An Overview of the Socioeconomic Status of Fisheries in Malaysia

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Abstract

Fish production in Malaysia increased steadily at 4.5% per annum from 801 000 t in 1985 to 1 280 906 t in 1997. Most of the production was contributed by marine capture fisheries, amounting to 1 168 973 t (91% of total production) in 1997, while the rest (132 700 t or 8%) came from inland fisheries and aquaculture. About 72% of the marine landings, or 837 574 t, were from Peninsular Malaysia while the rest were from the states of Sabah, Sarawak, and the Federal Territory Labuan. Marine fisheries thus contributed significantly in terms of employment in Peninsular Malaysia compared to Sabah and Sarawak.

In 1997 the value added by the fisheries sector was estimated at about RM2 million (US$0.71 million at 1 US$ = RM2.82), which represents about 1.5% of gross domestic product (GDP) or 11.1% of the agricultural GDP. Manufacturing, services and construction sectors are the other contributors to GDP in Malaysia. Fisheries net export earnings reached a negative value (-RM39.6 million or US$14.04 million) because Malaysia was a net importer of fish in terms of both quantity and value in 1997. Furthermore, the number of fishers decreased at a rate of 2.2% per annum from 102 900 in 1985 to 82 200 in 1995. In 1997, there were 79 616 fisherfolk in Malaysia and this constituted only about 1% of the total employment in the country. With declining catch and a higher incidence of poverty among the fishing households, fishers, particularly the younger ones, are attracted to better job opportunities in other sectors such as manufacturing.

Fish and fish products comprise about 60% of total animal protein consumed in the country (compared to poultry, beef and pork), a rate much higher than in other Asian countries. Per capita annual consumption of fish increased from 9.42 kg in 1960 to 23.05 kg in 1989, and further to 39.1 kg in 1995. This is expected to rise to 56 kg•capita•annum^{-1} in 2010.

Fishing operations in Malaysia can be classified into commercial and non-commercial (traditional). Trawl nets, fish purse seines, shrimp trawl nets and anchovy purse seines are classified as commercial gear, while drift nets and other traditional gear such as hook and lines, traps and lift nets are classified as non-commercial. About 63% (15 611) of fishers are involved in non-commercial (traditional) fishing and the rest in commercial operations.The majority of traditional fishers are involved in

other economic activities such as farming, contract work, retailing and tourism.

Due to limited fisheries resources, the number of registered fishing vessels decreased from 22 026 units in 1980 to 14 211 units in 1997 on the West Coast of Peninsular Malaysia. Commercial fishing vessels are generally larger than 25 GRT (gross registered tonnage) with engine capacities up to 180 HP, while traditional fishing vessels are generally less than 15 GRT with engine capacities less than 18 HP. Normally commercial fishing boats use modern navigational aids like Geographic Positioning Systems (GPS) and are fitted with Refrigerated Sea Water (RSW).

The capital investment for a trawler and purse seiner of 25 - 69.9 GRT was RM100 000 in 1989, including the boat hull, engine, gearbox, net and accessory equipment. Annual net profit derived from a 25 - 39.9 GRT trawler in 1989 was RM36 520, while that from a 40 - 69.9 GRT trawler was RM43 601. For the fish purse seine, 25 - 39.9 GRT and 40 - 69.9 GRT vessels made net profits of RM40 102 and RM63 562 respectively. In terms of productivity efficiency, the larger vessels, trawl and purse seine (40 - 69.9 GRT) are more efficient than the smaller fleet (25 - 39.9 GRT). Labor productivity for large trawls is 219 kg per person-day compared to the smaller trawl of only 129 kg•person-day^{-1}. For the purse seine fishery, large vessel labor productivity is 69 kg•person-day^{-1} and for the smaller vessel only 53 kg•person-day^{-1}.

The government has decided to reduce the number of trawl vessels especially those operating in inshore areas, and to encourage fishers to explore new areas in the offshore waters. In order to conserve fishery resources, the government has tried to provide incentives through tax deductions for 'pioneer status', investment tax allowances, tax exemptions for imports and a sales tax on fishing machinery, raw materials and equipment.

Socioeconomic Profile

Review of the Status of Fishery Resources

The fishery sector in Malaysia plays an important role with regards to the generation of income, employment, foreign exchange and the supply of protein, particularly to the rural population. Fish production in Malaysia increased steadily at 4.5% per annum from 801 000 t in 1985 to 1 241 000 t in 1995. During this period, marine capture fisheries registered a production growth of 4.0% per annum from 746 000 t in 1985 to 1 108 400 t in 1995, while aquaculture registered a growth rate of 9.2% per annum, from 55 000 t to 132 700 t.

Landings from marine capture fisheries were 1 168 973 t or 91% of total production in 1997 while production from aquaculture and inland fisheries was 111 933 t or 9%. Within the marine capture fishery, production from the inshore fishery was 1 037 887 t, which accounted for 89% of total marine landings while the deep-sea fishery contributed 11% (131 086 t). About 72% of the marine landings, 837 574 t, were from Peninsular Malaysia while the rest were from the states of Sabah, Sarawak and Federal Territory Labuan.

The number of fishers in Malaysia decreased at a rate of 2.2% per annum from 102 900 in 1985 to 82 200 in 1995. This is consistent with the Government's efforts to ensure sustainable fishing, particularly in inshore waters, and improve the catch from the available resources for the remaining fisher population. In 1997, there were 79 616 fisherfolk in Malaysia and this constituted only about 1% of total employment in the country. Out of the total number of fishers, 7 048 were foreign crew permitted to work in local fishing vessels.

The total demand for fish and fish products was estimated at about 809 300 t in 1995. Out of the total national production, consumable supply was estimated at about 764 500 t; therefore achieving a self-sufficiency level of 94.5%. The marine capture fishery in Peninsular Malaysia is the most important one in terms of total marine landings as well as employment. Hence, this study focuses only on Peninsular Malaysia's marine capture fisheries.

Contribution of the Fisheries Sector to Economic Growth and Welfare

Contribution of the Fisheries Sector to GDP and GVA (Gross Value-Added)

The Malaysian economy has expanded rapidly over the last decade with strong output recorded particularly in the manufacturing, services and the construction sectors. Since 1987, the manufacturing sector has been the leading growth sector in the economy with its contribution to GDP surpassing that of the agricultural sector. Major exports of manufactured goods are electrical and electronic products and machinery, chemical and chemical products, textiles and apparel, wood and wood products, transport equipment, iron, steel and fabricated metal products. The manufacturing sector is expected to remain the main engine of growth under the Second Industrial Master Plan (1996 to 2005). However, there is now a shift in government focus to give more emphasis to the agriculture sector.

New sources of growth are expected to emerge such as agro-forestry, specialty natural products, biotechnology and aquarium fish. Strong growth is also expected from the food sub-sector, arising from intensified efforts in resolving supply-side constraints and strengthening its economic foundation. Its value-added is expected to expand from about RM6.8 billion (US$1.96 billion)[1] to about RM10.3 billion for the 1995 - 2010 period, while its contribution to the sector's value-added is expected to increase from 42% to 46% during the same period.

In 1997, the total production from marine captured fisheries amounted to 1 168 973 t with a wholesale value of RM3 675 billion. The value-added for the fisheries sector is estimated at about RM2 million, which represents about 1.5% of GDP or 11.1% of the agriculture GDP.

Contribution of the Fishing Industry to Income and Employment

There were 88 972 fisherfolk operating in Peninsular Malaysia in 1980 and this number declined to 59 801 in 1990 and then to 50 735 in 1997. This was mainly due to the Government's efforts to prevent over-fishing and to reduce fishing pressure by placing a moratorium on the issue of new fishing licenses for coastal waters. With declining catch and a high incidence of poverty among fishing households, fishers, particularly the younger ones, are attracted to better job opportunities in other sectors.

Table 1. Number of vessels and fishers by states and by types of fishing in 1997.

State	Vessel			Fishers		
	Commercial	Traditional	Total	Commercial	Traditional	Total
West Coast:						
Perlis	297	292	589	3 353	620	3 973
Kedah	534	806	1 340	3 173	1 667	4 840
Penang	222	1 296	1 518	827	1 747	2 574
Perak	1 757	2 192	3 949	4 309	2 881	7 190
Selangor	819	1 891	2 710	2 359	3 266	5 625
N.Sembilan	1	197	198	1	301	302
Malacca	3	729	732	3	967	970
W. Johore	268	3 068	3 336	675	4 109	4 781
Sub-total	3 901	10 471	14 372	14 700	15 558	30 258

[1] 1 US$ = 3.46 Ringgit Malaysia, average from 1995 - 2003

Table 1. Number of vessels and fishers by states and by types of fishing in 1997. (continued)

State	Vessel			Fishers		
	Commercial	Traditional	Total	Commercial	Traditional	Total
East Coast:						
Kelantan	186	882	1 068	2 160	1 673	3 833
Terengganu	538	1 681	2 219	5 259	3 119	8 378
Pahang	386	739	1 125	2 380	1 330	3 710
E. Johore	310	271	1 581	2 076	2 480	4 556
Sub-total	1 420	4 573	5 993	11 875	8 602	20 477
TOTAL	5 321	15 044	20 365	26 575	24 160	50 735

Source: Department of Fisheries (DOF) 1971 - 97.

Of the total number of 50 735 fishers in Peninsular Malaysia in 1997, 60% were operating on the west coast (Table 1). More than half (52%) were involved in commercial fishing. The state of Johore has the highest number of fishers with 9 340, followed by Terengganu and Perak with 8 378 and 7 190 respectively.

Contribution of the Fisheries Sector to Foreign Exchange Earnings

In 1995, Malaysia was a net importer of fish in terms of quantity but a net exporter in value terms due to the export of high value fish and fish products. The import of fish and fish products increased from 200 700 t valued at RM363.6 million in 1990 to 230 000 t valued at RM762.4 million in 1995. During the same period exports increased from 145 400 t valued at RM606.1 million to 185 200 t valued at RM807.4 million. However, in 1997, Malaysia was a net importer of fish in terms of both quantity and value, exporting about 107 600 t of fish and fish products valued at RM939.6 million, and importing some 297 800 t valued at RM979.2 million.

Contribution of the Fisheries Sector to Domestic Nutrition

From the early 1960s to the mid-1980s, fish formed about 60% of the total animal protein consumed (Table 2), a rate much higher than in other Asian countries. From 1960 to 1989, the mean per capita consumption of fish was about 23 kg per annum. It is expected to increase to 56 kg per annum in 2010 (Table 3), in line with changing consumer preferences for fish and fish products as health food. Fish is popular because it is the cheapest and most accessible form of protein acceptable to all ethnic groups of the multiracial population (Ishak 1994).

Contribution of the Fisheries Sector to National Food Security.

The total demand for fish and fish products was about 809 300 t in 1995. Out of the total national production, consumable supply was estimated at about 764 500 t, which is equivalent to a self-sufficiency level of 94.5%.

The country has the potential and the necessary resources to further increase supply to meet domestic and export demand. The annual demand for fish and fish products by 2010 is estimated to be 1.59 million t (Table 4).

Table 2. Per capita annual consumption of various types of protein from 1960 to 1989.

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

Source: Department of Statistics 1985 - 2000.

Table 3: Production and demand for fish in Malaysia from 1985 to 2010.

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

Source: Ministry of Agriculture 2000.

Table 4. Production and demand for fish 1985 - 95 and forecast of production and demand, 2000 to 2010.

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

Source: Ministry of Agriculture 2000.

Socioeconomic Analysis of the Small Scale Fishery Sector

The study on the socioeconomic profile of the fishing community was confined to Peninsular Malaysia, and was obtained mainly from Annual Fisheries Statistics published by the Department of Fisheries (DOF), and various socioeconomic studies conducted by DOF and the Fisheries Development Authority (FDA). Most of the information was based on a Socioeconomic survey of fishers conducted by FDA in 1995; a follow-up of a similar survey carried out by FDA in 1982.

The survey conducted by FDA in 1995 covered all categories of fisherfolk in Malaysia, and both commercial and traditional fishing. Trawl nets, fish purse seines, shrimp trawl nets and anchovy purse seines were classified as commercial gear while drift nets and other traditional gear such as hook-and-lines, traps and lift nets were classified as non-commercial.

The number of fishers surveyed in Peninsular Malaysia was 24 949, representing about 45% of the total fisher population of 55 002 in Peninsular Malaysia. Of the total number surveyed, 15 611 or 63% were traditional while the rest were commercial fishers (Table 5). About 65% of the respondents, 16 124, were heads of households. Among the heads of household surveyed, 78% were involved in traditional fishing. The survey also involved 4 537 foreign fishers (or 18% of the total respondents) the majority (93%) of which were involved in commercial fishing. The number of vessels surveyed was 11 893, about 52% of the total number of 22 982 vessels operating in Peninsular Malaysia.

Table 5. Number of sample respondents by states, by types of fishing and by nationality in Peninsular Malaysia, 1995.

State	Commercial			Traditional			Total
	Malaysian	Non-Malaysian	Sub-total	Malaysian	Non-Malaysian	Sub-total	
West Coast:							
Perlis	64	1 397	1 461	243	195	438	1 899
Kedah	572	834	1 406	1 283	16	1 299	2 705
Penang	194	3	197	1 456	–	1 456	1 653
Perak	890	–	890	2 821	–	2 821	3 711
Selangor	434	2	436	1 627	6	1 633	2 069
N.Sembilan	–	–	0	119	–	119	119
Malacca	–	–	0	691	38	729	729
W. Johore	169	7	176	2 278	5	2 283	2 459
Sub-total	2 323	2 243	4 566	10 518	260	10 778	15 344
East Coast:							
Kelantan	360	402	762	1 259	24	1 283	2 045
Terengganu	1 167	1 008	2 175	1 258	2	1 260	3 435
Pahang	622	330	952	834	4	838	1 790
E. Johor	638	245	883	1 433	19	1 452	2 335
Sub-total	2 787	1 985	4 772	4 784	49	4 833	9 605
TOTAL	5 110	4 228	9 338	15 302	309	15 611	24 949

Source: Fisheries Development Authority (FDA) 1995.

Educational Level of Fisherfolk

The majority (66%) of the fishers surveyed received only primary education (Table 6). About 11% of the fishers did not receive any formal schooling. The percentage of fisherfolk who received lower secondary education was about 22%. Hardly 1% of the fishers surveyed had higher secondary or tertiary education.

Occupational Status of Fishers

The occupational status of fisherfolk can be broadly classified into four categories namely skipper, owner, owner-operator and fishing crew. The skipper (captain of the vessel) makes decisions regarding the fishing operation. Skippers are either employed by owners of vessels or they can be owners themselves. A *towke* is a vessel-owner who does not go out to fish but either hires other fishers to operate his vessel, or allows other fisherfolk to operate his vessel with attached conditions. An owner can also be a fish wholesaler or fish merchant. Crew members are workers in the fishing units and are mainly unskilled.

Of the total 9 338 commercial fishers surveyed, about 82% were crew members (Table 7). Owner-operators (i.e. owner-cum-skippers) represented about 10% while skippers and owners formed about 5% and 2% of the total surveyed respectively.

In traditional fishing, the majority of the fishers (57%) were owner-operators. This was mainly due to a condition of the license, which requires traditional fishing to be operated by owners only. However, a small number (about 3%) of owners allowed their vessels to be operated by their children or relatives.

Table 6. Number of fishers by states, by types of fishing and by education levels in Peninsular Malaysia, 1995.

State	Commercial					Traditional					Total
	No Formal	Primary	Lower Secondary	Higher Secondary	Tertiary	No Formal	Primary	Lower Secondary	Higher Secondary	Tertiary	
West Coast:											
Perlis	4	34	26	3	–	23	133	77	2	1	303
Kedah	16	348	163	1	1	119	903	240	7	2	1 800
Penang	6	144	41	1	–	65	1 067	316	2	1	1 643
Perak	73	695	118	1	–	228	2 204	370	13	1	3 703
Selangor	32	245	156	–	–	193	965	458	9	–	2 058
N. Sembilan	-	-	–	–	–	10	61	44	4	–	119
Malacca	-	-	–	–	–	38	481	195	5	–	719
W. Johore	11	118	43	1	–	266	1 424	530	5	2	2 400
Sub-Total	142	1 584	547	7	1	942	7 238	2 230	47	7	12 745
East Coast:											
Kelantan	42	176	139	1	2	289	661	198	10	–	1 618
Terengganu	135	691	339	21	5	223	812	212	7	–	2 445
Pahang	32	263	178	1	–	76	496	186	1	–	1 233
E. Johore	37	258	89	–	1	156	914	233	5	–	1 693
Sub-Total	246	1 388	745	23	8	844	2 883	829	23	–	6 989
TOTAL	388	2 972	1 292	30	9	1 786	3 059	70	70	7	19 734

Source: Fisheries Development Authority (FDA) 1995.

Table 7. Number of fishers by state, by type of fishing and by occupational status in Peninsular Malaysia, 1995.

State	Commercial					Traditional					Total
	Skipper	Owner	Diver	Owner Operator	Fishing Crew	Skipper	Owner	Diver	Owner Operator	Fishing Crew	
West Coast:											
Perlis	7	52	–	9	1 393	11	50	–	89	288	1 899
Kedah	36	19	–	22	1 329	178	44	–	594	483	2 705
Penang	16	11	1	20	149	24	8	–	991	433	1 653
Perak	127	14	–	297	452	175	35	–	1 619	992	3 711
Selangor	24	15	–	281	116	115	85	–	1 152	281	2 069
N. Sembilan	–	–	–	–	-	3	3	–	86	27	119
Malacca	–	–	–	–	-	44	5	–	459	221	729
W. Johore	11	3	-	75	87	28	20	–	1 975	260	2 459
Sub-Total	221	114	1	707	3 526	578	250	–	6 965	2985	15 344
East Coast:											
Kelantan	24	6	2	24	706	132	26	198	502	621	2 045
Terengganu	27	46	339	126	1 863	191	48	212	424	597	3 435
Pahang	71	5	178	61	815	107	4	186	343	384	1 790
E. Johore	53	25	89	28	766	74	91	233	694	593	2 335
Sub-Total	275	82	745	239	4 150	504	169	829	1 963	2 195	9 605
TOTAL	496	196	1 292	943	7 676	1 082	419	70	8 928	5 180	24 949

Source: Fisheries Development Authority (FDA) 1995.

Fishing Experience of Fisherfolk

Skippers generally have more than 20 years of fishing experience. In commercial fishing, about 40% of the skippers have more than 20 years experience while in traditional fishing, the percentage is higher, about 47% in 1995. (Table 8).

Dependency Ratio of Fishing Households

The ratio of non-working to working members was higher in the commercial fishing household (1.9:1) than in the traditional fishing household (1.5:1) (Table 9). The non-working members in the family were mainly children below 18 years of age, spouses of fishers and their aged parents or relatives.

Income of Fishers from Fishing

The average monthly income from fishing in 1995 was RM766 (Table 10). In general, fishers on the west coast received a higher monthly fishing income (RM840) than those on the east coast (RM663). On the average, the monthly fishing income of commercial fishers (RM976) was about 67% higher than that of the traditional fishers (RM583). In both categories owners received the highest income, followed by owner-operators. Skippers of commercial fishing vessels received an average income of RM1 089 per month while those in traditional fishing received only about half that (RM571). Commercial fishing crew received slightly higher average monthly incomes (RM515) than those in traditional fishing (RM431).

Table 8. Number of skippers by state, by type of fishing and by years of fishing experience in Peninsular Malaysia.

State	Commercial					Traditional					Total
	< 5	6 - 10	11 - 15	16 - 20	> 21	< 5	6 - 10	11 - 15	16 - 20	> 21	
West Coast:											
Perlis	4	11	10	5	33	4	27	21	31	67	150
Kedah	4	7	8	21	37	38	82	98	169	408	795
Penang	1	1	4	5	28	30	139	122	206	519	1 016
Perak	15	62	70	108	175	84	261	262	364	840	1 811
Selangor	21	66	73	92	67	124	297	246	299	378	1 344
N. Sembilan	–	–	–	–	–	6	5	21	21	38	91
Malacca	–	–	–	–	–	39	83	67	83	233	505
W. Johore	5	23	23	23	14	102	334	325	445	814	2 020
Sub-Total	50	170	188	254	354	578	1 228	1 162	1618	3 297	7 732
East Coast:											
Kelantan	1	6	6	8	22	132	63	69	116	370	648
Terengganu	15	28	28	48	157	191	41	54	100	421	640
Pahang	2	11	21	34	54	107	49	51	92	245	452
E. Johore	-	17	19	21	34	74	95	93	135	465	817
Sub-Total	18	62	74	111	267	504	248	267	443	1 501	2 557
TOTAL	68	232	262	365	621	1 082	1 476	1 429	2 061	4 798	10 289

Source: Fisheries Development Authority (FDA) 1995.

Table 9. Dependency ratios of fishing households by state and by type of fishing in Peninsular Malaysia, 1995.

	West Coast			East Coast	
	Commercial	Traditional		Commercial	Traditional
Perlis	1.4	1.4	Kelantan	2.4	1.8
Kedah	1.8	1.7	Terengganu	2.2	1.8
Penang	0.9	1.0	Pahang	1.8	1.6
Perak	1.9	1.8	E. Johore	2.0	1.6
Selangor	1.7	1.4			
N. Sembilan	–	1.2			
Malacca	–	1.3			
W. Johore	1.7	1.4			
Overall	1.7	1.5		1.9	1.5

Income of Fishing Households

Fishing household income is defined as the total income of head of household from fishing and other sources plus any other income in the household. The average monthly income of fishing households in 1995 was RM1 260 with income on the west coast (RM1 406) higher than that on the east coast (RM1 051) (Table 11). The average monthly income of commercial fishing households was higher at RM1 416, than traditional fishing households at RM1 126. Vessel-owners' households in both categories had the highest income followed by households of owner-operators. For both types of fishing, households of crew members had the lowest average monthly income at RM833 for commercial fishing and RM826 for traditional fishing.

Assessment of the Linkages of the Small Scale Fishery Sector to Other Productive Sectors

About 30% of fish production is processed. The main products include chilled, frozen and canned fish, surimi and surimi-based products, and dehydrated and fermented fish products. The processing industry is dominated by small and medium-scale enterprises (SMEs). The fishing industry is also linked to other industries such as plastic products, paper products, printing, machinery and equipment, wholesale and retail trade and business services. It also has significant linkages with the transport sector in terms of input supplies as well as distribution of fish and fish products.

Table 10. Average monthly fishing income (in RM) of heads of households by state, by type of fishing and by occupational status in Peninsular Malaysia, 1995.

State	Commercial					Traditional					Total
	Skipper	Owner	Owner Operator	Fishing Crew	Diver	Skipper	Owner	Owner Operator	Fishing Crew	Diver	
West Coast:											
Perlis	3 800	4 551	3 100	350	–	547	1 897	573	446	–	3 358
Kedah	1 031	4 533	1 089	450	–	461	457	454	381	–	559
Penang	1 643	3 209	2 391	809	–	848	764	790	611	–	890
Perak	1 132	1 256	1 343	660	–	738	802	736	534	–	861
Selangor	1 123	961	1 268	646	–	681	751	746	478	–	889
N. Sembilan	–	–	–	–	–	500	1 133	1 092	487	–	962
Malacca	–	–	–	–	–	454	675	488	393	–	464
W. Johore	1 103	1 549	2 178	661	–	764	551	625	548	–	742
Sub-Total	1 178	3 630	1 451	591	–	618	957	674	498	–	840
East Coast:											
Kelantan	560	4 225	2 205	405	–	402	414	397	301	266	510
Terengganu	884	3 254	2 232	365	1 349	525	627	543	337	–	663
Pahang	1 131	4 720	1 088	554	–	605	504	579	386	–	673
E. Johore	1 391	2 224	3 273	681	600	589	590	528	418	–	780
Sub-Total	1 009	3 118	2 053	460	1 118	517	570	506	351	266	663
TOTAL	1 089	3 399	1 617	515	1 222	571	765	635	431	266	766

Source: Fisheries Development Authority (FDA) 1995.

Table 11. Average monthly income (RM) of fishing households by state, by type of fishing and by occupational status in Peninsular Malaysia, 1995.

State	Commercial					Traditional					Total
	Skipper	Owner	Owner Operator	Fishing Crew	Diver	Skipper	Owner	Owner Operator	Fishing Crew	Diver	
West Coast:											
Perlis	6 925	5 858	4 113	410	–	941	2 460	1 166	860	–	4 458
Kedah	1 219	6 865	1 568	643	–	817	1 070	849	655	–	883
Penang	2 901	6 536	3 689	1 686	–	1 771	1 804	1 756	1 320	–	1 860
Perak	1 588	2 989	1 806	1 023	–	1 087	1 468	1 173	889	–	1 285
Selangor	1 725	1 452	1 851	1 443	–	1 216	1 727	1 326	1 244	–	1 504
N. Sembilan	–	–	–	–	–	1 260	3 230	2 244	936	–	1 997
Malacca	–	–	–	–	–	1 226	1 320	1 296	1 062	–	1 236
W. Johore	1 532	2 744	2 691	1 182	–	1 287	1 673	1 314	961	–	1 390
Sub-average	1 682	5 299	1 996	986	–	1 074	1 745	1 312	964	–	1 406
East Coast:											
Kelantan	949	10 983	2 626	610	–	785	730	795	563	846	881
Terengganu	1 265	3 834	2 720	621	1 533	965	1 112	1 058	675	–	1 029
Pahang	1 536	5 326	1 708	853	–	1 132	1 711	1 142	706	–	1 080
E. Johore	1 768	3 386	3 820	997	1 070	973	1 631	1 021	763	–	1 232
Sub-average	1 395	4 354	2 575	1 391	1 391	951	1 324	991	663	846	1 051
Overall average	1 532	4 874	2 156	1 391	1 391	1 017	1 569	1 238	826	846	1 260

Source: Fisheries Development Authority (FDA) 1995.

Involvement of Fishers in Other Economic Activities

Besides fishing, a small percentage of fishers were involved in other economic activities. Of the total number surveyed who were heads of household, 5.9% were involved in farming, 5.4% in contract work, 3.5% in retailing (i.e. operating sundry shops) and 2.3% in tourism (Table 12). Only 1.6% were involved in fish processing while 1.2% were involved in aquaculture.

Some 6.9% of the traditional fisherfolk surveyed were involved in farming and 6.4% were involved in contract works, compared to commercial fishers with 2.2% and 1.6% in farming and contract works respectively. However, the participation of commercial fishers in fish processing was slightly higher at 2.2% compared to traditional fishers at 1.4%.

Returns From Other Economic Activities

Among the other economic activities carried out by fishers, aquaculture provided the highest additional income in 1995 for both the commercial and traditional fishing population at RM590 and RM438 per month respectively (Table 13). Fish processing provided a monthly return of RM291 for the commercial fishers and RM156 for the traditional fishers. Farming, which was the most important side occupation of the traditional fishing population, gave a return of RM191 per month to these fishers.

Table 12. Percentage of heads of fishing households who were involved in other economic activities by type of fishing and by area in Peninsular Malaysia, 1995.

Area	Aqua-culture	Fish Processing	Farming	Animal husbandry	Tourism	Carpentry	Repairing (w/shop)	Contract Works	Retailing
Commercial:									
west	0.2	1.6	1.2	0.1	0.6	0.2	0.3	1.1	2.2
east	0.1	2.8	3.2	0.4	0.3	0.6	2.5	2.1	2.8
Sub-average	0.1	2.2	2.2	0.2	0.4	0.4	1.4	1.6	2.5
Traditional:									
west	2.0	1.0	7.5	0.3	1.9	1.0	0.4	7.5	3.3
east	0.3	2.2	5.7	0.7	5.0	1.1	0.9	4.1	4.7
Sub-average	1.5	1.4	6.9	0.4	2.8	1.0	0.6	6.4	3.7
Overall	1.2	1.6	5.9	0.4	2.3	0.9	0.8	5.4	3.5

Table 13. Average monthly additional income in RM of heads of households from other economic activities by state and by type of fishing in Peninsular Malaysia, 1995.

State	Commercial					Traditional				
	Aqua-culture	Fish Processing	Farming	Animal husbandry	Tourism	Aqua-culture	Fish Processing	Farming	Animal husbandry	Tourism
West Coast:										
Perlis	4	34	26	3	–	23	133	77	2	1
Kedah	16	348	163	1	1	119	903	240	7	2
Penang	6	144	41	1	–	65	1 067	316	2	1
Pera	73	695	118	1	–	228	2 204	370	13	1
Selangor	32	245	156	–	–	193	965	458	9	–
N. Sembilan	–	–	–	–	–	10	61	44	4	–
Malacca	–	–	–	–	–	38	481	195	5	–
W. Johore	11	118	43	1	–	266	1 424	530	5	2
Sub-Total	142	1 584	547	7	1	942	7 238	2 230	47	7
East Coast:										
Kelantan	42	176	139	1	2	289	661	198	10	–
Terengganu	135	691	339	21	5	223	812	212	7	–
Pahang	32	263	178	1	–	76	496	186	1	–
Pahang	32	263	178	1	–	76	496	186	1	–
E. Johore	37	258	89	–	1	156	914	233	5	–
Sub-Total	246	1 388	745	23	8	844	2 883	829	23	–
TOTAL	388	2 972	1 292	30	9	1 786	3 059	70	70	7

Demography, Labor Mobility and Other Transitions Gender Distribution

The survey conducted by FDA in 1995 found that almost all (99.6%) of the respondents were males (Table 14). There were only 92 females (or 0.4% of the total number of respondents) involved in fishing. Most of the females (77%) were concentrated in traditional fishing which does not require much physical strength, while those involved in commercial fishing were mainly vessel owners and did not go to sea.

Table 14. Number of fishers by state, by type of fishing and by gender in Peninsular Malaysia, 1995.

State	Commercial			Traditional			Total
	Male	Female	Sub-Total	Male	Female	Sub-Total	
West Coast:							
Perlis	1 458	3	1 461	434	4	438	1 899
Kedah	1 403	3	1 406	1 290	9	1 299	2 705
Penang	197	–	1 406	1 451	5	1 456	1 653
Perak	887	3	890	2 801	20	2 821	3 711
Selangor	436	–	436	1 627	6	1 633	2 069
N. Sembilan	–	–	0	118	1	119	119
Malacca	–	–	0	728	1	729	729
W. Johore	176	–	176	2 262	21	2 283	2 459
Sub-Total	4 557	9	4 566	10 711	67	10 778	15 344
East Coast:							
Kelantan	761	1	762	1 282	1	1 283	2 045
Terengganu	2 175	–	2 175	1 260	–	1 260	3 435
Pahang	942	10	952	837	1	838	1 790
E. Johore	882	1	883	1 450	2	1 452	2 335
Sub-Total	4 760	12	4 772	4 829	4	4 833	9 605
TOTAL	9 317	21	9 338	15 540	71	15 611	24 949

Source: Fisheries Development Authority (FDA) 1995.

Marital Status of the Fishing Population

About 71% of the fishers surveyed were married (Table 15). The percentage of married fishers was higher for the traditional fishing population (80%) than for the commercial fishing population (57%). This was mainly age-related, as traditional fishers were older than commercial fishers.

Size of Fishing Household

The average size of the traditional fishing household was 5.61 persons while the average number of persons in the commercial fishing household was 5.59 (Table 16). The size of a fishing household was generally larger than the national average of 4.8 persons per household (Department of Statistics 1991). Fishing households on the west coast were smaller than those on the east coast for both categories of fishing.

Table 15. Number of fishers by state, by type of fishing and by marital status in Peninsular Malaysia, 1995.

State	Commercial				Traditional				Total
	Married	Divorce	Single	Sub-Total	Married	Divorce	Single	Sub-Total	
West Coast:									
Perlis	480	13	968	1 461	279	4	155	438	1 899
Kedah	489	11	806	1 406	1 096	23	180	1 299	2 705
Penang	157	1	39	197	1 191	25	240	1 456	1 653
N. Sembilan	–	–	–	0	101	2	16	119	119
Malacca	–	–	–	0	614	18	97	729	729
W. Johore	122	4	50	176	1 880	76	327	2 283	2 459
Sub-Total	2 349	40	2 177	4 566	8 645	196	1 937	10 778	15 344
East Coast:									
Kelantan	422	6	334	762	1 093	24	166	1 283	2 045
Terengganu	1 410	29	736	2 175	1 030	20	210	1 260	3 435
Pahang	589	19	344	952	637	21	180	838	1 790
E. Johore	557	7	319	883	1 097	61	294	1 452	2 335
Sub-Total	2 978	61	1 733	4 772	3 857	126	850	4 833	9 605
TOTAL	5 327	101	3 910	9 338	12 502	322	2 787	15 611	24 949

Source: Fisheries Development Authority (FDA) 1995.

Table 16. Number and average size of fishing households by state and by type of fishing in Peninsular Malaysia, 1995.

State	Commercial		Traditional	
	No. of Household	Average size	No. of Household	Average size
West Coast:				
Perlis	58	5.74	201	5.08
Kedah	426	4.73	1 109	5.38
Penang	160	5.33	1 202	5.50
Perak	717	5.45	2 221	5.57
Selangor	284	5.91	1 272	5.45
N. Sembilan	–	–	106	5.08
Malacca	–	–	615	5.78
W. Johore	117	5.17	1 923	5.38
Sub-Total	1 762	5.33	8 649	5.48
East Coast:				
Kelantan	220	5.92	1 104	6.20
Terengganu	908	6.28	1 070	6.53
Pahang	374	5.46	629	6.00
E. Johore	293	4.92	1 115	5.03
Sub-Total	1 795	5.84	3 918	5.92
TOTAL	3 557	5.59	12 567	5.61

Source: Fisheries Development Authority (FDA) 1995.

Age of Fisherfolk

The study by FDA in 1995 revealed that most (41%) of traditional fishers were in the age group 41 to 55 years (Table 17). As for commercial fishers, more than half (53%) were in the 21 to 40 age group. Most of the young fishers in commercial fishing were crew members whose tasks required little skill or knowledge. The percentage of fishers above 55 years was higher in the traditional fishery (17%) than in the commercial fishery (8%).

Table 17. Number of fishers by state, by type of fishing and by age group in Peninsular Malaysia, 1995.

State	Commercial					Traditional					Total
	< 20	21 - 40	41 - 55	< 55	Sub-Total	< 20	21 - 40	41 - 55	< 55	Sub-Total	
West Coast:											
Perlis	–	18	31	15	64	5	108	93	37	243	307
Kedah	69	291	183	29	572	41	526	512	204	1 283	1 855
Penang	–	70	96	28	194	25	491	676	264	1 456	1 650
Perak	33	429	347	81	890	62	1 303	1 067	389	2 821	3 711
Selangor	22	272	132	8	434	42	786	641	158	1 627	2 061
N. Sembilan	–	–	–	–	0	3	54	50	12	119	119
Malacca	–	–	–	–	0	12	199	285	195	691	691
W. Johore	11	95	49	14	169	14	895	912	457	2 278	2447
Sub-Total	135	1 175	838	175	2 323	204	4 362	4 236	1 716	10 518	12 841
East Coast:											
Kelantan	32	215	91	22	360	23	458	547	231	1 259	1 619
Terengganu	64	579	414	110	1 167	52	428	552	226	1 258	2 425
Pahang	47	343	177	55	622	34	355	316	129	834	1 456
E. Johore	30	396	181	31	638	37	566	550	280	1 433	2 071
Sub-Total	173	1 533	863	218	2 787	146	1 807	1 965	866	4 784	7 571
TOTAL	308	2 708	1 701	393	5110	350	6 169	6 201	2 582	15 302	20 412

Source: Fisheries Development Authority (FDA) 1995.

Conflicts Between Small Scale and Commercial Fisheries

The introduction of trawl gear in the early sixties created serious conflicts between the trawlers and the inshore traditional fishers who felt their livelihood was being threatened (Goh 1976). The trawl fishers were fishing for prawns and bottom dwelling fishes which are more abundant in shallow waters. The traditional fishers using small seines, lift nets, drift nets, trammel nets, bag nets, traps and fish stakes were fishing in the same area. Physical conflicts between them led to the government ban on trawling in early 1964 (Selvadurai and Lai 1977). However, because of the highly profitable nature of fish trawling and the need to increase fish production to meet the growing demand for food, it was impolitic for the government to enforce the ban. The ban was then lifted in October 1964 and methods for better regulation of trawling were considered (Lam and Pathansali 1977). These methods were encapsulated in the Fisheries (Maritime) Amended Regulations 1980. The regulations defined not only the minimum cod-end mesh size for trawl nets of 1.5 inches (38 mm), but also the distance from the shore where trawling is allowed.

Four fishing zones were established to further reduce conflict between the traditional and commercial fishers. Each zone was designated for specific fishing gear, class of vessel and ownership. Waters inside 30 nautical miles (nm) are classified into three fishing zones, namely Zone A, B, and C or C1. Waters beyond 30 nm to the limit of the EEZ are classified as Zone C2. Zone A is less than 5 nm from shore and reserved solely for small scale fishers. They operate traditional fishing gear, using boats of less than 20 gross tonnage (GRT) and must be owner-operated.

Characteristics of the Labor Force In Commercial Fishing

In 1997, the fishing industry directly employed about 79 616 fishers or about 1% of the total labor force in the country. The contribution of the fisheries sector to national employment decreased continuously from 2.4% in 1970 to 2.3% in 1980 and 1.9% in 1990.

Based on a survey conducted by FDA in 1995, about 63% of the fishers in commercial fishing received only primary education. About 8% did not receive any form of formal schooling. The percentage of fishers who received lower secondary education was about 27% and hardly 1% of the fishers attended higher secondary or tertiary education. The poverty rate of commercial fishing households was higher at 10.2% as compared to the traditional fishing households at 7.1%. This figure results from the large percentage of crew members in commercial fishing at 82%, as against traditional fishing with only 33%.

The majority of fishers believed that the local fishing communities should be given exclusive rights over the resources but felt that the government should be the resource manager and law enforcer (Jahara 1993).

Institutional Factors in the Fishery Sector

There are various types of fishers' institutions that are formed by the fishing population themselves. They include the National Fishers' Association (NEKMAT), the State Fishermen Association, the Area Fishermen Associations and Fishermen Cooperatives. To date there are 116 such institutions of which over 60% of the fishers in Malaysia are members. The State and Area Fishermen Associations are also members of the Malaysian Investment Cooperative, which acts as an investment arm that helps promote savings, investment and business through its activities.

Social Implications of Fisheries Policies

The marine capture fisheries is the most important sub-sector as a provider of animal protein food and employment. It has undergone several phases of development and it is believed that Peninsular Malaysian marine capture fisheries have reached their maximum level of exploitation. As modernization has taken place, the proportion of non-powered fishing vessels has decreased. Due to limited fisheries resources, the number of registered fishing vessels has decreased, but the amount of effort is compensated for by technological improvements in fishing. Fishing is a physically demanding job, hence it has been monopolized by people with a low level of education, and it gives them a reasonable income.

In Malaysia equity considerations have been given a strong bias in fisheries management policies and strategies (Jahara 1993). This emphasis arises from the socioeconomic inequities that exist between groups of fishers, mainly along racial lines. Such economic inequities are most distinct between Malay and Chinese fisher. While Chinese fishers are relatively wealthy, Malay fishers have remained poor. Therefore, in line with the New Economic Policy, the government has made a serious political commitment to improve the Socioeconomic status of the Malay fishers. This is not being done at the expense of the other fishing communities.

Fleet Operational Dynamics

The State of the Fishing Fleet

The fishing fleet in Malaysia can be categorized into commercial and traditional fleets. The commercial fleet practices fishing with trawl and purse seine. The traditional fleet is comprised of vessels using a variety of traditional gear, of which the drift/gillnet is the dominant. Besides being classified by type of gear, the commercial and traditional fishing fleets in Malaysia are generally differentiated through size of vessels and the use of technology on board. From 1980 to 1997, a steady decrease in the number of licensed fishing vessels was recorded on the West Coast of Peninsular Malaysia (Department of Fisheries (DOF) 1971 - 97). Of the large scale or commercial fishing vessels, trawlers made up the largest number, ranging from 3 000 to 4 000 units. The largest number of small scale vessels was the drift-netters, their numbers ranging from 11 000 to 18 000 units of powered and non-powered vessels (Table 18).

Commercial fishing vessels are generally larger than 25 GRT (Gross Registered Tonnage). Licensed vessels average 45 GRT, but of those estimated to be in operation, there is a large number of trawlers in the 10 - 24.9 GRT category. Most commercial fishing vessels perform daily fishing trips but there

are increasing numbers of larger vessels that fish for up to a week or 10 days.

Commercial fishing vessels are only allowed to operate beyond 5 nm from shore in Zones B (5 - 12 nm), C (12 - 30 nm) and C2 (> 30 nm), with the exception of the anchovy purse seine which can fish in Zone A (0 - 5 nm). In addition commercial fishing vessels, > 40 GRT must fish in Zone C and beyond. Larger sized vessels in the commercial category catch mainly finfish further offshore, while the smaller of these vessels target shrimps in fishing grounds nearer shore.

Licensed traditional fishing vessels average 5 GRT but it is estimated that most vessels in operation are generally less than 15 GRT. There is a proportion of traditional fishing vessels that still use outboard engines of varying capacity. Fishing vessels operating traditional fishing gear are allowed to fish in Zone A. Most of these operate trammel nets targeting shrimps. There are some drift nets targeting the more valuable finfish. Besides these, there are several varieties of gear for specific and mixed species. Fishing trips are only day trips, with the exception of some portable fish trap operators who fish further away from shore and remain at sea for up to a week.

Another basic difference between the commercial and traditional fishery is the level of capital input and technology. The commercial fishery presently operates large fishing nets with the aid of power blocks, net haulers and net drums as well as sophisticated fish detecting equipment such as fish finders, echo-sounders and sonar. They also use modern navigational equipment such as the GPS (Geographic Positioning System) and are fitted with RSW (Refrigerated Sea Water) systems to maintain the quality of their catch. Engine capacities average 180 HP for commercial fishing vessels and 18 HP for traditional fishing vessels.

Commercial fishing vessels can operate throughout the year on the West Coast of Peninsular Malaysia but there is generally a slow-down in activities of the purse seine during the northeast monsoon season from November to February/March.

Most of the traditional or small scale vessels are not fitted with RSW, however some do use portable echo-sounders and GPS. Fishing nets are mostly handled manually but some drift netters use net haulers. The operation of traditional fishing vessels is usually tide-dependent, therefore they operate around 10 - 20 days per month. There is usually no fishing during inclement weather.

Table 18. Number of licensed fishing vessels in the commercial and traditional fishery on the West Coast of Peninsular Malaysia, 1980 - 97.

Year	Commercial	Traditional	Total
1980	3 975	18 051	22 026
1981	3 943	17 849	21 792
1982	3 908	15 695	19 603
1983	3 758	13 936	17 694
1984	3 539	14 515	18 054
1985	3 236	13 273	16 509
1986	3 146	12 903	16 049
1987	3 104	12 735	15 839
1988	2 948	12 091	15 039
1989	3 360	13 783	17 143
1990	3 294	13 510	16 804
1991	3 229	13 243	16 472
1992	3 077	12 622	15 699
1993	2 773	11 373	14 146
1994	2 605	10 682	13 287
1995	3 198	13 116	16 314
1996	2 844	11 668	14 512
1997	2 785	11 426	14 211

Source: Department of Fisheries (DOF) 1971 - 97.

Table 19. Average catch per unit effort (CPUE) ($t \cdot unit^{-1} \cdot year^{-1}$) by fisheries on the West Coast of Peninsular Malaysia.

Fishery	1996	1997
Trawl < 40 GRT	53.29	56.96
Trawl 40 - 69.9 GRT	211.80	222.77
Trawl > 70 GRT	331.42	286.51
Fish purse seine < 40 GRT	250.61	416.25
Fish purse seine 40 - 69.9 GRT	226.59	199.92
Fish purse seine > 70 GRT	274.73	272.61
Drift net	7.10	6.91

In terms of production, it can be seen from Table 19 that on the West Coast of Peninsular Malaysia, the trawler > 70 GRT lands more fish than the purse seiner of the same category while for vessels < 40 GRT, the purse seiner performs better.

Costs, Earnings and Profitability

This section looks at the cost efficiency of trawlers, purse seiners and drift-netters on the West Coast of Peninsular Malaysia.

Investment Costs

The capital investment for a trawler and purse-seiner between 25 - 69.9 GRT was RM100 000 in 1989 (Kamaruzaman and Lim 1999). The main capital cost incurred is in the engine, the boat hull, gear box, net and accessory equipment.

Cost Structure

The production costs of the large scale and small scale fisheries on the West Coast of Peninsular Malaysia for 1989 are shown in Table 20. Fuel, labor, maintenance, ice (for vessels without RSW) and food for crew constitute the main items in the operating costs.

Earnings and Profitability

The average costs and earnings of trawlers and purse seiners by state on the West Coast of Peninsular Malaysia and size of vessel are given in Table 20. The annual net profit derived from a 25 - 39.9 GRT trawler in 1989 was RM36 520, while that from a 40 - 69.9 GRT trawler was RM43 601. The gross profit for the same categories of trawlers are RM46 393 and RM57 163 respectively. For the purse-seiner a 25 - 39.9 GRT vessel made a net profit of RM40 102 and a gross profit of RM46 950 while a purse-seiner of the 40 - 69.9 GRT category made a net profit of RM63 562 and a gross profit of RM72 686 in 1989.

Table 20 also shows the costs and earnings for drift-nets, a traditional fishing gear on the West Coast of Peninsular Malaysia. An average net profit of RM6 636 and a gross profit of RM7 995 per year were recorded in 1989.

The Sharing System

Although slightly different sharing systems are practiced among the diverse fisheries in several localities on the West Coast of Peninsular Malaysia, basically, there are three main systems based on owner/crew division and commission (Ishak 1994).

For the trawl fishery, catches are divided into shares after deduction of operating costs. The number of shares will have been earlier agreed upon between boat-owners and crew and the shares accorded to the boat-owner and each crew member depends on their relative contributions to capital, skills and responsibilities. For example, on a four-member trawler, there are eight shares. Out of these, 4.75 shares go to the boat-owner, 1.25 shares go to the skipper while the remaining crew members get one share each. If the boat-owner goes to sea himself as the skipper, then he gets a slightly higher share. In terms of percentage of shares, a trawler or purse-seiner owner gets between 20% - 60% of shares (Anonymous 1995).

For a purse-seiner, the share system is more complex in that the first 450 kg of catch go to the crew, consisting of about 14 workers according to their respective shares. This fish is usually sold back to the boat-owner, who does not receive any reward when the catch is < 450 kg. Catches in excess of 450 kg are divided into shares after deduction of operating costs. From a total of 20 shares, the boat-owner requires 5 shares and the remaining 15 shares are distributed to the crew. The skipper receives 1.5 shares, the engine-man 1.25 shares and the rest of the crew receive one share each.

For the operation of the anchovy purse-seiner, each crew member receives a fixed monthly wage, the amount depending on the relative responsibilities and skills. In addition, each crew member will be paid a commission per basket of catch. Again, the amount of commission per basket varies according to responsibilities and skills. The skipper is also awarded a bonus of about 3% of the net value of the catch. Workers who boil anchovies on board are paid fixed wages.

For the traditional or small scale fisheries, catch sharing systems are also practiced. Generally the number of shares, after deduction of operating costs, are agreed upon among the boat-owner, skipper and crew members. Where the boat-owner is also the skipper, then the shares are divided between the boat-owner/skipper and crew. A boat owner receives between 20% - 60% of shares (Anonymous 1995). Certain fisheries are owner-

Table 20. Average costs and earnings in RM of trawlers, purse seiners and drift netters by size of vessel on the West Coast of Peninsular Malaysia in 1989.

	Trawlers*		Purse seiners		
Size of vessel (GRT)	**25 - 39.9**	**40 - 69.9**	**25 - 39.9**	**40 - 69.9**	**Drift-netters**
No. of days per trip	2	2	1	2	1
No. of trips per month	14	15	19	16	17
No. of trips per year	168	180	232	186	204
No. of workers	4	3	14	15	2
Annual Landings:					
Quantity (kg)	173 781	236 936	173 473	386 100	5 765
Value (RM)	186 407	217 392	193 008	403 278	21 095
Annual Operational Costs:					
Fuel (RM)	81 298	76 355	53 789	152 670	3 529
Ice (RM)	8 406	7 400	18 547	34 740	950
Food for workers (RM)	4 639	3 113	7 147	18 840	1 681
Wages (RM)	35 445	64 707	53 260	102 597	3 734
Maintenance cost (RM)	9 606	7 933	12 053	21 100	3 192
Others (RM)	620	721	1 262	645	14
Total (RM)	140 014	160 229	146 058	330 592	13 100
Annual gross earnings (RM)	46 393	57 163	46 950	72 686	7 995
Monthly gross earnings (RM)	3 866	4 764	3 913	6 057	666
Annual depreciation (RM)	9 873	13 562	6 848	9 124	1 359
Annual net earnings (RM)	36 520	43 601	40 102	63 562	6 636

Source: Department of Fisheries (DOF) 1989.
*** These vessels use a (RSW) system**

operated so that the whole catch belongs to the owner-operator.

Cost Efficiency and Cost Effectiveness of Fishing Vessels

This section evaluates the cost efficiency of commercial and traditional fishing gear. Table 21 shows a comparison of the commercial fishing vessels, the trawler is more productive in terms of labor, although production costs are slightly higher than for the purse-seiner. For both the trawl and purse seine fishery, the larger vessels of the 40 - 69.9 GRT category are more efficient than the smaller category of 25 - 39.9 GRT. The capital intensity of the trawl in terms of initial investment per person-day is the highest. The capital intensity for the purse seine fishery is lower than the trawl and close to that of the drift net. This could be explained by the low capital investment of RM100 000 estimated for the purse seine fishery of both categories and the same initial investment estimated for the trawl. The number of crew on board the trawl is four whereas on the purse-seiner there are 14 - 15 workers. For comparison, approximate current fixed costs for the trawler and purse-seiner of the 40 - 69.9 GRT categories are given in Table 22 below. The majority of purse seiners on the West Coast of Peninsular

Table 21. Productivity efficiency indicators of selected fisheries on the West Coast of Peninsular Malaysia.

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

Table 22. Approximate current fixed costs (RM) by fishery using 40-69.9 GRT vessels.

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

*** Mainly fishing and navigation equipment.**

Malaysia are now of the 40 - 69.9 GRT category. Capital investment can vary considerably depending on the sophistication of equipment used.

The drift net as a small scale gear is the most cost-effective, although production effectiveness per variable cost is the lowest. This benefit can probably be explained by the small quantities of high-valued catch.

By-catch

Before the intensification of coastal mariculture activities, a significant portion of by-catch from commercial fishing vessels was discarded at sea and usually only the by-catch from the last haul was brought ashore and landed. In the late 1970s, fishing vessels in Malaysia began installing RSW on board their vessels. This has improved storage on board, thereby enabling nearly all by-catch to be kept and sold in port especially during lean fishing seasons.

Aquaculture activities such as the culture of finfish and fattening of crabs in floating cages, depend on trash fish for their feed. In addition to fishmeal, certain species of fish are selected for processing. Traditionally, croakers are salted and dried. Since the early 1980s, mullids have been selected for making barbequed fish and snacks. Mantis shrimps and shovel-nosed lobsters formerly discarded are now collected and sold. Many other low valued species like synodontids and bull eye are now collected and processed into fish cakes and surimi-based products (Chee 1997).

Currently, the estimation of by-catch in Malaysian fisheries is based on the quantity of "trash fish" landed. Trawlers land the most by-catch compared to purse seiners and other traditional fishing gear. As by-catch constitutes a certain proportion of small and immature fish of commercial value, research is being conducted to develop more selective fishing gear.

Analysis of Market Structure and Price of Fish

Fish landed by commercial fishing vessels at the landing sites are initially traded at privately owned jetties or LKIM (Fisheries Development Authority) fish landing complexes. The main trading activities are conducted by boat owners, either operators themselves or non-operators, fish-collecting agents for coastal wholesalers, coastal wholesalers, commission agents, retailers, itinerant dealers and a small number of consumers. The bulk of fish consigned by coastal wholesalers is channeled to

wholesalers at inland or terminal markets, which are usually located in the larger towns. From here fish supplies are redistributed to other wholesale centers, retail outlets, institutional buyers like hotels and restaurants and consumers (Ishak 1994).

LKIM is a statutory body established in November 1971 to upgrade the socioeconomic status of fishers, in particular to enhance their incomes and to develop and expand the fishing industry. Through LKIM, the government strives to develop an efficient marketing system so that fishers are able to receive fair and stable returns while consumers are supplied with quality fish at reasonable prices (Megat Muhaiyadin 1995). LKIM now manages 26 fish landing complexes, and has powers of regulation and enforcement over the entire fish marketing system. To ensure an efficient and healthy fish marketing system, LKIM enforces regulations established in 1973 under the Fish Marketing Act, 1971. Besides providing for the designation of a fish marketing control area and the management of fish trade within it, these regulations also provide for the licensing of all fish dealers, wholesalers, exporters and importers.

In international fish trade, about 82% of the inflow of fish from Thailand passes through the LKIM fish inspection complex at Bukit Kayu Hitam. These fish are widely distributed to the large wholesale centers in Peninsular Malaysia. One-third of the fish supply in the Kuala Lumpur market is estimated to be from Thailand. Most of the fresh fish are exported to Singapore. These originate mainly from the east coasting landing complexes of Kuala Sedili and Mersing in Johore.

The factors that influence the price of fish in the wholesale market are freshness and quality, volume of fish in the market, time of day, monsoon season and the price level of the previous day. For the wholesale operation, prices for species are scouted around, usually from large wholesalers, to establish the initial price. Price formation and adjustments in the market are rapid and less than about 10% of fish are left unsold. Retailers buying at the wholesale markets usually patronize their regular wholesalers and varying price levels and bargaining are communicated through the use of hand signals as codes. Auctioning was not reported in the Ipoh and Kuala Lumpur wholesale markets (Ishak 1994).

Implications for Fishery Management

The inshore fisheries resources on the West Coast of Peninsular Malaysia are generally maximally exploited and a few fisheries, such as the inshore demersal fisheries, are over-exploited.

Over the years the total amount of commercial fishing gear estimated to be in operation has decreased. This decline is mainly due to a decrease in the number of smaller vessels. The number of larger vessels of the 70 GRT category has increased.

The increased efficiency and power of fishing vessels, through the use of new technology and larger nets coupled with larger engine capacities, has tremendously increased the overall fishing effort. While the number of vessels and fishing gear licensed can be strictly enforced and monitored, the actual effective fishing effort exerted is difficult to estimate and enforce. In particular, the actual HP of engines cannot be determined since most fishing vessels use converted engines from lorries and buses for their vessels. This has resulted in difficulties in the use of specific models for assessment, and hence insufficient scientific support for formulation of fisheries management measures. The assessment of effective fishing effort, fishing power and population abundance are further complicated by the multi-species and the multi-gear nature of tropical fisheries.

The trawl is more productive than the purse-seine although the production costs and capital intensity are higher (Table 21). This leads to an increase in the number of trawlers. Trawlers are less demanding in terms of labor, since four persons can operate a large 40 - 69.9 GRT category trawler, but a purse-seiner of the same size requires a minimum of 14 crew to operate the net. Labor is a problem in the west coast commercial fisheries and only a certain percentage of approved foreign labor is allowed. In the long term, there will probably be a continuous decline in the number of purse seiners because of the relatively high capital and operating costs. Technical modifications are also continuously being made to the trawls, so that they are now larger, have very high mouth openings, and are used on boats with high engine capacities. Trawlers now catch substantial proportions of pelagic fish in addition to their catch of demersal finfish, which gives rise to interaction between trawlers and purse seiners in the commercial fishery

The number of drift nets estimated to be in operation has increased although the number licensed has decreased. This is probably due to the low capital investment, low labor requirement and cost effectiveness of this gear. With good returns supported by the relatively good catches, the number of drift-netters is expected to further increase. This will lead to new entrants, and further improvement in nets and equipment will lead to over-capacity. There is a need to maintain the drift net fishery at a traditional level if this fishery is to provide job opportunities and food for traditional fishers. In addition, the problem of this gear and commercial gear fishing the same resources in the same limited fishing grounds has to be considered in relation to sustainability.

The prevalence of traditional small scale fisheries as opposed to commercial large scale fisheries in Malaysia has provided managers with a great challenge to achieve the objectives of sustainability of resources and the provision of food and employment. The demand for fish is expected to increase with increasing population. Further demand is expected from the increasing awareness of fish as a health food. Resources from capture fisheries are not infinite, and have to be rationally exploited to ensure their sustainability. Aquaculture is expected to meet the shortage in supply for fish. However, current practices that use trash fish as feed should be replaced by alternatives based on the use of formulated feeds. Efforts must be urgently focused on this area to supply feed to the aquaculture industry.

Two fundamental policy questions face fisheries on the West Coast of Peninsular Malaysia:

1. how to reduce over-fishing of the inshore areas and induce a recovery of the west coast's demersal fisheries resources without reducing fishery production and employment;

2. how best to utilize the west coast's offshore vessels and their technological advantages.

This is a difficult task for the fishery that deals with multi-species and multi-gear fishing activities and makes it difficult to define the target species for the existing fisheries. It is difficult to think of management interventions that will not involve curtailment of fisheries production, employment and increased conflicts, at least in the short-run.

Increased catches can be taken by increased fishing of some of the unexploited stock. The long-term prosperity of the fisheries depends on any expansion of fishing being selectively applied and combined with control of the amount of fishing of the more heavily exploited stocks. This selectivity might be achieved in terms of fishing area (distance offshore, water depth), general type of fishing gear, or the modification of specific fishing gear (e.g. control of mesh-size used by trawlers, use of high opening nets). There is a particular problem regarding the inter-relationship between shrimp and fish. The bulk of demersal fish of the west coast fishery resources are taken by trawlers but the main financial return for the trawlers come from shrimp. As the catch rates of demersal fish have fallen because of increased fishing, the west coast trawlers have concentrated on the shrimps in the shallow and inshore areas. Substantially larger mesh size than those currently used (say an increase of more than 40 mm) would probably benefit the fish stock and lead to greater increase in fish catches but reduce shrimp catches. Similarly, an introduction of high opening trawl nets, a modification of the original trawl, will lead to a substantial increase in pelagic catch (Lui 1992). This will minimize catches of demersal and shrimp resources of the west coast that form the bulk of the fishery.

As evidenced by the National Fisheries Policy and other official statements, the government does perceive these issues and attempts are being made towards the exploration of new areas in the offshore waters. At the same time, the DOF Malaysia will continue to place great importance on maintaining the existing coastal fisheries which are expected to provide the bulk of the marine landings and give employment to a major portion of the fishing labor force. The question is whether the existing legal and policy frameworks are appropriate and sufficient in dealing with these issues especially in the light of budgetary and manpower constraints, and the high enforcement costs. A review of the existing legislation and policy framework is necessary to investigate this question.

Conclusions and Recommendations

It is important that comprehensive studies based on a multi-disciplinary approach of integrating both biology and economic aspects be made for better management of the fisheries resource. Two fundamental policy issues need to be adressed. They are first, how to reduce over-fishing of the inshore

areas and induce a recovery of the west coast's demersal fisheries resources without reducing fishery production and employment and second, how best to utilize the west coast offshore vessels and their technological advantages. Management measures to eliminate competition and ensuing conflict between traditional fishers and inshore trawlers have proved successful. However, enforcement of banning push nets and control on minimum mesh size of 38 mm for cod-ends of otter trawls is still difficult to implement, due to constraints on manpower, facilities, budget and political interference.

Conservation programs will seldom succeed if they do not consider realistic alternatives. Therefore, before introducing any restriction on fishing gear or strictly enforcing regulations to eliminate illegal gear such as push nets, realistic alternative income-generating activities should be provided to the fisherfolk to compensate them for their losses. In view of the limited alternatives available in the fishery-related and non-fishery sectors, one of the options available is to encourage them to use other methods that are less damaging to the resources, such as trammel net fishing. Adnan and Lim (1994) noted that trammel net fishing exhibits good economic performance with the least damaging effect on marine resources.

One way of reducing costs for effective enforcement is to involve local people and stakeholders in the conservation process at all levels and activities. The villagers should be given the right and the authority to manage and look after their local fisheries resources. The local government agencies need to support the village organizations. The government agencies need to actively stop any illegal fishing by other groups who enter the area.

All coastal areas face the threat of devastation and little concerted action is being taken to conserve them. Thus, education and public awareness programs should be available to the stakeholders so as to change attitudes of groups that over-exploit vulnerable resources.

Coordination in the area of optimizing usage of coastal and marine resources should be given emphasis. The use of limited coastal resources should be determined by the developers, planners, policy-makers and scientific personnel that will make well-informed decisions based on scientifically sound methods of resource assessments. Issues arising from conflicts must be resolved.

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