PROSPECTS AND POTENTIAL IN THE FISHERIES SECTOR IN SABAH *

by
Rayner Datuk Stuel Galid

INTRODUCTION

Fish in Malaysia is everyman's food. The per capita consumption of fish and other seafood in the country is estimated to be around 30 – 35 kg. This represents more than two-thirds of the total animal protein consumed per capita locally. By the year 2010 when the population in Malaysia is projected to be around 33 million, the total demand for fish would have increased to more than 1 million tonnes.

One of the key national policies promulgated as a result of the present economic depression is the emphasis on lessening foreign imports including food items. Concurrent with this policy, the government has embarked upon a program to increase local food production. Thus the agriculture sector is once again in the limelight as it becomes one of the cornerstones upon which Malaysia hopes to rebuild its depressed enonomy.

Vision 2020 targets the agriculture sector to attain an annual growth of around 3.5%. The capture fisheries and aquaculture sub-sector is targeted to play a main role in achieving this sector's projection. To this end the Fisheries Department of Malaysia has targeted the fisheries sub-sector to grow by at least 5% annually. Because of the present economic situation it is imperative that at least these targets are achieved.

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* Paper presented at the Seminar "Pembangunan Ekonomi Setempat Dalam Era Globalisasi". Institue Development Studies, 23-24 Jun, 1998, Shangri-La Rasa Ria Resort, Tuaran

This paper discusses the status and potential of fisheries and aquaculture development in Sabah. As a backdrop of this discussion, this paper begins by briefly presenting the status of the national fisheries industry. The next section discusses the status of Sabah's fisheries industry paying particular interest to the principal sub-sectors. The main part of this paper discusses a number of key areas upon which the potential development of fisheries in Sabah rests. Finally, the paper highlights the main constraints and issues pertaining to fisheries development in Sabah.

STATUS OF THE FISHERIES INDUSTRY

A. Malaysia Fisheries

The fisheries industry in Malaysia is an important economy in the agriculture sector and has played a not insignificant role in the development of the national economy. Apart from contributing to the national Gross Domestic Product (GDP), it is a

Apart from contributing to the national Gross Domestic Product (GDP), it is a significant source of employment and foreign exchange as well as a source of cheap animal protein.

In 1996, overall fish production was 1,126,689 tonnes valued at RM3.3 billion. From this 994,144 tonnes were from caostal fisheries, 132,545 tonnes from deep sea fishing and 109,462 tonnes contributed by the aquaculture sub-sector. The value of the 1996 fish production made up about 2.3% of the national GDP or some 3.5% of the agriculture GDP. In terms of labour employment, there were 79,616 fishermen active in the sector.

The Malaysian claim of the Exclusive Economic Zone in 1984 has increased the national fisheries waters three and a half times of its original expanse. The fish resources in the EEZ waters (beyond the 12-mile limit) were estimated to be 964,700 MT:454,000 MT were surveyed to be demersal resources while 510,000 MT were pelagic fishes. Of this, commercially exploitable fish stocks were 437,550 MT, that are 166,700 MT demersal species and 270,850 MT pelagic fishes.

B. Sabah Fisheries and Aquaculture Status

At present fishing activities in the state are concentrated with the 30 nautical mile limit and thus Sabah's fisheries may be termed as predominantly coastal. The local fisheries produced 180,000 metric tons (MT) valued at RM590 million in 1997. The value of this production makes up about 2.4% of the state GDP or some 10% of the GDP produced from the agriculture and forestry sectors. This fish production is projected to increase annually by 10% in the next 3 years. The bulk of this increase will come mainly from fish production from deep sea fishing operations.

The number of full-time fishermen in Sabah employed in the marine capture fisheries industry in Sabah in the region of 20,000 persons[2]. Of these, commercial operators number about 30% while the rest are artisan fishermen and small-scale operators. The number pf part-time fishermen is unknown. The top 5 most populous areas are Semporna, Sandakan-Beluran, Tawau, Kota Kinabalu and Tuaran.

The top five fishing gears by predominance are as follows: trawls, gill-drift nets, hooked gears, lift nets (bagang and selambau), and seine nets (including purse seines)(Table 1). These gear statistics are based on licences issued; it is estimated

that there are many unlicenced gears of the traditional types such as rambat, bubu, hook and line and near- shore gill nets currently being operated.

Table 1. Licensed fishing fleet by gear type, Sabah 1996

Gear group	Numbers
Gillnet	4,209
Trawlnet	1,414

Hook & line	2,531
Seine net	195
Lift net	306
Others	1,181
TOTAL	9,836

There were approximately 9836 fishing vessels operating off Sabah waters in 1996. As can be seen in Table 2, Sabah's fishing fleet is predominantly comprised of relatively small traditional fishing vessels, i.e. 86 percent for non-powered boats and 41 percent for outboard engine boats. The main gears operated by small-scale fishing vessels are liftnets (selambau), hook and lines and other static gears (e.g. traps). Table 3 shows the breakdown of fish landings by gear groups and fish groups. Based on the number of fishing boats, the principal regions are: Kudat-Kota Marudu, Sandakan, Tawau, Semporna, Kota Kinabalu and Kota Belud.

Table 2. Licensed fishing fleet by GRT (gross tonnage), Sabah 1996

					Inboard engine boats GRT category						
	Grand total	Non powered	Outboard engined	Inboard engined	<10	10-20	20-25	25-40	40-70	>70	Unknown GRT
Sabah	9,836	2,557	4,065	3,214	1,020	635	178	337	52	9	986

Table 3. Marine fish landing breakdown by fish group and gear group, Sabah (1996).

FISHERIES	Gear landings (metric ton)			Wholesale value	Average
COMPONENT	Traditional	Commercial	Combined	(RM million)	RM/kg
Demersal species	10,369	22,584	32,953	106.26	3.22
Pelagic species	23,236	53,939	77,175	151.36	1.96
Crabs	2,398	1,433	3,831	12.86	3.36
Shrimps	1,104	11,386	12,490	89.03	7.13
Trash fish	809	15,101	15,910	2.07	0.13
Cephalopods	795	5,369	7,164	23.49	3.81
Others	2,830	887	7,717	3.21	0.86
Assorted species	104	3,877	4,981	7.03	1.77
Elasmobranches	1,256	2,851	4,107	3.65	0.89
TOTAL	42,901	117,427	167,328	398.96	2.49

I. Deep Sea Fisheries

Deep sea fisheries have seen major developments in the last 3 years. Although before this there have been fishing activities beyond the 30 nautical mile-limit, these have been using mainly traditional gears (especially hooked gears) which are inefficient and of low economic viability and thus not considered as true deep sea fishing operations. Most of the deep sea fishing is carried out by purse esiners larger than 70 GRT and bigger which use FADs (lights and payao-like devices). Presently there are 20 licences for deep sea fishing (vessels over 70 GRT size[3]) although around 7 vessels have started operations. Most of the deep sea fishing vessels actually operate not far from 30 nautical mile limit. The true deep sea fishing vessels, which are those that can oprate far out in the 200-mile EEZ and which are 100 GRT and bigger, are only 4 in number and operate off the West Coast. The main types of fish landed are the shoaling pelagics such as tuna, rumahan, tulai, etc. Deep sea fish production accounted for about 30% of the total fish landings in Sabah.

II. Coastal Fisheries

For coastal fisheries, trawling continues to be the mainstay activity, There were ??? trawlers in Sabah in 1997. Although finfish trawl fisheries is significant, in terms of value, the prawn fisheries is a large contributor. In 1997, most of the 7000 tonnes of prawn production were exported earning a value of RM135 million. This represent 65% of the total export value of marine fisheries products.

In 1996, the total fish production from marine capture fisheries was 167,000 metric tonnes. Of these, commercial gears contributed about 70 percent (117,427 metric tons) of the total marine fish landings. The bulk of the commercial landings were contributed by 25-40 GRT trawlers (24 percent of total marine landings), bottom gillnets (10 percent) and 10-40 GRT purse seiners (9 percent). Landings from traditional gears which represented 27 percent of the total marine fish landings were mainly contributed by hook & line (handlines contributed 10 percent of total marine landings), bagang (static liftnet) (7 percent) and selambau (active liftnet) (4 percent).

III. Aquaculture

Marine aquaculture is a nascent industry in Sabah. In terms of operation scale, small farm predominate which are practiced more on a subsistence level. Only a few farms of medium scale operations can be considered to be commercially oriented in practice. Marine aquaculture mainly deals, in order of importance, in the culture of tiger prawns *(Penaeus Monodon)* in brackishwater ponds, cage culture, brackishwater pond culture (fish), seaweed culture and mollusk culture.

Marine aquaculture (including mariculture) produced about 3,200 MT of fish and other aquatic life in 1993 (Table 4). The main contribution to this production comes from prawn farming, seaweed mariculture and cockle exploitation. The number of aquaculturists engaged in this sector number is about 900 persons.

Table 4: Aquaculture production statistics in Sabah

	1990			1997	
	Area (ha)	Prod (tonnes)	Value (RM million)	Area (ha)	Prod (tonnes)
Shrimp	412	800	12.0	502*	1,757
Finfish	n/a	n/a	n/a	n/a	855
Molluscs	0	none	0	>6.8	14.3
Seaweed**	n/a	302.7	0.39	52.5	1233
Total	>1,435.28	7917.7	43.59	>1,255.5	10,092.3

**Dried weight (10% of fresh weight) *Mussels only

At present the main activity of marine aquaculture in Sabah is the culture of prawn and fish in brackishwater ponds. The main species cultured id the tiger prawn, *P. Monodon*. The production from these prawn and fish farms was around 2,900 MT in 1997 from a total acreage of 600 hectares. The most extensive areas are found in Tawau, Sandakan, Kota Belud and Kota Kinabalu-Tuaran. There were 128 operators in 1997. There were 21 prawn hatcheries in the same year.

The next important aquaculture activity is the culture of marine fish in cages. At present there are 303 of these operators found mainly in Tuaran, Sandakan, Kudat, Kuala Penyu and Menumbok. The were 171 farms with a total cage area of 5000 square meter in 1997. A number of these operations are not true cage culture as they do not rear the fish from young but rather employ these cages as holding facilities for market-size fishes caught from the wild (for a few months) while waiting for export to foreign live fish markets as well as for sale in the domestic markets. Most of these fish are high-value species. The economic significance of this type of aquaculture is indicated by the export of around 400 tonnes (valued at RM19 million) of live fish in 1997.

Seaweed mariculture has gained prominence as a viable aquaculture enterprise in the last 3-4 years. In 1997 there were around 542 families engaged in this venture all in Semporna. The production was 2000 tonnes (value RM2 million) of dried seaweed in 1997 from a total farm hectarage of 120 ha and most if not all of these were exported.

Cockle, mussel, oyster and crab culture make up the rest of the marine aquaculture activities in Sabah.

Freshwater aquaculture in Sabah has a longer history than marine and brackishwater aquaculture. The development of freshwater aquaculture industry has however been at a slow rate. Yearly production hover around the 7000 to 8000 tonnes in the last 5 years. In terms of scale of operations, small aquaculture holdings predominate, many farmers practise subsistence aqua-farming and the few

are truly commercially oriented are at best, medium size operations.

The major activity in freshwater aquaculture in Sabah is fish pond culture that rears fish such as tilapia nile, lampan jawa, chinese carps, patin, kalui, kissing gorami and ketutu. At present there are several start-up operations on cage culture, tank culture and ornamental fish breeding and culture. There are also come small-scale operations in the culture of freshwater soft-shelled turtles and bullfrogs.

There were around 9800 total number of freshwater ponds which cover an area of some 1200 hectares in 1997. The top five districts where these ponds are located are in Kota Belud, Keningau, Ranau, Tambunan and Tuaran. There were about 4,600 fish farmers engaged in freshwater aquaculture in Sabah in 1993.

III. Freshwater Capture Fisheries

Sabah has few true large water bodies other than the 7 major river systems. Apart from some ox-bow lakes, the state does not have comparable freshwater bodies as found in West Malaysia where there are extensive mining pools, several dam likes and many naturally occurring lakes. Although there are no survey data on the fish production accruing from freshwater capture fisheries, indications are that fishing are carried out along the major rivers albeit on a part-time basis by riparian inhabitants for their own consumption. Some commercial fisheries are found along the S. Segama, S. Padas and S. Kinabatangan.

IV. Fish consumption, processing, export and import

It is estimated that the local (Sabah) consumption of fresh fish to be in the region of 50,000-60,000. The processing of fish accounts for about 60,000 tonnes consumption. In the past, processed fish were solely dried/salted fish but in the last few years downstream processors have diversified to semi-processed fish (de-headed, dressed, gilled and gutted) and value-added fish products such as fish fillet, shark's fins, surimi and fish meal. Also, apart from fish and prawns, processors have gone into processed cephalopods (whole, cleaned or fillet), jelly fish, slipper lobsters and coral lobsters. There are about 50 processing plants of various size and capacities in the state; 20 are primarily prawn-processing plants and 6 produce fishmeal.

The major foreign markets for fish and fish products are found in Brunei, Philippines, Japan, Singapore, Hong Kong, Taiwan while the secondary markets are in Europe, Australia and USA. A substantial volume is also sold to Peninsular Malaysia.

The overall quantity and value of fisheries exports were 35,906 tonnes with a wholesale value of RM216 million in 1996. This compare favourably with the 26,930 tonnes exported (value RM147 million) in 1992. In 1996, this accounted for a trade surplus of roughly RM223 million.

By far and large, fish products are exported to trading houses, importers, reprocessors, canneries and wholesalers while a small amount is sold directly to suppliers of restaurant or supermarket chains.

Prawn exports have always been an important component of Sabah's export trade in fish. In fact this has contributed not less than half of the total export value yearly. Indeed Sabah gained its status as a reputable seafood exporter on the quality of its prawn exports. In 1996, prawn exports amounted to 8,773 tonnes and accounted for slightly less than 50% (about RM101 million) of the wholesale export value. In the same year fresh, frozen and chilled fish exports totaled about 10,030 tonnes worth about RM13 million while the live fish export trade raked in about RM19 million and lobsters about RM3.5 million. The other significant export are fish meal, seaweed products and brined, salted or dried fish.

The live products export trade started in the early 1980s with the advent of the trade in breeder tiger prawns to Taiwan. These prawns are for hatchery purpose but nonetheless it was a lucrative business. The export of breeder prawns was banned in 1985 by which time the live foodfish export trade picked up. The main types of live fish exported include greasy grouper, spotted coral grouper, trevally, seabass and

red snapper. The majority of these live products were exported to Hong Kong, Singapore and Taiwan. In 1997 about 410 MT of live fish (including lobsters) was exported.

The fisheries imports of Sabah for the 1996 period totaled some 36,702 tonnes with an estimated value of Rm37.5 million. The import of non-processed fish into Sabah is not much; in 1996, this was in the region of 1100 tonnes which were mostly chilled fish and prawns. These are mainly from Indonesia and comprised of high-value species such as prawns, kurau, bawal, tenggeri, senangin.etc., and are mainly for in-state processing and re-export. Of the fisheries imports, canned fish products that are mainly from sardines, mackerels and tunas form the major portion.

PROSPECTS FOR FISHERIES AND AQUACULTURE DEVELOPMENT

The prospect for the development of the fisheries and aquaculture in Sabah is very good. This observation is based on a number of considerations. First, the potential for future exploitation of fisheries resources is still very high in deep sea fishing. In addition, Sabah has quite extensive land areas deemed suitable for particular types of aquaculture operations. Second, there is solid government support for fisheries development. Thirdly, fishing and aquaculture technology is readily available and applicable locally. Fourthly, there is very good potential for market development for fish and fish products nationally and regionally. Finally.

A. Resources

I. Fisheries Resource

Prior to the Exclusive Economic Zone (EEZ) claim of 1984, the expanse of Malaysian fisheries waters was only 47,000 square nautical miles but since then has increased to around 160,000 square nautical miles. The portion of the deep sea fisheries waters contiguous to Sabah's coast is estimated to be in the region of 25,000 square nautical miles.

The marine fisheries resources of Sabah's waters have an estimated potential yield of 252,000 tonnes. The coastal waters of Sabah has about 112,000 tonnes of demersal fish resources while pelagic stocks may make be about one-third as much. Deep sea resources are estimated to be 140,000 tonnes and of that pelagic resources comprised of about 100,000 tonnes. The above figure is probably conservative figure. This is based in the fact the resources of the deep seas off the east coast of Sabah, especially the Semporna waters, has not been included. (No data are available about the resources there because there had no stock assessment work done so far.) However, fish landing reports from the few fishing vessels which had operated in this area revealed that this place is rich in tuna and other deep sea pelagic fishes. Trial fishing done around the Terumbu Layang-Layang area off the west coast of Sabah indicated that some 50,000 tonnes of pelagic fishes (especially tuna) can be exploited in an area of 35,000 square nautical miles around this area (including Sarawak's portion of the EEZ).

The physical and oceanographic features of the Palawan Trench located off the West Coast makes it a potential fishing ground for oceanic tunas. Available data from past fishing operations indicated that both big eye (Thinness obesus) and yellow fin (Thunnus albacares) tunas are abundant and widely distributed in the area. The relatively shallow waters and numerous coral reefs and shoals found in the southern portion of the Spratly Islands (e.g. Ardasier Bank near Pulau Layang-Layang) was found to be very rich in fisheries resources. Past experimental handline operations had indicated good catch rates of many commercial value species (snapper, grouper, wrasse, trevally, barracuda). Acoustic surveys also indicated high fish biomass especially between the 100-200 meter isodepth, which consisted mainly of small pelagics.

Large pelagics refers mainly to oceanic tunas, some large carangids (e.g. trevally) and oceanic sharks. In this context, the "large pelagic" fishery refers only to tunas which formed the bulk of the pelagic landings. Available assessment information indicated that the small pelagic resources in the inshore caostal waters are moderately exploited, and for the outer shelf area and offshore waters to be lightly exploited. At present, the current pelagic landings of about 65,000 MT (55,000 MT of small pelagics and 10,000 MT of small to large tunas) are still below the combined potential yield of 100,000 MT (80,000 MT of small pelagics and 20,000 MT of small to large tunas). The current tuna landings of approximately 10,000 metric tons per

large tunas). The current tuna landings of approximately 10,000 metric tons per annum which includes both coastal (neritic) and oceanic tunas, cam be increased significantly if appropriate gears and techniques are used. In particular, the use of FADs in conjunction with purse seining, usage of midwater trawling and the expansion of both handline and longline operations, could enhance production. However, since the above estimates of stock availability are still preliminary in nature, more rigorous assessments will therefore be needed. Also, no data is available at the moment on the species breakdown of the tuna landings but a substantial portion consists mainly of coastal species.

There appears to be some resource development potential, particularly with respect to the small pelagics scattered over the outer shelf area and in the offshore waters. Despite the apparent potential for the further exploitation and pelagic resources on

both caostal and EEZ waters off Sabah, there are certain limitations relating to the relatively low density of these resources and also the longer travelling times required to reach these fishing grounds (e.g. along the Palawan Trench and around Pulau Layang-Layang). Both these factors may affect the overall viability of exploiting the offshore small pelagic resources. The most abundant small pelagics found in these areas are mainly sardines, small scombrids (e.g. mackerels), neritic tunas and carangids (mainly round scads, hardtail scads and scads). Furthermore, the demostic market prices for these species are generally low (wholesale price range : RM0.50 – 2.00/kg) and the local market potential is rather small. The use of appropriate gears (e.g. purse seiners with the aid of FADs or fish aggregating devices, midwater trawlers, pair trawlers) and larger vessels can improve the economic viability of the fishery, and the development of related processing and canning operations can enhance market potential if sufficient resources are available.

From past resource surveys carried out by both state and federal fisheries researchers, the most abundant oceanic tunas found along the Palawan Trench, off Semporna and other offshore waters are yellowfin and bigeye tunas.

Based on the analysis of available CPUE (catch and effort) data, it is clear that the shrimp resources in Sabah are intensively exploited and therefore there is no further development opportinities in this sub sector. There is compelling evidence to support a further reduction in the fishing effort that could not only enhance the present catch per unit effort but could also result in modest increase in the future overall shrimp landings.

Blood cockles *(Anadara granosa)* formed the bulk of bivalve landings in the state, which comes from Sandakan (mainly from Labuk Bay) and Tawau. Landings of other bivalves may have been significant but no data is presently available on their actual contribution to the fishery. Highly value species that has good investment opportunities, among others, are the artificial propagation and sea ranching of giant clams (*Tricdana spp.*), abalone *(Haliotis spp.*) and pearl oyster.

Cephalopods formed a significant portion of the trawl fishery in Sabah. More resource assessment, work and research into the distribution, abundance and general biology of major cephalopod species is needed before determinations can be made concerning the future development of this fishery. The intensive use of more species-specific gear types and techniques (e.g. light attractants, jigging gear) may result in substantial increases in landings.

The main components of the local crab fishery are mud crabs (Scylla serrata) and

pelagic crabs (Portunus pelagicus). Overall, mud crabs fetches better prices (RM4-6/kg) compared to pelagic crabs (RM2-3/kg). The crab fishery in Sabah are targeted for both local and export markets. Pelagic crabs are mainly caught as the by-catch of trawlers, while mud crabs are caught using traps in mangrove and estuarine areas. Juvenile or unmarketable mud crabs are also reared in ponds for fattening and grow-out purposes prior being sold to seafood restaurants or exported out of the state. At present, the crab landings in the state are relatively stable and to a certain extent reflect the level of fishing effort exerted. In view of the saturation of trawler effort and also the gradual destruction of mangrove areas due to uncontrolled coastal development, it is therefore unlikely for a significant development in this sector.

II Aquaculture Resource

There is potential for some expansion of shrimp culture in Sabah, although the area available is not large compared to other regional countries. The Aquaculture Masterplan Study undertaken by the Fisheries Department, Sabah in 1996 shows that for coastal shrimp aquaculture there is a total coastal area of 929,889 ha, areas with high potential covered 4,048 ha (0.4%), medium covered 145,551 ha (15.6%) and low potential 123,060 (13.2%) (Table 5). Areas of high and medium potential are most likely to be suitable for shrimp farm development, as borne out by the analysis of the Tawau area where much of the existing farms are on land classified as high and medium potential. The analysis also indicates that Sabah has a relatively low area which is ideal (high potential) for shrimp aquaculture development. Assuming that both high and medium have some physical potential for development (albeit under different constraints), this gives a potential area of 149,599 ha.

There was a considerable geographical variation in shrimp culture potential. The areas with largest apparent potential were Pitas and Sandarac. The analysis also shows a large area in Tawau covering 18,852 ha, including the existing shrimp farming areas.

Table 5: Shrimp aquaculture potential (ha) based on GIS analysis

Area	High	Medium	Low	Potential area*	% M/H of total potential area
Sipitang	167	12782	3973	12,949	8.66
Kuala Penyu	0	9787	9135	9,787	6.54

Kuala Penyu and Beaufort	0	9787	9133	9,787	6.54
Papar	441	13809	3714	14,250	9.52
Kota Kinabalu and Telipok	599	11464	2200	12,063	8.06
Kota Belud	357	7404	1344	7,761	5.19
Kudat	5	3953	2050	3,958	2,65
P. Banggi and Balambangan	0	3034	7961	3,034	2,03
Kota Marudu	517	7790	3580	8,308	5.55
Pitas	782	14926	9765	15,708	10.50
Jambongan	40	4301	8493	4,342	2.90
Sg. Labuk and Sugut	0	4105	17117	4,105	2.74
Sandakan	413	14784	2277	15,197	10.16
Kinabatangan	0	88	10196	88	0.06
Tambisan	63	10253	6011	10,317	6.90
Tungku	100	3557	9790	3,657	2.44
Bakapit	44	3069	1144	3,114	2.08
Lahad Datu	0	34	6580	34	0.02
Kunak	0	791	92	791	0.53
Semporna (A)	8	213	386	221	0.15
Semporna (B)	0.04	1063	579	1,063	0.71
Tawau (A)	63	6446	11785	6,509	4.35
Tawau (B)	446	11989	4886	12,344	8.25
Total Area	4048	145551	123060	149,599	100

*Potential areas(ha) = high + medium; ** potential area = (high + medium) * 100 / total

The same study by the Fisheries Department also analysed the potential cage farming areas in Sabah. The study indicated a significant area for marine cage farming in several districts (Table 6). The analysis confirms the high potential in Sandakan bay, where there is already some cage farming development, but also reveals a significant and untapped potential in Semporna. *(Note: The Study Report comments that there were a number of other areas where the GIS analysis could not be undertaken because of a lack of bathymetric data, including small mangrove creeks. The analysis therefore probably underestimates potential cage farming areas in Sabah).*

Table 6: Marine cage aquaculture potential (ha) based on GIS analysis

Place name	Potential for development (ha)		
	High	Medium	Low
Gaya and Sepangar Bay	9.9	856.7	637.3
Usukan Bay	93.4	191.1	
Kudat Bay	75.5	482.8	0.6
P. Banggi & Balambangan	0.2	1167.1	878.2
Sandakan Bay	113.2	3559.3	1247.3
Lahad Datu	0.7	2579.0	939.7
Semporna	936.3	6696.7	1107
	1229.25	15532.6	4172.8

A GIS analysis carried out by the Fisheries Department shows clearly that the northern and south-eastern part of Sabah are potentially more suitable for seaweed culture, more so than the western area. The area in the western part had only 300 ha, compared to the 15,958 ha in the northern part and 1,824 ha in the eastern part and 84,330 in the Semporna area (Table 7). This analysis fits in with the existing patterns of seaweed farming in Sabah, with most farms in the Semporna area, although it indicates the potential for expansion into other areas, subject to more detailed analysis of exposure, water depth, pollution risk, accessibility and potential environmental impacts on coral reefs.

Areas where oysters and green mussels are being cultured include Setompok bay (Kuala Penyu), Sg. klias, Menumbok, the Mengkabong estuary, Sandakan bay and Tawau bay. Other areas which may have similar environment or bottom substrate are the Sulaman bay in the west coast, kudat bay near Dampirit and the Labuk bay in Sandakan. Such areas have potential for future development for mollusc some types of mollusc culture, but field surveys are required to identify specific sites and to assess the extent of the potential areas.

Table 7: Potential areas for seaweed development (ha) and number of existing farms

Name	Area (ha.)	Total (ha.)
Kuala Penyu	239.4	299.8
Kota Kinabalu	14.0	
Pangalat	46.4	
Kudat	848.9	15,958.5
Karakit	2,531.8	
Tandak	10.3	
Telaga	294.0	
Bambangan	1,486.9	
Langkon	209.0	

Langkon (2)	297.7	
Pulau Tagajawan	2,632.3	
Pulau Malawali	4,246.1	
Balambangan Barat	246.2	
Pulau Mandidarah	3,155.3	
Kampung Lok Agong	1,034.8	1,824.8
Terusan	736.5	
Tanjung Labian	53.5	
Lahad Datu	129.7	
Apas Balung	37.3	
Bakapit	983.4	
Semporna	6,231.1	
Pulau Silawa	75,477.4	
Silam	626.4	
Pulau Timbun Mata	85.0	
Pulau Sakar	759.9	
	102,413.4	102,413.4

B. Government Polices And Support

The Sabah Government's commitment to ensuring and managing the development of the local fisheries and aquaculture is a laudable effort. In addition the government has or in the process of implementing a number of policies which has a positive impact on the future sustainable management of its coastal and marine environment and water resources.

The Outline Perspective Plan Sabah (OPPS) has stated that the two key growth areas in fisheries development in Sabah is in deep sea fisheries and aquaculture. In line with OPPS, the Ministry of Agriculture and Fisheries has drawn up the State Agriculture Policy and accepted by the Government early this year (1998). Contained within this policy is the statement to pursue on a maximum but rational and sustainable basis the development of the fishing and aquaculture sector. To flesh out this policy, the Fisheries department, Sabah is well on the way to establishing a masterplan for aquaculture development in Sabah.

The masterplan will be a two-level plan: an overall plan will be drawn up which will outline plans such as zonation of aquaculture areas, within the broader framework of an integrated coastal area management plan, fish health and diseases control, conveyance of fish, marketing, technology application, strategies for environmentally sustainable development of coastal aquaculture. The district-level plan will be the

in-situ detailed plan for local development of aquaculture. This plan will address issues such as the appropriate aquaculture technology, production, environmental management and siting of aquaculture project.

On the national level, the National Agriculture Policy has been in effect since 1994. The NAP, among other things, provides for the guidelines for the development of fisheries and aquaculture up to the 2000. The policy has been prepared with the objective of a balanced and sustained growth in agriculture in relation to other sectors of the national economy. The policy emphasizes that development should conserve land, water, plant and animal resources, and that such development should be environmentally non-degrading, technically appropriate, economically viable and socially acceptable. Among the targets for development in the fisheries sector is a high priority to the development of coastal aquaculture.

Recently, the Federal Department of Fisheries drafted a National Aquaculture Operation Plan, which covers the priority directions for the period 1996-2010. The plan gives emphasis to the development of 'modern' aquaculture technologies, particularly: (i) high intensity recirculating aquaculture: and (ii) deep sea cage culture. The objective of the plan is to increase national aquaculture output to a minimum of 350,000 tonners by the year 2010 through:

- New aquaculture zones
- Major nucleus estates (AKMAL) schemes;
- Technical and infrastructure support programmes;
- Research and development;
- Technical training centres;
- Financial and funding support.

Ever since the government laid official claim to the EEZ in 1984 with the passage of the EEZ Act. Its emphasis has been to fully develop the deep sea fisheries in its waters. This has been given a major impetus in 1987 with the implementation of specific programs, one of which has been the issuance of deep sea fishing licences. Apart from this, the government has embarked upon a program to form a core cadre of deep sea fishing workers by training local youths. In 1993 the government relaxed the ruling on ownership of fishing vessels operating in local waters by allowing operators to charter foreign vessels. At present companies are allowed to charter/lease steel-hulled fishing vessels from foreign countries as long as these are of 150 GRT displacement of larger. The government has also relaxed its ruling on the importation of particular fishing nets and fishing appurtenances.

The government is also encouraging deep sea fishing companies to undertake vertical integration of the business. Thus, holders of deep sea licences will find favorable consideration for manufacturing licences and export permits if they undertake value-added downstream processing of their catches. The government is also considering particular polices designed to help companies engaged in fishing and fisheries product manufacturing. These includes tailoring existing programs implemented in other sectors that seek to promote Small and Medium –scale Industries (SMI). Promoting integrated development on a regional basis and the more

industries (SMI). Promoting integrated development on a regional basis and the more active participation by the public sector in export market development.

The State Government of Sabah is also establishing a number of environment management-related policy frameworks. One of the main beneficiary of these policies will definitely be the fisheries sector. Currently under implementation of which the Town and Planning Department is the lead agency, is the Integrated Coastal Zone Management plan of the whole of Sabah. This plan envisages establishing a framework in which all coastal resources will be utilised and managed in an integrated and sustainable way. The establishment of this plan has the input of all government agencies and key non-governmental organizations that has vested interests and jurisdiction in the coastal zone. A similar plan, named the Sabah West Coast Shoreline Management Plan and Regional Environmental Assessment is being drawn up by the Ministry of Tourism and Environmental Development. In short, this policy will ensure that any large development in the coastal areas of the west coast of Sabah will have be in consonance with the established shoreline management plan.

A Sabah Water Resources Enactment is also in the final stages of being drafted. This law will provide to a water resources manager (a government institution) to ensure there is adequate supply of quality water for the state. This provides for the protection and conservation of watershed areas and other water sources. The direct benefit of this for the aquaculture industry is the supply of quality water.

C. Technology

The present fishing technology employed by deep-sea fishermen is a long-established one. Principally fishing is done by the use of trawl nets and purse seines. Trawling is commonly carried out by vessels of 60 – 80 GRT sizes towing bottom trawl nets in waters of depths up to 100 meters. Purse seines are nets which are used to first encircled the fish shoals and then the bottom part is pursed leaving the fished trapped inside. Present nets in use can be as big as over 1000 meters in length and 100 meters deep. Fish shoals are aggregated by means of Payao (made of

palm fronds tied to ropes which are anchored to the sea bottom) which have seen set weeks earlier.

The fishing practices mentioned earlier are comparatively simple as compared to those employed by other fishing nations. To fully exploit the deep sea resources in the South China Sea and Celebes Sea, fishermen need to upgrade the fishing capabilities. First, bigger, cost-effective and highly efficient vessels are needed. With these type of vessels not only the fishing season can be prolonged but with larger nets, the deeper shoaling fishes (especially large skipjacks and yellowfins) can be caught. In addition, the need for specialized fish carrier vessels, as done presently, is done away with.

Mid-water trawling is a fishing method not presently practiced in Malaysia. However, this method has been proven effective in other countries catching fish which are of the same types as found in Sabah waters (e.g., mackerel and sardines). This is one fishing technology which is potentially an area for development for the local fishery as an effective alternate to FAD-purse seine fishing for pelagic fishes.

Deep sea fishing using longlines is currently done at a small scale in Sabah. However this is one technology that is popular in other countries fishing for deep sea fish species. This fishing method can be adopted by the local fishery. Again, this type of fishing holds good potential because selectives fishing such as this can target high-value species.

Other examples of modern technology used on board deep sea fishing vessels that are not yet found in Sabah includes the use of autopilot and global positioning system receivers, satellite imagery particularly sea surface temperature maps. fish pumps, longline setting machines and electronic longline control. Etc. These technology goes a long way in improving the cost-effectiveness of fishing operations and there is no reason why this should not be introduced to the local industry.

In the local aquaculture scene, the technology is quite established in a number of fields. Comparatively these are low-technology but has shown to be productive and can be easily adopted by local fish farmers. Types of culture technology includes cage culture (which includes open sea cages), pond culture, and raft and rack culture of mollusc such as oysters and mussels. Mariculture of seaweed, which is the growing of seaweeds using the pole and line system has been established for the last 10 years. In freshwater aquaculture, culture technology such as fish pond culture is quite established. Seed production on in-demand species such as tilapia is not a problem.

The areas in which local aquaculture technology needs improvement are in farm management, fish husbandry and disease control. On this farmers can be easily trained to improve production rate and overall performance of their culture enterprises.

The one in which more research and development inputs in aquaculture is in the establishment of seed production technology. It is recognized that the lack of adequate seed supply in the local aquaculture sub-sector is a constraint in the diversification of aquaculture species production. The established technology for seed production in Sabah is limited to seaweed, oysters, tiger prawn and sea bass (Selunsung). There is a need to expand this list so that local aquaculturists has more choices as to what to rear and grow. In addition, seed production of high-value species such as groupers and warasses as well as popular aquarium/ornamental freshwater fish species need to be introduced to take opportunity of the market

freshwater fish species need to be introduced to take opportunity of the market demand for such fish.

D. Ship-Building Industry

Local shipyards (expect perhaps for Sabah Shipyard) can only build wooden-hulled fishing vessels to about 90-100 GRT size. At present there is popular demand for these type of vessels. In fact most of the local shipyards (about 6 of them) are booked 2 years in advance. In time however, due to the increasingly prohibitive costs of lumber, wooden-hulled vessels will become too costly. In addition in the context of deep sea fishing operations, the existing fishing vessel are technologically backward in terms of cost-effectiveness and operational efficiency. There is no doubt that bigger and better fishing vessels are needed to fully realized the potential for deep sea fisheries in Sabah. What were are talking here are steel-hulled vessels which must be at least 300-400 GRT in size, with fish hold capacities up to 600 cubic meters and installed with high-performance refrigeration systems. Ideally, to be more cost effective these vessels must have on board processing capability.

In summary, it is to be noted that the development of the deep sea fishing industry in Sabah will bring about a demand for more fishing vessels which are bigger and more efficient. This represent good opportunities for the local ship-building industry and maritime support and services industries.

E. Market

Sabah's local population consumes about 50,000 tonnes of fish at present. The

processing of fish accounts for about 60,000 tonnes consumption. This demand comes from the 40 processing plants of various size and capacities in the state: 20 are primarily prawn-processing plants and 6 produce fishmeal. A substantial volume of fish is sold to Peninsular Malaysia. The major foreign markets for fish and fish products are found in Brunei, Philippines, Japan, Singapore, Hong Kong, Taiwan while the secondary markets are in Europe, Australia and USA.

While direct consumption of fish in Sabah is not expected to have dramatic increase in the next 10 years, domestic consumption of fish will be in the downstream value-added processing industries in the state. It is estimated that the demand for fish in Sabah alone will reach 200,000 tonnes by the turn of the century. This demand will not only come from fish processors only but from other sectors. For example, one estimate put the demand for feedmill-produced animal feed (a major component being fish meal) to be around 480,000 tonnes by 2000. In addition, the Peninsular Malaysian markets demand for fish will increase many folds. All in all, domestic demand for fish in the country will reach 1 million tonnes by 2010.

Export markets for fish will expand in future. The opening up of regional markets,

particularly in the BIMP-EAGA region will increase the demand for Sabah's fisheries produce. The world demand for food (including fish) will continue to grow. One FAO (Food and Agriculture Organization) estimate put the demand for fish at 30-40% above current levels.

F. Manpower

One of the problems faced by deep sea fishing operators at the moment is the lack of local workers willing to work on board their vessels. In addition, these workers are lacking in knowledge in the more technical jobs on board. On this matter, the government has for a number of years conducted courses especially designed to train such fishermen for deep sea fishing work and will continue to do so. Further, the government still allows the engagement of foreign workers on board local fishing vessels if it can be shown that no suitable local workers can be engaged.

In aquaculture, the government is also implementing a number of training programs designed to train fish farmers in the latest aquaculture practices. These training courses are offered locally and also in West Malaysia.

9. Fisheries Management

As steward of the fisheries resources of the State, the government is ever mindful of the need for an effective and rational management plan for the local fisheries. This will be done through careful consideration of the number of fishing inputs entering the local fisheries and also through the control of the fishing effort of existing vessels. In short, the government is committed towards maintaining fisheries on a sustainable basis.

10. On-Shore Facilities And Services

At the moment, fisheries-related infrastructure and on-shore facilities are only adequate to support the current level of development of the marine capture fisheries industry. If the deep sea fishing industry is to take off, concurrent with the expansion of fishing fleet will be the need to put up infrastructure and facilities such as jetties, ship-maintenance yards, ice-making plants, and cold storage spaces, etc. The government will have to play an active role in development for at least the earlier stages. Particular policies need to be formulated to encourage the private sector to put up fisheries-related infrastructure.

CONCLUSION

The fishing and seafood industries in Sabah have great potential for development

The fishing and aquaculture industry in Sabah has great potential for development. Among the key reasons for this is the yet-untapped fisheries resources, established technology and the strong government support. Even though this sector faces a number of constraints and problems, these by no means will hamper the development of the industry. How this industry will develop in the next few years will depend on the close cooperation between the private sector and the government. The benefit is clear: the State of Sabah will become the premier fish-producing state in Malaysia.