CORAL TRIANGLE INITIATIVE
ON CORAL REEFS, FISHERIES AND FOOD SECURITY

CORAL TRIANGLE INITIATIVE:

ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT (EAFM)

Country Position Paper—Malaysia

May 2013

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Coral Triangle Initiative: Ecosystem Approach to Fisheries Management (EAFM): Country Position Paper – Malaysia

AUTHOR:
Kevin Hiew

EDITOR:
Jasmin Saad, OceanResearch

KEY CONTRIBUTORS:
Gopinath Nagarai, Fanli Marine Consultancy

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For more information on the Coral Triangle Initiative, please contact:

Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security Interim-Regional Secretariat
Ministry of Marine Affairs and Fisheries of the Republic of Indonesia
Mina Bahari Building II, 17th Floor
Jalan Medan Merdeka Timur No. 16
Jakarta Pusat 10110, Indonesia
www.coraltriangleinitiative.org

CTI-CFF National Coordinating Committee
Professor Nor Aeni Haji Mokhtar
Under Secretary
National Oceanography Directorate, Ministry of Science, Technology and Innovation,
Level 6, Block C4, Complex C, Federal Government Administrative Centre, 62662 Putrajaya, Malaysia.

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1.0

INTRODUCTION

EAFM represents a major shift in the manner in which fisheries resources and their sustainability are viewed. Malaysia has been proactive in embedding EAFM into the country's natural resource regime, beginning with initiatives in Sabah. As part of Malaysia's ongoing commitment to the regional effort to introduce Ecosystem Approach to Fisheries Management in all CT6 countries, this paper has been prepared to enable other countries to understand the situation relating to EAFM in Malaysia—its challenges and successes—so they can draw on this experience in pursuing their own EAFM goals.

In doing this, this position paper provides:

- A backdrop to the Malaysian fisheries sector, including its socio-economic importance and resource health.
- The current status of the EAFM implementation in the country:
  - Including current EFAM initiatives.
  - Major constraints faced in implementation.
- Future direction and recommendations for EAFM in Malaysia.

2.0

BACKGROUND

EAFM is a new direction for fishery management, essentially reversing the order of management priorities to start with the ecosystem rather than the target species (Pikitch *et al*., 2004). The main purpose of the EAFM is to plan, develop, and manage fisheries in a manner that addresses the multiple needs and desires of society, without jeopardizing the options for future generations to benefits from the full range of goods and services provided by aquatic ecosystems (FAO, 2009).

Thus, fisheries management strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic, and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries (FAO, 2003).

EAFM requires management of interactions between the core of the fishery, fish and fishers, and the other elements of the ecosystem, including the human systems relevant to management. EAFM aims to sustain healthy marine ecosystems and the fisheries they support. EAFM does not displace traditional management approaches but complements them substantially.

Understanding the complex ecological and socio-economic environments in which fish and fisheries exist, the effects that fishery management will have on the ecosystem and the effects that ecosystem change will have on fisheries, would enable its effects to be better anticipated.

3.0

THE MALAYSIAN NEED FOR EAFM

A key issue in implementing EAFM are the factors that compel its introduction. In the case of Malaysia, these factors relate to the status of its industry and health of the resources on which is based. Details of both are provided below.

3.1 CURRENT STATUS OF FISHERIES AND FISHERIES HABITATS IN MALAYSIA

3.1.1 STATUS OF THE MALAYSIAN FISHERIES INDUSTRY

OVERVIEW

Marine-capture fisheries constitute an important sector in the Malaysian economy, not only as a major food source but also a generator of foreign exchange and employment. In 2009, per capita fish consumption in the country was 56 kg, making fish a strategic food commodity (Abdullahi *et al.,* 2010). Fish landings amounted to 1,428,881 tonnes in 2010, valued at RM6.65 billion or 1.3 percent of GDP in value.

Of this tonnage, 76.5 percent was contributed from Peninsular Malaysia waters, while the balance of 23.5 percent originated from Sabah and Sarawak waters.

Landings had increased by 15.2 percent from 1,209,604 tonnes in 2005 to 1,428,881 tonnes in 2010, while values had increased 65.7 percent from RM 4.15 billion to RM 6.65 billion over the same period (Department of Fisheries, 2012).

In terms of employment, there were about 129,622 licensed fishermen in Malaysia as of 2010, 68.1 percent being from Peninsular Malaysia, while 31.9 percent were from the Sabah and Sarawak. The number of licensed fishermen increased by 42.9 percent from 90,702 in 2005 (Department of Fisheries, 2007; Department of Fisheries, 2012).

As of 2010, the Malaysian fishing fleet comprised 49,756 fishing vessels, an increase of 38.1 percent since 2005. Traditional gears such as drift/gill nets, hook and line, and bag nets outnumber commercial gears such as the trawl and purse seines.

Nevertheless, commercial gears landed almost 76.4 percent of the national catch in 2010. While traditional gears are confined to coastal waters, commercial gears harvest from both coastal and the deep sea. The government defines resources within 30 nautical miles from the shore as coastal and those beyond that as deep sea or offshore. The resources in these grounds can be further categorized as demersal and pelagic. Demersal catch revolves around a multitude of species, none of which are individually dominant. Conversely, the pelagic species count is much smaller, with some being of major economic concern.

FISHING GROUNDS AND FISHERIES DISTRICTS

There are four (4) major fishing grounds in the country i.e. the waters off the West and East Coast of Peninsular Malaysia and off Sarawak and Sabah states. In general, most of the fishing grounds in Peninsular Malaysia are located in the shallow waters of depths less than 40 m and lie relatively near to the mangroves (Arshad *et al.*, 1997). There are a total of 92 fisheries districts in Malaysia, of which 24 are located in West Coast of Peninsular Malaysia, 18 in East Coast Peninsular Malaysia, 16 in Sarawak, and 16 in Sabah (included F.T of Labuan) **(Figures 1–2)**.

FIGURE 1: FISHERIES DISTRICT IN PENINSULAR MALAYSIA

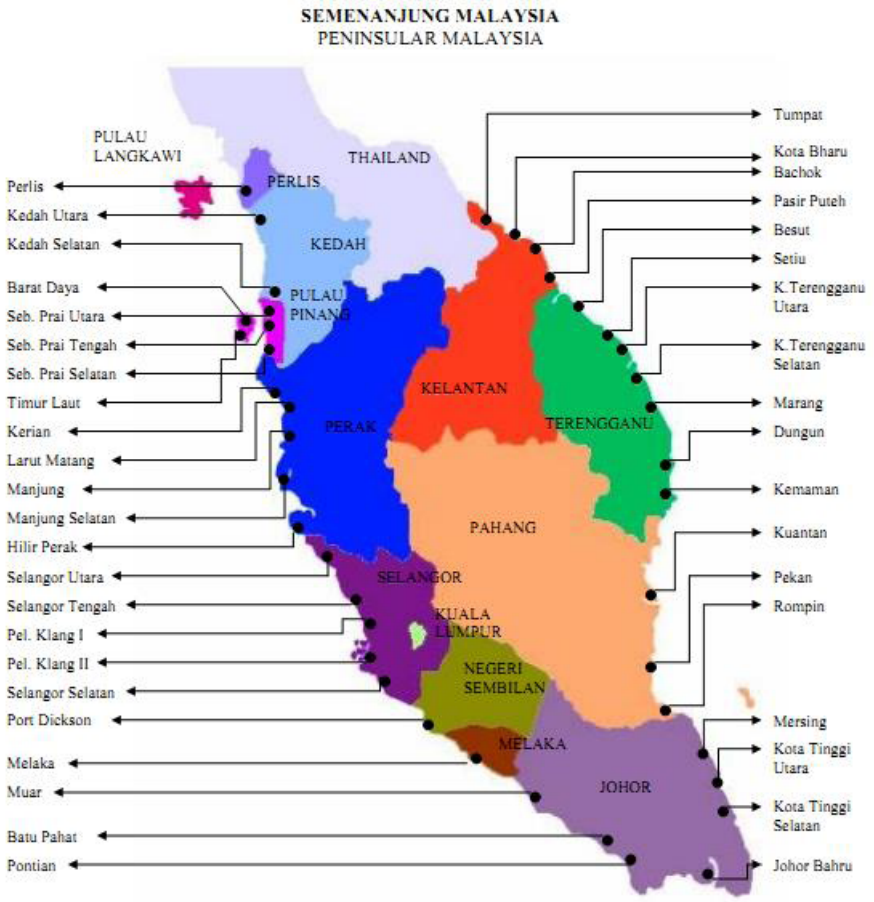
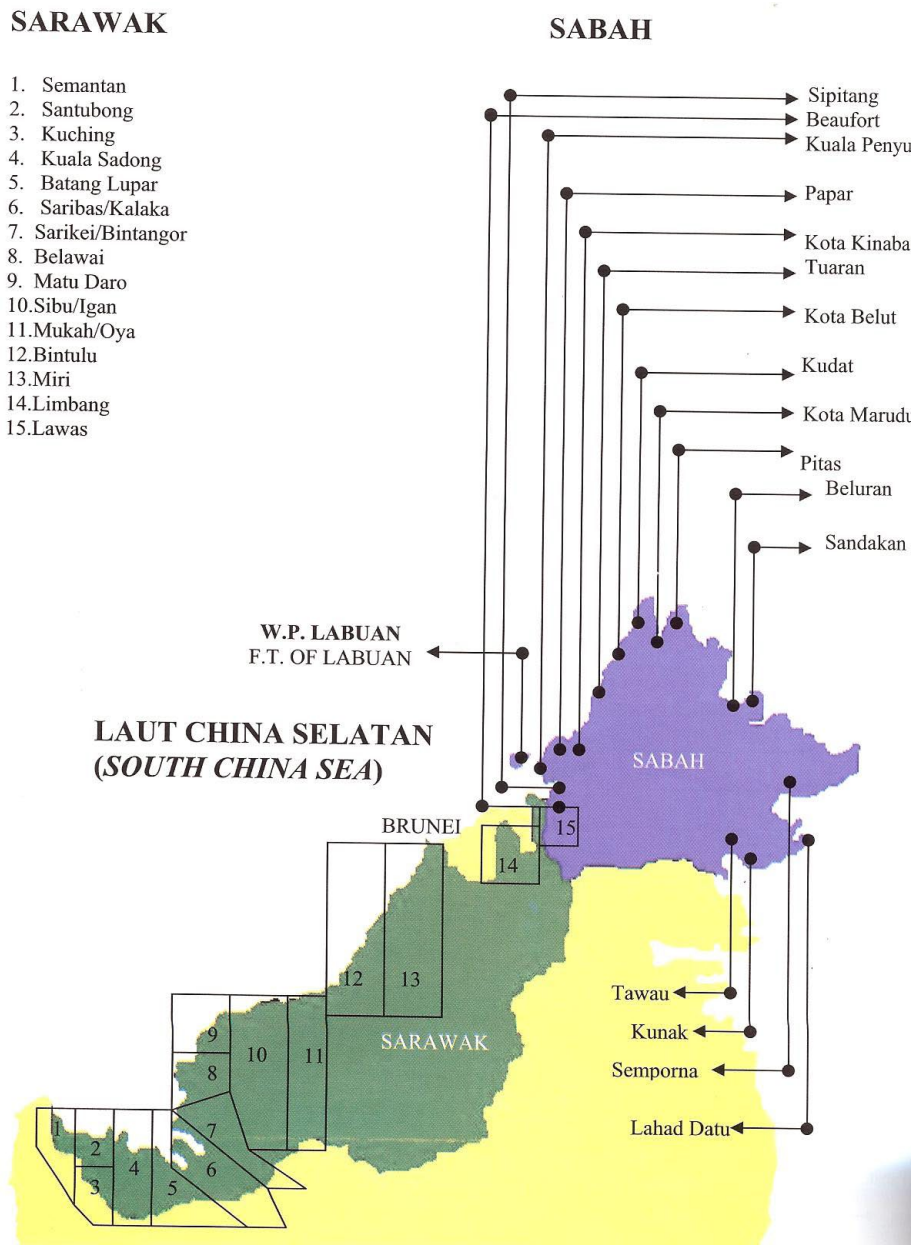


FIGURE 2: FISHERIES DISTRICT IN SARAWAK AND SABAH (INCLUDED F.T LABUAN)

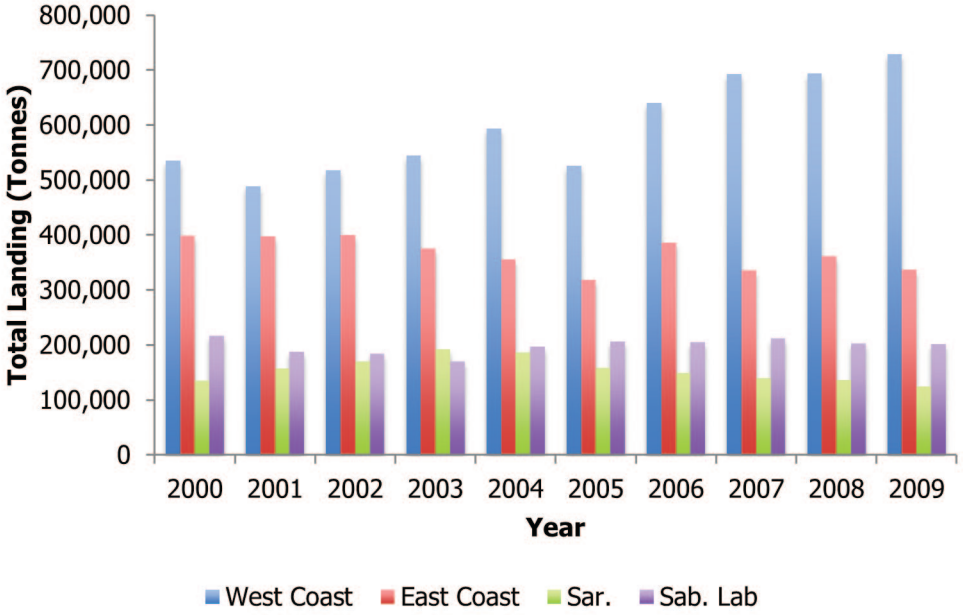


MARINE FISH LANDINGS (FISHERIES OUTPUT)

As shown in **Figure 3**, the fishery outputs of all regions in Malaysia from 2001 until 2010 have either been increasing or relatively steady. Total landings increased from 911,933 tonnes in 1991 to 1,428,881 tonnes in 2010 with an annual growth rate of 2.5 percent **(Figure 4)**. Total marine landings in 2010 were valued at RM6.65 billion. Inshore landings (1,108,897 tonnes or RM5.36 billion) contributed about 77.6 percent of the total marine landings, while the deep-sea landings only contributed 22.4 percent (319,984 tonnes or RM1.29 billion) (Department of Fisheries, 2012).

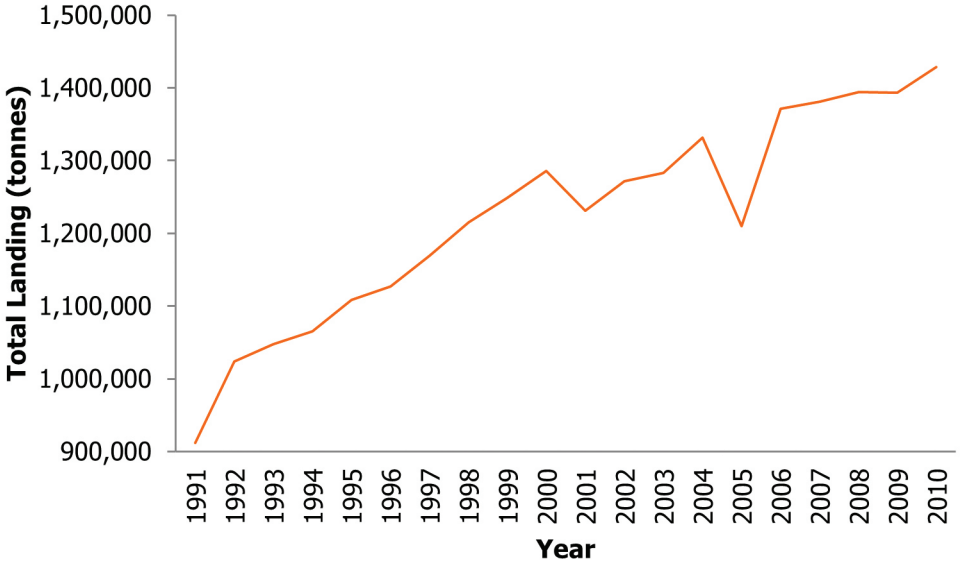
The West Coast of Peninsular Malaysia recorded an increase in landings from 489,026 tonnes to 755,826 tonnes with an annual growth rate of 3.9 percent, while the fisheries output in the East Coast of Peninsular Malaysia were maintained between 300,000 to 400,000 tonnes for all years of 2001 to 2010. Similarly for Sabah/Labuan and Sarawak, the outputs were recorded constant between 100,000 to 220,000 tonnes.

FIGURE 3: TOTAL REGIONAL LANDINGS OF MARINE FISH (TONNES) IN MALAYSIA, 2001-2010



Source: Annual Fisheries Statistics 2001-2010, Department of Fisheries

FIGURE 4: FISHERY LANDINGS (TONNES) IN MALAYSIA, 1991-2010



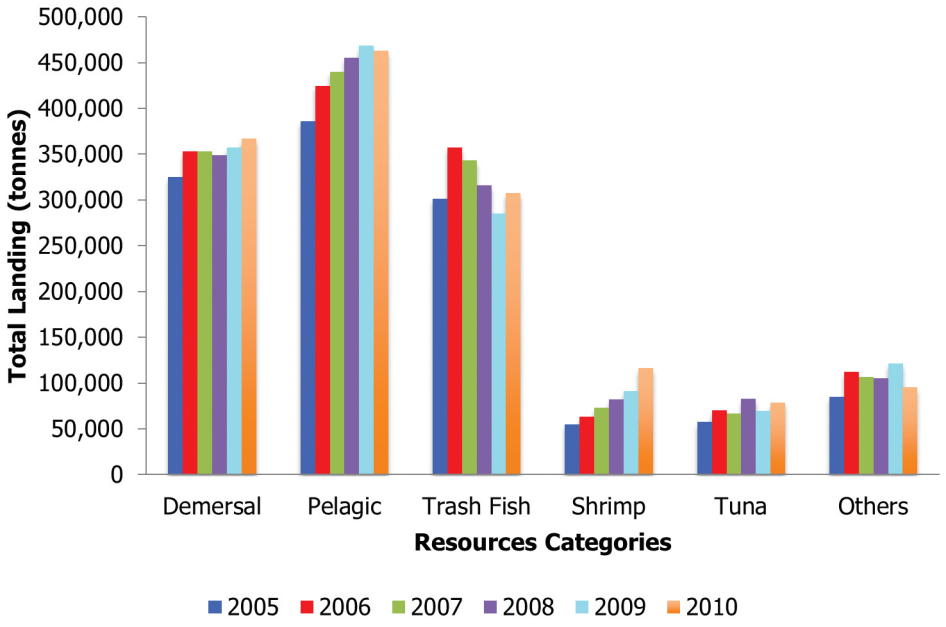
Source: Annual Fisheries Statistics 1991-2010, Department of Fisheries

Landings were divided into six (6) types of resource categories i.e. demersals, pelagics, tunas, trash fish, shrimp, and others (squids, crabs, jellyfish, and shellfish). Looking at the composition of landings from 2005 to 2010, it appears that the increases in total landings originated from increases in demersal, pelagic, and shrimp landings **(Figure 5)**. Also, despite total catch showing an increasing pattern (at least over the last six years) a significant quantum of this increase has come from offshore pelagics. In contrast, only trash fish landings show a decreasing pattern, while tunas and other (squids, crabs, jellyfish and shellfish) showed a fluctuated pattern over the six-year period (2005–2010).

In 2010, pelagic fish was the most dominant category amounting to 463,036 tonnes or 32.4 percent of total landings. This was followed by demersals (25.7 percent or 367,498 tonnes) and trash fish (21.5 percent or 307,439 tonnes) as shown in **Figure 5**. Other categories only constituted around 5.5 percent to 8.2 percent of total marine landings.

The highest pelagic fish landings came from Perak (105,482 tonnes), Perlis (88,919 tonnes), and Sabah (58,688 tonnes). Other states only contributed 236 to 38,577 tonnes of pelagic fish. In term of species, highest landings were from Pelaling/Temenong (*Rastrelliger* spp.), Selayang/Curut (*Decapterus* spp.), and Kembong (*Rastrelliger* spp.) that respectively contributed 121,500 tonnes, 82,802 tonnes, and 64,725 tonnes to total pelagic fish landings.

FIGURE 5: FISH LANDINGS IN PENINSULAR MALAYSIA BY RESOURCE CATEGORIES, 2005-2009



Source: Annual Fisheries Statistics 2005-2010, Department of Fisheries

Demersal fish landings were highest in Sabah (56,663 tonnes), Sarawak (54,833 tonnes), and Perak (50,237 tonnes) as compared to the other states (<45,000 tonnes). In term of species, the bulk of demersal fish was Kerisi (*Nemipterus* spp. / *Pentapodus* spp.), Gelama (*Pennahia* spp. /*Johnius* spp.), Mengkerong (*Saurida* spp. /*Trachinocephalus* spp.), and Temenggong (*Priacanthus* spp.).

As for trash fish, highest landing recorded at Perak (87,222), followed by Selangor (48,962 tonnes), and Perlis (33,121 tonnes). As for shrimp, high landings recorded from Selangor (29,529 tonnes), while tuna, particularly Aya Hitam (*Thunnus tonggol*) and Aya Kurik (*Euthynnus affinis*), from Perlis (16,132 tonnes).

TABLE 1: COMPOSITION OF FISH LANDINGS (TONNES) IN MALAYSIA, 2010

STATE	Resources Categories					
	Demersal	Pelagic	Trash Fish	Shrimp	Tuna	Others
WEST COAST OF PENINSULAR MALAYSIA						
Perlis	27,371	88,919	33,121	904	9,944	5,040
Kedah	20,707	28,717	15,377	3,325	2,367	3,775
P. Pinang	8,630	11,564	13,715	6,758	2,030	2,485
Perak	50,237	105,482	87,222	29,529	8,748	22,285
Selangor	17,448	21,533	48,962	45,773	3,092	7,628
N. Sembilan	364	236	0	38	28	26
Melaka	1,042	275	0	171	179	0
Johor west	6,664	4,486	2,638	5,173	812	1,000
EAST COAST OF PENINSULAR MALAYSIA						
Kelantan	23,941	19,063	10,516	947	4,434	4,941
Terengganu	21,788	38,577	1,162	575	6,863	3,954
Pahang	44,256	25,225	33,807	1,230	4,574	11,827
Johor east	16,517	28,912	26,516	2,640	6,341	7,851
SABAH/LABUAN & SARAWAK REGION						
Sarawak	54,833	27,989	13,435	6,401	10,751	8,002
Sabah/Labuan	73,711	62,057	20,964	13,247	18,442	16,767
Total	367,505	463,038	307,439	116,711	78,607	95,281

Source: Annual Fisheries Statistics 2010, Department of Fisheries

VALUE OF MARINE FISH LANDINGS

The wholesale value of fish landed in 2010 was RM6.65 billion. This value was much contributed from West Coast of Peninsular Malaysia (53.8 percent of total wholesale value or RM3.58 billion), followed by East Coast of Peninsular Malaysia (24.7 percent or RM1.64 billion), Sabah/Labuan (15.0 percent or RM1.00 billion) and Sarawak (6.6 percent or RM0.44 billion).

In terms of state, the highest wholesale value was contributed by Perak (RM1.38 billion) and Sabah (RM0.72 billion), which correlates with high landings in both of these states. The lowest wholesale value was recorded from Negeri Sembilan, which only contributed 0.1 percent of the total wholesale value. Over the six (6) years from 2005 to 2010, wholesale values generally showed an increasing pattern.

FISHING POPULATION

Fishermen in Malaysia are defined as those who undertake fishing at least 120 days in a calendar year. Those fishing less than 120 days are designated as part time fishermen. Also not included as fishermen are those operating hook and line with 3 hooks or less, cast nets or undertaking direct collection.

Based on published data, **Figure 6** shows an overall upward trend in the number of fishermen within the fishing industry between 2001 and 2010 for all regions in Malaysia. Within 10 years, the total number of fishermen in the fishing industry grew at an annual growth rate of 4.5%, from 84,496 fishermen in 2001 to 129,622 fishermen in 2010.

The main contributor to this increase was from the Sarawak region with an annual growth rate of 6.6 percent, followed by East Coast of Peninsular Malaysia (annual growth rate of 5.4 percent), West Coast of Peninsular Malaysia (annual growth rate of 5.3 percent), and Sabah/Labuan region (annual growth rate of 2.1 percent).

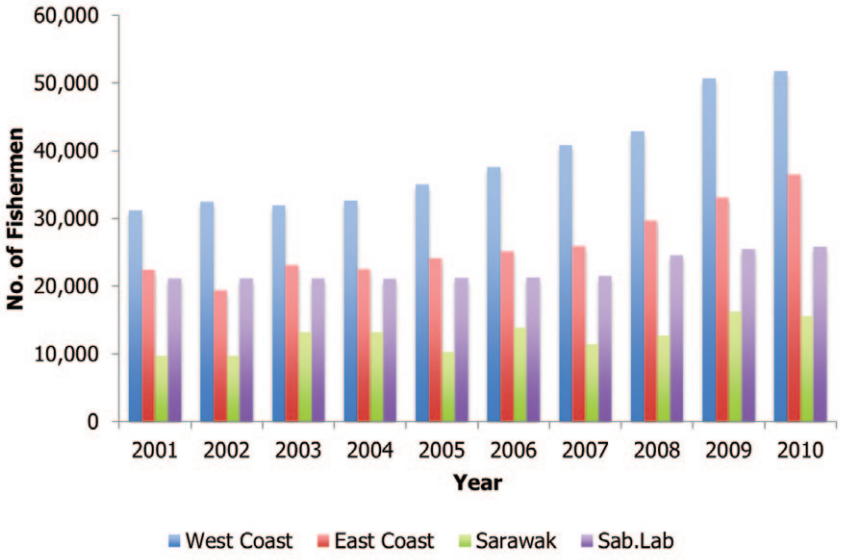
These increases were largely of foreign fishermen, particularly in East and West Coast of Peninsular Malaysia. There was a 191.8-percent increase in foreign fishermen in the East Coast of Peninsular Malaysia and a 133.6-percent increase in the West Coast of Peninsular Malaysia. On the other hand, local fishermen only increased by 52.2 percent in the West Coast of Peninsular Malaysia and 25.1 percent in the East Coast of Peninsular Malaysia.

In contrast, the percentage increase in foreign fishermen in Sabah/Labuan and Sarawak region was relatively small. Foreign fishermen only increased by about 4.2 percent and 36.3 percent in Sabah/Labuan and Sarawak respectively. As for the local fishermen, the increased percentages were comparable with the West and East Coast of Peninsular Malaysia, where the number increased by 28.6 percent in Sabah/Labuan and 69.9 percent in Sarawak.

However, in terms of the composition of fishermen in Sabah/Labuan and Sarawak, there was a relatively small change of 4 percent between years 2001 and 2010. The local fishermen in Sabah/Labuan and Sarawak increased from 72.6 percent to 76.6 percent and 72.9 percent to 77.0 percet respectively. Meanwhile, the foreign fishermen in Sabah/Labuan decreased from 27.4 percent to 23.4 percent, and in Sarawak decreased from 27.1 percent to 23.0 percent.

Some 54,334 (41.9 percent) fishermen worked on fishing vessels operating commercial gears (trawl nets and purse seines), while the remainder (75,288 people or 58.1 percent) worked on fishing vessels operating traditional gears.

FIGURE 6: NUMBER OF FISHERMEN (LOCAL AND FOREIGN) IN MALAYSIAN FISHING INDUSTRY, 2001-2010

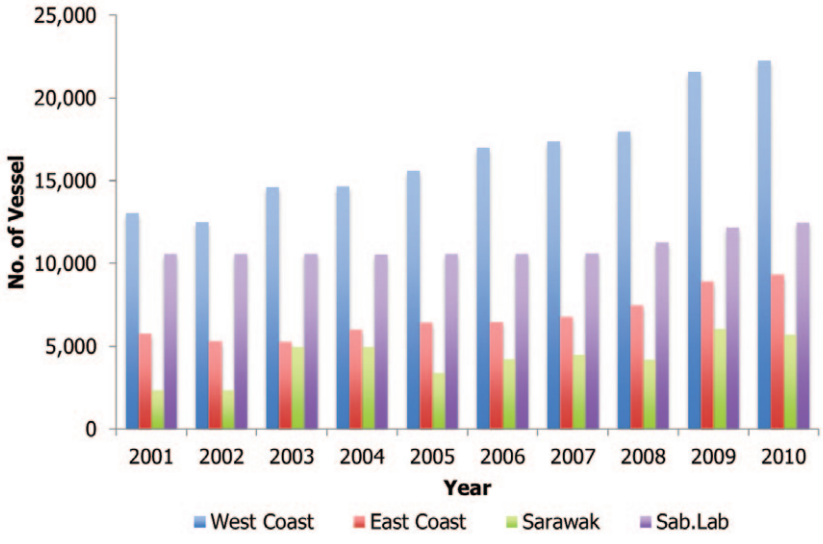


Source: Annual Fisheries Statistics 2001-2010, Department of Fisheries

FISHING FLEET (FISHING VESSELS)

In 2010, a total 49,756 fishing vessels operated in Malaysian waters, of which 22,258 vessels operated in the West Coast of Peninsular Malaysia, 9,307 vessels in the East Coast of Peninsular Malaysia, 12,475 vessels in Sabah/ Labuan, and 5,689 in Sarawak **(Table 2)**. The largest fishing fleet was in West Coast of Peninsular Malaysia (44.8 perent of the total number of fishing boats), followed by Sabah/Labuan (25.1 percent), East Coast of Peninsular Malaysia (18.7 percent), and Sarawak (11.4 percent).

FIGURE 7: NUMBER OF LICENSED FISHING VESSELS IN MALAYSIA, 2001-2010



Source: Annual Fisheries Statistics 2001-2010, Department of Fisheries

Out of the total fishing vessels, 29,003 units were outboard powered boats, while 17,776 units and 2977 units were inboard powered boats and non-powered boats respectively. The number of licensed fishing vessels in Malaysia increased 5 percent from 2001 to 2010 **(Figure 7)**, mostly occurring in the Sarawak region (14.2 percent), followed by the West Coast of Peninsular Malaysia (5.7 percent), the East Coast of Peninsular Malaysia (5.1 percent), and the Sabah/Labuan region (1.7 percent).

TABLE 2: NUMBER OF FISHING BOATS IN MALAYSIA, 2010

STATE	Type of Fishing Boat			Total
	Inboard	Outboard	Non-Powered Boat	
WEST COAST OF PENINSULAR MALAYSIA				
Perlis	567	554	0	1,121
Kedah	1,067	2,391	0	3,458
Penang	525	2,832	1	3,358
Perak	3,498	2,107	18	5,623
Selangor	1,561	2,584	52	4,197
N. Sembilan	32	361	0	3,93
Malacca	117	1,021	0	1,138
Johor west	526	2,456	15	2,997
EAST COAST OF PENINSULAR MALAYSIA				
Kelantan	1,150	883	0	2,033
Terengganu	1,517	1,590	0	3,107
Pahang	976	1,053	0	2,029
Johor east	712	1,423	3	2,138
SABAH & SARAWAK REGION				
Sarawak	2,365	3,322	2	5,689
Sabah/Labuan	3,163	6,426	2,886	12,172
Total	17,776	29,003	2,977	49,756

Source: Annual Fisheries Statistics 2010, Department of Fisheries

FISHING GEARS

In 2010, there were about 48,645 licensed fishing gears in Malaysia, of which 15.4 percent were commercial gears and 84.6 percent were traditional gears. Commercial gears included trawl net, fish purse seines, anchovy purse seines, while drift/gill nets, other seines, lift nets, stationary traps, portable traps, hook and line, bag nets, and barrier nets were common in the traditional fisheries sub-sector. As shown in **Table 3**, the major gear employed was drift/gill nets, which contributed 65 percent of the total gear count. It was followed by trawl nets with 12.9 percent. The least common gear was the scoop net (0.05 percent; 23 units).

By fishing ground, the highest numbers of licensed gears in Malaysia were from Sabah/Labuan (12,475 units), while the lowest from Negeri Sembilan (393 units).

Based on the region, Perak recorded the highest number of fishing gear in West Coast of Peninsular Malaysia (5,090 units), while the lowest number was recorded from Negeri Sembilan (393 units). In the East Coast of Peninsular Malaysia, most of the fishing gear was registered in Terengganu (3,045 units) while Pahang recorded the least(1,968 units). In West Malaysia, Sabah/Labuan outnumbered Sarawak in fishing gears registered by 6,788 units.

The number of licensed fishing gears also showed an increasing pattern from 2001 to 2010 **(Figure 8)**. A 5.4-percent growth rate was observed in the West Coast of Peninsular Malaysia, 4.8 percent in the East Coast of Peninsular Malaysia, 3.0 percent in Sarawak, and 4.3 percent in Sabah/Labuan.

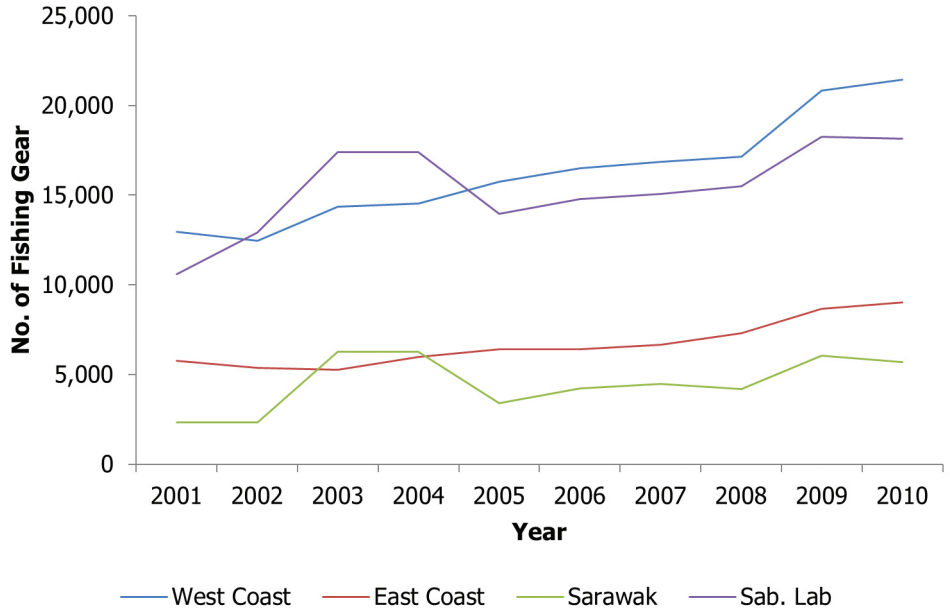
TABLE 3: NUMBER OF FISHING GEARS IN PENINSULAR MALAYSIA, 2010

State	Commercial Gears	Traditional Gears	Total
WEST COAST OF PENINSULAR MALAYSIA			
Perlis	323	707	1,030
Kedah	550	2,867	3,417
Penang	93	3,234	3,327
Perak	1,510	3,580	5,090
Selangor	747	3,393	4,140
N. Sembilan	0	393	393
Malacca	0	1,135	1,135
Johor west	129	2,797	2,926
EAST COAST OF PENINSULAR MALAYSIA			
Kelantan	439	1,556	1,995
Terengganu	481	2,564	3,045
Pahang	518	1,450	1,968
Johor east	348	1,669	2,017

State	Commercial Gears	Traditional Gears	Total
SABAH & SARAWAK REGION			
Sarawak	673	5,014	5,687
Sabah /Labuan	1,694	10,781	12,475
Total	7,505	41,140	48,645

Source: Annual Fisheries Statistics 2010, Department of Fisheries

FIGURE 8: NUMBER OF LICENSED FISHING GEARS IN MALAYSIA, 2001-2010



Source: Annual Fisheries Statistics 2001-2010, Department of Fisheries

3.1.2 FISHERIES HABITATS

MANGROVES

Mangrove forests in Malaysia are found mainly on the sheltered coasts, estuaries, rivers, and some near-shore islands.

In Malaysia, mangroves are found mainly in the states of Sabah (320,522 ha) and Sarawak (172,792 ha); in the West Coast of Peninsular Malaysia [Perak (43,000 ha), Johor (23,000 ha), Selangor (17,000 ha), Kedah (8,200 ha)]; and in Pahang (3,000 ha) on the East Coast of Peninsular Malaysia (Table 4). There are 74 mangrove forest reserves in Peninsular Malaysia, of which 54 are found in the West Coast of Peninsular Malaysia, while 20 are in the East Coast of Peninsular Malaysia (Jahara and Chenayah, 2004).

The bulk of the mangrove forests in Peninsular Malaysia are in sheltered estuaries, and to a lesser extent, in sheltered bays and coves. Mangroves can be found over a large extent of the Sarawak coastline and especially within the western half, i.e. approximately 60 percent of the state's total shoreline length.

In Sabah, most of mangroves are found on the east coast with associated extensive mudflats, especially in and around estuarine areas. Moreover, the southern part of the Klias Peninsula is characterized by extensive areas of tidal wetlands (mangroves and *nipah*) on the west coast.

TABLE 4: MANGROVE AREAS (HA) IN PENINSULAR MALAYSIA, 2005

State	Total Mangrove Area (ha)
WEST COAST OF PENINSULAR MALAYSIA	
Perlis	30
Kedah	8,200
Penang	1,400
Perak	43,000
Selangor	17,000
Negeri Sembilan	800
Melaka	100
EAST COAST OF PENINSULAR MALAYSIA	
Kelantan	150
Terengganu	2,500
Pahang	3,000
Johor	23,000
SABAH SARAWAK REGION	
Sarawak	172,792
Sabah	320,522

Source: Tan, 2007

TABLE 5: COMMON MANGROVE SPECIES IN MALAYSIA

Acanthus abracteatus	*Bruguiera gymnorhiza*	*Nypa fruticans*
Acanthus ilicifolius	*Bruguiera hainesii*@	*Rhizophora apiculata*
Acrostichum aureum	*Bruguiera sexangula*	*Rhizophora mucronata*
Acrostichum speciosum	*Ceriops tagal*	*Rhizophora stylosa*
Aegiceras corniculatum	*Ceriops zippeliana*	*Scyphiphora hydrophyllacea*
Avicennia alba	*Excoecaria agallocha*	*Sonneratia alba*
Avicennia marina	*Heritiera fomes**	*Sonneratia caesolaris*
Avicennia officinalis	*Heritiera littoralis*	*Sonneratia griffithii**
Avicennia rumphiana	*Kandelia candel*	*Sonneratia ovata*
Brugueira parviflora	*Lumnitzera littorea*	*Xylocarpus granatum*
Bruguiera cylidrica	*Lumnitzera racemosa*	*Xylocarpus molucensis*

Source: Tan, 2005; Tan, 2007; Tan and Primavera, 2008
* restricted to Merbok mangroves
@ restricted to Klang Islands and Kuala Trong

There are approximately 41 true mangrove flora taxa in Malaysia (Tan and Primavera, 2008; Tan, 2007; Tan, 2005). Two are hybrids (*Rhizophora x lamarckii* and *R. xannamalayana*), one is common on the east of Peninsular Malaysia and Sabah (*Avicennia rumphiana*), while others are restricted either to Sabah or Sarawak (*Aegiceras floridum, Aglaia cucullata, Heritiera globosa* and *Osbornia octodonta*). The list of mangrove species found in Peninsular Malaysia is given in **Table 5**.

Mangroves play an important role in the ecology of marine ecosystems. For instance, mangroves protect the coast from sea-level rise, wave action, and coastal erosion (Mazda *et al.*, 1997). Mangrove swamps also help to trap sediments and sink nutrients (Furukawa *et al.*, 1997; Wolanski, 1995; Wolanski *et al.*, 1992; Woodroffe, 1992). The root systems of mangrove trees keep the substrate firm, hence, contributing to a lasting stability of the coast.

As a fisheries habitat, mangroves act as nursery and feeding grounds for fishes, crustaceans, and molluscs (Xiaojun, 2009; Kjerfve and Macintosh, 1997; Chong, 1980; MacNae, 1974; Odum and Heald, 1972). The presence of mangroves is potentially vital to sustenance of the near-shore fisheries of the region. A study of mangrove-adjacent fishing grounds in East Johor reported landings of 17 species of shrimps within 3 to 5 km from the shores (Mohd. Zaki, 1991). Eight (8) common genera comprised of *Penaeus*, *Metapenaeus*, *Parapenaeopsis*, *Metaparapenaeopsis*, *Trachypenaeus*, *Solanocera*, *Plesionika,* and *Heterocarpus* were found. The four (4) genera were dominant in the catch and were considered important commercial species.

SEA GRASSES

Seagrasses are unique flowering plants, which able to live submerged in the shallow marine ecosystems (McRoy and McMillan, 1977; Den Hartog, 1970).

Generally the seagrasses of Malaysia are found in association with shallow inter-tidal pools, semi-enclosed lagoons, coral reef flats, and subtidal zones (Japar Sidik *et al*., 2001; Muta Harah *et al*., 2000; Muta Harah *et al*., 1999; Japar Sidik *et al*., 1999; Japar Sidik *et al*., 1996).

In Peninsular Malaysia, the seagrasses are widely distributed in east-coast islands (P. Redang, P. Perhentian, P. Besar, P. Sibu, P. Tengah, P. Tinggi, P. Tioman), Langkawi, Beting Tengah, Seberang Prai, Teluk Nipah, Port Dickson, Pulau Serimbun, Sg. Pulai Estuary, and the Marambong shoals (Tan and Nizam, 2004; Muta Harah *et al*., 2003; Japar Sidik and Muta Harah, 2003; Japar Sidik *et al.,* 2001; Zelina *et al*., 2000; Phang, 2000; Japar Sidik *et al.,* 1996; Japar Sidik *et al.,* 1995) **(Figure 9)**.

The common sea grass species found in Peninsular Malaysia includes *Enhalus acoroides, Thalassia hemprichii, Halophila decipiens, Halophila minor, Halophila ovalis, Halophila spinulosa, Halophila beccari, Cymodacea rotundata, Cymodacea serrulata, Halodule pinifolia, Halodule uninervis*, *and Syringodium isoetifolium* (Japar Sidik *et al*., 2006).

In Sarawak, records indicated the *Halophila beccari* was collected at Sungai Bintulu (Phang, 2000; Den Hartog, 1970) and *Halophila decipiens* at Pulau Talang-talang, Semantan (Phang, 2000).

Studies have discovered an extensive inter-tidal beach in front of the Sungai Lawas comprised of sandy flatland transverse by shallow channels and intermittent pockets of pools harboring five (5) sea grass species, *Thalassia hemprichii, Halophila minor, Halophila ovalis, Cymodocea rotundata,* and *Halodule pinifolia* (Jaaman *et al*., 2009a; Japar Sidik *et al*., 2006; Muta Harah and Japar Sidik, 2003).

The west and southeastern coasts of Sabah harbour mixed species sea grass beds in the inter-tidal zone down to a depth of 2.5 m. Seagrasses grow on substrates ranging from sand and muddy-sand to coral rubble. There are six (6) areas of inter-tidal mixed associations of sea grass along the west coast at Bak-Bak, Tanjung Mengayau, Sepangar Bay, and Pulau Gaya.

The four (4) isolated offshore islands of Pulau Maganting, Pulau Tabawan, Pulau Bohay Dulang, and Pulau Sipadan along the southeastern coast have sub-tidal seagrasses growing on coral rubble (Muta Harah *et al*., 2003; Phang, 2000; Japar Sidik *et al*., 1999; Josephine, 1997; Japar Sidik *et al*., 1997; Norhadi, 1993).

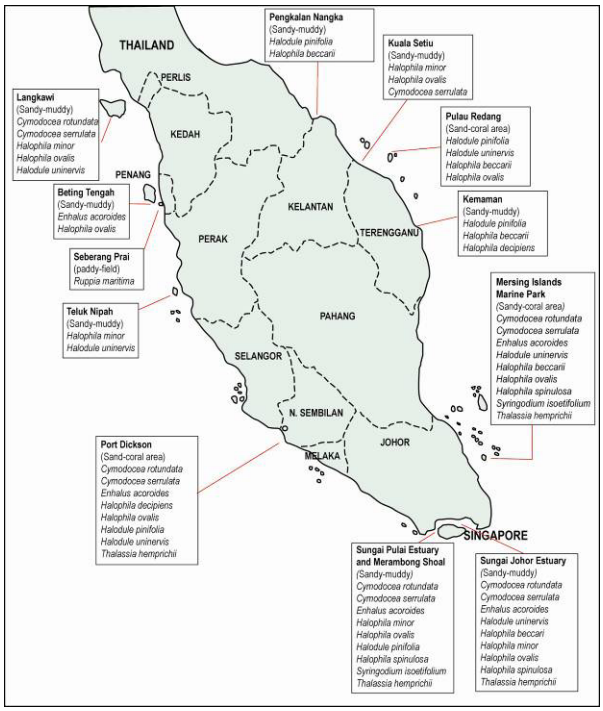
Approximately 100 fish species and 20 prawn species are known from sea grass beds on the west coast of the Peninsular (Tan, 2008).

Studies undertaken in Tanjung Adang, Johor sea grass areas indicated that approximately 76 species of fish from 41 families were recorded (Sasekumar *et al.,* 1989), of which 35 species have commercial importance (Arshad *et al*., 2001). Moreover, Sungai Lawas in Sarawak is known as a fishing ground for the traditional fishermen particularly for capture of Shad (*Ilisha elongata*), and a gleaning site of Asiatic hard clam (*Meretrix meretrix*).

However, digging activities for the collection of Asiatic hard clam have been shown to cause mechanical damage, reduce sea grass cover, and retard the spread and colonization of sea grasses (Japar Sidik and Muta Harah, 2003). Unlike Peninsular Malaysia and Sabah, the understanding of sea grass areas in Sarawak is very limited due to protection and conservation of sea grass not directly specified under any state's legislation.

The sea grass bed also acts as the primary habitat for the endangered species i.e. Dugong (*Dugong dugon*), seahorses (*Hippocampus* spp.), and Green Turtle (*Chelonia mydas*) (Japar Sidik *et al*., 2006). It is the only habitat in which the dugong is known to thrive in because they forage on specific species of sea grass such as the *Thalassia hemprichii*, *Cymodocea rotundata*, *Halophila ovalis*, *Halophila spinulosa*, *Halodule uninervis,* and the *Enhalus acoroides* (Zulkifli *et al*., 2009; Japar Sidik, 1994; Fortes, 1989). Studies in Kuala Lawas (Sarawak) sea grass meadow discovered a viable population of Dugong and Green turtle. In addition, numerous dugong feeding trails have been observed in Kuala Lawas (Jaaman *et al*., 2009a; Bali *et al*., 2009).

FIGURE 9: SEAGRASS AREAS IN PENINSULAR MALAYSIA



Source: Tan and Nizam, 2004

SEAWEEDS

Malaysian waters are rich with a wide variety of macroscopic algae or seaweeds. Algae are photosynthetic organisms possessing chlorophyll and simple reproductive structures, but lacking true root, stems, and leaves. Seaweeds play a role in the complex web of life as the main primary producers in aquatic environments. They are the foundation of the food chain in aquatic ecosystems (Medina, 2010). Seaweed beds also provide shelter, breeding, and nursery grounds for a variety of organisms such as crustaceans, fish, squid, cuttlefish, gastropods, and others (Lim *et al.*, 2001).

Seaweeds in Malaysia are generally found associated with corals, driftwood, epiphytes, mudflats, mangroves, water column, rock substratum and stones, sand substratum, wooden structures, fish cages, and fishing nets (Phang, 2006).

The tally of the Malaysian marine algae currently stands at 373 specific and intraspecific taxa (17 taxa of Cyanophyta, 102 Cholophyta, 182 Rhodophyta, and 72 Phaeophyta). Of these approximately 169 taxa are found on the east coast and 160 taxa in the west coast of Peninsular Malaysia (Phang, 2006).

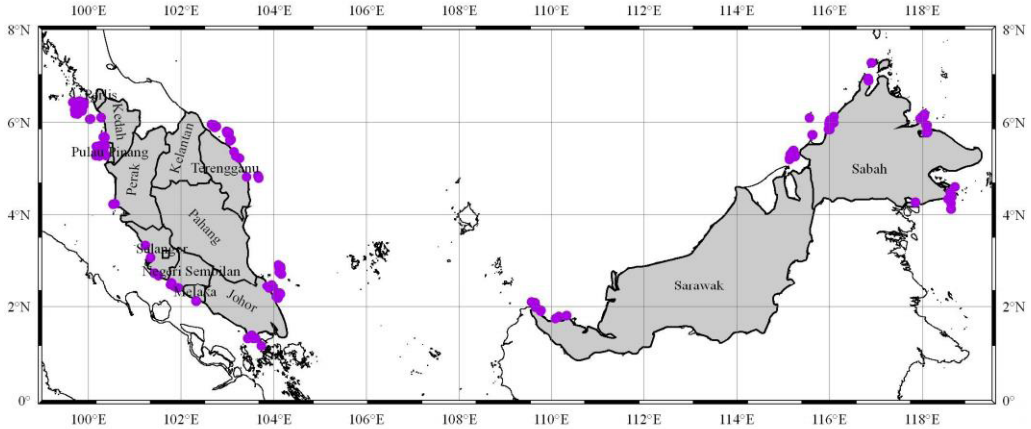
In East Coast of Peninsular Malaysia, seaweed beds are extensively found in islands such as Redang, Perhentian, Tioman, and Tinggi as well as at lagoon and coastal areas such as Bachok, Setiu, Desaru, and Mersing (Du *et al.*, 2008). In West Coast of Peninsular Malaysia, seaweed beds are found at Pulau Payar, Langkawi, Penang, P. Pangkor, Port Dickson, Blue Lagoon, Kukup, and Pulai **(Figure 10)**.

In Sarawak, a study undertaken from 1996 to 1998 indicated that seaweed beds grow richly on the reef flats in Kuching Division (southern portion and offshore islands) and Miri Division at the northern portion. Seaweeds grow well in protected areas, e.g. by attachment to the rocky beach in Pantai Similajau (Bintulu Division-northern portion).

Meanwhile the muddy mangrove area along Pulau Salak area supports specialized types of seaweeds of limited species (Nuriddan, 2007).

Based on the study, more than 93 species of seaweed were recorded. The most abundant seaweed in Sarawak was from the Division Rhodophyta (38 species), followed by Chlorophyta (34 species) and Phaeophyta (21 species). From the Rhodophyta Division, the most dominant Family was Gracilariaceae, while for Chlorophyta and Phaeophyta was Caulerpaceae and Sargassaceae respectively.

FIGURE 10: SEAWEEDS DISTRIBUTION IN MALAYSIA



Source: Du et al., 2008

Pantai Similajau and islands in Kuching reveal a variety and abundance of seaweeds, especially *Gracilaria salicornia*, *Laurencia papillosa*, *Laurencia lageniformis*, *Enteromorpha intestinalis*, and *Enteromorpha tubulosa*. However, the species in Kuching were smaller compared to those in Pantai Similajau.

In the mangrove areas of Pulau Salak, seaweeds such as *Bostrychia binderi*, *Dictyota friabilis*, *Cladophora sp.*, *Catenella nipae, Gracilaria changii*, and *Gracilaria blodgettii* can be found. In addition, several species of seaweeds were also found at the floating cage systems. These included *Gracilaria changii*, *Gracilaria edulis, Padina minor*, *Sargassum ilicifolium*, *Caulerpa verticillata*, *Acanthophora spicifera*, *Bryopsis hypnoides*, and *B. pennata*.

As for Sabah, a study on the seaweed beds undertaken in Tun Sakaran Park recorded three (3) divisions, namely Rhodophyta, Chlorophyta, and Phaeophyta. The most abundant seaweeds found were Family Caulerpaceae and Sargassaceae from the division Chlorophyta and Phaeophyta, respectively. Both of the family recorded five (5) genera under it.

Most of the seaweed beds were found to be large sized, most probably because the park was protected by the wave action. This, in turn, influences the morphological size of the seaweeds. Additionally, the seaweeds also have become one of the main aquaculture products in Sabah. The main seaweed cultivation sites located in the East Coast of Sabah i.e. Semporna, Kunak, and Lahad Datu (Sade *et al.*, 2006).

CORAL REEFS

In Peninsular Malaysia, significant coral areas found on the offshore islands such as the Pulau Perhentian group, P. Tioman group, P. Tinggi group, P. Sibu group, and P. Besar group. The coral reefs in the Straits of Malacca are poorly developed due to muddy conditions and as such are restricted to the northwest and southeast of the Peninsular with limited number of reefs (Tan, 2008; Chua and Charles, 1980).

These reefs are located in Pulau Payar Marine Park (Pulau Payar, Pulau Kaca, and Pulau Lembu), Pulau Langkawi (Geopark status), Pulau Sembilan and Pulau Pangkor in Perak, Pulau Besar in Melaka and Tanjung Tuan in Negeri Sembilan.

There are 519 species from 70 genera (MIMA, 2006; Veron, 1993) recorded from the Malaysian waters, of which 346 species are scleratinian corals (Spalding *et al*., 2001).

The P. Tioman group has the highest coral species richness with 183 species, followed by the P. Tinggi group (155 species) and P. Redang group (149 species) (MIMA, 2006). Coral reefs in the Straits of Malacca are less diverse probably due to higher stress conditions in the Straits compared to the South China Sea (Ridzwan, 1995). The most common genera found include *Acropora*, *Porites* and *Montipora* (Toda *et al*., 2007).

In Sarawak, coral reefs found within the area of Tg. Datu to Tg. Po, Tg. Sirik to Bintulu, and Tg. Kidurong to Tg. Baram. Major reef formations in Sarawak waters are found in Miri-Sibuti reefs.

The Miri reefs are considered one of the largest and most pristine in South East Asia. In addition, reefs are also extensively found off the islands of Pulau Talang Talang Kecil and Talang Talang Besar, which were both declared as a turtle sanctuary by the state government of Sarawak. Smaller reefs tracts can also be found in Pulau Sampadi, Satang Besar and Satang Kecil.

In the Miri-Sibuti reef area, there are 203 hard coral species in 66 genera recorded. Among the major genera are *Acropora, Montiphora, Symphyllia, Fungia, Favites, Favia,* and *Tubipora* (Michael, 2002; Elcee Instrumentation, 2002). In Pulau Talang-Talang, the predominant genera of hard coral include *Acropora, Favia, Echinopora, Porites, Diploastrea, Favites, Millepora, Pavona, Pocillopora,* and *Lobophyllia* (Daud *et al*., 2002). Soft coral reefs also have been reported. Among the major genera are *Dendronephthya, Siphonogorgion, Junceellla, Ellisella, Melithaea, Subergorgia, Comathina, Solenocaulon* (Michael, 2002; Elcee Instrumentation, 2002).

Sabah has extensive coral reefs, where they could be divided into three (3) major type: fringing, patch, and atoll.

Coral reefs near the mainland of Sabah are mostly recorded in the Kudat (109 km^2), Kota Belud (64 km^2), Kota Kinabalu (54 km^2), and the Labuan (37 km^2). However, the coral reefs in Sabah are mostly prone to be found in the islands fringing the mainland. There are 252 species and 71 genera of hard corals recorded in Sabah. Among the major genera found are *Acropora*, *Montipora*, *Fungia*, *Porites*, *Pavona*, *Leptoseris*, *Turbinaria*, *Astreopora*, and *Lobophyllia* (Fenner, 2001).

As a fisheries habitat, coral reefs have a major biodiversity value and support a wide variety of marine life. They do this directly by providing direct habitat resources to reef dwelling fish and invertebrates for spawning, nursery, and growth or indirectly by serving as aggregating device for oceanic fish species.

In this respect, coral reefs play a critical role is the marine food web and a are major mediator of icthyproductivity. Their role is particularly critical in open marine waters, which do not share substantially in coastal nutrient regimes and thus are highly reliant on coral reefs to sustain fish stocks and populations (Mcmanus, 1988).

Studies in 2000 showed that in Miri the reefs are threatened by pollution and sediments from the Miri and Baram rivers (Pilcher and Cabanban, 2000; SSPU and Danced, 2000). High sedimentation could block sunlight and kill the zooxanthellae that are so important for its survival. In addition, such silting is one of the causes of coral bleaching (Miller, 1999).

3.1.3 BIODIVERSITY OF CONSERVATION IMPORTANCE

TURTLES

Four (4) species of turtles are found in Malaysia, which includes the green turtles (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill *turtle (Eretmochelys imbricata),* and olive ridley turtle *(Lepidochelys olivacea).* These species are listed on the IUCN Red List as endangered.

In Peninsular Malaysia, most of the landing recorded at Terengganu, Pahang, Melaka, Johor, Perak, Penang, Kedah, and Kelantan. In Sarawak, most of the turtle landings are recorded at Talang-Satang National Park, shown by 737 in 2004 and 1,104 in 2009. Landings also occur on the beaches of Tanjung Dato National Park, Telok Melano,

Samunsam Wildlife Sanctuary, Sematan, and Similajau National Park. In 1998-2003, there were about 1,616-3,643 turtle nests recorded in Sarawak. The nesting in Sabah occurs primarily in the archipelago of the Turtle Islands Park and in Sipadan Island.

The green turtle is extensively distributed in Malaysia. According to Liew (2002), there are about 2,950 turtle nests recorded annually in Peninsular Malaysia. The most important nesting beaches can be found in Terengganu (mainly in Redang and Perhentian Islands, Penarik, Kemaman and Kerteh), Pahang (Chendor and Cherating), Perak (Pantai Remis), Melaka (Pengkalan Balak), and Penang (Pantai Kerachut). In East Malaysia, the green turtle nesting sites are on the shores of Sarawak Turtle Islands, the Turtle Islands in Sabah, and Sipadan Island.

The hawksbill turtle *(Eretmochelys imbricata)* nesting sites cover the shores of Terengganu, Johor, Melaka, Pahang, Kedah, and Kelantan as well as Sabah and Sarawak.

Leatherback nesting was mainly found on the 1.5 km stretch of beaches of Rantau Abang and Paka in Terengganu and was recorded at Chendor in Pahang as well as in Johor (Mohd Najib and Hiew, 1999; Kamarruddin *et al.,* 1996). An adult leatherback can reach a length of 2 meters and weigh up to 900 kg. It is the largest turtle in the world. Zulkifli *et al.* (2004) reported that around 2,000 leatherback nests were recorded in the 1950s, which dropped drastically in the 1990s to around 213 nests in 1994 and 5 nests in 2006.

The nesting status of the olive ridley turtle is fragmentary, with records available only for the states of Terengganu, Kelantan, and Penang.

Nesting also has been recorded in Sabah and Sarawak but the numbers are probably insignificant compared to the major sites. Olive ridley turtle is the smallest of all the turtles found in the world, where an adult olive ridley is only 60-65 cm in length and 35-40 kg in weight.

Table 6 shows the landing of turtles in Peninsular Malaysia from 1991 to 2006. After 40 years of concerted conservation efforts, most of the turtle populations in Peninsular Malaysia have not recovered (Chan, 2007). This supported by recent landing figures that indicate a decline in the landings of species such as the leatherback and olive ridley **(Table 6)**. This has been attributed to a number of factors including coastal development resulting in the lost of nesting beaches; illegal collection of turtle eggs; and incidental and illegal capture by fishing boats. The lack of scientific information and the weaknesses in enforcement and surveillance activities also contribute to this decline. To arrest the decline the Malaysian Government has intensified efforts to protect nesting beaches by declaring them as turtle sanctuaries, regulated and in some cases prohibited the collection and sales of turtle eggs, and adopted the regional cooperation strategy.

However, the green turtle at Pahang, Johor and Penang showed an increased pattern from 2002 to 2006. In addition, the hawksbill nesting population in Melaka also has somewhat reached a stable population numbering approximately 200 nests per year (Chan, 2006).

However, the Sarawak turtle population is in serious trouble, suffering a heavy declination. Over the 1998-2003 periods, turtle nesting in Sarawak only ranged from 1,616 to 3,643 annually compared to over 20,000 nesting per year recorded in the early '50s, indicating a decline of over 90 percent (Tisen and Bali, 2000).

This huge decline was due to over-exploitation of turtle eggs over several decades, as they are considered to be aphrodisiacs. The continuing loss of nesting habitat is also a major reason why marine turtles throughout the world are in danger. Turtles tend to come to the same beach where they were first hatched and normally imprint the beach.

The loss or reduction of a single nesting beach, due to resort development or setting up of recreational facilities, can have serious effects.

Besides that, accidental catches of adult turtles in fishing gears are also a major contributor to declining of turtle population in Sarawak as it only start breeding between age of 15 and 50 years (Tisen and Bali, 2000). Around 70 to 100 adult turtles were found stranded in Sarawak's beaches every year before 1998. Several initiatives have been taken to overcome this problem such as the Sarawak Reef Balls Project and Marine Turtle Adoption

Program. Since 1998 to 2006, 2,584 units of reef balls were deployed along the Sarawak coast i.e. around Talang-Satang National Parks, Lawas, Bintulu, and Kuching. It resulted in a marked reduction in number of dead turtles to about 20 individuals per year. In addition, the number of nesting turtles at the Talang-Satang National Parks rose from 737 in 2004 to 1,104 in 2009. The number of turtles tagged at the park for monitoring purposes also increased from 639 in 2004 to 1,028 in 2009.

The main threats to the turtles in Sabah are as the by-catch in the trawl fisheries, the uninterrupted long-term harvesting of the eggs and adults, and the destruction of their habitat. Recent estimates suggest an annual by-catch take of more than 1,000 turtles per annum (Pilcher, 2008). Another growing threat for the turtle are the ghost nets, as these nets, which are purposefully thrown or accidentally lost overboard, continue to fish indiscriminately for decades thereafter. Turtles which are caught in these nets could get entangled, which in turn prevents them from swimming and thus, they drown helplessly as they could not submerge for rebreathing.

Other than that, marine turtles and their products, in reality, have been used for many years as a food basis and for a host for other uses. They are therefore being hunted and harvested, thus depleting their populations in the environment.

In addition, the destruction of their nesting beaches and foraging grounds has decreased their survival, as many of the coastal development plans did not include the marine turtle habitat needs.

Problems such as erosion, sedimentation, and others land-based pollution will also arise without proper planning. There is also a lack of resources for enforcement, even though the legal framework for turtle conservation is already comprehensive (Pilcher, 2008). Lastly, the lack of understanding of the biology and thus, the needs of the turtles often complicate the conservation efforts.

In preventing the by-catch in the trawl fisheries in Sabah, the Sabah Fisheries Department and the Marine Research Foundation cooperate in introducing the Turtle Excluding Devices (TEDs) to the Sandakan trawl fishery. The program is sponsored by the GEF Small Grant Program-Malaysia, and has the opportunity to spread throughout all key trawl-fishing ports in the region.

Another one of the initiatives done by the Government of Malaysia and Philippines are the establishment of the Turtle Islands Heritage Protected Areas (TIHPA), which is the first and only trans-frontier protected area for marine turtles in the world. As both countries manage TIHPA, the conservation of the habitats and migratory pathways will encompass a large area independent of their territorial boundaries.

The extension of the TIHPA to the Berau Islands Conservation Area in Indonesia will strengthen the key nesting aggregations in the region.

As for now, TIHPA in Sabah only covers the area of Turtles Islands Park. However, it will continue to extend until Tun Sakaran Marine Park and Pulau Sipadan Park (Pilcher, 2008).

In addition, the formal gazetting of Tun Mustapha Marine Park, which will be by far the largest marine protected areas in Malaysia, would create the opportunity to develop turtle-friendly alternative livelihoods (e.g. seaweed farm screens) aside from the protection and legislation. On the other hand, the problems arising from erosion, such as habitat loss, can also be prevented with proper planning and conservation programs such as egg relocating and awareness campaign.

TABLE 6: ANNUAL TURTLE LANDINGS IN PENINSULAR MALAYSIA FROM 1991 TO 2006

State	Turtle	Year															
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Terengganu	Leather-back	207	231	63	213	38	68	41	19	10	28	21	3	14	5	1	5
	Green	5,311	1,688	3,296	1,960	3,032	1,938	2,776	2,350	2,115	1,510	2,721	2,730	1,479	2,118	1,037	2,522
	Olive Ridley	118	78	98	53	35	38	18	4	4	3	6	1	0	0	0	0
	Hawksbill	25	28	38	21	6	10	19	10	11	69	22	6	6	9	8	4
Pahang	Leather-back	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0
	Green	437	137	230	254	254	165	319	231	235	78	270	92	111	278	163	260
	Olive Ridley	8	2	0	3	3	4	0	1	2	1	0	0	0	0	0	0
	Hawksbill	2	0	8	1	1	0	0	0	3	0	1	0	2	0	0	0
Melaka	Green	0	5	15	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hawksbill	306	269	203	233	255	297	241	222	241	159	205	272	205	285	301	379
Johor	Leather-back	0	0	0	0	0	7	3	0	0	0	0	0	0	0	0	0
	Green	0	5	15	0	0	0	100	6	0	1	6	3	4	16	25	61
	Olive Ridley	0	0	9	0	0	0	0	1	0	0	0	12	3	10	15	2
	Hawksbill	63	69	94	10	0	45	108	43	15	15	33	88	57	105	55	39
Perak	Green	67	102	211	197	197	144	128	132	220	105	208	123	147	101	80	74
	Olive Ridley	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Kedah	Green	50	46	60	0	0	0	0	0	0	0	0	0	0	0	0	0
	Olive Ridley	0	5	22	0	0	0	0	0	0	0	0	0	0	0	0	0
Penang	Green	0	0	0	0	30	13	4	0	0	0	63	39	47	59	39	71
	Olive Ridley	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0
TOTAL		6,594	2,666	4,366	2,945	3,851	2,731	3,757	3,019	2,856	1,969	3,557	3,370	2,075	2,986	1,725	3,417

Source: Adaptation from National Coastal Resources and Marine Environment Profile of Malaysia, 2009

MARINE MAMMALS

Twenty-two taxa of marine mammals are known from the coastal and marine waters of Malaysia, either as residents or as occasional transients **(Table 7)**. These are comprised of one (1) species of sirenian—the dugong—and 21 species of cetaceans belonging to the Families Balaenopteridae, Ziphiidae, Kogiidae, Delphinidae, and Phocaenidae.

The Indo-Pacific humpback dolphins are found off Pulau Langkawi, the East Coast of Peninsular Malaysia, Matang, and Kuala Sepetang in Perak. Irrawaddy dolphins are observed around the waters of Penang, southwestern Johor, and East and West Coast of Peninsular Malaysia. Finless porpoises have been sighted around P. Langkawi and P. Penang and along the East and West Coast of Peninsular Malaysia (Ponnampalam *et al*., 2010). The Indo-Pacific bottlenose dolphins are known to occur along the East and West Coast of Peninsular Malaysia, and as far as the offshore island of Tioman with known stranding from Butterworth, Penang, and in Bagan Lalang. The pelagic long-beaked common dolphins are known to occur around the offshore islands of the East Coast of Peninsular Malaysia (P. Tioman, P. Aur and P. Pemanggil) (Ponnampalam *et al*., 2010).

Bryde's whales are known to occur in waters around Peninsular Malaysia (South China Sea, P. Perak, P. Langkawi) (Berry *et al*., 1973). The only record of the Omuras has been a stranding at Cherating, Pahang while false killer whales are sighted around P. Tioman and other East Coast of Peninsular islands. Spinner dolphins and the pygmy killer whale (skeletal remains) are known from waters off P. Tioman. The dugong (*Dugong dugon*) appears to be concentrated in the Johor Marine Parks and Johor Straits (Johor River estuary, P. Sibu, P. Tinggi) (Ponnampalam *et al*., 2010; Marsh *et al*., 2002;) and the Langkawi Islands. However, it is not known whether dugongs regularly occur around Langkawi.

TABLE 7: MARINE MAMMALS IN MALAYSIAN WATERS

Common Name	Scientific Name
FAMILY DUGONGIDAE	
Dugong	Dugong dugon
FAMILY BALENOPTERIDAE	
Omura's whale	Balaenopteridae omurai
Bryde's whale	Balaenopteridae edeni
Humpback whales	Megaptera novaeangliae
Non-edeni Bryde's whale	Balaenoptera sp.
FAMILY ZIPHIIDAE	
Ginkgo-toothed whale	Mesoplodon ginkgyodens
FAMILY KOGIIDAE	
Pygmy sperm whale	Kogia breviceps

continues next page

Common Name	Scientific Name
FAMILY DELPHINIDAE	
Indo-Pacific humpback dolphin	Sousa chinensis
Irrawaddy dolphin	Orcaella brevirostris
Indo-Pacific bottlenose dolphin	Tursiops aduncus
Bottlenose dolphin	Tursips truncatus
Bottlenose dolphin	Tursiops sp.
Long-beaked common dolphin	Delphinus capensis
Spinner dolphin	Stenella longirostris
Pantropical spotted dolphin	Stenella attenuata
Striped dolphin	Stenella coeruleoalba
False killer whale	Pseudorca crassidens
Pygmy killer whale	Feresa attenuata
Killer whale	Orcinus orca
Melon-headed whale	Peponocephala electra
Short-finned pilot whale	Globicephala macrorhynchus
Fraser's dolphin	Lagenodelphis hosei
FAMILY PHOCOENIDAE	
Finless porpoise	Neophocaena phocaenoides

Source: Ponnampalam et al., 2010; Agrojati, 2010; Jaaman, 2004; Jaaman et al., 2001

In Sarawak, a study undertaken during August-September 2008 showed that a group of 5-7 individuals of Bottlenose dolphins (*Tursiops* sp.) was sighted off Pulau Talang-Talang and Pulau Satang, Kuching (13 -14 m water depth) (Agrojati, 2010). Moreover, at deeper water (>30 m), Pantropical spotted dolphin (*Stenella attenuata*) were sighted off Oya, Mukah, Kidurong, and Similajau in a group of 3-5 individuals (Agrojati, 2010).

In 2009, during a research cruise on the Royal Malaysian Navy vessel KD Perantau, large groups of Indo-pacific bottlenose dolphins (*Tursiops aduncus*) were sighted several times over shelf waters, and occasionally in the vicinity of oil and gas rigs (Ponnampalam *et al.,* 2010). Spinner dolphins (*Stenella longirostris*) also have been sighted off Sarawak (Ponnampalam *et al.,* 2010; Beasley, 1998;) and mainly observed in open water at great distances away from any landmass (Ponnampalam, unpublished). The estuaries and coastal waters along the West Coast of Sarawak, from Kuching to Miri, are home to large numbers of three (3) small marine mammals, the Finless porpoise (*Neophocaena phocaenoides*), Irrawaddy dolphin (*Orcaella brevirostris*), and the Indo-Pacific humpbacked dolphin (*Sousa chinensis*).

Past studies by Minton and Peter (2009) indicated five (5) species of dolphins were observed at Sarawak waters from July 2009 to June 2010 i.e. Irrawaddy dolphin (*Orcaella brevirostris*), finless porpoise (*Neophocaena phocae-*

noides), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), Indo-Pacific humpbacked dolphin (*Sousa chinensis*), and one unidentified dolphin. The most prominent species is the Irrawaddy dolphin (*Orcaella brevirostris*), with 54 sightings compared to the 39 sightings for finless porpoise (*Neophocaena phocaenoides*) and five sightings for the other three species. The number of sighting for Irrawaddy dolphins (*Orcaella brevirostris*) and Finless porpoises (*Neophocaena phocaenoides*) increased from a previous survey (June 2008-June 2009).

In addition, the Irrawaddy dolphin (*Orcaella brevirostris*) also frequently occurs in Kuching, Bintulu, and Miri (Ponnampalam *et al.,* 2010). A small number of sightings of the Irrawaddy dolphins (*Orcaella brevirostris*) in the Kuching area have been made as far as 8 km upriver (Ponnampalam *et al.,* 2010). Irrawaddy dolphins (*Orcaella brevirostris*) have also been recorded from the Rajang, Sematan, Bako, Igan, Muara Tebas and Saribas Rivers (Ponnampalam *et al.,* 2010).

Indo-Pacific Humpback dolphin (*Sousa chinensis*) sightings have been recorded in Datu Bay, and the Baram and Rajang Rivers, as well as around Similajau and the Santubong and Buntal-Bako Bays, albeit infrequently. Furthermore, finless porpoises (*Neophocaena phocaenoides*) have also been recorded in the Saribas River, where a group of 10 individuals were observed feeding during a recent survey in April 2010.

Other than that, Dugongs (*Dugong dugon*) are found inhabiting the waters around Lawas and Labuan Island (Bali *et al.,* 2008; Jaaman and Lah-Anyi, 2003; Jaaman *et al.,* 2000; Jaaman, 2000). Populations of dugongs (*Dugong dugon*) in Sarawak have declined significantly since the first record in 1931, and in the 1980s many believed that this species was extinct in Sarawak waters. However, a study on dugong (*Dugong dugon*) conducted from 1996 to 2001 indicated that 18 dugongs were observed in East Malaysian waters. All the dugong sighted were found very close to the shore (Jaaman and Yuhana, 2002). A study undertaken in 2007 indicated that at least 13 individual dugongs in three groups, seven (7) whales and 140 dolphins belonging to four (4) species were sighted from Lawas to Tanjung Datu. The survey also recorded sightings of two humpback whales (*Megaptera novaeangliae*) off Miri (The Star, 6 July 2007) (Sarawak Forestry Corporation, 2007).

As for Sabah, the state shares the same species of marine mammals found in Sarawak.

The two most common species found in coastal waters are the Irrawaddy dolphin (*Orcaella brevirostris*) and the Indo-Pacific humpbacked dolphin (*Sousa chinensis*) (Jaaman *et al*., 2001).

Boat surveys by Universiti Malaysia Sabah (UMS) in 1996 and 2002 at coastal and pelagic waters, which also included Spratly islands, recorded a total of eleven species of cetaceans i.e. Irrawaddy dolphin (*Orcaella brevirostris*), Indo-Pacific humpbacked dolphin (*Sousa chinensis*), finless porpoise (*Neophocaena phocaenoides*), Bryde's whales (*Balaenoptera edeni*), short-finned pilot whales (*Globicephala macrorhynchus*), false killer whales (*Pseudorca crassidens*), Fraser's dolphin (*Lagenodelphis hosei*), pantropical spotted dolphins (*Stenella attenuata*), spinner dolphins (*Stenella longirostris*), common bottlenose dolphins (*Stenella longirostris*), and Indo-Pacific bottlenose dolphins (*Tursiops aduncus*).

The Irrawaddy dolphin (*Orcaella brevirostris*) and the Indo-Pacific humpbacked dolphin (*Sousa chinensis*) often found in bay areas (Brunei Bay, Sandakan Bay, Labuk Bay and Cowie Bay), estuarine areas (Beluran River, Segaliud River, Kinabatangan River, Kalabakan River and Marumar River), and at islands (Jambongan Island, Berhala Island and Silumpat Island) (Jaaman, 2010; Jaaman, 2008).

Common bottlenose dolphins (*Tursips truncatus*) have only ever been recorded from around the Spratly Islands, while short-finned pilot whales (*Globicephala macrorhynchus*) and Fraser's dolphins (*Lagenodelphis hosei*) have been sighted mainly in the deep waters of the South China Sea, Sulu Sea, and Sulawesi Sea. Sightings of Bryde's whales (*Balaenoptera edeni*) and false killer whales (*Pseudorca crassidens*) have only been observed cover the continental shelf waters of the South China Sea (Jaaman, 2010).

Spinner dolphins (*Stenella longirostris*), which are the most commonly occurring pelagic marine mammal species in Sabah waters, and pantropical spotted dolphins (*Stenella attenuata*) have been observed in the South China Sea and Sulawesi Sea but not in the Sulu Sea.

Sightings of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in Sabah waters have been made mainly in the waters over the continental shelf areas of the South China Sea (Jaaman, 2010). In addition, there are several confirmed anecdotal reports of melon-headed whales (*Peponocephala electra*) sightings from around the Spratly Islands (Jaaman, 2004; Pilcher *et al*., 1999) as well as killer whales (*Orcinus orca*) (Jaaman, 2004). Short-beaked common dolphins (*Delphinus delphis*) were also reported sighted from Layang-Layang Island (Pilcher *et al*., 1999).

On the other hand, Dugong (*Dugong dugon*) is the only species from the order Sirenian recorded in Sabah waters (Lah-Anyi and Jaaman, 2002). Jaaman (2004) mentioned that there is likely to be distinct populations in Kudat, Brunei Bay, and Kota Kinabalu. The dugong population inhabiting the coastal waters of Sabah is reportedly in very low density. It is scattered across a wide range and estimated to number less than 200 individuals (Jaaman and Lah-Anyi, 2003). Dugongs are at risk of capture from gillnets, trawl nets, and fish stakes, while cetaceans are at risk from those gears and also purse seine nets.

Species that are reported to be caught incidentally are Irrawaddy dolphins (*Orcaella brevirostris*), Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), spinner dolphins (*Stenella longirostris*), Indo-Pacific humpback dolphins (*Sousa chinensis*), and finless porpoises (*Neophocaena phocaenoides*) (Jaaman, 2010; Jaaman *et al*., 2009b). In Sarawak, an estimated 14 dugongs and 221 cetaceans are caught incidentally per year (Jaaman *et al.,* 2005).

As for Sabah, Jaaman *et al*. (2009b) reported that a total of 479 dugongs and 306 cetaceans were estimated to be incidentally caught annually by fishing.

Moreover, dead dolphins were also reported at Piasau Boat Club, Sarawak i.e. the Irrawaddy dolphin (*Orcaella brevirostris*) (November 2007), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) (March 2008) and Indo-Pacific humpbacked dolphin (*Sousa chinensis*) (July 2008). On 22 April 2009, a dead carcass of a finless porpoise (*Neophocaena phocaenoides*) was found at Bungai beach (Minton and Peter, 2009). While in Sabah, Jaaman (2010) reported two (2) species occupying Cowie Bay i.e. Irrawaddy dolphin (*Orcaella brevirostris*) and the Indo-Pacific humpbacked dolphin (*Sousa chinensis*) appear to be threatened with unsustainable population decline caused by disturbance due to heavy vessel traffic and urban industrial development in the area.

3.2 CURRENT HEALTH OF FISHERIES AND FISHERIES HABITATS

3.2.1 FISHERIES

From all perspectives, the health of the Malaysian fisheries faces serious decline in resources and sustainability. Almost all major indicators lead to the inevitable conclusion that fisheries stocks in Malaysia are overfished and need immediate remedial action. A discussion on these various indicators is provided below.

OUTPUT PER FISHERMAN

While total landings have been increasing, **Figures 11 and 12** show that the output per fisherman (tonnes/fisherman) has been declining for all regions in Malaysia from the year 2001 to 2010. This consequently contributed to a declining national trend in productivity at an average rate of 2.5 percent.

Productivity has declined the most for the West Coast of Peninsular Malaysia, from 15.7 tonnes per fisherman in year 2001 to about 14.6 tonnes per fisherman in 2010.

The East Coast of Peninsular Malaysia has experienced a similar decline in productivity with 17.8 tonnes of output per fisherman recorded in 2001, falling to about 9.5 tonnes per fisherman. As for the Sabah-Sarawak region, productivity also declined with efficiency of 11.2 tonnes per fisherman in year 2001, falling to 7.9 tonnes in 2010.

These trends suggest that while total landings have been maintained at previous levels, the productivity of each fisherman has been decreasing over the period under review.

FIGURE 11: OUTPUT PER FISHERMAN (TONNES/FISHERMAN) IN WEST COAST AND EAST COAST OF PENINSULAR MALAYSIA, 2000-2009

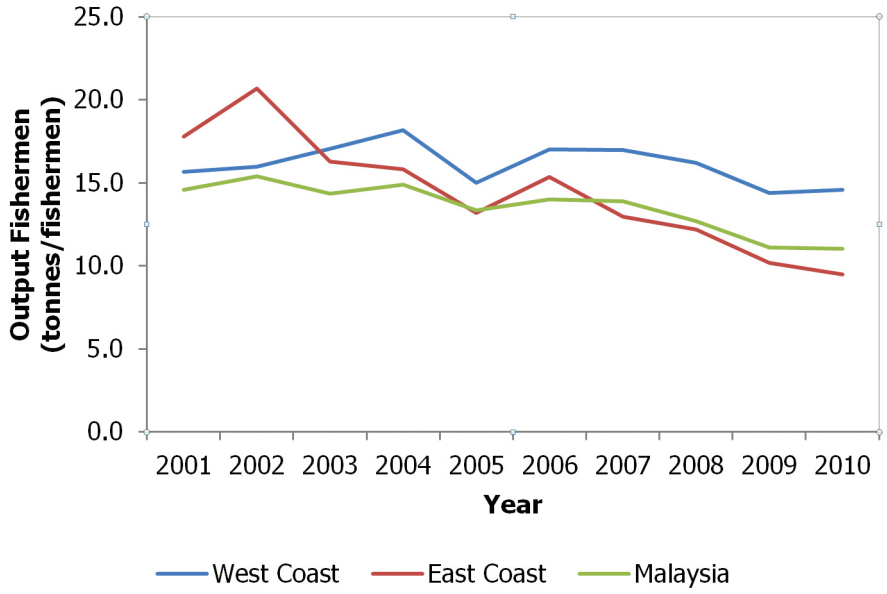
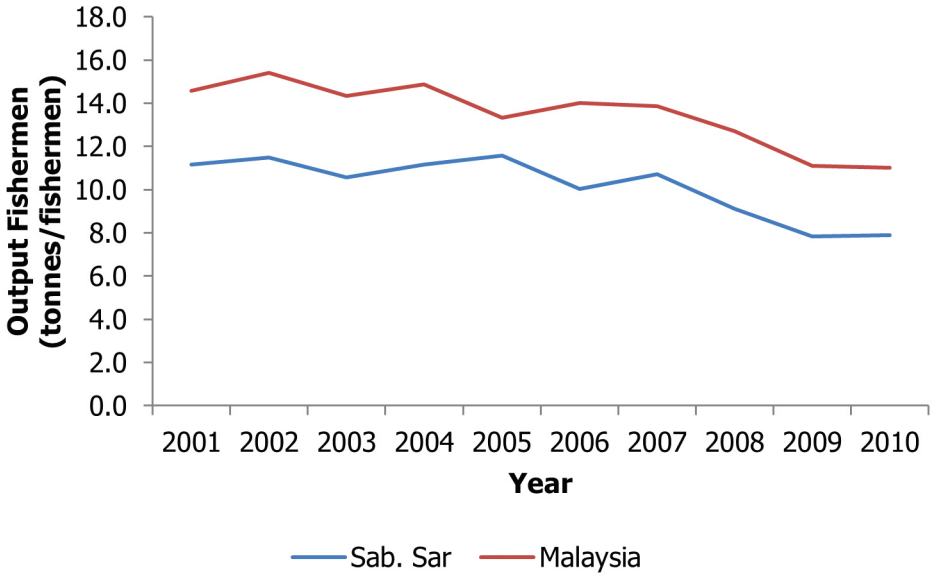


FIGURE 12: OUTPUT PER FISHERMAN (TONNES/FISHERMAN) IN SABAH AND SARAWAK, 2000-2009



INCREASE IN TRAWLER BY-CATCH/JUVENILES

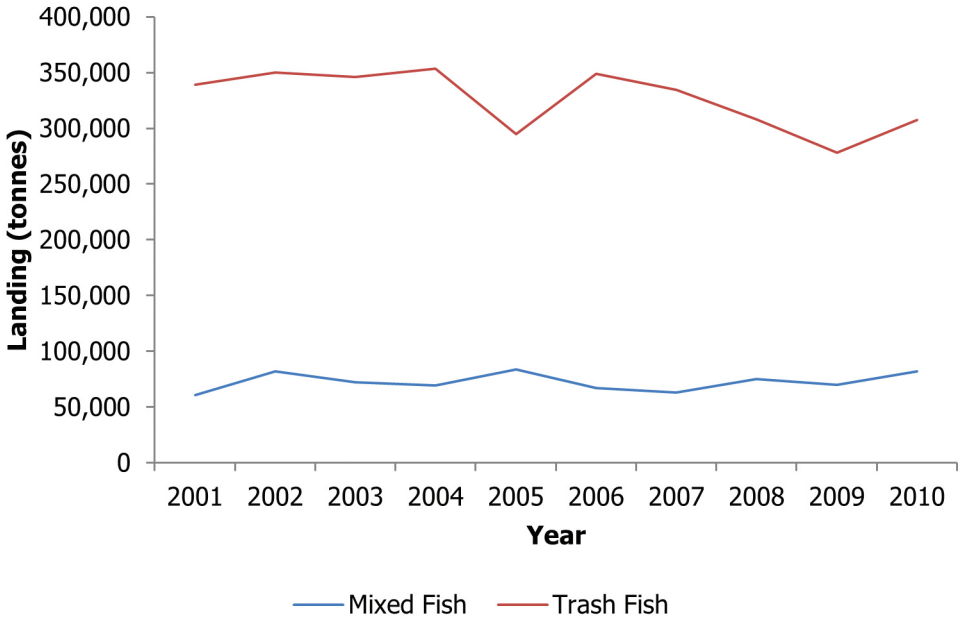
Trash fish or *ikan baja* refer to trawler by-catch that basically consists of undersized, inedible fish of low market-value and consumer preference. These fish are caught consequentially to commercial fish and usually discarded, unless it is of better quality and is used as fishmeal in marine aquaculture farms. The loss of such a large volume of biomass has long been recognised as a deleterious impact to the marine food web, and the increasing share of trash fish in overall landings is used an indication of gross overfishing (Kushairi, Tai and Tengku, 1997).

On the other hand, the diminution of larger individuals that usually account for much of the breeding stock is another a strong indicator of overfishing. Another powerful indicator of stock health comes from a grouping of fish called "mixed fish" or *ikan campur* in the Annual Fisheries Statistics. Mixed fish is not species specific and refers to commercial fish species that are undersized (juveniles) and thus do not enter the retail market. It is important to note that *ikan campur* is not simply "small fish."

Smaller fish such as anchovies (*ikan bilis*) have a ready market in their own right. Instead, *ikan campur* consist of fish that essentially are marketable at larger sizes and are generally in better condition than trash fish.

Some mixed fish is sold for human consumption, primarily to plantation communities. In the East Coast, mixed fish find a ready market among producers of traditional fish products such as *keropok* and *lekor*. However, in other areas, it is also consigned to aquaculture farms as feed. Being of better quality, mixed fish (RM1-3/kg) commands a better price than trash fish (RM0.2–0.60/kg). Nevertheless, this distinction between *ikan baja* and *ikan campur* is vague. If the *ikan campur* is not saleable, it is regarded and disposed off as *ikan baja*. In most analysis on the health of Malaysian fisheries, *ikan campur* is usually not considered due to its edible nature. However, it is included in this study because from an ecological standpoint it represents a major harvest of the recruitment of the standing stock.

FIGURE 13: MIXED FISH AND TRASH FISH LANDING TRENDS FOR MALAYSIA



Source: Department of Fisheries, 2001-2010

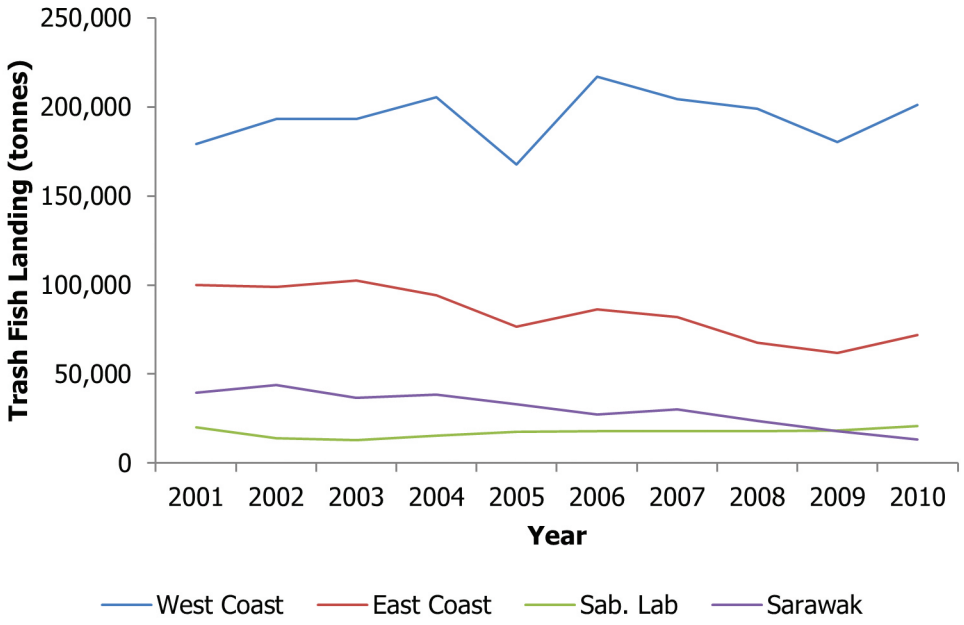
Hence, increases in both trash fish and mixed fish numbers within total catch indicate a decline in commercial fish of marketable size and hence a possible decline in fisheries stock.

TRASH FISH TRENDS

Despite recognition of trash fish being a deleterious impact to the marine food web, landings have generally decreased for the past 10 years **(Figure 13)**. High landing of trash fish has been recorded in the west coast of Peninsular Malaysia; with an 11 percent increase recorded from 2001 to 2010. In Sabah/Labuan, the landing has been constant, with only a 3 percent increase recorded since the year 2001.

On the other hand, the east coast of peninsular Malaysia and Sarawak both recorded decreases in the landing of trash fish from 2001 to 2010. The east coast recorded a 28 percent decrease in the landing, while Sarawak recorded a 66 percent decrease.

FIGURE 14: TRASH FISH LANDINGS TRENDS FOR WEST COAST AND EAST COAST OF PENINSULAR MALAYSIA AND SABAH AND SARAWAK



Source: Department of Fisheries, 2001 - 2010

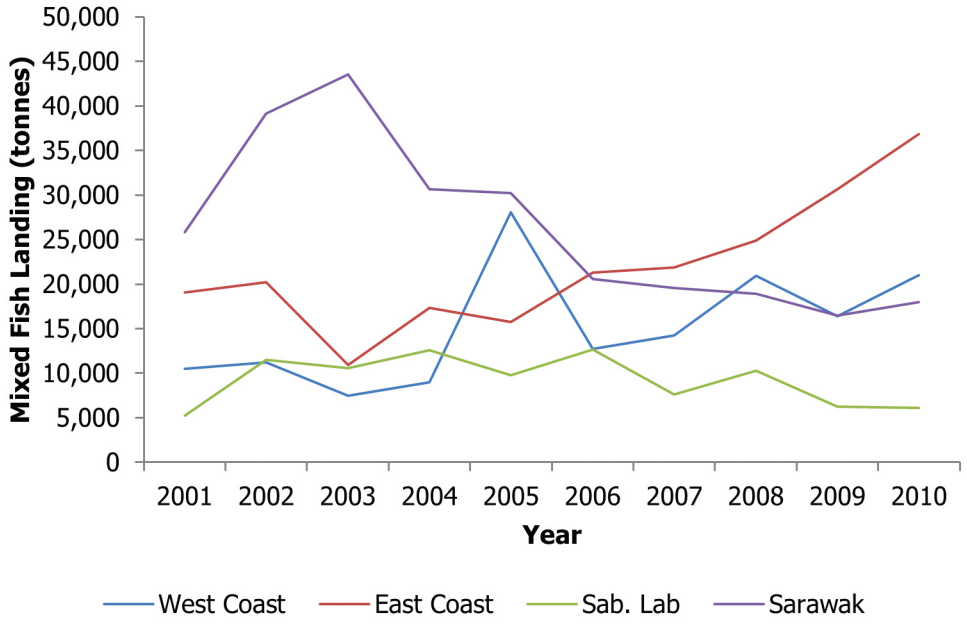
It is quite possible that the decrease was contributed by the overfishing, as the trash fish is highly demanded in the aquaculture sector. In addition, the increased fishing effort could also contribute to the decrease in the trash fish landing.

MIXED FISH TRENDS

The available data **(Figure 13)** indicates that mixed fish landings have been generally constant throughout 2001 to 2010. The entire region recorded increase in the landing of mixed fish except in Sarawak. In West and East Coast of Peninsular Malaysia, the landing has increased 50 percent and 48 percent, respectively. Furthermore, Sabah/Labuan also recorded increases in mixed landing albeit the percentage is less as compared to the Peninsular Malaysia (14 percent) **(Figure 15)**.

Sarawak, on the other hand, recorded decreases in the number of mixed fish landing of 30 percent from the year 2001 to 2010.

FIGURE 15: MIXED FISH LANDINGS TRENDS FOR WEST COAST AND EAST COAST OF PENINSULAR MALAYSIA AND SABAH AND SARAWAK



Source: Department of Fisheries, 2001-2010

3.2.2 FISHERIES-RELATED ECOSYSTEMS

Concurrent with the current situation of the fisheries stocks are their conditions of the ecosystems that support the recruitment, forage, and environmental health of the fisheries environment. A fuller assessment is provided below.

MANGROVES

The loss of Malaysia's mangrove forest areas **(Table 8)** seriously undermines the sustainability of fish stocks, both demersal and pelagic. Mangroves provide nursery grounds and forage in addition to sequestering nutrients and pollutants in the marine environment. In other words, mangroves are crucial mediators in sustaining the health of the marine environment as a whole. The impacts arising from the loss of mangroves, therefore, resonate throughout the marine food web and the life forms it supports.

Unsustainable human uses of mangrove and overexploitation of its natural resources are the main reasons for the damage and loss of mangrove habitats.

This is notwithstanding their economic value, where all non-market and net market values (products and services) amount to USD1.38 billion for the west coast Peninsular Malaysia mangroves alone (83,259 ha; MPP-EAS, 1999).

Coastal erosion has been a major concern due to the reduction of the coastal mangrove belt from its natural state to a width of 200 m to reclaim land for agriculture and settlement (EPU, 1985). This artificial belt of mangroves was then redefined to a more realistic width of 400 m (Ooi, 1996).

TABLE 8: TOTAL MANGROVE AREA (HECTARES) ALONG THE COASTAL AREAS OF THE STRAITS OF MALACCA, 1973-2005

	Mangrove Area (ha)		Mangrove Loss	
State	**1973**	**2005**	**Ha**	**%**
Johor*	39700	2300	-16700	-42
Kedah	10250	8200	-2050	-20
Melaka	300	100	-200	-67
N Sembilan	3500	800	-2700	-77
Perak	56500	43000	-13500	-24
Perlis	250	30	-220	-88
Penang	3900	1400	-2500	-64
Selangor	32000	1700	-15000	-47
TOTAL	146400	93530	-52870	-36

Source: Tan (2005)
* Area includes for East Coast of Johor

The demand for agriculture land has also stressed mangrove areas especially in Kedah and Selangor, where the former lost 1,500 ha for rice planting and the latter lost 7,500 or 30 percent of its mangrove areas for coconut and oil palm (Chan, 1987). Coastal pond aquaculture of prawns (*Penaeus monodon* and *P. merguiensis*), siakap (*Lates calcarifer*) and the snappers (*Lutjanus* spp.) has somewhat taken a toll on mangrove habitats.

Excision of mangrove areas for fishing villages, as well as ports such as Port Klang and Port of Tanjung Pelepas, has contributed to substantial loss of mangroves. The development of Pulau Lumut alone has led to a loss of 4,349 ha of mangroves. Removal of mangrove tracts also affects the associated mudflats and sea grass habitats. Mangroves and mudflats function as nursery, feeding, and breeding areas for almost 50 percent of the commercially exploited fish and 90 percent of commercially exploited prawn species (Jothy, 1984, Sasekumar *et al.*, 1994; Chong *et al.*, 1990, 1994). The commercially exploited fisheries utilize mangroves or the mudflats during some stage of their life cycle (Singh *et al.,* 1994). Mangroves are important areas for ecotourism (nature photography, bird watching, wildlife observation, nature education, recreational fishing, boating, and aesthetics) as shown by the number of visitors (40,000 in 1996) to Kuala Selangor Nature Park (Leong, 1999). Losses of mangroves can impact on the positive aspects that the mangroves can offer.

TABLE 9: TOTAL ECONOMIC VALUE OF MANGROVE ECOSYSTEMS (83,259 HA) IN THE WEST COAST OF PENINSULAR MALAYSIA

Use Value	Gross Benefits	Net Benefits	Assumptions
DIRECT VALUE			
Charcoal and Poles	28,641,130	8,592,339	RM344/ha; 30% net return
Fish and Prawns	5,099,344	1,496,148	29.3% net return
Mud Crabs	4,224,720	1,239,533	29.3% net return
Tourism	35,301,858	21,181,115	RM424/ha; 60% net return
INDIRECT USE			
Nursery Role	343,220,013	67,717,309	19.7% net returns
Carbon Sequestration	150,698,971	150,698,971	RM1,810/ha
Erosion Protection	207,659,742	207,659,742	RM221,333/km; 938.2km
OPTION VALUE			
Biodiversity Value	1,248,887	1,248,887	RM15/ha
NON-USE VALUE			
Existence Value	919,180,464	919,180,464	RM11,040/ha
Total (RM)	1,695,275,129	1,379,014,508	

Source: Chong, 2006

Effluents from industrial parks, plantations, piggeries, edible oils, rubber mills, raw sewage from fishing villages, and uncontrolled dumping of solid waste are examples of pollution threats for mangroves (Lee, 1993, Chong *et al.,* 1999). Unsustainable traditional fishing methods, like the use of empang in Johor (Chong and Sasekumar, 2002) and the motorized push net activity in Matang, impacts on the juvenile population of fishes and prawns.

There has been an overall decline of 22 percent of water birds in Malaysia between 1983 and 1986 and from 2004 to 2006 (Li and Ounsted, 2007) with the most significant (86 percent) along the coast of Perak followed by Johor (40 percent) and Selangor (26 percent). The decline has been attributed mudflat conversion to aquaculture, agriculture, industry, housing and recreation (Tan, 2008).

The continuing loss of mangrove would have the following impact on the fisheries resources:

- The continued loss of mangroves would have serious implications where marine water quality is concerned, as they sequester much of the nutrients that come down with rivers. This deterioration in water quality will affect all aspects of the marine environment.
- Mangroves serve as nursery grounds for many commercially valuable fish species. Their removal means that recruitment to fisheries stocks will be seriously affected. Mangroves also export detrital forage to near shore and coastal areas. The removal of mangroves will seriously affect the marine food web.

- Mangroves protect the coastline from erosion. Their removal would cause or exacerbate coastal and riverine erosion problems, which in turn would demand the government invest large sums in expensive mitigating infrastructure.

CORAL REEFS

As with mudflats, coral reefs ecosystems face intractable problems relating to their conservation and management. There has been no comprehensive survey of coral reef resources, both soft and hard, throughout the country. The present marine park coverage is limited to specific areas and many coral reef areas have yet to be protected in Peninsular Malaysia.

Only reefs within marine protected areas are protected. Reefs outside the marine protected areas come under state directorates (if within state waters) or the Federal Directorate of Lands and Mines (if outside state waters). The directorates have neither the mandate nor the capacity to manage and protect the coral reefs and, as a result, they are open to almost unlimited exploitation and destruction.

Land-based activities on islands and the main land adjacent to the marine protected areas such as resort development, agriculture activities, etc. also falls within the ambit of the state government. There is often a conflict between the land-management strategies pursued by land-management authorities and marine protected area management authorities. As much of the sediment loads in the water come from land-based sources, the coral reefs often end up on the losing end of the conflict.

The threats to the coral reefs of Malaysia are listed and scaled in **Table 10**. Despite their importance, the coral habitats are continuously being threatened by anthropogenic impacts. The significant threats to the east-coast coral habitats include sedimentation and high turbidity due to coastal development, solid and sewage pollution, destructive illegal trawl fishing within the marine parks, boat scouring and coral damage by boat anchoring, and tourism-related activities (resort development, increased visitor numbers, divers and snorkelers into reef areas where disturbance is mainly touching and walking on corals, excessive use of sun block lotion). Oil and grease from boating activities poison the corals while sewage increases euthrophication of coastal waters, resulting in excessive algae growth within coral areas.

TABLE 10: THREATS TO CORAL REEFS OF MALAYSIA

Threats	West Coast of Peninsular Malaysia	East Coast of Peninsular Malaysia	East Malaysia (Sabah and Sarawak)
Fishing Intensity	4	3	5
Fishing Damage	3	3	5
Fish Blasting	2	2	4
Gleaning	2	1	3
Boat Scouring	2	3	4
Population Pressure	4	3	4
Sedimentation	5	3	3

continues next page

Threats	West Coast of Peninsular Malaysia	East Coast of Peninsular Malaysia	East Malaysia (Sabah and Sarawak)
Domestic and Agriculture Pollution	3	2	4
Industrial Pollution	3	1	1
Oil Spill	2	1	2
Disease and Predation	2	4	3
Dredging	2	1	2
Coral Mining	1	1	3
Tourist Activities	1	2	2
Coral Bleaching	1	1	1

Note: Scale Values:
1 = None to Rare
2 = Very Low Concentration
3 = Some Damage, Some Stress
4 = Medium to High Damage
5 = Very High, High Stress, Very Damaging
Source: MIMA, 2006

Many islands do not have treatment for sewage and at times it is discharged raw. Recent threats due to global warming, which causes sea temperature rises resulting in bleaching of corals, is already affecting many coral areas in Malaysia and globally (Berkelmans and Oliver, 1999).

FIGURE 16: CORAL BLEACHING REPORTS IN PENINSULAR MALAYSIA

Source: The Star (Nation), July 22, 2010

SEA GRASS MEADOWS

Threats faced by the sea grass communities include sedimentation, sand mining, oil pollution, tourism, land reclamation and marine transport (boats and ships), mangrove removal, and aquaculture. Illegal trawl and push net activities, as well as digging activities for polychaetes and bivalves (*Hiatula solida, Meretrix meretrix*) within sea grass habitats, decimate sea grasses by total removal or by sediment resuspension (Japar Sidik, 1994; Japar Sidik and Muta Harah, 2003). Shipping activity in port areas can also generate strong waves that can impact deleteriously on the sea grasses.

The threat of sea-level rise and rise in sea temperature will alter the growth rates and the physiology of the sea grasses, affecting their primary productivity and reproduction (Short and Neckles, 1999). Sea-level rise may impact on the coastal currents, water depth, tidal patterns, and inundation patterns.

Overall, there has been no comprehensive survey of sea grass meadows resources throughout the country. Further, sea grass meadows have yet to be specifically protected. Only sea grass meadows within the marine protected areas are protected.

The present legislation governing sea grass meadows is disjointed and fragmented. As with coral reefs, there is often a conflict between the land-management strategies pursued by the land-management agencies and the marine protected area management authorities.

SEAWEEDS

Seaweeds are associated with many coastal and island habitats (mangroves, corals, sea grasses, and sand/rocky shores). The survival of the seaweeds depends on the health of the host habitats. Increased sedimentation, turbidity (reducing light), pollution, land reclamation, and urbanization are major threats to the seaweed resources of the east-coast mainland and islands in its waters.

3.3 THE NEED FOR EAFM IN MALAYSIA

While current fish landings are still significant enough to engender a degree of comfort among resource managers, the existing scenario does not point to a healthy fisheries resource base where Malaysia is concerned. It is pertinent to point out that taken in 2009, both by-catch and juveniles accounted for 303,321 tonnes or 28 percent of Malaysia's catch that year. Thus, while there has been an increase in landings over the years, a significant portion is of low-value undersized and juvenile fish or other inedible component of the marine food web.

In any other circumstances, the continued harvest of juvenile stock and the marine forage based would have manifested as a collapse in fishery. However, the problem with the Malaysian multi-species fishery (as in many tropical fisheries) is that overall volume figures often mask collapses of sub-fisheries that are often too small to make an impact.

Talib (2002) reported significant shifts in the species profile of the catch off the northern part of the Straits, indicating that some fish may have already been dangerously overfished to the point where species balance in the fishing population has been affected.

The population of invertebrates (cephalopods, jellyfish, and shrimp) was a stable 20-30 percent of total catch in the West Coast fishery from 1970-1998. After 1998, however, landings have become more erratic and on the downslide.

In addition, it is clear that generally marine fishery resources are currently being exploited beyond their maximum sustainable levels, and while catch levels continue to broadly sustain in volume terms, there have been major shifts in the species profile.

While a comprehensive fisheries management regimen is in place, it is still inadequate to address many issues of resource health. The health of the fisheries resources cannot be divorced from that of the overall marine envi-

ronment in which the activity is undertaken. For instance, current management regimes have tended to focus on controlling fishing effort through licensing and access limitations to sustain present stock levels. The complexity of the marine environment, however, precludes such one-dimensional management approach.

Fisheries resource management cannot be seen in isolation from issues such as habitat degradation and pollution. In this respect, the present regimen is still strongly lacking in fundamentals. For instance, habitat conservation has been limited to establishment of marine parks and protection of coral reefs.

While the parks have to a large extent managed to limit the kind of degradation seen elsewhere in the region (McManus, 1988), the dichotomy in jurisdiction between the federal government and the state governments means that while the latter is in charge of the marine parks, land matters (and land based development on the islands) largely remains under the jurisdiction of the state governments.

The dangers of coral reef ecosystem destruction posed by water-quality degradation associated with unsustainable land development on the islands adjacent to marine parks is very much still a concern. In addition, other habitats—notably mangroves and sea grasses—are also major determinants to marine environmental health, especially in coastal and near shore areas.

Mangroves and sea grass beds serve as important nursery areas for commercially important species of fish and prawns, and have been shown to support inshore fish production (MacNae, 1974; Fortes, 1988).

However, mangroves are classified as a forestry resource in Malaysia and come under the direct jurisdiction of the state governments.

Sea grass beds within three nautical miles of the low-water line are similarly within state jurisdiction. Another reason for the apparent bias towards reef-based parks is their economic appeal as tourist destinations.

On the other hand, mangrove and sea grass-based parks are unlikely to attract the same kind of visitor flow making it less appealing to government planners, who often need to justify setting aside reserves in economic terms.

In short, monetary worth of the resource being conserved has precedent over its biodiversity values (Mohd. Ibrahim *et al.*, 1997). As a consequence of these legal and administrative issues, there are no mangroves or sea grass reserves that have been so declared exclusively for marine environmental or fisheries purposes.

The deterioration of marine water quality, particularly from land-based sources, is another major factor mediating ecosystem health. Effluent from land-based industries and domestic discharges, coastal-land reclamation, illegal dumping of sludge from vessels, and accidental oil spills have contributed to the pollution and degradation of the water quality of the coastal aquatic environment (Mohd. Ismail, 1983).

The degradation of the environmental health of the marine environment, and the fisheries resources that depend on it, have strong socio-political implications. Fish is a staple protein in the local dietary intake and is a major feature of national cuisine. In addition, increasing affluence accompanying economic growth has led to an escalation in fish consumption.

Though some of this increase can and will undoubtedly come from aquaculture, traditional consumer preferences will dictate that the marine fisheries will have to cope with much of this increased demand.

Thus changes in the availability of fish supplies can have far-reaching effects. In this regard, it is significant to note that retail fish prices have risen precipitously over the last 30 years. Existing regimes can only work in an environment where stakeholders are willing make short-term sacrifices to ensure long-term sustainability. In the case of the Malaysian coastal fisheries, however, fishers are increasingly unwilling to accommodate short-term constraints because the continuing deterioration of the coastal marine environment (over which they have no control) will impact on future fisheries stocks.

In short, there is greater economic imperative to harvest the fish now than wait for some future time when conditions will most likely become untenable for the fish to survive anyway. In this view, any downslide in catch is expected to be compensated by the higher marker prices that such shortages would eventually engender.

Balancing this purely economic imperative would be the pressure to ensure security of supply for increased demand brought about by population increases and increasing affluence, and the need for conservation of natural biodiversity. Current management regimes must be revamped to move away from the one-dimension resource management model that currently underpins its legitimacy and instead look at the fisheries ecosystem as a whole. The current policy framework, the National Agro-Food Policy 32, stipulates output-oriented goals. Targets for volumes to be landed are stipulated in detail. However, there are no corresponding input goals in terms of fishing effort or ecosystem conservation. This policy bias has slanted current management regimes towards emphasising landing volumes rather than quality.

Establishing input goals would be a major step forward in ensuring institutional support for input based strategies, such as management of fisheries-based ecosystem. Towards this end, it may be necessary to establish a national council, along the lines of the Forestry Council, to bring together the disparate institutional stakeholders involved in the conservation of fisheries-based ecosystems, so that a common platform can be evolved on the implementation of EAFM in the country.

Also necessary would be an EAFM-based master plan for the management and development of the fisheries sector that takes into account the health of the fisheries resources in their entirety, covering both the animals as well as their habitats, and setting tangible and rational input and output goals. The establishment of such a master plan is, in fact, called for in the Fisheries Act, 1985 but has yet to be promulgated.

4.0

MAKING EAFM WORK IN MALAYSIA

In making EAFM work in Malaysia, two major hurdles need to be overcome as follows.

INSTITUTIONAL FRAGMENTATION

It is pertinent to note that EAFM is easier in Sabah than elsewhere in the country because both the management of fisheries and fisheries habitats are within state jurisdiction. This is not the case in the rest of the country, where these mandates are spread over several federal and state agencies.

A review of the legal and policy environment within which the management and fisheries habitats are reviewed identified 10 federal acts and 25 state ordinances governing them. The agencies mandated to implement the various legal instruments do not, at present, work on a formal platform, though a significant degree of coordination does occur between them.

LACK OF DATA ON FISHERIES RESOURCE/HABITATS AND THEIR HEALTH

Though fisheries resource studies are carried out from time to time, these are not on a scheduled and regular basis. Coupled with that is a limited understanding of the extent and role of fisheries habitats in sustaining the nation's fisheries resources. While there have been studies on fisheries habitats and their health, these have been sporadic and scattered. Even where such data exists, it tends to be of limited value. For instance, while there is excellent data on mangroves within forest reserves, state forest data is much more limited. The absence of a comprehensive appraisal of these habitats, their extent, and their health limits the ability to pursue their management and conservation effectively.

Cognisant of these hurdles, Malaysia has made serious strides to institute EAFM in the country. This is consistent with the country's commitment to fully introduce EAFM by 2016. Currently, initiatives to implement EAFM have been at two levels:

1. At federal (national) level
2. At state level. This has been largely confined to Sabah at present time.

The initiatives, and the extent to which they have been implemented, are detailed below.

4.1 NATIONAL PROGRAMS RELATING TO EAFM IMPLEMENTATION

4.1.1 CTI NATIONAL PLAN OF ACTION

The blueprint for the implementation of EAFM in Malaysia has been the National Plan of Action (NPOA). The NPOA embodies 12 guiding principles, of which nine were in the Regional Plan of Action. These guiding principles represent Malaysian commitments in various treaties, policies, and declaration commitments in international forums. These guiding principles are embraced in the 134 action plans spread out across the five goals, similar to the Regional Plan of Action goals.

These five goals are as follows:

Goal 1: Priority Seascapes Designated and Effectively Managed

Goal 2: Ecosystem Approach to Management of Fisheries and other Marine Resources Fully Applied

Goal 3: Marine Protected Areas Established And Effectively Managed

Goal 4: Climate Change Adaptation Measures Achieved

Goal 5: Threatened Species Status Improving

A total number of 53 action items have been identified for implementation under the NPOA. A full list of the various actions prescribed under these goals and their current implementation status is provided in **Table 11**.

For the purposes of this document, emphasis will be on the outcomes of Goal 2 (*Ecosystem Approach to Management of Fisheries and Other Marine Resources Fully Applied*). However, it is crucial to point out that all the other goal relate, directly or indirectly, to EAFM as well. The implementation of Goal 2 demands that a total 16 action items be pursued. These items and the current status of their implementation are described in greater detail below.

ACTION 1: IMPLEMENT A SUSTAINABILITY CERTIFICATION SCHEME AND STANDARDS FOR MALAYSIA LIVE REEF FISH (LRF) PRODUCTION

This action item is designed to emplace live reef fish production on a more sustainable platform. In its final form, this action item is expected to lead to a certification scheme that would provide traceability and stipulate production standards for farmed reef fish. This action is currently in implementation by the Departments of Fisheries in Malaysia and Sabah as well as relevant NGOs.

TABLE 11: LIST OF ACTION ITEMS UNDER THE NPOA AND CURRENT LEVEL OF IMPLEMENTATION.

Actions Description	Lead Agency	NPOA Target Date	Project Status
Implement an EAFM Plan for small pelagic fisheries for the SSME demonstration and replication sites throughout Malaysia.	DoF Sabah	ongoing	Proposed & Unfunded
Design and implement management measures and protocols, including economic incentives for protection and management of marine turtle populations and their habitats.	DoF Sabah	2010	New CTI Initiative
Strengthen a high-level EAFM steering committee comprising inter-agency government representatives and stakeholders.	DOFM	2010	Proposed & Unfunded
Establish a national policy on EAFM.	EAFM Steering Committee	2010	New CTI Initiative
Assess human resource capacity to identify and address gaps in EAFM implementation.	DOFM; DoF Sabah	2011	New CTI Initiative
Update the Fisheries Act 1985 to encompass EAFM principles.	DOFM	2012	Proposed & Unfunded

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Actions Description	Lead Agency	NPOA Target Date	Project Status
Harmonize relevant legislation between neighboring CTI countries.	MMEA	2015	New CTI Initiative
Finalize legally binding measures to conform to EC Regulation 1005/2008.	DOFM	2010	Proposed & Unfunded
Develop an EAFM Strategy for Sabah fisheries.	DoF Sabah	2010	Proposed & Unfunded
Develop a system for effective information sharing on enforcement between CT countries, with focal points designated.	MMEA	2010	Funded & Commenced
Determine the status and issues of IUU fishing, especially along borders within the SSME.	MMEA	2010	Proposed & Unfunded
Conduct regular tagging programs for economically important pelagic fish species in the Sulu and Sulawesi Seas with the cooperation and cost sharing of CT neighboring countries.	DOFM	ongoing	Proposed & Unfunded
Extend and improve the VMS program to monitor all commercial pelagic fisheries vessels, and to achieve internationally bench-marked standards of operational performance.	DOFM	2011	Partially funded & Commenced
Develop a program for the coastal community and fishers to report illegal activities to the MMEA.	MMEA	2011	Funded & Commenced
Double the number of MMEA officers and enhance training relevant to CTI targets and activities.	MMEA	2015	Funded & Commenced
Increase the number and capacity of maritime enforcement assets.	MMEA	2015	Funded & Commenced
Strengthen collaborative MCS programs with neighboring countries.	MMEA	2010	Funded & Commenced
Strengthen initiatives to combat IUU fishing in line with the RPOA-IUU.	MMEA	ongoing	Funded & Commenced
Nominate selected coastal communities in Sabah to participate in the CTI COASTFISH program.	NOD	2013	New CTI Initiative
As a SSME initiative, develop joint pilot projects with Indonesia and the Philippines to establish experimental farms for the culture of high-value seaweed species, and share improved quality seed stocks for seaweed farms.	DoF Sabah	2011	Proposed & Unfunded
Rehabilitate abandoned shrimp farms to their natural state or for other sustainable aquaculture uses.	DoF Sabah	2012	Proposed & Unfunded
Address problems faced by seaweed farmers.	DoF Sabah	2012	Proposed & Unfunded
Develop economically feasible and ecologically suitable seaweed farming using best culturing techniques and seaweed strains in Sabah.	DoF Sabah	2015	Proposed & Unfunded
Develop a Malaysian COASTFISH Investment Plan, and share information on the development process and contents of the plan with other CT countries.	NOD	2013	New CTI Initiative
Mobilise domestic and international funding, technology, and expertise to support Malaysian COASTFISH initiatives.	NOD	ongoing	New CTI Initiative
Share technologies, information, and approaches of relevance to COASTFISH with other CT countries.	NOD	ongoing	New CTI Initiative

Actions Description	Lead Agency	NPOA Target Date	Project Status
Produce maps denoting the location and boundary of COASTFISH sites in Sabah.	NOD	2013	New CTI Initiative
Implement public education and awareness initiatives focusing on sustainable fisheries, aquaculture, living aquatic resources exploitation, and trade.	DOFM; DoF Sabah	ongoing	Partially funded & Commenced
Undertake education and public awareness programs to foster better understanding among the general public of the multiple values of mangrove forests.	Sabah Forestry	ongoing	Proposed & Unfunded
Produce baseline data on trends in CPUE; incomes from fishing and non-fishing activities; and exploitation level of key species.	DOFM	2012	New CTI Initiative
Use satellite imagery to assist in the prediction of fish aggregation and harmful algal bloom in coastal waters.	NOD	2014	Proposed & Unfunded
Implement EAFM for the Sabah tuna fishery leading to sustainable certification based on internationally recognized certification standards.	DoF Sabah	2015	New CTI Initiative
Implement project proposal on seafood security to assess sustainability and accessibility of resource supply in Malaysia.	DOFM	2011	Proposed & Unfunded
Complete tuna-stock survey and determine MSY.	DOFM	2012	Funded & Commenced
Update baseline data on trends in CPUE; incomes from subsistence, artisanal, and commercial tuna fisheries; and contribution of tuna fisheries to the local economy; and employment.	DoF Sabah	2012	New CTI Initiative
Exchange information with neighboring countries on shared fish stocks, specifically on tunas and other highly migratory species as well as small pelagics.	DOFM; DoF Sabah	ongoing	New CTI Initiative
As a SSME initiative, share information on existing legislation and policies for the management of tuna and small pelagics.	DoF Sabah	2010	New CTI Initiative
Conduct regular oceanographic surveys in the SSME, and other Malaysian waters.	MMD	ongoing	Proposed & Unfunded
Implement a sustainability certification scheme and standards for Malaysia LRF production.	DOFM; DoF Sabah	2012	New CTI Initiative
Nominate a balanced representative delegation of Government officers, NGO members, academics, fishers, and private-sector companies to participate in the informal CTI Forum on Tuna Governance.	NOD	ongoing	New CTI Initiative
Implement and adopt Full-Cycle Aquaculture (FCA) to alleviate pressure on wild stocks.	DoF Sabah	2010	Funded & Commenced
Implement best-management practice for aquaculture, with emphasis on the production of reef fish.	DoF Sabah	2011	Proposed & Unfunded
Implement seasonal closure of spawning aggregation areas.	DoF Sabah	2015	New CTI Initiative
Develop a national management plan and policy for LRF and ornamentals trade that reflect EAFM and livelihood issues.	DOFM; DoF Sabah	2012	New CTI Initiative

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Actions Description	Lead Agency	NPOA Target Date	Project Status
Identify issues, lessons learned, and success factors related to the sustainable management of LRF and reef-based ornamentals trade, and publish data into the public domain.	DOFM; DoF Sabah	2010	New CTI Initiative
Collect and collate baseline information on groupers, humphead wrasse, and other targeted reef fish and ornamentals.	DOFM	2011	Proposed & Unfunded
Promote voluntary adoption by traders of a Code of Practice for sustainable LRFT.	DoF Sabah	2011	New CTI Initiative
Conduct an in-depth study on the value chain of LRFT for effective management.	DoF Sabah	2011	New CTI Initiative
Survey, identify, and map marine-spawning aggregation areas.	DoF Sabah	ongoing	Proposed & Unfunded
Undertake consumer survey of seafood consumption.	DoF Sabah	2010	New CTI Initiative
Promote sustainably-captured and cultured seafood to restaurant owners and wholesalers.	DoF Sabah	2013	Funded & Commenced
Strengthen public awareness on the consequences of IUU fishing.	DOFM	ongoing	New CTI Initiative
Impose and monitor export ban on humphead wrasse.	DoF Sabah	2010	Funded & Commenced
Impose and monitor export quota on targeted reef fish and ornamentals other than humphead wrasse.	DOFM; DoF Sabah	2012	New CTI Initiative

ACTION 2: NOMINATE A BALANCED REPRESENTATIVE DELEGATION OF GOVERNMENT OFFICERS, NGOS, ACADEMICS, FISHERS, AND PRIVATE SECTOR COMPANIES TO PARTICIPATE IN THE INFORMAL CTI FORUM ON TUNA GOVERNANCE

This calls for all stakeholders in the tuna resources of the country, especially those operating from Sabah, to come together to ensure the sustainability of tuna stocks in the country's waters.

Supported by the National Oceanographic Directorate, as well as the Departments of Fisheries in Malaysia and Sabah and relevant NGOs, a balanced representative delegation has been nominated and has started work.

ACTION 3: IMPLEMENT AND ADOPT FULL CYCLE AQUACULTURE (FCA) TO ALLEVIATE PRESSURE ON WILD STOCKS

The continued harvesting of fingerlings from the wild to meet the demands of the LRF farms is expected to eventually lead to depletion of reef fish resources. Hatchery bred fingerlings would clearly relieve the pressure on wild stocks. Thus, this action item is a major step forward in ensuring sustainability of wild LRF stocks.

This action item is ongoing. Both the Departments of Fisheries in Malaysia and Sabah have active research programs for the induced spawning and seed production of a number of reef fish species. However, given the paucity of data on the reproductive biology of many of these species, it is expected that FCA for many species can only be achieved in the long term.

ACTION 4: IMPLEMENT BEST MANAGEMENT PRACTICES FOR AQUACULTURE, WITH EMPHASIS ON THE PRODUCTION OF REEF FISH

In going forward in ensuring the sustainability of LRF culture, it is crucial that a commonly acceptable production platform towards which all producers can work towards is stipulated. Such a platform would embed husbandry standards as well a commitment to traceability of farmed stock and a no-take policy where reef fish of conservation importance is concerned.

This action is ongoing and spearheaded largely by the Department of Fisheries, Sabah. However, it is also pertinent to point out that the Department of Fisheries Malaysia had long developed a Code of Conduct for Marine Finfish Aquaculture that can be used as a basis for the LRF industry.

ACTION 5: IMPLEMENT SEASONAL CLOSURE OF SPAWNING AGGREGATION AREAS

Healthy, productive, and protected spawning aggregations leading to high levels of recruitment in marine populations are essential in sustaining fisheries stocks. The establishment of such protected areas is a major deliverable of the NPOA.

This action is to be implemented in 2012 in Sabah. However, preliminary work relating to identification of suitable sites has already begun.

ACTION 6: DEVELOPMENT OF A NATIONAL MANAGEMENT PLAN AND POLICY FOR LRF THAT REFLECT EAFM AND LIVELIHOOD ISSUES

A national policy framework would provide a legal and administrative platform for the LRF industry. Tied with the best-management practice, the policy would enable all stakeholders in the industry to act in concert where its growth and sustainability is concerned.

The development of the management plan and policy is ongoing, spearhead by both the Departments of Fisheries in Malaysia and Sabah.

ACTION 7: IDENTIFY ISSUES, LESSONS LEARNED, AND SUCCESS FACTORS RELATED TO THE SUSTAINABLE MANAGEMENT OF LRF AND REEF-BASED ORNAMENTALS TRADE AND PUBLISH THE DATA IN THE PUBLIC DOMAIN

Data on LRF, especially, the source of the traded stock is not readily available. This is an impediment, not only to management agencies intent on securing the industry's sustainability, but also the producers themselves, who then have little control over prices offered by buying cartels. Those who have worked in the industry and seen what solutions work also need to document their experiences so that industry can be better prepared to meet its obligations with respect to sustainable production.

The action is ongoing, and at present a significant volume of data on production and the issues related to the LRF trade has been obtained. However, market data and pricing is still not fully available.

ACTION 8: COLLECT AND COLLATE BASELINE INFORMATION OF GROUPERS, HUMPHEAD WRASSE, AND OTHER TARGETED REEF FISH AND ORNAMENTALS

This is similar in objective as Action 7 above, except that it is more targeted.

The action is currently ongoing, with the main actors being the Departments of Fisheries in Malaysia and Sabah.

ACTION 9: PROMOTE VOLUNTARY ADOPTION OF TRADERS OF A CODE OF PRACTICE FOR SUSTAINABLE LRFT

In consonance with the best-management practice standards to be voluntarily complied with by producers, a parallel document for traders should also be developed. This document would largely detail with sustainability issues, but would also include elements of animal welfare and transit mortalities.

The action is currently ongoing, with the main actors being the Departments of Fisheries in Malaysia and Sabah.

ACTION 10: CONDUCT AN IN-DEPTH STUDY OF THE VALUE CHAIN OF THE LRF INDUSTRY FOR MORE EFFECTIVE MANAGEMENT

This would involve a comprehensive appraisal of the trade practices and market linkages associated with the LRF industry.

The action is currently ongoing, with the main actors being the Departments of Fisheries in Malaysia and Sabah.

ACTION 11: SURVEY, IDENTIFY, AND MAP MARINE SPAWNING AGGREGATION AREAS

This links closely with Action 5, which calls for the declaration of closed areas.

The action is currently ongoing, with the main actors being the Departments of Fisheries in Malaysia and Sabah, universities and Sabah Parks.

ACTION 12: UNDERTAKE CONSUMER SURVEY OF SEAFOOD CONSUMPTION

There has been no detailed inventory of seafood consumption in the country, include the monitoring of changing tastes and trends. Such a study is important in addressing the issue of fish as a strategic commodity, both at the present time and in future.

The action is currently ongoing, with the main actors being the Departments of Fisheries in Malaysia and Sabah.

ACTION 13: PROMOTE SUSTAINABLY CAPTURED AND CULTURED SEAFOOD TO RESTAURANT OWNERS AND WHOLESALERS

The fish-trading community are a linchpin in ensuring sustainability as they can influence both consumer awareness and producer attitudes. WWF Malaysia, in fact, initiated a SOS (Save our Seafood) campaign to create awareness among consumers on the consumption of fish that are rare or threatened. Such a campaign needs to be extended at a national level.

This program is expected to take off in 2013 and will be spearheaded by the Department of Fisheries in Sabah.

ACTION 14: STRENGTHEN PUBLIC AWARENESS ON IUU FISHING

Enhanced awareness of destructive fishing practices and other IUU fishing issues would go a long way in strengthening consumer responses to fish caught by these means.

This program is expected to take off in 2013 and will be spearheaded by the Department of Fisheries in Sabah.

ACTION 15: IMPOSE AND MONITOR BAN ON HUMPHEAD WRASSE

The situation regarding the humphead wrasse is serious, with demand from export markets causing serious declines in natural stocks.

The Department of Fisheries in Sabah has already banned the export of the wrasse, though local consumption is allowed. The monitoring of its catch, however, is ongoing.

ACTION 16: IMPOSE AND MONITOR QUOTA ON TARGETED REEF FISH AND ORNAMENTALS OTHER THAN HUMPHEAD WRASSE

This calls for the imposition of quotas on specific reef fish and ornamentals, especially those populations showing signs of stress.

The action is currently ongoing, with the main actors being the Departments of Fisheries in Malaysia and Sabah, universities and Sabah Parks.

OTHER INITIATIVES

In addition to the NPOA, a number of other initiatives have been undertaken at national level to promote the concept of EAFM among all stakeholders.

ESTABLISHMENT OF A NATIONAL STEERING COMMITTEE ON EAFM IMPLEMENTATION

The proposed steering committee under the Department of Fisheries is the first step towards bringing a multitude of stakeholders to a common forum, where issues relating to fisheries management can be discussed on a holistic basis. The steering committee's first meeting is scheduled to be in early May 2012.

MULTI-STAKEHOLDER EAFM WORKSHOPS

A major workshop on *EAFM Visioning Workshop For The Management And Development Of Peninsular Malaysia Marine Resources Through Ecosystem Based Management Of Fisheries* held on 8-11 February 2011. It was largely organised by WWF Malaysia with support from the Department of Fisheries Malaysia, and was attended by a wide spectrum of stakeholders in the fisheries sector.

4.2 EAFM IMPLEMENTATION—A CASE STUDY OF EAFM IN SABAH FISHERIES

4.2.1 EAFM DEMONSTRATION PROJECT

EAFM initiatives in Malaysia were first attempted in Sabah since 2011, where a demonstration project was established in the district of Semporna and a replication site in the district of Kudat. The primary focus of the initiative was to create a platform for integrated management of fisheries and fisheries ecosystems, which sectorally limited management agencies as well as relevant coastal communities, could subscribe to. The focus was on fisheries as a whole, but more specifically on small pelagics.

The idea of the demonstration site was to develop workable modalities for EAFM and demonstrate their usefulness in fisheries management, while the replication site was to ensure that these modalities were generic enough to the replicated elsewhere in the state, and eventually the country.

Four major activities were involved in the demonstration site:

1. Establishment of the specific demonstration site and inter-sectoral committees.
2. Specific studies relating to fish-stock assessments, especially of small pelagics.
3. Development of inter-sectoral Integrated Fisheries Management Plan (IFMP) together with all stakeholders.
4. Implementation and monitoring of the plan

Basically, the demonstration activities that have and continue to be carried out are directed at looking at the current state of the fisheries industry at the site before proceeding with the IFMP. More specifically, it involves data collection relating to small pelagics, since it represents a regional concern involving Indonesia and the Phillipines as well.

The main species that were the focus of the study were mackerel (*Rastrelliger kanarguta*), sardine (*Sardinella lemuru*), and selar (*Selar crumenophthalmus*). The detailed information gathering is a crucial precursor to the development of the IFMP.

Currently, the focus is on socio-economic indicators at the demonstration site, where necessary data on demographics and societal structures within the affected coastal communities will be examined. Preliminary discussions between various government and community stakeholders towards this end have already been initiated.

This information is equally crucial since the strictures of the plan would not to take into account the cultural and social backdrop against which it is expected to operate. The establishment of inter-sectoral committees and detailed studies on the state of the fisheries resource's health would also be pursued concurrently. These committees are expected to be wide ranging in membership. Outside of representation from a diverse coastal community, members would be also drawn from the local governments, Malaysia Maritime Enforcement Agency (coast guard), Fisheries Development Board, and Wildlife Department. NGOs would include Ko-Nelayan (fishermen's cooperative), WWF Malaysia, Borneo Conservancy, and others.

Coordinated by the Department of Fisheries Sabah, a formal understanding on these committees and their membership is expected to be sealed by the end of 2012.

Training of resource persons within the management agencies and communities is also expected to be pursued at the same time.

The outcomes from these initiatives are still not clear. However, even without the benefit of monitoring and evaluation studies, it is clear that the collaborative mechanisms set up under the project would facilitate the sustainability of fisheries resources. It would create a greater understanding among land-use managers of the importance of maintaining habitats for the purposes of fisheries management in that they can now see themselves as stakeholders in the resource-management process, unlike the past, where they were relegated to by-stander status. Where coastal communities are concerned, these initiatives would impart the same lesson, emphasising that habitat management is not simply for some intangible benefit like heritage but to sustain their day-to-day livelihood.

SSME REGIONAL PROJECT

The Sulu-Celebes Sea (SCS) is a Large Marine Ecosystem in the tropical seas of Asia bounded by three countries: Indonesia, Malaysia (specifically Sabah), and the Philippines. Being at the heart of the most bio-diverse marine area in the world, the SCS is also a very rich fishing ground for large and small pelagics as well as bay and coral reef fishes, providing livelihoods to the coastal inhabitants and food for the entire region and beyond. The fishery resources, however, have declined due to various threats, including overexploitation, habitat and community modification, and global climate change.

In consonance with EAFM, a regional perspective has been adopted in looking at the SCS as whole rather than fragment its resource management based on national boundaries. Funded by the Global Environmental Fund (GEF), a transnational project involving the three countries, the Sulu-Celebes Sea Sustainable Fisheries Management Project has been instituted.

The goal of the project is to have an economically and ecologically sustainable marine fishery in the SCS, both for the benefit of communities who are dependent on these resources for their livelihoods and for the global community who benefit in the conservation of highly diverse marine ecosystems and their ecosystems services.

The objective of the project is to improve the condition of fisheries and their habitats in the SCS through integrated, collaborative, and participatory management at the local, national, and tri-national levels. The three countries and other stakeholders, including NGOs, have worked together to develop the Sulu-Sulawesi Marine Ecoregion Conservation Plan and formally put in place a regional institutional mechanism to implement the plan. The project activities, outcomes, and outputs will build on these strong regional and national initiatives.

There are five major outcomes of the project. The first is the achievement of a regional consensus on trans-boundary priorities and their immediate and root causes by updating an earlier Trans-boundary Diagnostic Analysis for the SCS and focusing on unsustainable exploitation of fisheries. The second outcome is agreement on regional measures for improved fisheries management through coordination in the formulation of a Strategic Action Program, which will build on the existing Ecoregion Conservation Plan.

The third outcome is the strengthening of institutions and introduction of reforms to catalyze implementation of policies on reducing overfishing and improving fisheries management. The primary target for institutional strengthening is the Sulu-Sulawesi Marine Ecoregion Tri-National Committee and its sub-committees, in particular the sub-committee on sustainable fisheries. The fourth outcome is increased fish stocks of small pelagics through the implementation of best fisheries-management practices in demonstration sites. The fifth outcome is the capture, application, and dissemination of knowledge, lessons, and best practices within the SCS and other LMEs.

5.0

THE WAY FORWARD

It is clear that the current situation is serious and urgently needs to be addressed. EAFM management regimes represent a holistic approach that can potentially blunt some of the more serious issues currently facing Malaysian fisheries. The solution thus lies within the ambit of the institutions now managing fisheries and fisheries-based ecosystems.

The main institutional stakeholder where fisheries management is concerned is the Fisheries Department. The department largely views its role in terms of sustaining commercial fish catch. This is a natural response from an organization which was essentially set up for the purpose of managing fisheries resources and whose success is measured by the tonnage of fish that is landed yearly. Its annual fisheries statistics do not discuss the health of fisheries-based ecosystems and focus entirely on landings and value.

There is no mention of the ability of fisheries ecosystems to support these figures. Conservation is undertaken by the Department of Fisheries, but the rationale behind conservation and management is to ensure sustainability of commodity production rather than the fisheries ecosystem as a whole. The marine environment is treated as a factory that can, with appropriate technological inputs, produce as much as the nation requires.

This has led to a situation where fish stocks are not managed for long-term benefit but almost entirely for short-term economic gain, leading to a skew in the conservation and management process.

The need to compare the less tangible benefits of patrimony and the long-term returns of sustainable fisheries stewardship against the more visible and cogent profile of revenue and employment generated by their exploitation has led to a situation where economic imperatives often overshadow fisheries conservation efforts.

The fragmented institutional environment governing the management of fisheries-based ecosystems is a major impediment to their sustainability. The Department of Marine Parks Malaysia, for instance, is limited to biodiversity management and conservation only within the boundaries of gazetted marine parks.

Mangrove reserves come under the state Forestry Department, while all other habitats outside its boundaries largely come under the state Lands and Mines departments, which have no capacity to undertake the kind of management that they need. State lands and forests come under state governments, which have traditionally taken a "hands-off" approach to fisheries management, always regarding that as a federal responsibility.

Thus, a crucial stakeholder group—the state governments—has never been involved to any significant extent in fisheries management, notwithstanding the fact that most fisheries-based ecosystems come under their suzerainty.

Even where federal lead agencies are concerned, there is a significant degree of fragmentation. The management of forests, lands, and shorelines and marine parks is coordinated by the Peninsular Malaysia Department of Forest, the Federal Directorate of Lands and Mines, Department of Drainage and Irrigation, and Marine Parks Department while the monitoring of water quality is undertaken by the Department of Environment. All these five departments are within the Ministry of Natural Resources and Environment, while the Fisheries Department comes under the Ministry of Agriculture.

Lying at the core of the problem is the absence of a single institution that can champion the cause of conservation and management of fisheries and fisheries-based ecosystems. Different government agencies are involved, and each is governed by its own set of rules and regulations to cater to specific geographic areas or species.

The following recommendations have been framed against this backdrop.

REVISION OF CURRENT POLICY ENVIRONMENT

The current policy environment contained in the National Agriculture Policy 3 promotes sustainability of the fish stocks in the country. Its heavy emphasis on sustaining—if not increasing—landing volumes, without corresponding emphasis on protection and conservation of the marine environment, is a serious shortcoming and must be addressed in future reviews of the policy.

ESTABLISHMENT OF ECOSYSTEM BASED FISHERIES MANAGEMENT REGIME

It is clear that the current fisheries resource-management regimes are inadequate and ineffective in sustaining catch levels. A new regime needs to be framed: one that combines control of fishing efforts and conservation of ecosystems in a cohesive, integrated package.

ESTABLISHMENT OF A NATIONAL COUNCIL TO DISCUSS FISHERIES ISSUES

A national council chaired by the Prime Minister and consisting of all Mentris Besar and Chief Ministers should be established to decide on issues relating to management of fisheries and fisheries-based ecosystems. Towards this end, a National Fisheries Council modeled after the National Land Council, the National Forestry Council, and National Spatial Planning Council can be established.

Alternatively, it can be a dedicated sitting of the National Biodiversity Council. The idea would be to bring a disparate group of state and federal stakeholders together to engender a consensus on the management of fisheries and fisheries-based ecosystems. In particular, it would involve the state governments in fisheries management, ensuring that they carry some responsibility for the health of the resource.

EXTENSION OF FISHERIES PROTECTED AREAS TO COVER ALL FISHERIES-BASED ECOSYSTEMS

Section 65 of the Fisheries Act, 1985 provides for the establishment of Fisheries Protected Areas, where valuable habitats can be afforded protection. However, its use so far has been limited to specific areas, mainly reef areas. Its use should be expanded to cover sea grass, sea weed, and other habitats. The use of relevant provisions with State Forestry Enactments for declaration of mangrove forests as fisheries reserves should also be pursued.

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