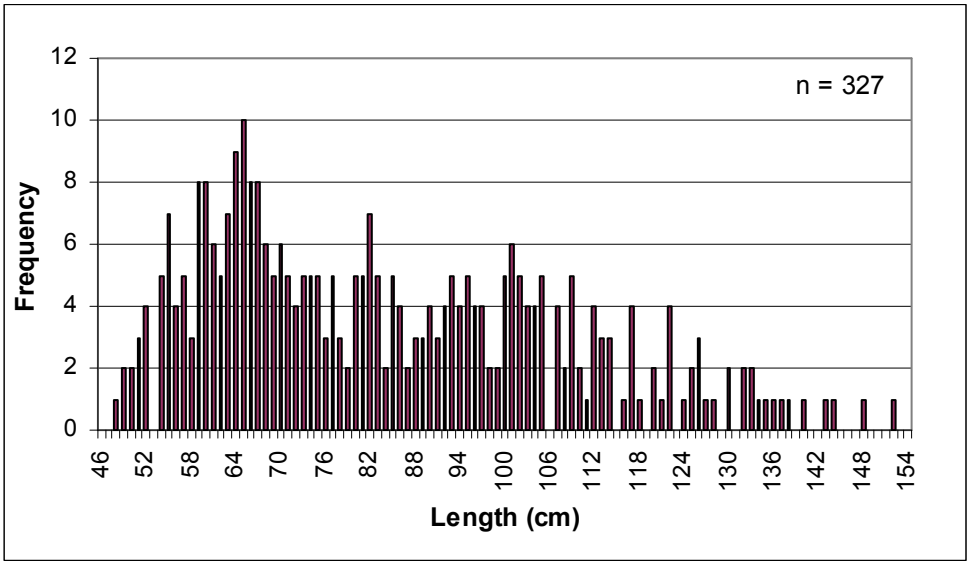


Figure 6.3: Length frequency distribution of bigeye tuna

6.3.2 Species composition

The catch is composed of 74% skipjack, 21% yellowfin, 4% bigeye and 1% miscellaneous fish. The species composition of the purse seine catch unloaded in Mauritius for the past five years is presented in table 6.10.

Table 6.10: Species composition of purse seiners catch (%)

Year	Species			
	Skipjack	**Yellowfin**	**Bigeye**	**Miscellaneous**
2003	68	25	6.0	1.0
2004	60	31	8.0	1.0
2005	55	38	5.0	2.0
2006	63	33	3.5	0.5
2007	74	21	4.0	1.0

6.3.3 Reproductive biology of skipjack tuna

Gonad and liver samples of 526 skipjack tuna were obtained at the local cannery for biological studies to determine maturity stage, spawning period, reproductive index, sex ratio, seasonal sexual variation and length at first maturity. These samples were collected during 2006 and 2007.

Data for at least two years were merged to provide a better view and consistency in the estimation of different biological parameters

6.3.3.1 Gonado-somatic Index (GSI)

The GSI for both males and females was maximum during February, April, July and October and minimum during January, March and September. The monthly variations of the GSI are presented in figure 6.4, showing four peaks of intense sexual activity and spawning. The reproductive cycles of the males and females were synchronous as observed in previous years.

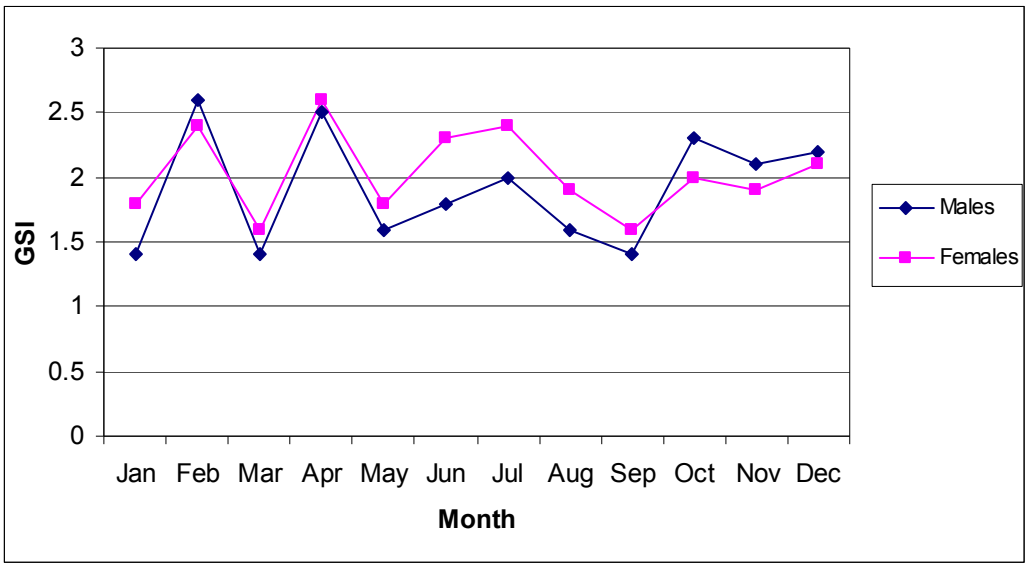


Figure 6.4: Gonado-somatic Index (GSI) of skipjack tuna

6.3.3.2 Spawning period

The skipjack tuna spawned throughout the year with certain periods of intense sexual activity. More than 85 % of females had ovaries in the terminal stage of maturation during different months of the year except in December when it was 53%.

6.3.3.3 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.

6.3.3.4 Length at first maturity (Lm_{50})

Lm_{50} was calculated for each size class starting from 41 cm as shown in figure 6.5. Lm_{50} for males and females was found to be at 43 and 42 cm respectively.

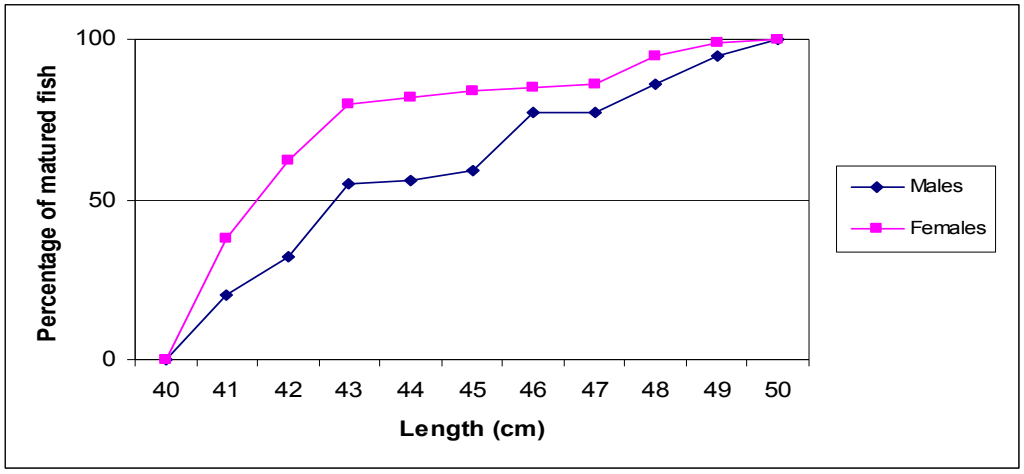


Figure 6.5: Length at first maturity of skipjack tuna

6.3.4 Monitoring of the catch of licensed longliners

Licensed longliners transhipped 15 580 tonnes of tuna and tuna-like species out of which 4 268 tonnes were caught by Non-European licensed longliners and 669 tonnes by three Mauritian flagged vessels. Out of 214 logbooks received, only 208 were processed since the remaining contained inconsistencies.

6.3.4.1 Species composition of the catch

The species composition of the catch of the licensed foreign longliners is shown in table 6.11.

Table 6.11: Species composition of the catch

Species	Scientific name	Catch (t)	%
Albacore	*Thunnus alalunga*	3 445	22.1
Swordfish	*Xyphias gladius*	2 943	18.9
Yellowfin	*Thunnus albacares*	3 408	21.9
Bigeye	*Thunnus obesus*	2 165	13.9
Sailfish	*Istiophorus albicans*	158	1.0
Skipjack	*Katsuwonus pelamis*	77	0.5
Bluefin	*Thunnus maccoyii*	21	0.1
Sharks		1 464	9.4
Others		1 636	10.5
Other billfishes		263	1.7
	Total	**15 580**	**100.0**

The catch composed mainly of albacore, yellowfin, bigeye and swordfish; albacore being the target species for most of the Taiwanese longliners. With an increase in the number of calls of Japanese longliners targeting yellowfin and swordfish, a higher volume of these species was noted in the catch.

6.3.4.2 Spatial distribution of the catch of licensed longliners

The fishing area of the licensed longliners was spread widely in the Western Indian Ocean between 06º N and 34º S and 36º E and 89º E as depicted in figure 6.6.

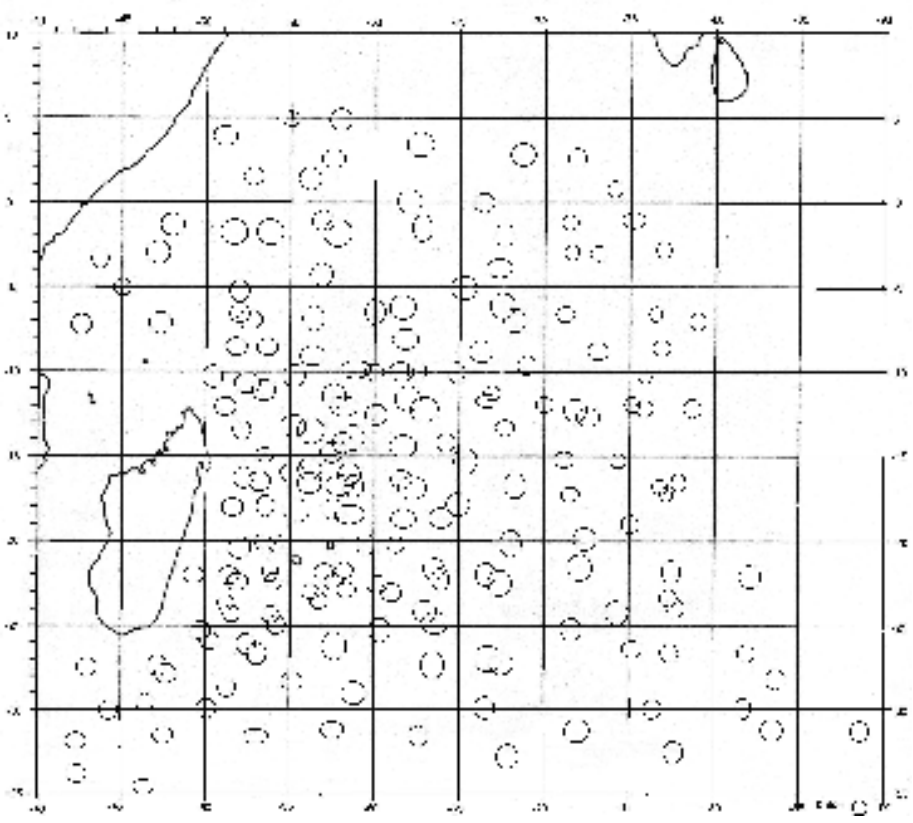


Figure 6.6: Catch distribution of licensed longliners

6.3.4.3 Sampling of albacore tuna from licensed longliners

Length frequency data of the albacore tuna were obtained during regular sampling carried out on the catch of licensed longliners. A total of 3 981 albacore tuna was sampled. The length frequency distribution is shown in figure 6.7. The length varied from 72 to 135 cm. The major part of the catch comprised fish in the range of 95 to 111 cm.

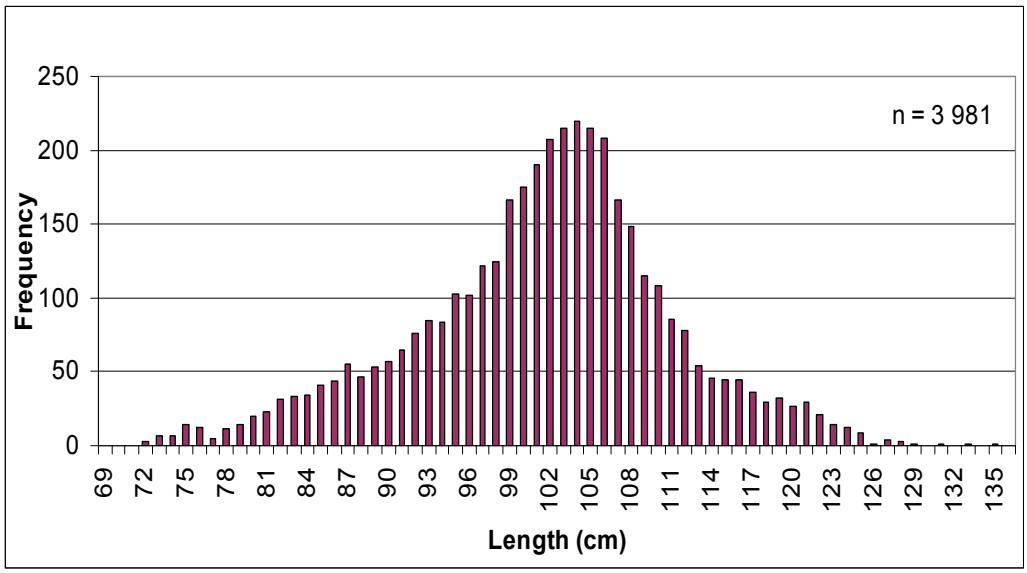


Figure 6.7: Length frequency distribution of albacore tuna

6.3.5 The local longline fishery

Two vessels operating under the Mauritian flag were actively engaged in the fishery. They undertook 4 fishing trips, unloading a total of 669 tonnes of fish. The species composition of the landings is shown in figure 6.8. Most of the catch composed of swordfish (58%), which was the target species of the vessels. The catch per unit effort was 1.06 kg per hook. The fishing area was spread between latitudes 24º S and 36º S and longitudes 32º E and 80º E.

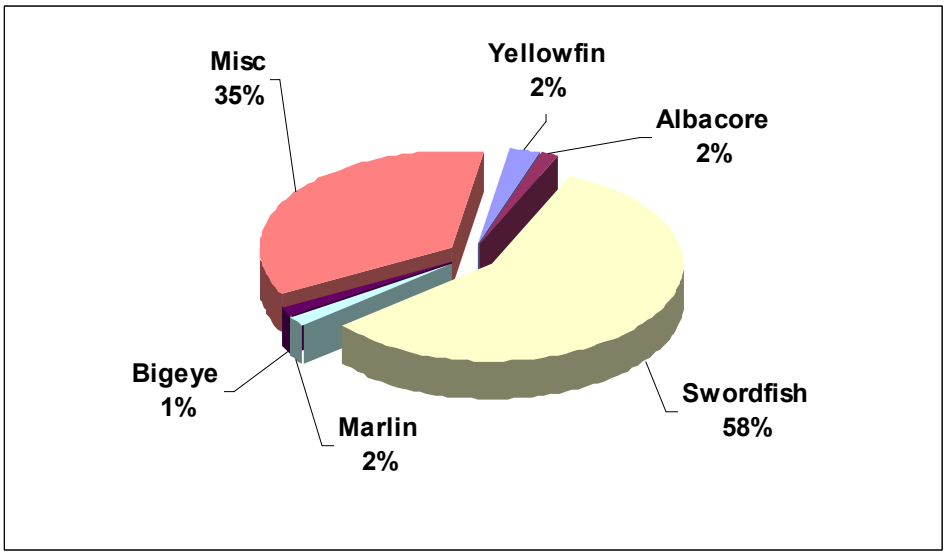


Figure 6.8: Catch composition of Mauritian longliners

6.3.6 Transshipment by tuna longliners

Licensed and non-licensed longliners made 453 calls at Port Louis and transshipped 23 955 tonnes of tuna and tuna-like species, details of which are shown in table 6.12. Albacore tuna constituted 12 182 tonnes of the total quantity transshipped. With lesser Taiwanese vessels calling at Port Louis, a decrease in the volume of albacore tuna transhipped was noted. The percentage of the three main species which were transshipped is shown in figure 6.9.

Table 6.12: Species composition of fish transshipped (t)

Year	Albacore	Yellowfin	Bigeye	Skipjack	Swordfish	Bluefin	Marlin	Sailfish	Shark	Misc.	Total
2003	6 225	1 280	415	25	2 126	3	187	59	1 657	456	**12 433**
2004	4 633	4 110	1 361	3	1 595	1	172	6	2 022	352	**14 255**
2005	4 947	3 887	1 413	-	3 357	-	318	35	2 473	1 237	**17 667**
2006	20 307	1 995	359	127	1 934	230	242	131	1 890	2 017	**29 232**
2007	12 182	3 281	494	134	2 305	8	67	486	1 881	3 110	**23 948**

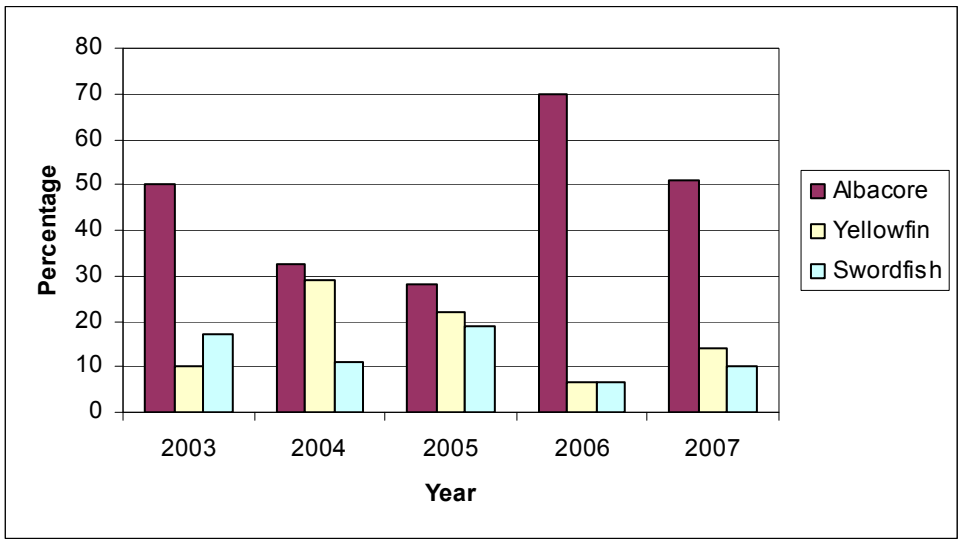


Figure 6.9: Percentage of the three main species transshipped by longliners

6.4 Swordfish fishery

Seven local fishing vessels undertook 67 trips and landed 184.3 tonnes of fish, of which swordfish constituted 25%. The fishing areas were spread around Mauritius, between latitudes

14°S and 21ºS and longitudes 56°E and 61°E. The catch and species composition are shown in table 6.13 and figure 6.10.

Table 6.13: Catch composition of the local swordfish fishing vessels (kg)

Year	Swordfish	Yellowfin	Bigeye	Albacore	Marlin	Shark	Sailfish	Misc.	Total
2003	35 123	21 395	2 190	14 003	2 413	228	nil	3 986	**79 338**
2004	51 844	12 597	4 412	19 864	2 236	538	nil	5 876	**97 187**
2005	86 069	35 219	11 059	29 774	4 298	578	1 549	9 033	**177 581**
2006	74 157	102 632	15 444	40 840	6 508	1 212	1 590	4 873	**247 256**
2007	45 913	65 924	nil	56 416	6 597	1 056	2 156	6 264	**184 326**

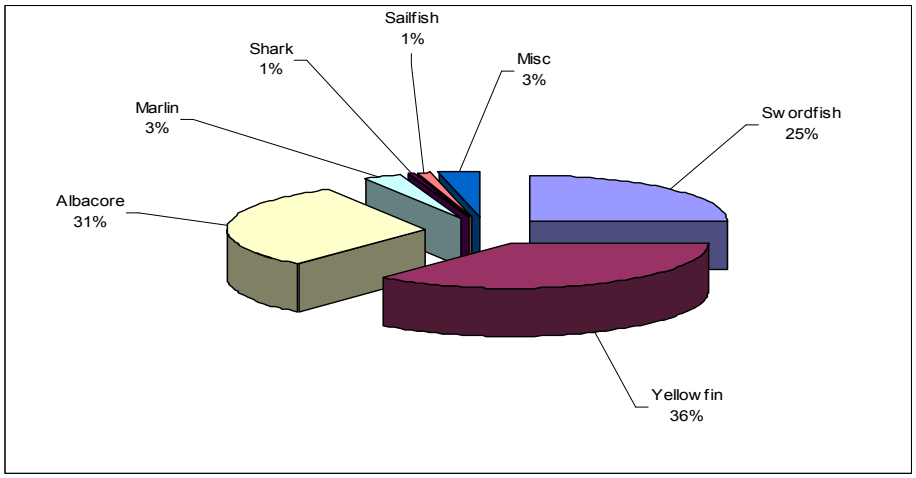


Figure 6.10: Species composition of the catch

6.4.2 Length frequency distribution of swordfish

The length of swordfish was measured during the landings of the local vessels. The length frequency distribution is shown in figure 6.11. The length was measured from the operculum to the keel and ranged from 49 to 188 cm with the maximum number between 73 and 122 cm.

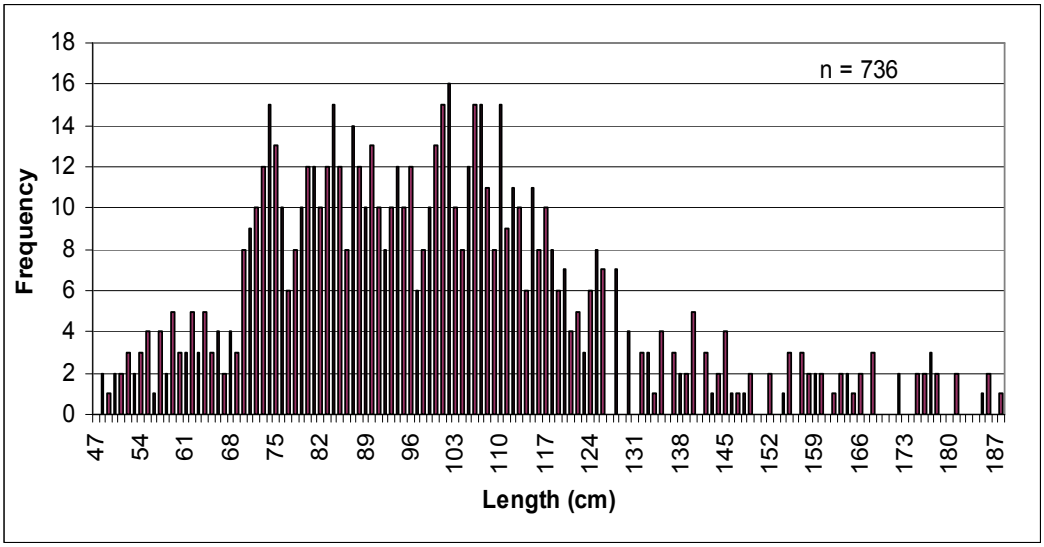


Figure 6.11: Length frequency distribution of swordfish

6.5 Vessel Monitoring System

231 logbooks were checked against data reports received by the Fisheries Monitoring Centre (FMC) and details are given in the table 6.14.

Table 6.14: Number of logbooks verified

Month	Logbooks checked	Logbooks with anomalies
January	11	1
February	19	3
March	18	7
April	22	0
May	29	3
June	23	2
July	20	2
August	12	4
September	15	3
October	27	5
November	9	1
December	26	3
Total	**231**	**34**

During the year, 236 fishing vessels reported to the FMC comprising 33 local and 203 foreign vessels. Table 6.15 shows the breakdown of the fishing vessels by registration and transponder type i.e., Inmarsat or Argos.

Table 6.15: Vessels reporting to FMC

Registration	Inmarsat	Argos	Total
Local	**29**	**4**	**33**
Foreign			
Taiwanese	47	39	86
Japanese	0	28	28
Malaysian	14	0	14
Indonesian	7	2	9
Malagasy	3	0	3
Belize	2	1	3
Korean	0	1	1
Sub total	**73**	**71**	**144**
EU *			
French			29
Spanish			27
Portuguese			2
Italian			1
Sub total			**59**
Grand Total	**102**	**75**	**236**

* *Information not available*

The FMC provided VMS data to the Seychelles Fishing Authority from 10 to 14 December in connection with the 'Plan Régionale de Surveillance de Pêche dans le Sud-ouest de l'Océan Indien' (IOC/MCS Project).

6.6 Import and export of fish and fish products and fish processing

6.6.1 Import of fish and fish products

During the year, 2 106 permits were issued for the import of fish and fish products, including 18 permits for the import of fish samples and fish bait, representing an increase of 12.8% in the number of permits issued compared to the previous year. Proceeds from permits amounted to Rs. 4 185 000.

The import of fish and fish products for direct consumption amounted to 9 980 tonnes representing about 9.6% of the total imports for the year. The tuna processing plants, namely Princes Tuna and Thon des Mascareignes, imported 62 500 and 30 623 tonnes of raw materials, respectively. 1 066 tonnes of frozen barracouta were imported for the production of salted snoek. Barracouta was imported from New Zealand and Namibia while tuna for the processing plants was obtained from French and Spanish vessels transshipping in Seychelles. Figure 6.12 gives details of total imports.

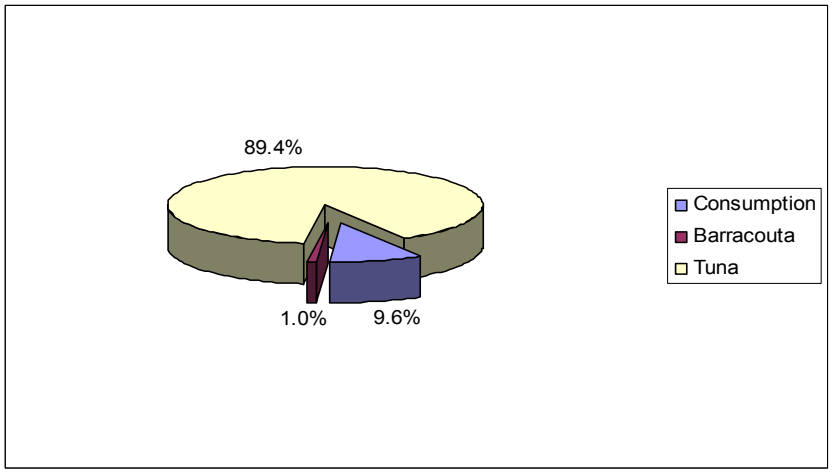


Figure 6.12: Details of total imports

6.6.1.1 Imports for direct consumption

Fish and fish products imported for direct consumption has been classified into four categories, namely fish, crustacean, cephalopod and shellfish. Crustaceans comprise prawn, shrimp, crab and lobster. Cephalopods consist of octopus, squid and cuttlefish. Mussels, oysters, clams and scallop constitute the shellfish category and the rest were considered as fish. Details are given in figure 6.13.

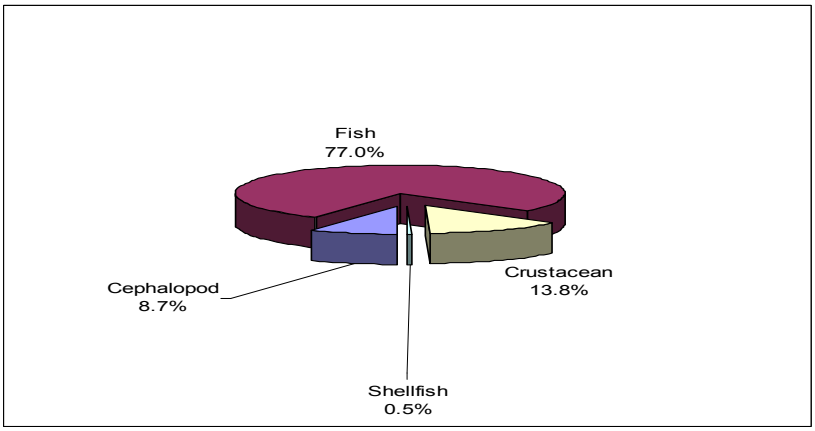


Figure 6.13: Imports per category

Fish and fish products in different forms of preservation, namely frozen, chilled, canned, dried, smoked and live crustaceans were imported. Frozen and canned products constituted the main imports with 6 691 and 2 945 tonnes, respectively as shown in figure 6.14.

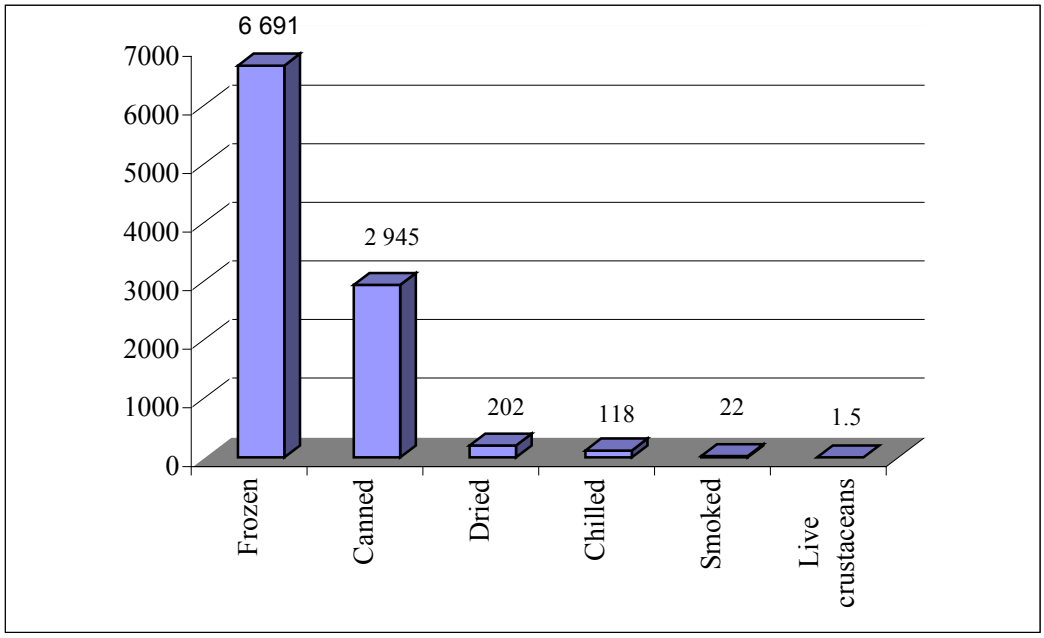


Figure 6.14: Categories of fish and fish products for direct consumption

Imports were from high seas/Freeport and five countries namely India, South Africa, Madagascar, Morocco and Chile. The imports from Morocco and Chile were mainly canned fish comprising pilchards, sardines, mackerel and tuna. Imports from high seas/Freeport, India, South Africa and Madagascar were mainly frozen fish while the dried bombay duck and some dried prawn were mainly imported from India. Details on import of fishery products for consumption by origin are presented in figure 6.15.

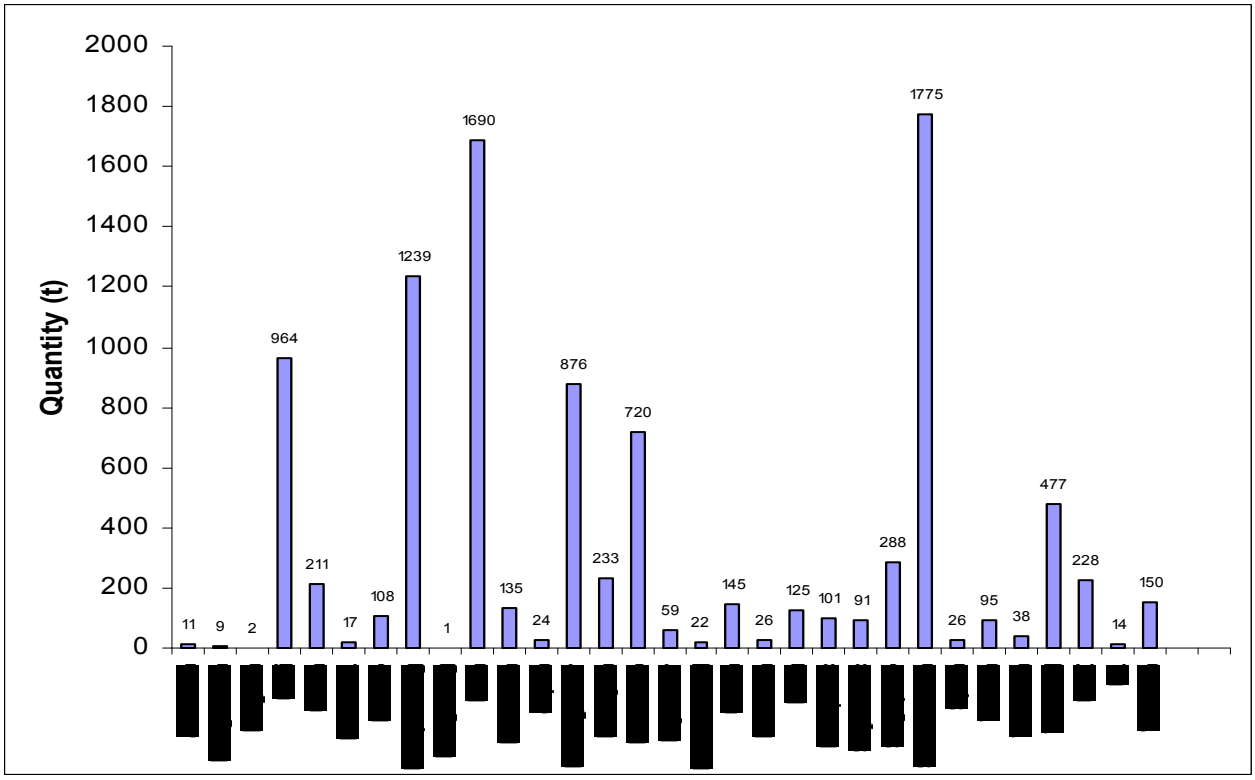


Figure 6.15: Import of fish and fish products by country of origin

6.6.1.2 Chilled fish and fish products

Chilled fish and fish products, amounting to 98 tonnes, were mainly imported from Seychelles, India and France. The import of 56 tonnes of fish from Seychelles comprised mainly capitaine, sacréchien, vacoas and bourgeois, the latter was to supply hotels only. The main imports from India were lobster and prawn and amounted to around 6 tonnes. The imports from France consisted of 22 tonnes of salmon while the other species comprised trout, turbot, sardine, dorade, bar, oyster, mussel, clam, noix Saint Jacques, hareng, sea urchin, lobster and shrimp. Details of the import of chilled fish and fish products are shown in table 6.16.

Table 6.16: Import of chilled fish and fish products (tonnes)

Year / Product	Fish	Crustacean	Shellfish	Squid	Total
2003	21	14	8	1	44
2004	48	27	0	0	75
2005	95	10	15	0	120
2006	110	22	5	0	137
2007	79	11	8	0	98

6.6.1.3 Frozen fish and fish products

Imported frozen fish and fish products amounted to 6 654 tonnes. These products were imported mainly from India, South Africa, Madagascar, Thailand, Malaysia, Indonesia, Oman, Philippines, France, Taiwan Province of China, Mauritius Freeport and fishing vessels calling at Port-Louis. Details of import for the past five years are presented in table 6.17.

Table 6.17: Import of frozen fish and fish products (tonnes)

Year / Product	Fish	Crustacean	Cephalopod	Shellfish	Total
2003	2 690	991	776	23	4 480
2004	3 497	1 216	822	21	5 556
2005	4 721	1 326	1 174	55	7 276
2006	4 848	1 061	696	49	6 654
2007	4 473	1 298	907	42	6 720

The species composition of frozen fish imported is shown in figure 6.16. Fish commonly imported were capitaine, cateau, vacoas, catfish, marlin, vieille, sailfish and tuna. By-catch from tuna longliners purchased by the Agricultural Marketing Board (eventually sold to fishermen cooperatives) amounted to 353 tonnes comprised tuna, oil fish, sailfish, moonfish, marlin, becune, angelfish, shark and dorade. Fish products include fish fingers, fish cakes, fish fillets, fish balls and other breaded products.

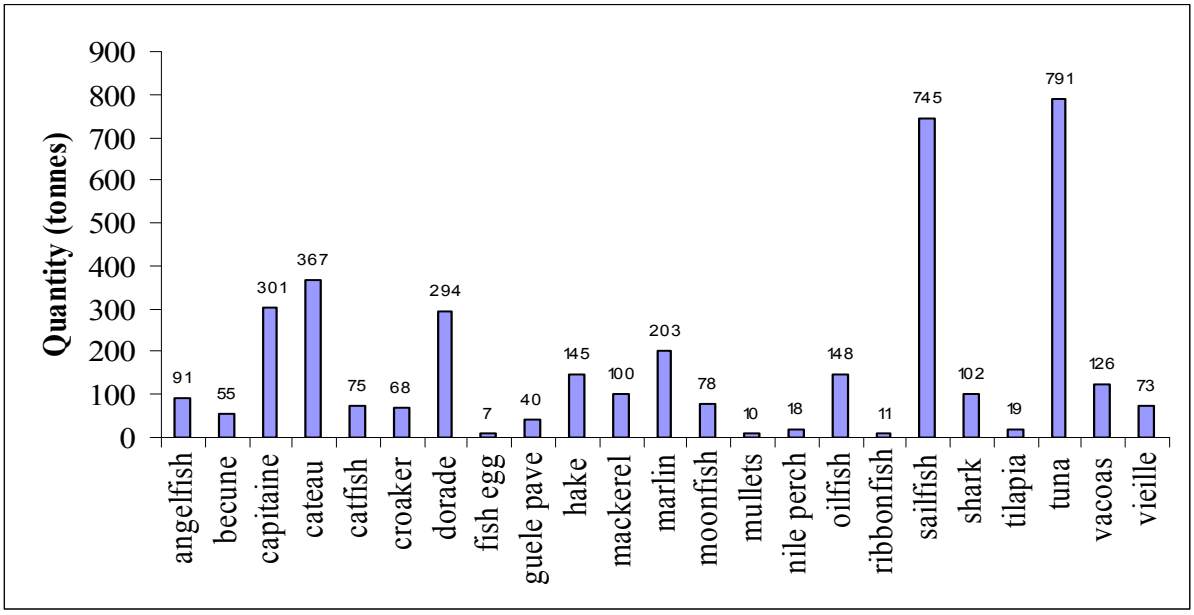


Figure 6.16: Import of frozen fish

6.6.1.4 Dried fish and fish products

Dried fish and fish products were imported from India, China, Malaysia, Indonesia, Pakistan and Singapore. The total import amounted to 199 tonnes. Details are presented in table 6.18.

Table 6.18: Import of dried fish and fish products (tonnes)

Year / Product	Fish	Bombay duck	Squid, cuttlefish	Prawn	Others	Total
2003	4	157	1	132	1	295
2004	2	189	2	127	2	322
2005	23	136	1	97	0	257
2006	2	175	0	109	0	286
2007	2	104	0	93	0	199

6.6.1.5 Smoked fish and fish products

Smoked fish and fish products were imported from France, Denmark, South Africa, Australia and the United Kingdom for supermarkets, hotels and restaurants. Smoked fish and fish products comprised hareng, trout, salmon, haddock, surimi, morue and mackerel and amounted to 8 tonnes.

6.6.1.6 Canned fish and fish products

Canned fish and fish products such as sardines, pilchards, mackerels, anchois, foie de morue, salmon, tuna, crabmeat, prawn and mussels were imported from Morocco, Chile, Peru, South Africa, Thailand, Indonesia, India, Malaysia, China, France and the United Kingdom. With the exception of tuna, these products are not produced locally. The main country for the supply of sardines, pilchards and mackerel were Morocco, South Africa and Chile respectively. A total of 2 946 tonnes of canned fish and fish products were imported during the year and details are presented in table 6.19.

Table 6.19: Import of canned fish (tonnes)

Year / Product	Sardines	Pilchards	Mackerel	Tuna	Others	Total
2003	1 073	1 360	742	243	84	3 502
2004	1 022	1 102	994	107	193	3 418
2005	804	624	1 015	118	63	2 624
2006	900	889	838	230	40	2 897
2007	630	967	1 166	171	12	2 946

6.6.1.7 Live crustaceans

530 kg of live lobster and 1 400 kg of live crab were imported from South Africa and Madagascar respectively.

6.6.1.8 Live ornamental fish

A total of 617 846 units of live fresh water ornamental fishes were imported from Singapore and Malaysia. Common aquarium fish include gold fish, tetra, guppies, mollies, cichlids, arrowana and terrapins.

6.6.1.9 Live fish for culture

545 units of tilapia fingerlings (*Oreochromis mozambicus* and *O. niloticus*) were imported from South Africa and the United Kingdom for culture purposes.

6.6.1.10 Fishmeal

A total of 329 tonnes of dried fishmeal were imported from China, France and South Africa. These products were used in the manufacture of animal feed.

6.6.1.11 Sea shells

A total of 51 854 units of seashells were imported from Philippines and Hong Kong.

6.6.2 Export of fish and fish products

6.6.2.1 Export of chilled fish

Two companies exported a total of 25 464 kg of chilled fish to Reunion. The species exported were vieille rouge (*Epinephelus fasciatus*), croissant queue blanc (*Variola albimarginata*), vieille maman rouge (*Cephalopolis sonnerati*), vivano (*Pristipomoides zonatus*) and cabot (*Epinephelus multinotatus*).

6.6.2.2 Export of ornamental fish

Two companies exported live ornamental marine fish to Reunion, USA, Hong Kong, UK, Germany, Italy, Israel, Switzerland, France and Spain. Out of the established quota of 6 500 units, 4 385 units of marine fish were exported.

6.6.3 Fish processing

6.6.3.1 Canned tuna

The local cannery imported 62 500 tonnes of raw tuna from European vessels. 32 575 tonnes of canned tuna was exported to European countries and 1 131 tonnes were put on sale on the local market. Export and local sale of the produce for the past five years is presented in table 6.20. Pet food was not produced during the year 2007.

Table 6.20: Export and local sale of canned tuna and pet food (tonnes)

Product / Year	2003		2004		2005		2006		2007	
	Local	**Export**	**Local**	**Export**	**Local**	**Export**	**Local**	**Export**	**Local**	**Export**
Canned tuna	643	30 787	1 005	30 555	1 142	31 674	1 278	34 463	1 131	32 575
Pet food	183	3 301	231	3 070	195	2 394	201	4 470	0	0
Total	**826**	**34 088**	**1 236**	**33 625**	**1 236**	**33 625**	**1 479**	**38 933**	**1 131**	**32 575**

6.6.3.2 Tuna loin production

A processing plant, engaged in the production of tuna loins for export, obtained its raw materials amounting to 30 623 tonnes of frozen tuna from Spanish vessels transshipping in Seychelles. A total of 10 635 tonnes of tuna loins was produced and exported to Spain, Italy, France, Greece and Portugal.

6.6.3.3 Salted fish

Two companies are engaged in the production of salted snoek from frozen barracouta (*Thyrsites atun*). The amount produced was 651 tonnes out of which 98 tonnes were exported to UK, Reunion, France and Australia. Details of the import of raw materials, production of snoek and their sale for the past five years are presented in table 6.21.

Table 6.21: Import, production and sale of salted fish (tonnes)

Year	2003	2004	2005	2006	2007
Import of barracouta	1 105	1 183	1 126	962	1 066
Production of snoek	717	958	772	644	651
Local sale of snoek	632	672	570	486	491

6.6.3.4 Fish meal production

One company was involved in fishmeal production. The raw materials (tuna offal) were obtained from the fish processing factories. A total of 10 393 tonnes of fishmeal was produced during the year. A total of 8 359 tonnes was sold on the local market and 2 034 tonnes were exported. The productions for the last five years are given in table 6.22.

Table 6.22: Production of fish meal (tonnes)

Year	2003	2004	2005	2006	2007
Production	5 189	5 263	6 584	10 265	10 393

6.6.3.5 Re-export of canned sardines

Two companies were involved in the import and re-export of canned sardines. The sardines were imported from Morocco and Chili and the total re-export for the year amounted to 122 tonnes.

6.7 Inspection and certification of fishery products at the One Stop Shop - Seafood Hub

Following the mission of the EU Food and Veterinary Office in January 2006, the consultant attached to the One Stop Shop was required to provide hands-on training to the Competent Authority (CA) on HACCP and inspection of establishments and to help the CA to prepare the certification manual, the inspection manual for fish and fish products and aquaculture, the procedures manual for monitoring of fishing vessels, freezer vessels, processing and storing fish and fishery products for export and the sampling procedures manual.

Several meetings were held with the fish business operators to consolidate private/public partnership for the implementation of EU norms at all stages of production. The fish business operators were also informed of the non-compliance issues in their establishments and during unloading operations at the quay.

Four laboratories, Albion Fisheries Research Centre, National Environment Laboratory, Food Technology Laboratory and Mauritius Standard Bureau, were designated to carry out official testing of water, ice and fish and fishery products. A Memorandum of Understanding between the CA and the four laboratories was signed. Laboratory staff benefited from training on accreditation by an EU expert under the Strengthening of Fisheries Products (SFP) programme funded by EU.

Auditing of establishments exporting fish and fishery products to EU were carried out. Small-scale fishing boats supplying chilled fish to the establishments were also inspected regularly to ascertain compliance with EU standards.

The Export of Fish and Fish Products Regulations (No 2) of 2006 - GN 148 of 2006, was reviewed and amended to align our legislation with international standards.

As at the end of the year, the following establishments were approved to export fish and fishery products to the EU:

(i) Princes Tuna (Mauritius) Ltd.
(ii) Thon des Mascareignes Ltée
(iii) Mauritius Freeport Development
(iv) Froid des Mascareignes
(v) Seskel Enterprises Ltd.
(vi) Marlin Exports Ltd.
(vii) Pelagic Process Ltd.
(viii) Isla Gorriti (Mauritian Seafisheries Co. Ltd.)
(ix) Illa de Rua(c/o Adam & Co. Ltd.)
(x) Aurifla Co. Ltd.
(xi) Vieille Fishing Co. Ltd.
(xii) VIKS Enterprise Ltd.
(xiii) SFM Trading Co. Ltd.
(xiv) Saurimarine

6.8 Fish production, consumption and trade balance

6.8.1 Total fish production

A decrease of catch was noted in the different fishery sectors particularly in the artisanal, banks, semi-industrial chilled fisheries which could be attributed to a decrease in fishing effort and bad weather conditions prevailing during the year while that for the tuna fishery was due to the decrease in the number of vessels engaged in that fishery. The total annual production by the different fisheries is given in table 6.23.

Table 6.23: Total fish production (tonnes)

Sector	2003	2004	2005	2006	2007
Artisanal fishery					
Mauritius	1 166	1 043	947	950	640
Rodrigues	1 664	1 204	1 040	1 067	1 067
Agalega	30	30	30	30	30
Sports fishery	650	650	650	650	650
Amateur fishery	300	300	300	300	300
Barachois	6	4	5	4	2
Ponds (prawn & fish)	27	32	23	0	17
Marine aquaculture (cage)	--	325	367	436	550
FAD Fishery				214	164
Sub-total	**3 843**	**3 588**	**3 362**	**3 682**	**3 420**
Offshore demersal fishery					
Shallow water banks	3 713	3 216	2 178	3 112	2 848
Banks deep water snappers	--	7	--	0	0
St Brandon inshore	578	204	414	235	54
Semi-industrial chilled fish	234	284	223	311	171
Tuna fishery	1 118	1 640	1 402	1 380	803
Semi-industrial pelagic fish	79	97	177	247	184
Demersal trawlers	1 806	1 595	2 584	1 112	0
Sub-total	**7 528**	**7 043**	**6 978**	**6 397**	**4 060**
Grand Total	**11 371**	**10 631**	**10 340**	**10 079**	**7 480**

6.8.2 Per capita consumption of fish

Table 6.24: Per capita consumption of fish (kg)

Per capita consumption of fish	
Year	Quantity
2003	18.7
2004	19.8
2005	18.8
2006	19.9
2007	18.3

Source: CSO

6.8.3 Trade balance in relation to total imports and exports

The import of fish and fish products and trade balance are given in table 6.25. In 2007 a positive trade balance of Rs 1 104.8 million was noted.

Table 6.25: 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*)
2003	62 323	2 560.1	48 719	3 178.4	618.3
2004	80 943	3 170.1	54 241	3 358.1	188.0
2005	104 830	4 265.7	67 249	4 842.1	580.9
2006	150 728	6 720.9	79 580	7 120.4	395.5
2007	129 085	7 068.0	86 170	8 172.8	1 104.8

Source: CSO
MR* – Million rupees

7 FISHERIES PLANNING

7.1 The Fisheries and Marine Resources Act

A new Fisheries and Marine Resources Act was passed in Parliament on 13 November and enacted on 26 December. It reinforces, amongst others, provisions for monitoring, control and surveillance such as implementation of international fisheries conservation and management measures, entry and exit of fishing vessels to and from the maritime zones, marking of fishing vessels, port access, use of photographic evidence and use of information from position fixing instruments in court proceedings. The penalty scales has also been increased to reflect current practices.

7.2 The Fisherman Investment Trust (FIT)

The Fisherman Investment Trust Act was proclaimed in January. A fishing quota of 1000 tonnes has been allocated to the FIT in areas of St Brandon and the banks. Pending the acquisition of fishing vessels, the FIT sold part of the quota to operators in the fishing industry in order to generate revenue.

7.3 Regional and International Cooperation

7.3.1 Fisheries Partnership Agreement (FPA)

The negotiations for a new Fisheries Partnership Agreement (FPA) and a new Protocol started in June. Negotiations will continue for conclusion of the FPA. The existing agreement expired in December.

7.3.2 Cooperation with Kuwait

The contract document for the feasibility study by the Kuwait Fund for Arabs Economic Development for the development of a longline fishery was awarded. A delegation would be in Mauritius in January 2008 for submission of an inception report.

7.3.3 Cooperation with Norway

An assessment team of the Centre for Development Cooperation in Fisheries of Norway visited Mauritius in September for the drafting of a project document defining assistance to be provided to Mauritius.

7.3.4 Cooperation with the Overseas Fisheries Cooperation Foundation of Japan

The project for the maintenance of equipment at the Albion Fisheries Research Centre (AFRC), Fisheries Training and Extension Centre (FiTEC) and the Agricultural Marketing Board (AMB) has been implemented in terms of supply, replacement and repairs of equipment donated by the Government of Japan. This has led to more efficient use of equipment and facilities. A delegation of the Overseas Fisheries Cooperation Foundation of Japan fielded another mission in November in relation with the rehabilitation of the fisheries facilities in Mauritius.

7.3.5 Cooperation with Greece

A sum of 611 072€ was received from the Hellenic Republic of Greece for the setting up of a fish auction market at the Trou Fanfaron Fishing Port where a commemorative plaque was unveiled to mark that event on 28 February.

7.4 Project appraisal

Five projects for the fishing of demersal and tuna fishes by private operators were examined and assessed. The projects were recommended for implementation.

8. FISHERIES PROTECTION SERVICE (FPS)

The key priorities of the FPS are to enforce the fisheries legislation, combat illegal fishing and monitor fishing activities to protect the fishery resources. FPS officers effect control and surveillance of lagoon and off-lagoon fishing, issue fishmonger licences, register and issue fishermen cards, register fishing boats, process applications and issue licences/permits for fishing gears, sensitise fishermen and members of the public and participate in search and rescue operations at sea whenever required.

8.1 Artisanal fishermen

As at end of December, the number of registered artisanal fishermen was 2 300, compared to 2 365 in 2006. During the year, 13 new fishermen were registered and 78 deregistered. Details of registered fishermen as per gear category are given in table 8.1.

Table 8.1: Details of registered fishermen

Fisheries Post	Net	Basket trap	Line	Basket trap /line/ harpoon	Total
Port Louis	0	2	52	55	**109**
Tombeau Bay	0	13	55	75	**143**
Trou aux Biches	4	1	90	102	**197**
Grand Gaube	31	16	62	189	**298**
Poudre d'Or	0	14	1	136	**151**
Poste la Fayette	18	4	0	78	**100**
Trou d'Eau Douce	18	10	31	65	**124**
G.R.S.E	0	2	4	90	**96**
Bambous Virieux	0	15	22	172	**209**
Mahebourg	31	16	44	240	**331**
Riambel	6	4	4	72	**86**
Baie du Cap	3	7	19	65	**94**
Case Noyale	10	7	6	106	**129**
La Preneuse	18	2	51	71	**142**
Pointe aux Sables	17	4	38	32	**91**
Total	**156**	**117**	**479**	**1 548**	**2 300**

8.2 Registration of boats

The number of registered boats at the end of December is shown in table 8.2. During the year, 102 new boats were registered, bringing the total to 5 051.

Table 8.2: Registration of boats

Fisheries Post	*AF	*PB	*B	*SC	*BG	Total
Port Louis	196	40	58	0	0	**294**
Tombeau Bay	150	0	260	0	0	**410**
Trou aux Biches	202	213	195	0	25	**635**
Grand Gaube	283	45	104	2	1	**435**
Poudre d'Or	164	102	69	32	0	**367**
Poste la Fayette	104	39	86	9	0	**238**
Trou d'Eau Douce	124	9	134	0	3	**270**
G.R.S.E	139	18	79	12	0	**248**
Bambous Virieux	194	42	25	0	0	**261**
Mahebourg	356	205	216	0	2	**779**
Riambel	31	2	5	0	0	**38**
Baie du Cap	81	27	24	0	1	**133**
Case Noyale	140	51	108	0	3	**302**
La Preneuse	128	159	72	0	17	**376**
Pointe aux Sables	86	71	108	0	0	**265**
Total	**2 378**	**1 023**	**1 543**	**55**	**52**	**5 051**

***AF** – Artisanal fishing, **PB** – Pleasure boat, **B** - Boats, **SC**- Sand carrier, **BG**- Big game*

8.3 Licences

The number of the different types of licences in the artisanal fishery is given in table 8.3

Table 8.3: Number of licences

Fisheries Post	Large net	Gill net	Fishmonger	Bait gear
Port Louis	0	0	162	0
Tombeau Bay	0	0	58	41
Trou aux Biches	1	0	64	25
Grand Gaube	4	0	78	5
Poudre d'Or	0	0	47	7
Poste la Fayette	2	0	29	6
Trou d'Eau Douce	1	1	24	20
G.R.S.E	0	0	31	6
Bambous Virieux	0	0	16	21
Mahebourg	3	2	150	54
Riambel	1	0	31	12
Baie du Cap	0	1	30	11
Case Noyale	1	0	37	8
La Preneuse	3	0	51	46
Pointe aux Sables	1	0	25	54
Total	17	4	833	316

8.4 Illegal fishing

Details of action taken against illegal fishing are given in table 8.4.

Table 8.4: Number of interventions

Year	Underwater fishing	Net fishing	Others	Length of illegal net seized (m)
2003	12	16	47	5 570
2004	8	14	13	697
2005	21	12	32	6 183
2006	105	146	83	12 033
2007	64	123	49	2 837

8.5 Allowances to artisanal fishermen

8.5.1 Bad weather allowance

The number of beneficiaries ranged from 1 935 to 2 260, while the rate for a bad weather day increased from Rs. 155 to Rs. 168. An amount of Rs. 47.3M was thus paid in 2007. Details are shown in table 8.5.

Table 8.5: Bad weather allowance

Year	No. of days	Rate (Rs)	Beneficiaries	Total (Rs)
2003	114	125 - 130	2 121 - 2 363	**32 809 255**
2004	118	130 - 135	2 012 - 2 111	**34 357 665**
2005	137	135 - 145	1 978 - 2 247	**41 597 895**
2006	zoning	145 - 155	1 054 - 2 257	**35 890 800**
2007	zoning	155 - 168	1 935 - 2 260	**47 380 770**

8.5.2 Closed season allowance

During the closed season when net fishing is prohibited, net fishermen are entitled to a daily allowance (Rs. 168). A total of Rs. 2.6M was paid and details are shown in table 8.6.

Table 8.6: Closed season allowance

Year	No. of days	Rate (Rs)	Beneficiaries	Total (Rs)
2003	123	125-130	179-184	**2 849 250**
2004	121	130-135	179	**2 815 670**
2005	122	135-145	161	**2 763 010**
2006	121	145-155	161-153	**2 852 125**
2007	112	155-168	153-146	**2 565 825**

8.5.3 Sick leave allowance

A registered fisherman is entitled to a sick leave allowance of Rs 168 per day when admitted to a hospital or clinic for 14 days. Such allowance paid is shown in table 8.7.

Table 8.7: Sick leave allowance

Year	Rate (Rs)	Beneficiaries	Total (Rs)
2003	125 - 130	4	**7 210**
2004	130 - 135	3	**5 670**
2005	135 - 145	6	**11 480**
2006	145 - 155	5	**9 870**
2007	155-168	5	**10 710**

8.6 Incentives to registered fishermen

8.6.1 Scholarships to children

The Fishermen Welfare Fund disbursed Rs 1.8M, as scholarship allowance to children of registered fishermen. Details are shown in table 8.8.

Table 8.8: Scholarship allowance

Education Level	Beneficiaries	Amount (Rs)
Post C.P.E (Form I to V)	229	1 030 500
Post S.C (Lower and upper six)	46	414 000
Post H.S.C (Degree and professional qualifications)	19	342 000
Vocational	3	11 250
Total	**297**	**1 797 750**

8.7 Buy-back scheme for nets

Implementation of the buy-back scheme for the reduction of the number of nets operating in the lagoon was continued. Four net fishermen gave up net fishing and were compensated accordingly. Details of payment effected are shown in table 8.9.

Table 8.9: Amount paid (Rs)

Year	Fishermen		Nets surrendered			Total
	Number	Amount	Large net	Gill net	Amount	
2003	2	100 000	0	0	0	**100 000**
2004	9	250 000	1	1	325 000	**575 000**
2005	2	140 000	0	0	0	**140 000**
2006	7	315 000	1	0	133 000	**448 000**
2007	4	245 000	0	0	0	**245 000**

8.8 Nesting of marine turtle at Gris Gris public beach

On Wednesday 31 October at about 19.15 hours one marine turtle came on the beach for nesting. Officers of the FPS kept watch on a 24-hour basis to prevent public interference at the nesting site until hatching.

9. MISCELLANEOUS

9.1 Visits

6 029 persons visited the Albion Fisheries Research Centre. The majority of the visitors were students from primary and secondary schools. Table 9.1 shows the number of visitors by type of institutions.

Table 9.1: Visits to AFRC

Institutions	Number of visitors
Primary Schools	2 787
Secondary Schools	1 178
Social organizations/welfare centres	1 480
Pre-primary schools	398
Government/Parastatal organizations	71
Other (tourists, private firms, UoM students)	60
Pre-vocational institutions	55
Total	**6 029**

9.2 Information Service

The Documentation Unit/Marine Information Centre continued to provide information and access to reference materials on fisheries, and the marine environment to students, stakeholders and the public in general.

9.3 New library holdings

180 publications (local and foreign) and ten CD-ROMs were received during the year. An acquisition list is produced on a monthly basis for circulation to staff.

9.4 Sales and distribution of publications

Sales of posters, charts, maps and books published by the Fisheries Division amounted to Rs. 41 635.

Annual reports for 2004 and 2005 were distributed to staff and to different ministries, organisations and libraries.

9.5 ODINAFRICA III

During the on-going third phase, five more countries joined the project. All the data and information centres which had been established were fully operational, including the Documentation Unit (AFRC). Cataloging was pursued by using the Inmagic DbTextworks software. A set of computer equipment was received from ODINAFRICA. The ultimate objective of the project is to make available material that cannot be obtained through the traditional printing process.

9.6 Reprint

Five hundred copies of each of the following publications were re-printed:

- Field Guide to Coastal Fishes of Mauritius
- Poster on Common Reef Fishes of Mauritius
- Poster on Commercial Fishes of Mauritius
- Poster on Toxic Fishes of Mauritius

9.7 Management of the Fisheries Division Website

The website of the Fisheries Division was updated.

9.8 Land-Based Oceanic Industry (LBOI)

In the context of the proposed LBOI, bathymetric surveys were carried out onboard RV Sphyrna II at potential sites in the Belle Mare and Flic en Flac regions. The objective of the survey was to acquire bathymetric data at the proposed sites with a view to defining the 1 000 m contours.

9.9 Aquatic Business Activities

In the wake of the recommendations of the Aquaculture Master Plan, draft legislation relating to Aquatic Business Activities was prepared by the Attorney General's Office. It was circulated amongst stakeholders and members of the public for comments and suggestions. The draft legislation was posted on the website of the Ministry for comments and subsequently six consultative meetings were held with stakeholders. A revised draft was then sent to the Attorney General's Office for vetting.

9.10 Workshops

A workshop in the context of the "Study to set up a system of data collection, processing, analysis and monitoring of the FAD fishery" was held in May to present the new system for data collection, processing and analysis of the FAD fishery.

A workshop in the context of the **"**Study on Fish Handling, Preservation and Marketing in Mauritius and Rodrigues" was held in June at the AFRC to disseminate information gathered during the study and to present the recommendations.

A workshop was organized by the National Productivity and Competitiveness Council (NPCC) on the strategy to be adopted by evaluating and proposing recommendations to improve the licensing system on 25 April.

The staff of the 'Competent Authority' was trained on EU fishery and aquaculture standards organized by the European Application of Technology and Services Consortium during a workshop held in Mauritius in May.

9.11 Training courses for officers of FPS

23 Principal Fisheries Protection Officers and 4 Senior Fisheries Protection Officers followed a course in prosecution matters at the Fisheries Training and Extension Centre. The course was dispensed by officers of the Attorney General's Office.
15 Senior Fisheries Protection Officers are following a 3-year part time Diploma course in "Fisheries Enabled Services" at the University of Technology, Mauritius.

9.12 In-house training courses

A training course in the context of the "Study to set up a system of data collection, processing, analysis and monitoring of the FAD fishery" was held in March at the FiTEC. The staff of the Ministry was trained to understand the new system and use the software developed for the system.

In the context of the "Study on Fish Handling, Preservation and Marketing in Mauritius and Rodrigues" a 2-day training programme was held in June to train institutional personnel for the implementation of quality guidelines and procedures including HACCP in fisheries.

A six-day in-house training course in outboard motors was held in January/February for six trainers of the FiTEC and two officers of the Fisheries Protection Service. The course was conducted by Mr. Kazuhiko Kozakai, instructor of Yamaha Service Training, Japan. The training course was organised by the OFCF of Japan within the project "The Rehabilitation of Fisheries Facilities for Fisheries Development in Mauritius"

Disappearance of crew members and fishermen

Sixteen crew members and fishermen on board "King Fish II" and "King Fish V" were reported missing at sea following cyclone "Gamede" in the vicinity of St Brandon on 26 February. The "King Fish II" was wrecked on the reef at St Brandon while the "King Fish V" was not traceable.