

Overview of the National Fisheries Situation with Emphasis on the Demersal Fisheries off the West Coast of Peninsular Malaysia

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Abstract

The marine fisheries sector in Malaysia contributes significantly to the national economy in terms of income, foreign exchange and employment. In 1999, marine fisheries contributed 1.245 million t (90% of total fish production) valued at US\$1.18 billion. The total value accounted for about 1.53% of national GDP and 11.31% of agricultural GDP. The export of fish and fishery products amounted to about US\$210 million. The sector provided employment to about 80 000 fishers.

Fisheries management is currently guided by the Third National Agricultural Policy (NAP3 1998 - 2010). The NAP3 aims to maintain the coastal fisheries production while increasing the production from deep-sea fisheries within Malaysia's Exclusive Economic Zone and the high-seas. Fisheries management of fisheries is centralized and is the primary responsibility of the Department of Fisheries. The key challenges identified for Malaysian fisheries are overfishing, excess fishing capacity and ensuring the well-being of coastal fishing communities. These are issues across the whole of Malaysia.

The West Coast of Peninsular Malaysia produces 44% (1997) of total marine landings and 86% of this came from commercial (large scale) vessels. The landings in 1997 exceeded the estimated MSY and the biomass of demersal species in the region has been severely reduced. A national consultative workshop identified the primary aims for this region to improve production and efficiency of the fisheries, equitable distribution of the benefits, resources sustainability and the viability of the fishing communities.

The workshop also identified key interventions needed. In terms of production and efficiency, overfishing and overcapacity must be addressed, including the illegal fishing. In terms of achieving greater equity, the workshop suggests greater involvement of small scale fishers in marketing of the catch. For resource sustainability, the serious decline in biomass must be addressed but there are also significant cross-sectoral issues. To achieve viable fishing communities, the workshop suggests the need for greater involvement and potentially a co-management approach for fisheries management.

Introduction

The fisheries sector is vitally important to Malaysia. Apart from contributing to the national Gross Domestic Product (GDP), it is also a source of employment, foreign exchange and protein (Department of Fisheries (DOF) 1995a, 1995b). In 1999, marine fisheries catch was 1 245 000 t (90% of total fish production) valued at RM5 billion (US\$1.18 billion). The catch value accounted for 1.53% of GDP and 11.31% of agricultural GDP. Demand for fish, which is the main source of protein, is expected to increase from an annual consumption of 630 000 t to 1 580 000 t by the year 2010 (Department of Fisheries (DOF) 1995b). The quantity and value of fishery exports increased from 163 453 t valued at RM295 million in 1985 to 107 622 t valued at RM939.58 million in 1997. However, imports of fish and fishery products also increased from 200 700 t valued at RM363.6 million in 1990 to 297 800 t valued at RM979.2 million in 1997. Malaysia is now a net importer of fish and fishery products in terms of both quantity and value. In terms of employment, the 80 000 persons employed in the fisheries sector in 1999 made up 1% of the national work force. The number of persons employed in the sector has steadily decreased by 2.2% per annum since 1985.

As demand for fish continues to increase, the task of managing fisheries resources on a sustainable

basis has become increasingly challenging. The threats of over-exploitation and the degradation of aquatic habitats have become serious problems. Some mangrove forests, which provide important breeding, nursery and feeding grounds for fish, prawns and a variety of invertebrates, have been cleared for development or affected by pollution or diversion of drainage water. Coastal areas are threatened by severe erosion along extensive parts of the coastline. Continued economic growth and industrialization are exerting considerable pressure on sensitive coastal ecosystems. Effluents from industrial and domestic discharges, land reclamation as well as illegal dumping and accidental spills contribute to degradation of water quality in the aquatic environment. Technological advancements and the growing needs of the population have drastically increased utilization of coastal resources. Large scale extraction of hydrocarbons, mining of coral reefs, intensive exploitation of fisheries, marine tourism and transportation often manifest in conflicts of interest that further endanger the resources (Ngoile and Horrill 1993). To ensure sustainable exploitation of fisheries resources in coastal areas, the country must address these issues by formulating sound and integrated management measures.

This paper provides an overview of the national fisheries situation, and then focuses on key management issues and directions for the West Coast

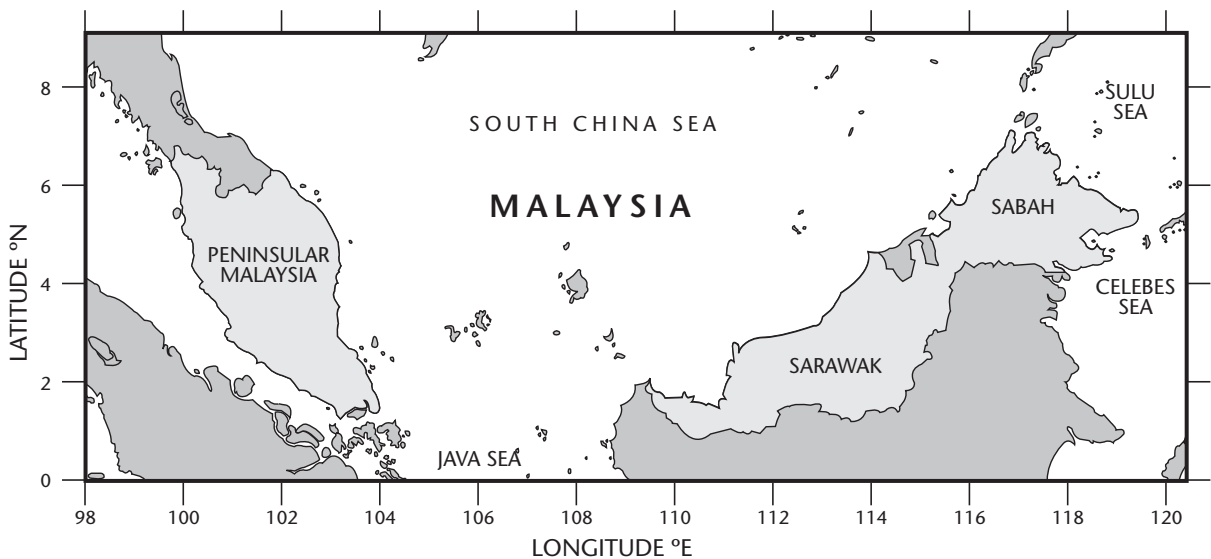


Fig. 1. Location map of Malaysia.

of Peninsular Malaysia (WCPM). The WCPM contributed about 44% or 515 400 t of total marine capture fisheries production in 1997. Total catch in this area consisted of 53% demersal fish, 29% pelagic fish, 13% prawn and 5% squid and cuttlefish. Commercial (large-scale) fishing landed 71% of this catch. Although the area has been known as the most productive in the country, assessments (see Abu Talib et al. paper no. 6) indicate a marked decrease in abundance of demersal fish. Hence, management efforts in the area must be given special attention if the benefits derived from its fisheries are to be maintained.

Environmental Setting

Malaysia is a confederation composed of the Malay Peninsula (or Peninsular Malaysia) at the southeastern tip of the Asian mainland and the States of Sabah and Sarawak in the northwestern part of Borneo Island (Fig. 1). It has a land area of 330 000 km² and a coastline of 4 675 km. The Malay Peninsula faces the Indian Ocean in the west and the South China Sea in the east. The state of Sarawak borders the South China Sea. Sabah borders the South China Sea, Sulu Sea and Celebes Sea. The waters off the West Coast of Peninsular Malaysia, with the most extensive mangrove area, are considered the main marine fishing ground.

Coastal waters (up to 200 m depth) of Malaysia have a surface area of 373 500 km², which includes territorial waters of 161 200 km² (up to 12 nm). Malaysia claims an Exclusive Economic Zone (EEZ) of 548 800 km², 29% of which is located off Sarawak State and 16% off Sabah State. The coastal waters represent about 69% of the EEZ.

Malaysian waters are divided into four areas: the West Coast and the East Coast of Peninsular Malaysia, the coast of Sarawak and the coast of Sabah. Located between latitude 1° 01' N and 6° 30' N and longitude 98° 01' E and 103° 30' E, the waters off the West Coast of Peninsular Malaysia (WCPM) form part of the Straits of Malacca. The maritime jurisdiction in this area can be divided into two: the territorial waters of about 56 450 km² and the overlapping Malaysia-Indonesia EEZ area of about 11 320 km². Off WCPM, depth seldom exceeds 120 m. The bottom gradually slopes downward from the coastline of east Sumatra and from the WCPM (Liong 1974). From the 30-m isobath near One Fathom Bank off Selangor, depth increases

northward to the Andaman Sea and southward to the South China Sea.

The East Coast of Peninsular Malaysia (ECPM) is located between latitude 1° 13' N to 7° 49' N and longitude 102° 07' E to 105° 49' E. The maritime jurisdiction in the area can be divided into two: territorial waters of about 35 900 km² and EEZ waters of about 99 750 km². The ECPM has a relatively flat sea bottom and a maximum water depth of about 80 m.

The coastal waters off Sarawak are located between latitude 1° 30' N to 7° 07' N and longitude 109° 38' E to 114° 05' E. The area is about 132 440 km², of which 19% is located in territorial waters. The continental shelf off Sarawak extends up to 220 nautical miles (nm) at its widest span north of Tanjong Po in the south, and its narrowest span is 30 nm north of Tanjong Baram in the north. Beyond the 200-m isobath in this area, depths drop to 1 000 m over a mean distance of 2.5 nm.

The coastal waters off Sabah are located between latitude 4° 50' N to 8° 24' N and longitude 112° 30' E to 117° 00' E. The area extends from the boundary of Brunei Darulssalam waters to Kudat on the northern tip of Sabah. From the coastline the area extends seaward to 30 nm, totaling 30 940 km². Most of the area is located within territorial waters.

Throughout the year, surface currents in the Straits of Malacca flow northwestward through the center of the Strait. During the northeast (NE) monsoon from October to April, the northwest current results from the south-going monsoon current in the South China Sea, which passes the extremity of the Malay Peninsula into the Strait. During the southwest (SW) monsoon from May to September, water flows westward in the Java Sea and northwestward through the Kalimantan Strait towards the South China Sea, then passes directly into the Malacca Strait (Hydrographic Department. Admiralty 1964). Current speeds may exceed 1 knot throughout the year in the Malacca Straits.

Surface currents in the South China Sea flow according to the monsoon-driven wind system. The southwesterly current of the northeast monsoon is stronger and more constant than the northeasterly current of the southwest monsoon (Hydrographer of the Navy 1975). The southwesterly flow of the northeast monsoon prevails from October to February, while currents reach their greatest speed and

constancy from December to January.

The northeasterly current of the southwest monsoon occurs in May after the transition period from March to April. The current attains its greatest speed and constancy from June to around August-September. During the monsoons, wind speeds fluctuate considerably due to variations in distribution of atmospheric pressure. The northeast monsoon winds are stronger and less liable to interference than the southwest monsoon winds. The direction of water movement in the eastern side of the South China Sea is largely controlled by eddies which occur in most months, and by the flow of water to or from the Sulu Sea and through the broad straits between Peninsular Malaysia and Borneo. Oceanographic and meteorological conditions within and outside the area control these features. The currents are generally weak with means of less than 0.5 knots in most areas. When monsoons are fully developed (July to August and December to February) the mean speeds increase from 0.5 to 1 knot. On rare occasions, currents may run up to 3 knots between Peninsular Malaysia and Borneo, and 4 knots in some of the passages linking the South China Sea to the Sulu Sea.

Data from trawl surveys show a gradual transition in bottom sediment type along WCPM from mud in the north to rocky and uneven ground in the south. Substrates in the central area are mixtures of mud and sand (Mohammed Shaari et al. 1974). Substrates off ECPM are suitable for trawling, with minor patches of hard and soft corals and mud-clay sediments (Pathansali et al. 1974). Bottom substrates in the continental shelf off Sarawak and the west coast of Sabah generally consist of sandy, mud, mud-sand and coral areas. About 22% of the shelf off Sarawak is composed of reefs and rough grounds, which include areas such as steep undulating grounds and rocky bottom. About 50% of the west coast of Sabah consists of rough ground, mostly due to the presence of reefs.

Sea surface temperature in the Straits of Malacca ranges from 26 to 27° C during the northeast monsoon and 28 to 30° C during the southwest monsoon (Chua et al. 1997). The warmer waters occur nearshore especially at the northern and southern region of the strait (Kassim and Nasir unpublished). During the northeast monsoon off WCPM, salinity ranges from 27 to 33.3 ppt on the surface and between 25.4 to 33.4 ppt at depths of 13 to 21 m. In the South China Sea off ECPM, sea surface tem-

perature during the northeast monsoon varies from 26 to 29° C. The off monsoon period brings water temperatures of 28° C to 30° C. Mean sea surface temperature during the SW monsoon ranges from 29° C to 32°C (Hamid 1989). Sea surface temperature off Sarawak and the West Coast of Sabah during the southwest monsoon ranges between 29° C to 30° C, with salinity varying from 33.8 to 34.0 ppt (Nasir et al. 1988).

In most cases, thermocline depth is between 20 to 50 m (Anon. 1987; Nasir et al. 1988). Water temperature above the thermocline typically ranges from 28° C to 30° C. No thermocline has been observed off the WCPM due to the relatively shallow water. Thermocline layers are present off the ECPM, both before and after the northeast monsoon. The thermocline depth is deeper before the northeast monsoon and becomes shallower after the northeast monsoon (Nasir et al. 1999).

Primary productivity in the South China Sea off the ECPM ranges from 0.29 - 0.47 g C·m⁻²·day⁻¹. It is higher near the surface and gradually decreases with depth (Musikasung et al. 1999a). The most dominant phytoplankton and zooplankton in this area are diatoms and copepods, respectively. Average concentration of chlorophyll a is 0.08 mg·m⁻³ on the surface and 0.21 mg·m⁻³ in the water column (Raihan and Ichikawa 1986). Off Sarawak and the west coast of Sabah, primary productivity varies between 0.13 - 0.88 g C·m⁻²·day⁻¹ in the coastal zone and 0.23 - 0.89 g C·m⁻²·day⁻¹ in the open sea (Musikasung et al. 1999b). Like the waters off ECPM, Sarawak waters exhibit low chlorophyll a values ranging between 0.0493 to 0.1505 mg·m⁻³ (Lokman et al. 1988).

Siltation has been a major problem in Malaysian coastal waters. Intensive land clearing, uncontrolled development, mining and logging in the catchments may be responsible for increased siltation. In addition, effluents from palm oil and rubber processing, which contain very high concentrations of organic material, suspended solids and nutrients (like nitrogen and phosphorus), may also end up in coastal waters.

In the WCPM, average concentration of orthophosphate during post NE monsoon at the surface water, thermocline layer and bottom water is 0.06, 0.32 and 0.72 µM, respectively. During the northeast monsoon, concentrations were 0.11, 0.17 and 0.26 µM, respectively (Tengku-Rozana in press).

Generally, the concentration of ortho-phosphate are higher in surface waters closer to rivers and ports. Total suspended solids concentration off WCPM ranged from 0.2 to 5.4 mg·l⁻¹ (in March) and from 0.5 to 18.2 mg·l⁻¹ (in November) (Ku-Kassim unpublished). Concentration of heavy metals were reported higher in the WCPM compared to other areas because of more extensive land use and industrialization. Almost all samples collected from the coastal waters of Malaysia had values exceeding proposed standards of 0.05 mg·l⁻¹ lead, 0.01 mg·l⁻¹ copper and 0.005 mg·l⁻¹ cadmium. However, analyses indicated that levels of heavy metals found in Malaysian fish and shellfish do not pose a major threat to public health (Shahunthala 1989).

In the South China Sea off the ECPM average concentration of ortho-phosphate in surface water, the thermocline layer and bottom water were 0.33, 0.33 and 0.36 µM respectively. For coastal waters off Sarawak and the west coast of Sabah, average concentration of ortho-phosphate in surface water, the thermocline layer and bottom water (up to 1000 m deep) were 0.50, 0.49 and 0.69 µM respectively (Tengku-Rozana unpublished). Total suspended solids concentration in the ECPM ranged between 0.1 to 10.0 mg·l⁻¹. The highest concentration of suspended solids was recorded near Pahang estuary in the south. The concentration decreased toward the northern region to almost zero. Concentration of suspended solids in Sarawak and Sabah waters ranged from 0.3 to 8.7 mg·l⁻¹. The highest concentration was in the outer area and the areas around Rajang estuary (Ku-Kassim unpublished).

Coral reefs are widespread off Peninsular Malaysia as well as Sabah and Sarawak. Along the WCPM, coral reefs are mainly found near the islands of Langkawi, Pangkor, and Sembilan and off the coast of Port Dickson. Off the ECPM, coral reefs are found around the islands off the coast of Terengganu (Redang, Perhentian and Tenggol islands) and Pahang/Johor (Tioman islands group). The more extensive coral reef areas are located off the north coast of Sabah and the Spratleys.

The biggest threat to coral reefs has been exploitation for commercial and tourism purposes, coupled with siltation and sedimentation caused by development projects (Liew and Hoare 1982). These have subjected corals to stress and leaching resulting in deterioration of coral reefs. Actions have

been taken to conserve and rehabilitate the country's coral reefs, including gazettement of areas as marine parks and fisheries protected areas. A marine park is a sea area zoned as sanctuary for protection of its marine ecosystems, especially coral reefs and associated fauna and flora. To date, waters surrounding 40 islands are grouped into five marine parks: Pulau Payar Marine Park in Kedah (comprising 4 islands); Pulau Redang Marine Park in Terengganu (11 islands); Pulau Tioman Marine Park in Pahang (9 islands); Mersing Marine Park in Johore (13 islands) and Labuan Marine Park in Labuan (3 islands). Activities that are harmful and destructive to the coral reef and marine ecosystem are prohibited under Fisheries Act 1995 (Section 43). Prohibited activities include fishing and killing of fish; spear-gun fishing; collecting corals, shells and other living marine organisms; collecting sand, dead corals and shells; littering and polluting; anchoring of boats directly on the reef; and constructing and erecting a structure without permission.

Malaysia has the fifth most extensive mangrove area in the world (World Resources Institute (WRI) 1996). About 446 000 ha of the 641 000 ha mangrove forests in the country are gazetted as forest reserves, with the remaining classified as state land forests (Chew 1996). Mangrove forests in Peninsular Malaysia have been estimated at around 103 000 ha mainly located off the sheltered West Coast (Tang et al. 1990). The major areas include the Larut Matang mangroves in the state of Perak (40 000 ha), the mangroves in Johor (25 618 ha), Kelang in Selangor (22 500 ha) and Merbok in Kedah (9 037 ha) (Choo et al. 1994). The Larut Matang mangrove area was reported to be the largest in Peninsular Malaysia and the best managed in the world (Gong et al. 1980). The area has been sustainably managed for timber since the 1920s. Along the ECPM, mangroves are found in small patches within sheltered estuaries of rivers (Chan et al. 1992). More than half of the mangrove forests in Malaysia are found in eastern Sabah. In Sarawak, mangrove forests are distributed along the northern and southwestern coasts. The mangrove forest is an important ecosystem that plays a vital role in the socioeconomic well-being of coastal communities. The main threat to mangroves in Malaysia stem from land conversion for agriculture, industry and aquaculture.

Thirteen species of seagrass have been recorded in Malaysia (Japar 1995; Kushairi 1992). The species are *Halophila beccarii*, *H. decipiens*, *H. ovalis*, *H. minor*,

H. spinulosa, *Enhalus acoroides*, *Thalassia hemprichii*, *Cymodocea rotundota*, *C. serrulata*, *Halodule pinifolia*, *H. univernis*, *Syringodium isoetifolium* and *Ruppia maritime*. Seagrasses are found in shallow waters between 0.2 and 1.8 m in the Straits of Malacca and off the coasts of Sarawak and Sabah. Threats to seagrasses include land conversion, sand mining, unsustainable marine aquaculture, reclamation, sedimentation, fecal contamination and heavy metal pollution (Kushairi 1992; Phang 1990).

In the ECPM, macrobenthos density decreases with increasing depth (Piamthipmanus 1999a). Macrobenthos, which include polychaetes, crustaceans and echinoderms, show marked changes in density during pre- and post-monsoon periods. Greater density occurs during the pre-monsoon period at an average of 67.6 individuals·m⁻², compared to only 16.8 individuals·m⁻² during the post-monsoon period (Abdul-Hamid and Solahuddin 1999). Average macrobenthos density in Sarawak and Sabah is 100 individuals·m⁻² during the southwest monsoon and 167 individuals·m⁻² during the transition period between northeast and southwest monsoon (Piamthipmanus 1999b).

According to the 1995 river water quality survey, of Malaysia's 119 rivers and tributaries, 48 were "clean", 53 were "slightly polluted" and 14 were "polluted" (Department of Environment 1996). This is based on five parameters - biochemical oxygen demand, chemical oxygen demand, ammoniacal nitrogen (NH₃-N), suspended solids and pH. The main contributors to river pollution were silt due to soil erosion, and organic pollution or nutrients due to sewage and animal wastes.

Fisheries Resources and Potentials

In 1997, total marine landings were recorded at nearly 1 169 000 t (Table 1). Most of these landings came from the WCPM (44%) and the ECPM (28%). Sabah (including Labuan) and Sarawak contributed 17% and 11% of the landings respectively. In the WCPM, the commercial or large-scale fisheries contributed 71% of landings (Table 2). The landings consisted of 53% demersal fish, 29% pelagic fish, 5% squid and 13% prawn. Commercial fisheries contributed 86% of the landings in the ECPM. Landings in this area were 46% demersal fish, 45% pelagic fish, 7% squids and 2% prawns. In Sarawak, 59% of landings was contributed by traditional or small-scale fisheries. Pelagic fish constituted about 48% of the total, followed by demersal fish at 39% and prawn at 9%. Commercial and traditional fisheries are almost equally important in terms of landings in Sabah. Commercial fisheries contributed about 56% of the landings. Demersal fish made up about 47% of landings in Sabah. Pelagic fish and prawn contributed about 43% and 4%, respectively, of the landings in this area. The commercial fisheries involve three main types of gear-the trawl, fish purse seine and anchovy purse-seine. The traditional fisheries includes shellfish collection and fishing with the use of other seines, drift gillnets, traps, hooks and lines, bag nets, barrier nets and push nets.

Landings have stabilized in inshore areas within 30 nm from the shoreline in the west and east coast of Peninsular Malaysia, and in inshore areas within 12 nm of the coastline in Sarawak and the west coast of Sabah. It is believed that yield has already

Table 1. Marine landings (t) in Malaysia by area and resource group in 1997.

Area	Landings (t)				
	Demersal	Pelagic	Prawn	Squid	Total
Peninsular:					
West coast	270 959	151 757	64 722	27 991	515 429
East coast	149 161	146 162	5 431	21 391	322 145
Sarawak	50 329	64 890	11 054	1 920	128 193
Sabah and Labuan	95 730	87 402	11 024	9 050	203 206
TOTAL	566 179	450 211	92 231	60 352	1 168 973

Source: Annual Fisheries Statistics 1965 - 97.

Table 2. Marine landings by area and fishing type in 1997.

Type of Fishing	Landings (t)								Total
	West coast		East coast		Sarawak		Sabah and Labuan		
	t	%	t	%	t	%	t	%	
Commercial									
Trawl	307 277	59.6	160 705	49.9	50 730	39.6	78 047	38.4	596 759
Purse-seine	58 152	11.3	114 962	35.7	25 115	19.6	38 860	19.1	237 089
Sub-Total	365 429	70.9	275 667	85.6	75 845	59.2	116 907	57.5	833 848
Traditional	150 000	29.1	46 478	14.4	52 348	40.8	86 299	42.5	335 125
TOTAL	515 429	100.0	322 145	100.0	128 193	100.0	203 206	100.0	1 168 973

Source: Annual Fisheries Statistics 1965 - 97.

reached (if not exceeded) the resource potential in these areas. Further increases in production to meet projected increases in local demand may now be based only on offshore fishing and mariculture. Reassessment of the sustainability of these possibilities needs attention while sustainable exploitation of fisheries resources in inshore waters is given increased emphasis.

Demersal

In the WCPM, demersal fish resources are caught mainly by otterboard trawlers, drift gillnets and push nets. In 1997, there were 3 107 licensed trawlers and 4 licensed push nets, down from 3 331 trawlers and 41 push nets in 1989. Landings of demersal fishes in this area peaked at about 294 900 t in 1990, declined to about 239 000 t in 1991 and increased steadily to about 315 700 t in 1997 (Table 3). Demersal fish stock density obtained from trawl surveys show that inshore resources have been over-exploited (Table 4). The start of offshore fishing in 1986/87 following declaration of the EEZ resulted in increased landings, which stabilized again in the mid-nineties. The first demersal survey conducted in 1987 beyond 30 nm from the coastline indicated a potential yield of 11 300 t of demersals (Table 5). Since then, a total of 154 offshore (deep-sea) fishing vessels have been licensed to fish in the area. The latest survey in 1997 indicated a 67% reduction in abundance of demersal fish from 1.19 t·km⁻² in 1987 to 0.39 t·km⁻² (Table 4). The potential yield for the offshore area is much lower than the land-

ings for 1997 (Table 5 and 6). Exploitation rates of 15 dominant demersal fishes in the area was above 0.60 (Abu Talib et al. paper no.6). Further, analysis of catch and effort data since 1971 indicates an

MSY of 273 000 t, compared to the 1997 demersal landings of 315 700 t. These indicate that the demersal resources in the area are overfished. Changes in species composition were also observed from both onboard and fish landing surveys. Squid has emerged as the most dominant species. Landings of squid increased steadily from 9 000 t in 1980 to 27 991 t in 1997 (Table 7).

In the ECPM, otterboard trawling is the main gear exploiting demersal resources. In 1997, there were 874 licensed trawlers, which is only about one-third of the number for the west coast. The number of licensed trawlers had decreased from 1 535 units recorded in 1982. The decreasing trend is also observed in landings, from about 198 300 t in 1990 to only about 170 300 t in 1997 (Table 3). In the early 1970s, the MSY of coastal stocks was estimated at around 90 000 to 150 000 t (Latiff 1976; Pathansali 1976). In the early 1980s, the MSY was revised to around 50 000 to 80 000 t (Abu-Talib and Hayase 1984) (Ibrahim unpublished). The first offshore demersal survey conducted in 1986 beyond 25 nm from the coastline revealed a potential yield of 82 200 t of demersals (Table 5). Presently, 223 offshore (deep-sea) trawlers have been licensed to fish in the area. The latest survey conducted in 1997, indicated more than 83% reduction in abundance of demersal

Table 3. Landings of demersal fish (t) by area during the period 1971 - 97.

Year	Peninsular Malaysia		Sarawak
	West coast	East coast	
1971	86 514	30 534	7 126
1972	100 405	26 418	9 132
1973	127 351	39 158	24 483
1974	150 342	52 019	29 726
1975	135 944	39 540	41 134
1976	152 597	54 099	46 396
1977	180 007	44 133	46 870
1978	181 658	53 336	47 392
1979	180 813	50 727	52 487
1980	168 873	43 457	46 256
1981	187 661	63 061	37 315
1982	192 449	52 480	38 749
1983	208 168	56 736	37 138
1984	185 298	51 399	29 880
1985	215 500	50 069	29 778
1986	261 212	70 693	39 248
1987	279 749	87 892	31 072
1988	235 168	136 269	34 796
1989	271 876	147 691	40 092
1990	294 931	198 307	36 943
1991	239 023	183 962	46 669
1992	263 985	175 980	45 212
1993	258 878	198 084	43 078
1994	257 318	192 702	58 460
1995	278 976	178 109	66 790
1996	304 668	169 660	56 053
1997	315 716	170 261	52 902

Source: Annual Fisheries Statistics 1965 - 97.

Table 4. Changes in demersal stock density (t·km⁻²) in the northern part of the West Coast of Peninsular Malaysia obtained during trawl surveys conducted in various years. (Talib et al. this vol.)

Year	Stock Density (Langkawi - Pangkor)	
	≤ 55 m deep (t·km ⁻²)	> 55 m deep (t·km ⁻²)
1971	2.45	–
1981	1.34	–
1987	0.87	1.19
1991	0.45	0.84
1997	0.27	0.39

fishes in all four sub-areas both inshore (≤ 55 m depth) and offshore (> 55 m) (Table 8). Exploitation rates of 28 dominant demersals have a mean of 0.58 (Mahyam et al. unpublished). Threadfin bream was previously found to be overexploited by as much as 30% (Kimoto and Ibrahim 1996). This fish is commonly found in coastal waters and is dominant in the catches of trawlers. These findings show that the demersal resources in the ECPM have been exploited beyond sustainable levels. Data from surveys indicate changes in dominant species and the disappearance of jewfish (Sciaenidae). As observed in the west coast, squids became the most dominant, replacing threadfin breams during the 1990s.

As in the WCPM, otterboard trawlers and push nets are the main types of fishing gear exploiting demersal resources in Sarawak waters. In 1997, the number of licensed trawlers and push nets were 579 and 24 respectively, having decreased from 1 010 licensed trawlers and 104 licensed push nets in 1989. Landings fluctuated between 40 000 and 66 790 t between 1991 and 1997 (Table 3). Landings in 1997 was 52 900 t, 60% of which came from the inshore area. Assessments indicate that there is substantive overfishing of coastal demersal stocks in Sarawak waters (see Table 9 and Abu Talib et al. paper no. 6) The first demersal survey conducted in 1986 in the EEZ beyond territorial waters gave a potential yield estimate of 62 300 t (Table 5). Presently, 88 offshore (deep-sea) trawlers have been licensed to fish in the area. The latest

Table 5. Estimates of potential yield and 1997 landings for the various offshore areas.

Area	Potential Yield ^a (t·year ⁻¹)				Offshore > 30nm, 1997 Landings (t)
	Demersal	Pelagic	Tuna	Total	Total
West Coast of P. M. (> 30nm)	11 300	16 650	–	28 250	29 901
East Coast of P. M. (> 25nm)	82 200	54 600	50 000	186 800	64 007
Sarawak (> 12 nm(D)), (> 30nm(P))	62 300	81 550	–	143 850	21 000
TOTAL	155 800	152 800	50 000	358 900	114 908

Note: ^a estimated from demersal fish and acoustic surveys in 1986 - 87.

D - Demersal; P - Pelagic.

Table 6. Estimates of potential yield and 1997 landings for the offshore area beyond 12 nm from the shoreline.

Area	Potential Yield ^a (t·year ⁻¹)			Offshore > 12nm, 1997 landings (t)
	Demersal	Pelagic	Total	Total
West coast of P. M. (> 12nm)	62 000	129 945	191 945	370 000
East coast of P. M. (> 12nm)	55 500	222 019	277 519	273 000
Sarawak (> 12 nm)	86 983	456 940	543 923	32 000
TOTAL	204 483	808 904	1 013 387	675 000

Note: ^a estimated from demersal fish and acoustic surveys in 1997 - 98.

Table 7. Landings (t) of squid and cuttlefish off the West Coast of Peninsular Malaysia

Year	Landings (t)
1980	8 923
1985	8 134
1990	20 397
1995	21 824
1997	27 991

Source: Annual Fisheries Statistics 1965 - 97.

survey conducted in 1998 indicated only slight changes in the density of demersal fish in the offshore area (Table 9). The estimated potential yield obtained in this study came to about 87 000 t. In 1997, the estimated landing of demersal fish from the offshore area was only 20 000 t. One of the predominant fish families in the area was Monacanthidae, which inhabits areas near the continental shelf. Changes in dominant species were also observed since the first offshore survey in 1986. Some high quality fish like snappers (*Lutjanus* spp.), grunter (*Pomadasys* spp.) and sharp tooth jobfish (*Pristipomoides* spp.) were no longer dominant.

Table 8. Changes in demersal stock density (t·km⁻²) off the East Coast of Peninsular Malaysia obtained during trawl surveys conducted in various years.

Year	Kelantan		Terengganu		Pahang		East Johore	
	≤ 55 m (t·km ⁻²)	> 55 m (t·km ⁻²)	≤ 55 m (t·km ⁻²)	> 55 m (t·km ⁻²)	≤ 55 m (t·km ⁻²)	> 55 m (t·km ⁻²)	≤ 55 m (t·km ⁻²)	> 55 m (t·km ⁻²)
1967	4.78	–	5.76	–	7.61	–	2.69	–
1972	5.68	–	6.78	–	4.07	–	3.64	–
1981	2.17	–	2.42	–	6.78	–	2.29	–
1986	1.34	1.93	–	1.89	2.16	1.71	–	2.29
1991	0.66	–	1.16	–	0.91	–	4.01	–
1998	0.26	0.33	0.33	0.17	0.26	0.09	0.07	0.09

Table 9. Changes in demersal stock density (t·km⁻²) in Sarawak waters obtained during trawl surveys conducted in various years.

Year	Sub-area I (Tg. Dato -Tg. Sirik)		Sub-area II (Tg. Sirik-Tg. Kidurong)		Sub-area III (Tg. Kidurong-K. Batam)	
	≤ 55 m	> 55 m	≤ 55 m	> 55 m	≤ 55 m	> 55 m
1972	3.69	–	2.39	–	7.49	–
1981	3.39	–	5.90	–	8.10	–
1986	1.29	1.24	1.90	1.28	1.18	0.53
1989/91/92	0.84	1.85	1.44	1.59	1.91	1.57
1998	0.45	0.85	0.76	1.54	1.85	1.07

Small Pelagic

Six main groups comprise the landings of small pelagic fishes in the WCPM, namely: mackerels (*Rastrelliger*), scads (*Atule* spp., *Alepes* spp., *Selar* spp), roundscads (*Decapterus* spp.), sardines (*Sardinella* spp., *Dussumieria* spp.), hardtails (*Megalaspis cordyla*), and small tunas (mainly *Euthynnus affinis*, *Auxis thazard* and *Thunnus tonggol*) (Chee 2000). These groups are fished mainly by purse seines. Other groups of small pelagic fish are pomfrets (*Pampus* spp. and *Formio* spp.), spanish mackerels (*Scromberomorus* spp.), threadfins (*Eleutheronema* spp.), wolfherrings (*Chirocentrus* spp.) and queen fishes (*Scomberoides* spp.). Trawls and drift nets mainly catch these groups of fish. The number of units in operation for both trawls and purse seines have decreased steadily since 1985. However, drift nets increased from 8 430 units in

1986 to 10 729 units in 1999. There is a substantial catch of anchovies (*Stolephorus* spp.) near to islands by anchovy purse seiners. In 1997, there were 13 092 t of anchovies landed by 60 anchovy purse seiners from this area. Acoustic surveys in 1986 in the area beyond 12 nm gave a potential yield estimate of about 26 000 t of small pelagics. Of these, 60% inhabit offshore areas beyond 30 nm from the coastline (Table 5). The latest acoustic survey in 1997 gives a higher small pelagic potential yield of 130 000 t (Table 6). The 135 000 t landing of small pelagic fishes in 1997 indicates that the resource is over-exploited. This is plausible since the pelagic fisheries in the WCPM is the most developed in the country.

Small pelagic fish resources off Sarawak and the ECPM beyond 12 nm from the coastline have a potential yield of about 679 000 t (Table 6). About

33% of this are found in the ECPM. Among the major groups are round scads, scads, mackerels, hardtail scads and sardines. Most of the small pelagic species in this area have two spawning peaks, one each during the post- and pre-monsoon period (Mansor et al. 1996). The 1997 small pelagic catch beyond 12 nm in the ECPM was 146 983 t. The estimated potential was 222 000 t (Table 6) indicating some scope for expansion. A potential yield of 457 000 t of small pelagic fish was estimated for Sarawak. Landings in 1997 were only around 15 000 t indicating substantive scope for expansion. However, the scattered nature of the resource and distance from markets probably restricts exploitation. Among the main groups fished in the area are Ariommatidae (*Ariomma* spp.), round scads, hardtail, scads, Caesioididae (*Caesio* spp., *Pterocaesio* spp.), sardines and mackerels.

Prawn

The WCPM and Sarawak are the main fishing grounds for prawn. Analysis of catch and effort data in the WCPM give a potential yield of about 70 400 t at standard effort of about 64 600 units. Landings in 1996 were about 65 000 t using 102 600 standard units of effort, indicating that the resource had already been over-exploited. The main species of prawns in this area are from the genera *Penaeus*, *Metapenaeus*, *Metapenaepsis*,

Parapenaepsis, *Trachypenaeus* and *Solenocera*. Prawns in Sarawak waters have also been over-exploited. Current landings of about 11 000 t are more than double the estimated potential yield of 5 000 t for the area.

Tuna

A relatively new fishery in Malaysia is that for oceanic tuna. Tunas such as skipjack, kawakawa, frigate and yellowfin are found in deeper waters off the Sarawak and Sabah coast. With the expansion of maritime jurisdiction, tuna stocks are seen as an important resource to be exploited. In 1984, Malaysian and Thai fishers operating in the Gulf of Thailand and off the ECPM landed an estimated 84 000 t of tuna. The dominant species in this catch was longtail tuna. The potential yield of tuna from the ECPM was estimated at about 50 000 t (Table 5).

Squid, Cuttlefish and Jellyfish

As traditional fisheries resources are being fully exploited, 'new' fisheries targeting squid, cuttlefish and jellyfish have emerged. Landings of squid and cuttlefish in Peninsular Malaysia contributed 5% to 7% of marine landings in 1997 (Table 1). In Sarawak, jellyfish landings totaled 49 665 t.

Table 10. Number of fishers by ethnic group working on licensed fishing vessels in Malaysia.

Ethnic Group	Number of fishers				
	West coast	East coast	Sarawak	Sabah & Labuan	Total
Bumiputras	12 207	15 250	6 642	15 284	49 383
Chinese	15 033	2 100	813	191	18 137
Indians	235	1	-	-	236
Portuguese	54	-	-	-	54
Thais	2 470	3 087	-	35	5 592
Indonesians	52	3	-	10	65
Others	207	36	8	5 271	5 522
TOTAL	30 258	20 477	7 463	20 791	78 989

Source: Annual Fisheries Statistics 1965 - 97.

Socioeconomic and Development Background

The multiracial population of Malaysia consists of 55% Bumiputras (Malays and other indigenous people), 34% Chinese and 11% Indians and other groups. The population of 17.8 million in 1990 increased to slightly more than 20 million in 1995. By the year 2010 the population is expected to be around 28 million. The real annual population growth rate for Peninsular Malaysia was estimated at 7.8% in 1970 and 9.8% in 1990 (Government of

Malaysia (GOM) 1999). About 83% of the population reside in Peninsular Malaysia, which had a 1997 population density of 101.0 persons·km⁻². Sarawak had only 12.2 persons·km⁻² and Sabah had 17.2 persons·km⁻². Peninsular Malaysia consists of 11 states and a Federal Territory that can be divided into two economic regions, the west coast and the east coast. The majority of manufacturing industries, plantations, tin reserves and population are concentrated in the west coast states. The east coast states are sparsely populated and relatively less developed.

Table 11. Number of fishers by ethnic group working on licensed fishing vessels in Peninsular Malaysia during the period 1977 - 97.

Year	Number of fishers				
	Malays	Chinese	Indians	Others	Total
1977	44 373	30 131	541	600	75 645
1978	51 265	30 980	637	812	83 694
1979	50 816	30 232	528	1 259	82 929
1980	55 008	31 802	410	1 752	88 972
1981	54 538	30 084	609	1 694	86 925
1982	49 232	28 306	739	1 960	80 237
1983	47 322	25 238	534	2 496	75 590
1984	48 616	25 077	564	2 111	76 368
1985	42 620	23 532	471	2 907	69 530
1986	34 269	21 357	448	3 378	59 452
1987	33 815	21 634	394	4 726	60 569
1988	32 386	21 367	409	4 121	58 283
1989	35 907	22 443	454	3 776	62 580
1990	34 719	21 364	471	3 247	59 801
1991	35 609	21 385	448	3 867	61 309
1992	35 279	21 094	440	3 597	60 410
1993	28 607	18 466	245	6 569	53 887
1994	27 499	17 984	249	6 463	52 195
1995	30 440	17 976	239	6 347	55 002
1996	28 418	17 010	206	6 676	52 310
1997	27 457	17 133	236	5 909	50 735

Source: Annual Fisheries Statistics 1965 - 97.

In 1997, there were 78 989 people working in licensed fishing vessels, a figure representing slightly more than 1% of total employment in the country. The breakdown of fishers by ethnic group is given in Table 10. On the west coast, nearly 50% of the 30 258 fishers are ethnic Chinese. Bumiputras and Thais make up 40% and 8%, respectively. Over 75% of fishers in the ECPM, Sarawak and Sabah are Bumiputras. The number of fishers in Malaysia decreased at a rate of 2.2% per annum from 102 900 in 1985 to 82 200 in 1995 (Table 11). In Peninsular Malaysia, the rate of decrease was slightly higher at 2.4% per annum from 88 972 fishers in 1980 to 50 735 fishers in 1997. The reduction was more than 50% for all ethnic groups except the “others” group, which represents foreign fishers. For the “others” group, the number of fishers increased three-fold. In 1997, 8 437 foreign crews were permitted to work in local fishing vessels, mostly comprising Thais (97.5%) and Indonesians (0.7%).

The reduction in number of fishers is consistent with Government policy to ensure sustainable fishing particularly in inshore waters and improve the catch for the remaining fishers. It is reported that 44.7% of the 40 500 fishing households in Peninsular Malaysia lived below subsistence level in 1983 (Government of Malaysia (GOM) 1984). The venture into offshore fishing after EEZ declaration in 1985 changed the composition of fishing vessels (Table 12). Non-powered boats that made up 45% of the total in 1965 were reduced to only 2% in 1997. The ECPM with an extensive EEZ has a higher composition of inboard powered vessels (71%) as compared to the east coast (55%) (Table 13). About 58% of the fishers in the ECPM were involved in commercial fisheries, 10% more than the number in the WCPM (Table 14). As a whole, more than half (52%) of the fishers in Peninsular Malaysia were involved in commercial fishing. The state of Johore has the highest number of fishers at 9 340, followed by Terengganu and Perak at 8 378 and 7 190 respectively.

Table 12. Changes in composition of licensed fishing vessels in Peninsular Malaysia between 1965 and 1997 .

Vessel type	1965		1985		1990		1997	
	Number	%	Number	%	Number	%	Number	%
Non-powered boats	10 182	45	1 296	6	779	3	393	2
Outboard-powered boats	3 908	18	6 751	29	7 029	30	7 875	39
Inboard-powered boats	8 374	37	15 324	65	15 326	67	12 097	59
TOTAL	22 464	100	23 371	100	23 134	100	20 365	100

Source: Annual Fisheries Statistics 1965 - 97.

Table 13. Composition of licensed fishing vessels in Peninsular Malaysia in 1997.

Vessel type	West Coast		East Coast	
	Number	%	Number	%
Non-powered boats	352	2	41	1
Outboard-powered boats	6 194	43	1 681	28
Inboard powered boats	7 823	55	4 271	71
TOTAL	14 372	100	5 993	100

Source: Annual Fisheries Statistics 1965 - 97.

Table 14. Number of fishers by fishing type in Peninsular Malaysia in 1997.

Area	Number of fishers		
	Commercial	Traditional	Total
West coast	14 700	15 558	30 258
East coast	11 875	8 602	20 477
Peninsular Malaysia	26 575	24 160	50 735

Source: Annual Fisheries Statistics 1965 - 97.

In 1995, Malaysia was a net importer of fish in terms of quantity but a net exporter in value terms due to the high value of its fish and fishery product exports. However, the net foreign exchange earnings has declined recently due to increased importation of low-grade fish and the fast increase in import prices. Imports increased from 200 700 t valued at RM363.6 million¹ in 1990 to 260 570 t valued at RM828.4 million in 1995. During the same period exports increased from 145 400 t valued at RM606.1 million to 247 840 t valued at RM892.2 million. Since 1996, however, Malaysia has become a net importer of fish in terms of both quantity and value. In 1997, Malaysia exported about 107 620 t valued at about RM939.6 million and imported 297 780 t valued at RM979.2 million (Table 15).

Average income for commercial and traditional fishers in Peninsular Malaysia in 1995 was RM1 121 and RM715 respectively. In the WCPM, 87% of income came from fishing activities and the balance was from additional activities such as aquaculture, fish processing, farming, animal husbandry and tourism. In the ECPM, only 81% of the income came from fishing. In general, fishers in the WCPM obtained higher fishing incomes for both commercial RM1 110 and traditional RM642 fishers compared to those in the ECPM. The WCPM fishers also received higher additional income than those in the ECPM (Table 16).

In 1997 the fishing industry directly employed about 79 616 fishers or about 1% of the total labour force in the country. The contribution of fisheries to national employment decreased continuously from 2.4% in 1970 to 2.3% in 1980 and 1.9% in 1990. However, if indirect employment in fishery-related activities, such as handling, processing and distribution are included, the figure could be much

higher. (Clad 1984) estimated that employment in fisheries and related activities was around 4.3 % of the economically active population.

Based on a survey conducted by the Fisheries Development Authority (FDA) in 1995 that covered 45% of fishers in Peninsular Malaysia, about 63% of fishers in both commercial and traditional fishing received only up to primary education (Table 17). About 8% and 12% of fishers in commercial and traditional fishing, respectively, did not receive any form of formal schooling. The percentage of fishers who received up to lower secondary education was about 27% in commercial fishing and 20% in traditional fishing. Hardly 1% of fishers in both sectors attended higher secondary or tertiary education.

About 71% of the 24 949 fishers sampled in Peninsular Malaysia in 1995 were married (Table 18). The percentage of married fishers was higher for traditional fishers (80%) than for commercial fishers (57%). This was mainly due to age, which was generally higher for traditional fishers compared to commercial fishers. The average size of the traditional fishing household (5.61 persons) was almost the same as that of the commercial fishing household (5.59 persons) (Table 19). The size of a fishing household was generally larger than the national average of 4.8 persons per household (Department of Statistics, 1991). On the average, traditional and commercial fishing households on the west coast were smaller than those on the east coast. The ratio of non-working to working members was higher in the commercial fishing household (1.9 : 1) as compared to the traditional fishing household (1.5 : 1) (Table 20). The non-working members in the family comprised mainly children below 18 years of age, spouses of fishers and their aged parents or relatives.

¹ 1 US\$ = RM2.70455 (1990)

Table 15. Import and export of fish and fishery products by Malaysia for various years.

Activity	1990		1995		1996		1997	
	Quantity ('000 t)	Value (RM mil.)	Quantity ('000 t)	Value (RM mil.)	Quantity ('000 t)	Value (RM mil.)	Quantity ('000 t)	Value (RM mil.)
Export	145.40	606.10	247.84	892.22	134.94	826.92	107.62	939.58
Import	200.70	363.60	260.57	828.43	299.92	887.53	297.78	979.23

Source: Annual Fisheries Statistics 1965 - 97.

Table 16. Monthly income (RM) for commercial and traditional fishers in Peninsular Malaysia during 1995.

	Commercial			Total	Traditional		Total
	Fishing	Others*			Fishing	Others*	
West coast	1 110	159	1 269	642	139	781	
East coast	846	131	977	451	118	569	
Peninsular Malaysia	976	145	1 121	583	132	715	

Source: FDA Survey 1995.

* Others: Unskilled labour in Aquaculture, Fishing processing, Farming, Animal husbandry and Tourism.

Table 17. Distribution (%) of fishers by educational levels in Peninsular Malaysia in 1995.

	Commercial					Traditional				
	No Formal	Primary	Lower Secondary	Higher Secondary	Tertiary	No Formal	Primary	Lower Secondary	Higher Secondary	Tertiary
West coast	6	69	24	0.3	0.04	9	69	21	0.4	0.06
East coast	10	58	31	1	0.3	18	63	18	0.5	0
Peninsular Malaysia	8	63	27	0.6	0.2	12	67	20	0.5	0.0

Source: refer FDA Survey 1995.

Table 18. Marital status of fishers by type of fishing in Peninsular Malaysia in 1995 (in %).

	Commercial				Traditional			
	Married	Divorced	Single	Total	Married	Divorced	Single	Total
West Coast	51.4	0.9	47.7	100	80.2	1.8	18.0	100
East Coast	62.4	1.3	36.3	100	79.8	2.6	17.6	100
Peninsular Malaysia	57.0	1.1	41.9	100	80.0	2.0	18.0	100

Source: FDA Survey 1995.

Table 19. Average size of fishing household by type of fishing in Peninsular Malaysia in 1995 (in %).

	Commercial		Traditional	
	No. in household	Average size	No. in household	Average size
West coast	1 762	5.33	8 649	5.48
East coast	1 795	5.84	3 918	5.92
Peninsular Malaysia	3 557	5.59	12 567	5.61

Source: FDA Survey 1995.

Table 20. Dependency ratio of fishing household by type of fishing in Peninsular Malaysia in 1995.

	Commercial	Traditional
West coast	1.7	1.5
East coast	2.1	1.7
Peninsular Malaysia	1.9	1.5

Source: FDA Survey 1995.

In Malaysia, fishers are encouraged to market their catch directly or via middlemen at government-provided landing ports. These ports centralize fish landings, provide efficient facilities such as loading/unloading machineries and cold-rooms, and facilitate the gathering of catch statistics. More and more of the fish trade is now being handled by fishers' associations, which are well supported by the Malaysian Fisheries Development Authority (FDA), a government organization mandated for fisheries marketing in the country. The FDA controls all major fish ports/harbors in the country.

Fish and fish products will continue to form the essential dietary component of Malaysians. From the early 1960s to mid-1980s, fish formed about 60% of the total animal protein consumed in the country (Table 21), a rate much higher than in other Asian countries (Josupeit 1981). During 1960 to 1989, the mean per capita consumption of fish was about 23 kg. It is expected to rise to 56 kg per annum in 2010 (Table 22) in line with population increase and changing consumer preferences for fish and fishery products. Fish is popular because it is the cheapest and most accessible form of protein acceptable to all ethnic groups of the multiracial population (Ishak 1994). Total demand for fish and fishery products was about 809 300 t in 1995.

Out of the total national production, consumable supply was estimated at about 764 500 t, which is equivalent to a self-sufficiency level of 94.5%.

The Malaysian economy has expanded rapidly over the last decade, with strong output recorded particularly in the manufacturing, services and construction sectors. The manufacturing sector was the main driving force in this growth. Since 1987, manufacturing has become the lead growth sector in the economy with its contribution to GDP surpassing agriculture. Major exports of manufactured goods comprise electrical and electronic products and machinery, chemical and chemical products, textiles and apparel, wood and wood products, transport equipment, iron, steel and fabricated metal products. The manufacturing sector is expected to continue to be the main engine of growth under the Second Industrial Master Plan (1996 to 2005). There is already a shift in government focus to give more emphasis to agriculture.

Development of agriculture has been affected by problems including labour shortages and rising wages, and increasing competition for land for other uses. Consequently, the contribution to GDP from agriculture has declined to second after the manufacturing sector since 1987. Favourable industrialization policies have also created conditions not attractive for agriculture investment and consequently have led to the outflow of resources from agriculture.

The Third National Agriculture Policy (NAP3) for 1998 - 2010 was formulated to maximize agriculture's contribution to national income and export earnings, and to maximize incomes of producers through optimal utilization of resources in the sector. New sources of growth are expected to emerge in agriculture by promoting new and emerging industries such as agroforestry, specialty natural

Table 21. Per capita consumption (kg) of various types of meat in Malaysia

Year	Source of Protein					% fish
	Poultry	Beef	Pork	Fish	Total	
1960	3.02	0.56	5.46	9.42	18.46	51.0
1970	6.51	0.63	5.88	21.11	34.12	61.9
1980	8.70	1.28	9.01	24.50	43.49	56.3
1989	13.60	1.53	8.85	23.05	47.03	49.0

Source: Department of Statistics 1991.

Table 22. Production and demand for fish in Malaysia from 1985 to 2010.

	Year					
	1985	1990	1995	2000	2005	2010
Fish production (capture) ('000 t)	746.0	951.3	1 108.4	1 255.8	1 305.6	1 331.9
Food fish supply ('000 t)	500.0	564.6	764.5	1 012.0	1 228.2	1 500.4
Per capita consumption (kg)	33.4	34.8	39.1	49.0	53.0	56.0
Food fish demand ('000 t)	527.0	619.9	809.3	1 142.0	1 369.5	1 591.0
Self-sufficiency level (%)	94.9	91.1	94.5	89.0	89.7	94.3
Export of fish ('000 t)	149.0	145.4	185.2	170.0	179.7	225.4
Import of food fish ('000 t)	176.0	200.7	230.0	300.0	321.0	316.0

Source: GOM 1999.

products, biotechnology and aquarium fish. Strong growth is also expected from the food sub-sector arising from intensified efforts in resolving supply-side constraints and strengthening the economic foundation for this sub-sector. Past and projected value-added for the agriculture sector is summarized in Table 23.

The NAP3 identified the environment and sustainable development at both domestic and global levels as one of the main challenges (Government of Malaysia (GOM) 1999). The policy outlines the need for more innovative and efficient agriculture and forestry practices for economic development as well as the maintenance of the ecological and environmental balance of the country. The country also recognizes the urgent need for a national coastal zone management policy and area-specific coastal zone management plans (CZMPs) to manage coastal

resources effectively. The first CZMP in the country was developed in 1986 for South Johore to provide sustainable management of resources and minimize use conflicts, especially among tourism, aquaculture and industrial development. In 1994 the development of CZMP for the coastal zones of Penang and Sabah was initiated. The country has also a National Conservation Strategy, which was initiated in 1993. Since then, people's organizations and NGOs have increasingly participated in natural resource and environmental conservation and management. Their participation can be seen in various activities conducted in the national marine parks throughout the country.

The NAP3 recognizes that the structure and pattern of development within the agriculture sector varies between industries. This includes different characteristics pertaining to structure of production,

Table 23. Agriculture value-added for 1990 - 95 and forecast of value-added for 2000 - 2010.

Item	1990		1995		2000		2005		2010	
	RM	%	RM	%	RM	%	RM	%	RM	%
Industrial Crops:										
	10 900	73.5	11 629	71.6	11 991	67.2	12 796	64.6	13 321	59.7
Food Commodities:										
	3 564	24.0	4 340	26.7	5 246	29.4	6 123	30.9	7 256	32.5
Paddy	622	4.2	672	4.1	702	3.9	742	3.7	788	3.5
Fruits	406	2.7	476	2.9	576	3.2	775	3.9	1 042	4.7
Vegetables	427	2.9	503	3.1	635	3.6	826	4.2	1 132	5.1
Fisheries	1 505	10.1	1 823	11.2	2 221	12.4	2 563	12.9	2 900	13.0
Livestock	604	4.1	866	5.3	1 112	6.2	1 217	6.1	1 394	6.2
Miscellaneous:										
	364	2.5	262	1.6	603	3.4	876	4.4	1 747	7.8
Total Agriculture:										
	14 828	100	16 231	100	17 840	100	19 795	100	22 324	100
Share of Agriculture to GDP		18.7		13.5		12.8		9.5		7.2

Source: Economic Planning Unit and Ministry of Agriculture, DPN3.

markets they serve, stages of development and role in the economy. Fisheries products primarily, though not exclusively, serve the domestic market. The production structure comprising mainly small and medium scale production units is showing signs of consolidation into large scale operations and is becoming more commercialized. The fisheries industry has undergone rapid development in the last ten years with remarkable improvements in fish production. Active participation of the private sector and the use of new technologies have made possible the gradual shift from small scale to large scale fishing. Fisheries is linked to fish processing, fishmeal production and industries such as plastics, paper, printing, machinery and equipment, wholesale and retail trade, and business services. Fisheries is also significantly linked to the transportation sector for input supplies as well as distribution of fish and fishery products.

One of the main challenges in fisheries is the over-exploitation of resources in inshore waters. Although there may be resources in offshore areas, acute

shortage of skilled and semi-skilled workers and unwillingness of local fishers to work in deep-sea fishing vessels will limit production from this resource. Limited research to develop appropriate fishing technologies to exploit deep-sea resources and frequent encroachment by foreign fishing vessels deserve attention. Fish processing is dominated by small and medium enterprises that lack managerial and marketing know-how and rely on low-level processing technology.

Despite the challenges, there are good prospects in fisheries. The country has the potential resources to further increase supply to meet domestic and export demand. It is estimated that annual demand for fish and fishery products by 2010 will be 1.59 million t (Table 24).

Total private investment in the agriculture sector during NAP1 (First National Agriculture Policy, 1990 - 95) was only RM9.5 billion compared to RM84 billion in the manufacturing sector. The food sub-sector including fisheries was not able to

Table 24. Production and demand for fish 1985 - 95 and forecast of production and demand, 2000 - 2010 (in t).

Year	1985	1990	1995	2000	2005	2010
Fish Production ('000 t)	801.0	1 003.6	1 241.1	1 511.0	1 708.8	1 933.3
Aquaculture ('000 t)	55.0	52.3	132.7	255.2	403.2	601.4
Capture fisheries ('000 t)	746.0	951.3	1 108.4	1 255.8	1 305.6	1 334.9
Food Fish Supply ('000 t)	500.0	564.6	764.5	1 012.0	1 228.2	1 500.4
Per capita consumption (kg)	33.4	34.8	39.1	49.0	53.0	56.0
Food fish demand ('000 t)	527.0	619.9	809.3	1 142.0	1 369.5	1 591.0
Self-sufficiency level (%)	94.9	91.1	94.5	89.0	89.7	94.3
Export of food fish ('000 t)	149.0	145.4	185.2	170.0	179.7	225.4
Import of food fish ('000 t)	176.0	200.7	230.0	300.0	321.0	316.0

attract much private investment. Consequently, NAP3 outlines the need to encourage participation of the private sector in commercial fishing. Government agencies undertake efforts to unify individual entrepreneurs into consortia led by corporate leaders to venture into commercial fishing and to develop and manage integrated processing complexes and mega-fishing ports in the country. Government aspires to secure economies of scale, modernize operations, enhance ventures into export markets and attract foreign vessels to land their catches in the country. In addition, joint ventures between local and foreign investors will be promoted under regional efforts such as BIMP-EAGA (Brunei, Indonesia, Malaysia and the Philippines-East ASEAN Economic Growth Area), IMT-GT (Indonesia, Malaysia and Thailand-Growth Triangle) and IMS-GT (Indonesia, Malaysia and Singapore-Growth Triangle) to engage in distant-water fishing.

Institutional Background Fisheries-related Policies

The Department of Fisheries Malaysia under the Ministry of Agriculture is entrusted with the role of developing, managing and regulating the fisheries industry. It is the mission of the Department of Fisheries Malaysia to bring about changes in the country's fisheries that will encourage its evolution into a commercial, modern and progressive sector and to ensure sustainability of fisheries resources for the needs of the nation. With the Government's Vision 2020, the fishing industry will be developed

into a modern, efficient and highly commercialized industry. Coastal fisheries will be managed at a sustainable level while deep-sea fisheries will be fully developed in the Exclusive Economic Zone as well as the high seas. The objectives of the Department of Fisheries are to:

- a. increase the national fish production
- b. manage the fisheries resources on a sustainable basis
- c. develop a dynamic fisheries industry
- d. intensify the development of fish-based industries
- e. maximize the income of the fishing industry

The functions of the Department of Fisheries include:

- formulating policies and strategies for the fisheries industry
- enforcing the Fisheries Act 1985 and the Exclusive Economic Zone Act
- managing, conserving and rehabilitating fisheries resources
- conducting fisheries research
- promoting sustainable aquaculture
- providing fisheries extension services
- training fishers, farmers and downstream industry entrepreneurs
- controlling fish diseases and providing quarantine services
- promoting recreational fisheries
- monitoring pollution affecting fisheries resources
- providing basic fisheries data

- establishing standards and inspecting fisheries products with the cooperation of other related agencies.

The Department of Fisheries Malaysia is headed by the Director General of Fisheries, who is assisted by the Deputy Director-General. There are seven divisions in the Department of Fisheries and a Director heads each of these divisions. These Divisions are:

- Corporate Planning Division
- Resource Management and Protection Division
- Marine Fishery Resources Development and Management Department (MFRDMD)
- Research Division
- Extension and Training Division
- Engineering Division
- Administration and Finance Division.

There are 33 sections under these divisions. There are also 12 state fisheries offices in charge of all the district fisheries offices throughout the country. A State Fisheries Director heads each of these state fisheries offices. There is currently a total of 2 445 staff - two at the top management level, 246 professional technical officers and 2 197 supporting staff. The organizational structure is detailed in Fig. 2.

The Fisheries Development Authority of Malaysia (FDAM) is a statutory body established in 1971 with the objective of upgrading the socioeconomic status of fishing communities, particularly by enhancing their incomes and developing and expanding the fishing industry. The functions of FDAM are to:

- promote and develop efficient and effective management of fishery enterprises and fish marketing
- create and provide credit facilities for fish production
- engage in fishery enterprises through boat construction, and the production and supply of fishing gear and equipment
- promote, facilitate and undertake economic and social development of the Fishers' Associations
- register, control and supervise Fishers' Associations and Fisheries Co-operatives
- control and coordinate the implementation of the above activities.

There are various types of fishers' institutions that are formed by the fishers themselves. They include

the National Fishers' Association (NEKMAT), the State Fishers' Associations, the Area Fishers' Associations and Fishers' Co-operatives. To date there are 116 of such organizations with over 60% of fishers in Malaysia as members. The State and Area Fishers' Associations are also members of the Malaysian Investment Co-operative, which acts as an investment arm that helps promote savings, investment and business through its activities.

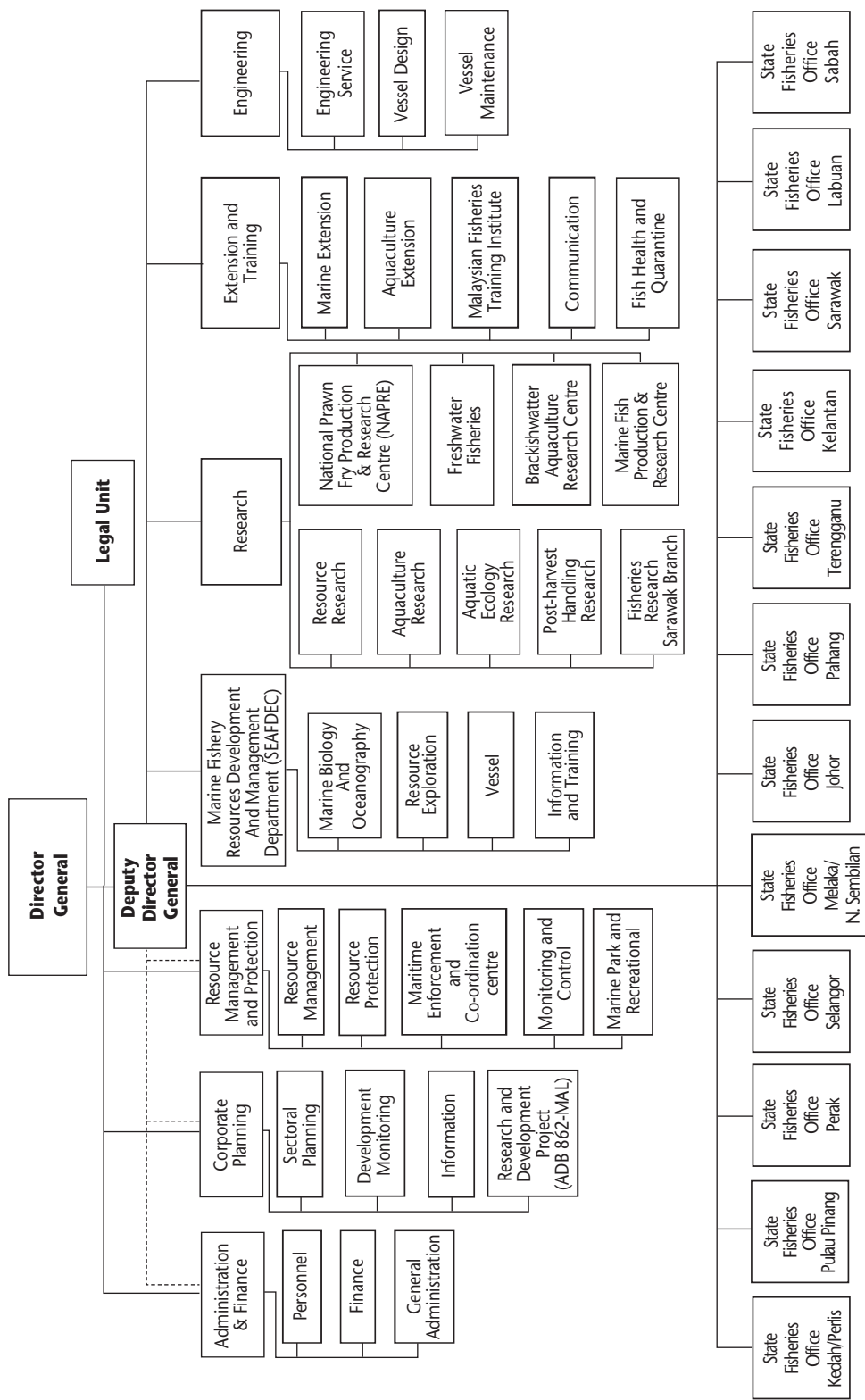
The Fisheries Research Institute of the Department of Fisheries undertakes fisheries research with its headquarters located in Penang. It has its Fresh-water Research Branch situated in Batu Berendam, Malacca; Brackish-water Branch in Gelang Patah, Johore; Marine Fisheries Research Development and Management Division (MFRDMD/SEAFDEC) in Chendering, Kuala Trengganu; East Coast Peninsular Malaysia Aquaculture Branch in Tanjung Demong; Fisheries Research Centre, Bintawa, Sarawak; and its National Prawn Fry Production and Research Centre in Pulau Sayak, Kedah. The headquarters in Penang is responsible for research on marine capture fisheries, marine aquaculture and ecology, while the branches specialize in their respective areas of research.

Local universities also conduct fisheries research, namely in resource assessment, fish biology, aquaculture, mangroves, corals, habitat development and rehabilitation, pollution monitoring and assessment, virology, toxicology and others. The universities engaged in such research include the University of Science Malaysia (USM) in Penang; the University Malaya (MU) in Kuala Lumpur; the University Putra Malaysia (UPM) in Serdang, Selangor and Kuala Trengganu; the University Malaysia Sarawak (UNIMAS) in Kuching, Sarawak; the University Malaysia Sabah (UMS) in Kota Kinabalu, Sabah; the National University Malaysia (UKM) in Bangi, Selangor; and the University Technology Malaysia (UTM) in Johore.

The Fisheries Training Institute of the Department of Fisheries is based in Chendering, Kuala Trengganu. Its main objectives are to:

- produce skilled fishers in line with the needs of the fishing industry
- provide training for fishers to upgrade their technical capabilities
- provide training for staff of the Department of Fisheries to enable them to provide better services to the industry.

Fig. 2. Organizational structure of the Department of Fisheries, Ministry of Agriculture, Malaysia (2000).



A more detailed legal/institutional background relevant to fisheries in Malaysia is given in Appendix 1.

Demersal fisheries in the West Coast of Peninsular Malaysia Catch and Effort

Fisheries in the WCPM use various types of commercial and traditional fishing gears. Commercial gear consists of trawls and purse seines, while traditional gear includes other seine nets, drift/gillnets, bag nets, hooks and lines, trammel nets, lift nets, traps, barrier nets and push nets. In 1997, there were 14 211 licensed fishing vessels (Table 25). About 80% of the vessels use traditional fishing gear, most (88%) of which are powered. The number of licensed vessels in 1997 is 35% less than the number in 1980. The reduction over the last 17 years took place in both commercial and traditional fisheries.

Estimates of the number of fishing vessels actually

operating in the WCPM is given in Table 26. Important traditional fishing gear exploiting demersal fish in this area includes drift gillnets, other seines, hook and lines, bag nets, push nets, barrier nets and traps. lift net is the only traditional gear in the WCPM not catching demersal fish. Except for push net and drift gillnet, other gear showed a reduction in number after the peak in 1981 - 82 (Table 26). Drift gillnets and push nets fluctuated with an increasing trend. However, the target species of these two types of gear are not demersal fish but rather pelagic fish and prawns.

The only commercial fishing gear exploiting demersal fish in the area are trawls. The number of trawlers in operation decreased steadily from a peak of 5 265 units in 1980 to 3 735 units in 1997 (Table 26). The number of units in operation in 1997 is similar to those in the early 1970s. A breakdown of the trawlers by size category in 1997 shows that 50% of the trawlers were 10 - 24.9 gross tons (GRT), and only 2% were more than 70 GRT (Table 27).

Table 25: Number of licensed fishing vessels in the West Coast of Peninsular Malaysia during the period 1980 - 97.

Year	Commercial	Traditional			Total
		Powered	Non-Powered	Total	
1980	3 975	14 254	3 797	18 051	22 026
1981	3 943	14 905	2 944	17 849	21 792
1982	3 908	14 139	1 556	15 695	19 603
1983	3 758	12 692	1 244	13 936	17 694
1984	3 539	12 759	1 756	14 515	18 054
1985	3 236	11 667	1 606	13 273	16 509
1986	3 146	11 342	1 561	12 903	16 049
1987	3 104	11 194	1 541	12 735	15 839
1988	2 948	10 628	1 463	12 091	15 039
1989	3 360	12 115	1 668	13 783	17 143
1990	3 294	11 876	1 635	13 510	16 804
1991	3 229	11 641	1 602	13 243	16 472
1992	3 077	11 095	1 527	12 622	15 699
1993	2 773	9 997	1 376	11 373	14 146
1994	2 605	9 390	1 292	10 682	13 287
1995	3 198	11 529	1 587	13 116	16 314
1996	2 844	10 256	1 412	11 668	14 512
1997	2 785	10 043	1 383	11 426	14 211

Source: Annual Fisheries Statistics 1965 - 97.

Table 26: Number of fishing vessels in operation by gear type in the West Coast of Peninsular Malaysia during the period 1967 - 97.

Year	Commercial	Traditional						
	Trawlers	Drift/ Gillnets	Other Seines	Hooks & Lines	Bag nets	Push nets	Barrier nets	Traps
1967	899	3 321	1 342	-	-	-	-	-
1968	1 028	3 389	1 482	-	-	-	-	-
1969	1 396	3 472	1 879	461	1 161	-	99	712
1970	2 683	3 016	1 556	454	1 307	-	87	704
1971	3 252	3 244	1 460	397	1 202	402	68	642
1972	4 068	3 698	1 488	416	1 249	289	62	638
1973	3 267	3 530	1 446	553	1 244	169	61	623
1974	3 909	4 091	1 535	541	1 93	122	64	524
1975	3 873	4 359	1 687	651	1 248	114	75	423
1976	4 008	5 092	1 425	666	1 050	183	85	538
1977	4 195	5 951	1 204	674	1559	183	191	446
1978	4 463	6 968	1 394	921	1 526	245	152	488
1979	5 112	7 878	1 542	1 039	1 517	306	186	496
1980	5 265	8 453	1 951	1 185	1 630	306	209	530
1981	5 321	8 525	2 081	1 226	1 513	473	207	595
1982	5 259	8 689	2 133	889	1 403	508	147	609
1983	5 116	9 096	2 046	982	1 104	490	75	455
1984	5 255	9 694	1 167	967	1 055	467	147	469
1985	5 163	10 417	2 047	897	1 417	568	124	472
1986	4 505	8 430	1 449	669	419	468	105	249
1987	4 260	8 402	1 176	504	488	639	79	260
1988	4 232	8 660	1 105	500	424	659	80	232
1989	4 469	8 388	1 013	606	469	535	77	231
1990	4 416	9 446	1 004	553	425	490	74	221
1991	4 600	9 095	1 020	517	442	504	77	207
1992	4 185	9 376	948	490	423	582	73	199
1993	3 939	10 232	845	406	412	650	66	187
1994	3 951	10 351	883	369	390	575	64	158
1995	3 933	10 360	871	393	308	317	104	168
1996	4 032	10 716	843	351	369	754	46	159
1997	3 735	10 730	538	334	220	869	180	150

Source: Annual Fisheries Statistics 1965 - 97.

Table 27. Landings (t) of trawlers by tonnage class in the West Coast of Peninsular Malaysia in 1997.

Type of catch	Landings (t) by trawler tonnage class					Total (3 735 units)
	0.1 - 9.9 (660 units)	10 - 24.9 (1879 units)	25 - 39.9 (655 units)	40 - 69.9 (463 units)	≥ 70 (78 units)	
Demersal taxa:	9 021	57 982	68 789	66 726	18 711	229 761
Fish	8 330	52 606	60 571	64 511	16 496	202 514
Squid and cuttlefish	691	5 376	8 218	10 747	2 215	27 247
Pelagic fish	369	5 329	14 102	19 262	1 828	40 890
Prawn	4 449	17 111	3 907	1 174	87	26 728
Jellyfish	13	830	46	7 502	1 507	9 898
TOTAL	13 852	81 252	86 844	103 196	16 496	307 277
Fishing zone	Zone B			Zone C	Zone C2	

Source: Annual Fisheries Statistics 1965 - 97.

Trawl nets contributed 84% of demersal fish landings in 1997. The remaining came from drift gillnets (9%), other seines (3%) hook and lines (2%) and bag nets (1%).

Demersal fish (including squid and cuttlefish) made up 75% of the landings of trawl nets. The breakdown of the catch by trawler size category is given in Table 27. Trawlers in categories 0.1 - 9.9, 10 - 24.9 and 25 - 39.9 GRT operated in fishing zone B (between 5 to 12 nm from shore). Demersal fish comprised about 75% of the landings of trawlers in this zone. The average annual landings of demersal fish increased with the size of trawlers 13.7 t·unit⁻¹ for 0.1-9.9 GRT, 30.9 t·unit⁻¹ for 10 - 24.9 GRT and 105.0 t·unit⁻¹ for 25 - 39.9 GRT. The 40 - 69.9 GRT trawlers operated in fishing zone C (between 12 to 30 nm from shore). Demersal fish contributes about 75% of the landings of trawlers in this zone with an annual average of 162.5 t·unit⁻¹. The big trawlers (70 GRT and above) operate beyond 30 nm from shore (fishing zone C2). Demersal fish made up 85% of their landings with an average of 243 t·unit⁻¹.

In the traditional fisheries, demersal fish was dominant in the landings of hooks and lines (98.2%) and barrier nets (90%). The percentage of demersal fish for drift gillnets, other seines and push nets was between 30% and 45% of landings. For bag nets and fish traps, demersal fish only contributed 10% to 20% of landings. Traditional gear fishers are allowed to fish in any fishing zone, but most of them fished in zone A (within 5 nm from shore).

Total landings of demersal fish in the WCPM was 230 000 t in 1997. Trawl nets landed 246 000 t (84%) while traditional fishing gear landed 46 000 t (16%) (Table 28). Landings of demersal fish by the commercial fisheries reached a peak of 254 000 t in 1990. For the traditional fisheries, landings were in the range of 27 000 - 45 000 t during the 1970s, 27 000 - 60 000 t during the 1980s, and 37 000 - 71 000 t during the 1990s. The highest landings of demersal fish in the WCPM was recorded at 304 000 t in 1996, with the bulk coming from traditional gear.

Table 28. Demersal fish landings (t) by commercial and traditional fisheries on the West Coast of Peninsular Malaysia from 1971 to 1997.

Year	Demersal landings (t)		Total
	Commercial	Traditional	
1971	59 185	27 329	86 514
1972	65 624	34 781	100 405
1973	82 037	45 314	127 351
1974	115 591	34 751	150 342
1975	108 616	27 328	135 944
1976	120 371	32 226	152 597
1977	137 041	42 966	180 007
1978	151 530	30 128	181 658
1979	144 497	36 316	180 813
1980	141 424	27 449	168 873
1981	155 292	32 369	187 661
1982	151 307	41 142	192 449
1983	152 894	55 274	208 168
1984	142 775	51 616	194 391
1985	158 279	57 221	215 500
1986	200 817	60 395	261 212
1987	243 555	36 194	279 749
1988	214 501	20 667	235 168
1989	233 824	38 052	271 876
1990	254 279	40 652	294 931
1991	201 259	37 764	239 023
1992	213 859	50 126	263 985
1993	212 713	46 165	258 878
1994	209 571	47 747	257 318
1995	231 021	47 955	278 976
1996	233 566	71 102	304 668
1997	246 689	45 949	292 638

Source: Annual Fisheries Statistics 1965 - 97.

Trawls in operation on the WCPM numbered over 5 100 units during 1979 to 1985 (Table 26). The number decreased to 3 735 units by 1997. The reduction was a result of government policy since 1987 to reduce effort in coastal areas while encouraging offshore fishing. A steady reduction was observed in 0.1 - 24.9 t and 25 - 39.9 GRT trawlers (Table 29). A 40% reduction was recorded for the 0.1 - 24.9 GRT category from 1981 to 1997. During the same period, trawler numbers of 25 - 39.9 GRT were reduced by about 33%. Although bigger (40 - 69.9 GRT) trawlers increased with time, trawlers of 70 GRT and above declined since

1991. One reason for this was the difficulty in getting crew. Government moves to allow foreign crew on board local fishing vessels has not improved the situation.

Average annual catch-per-unit effort (CPUE) of trawlers < 25 GRT increased from 14.20 t·unit⁻¹ in 1981 to 37.44 t·unit⁻¹ in 1997, as the number of units decreased by about 38%. The same trend was observed for 25 - 39.9 GRT trawlers. Bigger size trawlers show no clear trend over the last ten years. Overall, a 30 % reduction of the number of trawlers has increased catch rate 2.5 times during the period 1981 to 1997.

Table 29. Number and average CPUE (t·unit⁻¹·year⁻¹) of trawlers in operation in the West Coast of Peninsular Malaysia from 1981 to 1997

Trawler tonnage class										
Year	0.1 - 24.9		25 - 39.9		40 - 69.9		> 70		Total	
	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
1981	4 095	14.20	972	109.71	254	140.01	-	-	5 321	263.82
1982	4 048	17.32	894	104.92	317	137.51	-	-	5 259	260.12
1983	3 969	17.32	780	93.96	367	194.05	-	-	5 116	305.32
1984	4 083	-	797	-	375	-	-	-	5 255	-
1985	4 012	-	783	-	368	-	-	-	5 163	-
1986	3 481	27.14	608	115.71	363	182.61	53	638.11	4 505	963.58
1987	3 268	26.13	553	138.15	410	337.94	29	372.10	4 260	874.32
1988	3 211	26.11	555	119.71	415	247.09	51	277.39	4 232	670.31
1989	3 374	28.69	603	125.51	430	260.95	62	228.53	4 469	643.67
1990	3 385	30.53	579	160.93	411	257.53	41	544.32	4 416	993.31
1991	3 538	23.86	567	122.40	397	205.58	98	243.85	4 600	595.58
1992	3 165	35.88	558	141.02	379	206.18	83	257.72	4 185	640.80
1993	2 816	32.13	609	123.56	430	189.16	84	277.23	3 939	622.08
1994	2 752	29.62	656	121.31	462	202.37	81	256.02	3 951	609.32
1995	2 695	32.25	679	142.56	481	211.50	78	253.90	3 933	740.21
1996	2 797	37.12	679	119.88	480	211.76	76	331.05	4 032	699.82
1997	2 540	37.44	655	132.59	463	222.88	77	287.44	3 735	680.36

Source: Annual Fisheries Statistics 1965 - 97.

Table 30. Composition of the landings of trawls, purse seines and traditional gear in 1997 in the West Coast of Peninsular Malaysia.

Resource Group	Trawls (%)	Purse seines (%)	Traditional gear (%)
Demersal:			
Food Fish	14.9	–	42.9
Trash fish and others	51.0	9.1	12.1
Squid & Cuttlefish	8.9	–	2.3
Prawn	8.7	0.2	17.5
Pelagic	13.3	90.7	23.9
Jellyfish	3.2	–	1.3
Total landings (t)	307 277	1 163 092	163 092

Table 30 gives the composition of landings by gear type in the WCPM in 1997. Trawl landings consisted mainly of trash fish (51%), demersal fish (14.9%) and pelagic fish (13.3%). The dominance of trash fish is characteristic of trawls. Trawlers in the smaller GRT categories contributed most of the prawn catch. The landings of purse seiners consisted mainly of small pelagic fish such as mackerels, scads and sardines. Recently, about 10% of the landings have consisted of demersal species and prawns due to the use of fish aggregating devices (FADs) and spotlight. Traditional gear caught mainly demersal and pelagic fish as well as prawns. Trammel nets and push nets are the two main traditional gear used for catching prawns. The drift nets/gillnets mainly catch pelagic and demersal fish. The trash fish component is very much lower than that of the trawl.

Mackerels dominated the catch of trawls. *Rastrelliger* spp. became the main catch in the WCPM with the introduction of high opening trawl nets. Among the demersal fish, threadfin beam, lizard fish and croaker were most abundant. The five most abundant groups since 1986 are given in Table 31.

Table 31. Five dominant finfish groups in the landings of trawlers in the West Coast of Peninsular Malaysia from 1986 to 1997.

Year	Percentage of trawl landings					Trawl landings (t)
	1	2	3	4	5	
1986	A = 5.3	B = 1.8	C = 1.8	D = 1.2	E = 1.1	192 902
1987	A = 5.4	C = 3.0	B = 2.4	F = 1.1	G = 1.0	311 132
1988	A = 4.4	C = 2.9	B = 2.7	H = 1.9	F = 1.8	226 976
1989	A = 5.3	C = 2.8	B = 1.9	E = 1.2	F = 1.0	298 852
1990	A = 5.1	C = 3.7	B = 1.9	G = 1.2	F = 1.0	436 287
1991	A = 4.1	C = 3.9	B = 2.0	G = 1.6	H = 1.3	259 276
1992	A = 5.0	C = 3.1	B = 2.5	H = 2.0	G = 1.3	291 771
1993	A = 4.0	C = 4.0	B = 2.6	G = 1.6	H = 1.5	270 343
1994	A = 7.1	C = 3.3	B = 2.5	I = 2.2	G = 2.0	275 330
1995	A = 10.3	C = 2.2	I = 2.1	B = 2.0	G = 1.9	313 068
1996	A = 7.4	C = 3.3	B = 2.6	G = 2.3	I = 1.8	312 038
1997	A = 5.7	C = 3.0	G = 3.0	B = 2.5	I = 1.7	307 277

Source: Annual Fisheries Statistics 1965 - 97.

Economics and Marketing

One of the basic differences between the commercial and traditional fishery is the level of capital input and technology. Engine capacities average 180 HP for commercial fishing vessels and 18 HP for traditional fishing vessels. The commercial fishery operates large fishing nets with the aid of power blocks, net haulers and net drums as well as sophisticated equipment like fish finders, echo-sounders and sonar. They also use modern navigational equipment and are fitted with Refrigerated Sea Water (RSW) systems to maintain the quality of their catch. The catch is kept in large plastic bins and stored in insulated fish holds cooled by the RSW system. Fishing trips normally do not exceed a week, and thus the catch is kept in very good condition. Traditional fisheries normally use ice blocks on board and insulated fish boxes, except those in remote areas where a regular supply of ice is not available.

Fishers or boat owners are encouraged to market their catch direct or via middlemen at government-controlled landing sites. This is to facilitate statistics gathering, centralize fish landings and provide loading/unloading and cold-room facilities to the fishers. Depending on quality and species, fish are either sold in local markets or exported. Increasingly, fish marketing is being handled by Fishermen's Associations, which are well-supported by the Malaysian Fisheries Development Board (LKIM). The major fish landing/handling harbours are all controlled by LKIM. Fish meant for the major towns is distributed in iced crates by lorries. The availability of cold-rooms at landing jetties provide support to middlemen or the local fishermen's association. Traditional fishers, however, sell their catch locally or to fish traders who collect and send the fish consignment to the wholesale market.

Fish processing has evolved with time and new technologies. There are now more varieties of fish products with longer shelf life. At present, the bulk of demersal fish caught are consumed fresh. These are packed in ice for both the local and foreign markets such as Singapore and Thailand. Some demersal fish are sold dried, salted or boiled. Over the last decade, there has been increased utilization of previously low-priced fish species for the production of value-added fish and fish-based products like surimi, fish cakes, fish fingers, fish balls and fish crackers.

The economics of trawl, purse seine and drift net fishing in the WCPM was studied by (Kamaruzaman and Lim, 1999). Capital investment for a trawler and purse seiner between 25 - 69.9 GRT was RM100 000 in 1989. The main capital costs are for the boat hull, engine, gearbox, net and accessory equipment. The mean costs and earnings for 1989 are given in Table 32. Fuel, labour, maintenance, ice (for vessels without RSW) and food for crew constitute the main operating costs. The mean net profit derived by a 25 - 39.9 GRT trawler in 1989 was RM36 520 while that of a 40 - 69.9 GRT trawler was RM43 601. For purse seiners, a 25 - 39.9 GRT vessel made a net profit of RM40 102 while a 40 - 69.9 GRT vessel made a net profit of RM63 562. Average net profit for drift nets was RM6 636 in 1989.

Although slightly different sharing systems are practiced across fisheries and localities in the WCPM, basically there are three main systems (Ishak 1994). For the trawl fishery, catches are divided into shares after deduction of operating costs. The number of shares are earlier agreed upon between boat-owner and crew, and the shares accorded to the boat-owner and each crew member depending on relative capital inputs, skills and responsibilities. Typically, on a 4-crew trawler, there are a total of eight shares where 4.75 shares go to the boat owner, 1.25 shares go to the skipper and the remaining shares are equally divided among crew members. In terms of percentage, a trawler owner gets between 20% - 60% of shares (Anon. 1995).

For a purse seine, the sharing system is more complex. The first 450 kg of the catch go to the crew consisting of about 14 workers. The boat owner does not get anything when the catch is < 450 kg. Catches in excess of 450 kg are divided into 20 shares after deduction of operating costs. The boat owner gets 5 shares and the remaining 15 shares go to the crew. The skipper gets 1.5 shares, the engine man 1.25 shares and the rest of the shares are divided equally among the remaining crew. For anchovy purse seiners, each crew member instead gets a fixed monthly wage, with the amount depending on their relative responsibilities and skills. In addition, crew members are paid a commission per basket of fish caught. The amount of commission again varies according to responsibilities and skills.

Table 32. Average costs and earnings of trawl, purse seine and drift net boats in the West Coast of Peninsular Malaysia in 1989.

	*Trawler (tonnage)		Purse seine (tonnage)		Drift nets
	25 - 39.9	40 - 69.9	25 - 39.9	40 - 69.9	
No. of day per trip	2	2	1	1	1
No. of trip per year	108	180	232	186	204
No. of workers	3	3	14	15	2
<u>Annual landings:</u>					
Quantity (kg)	173 781	236 936	173 473	386 100	5 765
Value (RM)	186 407	217 392	193 008	403 278	21 095
<u>Annual Operation costs (RM):</u>					
Fuel	81 298	76 355	53 789	152 670	3 529
Ice	8 406	7 400	18 547	34 740	950
Food for workers	4 639	3 113	7 147	18 840	1 681
Wages	35 445	64 707	53 260	102 597	3 734
Maintenance cost	9 606	7 933	12 053	21 100	3 192
Others	620	721	1 262	645	14
TOTAL	166 340	160 229	146 058	330 592	13 100
Annual gross earnings	46 393	57 163	46 950	72 686	7 995
Monthly gross earnings	3 866	4 764	3 913	6 057	666
Annual depreciation	9 873	13 562	6 848	9 124	1 359
Annual net earnings	36 520	43 601	10 102	63 562	6 636

Source: DOF Survey 1989.

Note: * Vessel with Refrigerated Sea Water (RSW) system.

For the traditional fisheries, catch-sharing systems are also practiced. Generally, the number of shares, after deduction of operating costs, is agreed upon among the boat owner, skipper and crewmembers. Where the boat owner is also the skipper, the shares are divided only between the boat owner/skipper and crew. A boat owner gets between 20%-60% of shares (Anon. 1995). For traditional gear which is owner-operated; the whole catch belongs to the owner-operator.

From 1980 to 1997 a steady decrease in number of fishing vessels was recorded in the WCPM (Tables 25 and 26). Most commercial fishing vessels perform daily fishing trips, but there is an increasing number of larger vessels that fish for up to a week

or 10 days. Commercial fishing vessels are only allowed to operate beyond 5 nm from shore in Zones B (5 - 12 nm), C (12 - 30 nm) and C2 (> 30 nm), with the exception of anchovy purse seiners which can fish in Zone A (0 - 5 nm). In addition commercial fishing vessels > 40 GRT have to fish in Zone C and beyond. Larger size commercial vessels catch mainly finfish further offshore while the smaller commercial vessels target shrimps near shore.

Licensed traditional fishing vessels average 5 GRT but most vessels in operation are generally less than 15 GRT. There is still a large proportion that use outboard engines. Traditional fishing vessels are allowed to fish in Zone A. Most of these operate

trammel nets targeting shrimps. Drift nets target the more valuable finfish. Besides these, there is a variety of fishing gear targeting mixed species. Fishing trips are only day trips, with the exception of some portable fish trap operators who fish further away from shore and remain at sea for up to a week.

Table 33 gives a comparison of the efficiency of commercial and traditional fishing gears. Among commercial gear, the trawl has higher labour productivity although production costs are slightly higher than the purse seine. For both the trawl and purse seine, larger vessels (40 - 69.9 GRT) have

higher labour productivity than the smaller (25 - 39.9 GRT) vessels. However, capital intensity of trawl (in terms of initial investment per person-day) is the highest. Capital intensity for purse seine is lower than trawl and close to that of the drift net. This could be explained by the low capital investment (RM100 000 for both gear) but differing crew size (four for trawl and 14 - 15 for purse seine). For comparison, fixed costs for the trawl and purse seine of 40 - 69.9 GRT are given in Table 34. Majority of purse seiners in the WCPM are currently 40 - 69.9 GRT. Capital investment varies widely depending on the sophistication of equipment used.

Table 33. Productivity indicators of selected fisheries on the West Coast of Peninsular Malaysia.

Fishery	Production Costs (RM·kg ⁻¹)	Labour Productivity (kg·person·day ⁻¹)	Capital Intensity (RM·person·day ⁻¹)
Trawl (25 - 39.9 GRT)	1.24	129	74.40
Trawl (40 - 69.9 GRT)	1.48	219	92.59
Purse seine (25 - 39.9 GRT)	1.19	53	30.79
Purse seine (40 - 69.9 GRT)	1.17	69	17.92
Drift net	0.44	14	29.41

Table 34. Estimate of fixed costs (RM) by fishery for 40 - 69.9 GRT vessels.

Fishery	Boat	Engine	Gear	Net	Others *	Total
Trawl	120 000	100 000	110 000	27 000	17 000	374 000
Purse seine	120 000	92 000	70 000	50 000	128 000	460 000

Note: * Mainly fishing and navigation equipment.

Exploitation Status

Abu-Talib et al. paper no. 6) show that demersal fish density in 1997 in coastal waters of Sub-area I and II (Fig. 3) was only 8% and 14%, respectively, of the value in 1971 - 72. Density in stratum 2 in Sub-area I and Sub-area II was only 38% and 25% respectively, of the values estimated in 1987. Demersal fish density in stratum 3 of Sub-area I was similar to the value obtained in 1987.

Length-based analyses of 15 demersal fish and three cephalopod species give a mean E value of 0.62 and confirm the existence of over-exploitation of the resources. These selected species comprised 48% of demersal fish abundance in 1997. More-

over, the MSY (273 000 t) and f_{MSY} (7.06 million standard trawling hours) estimates for demersal resources in the WCPM had been well exceeded by the 1997 catch and effort in the area.

The exploitation of demersal fish resources in the WCPM occurred in two phases. The first phase (1973 - 85) is the period before the introduction of offshore vessels. The catch was generated mainly inshore by vessels of less than 70 GRT. During this period, fishing grounds in the WCPM were mostly located in inshore areas less than 30 nm from the coastline. The second phase (1986 - 97), is the period when the fishery experienced reductions in fishing effort with simultaneous increase in fishing area as offshore fishing ventures increased. The introduction of offshore vessels in 1986 resulted in a 15% increase in demersal fish landings (from 261 212 t in 1986 to 279 931 t in 1987).

Alias (paper no. 12) shows that there are two demersal resource assemblages in the WCPM. These two assemblages exhibit a boundary at about 40 m depth. The implications of these findings on spatial zoning of fishing in the WCPM deserve further attention.

Management Issues and Opportunities

The overall goal of management in the WCPM is to sustain production and development in the coastal demersal fisheries. This goal is sought through formulation and implementation of management strategies and actions to improve productivity/efficiency, equity among fishers, resources sustainability and viability of coastal fishing communities. Fig. 4 illustrates the hierarchy of objectives together with illustrative third level objectives that have been translated into various policy/regulatory instruments and management measures. The instruments and measures implemented in the WCPM by the Department of Fisheries have led to considerable progress. The moratorium on new fishing vessel and gear licences indicates the strong commitment on the part of Government in improving management of the fisheries. Substantial challenges however remain, which require concerted action by fisheries agencies and various stakeholders.

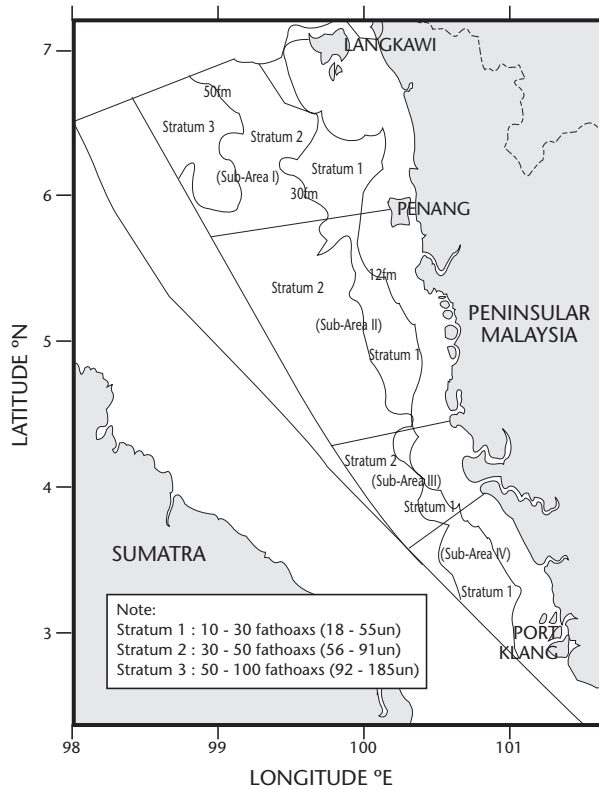


Fig. 3. The West Coast of Peninsular Malaysia showing the sub-areas (I, II, III and IV) and depth strata (1, 2 and 3) used in the study.

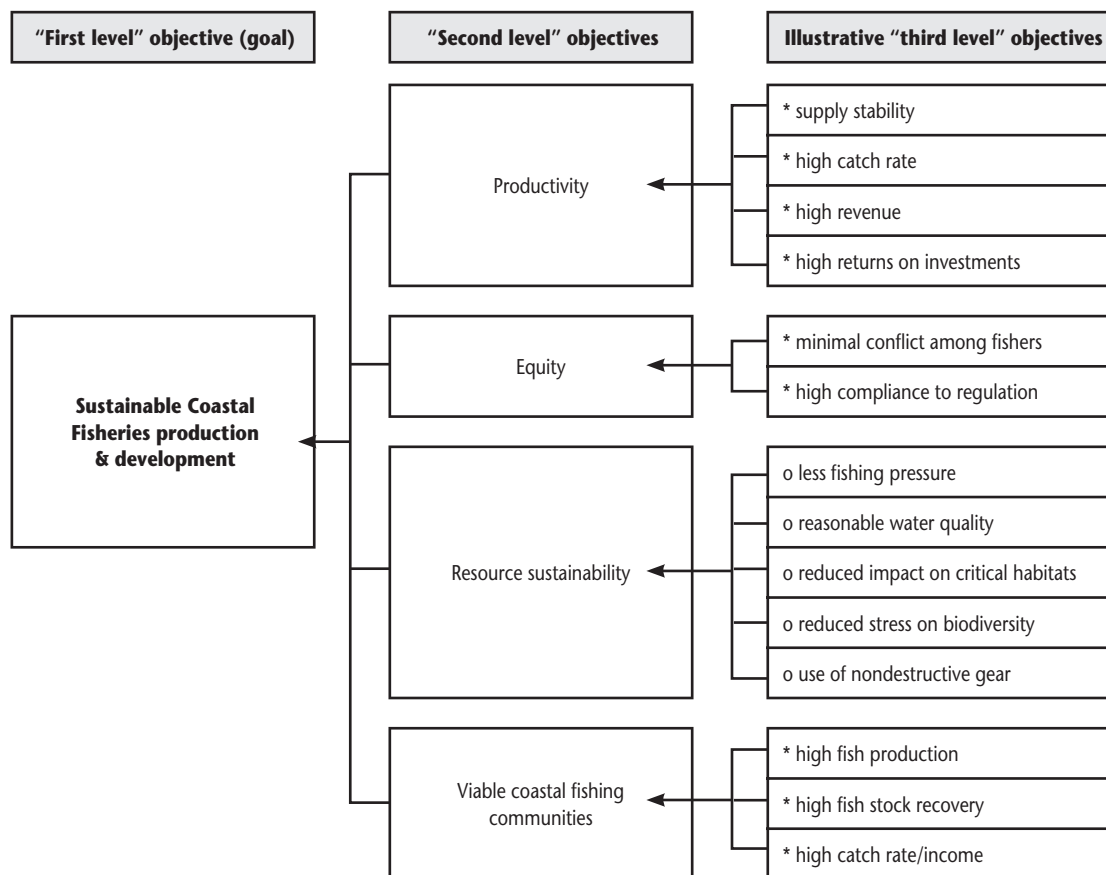


Fig 4: Goals and objectives in management of demersal fisheries on the West Coast of Peninsular Malaysia.

Table 35 gives a summary of key issues (problems/constraints) affecting demersal fisheries in the WCPM, as well as suggested interventions to help resolve or mitigate them. Relative to the management objective to improve productivity/efficiency, overfishing/overcapacity is the core issue and catches exceed the level considered desirable. Assessments indicate the occurrence of biological overfishing in the WCPM. The problem requires better information on resource characteristics and management options, and rationalization of the number and design of fishing gear and vessels operating in the WCPM. Illegal fishing is a problem in both commercial and traditional fisheries - the number of boats in operation is higher than the number of boats licensed and sighting records indicate substantial fishing by foreign vessels. Improved fishing skills and fishing technology have also contributed to overcapacity. Interventions requiring attention include buy-back-schemes, enhancing stakeholders'

awareness on the prevailing situation, and strict enforcement against illegal fishing and fishing practices. Inappropriate exploitation patterns whereby under-sized and juvenile fishes are common in the catch is an issue. This mainly emanates from the use of non-selective fishing gear such as trawl (commercial) and push net (traditional). Improving gear selectivity and design requires increased attention. Post-harvest losses remain an issue that requires continuing extension programs on better fish handling methods and research in utilization of low-priced fish species for production of value-added fish and fish-based products. Illegal fishing techniques such as push net continue to pose problems and require community involvement and stringent enforcement activities. Lack of information dissemination about the fisheries situation is also one of the key issues and requires expansion of information and training programs in the area. The Department of Fisheries will establish a

consultative committee (to include representatives from fishers) during preparation of the management plan for demersal fisheries in the WCPM. The plan will be formulated with all relevant stakeholders and information activities will be an integral part of the planning process.

Relative to equity, the low productivity of fishers (particularly traditional fishers) is a key concern. This will require improving fishers' participation in the marketing of their catch. Fishers' associations should be encouraged to participate in fish marketing. Alternative marketing channels should be explored since penetrating the existing marketing channel is very difficult. Low productivity can also be addressed with the use of modern, labour-saving fishing equipment onboard vessels. This should be encouraged, however, without aggravating overcapacity in the fisheries. Differentiation in price of fishery products can be improved via introduction of product eco-labeling (such as "prawn from turtle-free trawl"). This should increase prices, incomes and encourage the use of environment-friendly fishing gear. Poaching by foreign fishing vessels needs to be curtailed by improving enforcement capacity in the area. The Maritime Enforcement Coordinating Centre (MECC) supervises enforcement activities in the country, and involves the Department of Fisheries (DOF), Royal Malaysian Navy, Marine Police and Customs Department. In the WCPM, DOF is equipped with two 75 feet vessels, two 45 feet vessels, and 28 speedboats with twin outboard engines of 150 - 240 HP. The bases of these patrol vessels are in Langkawi (Kedah state), Lumut (Perak state) and Port Kelang (Selangor state). The low fee structure for big vessels is also an equity issue. This requires review and amendment of the fee rates fixed by the Fisheries Maritime Regulation 1967 and Fisheries (Licensing of Local Fishing Vessels) Regulations 1985. Conflicts among commercial and traditional fishers have resulted in introduction of the fishing zone scheme. Review of the existing fishing zone scheme and the introduction of co-management arrangements appear to be in order. The poverty level among fishers is an underlying equity issue and requires enhancement of poverty reduction and livelihood programs for rural areas.

Relative to resource sustainability in the area, resource depletion is an overriding issue and relevant interventions have been discussed above. In addition, a program to encourage landing of fish by deep sea foreign fishing vessels in local ports is proposed. The program (called "Fish for Fuel" or the 3F Program) is intended to attract foreign fishing vessels to land their catch in the country in exchange for cheaper fuel prices. This should bring more fish for the local market. Other issues and suggested interventions relevant to resource sustainability are given in Table 35. A number of cross-sectoral issues need attention in this context, including:

- eutrophication in coastal waters due to excessive fertilizer use in catchment areas
- siltation from clearing of coastal land area for agriculture and aquaculture
- catching of juvenile fish (such as grouper) for aquaculture
- use of trash fish (including under-sized food fishes) as feed in aquaculture
- stress to sensitive coastal ecosystems due to promotion of MPA (marine protected areas) and marine parks as tourism spots
- aggravation of overfishing by recreational fisheries promoted by the tourism sector.

There are 8 key issues pertaining to the management objective of promoting viable coastal fishing communities (Table 35). Ten interventions are suggested in response to these issues. An urgent priority in promoting viable coastal fishing communities is to get them involved in the management of fisheries through CBFM (community-based fisheries management) or co-management arrangements. Training and pilot programs to prepare communities for this concept are needed.

As part of initiatives to improve management of demersal fisheries in the WCPM, many of the key interventions given in Table 35 has been packaged into projects and programs proposed for implementation under the Eight Malaysian Plan (RMK-8) during 2001 - 2005. Table 36 lists the proposed projects incorporating the suggested management interventions identified above. These projects are in line with the overall national goal to achieve sustainable fisheries as stated in NAP3.

Table 35. Summary of key objectives, issues and interventions for management of the demersal fisheries on the West Coast of Peninsular Malaysia.

Management Objectives	Key Issues (Problem/Constraints)	Key Interventions (Strategies/Actions)
1. Productivity/Efficiency	1. Overfishing/Over-capacity	• Rationalize boat/gear design and number
		• Enhance research & information gathering
		• Examine feasibility of buy-back-scheme
		• Ban night trawling
		• Limit engine size & impose higher fee for bigger engine
		• Limited entry
		• Enhance stakeholders' awareness/participation
		• Improve gear selectivity
		• Strict enforcement against illegal fishing
	2. Inappropriate exploitation patterns	• Improve design of shrimp trawl
		• Improve gear selectivity
		• Introduce season & area closures
	3. Post-harvest losses	• Improve fish handling on board vessels.
		• Enhance research on product development
		• Improve transportation & storage
4. Illegal fishing techniques	• Enhance enforcement	
	• Get community involvement in management	
5. Lack of information dissemination	• Expand training and information program	
2. Equity	1. Low productivity of fishers	• Increase productivity through involvement in fish marketing
		• Promote the use of labour-saving equipment
	2. Lack of product price differentiation	• Introduce eco-labeling
	3. Minimal participation of fishers' associations in marketing	• Encourage fishers' associations in marketing their products
	4. Poaching by foreign vessels	• Improve monitoring and enforcement
	5. Low fee structure especially for big vessels	• Review and amend fisheries regulations
	6. Conflicts among commercial & traditional fishers	• Review existing fishing zone scheme
• Introduce co-management arrangements		
7. Poverty	• Enhance livelihood and poverty-reduction programs	

Table 35. Summary of key objectives, issues and interventions for management of the demersal fisheries on the West Coast of Peninsular Malaysia (Continued)

Management Objectives	Key Issues (Problem/Constraints)	Key Interventions (Strategies/Actions)	
3. Resource sustainability	1. Overexploitation/Resource depletion	• Fish for fuel (incentives) program for foreign fishing vessels	
	2. Insufficient scientific information for management	• Enhance research to support management	
	3. Insufficient enforcement to curb illegal fishing	• Increase enforcement activities at sea	
	4. Use of non-selective fishing gear	• Promote the use of selective fishing gear	
	5. Exploitation of undersized fish and fish fry collection		• Review appropriate mesh sizes
			• Regulate fry collection
			• Conduct breeding & restocking program
	6. Environmental and habitat degradation		• Establish ICZM/MPA/Sanctuaries program
			• Ban on sand mining in critical areas
			• Enhance artificial reefs
• Conduct habitat enhancement/rehabilitation			
7. Loss in biodiversity	• Enhance research and options for biodiversity conservation		
4. Viable coastal fishing communities	1. Economic dualism and lack of land-based job opportunities	• Injection of funds to fishers associations for various livelihood/economic activities.	
	2. Excess fishers	• Relocation to other economic activities	
	3. Existence of foreign crews	• Phase out foreign crews	
	4. Unskilled local crew & low level of education.	• Conduct training programs	
	5. Lack of awareness on fisheries management		• Introduce CBFM/Co-management arrangements
			• Conduct education & training programs
	6. Conflict within community		• Form/enhance community organizations
			• Conduct leadership development program
7. Influence of NGOs & politicians	* Establish better interactions with NGOs & politicians.		
8. Lack of financing/credit facilities	• Provision of viable credit programs.		

Table 36. Selected programs and projects to be carried out to achieve management objectives for the demersal fisheries on the West Coast of Peninsular Malaysia. These are proposed in the Eight Malaysian Plan (RMK-8) 2001 - 2005.

Program	Project
A. Sustainable Fisheries Management	1. Development of fisheries management information system
	2. Development of sustainable fisheries management plans
	3. Modernization of fisheries surveillance system
	4. Monitoring and protection of fisheries
	5. Development of environment-friendly fishing gear
	6. Conservation of ecosystems and biodiversity
	7. Development of marine parks and artificial reefs
	8. Development of co-management arrangements
B. Development of Capture Fisheries	1. Development of high seas tuna fisheries
	2. Increase in fish/prawn fry production
	3. Development of appropriate recreational fisheries
C. Development of Aquaculture	1. Development of appropriate aquaculture technology Industry
	2. Development of fish fry industry
	3. Development of feeds for aquaculture
	4. Development of sustainable aquaculture

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Appendix 1. Legal and Institutional Framework Relevant to Fisheries in Malaysia.

One of the current goals of fisheries management is to achieve sustainable coastal fisheries. To achieve this goal, various management strategies have been formulated and implemented to control fishing effort and rehabilitate and conserve marine resources and ecosystems. These measures include:

- a. Direct limitation of fishing effort via licensing of fishing gear and fishing vessels. A review of effectiveness of the fisheries licensing procedures is a continuing process.
- b. Identification of nursery areas that should be protected and managed to ensure survival of juveniles of commercially important fish species. These areas could be gazetted as closed fishing areas or areas that are zoned for specific fishing gear based on tonnage of the fishing vessels.
- c. Facilitation of co-operative research efforts to provide data essential for formulation of area management plans.
- d. Strict enforcement of regulations that address the problem of illegal fishing.
- e. Rehabilitation of resources through establishment of artificial reefs and coral replanting programs.
- f. Conservation of turtles and biodiversity of marine ecosystems.

The Federal Constitution of Malaysia 1957

The Federal Constitution, which is the supreme law of Malaysia, was enacted on 31 August 1957. Any law made thereafter that is inconsistent with the Constitution shall be void.

Federal and State governments have jurisdiction over different aspects of natural resources. The Federal Government has jurisdiction over “shipping, navigation and fisheries, including - maritime and estuarine fishing and fisheries excluding turtles”. On the other hand, “land, turtle and riverine fishing” fall under the State Government’s jurisdiction. However, for the state of Sabah and Sarawak, governance of “shipping under 15 registered tons including carriage of passengers and goods by shipping, maritime and estuarine fishing and fisheries” needs concurrence from both Federal and

State Government. The subject of Federal and State laws are dealt with in Article 74 of the Federal Constitution, viz.

- Article 74(1) states that Parliament may make laws on matters in the Federal List or Concurrent List, that is in List I or List III of the Ninth Schedule. In the states of Peninsular Malaysia, “shipping, navigation and fisheries, including - maritime and estuarine fishing and fisheries excluding turtles” fall under the Federal List which means that the Federal Government has the power over the above matters. However, in the States of Sarawak and Sabah the above matters fall under the Concurrent list and the enactment of any law relating to fishing needs the concurrence of the State Government.
- Article 74(2) states that the State Legislature may make laws on matters in the State List, that is in List II set out in the Ninth Schedule or the Concurrent List. Riverine fishing and turtles fall under the State List and the State Government has the mandate to enact legislation on this matter.

In case of inconsistency between State and Federal law, Article 75 of the Federal Constitution states that: “If any state law is inconsistent with a federal law, the federal law shall prevail and the state law shall, to the extent of the inconsistency, be void.”

Legislation

Since the early 1900s, the fishing industry in Malaysia has been covered by the Fisheries Ordinance 1909. This Ordinance was subsequently amended in 1912, 1924, and 1926, and finally repealed in 1951 and replaced by the Fisheries Rules of 1951. There were also seven Fisheries Ordinances/ Enactments enforced by the various states. The fishing industry at that time was mostly traditional fisheries and regulation of the industry was minimal.

However, in the 1960s and 1970s, introduction of trawl nets in coastal waters created much conflict with traditional fishers. This led to formulation of the Fisheries Act 1963. This Act provided a more comprehensive legal framework to manage fisheries in Malaysian waters. This Act was formulated to integrate and strengthen the legal framework relating to marine and inland fisheries; to protect the

natural living resources; to protect the interest of fishers; to ensure an equitable allocation of fisheries resources; and to strengthen the administrative activities as well as to reduce conflicts among the fishing communities. This Act was subsequently repealed and replaced by the Fisheries Act 1985.

The Fisheries Act 1985 is an improvement on the previous act, incorporating the exclusive economic zone (EEZ) so as to be consistent with relevant provisions in the 1982 Law of the Sea. Malaysia became a party to the 1982 Law of the Sea on 14 October 1996. Several new provisions have been incorporated in this Act. For instance, the Act now requires the Director-General to formulate and continuously upgrade fishery programs based on the latest scientific knowledge to ensure optimum utilization of fishery resources in line with good management practices. The Fisheries Act 1985 has provisions for monitoring, control and surveillance of fishing vessels in the EEZ. Foreign fishing vessels caught fishing in the Malaysian EEZ are severely dealt with under this Act. The objective of this Act is to provide for better conservation, management and development of fisheries in light of Malaysia's commitment towards implementation of the provisions of the 1982 Law of the Sea. The provisions of the Fisheries Act 1985 follow those provided for in the 1982 Law of the Sea. Briefly, the Act covers:

- Administration of fisheries in Malaysia
- Licensing and management of local/estuarine fishing operations
- Control of fishing by foreign fishing vessels in Malaysian waters
- Offenses, prohibitions and control of certain methods of fishing
- Establishment of marine parks and marine reserves
- Offenses and legal procedures relating to the implementation of the Act.

Subsidiary Legislation/Regulations

The Fisheries Act 1985 is the main law regarding control and management of fisheries in maritime and estuarine waters. This Act provides the Minister of Agriculture with powers to make regulations for management and conservation of marine resources. A number of fisheries regulations have been made under the Fisheries Act, including:

- a. Fisheries (Marine Culture System) Regulations 1990

This regulation provides procedures for establishment of marine culture systems and licensing of such systems. This regulation is for the control of aquaculture activities and pollution arising from such activities.

- b. Fisheries (Maritime) Regulations 1967

This regulation provides procedures for licensing different types of fishing appliances, covering license fees, deposits and conditions attached to such licenses. This regulation is applicable in maritime waters off the east coast and West Coast of Peninsular Malaysia.

- c. Fisheries (Maritime) Regulations (Sarawak) 1976

This regulation is applicable in waters off the coast of Sarawak. It provides procedures for licensing fishing appliances, covering license fees, deposits and conditions attached to the licenses.

- d. The Fisheries Regulations (1964)

This regulation is applicable in waters off the coast of Sabah. It provides procedures for licensing fishing appliances, covering license fees, deposits and conditions attached to the licenses.

- e. Establishment of Marine Parks and Marine Reserves Order 1994

Waters around 40 islands have been gazetted as Malaysian Marine Parks. Fishing and collection of fish and other aquatic animals in these gazetted areas are prohibited.

- f. Fisheries (Conservation and Culture of Cockles) Regulations 1964

This regulation is for management, control and licensing of the collection of adult cockles and cockle spat from natural spat fall areas and culture areas. The size for collection of adult cockles and cockle spat is covered, as well as the fee charged for the license to collect cockles.

- g. Fisheries (Prohibition of Methods of Fishing) Regulations 1980

This regulation prohibits unsustainable fishing practices such as blast fishing, electric fishing and fishing with the use of poisons, pair trawls,

beam trawls and drift nets/gillnets of more than 10 inches for catching rays and other species.

h. Fisheries (Licensing of Local Fishing Vessels) Regulations 1985

This regulation provides procedures for licensing local fishing vessels, including conditions for marking vessels, fees and deposits payable.

i. Fisheries (Closed Season for the Catching of Grouper Fries) Regulations 1996

This regulation is applicable in the state of Kelantan and Trengganu only. Fishing of grouper fry during the month of November to December is prohibited unless permitted by the Director General of DOF.

j. Fisheries (Prohibited Fishing Methods for the Catching of Grouper Fry) Regulations 1996

This regulation prohibits the collection of grouper fry in lagoons and estuaries without a license. Only fish traps can be used to catch grouper fry in lagoons and estuaries.

k. Fisheries (Prohibited Areas) Rantau Abang Regulations 1991

To protect nesting turtles in Rantau Abang, a turtle sanctuary, this regulation prohibits fishing in specific areas.

l. Fisheries (Prohibited Areas) Regulations 1994

The waters around the islands in Sarawak have been gazetted as a fisheries protected area. Collection of shells, mollusks and corals is prohibited. Fishing without a license is prohibited.

m. Fisheries (Prohibition) Regulations 1990

This regulation prohibits the import, export, sale or keeping in captivity of piranhas unless permitted by the Director General of DOF.

n. Fisheries (Control of Endangered Species of Fish) Regulations 1999

This regulation lists all species of fish and mammals which are protected, including endangered species listed in the Convention On International Trade of Endangered Species

(CITES) such as the dugong, whale, dolphin, whale shark and the giant clam. It is an offence to fish for, harass, catch, kill, possess, sell, buy, export or transport any endangered species as specified in this regulation. Any of the listed endangered species caught unintentionally shall be released immediately or disposed as directed by a Fisheries Officer.

National Development Plans/Policies

a. The First National Agriculture Policy (NAP1, 1984 - 91)

In 1978, a Cabinet Committee on agriculture policy was established. This committee consisted of eight working groups covering all aspects of agriculture. One of the working groups focused on fisheries development and submitted its report to the Cabinet Committee in early 1979. Following this, the National Council formed another subcommittee to undertake a comprehensive study on the management and exploitation of living marine resources of the country. Based on these reports, NAP1 was unveiled in 1984. In relation to fisheries, the objective of NAP1 was to increase fish production through modern fishing technology. Deep-sea fisheries would be promoted to increase fish production using local and foreign expertise, and to ensure a sufficient number of fishing vessels to exploit the fisheries resources.

b. The Second National Agriculture Policy (NAP2, 1992 - 2010)

In 1990 a review of NAP1 was necessitated by the need to increase the contribution of the agricultural sector to overall growth and development of the economy in the face of structural changes and developments in international trade. The NAP2 was formulated with a vision of creating a market-led, commercialized, efficient, competitive and dynamic agriculture sector in the context of sustainable development. Other national policies such as the New Development Policy and the Vision 2020 were taken into consideration during formulation of NAP2. The NAP2 emphasized optimum and sustainable utilization of resources and commercialization of the sector with market-oriented growth. It was formulated on the basis of the predominant role of the private sector and incorporated

the development philosophies and aspirations of Vision 2020.

Under NAP2 the fisheries industry, in particular the deep-sea fisheries, would be further developed and expanded to support the growth of agriculture and related industries, as well as to further increase and diversify the supply of protein sources. The industry would be highly commercialized through exploitation of available resources on a sustainable basis. To sustain the level of fisheries output, fisheries management and conservation measures would be the main thrust of the industry's development. Inland and inshore fishing would be carefully undertaken to sustain the fisheries resources. The productivity of fishing effort would be the main source of output growth through expanded promotion of the use of modern fishing technology (including fish handling and storage), as well as improvement of marketing infrastructure. Traditional fishing vessels operating within 30 nm from the coastline would be gradually phased out and replaced by modern fishing fleets with efficient fishing gear.

Aquaculture would be promoted to increase fish production. Development of aquaculture estates in suitable water bodies would be promoted. The exploitation of these resources would be on a sustainable basis. Further downstream activities utilizing modern processing technologies in fish canning and production of processed fish would be further promoted.

c. The Third National Agriculture Policy (NAP3, 1998 - 2010)

The NAP3 was initiated in 1996 to cover the period from 1998 - 2010. It seeks to provide gradual but effective transformation of the agriculture and forestry sectors for the next millennium. This policy is in tandem with the National Development Policy, the Second Industrial Master Plan, the Science and Technology Policy and the Biodiversity Policy. The NAP3 provides the policy framework for future growth of fisheries. The objectives of NAP3 for fisheries are to: ensure adequate supply of fish to meet domestic demand for fresh fish as well as for the processing industries; capitalize on export markets for selected high value fish products; and conserve and sustainably manage and utilize fisheries resources. The strategic directions are:

- i. to increase efficiency and productivity by intensifying technological improvement and private sector participation;
- ii. to rationalize resource use through development of aquaculture development areas;
- iii. to strengthen competitiveness by improving market networking, enhancing quality and safety assurance of fisheries products, exploiting market opportunities, and strategic positioning in niche markets;
- iv. to strengthen economic foundations by enhancing institutional support via research and development programs;
- v. to promote sustainable development by managing sustainable production and rehabilitating depleted fisheries resources.

d. The Fisheries Development and Management Plan

In 1985, "The Fishery Sector Strategy And Development Program until the Year 2000" was published. This plan detailed the strategy, programs and expenditure required for fisheries to achieve the objectives that are outlined in NAP1. It also outlined the strategy, programs and expenditure for five sub-sectors, namely: inshore fisheries, offshore fisheries, aquaculture, development support, and social and institutional development.

Coastal Resources Policies/Laws

a. Mangroves

The National Forestry Act 1984 provides for administration, management and conservation of forests and forest developments within states in Peninsular Malaysia. The states of Sabah and Sarawak have their own state laws on forestry. Section 7(1) of the National Forestry Act 1960 authorizes the state to gazette any land as a permanent forest reserve. Currently, there are 112 mangrove reserves in the country. These reserves form part of the country's Permanent Forest Estate (PFE), which is sustainably managed for production and protection. The Environment Quality (Prescribed Activities) Environmental Impact Assessment (EIA) Order 1987 is designed to protect the forest environment and biodiversity, particularly with regard to logging of natural forests.

b. Coral Reefs

Coral reefs in Peninsular Malaysia occur in off-shore islands as shallow fringing reefs and isolated coral patches. The corals in Malaysia are highly diverse with 64 reported genera of hard corals composed of 174 species. Coral reefs are threatened mainly by human activities. The only legislation that protects coral reefs in maritime waters is the Fisheries Act 1985, which provides for establishment of marine parks and marine reserves. So far, Malaysia has established marine parks and marine reserves in waters surrounding 40 islands. Fishing and collection of corals, shells and other marine organisms is prohibited in the waters of these gazetted islands.

c. Seagrasses

Seagrass is a relatively unknown coastal resource in Malaysia. Scientific works have documented 10 genera and 14 species along Malaysia's coastline. The location of seagrass beds in coastal waters makes them vulnerable to both natural and man-induced stresses. Sedimentation, excessive freshwater inputs, coastal reclamation, accidental oil spills and shipping activities have impacted seagrasses in specific areas. To date, there is a distinct absence of legislation that explicitly establishes seagrass protected areas.

d. Endangered/Threatened Species

Malaysia has four species of sea turtles which nest along its coast, namely: the Leatherback (*Dermochelys coriacea*), Green turtle (*Chelonia mydas*), Hawksbill turtle (*Eretmochelys imbricata*) and Olive Ridley (*Lepidochelys olivacea*). The nesting population of sea turtles have declined by as much as 60 - 99 percent since the 1950s (MOSTE 1997). Conservation efforts through development of hatcheries were started in Trengganu in 1961, Kelantan in 1964, Pahang in 1971, Malacca in 1987 and Perak in 1990. Efforts undertaken to control collection and sale of leatherback turtles are regulated through the Trengganu state enactment. Other measures undertaken to conserve turtles include:

- i. The gazetting of the Fisheries (Prohibition of Methods of Fishing) Regulations 1990 which bans the use of drift nets/gillnets with mesh sizes of more than 10 inches.

- ii. The Establishment of the Rantau Abang Sanctuary in 1990.
- iii. The gazetting of the Fisheries (Prohibited Area) Regulations 1991 where waters off the coast of Merchang to Kampung Kuala Abang (Tanjung Jara, Trengganu) was declared a prohibited area.
- iv. Establishment of turtle hatcheries and the release of hatchlings into the sea.
- v. Research on the biology and migratory behavior of turtles.
- vi. Formulation and implementation of education/awareness programs on Malaysia's turtle heritage.

e. Dugongs

Dugongs are protected under the Fisheries (Control of Endangered Fish Species) Regulations 1999, which disallows catching of dugongs and requires the release of these mammals if caught accidentally. In addition, dugongs are protected under the Convention on International Trade of Endangered Species (CITES).

Fisheries Investment Policies

Under the Promotion of Investment Act 1986, the term "company" in relation to agriculture includes agro-based associations and sole proprietorships and partnerships. Incentives offered by the Government for manufacturing, agriculture (including fisheries) and tourism sectors are provided under the Promotion of Investment Act 1986 and the Income Tax 1967. Incentives provided are in the form of deduction or exemption from taxes. Among the incentives offered by the Government for the agriculture sector, including fisheries, are:

- a. Pioneer Status
- b. Investment Tax Allowance
- c. Reinvestment Allowance
- d. Agricultural Allowance
- e. Deduction for Capital Expenditure on Approved Agriculture Projects
- f. Export Credit Refinancing
- g. Double Deduction for Export Credit Insurance Premium
- h. Double Deduction for Expenses On Promotion of Export
- i. Industrial Building Allowance
- j. Incentives for Research and Development.

In addition to the above, other incentives related to fisheries activities include:

- a. Infrastructure Allowance,
- b. Incentives for Small-Scale Companies,
- c. Exemption from Import Duty on Direct Raw Materials/Components
- d. Drawback of Sales Tax on Materials Used in Manufacture
- e. Exemption from Import Duty and Sales Tax on Machinery and Equipment
- f. Incentives for Operational Headquarters
- g. Drawback of Excise Duty on Parts, Ingredients or Packaging Materials
- h. Goods Exported to Free Zones, Labuan And Langkawi.

Priority fisheries activities and products that are eligible for pioneer status and investment tax allowance under the Promotion of Investment Act 1986 include:

- a. agriculture production which includes spawning, breeding and culturing of aquatic products and offshore fishing
- b. integrated agriculture which includes cultivation and processing of aquatic products
- c. processing of agricultural produce which includes aquatic products and aquaculture feeds.

External Policies Affecting Fisheries

General Land Use

As provided for under the Federal Constitution of Malaysia, land use planning falls under the jurisdiction of State Governments. The National Land Code 1965 is an act that introduced a uniform system for land administration in Peninsular Malaysia. Provisions under this Act include the vesting of unalienated land within a state in the state authority, including minerals and rock materials. However, for any land which is being alienated, the power to approve or refuse an application rests with the State Authority (with reference to the Town and Country Planning Department or local authority so that development is in accordance with existing plans). The National Land Council was established to play a role in resolving land-use issues and facilitating the adoption of a comprehensive and coordinated approach to land-use planning. Other related acts include the Town and Country Planning Act 1974 (Amended 1994), Structure and Local Plans and the Land Conservation Act 1960. The latter regulates projects on hill

slopes. Although 11 states in Peninsular Malaysia have adopted the Act, only the State of Penang has gazetted this Act.

At the State level, the State Planning Committee was also established to provide a channel for the coordination and proper management of land resources. This committee screens and approves development plans at the state level.

Pollution/Environmental Protection

Environmental policies are backed by laws at the Federal and State level. Malaysia is relatively well-served with legislation that regulates potential environmental threats. The Merchant Shipping Ordinance 1952, Merchant Shipping Ordinance 1960 (Sabah) and the Merchant Shipping Ordinance 1960 (Sarawak) (under the purview of the Marine Department Peninsular Malaysia, Marine Department Sabah and Marine Department Sarawak, respectively) controls pollution from shipping. The Exclusive Economic Zone 1984 also controls pollution from ships and dumping at sea.

The Environment Quality Act 1974 (Amended 1985) provides pollution control regulations and empowers the Department of Environment to regulate air and water pollution and to manage scheduled wastes. However, control of pollution from sewage and animal waste and also soil erosion are under State and Local Government jurisdictions. The Department of Environment has also drawn up guidelines for environmental impact assessment (EIA) to assist proponents of major development projects to meet environmental standards. The types of activities which are subjected to Environment Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987 are agriculture, airport, drainage and irrigation, land reclamation, fisheries, forestry, housing, industry, infrastructure, housing, industry, infrastructure, ports, mining, petroleum, power generation and transmission, quarries, railways transportation, resort and recreational development, waste treatment and disposal, water supply and development of hill-slopes, golf courses, former landfills and ex-mining land.

Minerals

The National Mineral Policy of 1992 guides the sustainable development of mineral resources. In line with this, the Mineral Development Act, which deals with regulatory aspects of exploration and

mining, was gazetted in 1994. The Continental Shelf Act 1966 regulates exploration and exploitation of the continental shelf.

International/Regional Conventions

Malaysia is a party to a number of international treaties /conventions, including the:

- a. 1958 Convention on The Continental Shelf
- b. 1971 Convention on Wetlands of Importance Especially as Waterfowl Habitat (RAMSAR Convention)
- c. 1972 Convention Concerning Protection of the World Cultural and Natural Heritage
- d. 1973 Convention for the Prevention of Pollution from Ships (MARPOL)
- e. 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- f. 1982 United Nations Convention on the Law of the Sea (LOS),
- g. 1987 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- h. 1987 Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol)
- i. 1992 Convention on Biological Diversity
- j. 1992 Framework Convention on Climate Change, and
- k. Forest Principles (Non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests).

The Department of Fisheries Malaysia also maintains direct contact on technical issues with regional and international organizations dealing with fisheries, including the:

- a. Food and Agriculture Organization (FAO) of the United Nations
- b. ASEAN-Cost Subcommittee on Marine Science
- c. Asia Pacific Fisheries Commission (APFIC)
- d. Asia Pacific Economic Cooperation (APEC)
- e. Association of South East Asian Nations (ASEAN)
- f. Bay of Bengal Programme (BOBP)
- g. Indian Ocean Tuna Commission (IOTC)
- h. International Center For Living Aquatic Resources Management (ICLARM)
- i. International Development Research Centre (IDRC)
- j. Japan International Research Center for Agriculture Science (JIRCAS)

- k. Marketing Information and Advisory Services for Fish Products in the Asia/Pacific Region (INFOFISH)
- l. Network of Aquaculture Centers in Asia and the Pacific (NACA), and
- m. Southeast Asian Fisheries Development Centre (SEAFDEC).

International regulations play a major role in governing trade, especially for developing countries. Two recent international agreements of particular significance are the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) and the Agreement on Technical Barriers to Trade (TBT). These agreements were concluded under the Uruguay Round of multilateral trade negotiations (MTNs) and are binding on all members of the World Trade Organization (WTO).

The SPS Agreement specifies when food safety concerns are a valid reason for exceptions to the principle of non-discrimination in international trade. The agreement encourages WTO members to use international standards. All processing has to adopt the Hazard Analysis of Critical Control Points (HACCP) System and must be enforced in a manner that respects the SPS Agreement.

The TBT Agreement sets out rules for technical regulations that are not directly related to health. The TBT Agreement would apply to a country intending to impose the use of eco-labels on internationally traded fish products. Countries now have to restructure production and trade towards trade liberalization.

Other Institutions Involved in Fisheries and Coastal Zone Management

At present there is no national institution whose exclusive function is for integrated coastal zone management in Malaysia. There are a number of multi-sectoral, inter-agency and consultative Councils and Committees at the federal and the state level which have been established to resolve issues related to land, forestry, local government, water, environment and development. The list of relevant councils and committees is given in Appendix Table 1 and key government agencies involved in development and environment activities in the coastal zone are given in Appendix Table 2.

Relevant non-government organizations and groups include the following:

- a. Environmental Management and Research Association of Malaysia
- b. Malayan Nature Society
- c. Environmental Protection Society Malaysia
- d. Malaysian Fisheries Society
- e. Malaysian Society of Marine Sciences
- f. WHO Western Pacific Regional Center for the Promotion of Environmental Planning and Applied Sciences
- g. World Wide Fund for Nature, Malaysia
- h. Sahabat Alam Malaysia
- i. Malaysian Institute of Maritime Affairs (MIMA)
- j. Resident Associations
- k. Clubs and charities
- l. Fishers' Association
- m. Media
- n. Tourism promotion association
- o. Manufacturer's trade association and Chambers of Commerce
- p. Offshore industries like petroleum companies
- q. Professional societies

Appendix Table 1. Relevant councils and committees established to resolve issues related to land, forestry, local government, water, environment and development

	Name of Council/Committee	Function	Membership
1	National Land Council (NLC)	Provided for in the Federal Constitution and advises on matters relating to natural resources, land, mining, forestry, agriculture and related subjects. Any policy formulated by NLC is binding on both Federal and State Governments.	Chairman: Deputy Prime Minister Members: Chief Ministers and Federal Ministers.
2	National Forestry Council (NFC)	Similar to NLC but role relates to forestry issues.	Chairman: Deputy Prime Minister Members: Chief Ministers and Federal Ministers.
3	National Council For Local Government (NCLG)	Formulates policies as well as operating mechanisms for all local governments.	Chairman: Minister of Local Government and Housing Members: State Executive Committee members responsible for local government matters and Federal Ministers.
4	National Water Council	Formulates policies on water and helps resolve interstate water issues.	Chairman: Prime Minister Members: Chief Ministers and Federal Ministers.
5	National Development Council (NDC)	Considers matters on implementation of development programs and projects.	Chairman: Prime Minister Members: Chief Ministers and Federal Ministers.
6	National Economic Action Council (NEAC)	Oversees implementation of the national economic recovery action plan.	Chairman: Finance Minister Members: Federal Ministers and private sector representatives.
7	Federal-State Liaison Committee	Resolves issues and conflicts between Federal-State governments.	Chairman: Prime Minister Members: Chief Ministers and Federal Ministers.
8	Meeting of Federal-State Environment Ministers/Executive Council Members For Environment	Discusses matters related to development and environment.	Chairman: Minister of Science, Technology and Environment Members: State Environment Ministers/ Executive Council Members.
9	National Development Planning Committee	Coordinates preparation of the National Development Plans for submission to the Cabinet and Parliament for approval.	Chairman: Chief Secretary Members: Secretary-Generals/Heads of all Ministries.
10	Environmental Quality Council (EQC)	Oversees implementation of Environment Quality Act (EQA) 1974, advise the Minister of Science, Technology and Environment on policies relating to environment and on matters relating to EQA.	Chairman: Appointed by the Minister Members: Secretary-Generals of various Ministries and representatives from the private sector, NGOs and states of Sabah and Sarawak.

Appendix Table 1. Relevant councils and committees established to resolve issues related to land, forestry, local government, water, environment and development. (continued)

	Name of Council/Committee	Function	Membership
11	EIA Review Panel	Reviews detailed EIA reports.	Chairman: Director-General of Environment Members: Government agencies, universities, environmental experts, NGO's.
12	National Coastal Erosion Control Council (NCECC)	Formulates coastal erosion control strategies.	Chairman: Director-General of Implementation and Co-ordination Unit (ICU) Members: Representatives from relevant agencies.
13	State Executive Council	Equivalent to State Cabinet, makes all important decisions on behalf of the State.	Chairman: Chief Minister Members: State Assemblyman in charge of various development and environment portfolios or in the State of Sabah and Sarawak the State Ministers.
14	State Development Council	Supervises implementation of the State Development Plan.	Chairman: Chief Minister Members: State Ministers/Executive Committee (EXCO) Members, State Development Officers, Heads of State Departments.
15	State Environmental Committee	Forum for promoting greater awareness of environmental issues of the state level and identifying and resolving these issues.	Chairman: State EXCO Members in charge of environment or state Minister of environment in Sabah /Sarawak. Members: Heads of State Departments.
16	City Council, Municipal Council or district Council	Forum for promoting greater awareness of environment and development issues at the local level and identifying and resolving these issues.	Chairman: Mayor of City Council or President of Municipal Council or District Council Members: Heads of State Departments/ Heads of Districts.
17	State Planning Committee	Responsible for approval of structure plans and all physical planning issues.	Chairman: Chief Minister Deputy Chairman: An EXCO Member. Secretary: Director, State Town and Country Planning. Members: State Secretary. Director, State Lands and Mines; Director, UPEN; Director, State Public Works; State Legal Advisor; State Financial Advisor; State Development Officer; Director, State Department of Environment; Four additional members (EXCO members).

Source: Economic Planning Unit, Prime Minister's Department. Integrated Coastal Zone Management, September 1999. p. A4 - A7.

Appendix Table 2. Key government agencies involved in development and environment activities in the coastal zone.

	Agency	Objectives and functions
1	Prime Minister's Department (PM)	To plan, formulate and co-ordinate all matters pertaining to implementation of national policies to achieve the stated policies of the Government. To ensure that all administration of development projects, international conferences, etc. are carried out in accordance with policies and procedures formulated from time to time.
2	Economic Planning Unit of the Prime Minister's Department (EPU)	The objective of EPU is to formulate policies, strategies and programs for short-and long-term economic development of the nation. EPU is the reference on national development, planning and economic issues for the Government. Each state has a State EPU or its equivalent. Within State EPUs, sectors or individual officers handle similar fields covered by the Federal EPU, e.g. industry, agriculture, tourism, etc.
3	Implementation and Co-ordination Unit of the Prime Minister's Department (ICU)	The objective of ICU is to be the premier agency in monitoring and coordinating implementation of development programs and projects to ensure the achievement of objectives of the national development policies towards building a progressive and successful nation.
4	Town and Country Planning Department (TCPD) of the Ministry of Housing and Local Government.	TCPD administers and enforces the Town and Country Planning Act 1976 and ensures that development plans form the basis for planning and control of use and development of land.
5	Drainage and Irrigation Department (DID)	DID's objectives are to provide infrastructure and services in irrigation to increase agricultural productivity; provide flood mitigation works, conserve river systems, provide coastal protection works; and to develop a hydrological database for water resource development. DID administers and enforces the Water Enactment 1920 and River and Drainage Enactment 1920. DID operates a national network of hydrological/rainfall stations; river water quality stations; provides technical advice and support to Ministry of Agriculture agencies. DID's Coastal Engineering Technical Centre is the Secretariat to the NCEC chaired by ICU, Prime Minister's Department. .
6	Department of Environment (DOE), Ministry of Science, Technology and the Environment (MOSTE)	DOE's primary objectives are to enhance and improve the quality of the environment, and to balance the goals of economic development and environmental control for sustainable utilization of natural resources. DOE administers the Environment Quality Act 1974. It assesses the EIA for prescribed activities and reviews existing (and introduces new) environmental regulations.
7	Ministry of Transport (includes shipping) (MOT)	The MOT's objective is to plan and formulate transportation policies, to provide for the development and implementation of an efficient, safe and integrated transnational system (air, sea, land) to accelerate socioeconomic development of the country. The Marine Division in MOT oversees the enforcement of shipping legislation such as Port Authority Act 1963 etc.
8	Department of Fisheries (DOF), Ministry of Agriculture (MOA)	DOF's objective is to increase food production to meet the domestic and export market, to sustain production levels of inshore fisheries, develop and manage deep sea fisheries and to increase value of fisheries products. DOD is responsible for the overall management of fisheries and related matters including management of gazetted marine parks, and administers and enforces the Fisheries Act 1985 and EEZ Act 1984. It also undertakes research, provides technical support for the marine and freshwater fisheries industry.
9	Department of Forestry (DoFor), Ministry of Primary Industries	DoFor's objective is guided by the National Forestry Policy i.e. to manage the forest resources sustainably for the continuous production of forest goods and services and their optimum utilization, compatible with environmental requirements. DoFor provides advice and technical assistance to the states, maintains experimental stations and conducts training and research. States are empowered to formulate independent forest policies.

Appendix Table 2. Key government agencies involved in development and environment activities in the coastal zone. (continued)

	Agency	Objectives and functions
10.	Department of Agriculture (DOA), Ministry of Agriculture (MOA)	DoA's objective is to increase farm productivity through effective transfer of technology and research, to involve farmers in technology-use and to increase the contribution of the agriculture sector to the Federal and State level, focusing on farmers' training and development.
11	Geological Survey Department (GSD). Ministry of Primary Industry	GSD is the principal agency for discovery and investigation of mineral, water and energy resources (excluding oil and gas). It produces terrain/topography/aerial photos, studies hill slopes of various gradients and erosion risks. Geological mapping, hydrogeology, engineering geology, mineral exploration etc are some of its functions.
12	Public Works Department (PWD), Ministry of Works	The PWD's objective is to develop the infrastructure and public utilities such as roads, water supplies, building, airports, ports and jetties to meet the needs of the nation.
13	Department of Wild Life and National Parks, (PERHILITAN), MOSTE	PERHILITAN's objectives are to conserve wildlife species with the goal of fulfilling the needs and interests of the people; to create and manage National Parks, wildlife Reserves and Sanctuaries. PERHILITAN administers and enforces the Wildlife Act 1972 as well as being the national agency for international instruments e.g. CITES. It maintains a wildlife database and operates several wildlife breeding projects e.g. Sumatran Rhino, Seladang, Deer, Terrapin and Pheasant; elephant translocation and shore birds conservation. It also manages the National Park and the National Zoo.
14	Ministry of Culture, Arts and Tourism (MCAT)	The objective of MCAT is to develop and promote national culture and to develop and promote tourism as a major industry in the country. It formulates tourism policy plans, monitors the implementation of tourism programs.
15	Department of Mines, (DOM) Ministry of Primary Industries	DoM's objective is to encourage optimum development of the mining industry and advises the Federal and State Governments on matters pertaining to mining, minerals and related activities. DoM administers and enforces mining related laws (Mining Enactment Cap 148 and other State Enactment Ordinances, Mineral Ore Enactment FMS Cap 148) and other state enactments and activities such as exploration, production etc. At state level, it monitors mining activities and surveys their environmental impacts.
16	Department of Veterinary Services (VSD), Ministry of Agriculture (MOA)	VSD's objective is to develop the livestock industry and all aspects of animals and veterinary public health. VSD administers and enforces the Rearing of Pigs Enactment 1980, Animal Quarantine. It also solves animal health problem in the livestock industry and develops vaccines for animal diseases.
17	Marine Department (MD), Ministry of Agriculture (MOA)	The MD's objective is to establish an organized and safe navigation system and ship safety. It administers and implements the Merchant Shipping Ordinance 1952, Merchant Shipping (Oil Pollution) Act 1994. It ensures all ships are seaworthy and safe, merchant shipping navigation is organized and safe, provides ship survey, inspection, registration, sea manning, seafarer examination and administers ports which are not under the Port Authority Act 1963. It undertakes management audits on shipping companies, shipping management companies and ships. It is responsible for compensation with regard to oil spill/pollution damage and provides ferry services for passengers, examines seamen and collects port and shipping statistics.
18	Land and Mines Department, Ministry of Land and Co-operative Development	To formulate laws and policies and develop human resources in land administration geared towards achieving the objectives of the National Development Policy; to motivate and lead reforms in land administration; to improve capacity of management of federal land property so as to maximize returns to the Government.

Appendix Table 2. Key government agencies involved in development and environment activities in the coastal zone. (continued)

	Agency	Objectives and functions
19	Malaysian Industrial Development Authority (MIDA), Ministry of International Trade (MITI)	MIDA's primary objective is to promote and co-ordinate industrial development in Malaysia. It administers the manufacturing license under the Industrial Co-ordination Act 1986. It undertakes industrial promotion, advises State and Federal governments on industries promotion, formulation of policies pertaining to the industrial sector to expedite industrial development.
20	Department of Local Government, Ministry of Housing and Local Government	The objective of the Department of Local Government is to help Local Authorities render efficient and modern urban services, provide public amenities and recreational facilities and also to create economic opportunities for their respective areas. It administers a number of Acts such as Local Government Act 1976 (Act 171), the Street, Drainage and Building Act 1974 (Act 133), the Uniform Building By-Laws 1984 and the Town and Country Planning Act 1976.
21	Ministry of Defense (MOD), Navy	MOD's objective is to maintain the sovereignty and national integrity of Malaysia as well as the strategic interest of the country by military and other means related to defense. It manages the national defense and the Armed Forces and it implements national defense policy
22	Local Authority - City Council, Municipal Council or District Council	The objective of Local Authorities under the Local Government Act 1976 is to perform local government functions, namely provision of urban services, collection of assessment tax, licensing financial management and enforcement. The Town and Country Planning Act 1976 and the Street, Drainage and Building Act 1974 empowers Local Authorities as local planning, control and development agencies.

Source: ICZM Working Document 1999 and Marine Department 1999.

Appendix 2: Two Sample Projects To Be Carried Out in the West Coast of Peninsular Malaysia.

Project Title:

1. Conservation of Habitat Ecosystem and Biodiversity

Project Objective:

The main objective of this project is to conserve the existing habitat ecosystem to increase the fisheries resources naturally and artificially through formation of databases through formation of databases for the ecosystem.

Project Description:

The main activity of this project is data collection on basic information on the ecosystem. A database will be developed for each ecosystem under study. In general, research will encompass mapping of the coral and sea-grass areas, digitizing ecosystems, making an inventory and monitoring the biodiversity of reefs, the open water stocking of giant clams, sea cucumbers and lobsters and monitoring the distribution of groupers and snappers. Besides providing a detailed database on the various ecosystems, this project will also aid in the formulation of management and conservation strategies such as zone demarcations, identifying activities that pose a threat to the habitat, and determining areas with low/high impacts.

Project Implementation:

5 years (Year 2001 - 2005)

Resource Requirement:

Total Funding RM 6.76 million

<u>Year</u>	<u>Budget (RM)</u>
2001	772 000
2002	497 000
2003	497 000
2004	497 000
2005	497 000

Implementing Institutions:

- * Staff from the Ecology Branch (FRI), Batu Maung
- * Marine Fishery Resources Development and Management Department (MFRDMD), Kuala Terengganu
- * Staff from the Ecology Branch (FRI), Sarawak.

Project Monitoring and Evaluation:

This Project will be funded under the 8th Malaysian Plan, which will be monitored and evaluated by the Department of Fisheries and Central Agency (Economic Planning Unit).

Project Title:

2. Development of Fisheries Management Information System

Project Objective:

The main objectives of this project are:

- * To detect any changes in the trend of fish landings, fish composition and total catch from inshore and offshore fisheries and to determine the contributing factors.
- * To provide scientific information to formulate regulations on the management of inshore (<30 nm from shore) and offshore (>30 nm from shore) fish resources in order to sustain the inshore production and to increase offshore production. Management measures will ensure that the fisheries resource is exploited at an optimum level by reducing fishing effort, especially in the inshore area. This is in line with the third National Agriculture Policy.

Project Description:

This project encompasses several aspects such as monitoring of fish landings; stock and resource assessment; demersal and pelagic stock survey; prawn resource survey; inshore and offshore fisheries survey; biological and oceanographic studies; and potential fishing ground forecasting in Malaysian waters. Data collection will be done in the field and a database will be set up for analysis of data and preparation of reports.

Project Implementation:

5 years (Year 2001-2005)

Resource Requirement:

Total Funding RM 12.49 million

<u>Year</u>	<u>Budget (RM)</u>
2001	15 000
2002	3 145 000
2003	3 050 000
2004	2 745 000
2005	1 835 000

Implementing Institutions:

Staff of FRI, Batu Maung, Penang
Staff of MFRDMD, Kuala Terengganu
Staff of FRI, Sarawak
Staff of Fisheries Management Information System
Branch (FMIS), Department of Fisheries.

Project Monitoring and Evaluation:

This Project will be funded under the 8th Malaysian Plan, which will be monitored and evaluated by Department of Fisheries and Central Agency (Economic Planning Unit).