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FISHERIES AND THE NATIONAL FOOD SECURITY: THE MALAYSIAN PERSPECTIVE

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Introduction

Fisheries constitute one of nature's renewable, highly diverse and dynamic agricultural resources. These resources exist in an aquatic environment that are subjected to an ever increasing degradation, notably pollution. They represent an extremely valuable commodity, much sought after for food, ornaments and recreational purpose. Food is a very important and sensitive topic, especially when a substantial amount of our requirement is produced by others (imported). Shortages of food is detrimental and can create unrest in the country. One of the greatest challenges in the new millennium is to meet the demand for safe and nutritious food for our growing population.

Nationally, the fishing industry is a strategic industry, providing a principal source of protein in the diet as well as generating employment and revenue. The fishery sector contributed about 1.5 % towards the National Gross Domestic Product (1997) and 11.1 % towards the Gross Agricultural Domestic Products. At present, the Malaysian fisheries sector comprises of three sub-sectors, namely the inshore and deep-sea capture fisheries, and aquaculture. The inland or freshwater capture fisheries be perhaps be the insignificant fourth sector. Over the last decade, this industry has undergone rapid development with a clear shift from artisanal fishing to one with a more commercial orientation.

A total of 1.2 million metric tons (tonnes) were produced annually (1997), mostly from inshore areas valued at RM 3.7 billion. Many people are involved in the fishing industry including fisherman, fish farmers, farm workers, fish traders, input suppliers, fish processors, transporters, boat builders and repairers, ice makers and other support service providers. In 1997 the sector provided direct employment to 79,000 fishers and 20,000 aqua farmers (Anon, 1998); with an estimated 450,000 persons involved in fishery related activities.

In Malaysia, the demand for fish as food is reflected by the per capita annual consumption of 45 kg which compares well with meat consumption at 31.8 kg. Although 1.2 million tonnes of fish are produced annually, the country still import 300,000 tonnes fish from her neighbours worth RM 979 million. The demand for fish is expected to increase further due to increase in the human population (@1.5 % per year), the increasing perception of fish as a health food and the expected growth in downstream activities. Based on the projected per capita consumption and the population growth, the demand for fish as food is expected to be 1.7 million tonnes in the year 2010.

In order to fulfill this expected demand, proper planning and strategies have to be developed and this paper seeks to examine the present scenario and future trends, the emerging issues and challenges for the fishery sector in this new millennium.

Global Outlook

In the last millennium, total world fish production, through capture fisheries and aquaculture, increased tremendously, reaching a peak in 1989 at over 100 million tonnes, contributed mainly by marine capture fisheries which accounts for more than 90 percent of the world capture fisheries. Of this catch, about 30 % was utilised for non-food purposes, mainly for reduction into fish meals and fish oils. In the 1950's and 1960's, total marine fisheries production increased at a rate of 6 percent per year, doubling from 17 million tonnes in 1950 to 34.9 million tonnes in 1961, and doubling again in the following two decades to reach 68.3 million tonnes by 1983. The increased production comes mainly from the increased landings of pelagic fish while landings of demersal fishes had remained static since the 1970's. In 1990's, the average annual rate of increase of marine capture fisheries production dropped to 1.5 percent and fish production was augmented through aquaculture.

In 1996, total world fish production was 121 million tonnes, 94.6 million tonnes through capture fisheries and 26.4 million tonnes through aquaculture. Although a similar total production figure was reported for 1997 (source: FAO) the contribution from aquaculture had increased to 28.3 million tonnes. (Table 1).

TABLE 1. WORLD FISH PRODUCTION AND UTILIZATION.

Activities	PRODUCTION (million tonnes)					
	1990	1992	1994	1995	1996	1997[1]
INLAND						
Aquaculture	8.17	9.39	12.11	13.86	15.61	17.13
Capture	6.59	6.25	6.91	7.38	7.55	7.70
Total inland	**14.76**	**15.64**	**19.02**	**21.24**	**23.16**	**24.83**
MARINE						
Aquaculture	4.96	6.13	8.67	10.42	10.78	11.14
Capture	79.29	79.95	85.77	85.62	87.07	86.03
Total marine	**84.25**	**86.08**	**94.44**	**96.04**	**97.85**	**97.17**
Total aquaculture	13.13	15.52	20.77	24.28	26.38	28.27
Total capture	85.88	86.21	92.68	93.00	94.63	93.73
Total world fisheries	**99.01**	**101.73**	**113.46**	**117.28**	**121.01**	**122.00**
UTILIZATION						
Human consumption	70.82	72.43	79.99	86.49	90.62	92.50
Reduction	28.19	29.29	33.47	30.78	30.39	29.50

[1]Preliminary estimate.

Traditionally, fresh fish is the most important fish product for direct consumption, thus between 1970 to 1990, its share remained at 30 % of total production. However, in recent years the volume of fishery products marketed fresh has increased. In 1996, about 33 percent of all fish was marketed fresh (source: FAO). Canned products had remained at 12 % while frozen products have increased their share at the expense of cured products. The production of frozen fish fillets, shrimps, and the supply of fish in 'ready to eat' form has increased in volume. The present world consumption of fish as food is estimated at 86.4 million metric tons, with an average per caput consumption of 13 kg. Asia is the largest fish consuming continent followed by Europe. Japan has the highest per caput consumption level in the world at 71 kg, EU – 17 kg and USA – 7 kg. Consumer's expenditure on seafood in the USA is around US$ 26.7 billion.

According to the FAO, fish, shellfish, and the fishery products are widely traded, with no less than 195 countries exporting part of their production and some 180 countries reportedly importing varying amounts in 1996. World trade in seafood is estimated at US$ 100 billion, with major market in Japan, USA and EU. Japan is the leading importer with US$ 15.5 billion worth of imports in 1997. The European Union imports about 5 million tons per year, valued at US$ 11 billion and USA imports about 1.5 million tons per year worth US$ 6 billion.

In term of species composition, the pattern of consumption has change a bit with a slight decline in finfish as compared to increasing consumption of crustaceans (shrimps and crabs), mollusc and cephalopods. Consumption of freshwater finfish has also increased from its 16 % share in 1970 to 22 % in 1990. During the same period, there was a decline in consumption of demersal fishes, while per caput consumption of pelagic fishes increased.

Globally, the marine demersal high value species were overfished and according to Ermann and Pet-Soede (1996) lucrative live reef food fish trade and cyanide fishing contributes to the decline in these high value fish populations. According to the FAO report, a reduction of at least 30 % of fishing effort is required to rebuild the demersal resources.

The demand for fish and fish products is continually increasing, as the general public is getting more health conscious. According to the FAO (1999), the increase in world consumption is estimated at 0.5 – 3.0 % per year. This means on an average, the EU will require an additional 650,000 tons seafood per year, and the USA another 250,000 tons. Besides population growth and social conditions, other contributory factors that will help shape future demands for fish and fishery products are the degree of sophistication of fish production, processing, distribution and marketing structure (Westlund, 1999). With the present rate of fish production, the world is expected to face a shortage of about 20 million tons of fish for food by the year 2010.

The Nature of the Fisheries Resource

According to Hilborn and Walters, 1992, 'commercial fisheries are not static system that can be manipulated and reshaped at will by management'. One of the greatest challenges to fishery managers is the very high diversity of the fisheries resources and its dynamic nature.

Biodiversity

Fisheries resources, most of which are marine, comprise of three groups of invertebrates – Molluscs (including clam, mussels, snail and squids), Echinoderms (sea cucumber), Crustaceans (shrimp, prawns, lobster, crabs) and one vertebrate group – Fishes.

Out of more than 65,000 species of molluscs, perhaps the important ones are the cephalopods (squids, cuttlefish, octopus), which are quite dynamic, the bivalves (cockles, clams, scallops, oysters, mussels), and gastropods (abalones) which are sedentary animals. The giant clam for instance is the world biggest bivalve and *Tridacna gigas,* found in waters in reef areas, can reach a size of 250 kg and has a life span of over 100 years. Giant clams are harvested for their meat or adductor muscles.

In terms of export, the most valuable fisheries are based on decapod crustaceans namely shrimps, prawns, lobsters and crabs. The majority of the marine shrimps exploited by Malaysian fishers belong to the Family Panaeidae which comprise of 12 Genus and more than 90 species. Commercially important species include *Penaeus* spp., *Metapenaeus* spp., *Parapenaeopsis* spp. And *Metapenaeopsis* spp. Penaeid shrimp form the basis of coastal trawl fisheries in the west coast of Peninsular Malaysia as well as pond farming/aquaculture.

With regard to fish, according to King (1995), there are 21,000 known species of fish, which is almost half of all species of animals with vertebral bone, living in diverse habitats ranging from cold mountain streams to the deepest part of the ocean. Mohsin and Ambak (1996) collected 712 species of marine fish in Malaysian waters, out of which 458 species were found to be commercially important. They belong to various groups and families, differing in shape and size, living in inshore as well as offshore areas and are either pelagic or demersal (Appendix 1).

Pelagic fishes are those that live in the water column, often near the surface, swimming in groups and relying on speed for feeding and avoiding predators. Their bodies are topedo shaped, thus giving least resistance when moving and their pectoral fins are used as brakes for stopping. Most of the world's largest fisheries are based on single species pelagic fish such as sardines, pilchards, herrings, anchovies, tunas and mackerels. They are either eaten fresh or canned but most are processed into fish meals for use in the animal feed industry. In Malaysia, important pelagic species are Indian mackerels/*kembung,* Scads/*selayang,* sardines/*tamban,* anchovies/*bilis* and tunas/*aya* which are mostly caught by purse seines.

Demersal fish are those that live near the sea floor, relatively slow moving, which through evolution, have taken many shapes and forms. In terms of diversity the south-east Asian region can boast of having the largest number of species, which decreases as we move towards the polar regions. However, in terms of abundance, although there is a lower species diversity in the temperate cooler waters, some species such as the cod are found in large numbers and form an important single species fishery. On the other hand, our tropical species are low in numbers and our fishery are multispecies, exploited mainly by trawling. The distribution of the demersal species is influenced by the type of sea bottom, the scienids (croakers/*gelama*) for instance are found in muddy areas while the sparids and pomadasids are common on sandy bottom. In rocky areas, fishes like Ephinephelids (groupers/*kerapu*) and Lutjanids (snappers/*merah*) are normally found.

The most diverse group of fishes are found in the coral reefs, which provide shelter and food to a great variety of living organisms, greater than those found in other natural areas in the world. These reefs also provide substrate for the growth of corraline algae and coral polyps and together with their zooxanthellae (symbiotic algae) contribute significantly towards the primary productivity.

Coral reef fishes have coexisted for millions of years, quite specialised, thus, although their diversity is high, the number of individuals within each species is quite low. They have adopted an array of reproductive strategies, some even caring for their eggs and young. Many species are sequential hermaphrodites, parrotfish for example change from males to females, while wrasses and emperors (*Lethrinus* spp.) from females to males. Adult coral reef fishes normally live within a small home range on the reef, but they produce pelagic larvae which drift far out in the ocean before settling on coral reef or return as adults. Coral reef fishes such as groupers and snappers form an important fishery, particularly trap and hook and line fishery.

With regard to freshwater fishes, Mohsin and Ambak (1983) reported the presence of 382 species in Peninsular Malaysia, 118 species were classified as rare and 59 as endangered. In their later work, Ambak and Mohsin (1992a, 1992b), described the biogeographic distribution, biology and trophic status of freshwater fishes with reference to the endangered species community.

Dynamic Behaviour of Fish Populations

Besides being very diverse in terms of taxonomy, habits and habitat requirement, the dynamicity of fish populations also varies significantly. Fish populations or fish stocks increase by reproduction of the adult fish, which eventually results in new fish being added or recruited into the stock. On exploitation, the fish stocks are reduced by fishing and natural mortality. The controlling factors on the abundance of fish stock is represented in Figure 1 (King, 1995).

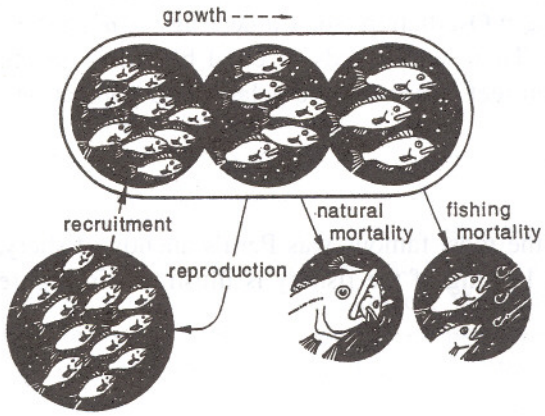

Figure 1 Example of an exploited fish stock. The stock biomass is increased by growth (three age group are shown) and recruitment, and is reduced by normal mortality and fishing mortality. (after King, 1995)

When a fish stock is underexploited or fished at low level, population decrease due to fishing and natural mortality are balanced by recruitment and growth, thus their abundance will fluctuate at some level. When exploitation is high, the number of adult fish caught becomes large and when the spawning population is reduced, eventually recruitment will be too small to maintain the numbers lost through fishing. Different fish populations have different vulnerability to fishing. Some fishes are more resilient to fishing pressures than others. Some exhibit what ecologist refer to as k-strategist (like elephants) which are stable communities, less affected by environmental changes eg coral reef fishes, while some are r-strategists (like flies) eg pelagic fishes, which exhibit great fluctuations in abundance. Coral reef fishes are more vulnerable to fishing pressure. In Fiji, two giant clam species are already extinct due to overfishing.

Thompson-Burkenroad debate

Most fishermen believe that fluctuating abundance in fish populations, hence fish catches, are natural events. Fishery managers, however, ascribe poor catches to too much fishing, and that fish stock can recover with proper management. Perhaps it is worthwhile to recall the classic twentieth century debate between W.F Thompson (Thompson *et al.,* 1931, Thompson 1950) and M.D. Burkenroad (1948, 1950, 1951, 1953) with reference to the Pacific halibut *(Hippoglossus stenolepis)* as reviewed by Skud (1975) and mentioned by Hilborn and Walter (1992). In essence, Thompson was convinced that the decline in halibut abundance was due to overfishing and the stock would recover when fishing pressure was reduced. Burkenroad on the other hand believed that the decline was a natural phenomenon and caused by natural fluctuations in oceanographic conditions which in turn affected the survival of young halibuts. These arguments were seriously studied and discussed in 1940's and 1950's and by mid 1950's, Thompson emerged as the 'winner'. It was then an established theory that changes in fish abundance is due to growth and reproductive capability of fish stock 'balanced' against fishing mortality.

This debate however was renewed in the last decade as our knowledge on oceanography and climatic change increased and the effects of temperature, ocean circulation and other environmental factor on fish stock are being studied. The Malaysian scientific community is still not certain about the consequence of the recent 1997-1998 El Nino ("the child", in Spanish), which is the warm phase of the Southern Oscillation (see Camerlengo *et al.,* 1998), on our fish populations and other marine life. There are records of coral bleaching in our waters, but we are still investigating its effect on reef fishes and the pelagic fish populations.

The Case of Peruvian Anchovy Fishery

In the history of the fishing industry, perhaps the most famous was Peru's anchovy fishery, the largest fishery in the world in 1960's. The landing of the fishery is illustrated in Figure 2.

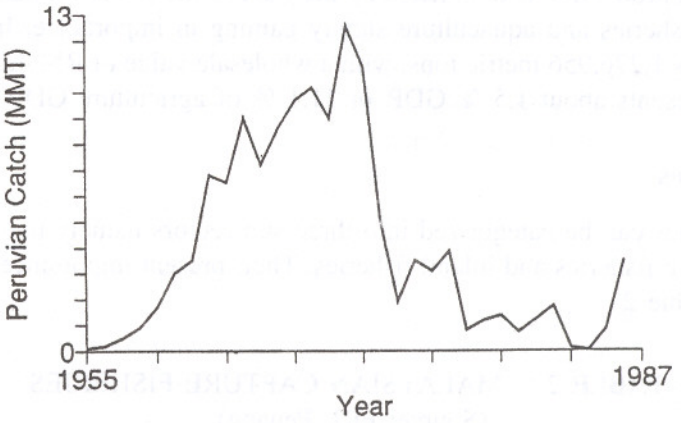

Figure 2 Catch history of Peru's anchoveta fishery. Data from FAO Yearbook of Fisheries Statistics (1980-1985) (as seen from Hilborn and Walter, 1992).

In the early 1950's, this fishery was the largest producer of fish meal with landings reaching 9 million metric tons in 1964-65. A year later, the catch was reduced by 2 million metrics tons which was associated with the warm surface water due to the El Nino effect. Fishery scientists were alarmed and experts were called by the Peruvian government to assess the anchovy stock. Many estimates of sustainable yield figures were given, and a consensus was established at the level of 9.5 million metric tons. However, because of high demand for fish meal and because of their economic importance, the Peruvian government was unable to reduce the fishing effort, thus fishing continued at high rates to yield almost 13 million metric tons in 1971. A second El Nino hit Peru in 1972-73 and the after effect was catastrophic, with catches dropping to 2 million tons in 1973, a reduction of 11 million tonnes. Among the reasons given was firstly the fish moved closer inshore where they became more vulnerable to fishing, and secondly, offspring from spawners suffered high mortality rates resulting in lower recruitment. The third El Nino oceanic conditions occurred in 1982-83.

The Status of the Malaysian Fisheries

One of the objectives of the national fisheries industry is to ensure adequate supply of fish to meet domestic demand and for export. This is certainly a formidable task since even with the present rate of exploitation, maintaining the fisheries resources on a sustainable basis is a difficult endeavor. Because of high demand for food brought about by economic growth, the threat of fish overexploitation together with the decrease in recruitment due to degradation of the aquatic environment and the destruction of natural habitats have become serious problems which need to be addressed. Mangrove areas, which are vital habitats for molluscs, crustaceans and some fish species are being reclaimed or cleared for development. Effluents from industrial and domestic discharges, illegal ocean dumpings and oil spills, continue to degrade our water quality, thus making sustainable development of fisheries difficult.

The Malaysian fish production is dominated by marine capture fisheries, mainly coastal, with offshore capture fisheries and aquaculture slowly gaining in importance. In 1997, the total fish production was 1,276,956 metric tons, with a wholesale value of RM 4.28 billion (Salim, 1999), which represents about 1.5 % GDP, or 11.1 % of agriculture GDP.

Capture Fisheries

The capture fisheries can be categorized into three sub-sectors namely the coastal fisheries, deep-sea or offshore fisheries and inland fisheries. Their present importance and basic statistic is present in table 2.

TABLE 2 MALAYSIAN CAPTURE FISHERIES
(Source: FRI, Penang)

Activities	Coastal Capture Fisheries	Deep-sea Capture Fisheries	Inland Capture Fisheries
Status	Important sub-sector	Growing sub-sector	Small sub-sector
Fish landing (value)	1,037,887 MT (RM3.309 billion)	132,545 MT (RM350.6 million)	3,950 MT (RM13.0 million)
Effort	32,117 vessels of less than 70 GRT; 71,000 fishers	555 vessels of 70 GRT & above; 6,952 fishers	Mostly using small craft; Part-time basis
Gears	Traditional fishing gears (gill nets, traps, hand-lines, etc.)	Commercial fishing gears (trawl nets, fish purse-seine nets, and long-lines)	Hand-lines, casting nets, gill nets and trap

Over the past thirty six years (1961-1997), total fish catch has increased 9 fold with periods of decline from 1979 to 1986 (Fig. 3). There was a steady increase in fish landing from about 150,650 tonnes in 1961 to 198,377 tonnes in 1965 mainly due to mechanisation of boats and from 236,607 tonnes in 1996 to 684,000 tonnes in 1978, due to the introduction of trawl nets in 1965. Catch by trawls contribute towards more than 60 % of marine fish landing. Besides prawns, the major groups of demersal fishes caught by trawling are nemipterids, scianids, lutjanids, epinephelids, carangids and mullids. During that time, the west coast of peninsular Malaysia was the major contributor to the Malaysian fish landings. A significant decline in landing was observed from 1979 onwards, and this has alarmed those involved in the development of this sector. Some food fish, eg *Lactarius lactarius* which was commonly caught in the 1970's has virtually disappeared. Scientists at Universiti Putra Malaysia made attempts to evaluate and assess the fish stock and came to the conclusion that the demersal fish catch had exceeded almost three times the sustainable yield estimates (Ambak *et al.*, 1981; Ambak and Mohsin, 1982; Ambak *et al.*, 1982), and recommended that the number of trawlers be reduced.

The establishment of 200 nautical mile economic zone as outlined by the United Nation's Law of the Sea, 1982, has affected the National Agriculture Policy which provides guidelines on fisheries development through offshore fishing. Since our waters has increased four fold, the government encouraged full exploitation of the newly found EEZ and as a result there was a sudden increase in fish catch in 1987, which has continued to increase until today.

Certainly it is important to know how much we can harvest from our waters without jeopardizing the fish stock. The last extensive survey conducted on board RV Rastrelliger (Nov. 1985-June 1987) indicated a stock biomass of 964,700 tonnes in the Malaysian EEZ (Anon, 1989). Looking at the present landings, the most logical assumption is that fish production through marine capture fisheries can be sustained at around a million metric tons, with close to 900,000 MT coming from coastal waters and the balance from offshore areas.

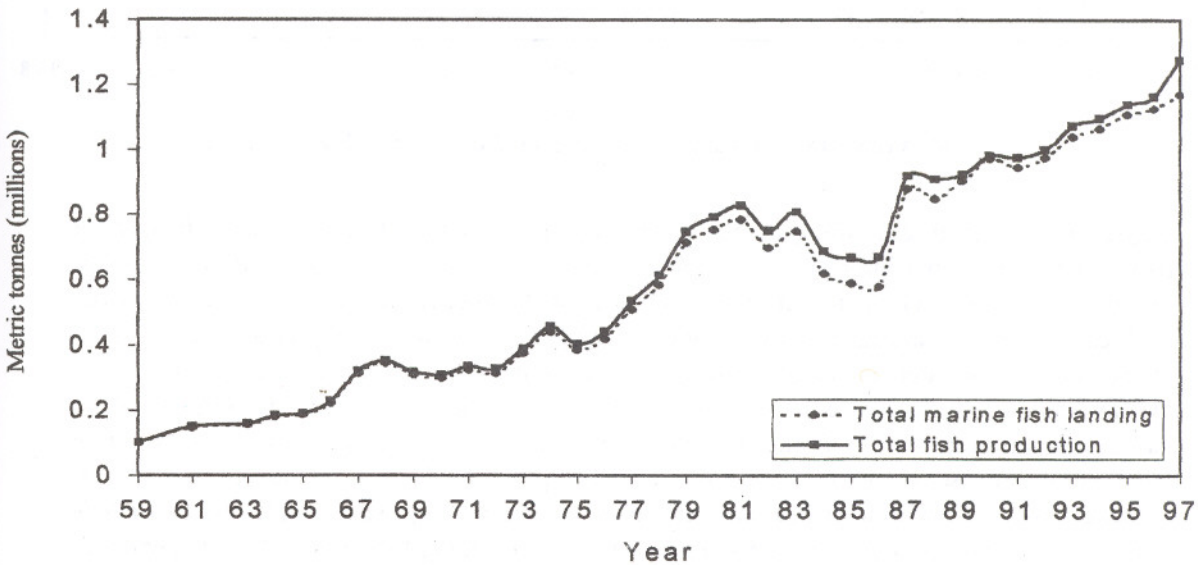

Figure 3 : Total marine fish landing of Malaysia (1959-1997)

Aquaculture

Aquaculture is an emerging, fastest growing fishery sub-sector with current production at slightly above 100,000 metric tons or almost 10 % of total national fish production (Anon, 1999). This industry is relatively new, although the culture of freshwater Chinese carps started in 1930's.

The aquaculture industry slowly gained importance in 1980's with the culture of brackishwater shrimp (tiger prawn) which registered a rapid expansion in production in the 1990's (fig. 4)

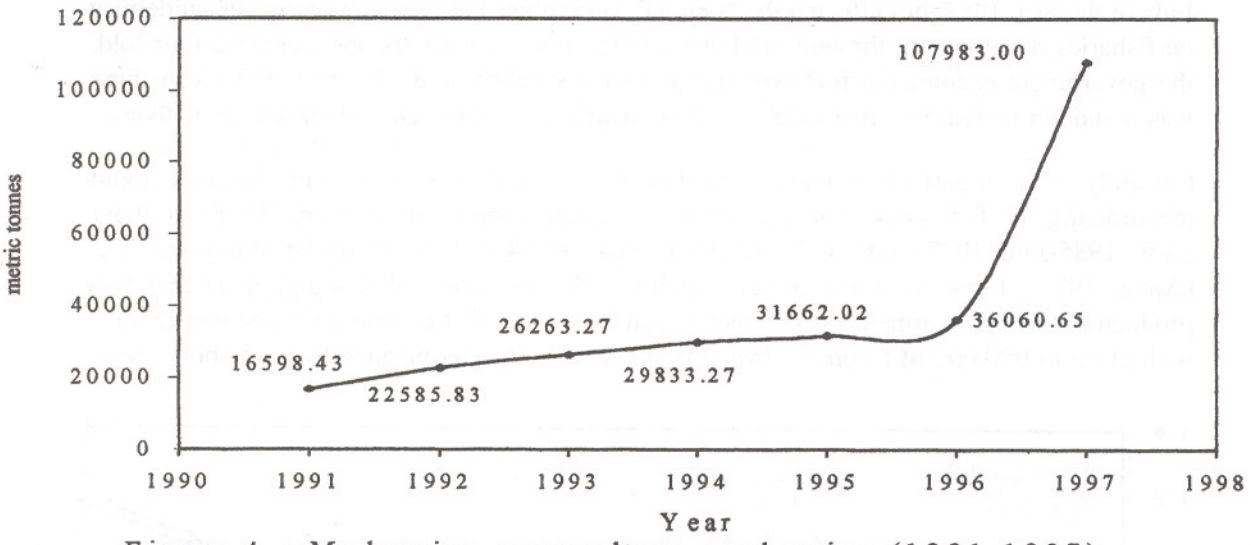

Figure 4 : Malaysian aquaculture production (1991-1997)

At present, aquaculture in Malaysia can be divided into three broad categories, i.e. freshwater fish/prawn culture, marine or brackishwater finfish/shrimp culture and the culture of marine mollusc. In terms of contribution, more than half of the aquaculture production comes from cockles, *Anadara granosa,* a marine mollusc (bivalvia) with an annual production of 71,796 metric tons. Freshwater fish culture, mostly tilapia, contributes towards another 28 % (31,672 metric tons), while the rest comes from brackishwater culture. Brackishwater prawn culture had developed quite rapidly in the past with a production of 60 MT in 1984 to 7,000 MT in 1995. However disease outbreaks and water quality problems had slowed down its development. Culture of marine fishes has only recently begun, with seabass *(Lates calcarifer),* snapper *(Lutjanus spp.)* and groupers *(Epinephalus spp.)* being the main cultured species. A relatively new venture between Aman Marine Farm Inc. and Malaysian Fisheries Department in Pulau Gedung, Penang has already faced difficulties due to water quality problems.

Issues and Challenges

With proper planning and management, our fish production can be increased to meet national demand and for export. The Government, through the NAP 3, has set the fish production target at 1,930,000 metric tons by the year 2010; 600,000 through aquaculture and the balance from capture fisheries (Anon, 1999). Among the potential areas being identified for further development of capture fisheries is coastal water of Sabah. However, certain pertinent issues have to be addressed. First and foremost we must know the carrying capacity of our waters, the current fish biomass and the accepted exploitation rates. Are our fishery resources enough to support inshore and offshore fishing? Are they sustainable? Can the policy of increasing fish production to meet national demand thus reducing fish imports be achieved?

With regard to marine capture fisheries, the biggest challenge facing the Department of Fisheries is the sustenance of the heavily exploited coastal fisheries. The threat of overexploitation of adult stocks and reduced recruitment due to destruction of aquatic habitats are serious problems which need to be addressed. Management measures which are being implemented include licensing, zone restrictions, mesh sizes and fishing gear regulations. However, some of the perpetual problems encountered are the of encroachment of illegal vessels into different fishing zones, illegal fishing by unlicensed fisherman, blasting of coral reefs and also encroachment by foreign vessels.

The United Nation's Law of the Sea granted certain rights and obligations of coastal state like Malaysia, including matters pertaining to the problem of exploitation and conservation of living resources. Articles 61 and 62 for instance, require coastal states to determine the allowable catch of the living resources in its economic zone. The determination of allowable catches, the restrictions on the capacity of coastal states to harvest the allowable catch, the question of access to be granted to other states (especially Thailand) and other matters relating to conservation and management of the fisheries resources is not an easy task and in cases of shared stocks, regional arrangements have to be made (see Ambak, 1994a, 1994b; Valencia, 1991).

As for the aquaculture industry, there has been much adverse publicity on the impact of aquaculture development to the coastal environment. Shrimp farming for instance has received negative criticism from environmentalist. One of the biggest issues highlighted was its perceived incompatibility with the surrounding environment. Discharges from aquaculture farms are thought to pollute the coastal waters which in turn cause a reduction in natural fish populations and biodiversity. Other unresolved issues are both technical and scientific in nature, for instance, the collapse of many shrimp farms in a number of countries was due to disease outbreak and water pollution.

Other issues which are relevant to both the capture and culture fisheries are acute shortage of skilled and semi skilled manpower to man the fishing fleet and aquaculture farms and lack of R&D in many critical areas.

On the international scene, the impact of globalization on our fish industry is also important. There are trade issues which has to be addressed and there is a need to meet not only national but also international demands. Shrimp embargo, for example, was enforced when we were suspected of not doing enough to conserve our sea turtles. Issues like eco-labelling and HACCP (Hazard Analysis and Critical Control Points) certification have become important trade issues for export of fisheries products. There is a dire need for those involved to keep abreast with the requirements and current developments in order to be competitive in the global market.

Agenda for Change

My research partner the late Prof. Mohsin once said that although Malaysia is moving rapidly towards industrialization, she must not ignore the production of food, particularly high quality but cheap protein, and we have to produce a lot of ikan sepat, "makanan untuk orang miskin".

Although there is a decline in the agricultural sector's contribution to national income, export earnings and employment as compared to other industries, this sector has the potential to provide the vital source of raw materials for the agro-resource based industrial development. The recent financial crisis and the liberation of the financial market has affected the stability and security of the country's food supply. Given the vulnerability of the country's food supply to external factors the role of agriculture has to remain strategically important as a provider of food. Towards this end the National Agricultural Policy was formulated and in the Prime Minister's own words "the Third National Agricultural Policy (1998-2010), in tandem with the National Development Policy, the Second Industrial Master Plan, the Science and Technology Policy, and the National Biodiversity Policy, is set to provide the policy framework for the future growth of the agricultural sector into the new millenium ...whilst increasing the production of major food products which are cost competitive ... will enhance food security and enable Malaysians better access to quality food at affordable prices."

The objectives of the fisheries industry as outlined by NAP3 (Anon,1999) are:

i) to ensure adequate supply of fish to meet domestic demand for fresh fish as well as for the processing industries.

ii) to capitalize on export markets for value added fish products; and

iii) to conserve and sustain the utilization and management of fisheries resources.

In order to meet these objectives, many scientific and technical issues have to be understood and resolved. For instance, we have to develop a better scientific basis for the sustainable exploitation and management of our fisheries resources. Our capture fisheries are dependent on wild fish population in freshwater and marine environment, which has limits to its own carrying capacities. We have to find a more accurate fish forecasting and stock assessment techniques. Different fish populations react differently to exploitation, some being more vulnerable than others. Fishing gears should be more selective and environmentally friendly to safeguard both the natural fish populations as well as their habitat. Therefore enhancing our capability and excellence in research and development in these areas are important.

Research efforts should focus clearly on the creation of a more environmentally sustainable fisheries and food production systems. The research should be directed to low as well as high potential areas according to their specific research needs, blending pure and applied research. New efforts should be made to involve fishers, processors and government agencies in setting research priorities and direction and to make research findings accessible to those concerned.

Looking at the past trends in fish catches from our waters, it is safe for us to conclude that further expansion in fish production from capture fisheries is not so bright and we have to focus on fish farming in order to meet the demand of fish as food. Since this field is relatively new, scientific and technical support is necessary in order to enhance fish production through the development of sound, large scale culture systems, refinement of appropriate technology for seed production and management of commercially important species for aquaculture. In certain countries, as in China, aquaculture accounts for half of the national fish supply. To this end R & D should be well directed with due consideration given to solving scientific

and technical issues to support and sustain the development of the aquaculture industry while strengthening the economic foundation.

While the main focus is on improving the scientific and technical support, there is no doubt that the social and economic changes are also necessary. Perhaps, special emphasis should be given in creating awareness level of the population to change their present diet and food intake. The consumption of farmed species, for instance, should be encouraged. This paradigm shift is necessary in order to safeguard our dwindling resources. There is also a need to further improve marketing and market distribution in order to reduce wastage, minimize intermediaries and stabilize prices. The government could also assist in stabilizing fish supply by stockpiling the pelagic species in deep freezers during periods of high catches.

Private sector participation should be strongly encouraged in the production, processing and supporting industries. May be the role of the private and public sub sectors should be redefined in the context of fisheries development, so that these sectors as a whole can continue to supply food and generate income, while providing more equitable access to fishing and gainful employment (especially for the artisanal sector). While encouraging the private sector involvement, the government must also provide the legal and administrative framework to promote and facilitate responsible fishing and responsible aquaculture practices. Guidelines on water extraction, land use, discharge of effluents, use of drugs, hormones and chemicals, introduction of non-native species and other aquaculture activities must be established.

Conclusion

Fish as food and food security is important in this country, since fish and fishery products represent a large share of the total protein intake. In coastal areas, fish is often considered as staple food. Factors that will shape the future demand for fish and fishery products include population growth, economic growth, generation of disposable income hence purchasing power and social attitudes such as changing food consumption patterns. General trends indicate increasing demand for fresh and frozen products, and for value-added products. Consumer demand for white fish will continue to outstrip supply which has contributed to the significant price increase of demersal fish. Exploratory calculations for future demand in Malaysia by 2010 is 1.6 to 1.7 million tonnes. At the international level, demand for high value fresh fish and processed products such as surimi, fish oils and protein concentrates are also expected to increase. The fisheries sector can therefore generate hard currency that can be used to import food staples such as cereals.

Malaysia has the potential to further increase fish supply to meet domestic requirements and export demands. The present production from capture fisheries can be sustained through prudent and systematic management measures, while aquaculture can be developed to meet requirements. Fish production in Malaysia is facing a host of biological, physical and operational constraints such as shortage of good quality water resources, escalating prices of farm inputs, low water use efficiency, high post harvest losses, low technology, labour shortage, lack of R&D etc. Thus a long term vision and commitment supported by workable and comprehensive strategies will be required to realize the full potential of fisheries in the national food security.

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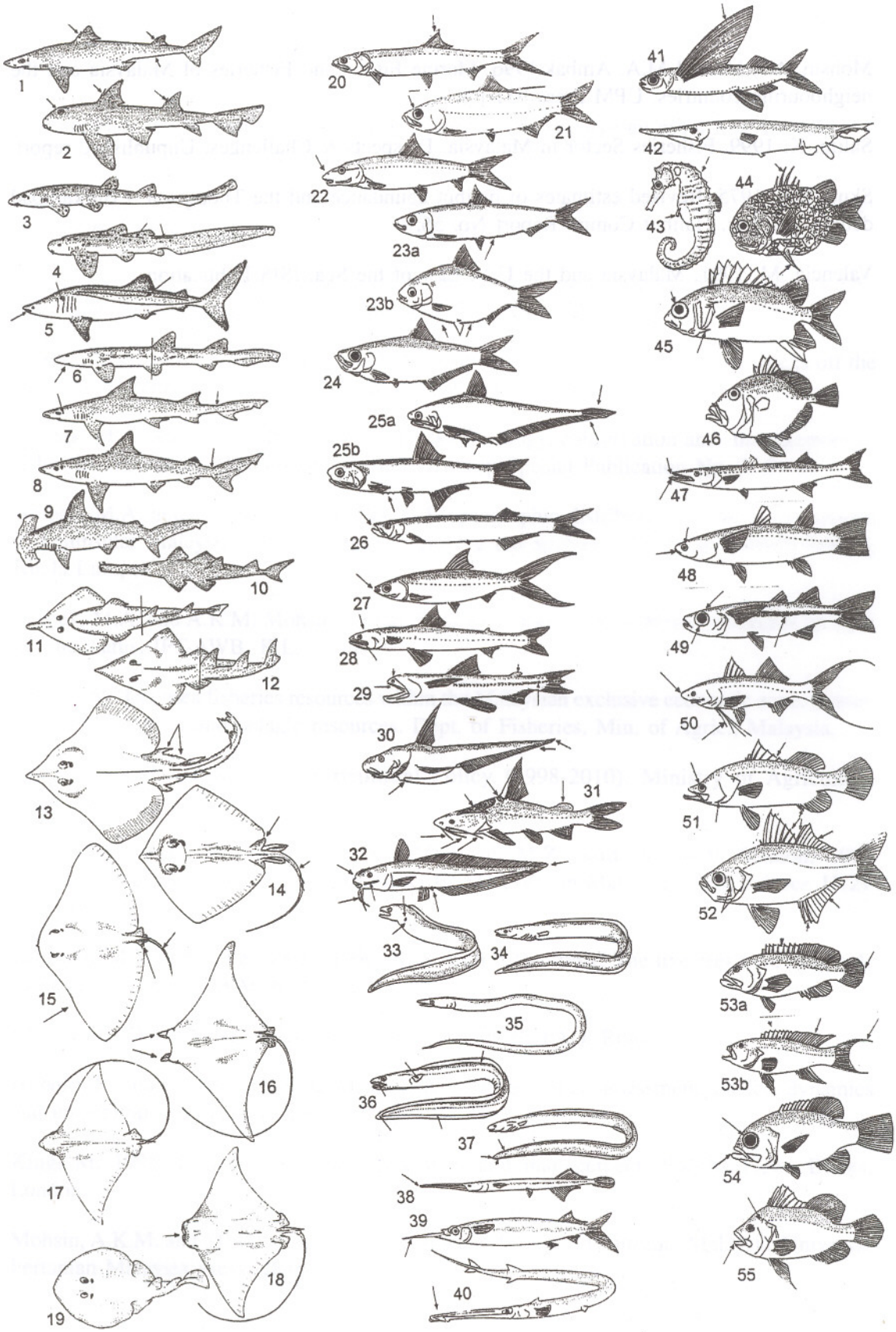
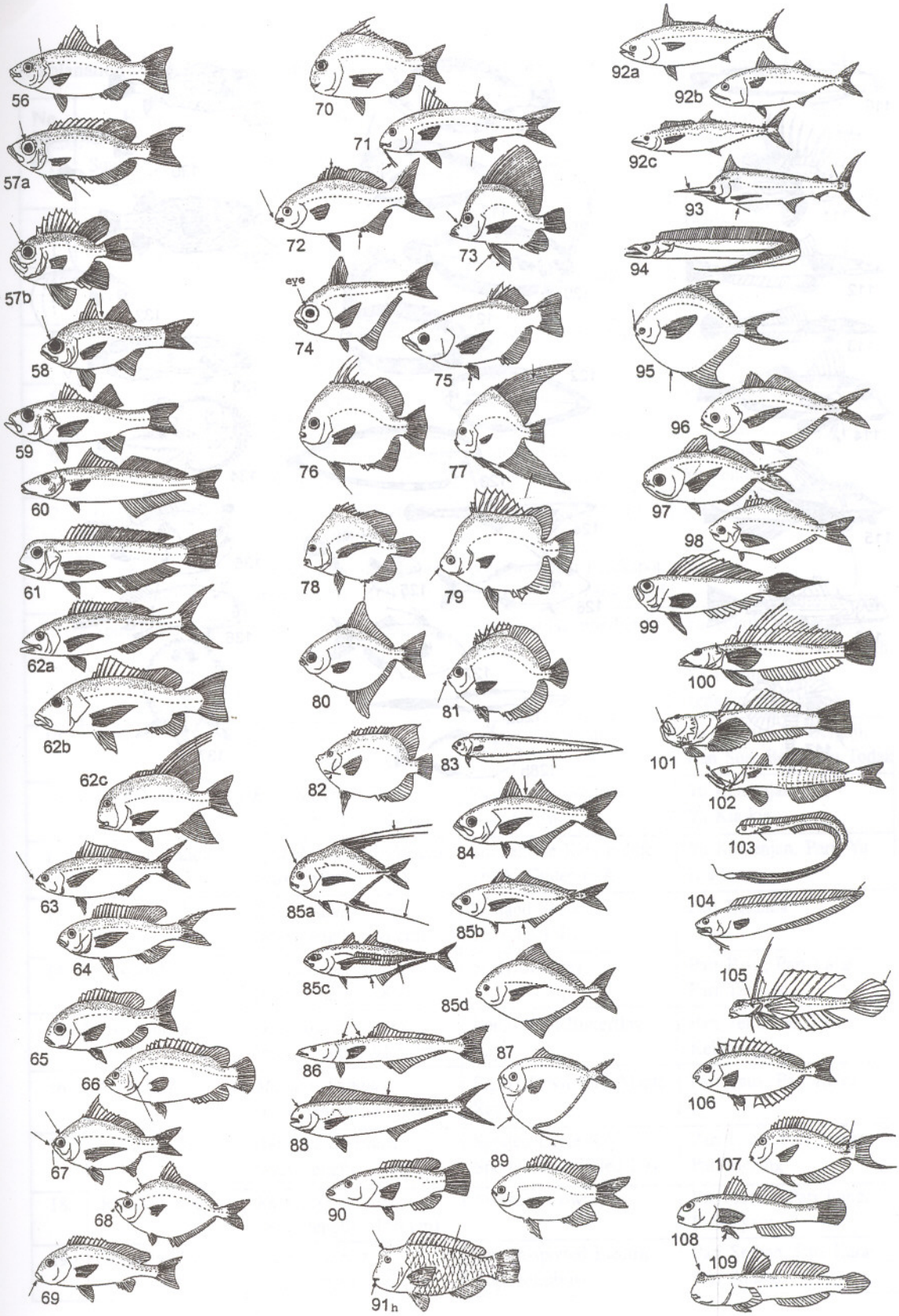
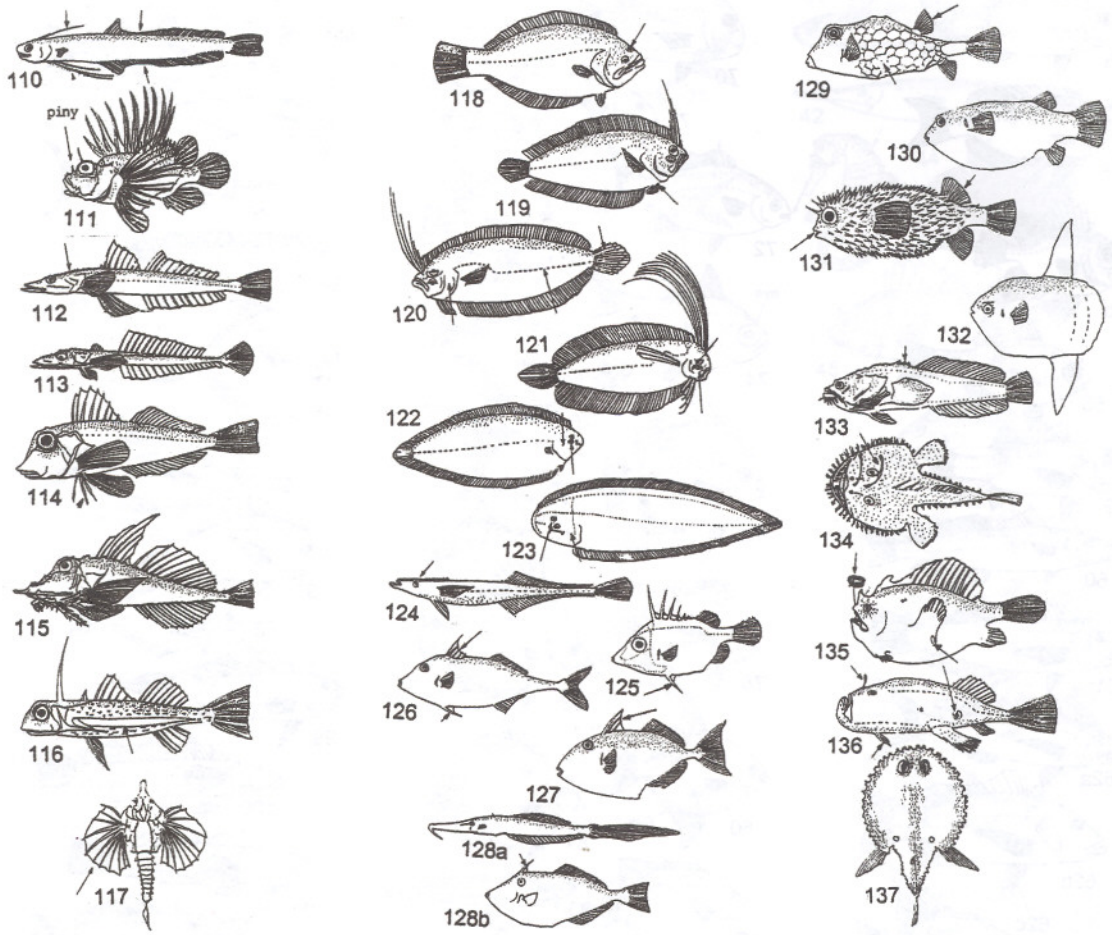


Appendix 1 Malaysian marine fish families with examples; approximate length in parentheses.



Appendix 1 (continued)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(Explanation of Appendix 1 - Malaysian marine fish families, approximate length in parentheses)

No.	Family	Example	English Name	Malay Name
1.	Squalidae	*Squalus japonicus* (max. length : 91 cm)	Dogfish Shark, Japanese Spurdog	Yu Duri Pasir, Yu Jereh
2.	Heterontidae	*Heterodontus zebra* (max. length : 2 m)	Zebra Bullhead Shark	Yu Kebut
3.	Hemiscylliidae	*Chiloscyllium indicus* (max. length : 64 cm)	Slender Bambooshark	Yu Bodoh, Yu Tokeh, Yu Pasir
4.	Stegostomatidae	*Stegostoma fasciatum* (max. length : 3 m)	Catshark, Zebra Shark, Leopard Shark	Yu Kebut, Yu Checak, Yu Tokeh
5.	Rhiniodontidae	*Rhinidon typus* (max. length : 20 m)	Whale Shark	Yu Paus
6.	Scyliorhinidae	*Atelomycterus marmoratus* (max. length : 70 cm)	Coral Catshark, Marble Catshark	Yu Cicak, Yu Tokeh, Yu Pendek
7.	Hemigaleidae	*Hemigaleus microstoma* (max. length : 91 cm)	Sicklefin Weasel Shark	Yu Pasir
8.	Carcharhinidae	*Carcharhinus dussumieri* (max. length : 100 cm)	Wide-mouthed Blackspot Shark, White-cheek Shark	Yu Pasir
9.	Sphyrnidae	*Sphyrna lewini* (max. length : 420 cm)	Scalloped Hammerhead Shark	Yu Tukul, Yu Benkong, Yu Sanggul, Yu Mata Jauh, Yu Palang, Jerong, Tenggiri, Yu Parang
10.	Pristidae	*Pristis cuspidatus* (max. length : 6 cm)	Narrow Shawfish	Yu Parang, Yu Gergaji, Kan Sua, Beroi, Yu Todak
11.	Rhinobatidae	*Rhinobatus thouinina* (max. length : 1.2 cm)	Shaw's Shawvelnose Guitar Fish	Yu Kemenjan, Yu Kia-kia
12.	Rhynchobatidae	*Rhynchobatus djiddensis* (max. length : 3 m)	Shovelnose Ray, Fiddle Shark, Guiter Fish	Yu Kemenjan, Pari, Yu Kia-kia
13.	Rajidae	*Raja hollandi* (max. length : 40 cm)	Holland Skate, Thornback Ray	Pari Belanda
14.	Dasyatidae	*Dasyatis imbricatus* (max. length : 180 cm)	Scaly Stingray	Pari Pasir, Pari Lalat, Pari Tanjung
15.	Gymrunidae	*Gymnura poecilura* (max. length : 91.5 cm)	Long-tailed Butterflay Ray	Pari Tembikar, Pari Kelawar
16.	Mobulidae	*Mobula diabolus* (max. length : 130 cm)	Pigmy Devil Ray, Manta Ray	Pari Paus, Pari Kalok
17.	Myliobatidae	*Aetobatis narinari* (max. length : 3 m)	Spotted Eagle Ray, Spotted Duckbilled Ray	Pari Lang, Pari Lung, Pari Helang
18.	Rhinopteridae	*Rhinoptera javanica* (max. length : 156 cm)	Javanese Cowray	Pari Susun, Pari Lang, Pari Ayam
19.	Torpedinidae	*Narcine timlei* (max. length : 60 cm)	Brown-spotted Electric Ray, Numbfish	Pari Serban, Pari Karas, Pari Ampai

No.	Family	Example	English Name	Malay Name
20.	Elopidae	*Elops machnata* (max. length: 95 cm)	Tenpounder	Bandang, Menangin, Banang Bulat
21.	Megalopidae	*Megalops cyprinoides* (max. length: 55 cm)	Indo-Pacific Tarpon	Bulan-bulan, Banang Pipih, Bulan
22.	Albulidae	*Albula vulpes* (max. length: 45 cm)	Bonefish, Ladyfish, Bananafish	Pisang-pisang, Pepisang, Banang Bulat Daun
23.	Clupeidae	a) *Amblygaster leiogaster* (max. length: 23 cm)	Smoothbelly Sardinella	Tamban Beluru
		b) *Anodontostoma chacunda* (max. length: 17 cm)	Shortnosed Gizzard Shad, Bony Bream, Shortfinned Gizzard Shad, Chacunda Gizzard Shad	Selangat, Kebasi, Nandang, Pias, Nandong, Kuaci, Tamban, Kuasi
24.	Pristigasteridae	*Ilisha elongata* (max. length: 29.3 cm)	Slender Shad, Elongate Ilisha	Beliak Mata, Puput, Tiruk, Kirang-kirang, Puput Melaka, Bersia
25.	Engraulidae	a) *Coilia dussumieri* (max. length: 20 cm)	Gold-spotted Grenadier Anchovy	a) Bilis Bulu Ayam, Lawi Ayam, Gonjeng
		b) *Stolephorus commersonii* (max. length: 11.3 cm)	Commerson's Anchovy, Long-jawed Anchovy Mempinis Teri	Bilis Tembaga, Bunga Air, Bilis, Pusu,
26.	Chirocentridae	*Chirocentrus dorab* (max. length: 83.1 cm)	Dorab Wolf-herring, Siver Bar	Parang, Pacal, Cabuk Tegap, Sudip, Parang-parang
27.	Chanidae	*Chanos-chanos* (max. length: 91.8 cm)	Milkfish, White Mullet, Salmon Herring	Belanak Sembawa, Pisang-pisang, Bandang, Jangas, Bangus, Bagas
28.	Synodontidae	*Saurida elongata* (max. length: 37.7 cm)	Slender Lizardfish	Chonor, Mengkarong, Ubi, Hai La, Bekut Laut
29.	Harpadontidae	*Harpadon nehereus* (max. length: 40 cm)	Bombay-duck, Lizardfish	Lumi-lumi, Uli-uli, Luli, Luli-luli, Lumek
30.	Atelepoididae	*Atelopus japonicus* (max. length: 95 cm)	Tadpole Fish	Berudu
31.	Ariidae	*Arius maculatus* (max. length: 61 cm)	Spotted Catfish	Sedudu, Blotan, Otek, Pepulut, Pedukang
32.	Plotosidae	*Plotosus cantus* (max. length: 150 cm)	Striped Eel Catfish, Canine Eel Catfish, Young Catfish Eel, Barbel Eel	Gemang, Unsat-unsat, Kelara, Sembilang, Sembilang Gemang, Sembilang Karang, Senangin
33.	Muraenidae	*Gymnothorax fimbriata* (max. length: 40 cm)	Moray Eel	Malong, Belut

No.	Family	Example	English Name	Malay Name
34.	Muraenesocidae	*Muraenesox cinereus* (max. length: 200 cm)	Daggertooth Pike Conger, Silver Conger Eel, Pike Eel	Malong, Belut, Tuna, Nong, Indong, Ketingkor
35.	Nettastomatidae	*Saurenchelys fierasfer* (max. length: 50 cm)	Duckbill Eel	Belut, Malong
36.	Congridae	*Ariosoma anago* (max. length: 21 cm)	Conger Eel	Belut Laut, Malong
37.	Ophichthidae	*Pisodonophis cancrivorus* (max. length: 100 cm)	Snake Eel	Belut Laut, Belin, Sesirat, Malong
38.	Belonidae	*Strongylura strongylura* (max. length: 65 cm)	Spottail Needlefish	Todak, Jolong-jolong
39.	Hemirhamphidae	*Hemiramphus far* (max. length: 44 cm)	Black-barred Halfbeak	Jolong-jolong, Todak Pendek, Puput, Puput Bandang
40.	Fistularidae	*Fistularia villosa* (max. length: 55 cm)	Rough Flutemouth, Red Cornet Fish)	Jolong-jolong
41.	Exocoetidae	*Parexocoetus mento* (max. length: 35 cm)	Indian-spotted Flying-fish	Terbang, Belalang
42.	Centriscidae	*Centriscus scutatus* (max. length: 16 cm)	Razorfish, Shrimpfish, Guttersnipe Fish	Lidi, Kering
43.	Syngnathidae	*Hippocampus kuda* (max. length: 30 cm)	Spotted Sea-horse	Kuda Laut, Korek Telinga, Kuda-kuda
44.	Monocentridae	*Monocentris japonicus* (max. length: 17 cm)	Pipeapple Fish, Knight Fish, Pinecone Fish	Setonggang, Jepun, Jepan
45.	Holocentridae	*Sargocentron spiniferum* (max. length: 45 cm)	Soldierfish, Sabre Squirrelfish	Lolong Batu
46.	Zeidae	*Cyttopsis roseus* (common length: 7 cm)	Rosy Dory	
47	Sphyraenidae	*Syhyraena barracuda* (max. length: 180 cm)	Great Barracuda, Sea Pike	Alu-alu Tenak, Titil, Tenok, Kacang-kacang, Pengaluan
48.	Mugilidae	*Liza vaigiensis* (max. length: 50 cm)	Diamond-scaled Grey Mullet, Long-scale Mullet, Square-tail Mullet	Belanak, Kedera, Pelung, Putting Damar, Tamok, Belanak Tamok
49.	Atherinidae	*Atherinomorus lacunosus* (max. length: 15 cm)	Hardyhead Silver, Robust Hardyhead	Paku, Rennyau
50.	Polynemidae	*Polynemus indicus* (max. length: 142 cm)	Indian Thredfin, Indian Tassel Fish	Senangin, Kurau, Kurow, Mancong
51.	Cetropomidae	*Lates calcarifer* (max. length: 152 cm)	Giant Seaperch, Silver Seaperch, Barramundi, Bhekti	Siakap Putih, Gelungsung, Kakap Putih, Sulungsung, Kakap, Bukai-bukai

No.	Family	Example	English Name	Malay Name
34.	Muraenesocidae	*Muraenesox cinereus* (max. length: 200 cm)	Daggertooth Pike Conger, Silver Conger Eel, Pike Eel	Malong, Belut, Tuna, Nong, Indong, Ketingkor
35.	Nettastomatidae	*Saurenchelys fierasfer* (max. length: 50 cm)	Duckbill Eel	Belut, Malong
36.	Congridae	*Ariosoma anago* (max. length: 21 cm)	Conger Eel	Belut Laut, Malong
37.	Ophichthidae	*Pisodonophis cancrivorus* (max. length: 100 cm)	Snake Eel	Belut Laut, Belin, Sesirat, Malong
38.	Belonidae	*Strongylura strongylura* (max. length: 65 cm)	Spottail Needlefish	Todak, Jolong-jolong
39.	Hemirhamphidae	*Hemiramphus far* (max. length: 44 cm)	Black-barred Halfbeak	Jolong-jolong, Todak Pendek, Puput, Puput Bandang
40.	Fistularidae	*Fistularia villosa* (max. length: 55 cm)	Rough Flutemouth, Red Cornet Fish)	Jolong-jolong
41.	Exocoetidae	*Parexocoetus mento* (max. length: 35 cm)	Indian-spotted Flying-fish	Terbang, Belalang
42.	Centriscidae	*Centriscus scutatus* (max. length: 16 cm)	Razorfish, Shrimpfish, Guttersnipe Fish	Lidi, Kering
43.	Syngnathidae	*Hippocampus kuda* (max. length: 30 cm)	Spotted Sea-horse	Kuda Laut, Korek Telinga, Kuda-kuda
44.	Monocentridae	*Monocentris japonicus* (max. length: 17 cm)	Pipeapple Fish, Knight Fish, Pinecone Fish	Setonggang, Jepun, Jepan
45.	Holocentridae	*Sargocentron spiniferum* (max. length: 45 cm)	Soldierfish, Sabre Squirrelfish	Lolong Batu
46.	Zeidae	*Cyttopsis roseus* (common length: 7 cm)	Rosy Dory	
47	Sphyraenidae	*Syhyraena barracuda* (max. length: 180 cm)	Great Barracuda, Sea Pike	Alu-alu Tenak, Titil, Tenok, Kacang-kacang, Pengaluan
48.	Mugilidae	*Liza vaigiensis* (max. length: 50 cm)	Diamond-scaled Grey Mullet, Long-scale Mullet, Square-tail Mullet	Belanak, Kedera, Pelung, Putting Damar, Tamok, Belanak Tamok
49.	Atherinidae	*Atherinomorus lacunosus* (max. length: 15 cm)	Hardyhead Silver, Robust Hardyhead	Paku, Rennyau
50.	Polynemidae	*Polynemus indicus* (max. length: 142 cm)	Indian Thredfin, Indian Tassel Fish	Senangin, Kurau, Kurow, Mancong
51.	Cetropomidae	*Lates calcarifer* (max. length: 152 cm)	Giant Seaperch, Silver Seaperch, Barramundi, Bhekti	Siakap Putih, Gelungsung, Kakap Putih, Sulungsung, Kakap, Bukai-bukai

No.	Family	Example	English Name	Malay Name
52.	Ambassidae	*Ambassis commersoni* (max. length: 16 cm)	Glassy perchlet, Cardinal Fish	Seriding Putih, Pridin
53.	Serranidae	a) *Cephalopholis muniata* (max. length. 50 cm)	Vermilion Sea Bass, Coral Cod, Vermillion Grouper	Kerapu Karang, Kerapu Bara
	Serranidae	b) *Variola albimarginata* (max. length: 40 cm)	Yellow-edged Lunartail, White-edged Lunartail, White-edged Lyretail, Lyretail Trout	Kerapu
54.	Glaucosomatidae	*Glaucosoma hebraicum* (max. length: 40 cm)	Bigmouth Bream, Pearl Perch	
55.	Grammistidae	*Diploprion bifaciatum* (max. length: 25 cm)	Hua Dan Chee	Sebekah Laut
56.	Teraponidae	*Pelates quadrilineatus* (max. length: 30 cm)	Trumpeter Perch, Croaker, Four-lined Terapon	Kerong-kerong, Gendang, Gelama, San Gaa
57.	Priacanthidae	a) *Priacanthus hamrur* (max. length: 40 cm)	Lunar-tail-Bullseye, Dusky-finned Bullseye, Moontail Bullseye, Black-spot Big-eye	Lolong Bara, Temenggung, San Ga
		b) *Pristigenys niphonia* (max. length: 20.8 cm)	White-striped Big-Eye, Oval Big-eye	Lolong Bara, Gelama, San Gaa
58.	Apogonidae	*Apogon aureus* (max. length: 12 cm)	Ring-tailed Cardinal Fish	Sebekah
59.	Acropomatidae	*Acropoma japonicum* (max. length: 15 cm)	Glow-belly	
60.	Sillaginidae	*Sillago sihama* (max. length: 25 cm)	Silver Whiting, Sand Borer, Indian Whiting, Smelt	Bulus-bulus, Puntung Damar, Ubi, Bebolos, Kedondong-kedondong, Bebulus
61.	Branchiostegidae	*Branchiostegus argenteus* (common length: 25 cm)	Tile Fish	Ubin
62.	Lutjanidae	a) *Aphareus rutilans* (max. length: 80 cm)	Small-toothed Jobfish, Rusty Jobfish	Kerisi Basi, Guntur
		b) *Lutjanus argentimaculatus* (max. length: 120 cm)	Mangrove Red Snapper, Grey Snapper, Silver Snapper, Silver-spotted Grey Snapper	Siakap Merah, Kakap Merah, Merah, Merah Bakau, Sendarat, Jenahak Temerah, Ungar
		c) *Symphorichthys* (max. length: 60 cm)	Sailfin Snapper, Bleulined Seabream	Kunyit Mamong
63.	Caesionidae	*Caesio caerulaurea* (max. length: 35 cm)	Blue and Gold Fusilier, Gold-banded Fusilier	Pisang-pisang, Sulit, Pinang-pinang
64.	Nemipteridae	*Nemipterus bathybius* (max. length: 28 cm)	Yellow Belly Threadfin Bream	Kerisi

No.	Family	Example	English Name	Malay Name
65.	Lethrinidae	*Gymnocranius griseus* (max. length: 80 cm)	Naked-head Seabream, Large-eye	Kapas-kapas Laut, Mempasir
66.	Lobotidae	*Lobotes surinamensis* (max. length: 100 cm)	Tripletail	Kakap Batu, Kuku Laut, Tidur, Pechah Periok, Sung-sung, Pelayak, Sekusong, Sepat Karang
67.	Gerreidae	*Gerres abbreviatus* (max: length: 25 cm)	Deepbody Silver-biddy, Deepbody Majorra	Kapas-kapas, Kekapas, Senolong, Kapas Laut, Tampok-tampok
68.	Leiognathidae	*Leiognathus bindus* (max. length: 14 cm)	Orangefin Ponyfish, Slimy, Soapy, Silverbelly	Kekek, Pepetek, Sekiki, Kikeh
69.	Haemulidae (Pomadasyidae)	*Diagramma pictum* (max. length: 60 cm)	Painted Sweetlip	Kaci, Tebal Bibir, Mandi Abu
70.	Sparidae	*Johnius belangerii* (max. length: 28 cm)	Belanger's Croaker	Gelama Panjang, tengkerong, San Gaa
71.	Mullidae	*Upeneus bensasi* (max. length: 24 cm)	Red Mullet Goatfish, Yellow Fin Goatfish	Butir Nangka, Biji Nangka
72.	Kyphosidae	*Kyphosus vaigiensis*	Sea Chub, Rudder Fish, Long-finned Drummer	Beras-beras, Achlat Karang
73.	Pentacerotidae	*Histiopterus typus* (max. length: 35 cm)	Sailfin Armourhead	Bagang
74.	Pempheridae	*Pempheris moluca* (max. length: 15 cm)	Moluccan Sweeper	Sepat Laut
75.	Toxotidae	*Toxotes jaculator* (max. length: 30 cm)	Banded Archer Fish	Sumpit-sumpit
76.	Emhippidae	*Ephippus orbis* (max. length: 17.5 cm)	Spade Fish	Daun Baharu, Pluru, Patipo
77.	Platacidae	*Platax tiera*	Long-finned Batfish, Round Batfish, Teira Batfish, Anglefish, Butterfly Fish, Dark Batfish	Gadang-gadang, Berbaharu, Tudung Periuk, Manchung Laut, Tudung Tempayan, Telinga Gajah
78.	Drepanidae	*Drepane longimana* (max. length: 40 cm)	Banded Sicklefish, Banded Drepane	Daun Baharu, Berbaharu, Baharu-baharu
79.	Scatophagidae	*Scatophagus argus* (max. length: 30 cm)	Spotted Butterfish, Spotted Scat	Kitang, Kendang, Kertang
80.	Monodactylidae	*Monodactylus argentus* (max. length: 23 cm)	Silver batfish, Moonfish, Fingerfish, Buttercream, Kitefish, Silver Moony	Gedabang, Bebulan, Nyior-nyior, Bat Hu
81.	Chaetodontidae	*Chaetodon octofasciatus* (common length: 12 cm)	Eight-banded Butterfly Fish	Keper Laut, Bagang, Pinang-pinang

No.	Family	Example	English Name	Malay Name
82.	*Pomacanthidae*	*Pomacanthus annularis* (max. length: 60 cm)	Ringed Angel Fish	Babi, Taring Pelandok, Ketang
83.	*Cepolidae*	*Acanthocepola abbreviata* (max. length: 30 cm)	Band Fish, Snake Fish	
84.	*Lactariidae*	*Lactarius lactarius* (max. length: 35 cm)	False Trevally, Milk Trevally, Whitefish, Bigjawed Jumper, Silvery Lactarid	Lelemah, Selemah, Selembu, Shrumbu, Lemak, Kelapa-kelapa, Lemoh, Selembus, Lemuk, Lami-lami, Kapas, Senohong
85.	*Carangidae*	a) *Alectis ciliaris* (max. length: 150 cm)	Threadfin Trevally, Pennantfish	Ebek, Cermin, Rambai Landeh
		b) *Atule mate* (max. length: 40 cm)	One-finlet Scad, Yellowtail Scad, Slender-scaled Scad	Selar Gelek, Selar Pucat, Lecek, Jamak, Temanung, Selar Kuning, Pelata Kuning
		c) *Megalapsis cordyla* (max. length: 80 cm)	Tropedo Trevally, Hardtail Scad, Torpedo Scad, Finny Scad	Cencaru, Keras Ekor, Celek, Kerongan, Tegap, Gelenggu, Geronggong, Besi Hangat, Selikur, Jaru-jaru, Tentenkel, Tetengkek
		(d) *Parastromateus niger* (max. length: 30 cm)	Betterfish, Black Pomfret	Bawal Hitam, Dueh Hitam, Bawal Tumbak, Bawar
86.	*Rachycentridae*	*Rachycentron canadum* (max. length: 200 cm)	Black King Fish, Cobia	Aruan Tasik, Gabus Laut, Buntut Karbo, Jaman
87.	*Menidae*	*Mene maculata* (max. length: 24 cm)	Razor Trevally, Moonfish	Kapak, Gedabang, Golok, Kasut, Cermin, Kekek Gedabang, Kekek Jawa
88.	*Coryphaenidae*	*Coryphaena hippurus* (max. length: 126 cm)	Common Dolphin-fish, Dorado	Belitong, Parang, Lumba
89.	*Pomacentridae*	*Abudefduf sexfaciatus* (max. length: 15 cm)	Damsel Fish, Scissor-tail Sergeant	Bombin, Kepal Batu
90.	*Labridae*	*Cheilinus diagrammus* (max. length: 37 cm)	Cheeklined Wrasse, Rainbow Fish	Bayan, Bechok, Kakaktua, Tetarap, Nuri-nuri, Nuri, Lingkar Karang, Bebarat, Bayan-bayan, Batu
91.	*Scaridae*	*Bolbometopon muricatum* (max. length: 120 cm)	Napoleon's Fish, Bumphead Parrotfish, Double-headed Parrotfish, Green Bumphead Parrotfish	Bayan, Perencong

No.	Family	Example	English Name	Malay Name
92.	Scombridae	a) *Euthynnus affinis* (max. length: 64.4 cm)	Eastern Little Tuna, Bonito, Black skipjack, Kawakawa, Mackerel Tuna, Little Tunny	Tongkol, Aya Kurik, Kayu, Sembak, Ambu-ambu, Cherong Tombol Mas, Kebal Mas, Bakulan, Ayer, Mangkok, Tongkol Kurik
		b) *Rastelliger brachysoma* (max. length: 34 cm)	Short-bodied Mackerel, Chub Mackerel	Kembong, Temenong, Rumahan
		c) *Scomberomorus commerson* (max. length: 220 cm)	Narrow-barred Spanish Mackerel, Narrow-striped King Mackerel	Tenggiri Batang, Tohok Langgi, Tohok, Dengkeh, Iyot, Tenggiri Bunga, Luding
93.	Istioporidae	*Makaira indica* (max. length: 4.6 m)	Black marlin	Suji, Mersuji, Layaran
94.	Trichiuridae	*Trichiurus lepturus* (max. length: 110 cm)	Large-head Hairtail, Ribbon Fish	Timah, Selayur, Timah-timah, Tetimah, Tima, Langgal, Layur
95.	Stromateidae	*Pampus argenteus* (max. length: 33.7 cm)	Silver Pomfret, White Pomfret	Bawal Putih, Bawal Cermin, Kilat, Dueh Bujang, Dueh Putih
96.	Nomeidae	*Psennes cyanophrys* (max. length: 100 cm)	Black Driftfish	Jepun
97.	Ariommidae	*Ariaomma indica* (common length: 13.5 cm)	Pomfret, Indian Ariomma, Indian Driftfish	Jepun
98.	Centrolphidae	*Psenopsis shojimai* (max. length: 30 cm)	Pomfret, Medusa Fish	Jepun
99.	Owstonidae	*Owstonia tosaensis* (max. length: 40 cm)	Band Fish	
100.	Mugiloididae	*Parapercis filamentosa* (max. length: 12 cm)	Treadfinned Sand Perch	Marabahan, Belukur
101.	Uranoscopidae	*Uranoscopus bicinctus* (max. length: 25 cm)	Stargazer	Kertatok, Depu, Belokok
102.	Champsodontidae	*Champsodon longipinnis* (max. length: 25 cm)	Graper	-
103.	Blennidae	*Xiphasia setifer* (max. length: 66 cm)	Blenny	-
104.	Ophidiidae	*Sirembo imberbis* (max. length: 140 cm)	Brotula, Cuskeel	Belukor Batu

No.	Family	Example	English Name	Malay Name
105.	Callionymidae	*Dactylopus dactylopus* (max. length: 10 cm)	Dragonet	Bebaji
106.	Siganidae	*Siganus canaliculatus* (max. length: 36 cm)	White-spotted Spine-foot, Rabbit Fish	Dengkis, Bliais, Deban, Gelibas, Lambai, Ketang Lada, Kelang, Lumban, Belaris
107.	Acanthuridae	*Acanthurus auranticavus* (max. length: 35 cm)	Orange-socket Surgeonfish	Debam, Dengkis, Gebang
108.	Gobiidae	*Bathygobius scapulopunctatus* (max. length: 7.5 cm)	Goby	Belukor
109.	Periophtalmidae	*Periophthalmodon schlosseri* (max. length: 27 cm)	Mud Skipper	Tembakul, Belacak
110.	Bregmacerotidae	*Bregmaceros mccleellandi* (max. length: 10 cm)	Indian Cod. Spotted Codlet	Kod India, Lepu
111.	Scorpaenidae	*Dendrochirus zebra* (max. length: 20 cm)	Scorpion Fish, Lion Fish, Fire Fish	Depu, Lepu, Gedempu
112.	Platycephalidae	*Platycephalus indicus* (max. length: 100 cm)	Bartail Flathead, Flathead	Baji-baji, Bebaji
113.	Hoplichthyidae	*Hoplichthys gilberti*	Ghost Flathead	Baji-baji
114.	Triglidae	*Lepidotriga abyssalis* (max. length: 17 cm)	Continental Sea Robin	Belalang
115.	Peristediidae	*Gargariscus prionocephalus* (max. length: 23 cm)	Armoured Sea Robin	Belalang
116.	Dactylopteridae	*Dactyloptena orientalis* (max. length: 40 cm)	Oriental Flying Gurnand	Belalang
117.	Pegasidae	*Pegasus volitans*	Sea Moth	Belalang Karang
118.	Psettodidae	*Psettodes erumei* (max. length: 52.8 cm)	Indian Halibut, Indian Spiny Turbot	Togok, Seberang Jaring, Sisa Nabi, Tipo, Pila-pila, Lidah, Siblah
119.	Citharidae	*Brachypleura novae-zeelandie* (max. length: 10 cm)	Flounder	Lidah
120.	Bothidae	*Arnoglossus brevirictis* (max. length: 13 cm)	Short-snout Flounder	Sebelah
121.	Pleuronectiidae	*Samaris cristatus* (max. length: 15 cm)	Right-hand Flounder	Lidah
122.	Soleidae	*Euryglossa orientalis* (max. length: 24 cm)	Oriental Sole	Lidah, Baji

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123.	Cynoglossidae	*Cynoglossus arel* (max. length: 31.5 cm)	Large-scale Sole	Lidah, Sebelah
124.	Echeneidae	*Echeneis naurcrates* (max. length: 66 cm)	Remora, Live Sucksucker	Gemi-gemi, Tapak Kasut, Gemi, Gedemi, Rumi-rumi
125.	Triacanthodidae	*Triacanthodes anomalus* (common length: 10 cm)	Spike Fish	Cagak Langit, Barat-barat
126.	Triacanthidae	*Triacanthus biaculeatus* (max. length: 300 cm)	Short-nosed Tripodfish	Cagak Langit, Sereka, Barat-barat, Tunjuk Langit
127.	Balistidae	*Abalistes stellatus* (max. length: 44.5 cm)	Starry Triggerfish, Leatherjacket	Jabong, Ayam Laut, Pokut
128.	Monacanthidae	a) *Anacanthus barbatus* (max. length: 30 cm)	Longsnout File Fish, Beardie Leatherjacket, Tapefish	Barat-barat
		b) *Alutera monoceros* (max. length: 55 cm)	Unicorn Leather jacket, Triggerfish, File Fish	Barat-barat, Kerosok Padi
129.	Ostraciidae	*Tetrasomus concatenatus* (max. length: 30 cm)	Smallspine Terretfish, Boxfish	Buntal Peti, Buntal Kotak
130.	Tetraodontidae	*Amblyrhynchotes spinosissimus* (max. length: 10.5 cm)	Shortnose Toadfish, Fine-spined Pufferfish	Buntal
131.	Diodontidae	*Diodon hystrix* (max. length: 71 cm)	Porcupinefish	Buntal Landak
132.	Molidae	*Masturus lanceolatus (max. length: 200 cm)*	Trunkfish, Sunfish	-
133.	Bartachoididae	*Halophyrene gangene*	Toadfish	Gedempu, Gedema
134.	Lophiidae	*Lophiomus setigerus* (max. length: 40 cm)	Goose Fish, Blackmouth Angler	Kertatok
135.	Antennariidae	*Antennarius hispidus* (max. length: 20 cm)	Zebra Angler, Shaggy Angler, Frog Fish, Toadfish	Kertatok, Lepu, Kelalawar
136.	Chaunacidae	*Chaunax abei* (common length: 30 cm)	Sea Toad	Kertatok
137.	Ogcocephalidae	*Haliutea fumosa* (max. length: 14 cm)	Batfish	Kertatok

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