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FISHCODE

MANAGEMENT

SUPPLEMENT TO THE REPORT OF A WORKSHOP ON THE FISHERY AND MANAGEMENT OF SHORT MACKEREL (*RASTRELLIGER* SPP.) ON THE WEST COAST OF PENINSULAR MALAYSIA

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, October 2000

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held in

Penang, Malaysia

4-6 May 1999

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

ROME, OCTOBER 2000

ABSTRACT

The Workshop on the Fishery and Management of Short mackerel (*Rastrelliger* spp.) on the West Coast of Peninsular Malaysia held in Penang (Malaysia), 4-6 May 1999, had a produced a Workshop Report of the FISHCODE Project (GCP/INT/648/NOR) as Field Report F-4. The present report is a supplement to this report and it contains a compilation of papers presented during the Workshop. The papers include the Status of the Kembong Fishery by Chee Phaik-Ean, Management of the Kembong Fishery by Raja M. Noordin Raja Omar, Socio-economic Aspects of the Kembong Fishery by Kamaruzaman and Lim Chai-Fong and four papers presented by fishermen representatives and fishing boat associations from various states in the West Coast of Peninsular Malaysia. A paper on the Process of Developing Fishery Management Plan presented by B. Pollock is also included, although the same paper had already been incorporated in the Workshop Report.

CONTENTS

THE STATUS OF THE *RASTRELLIGER* (KEMBUNG) FISHERY ON THE WEST COAST OF PENINSULAR MALAYSIA

by

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ABSTRACT

Pelagic fish that are harvested by fishermen on the west coast of Peninsular Malaysia totaled 128,930 tonnes or 25% of the total marine landings in that area in 1996. The highest annual landing of pelagic fish so far recorded on the west coast, in 1995, was 159,000 tonnes or 30% of the total marine landings. Despite the intense commercial exploitation of the pelagics, they still remain the backbone of the marine fishery on the west coast of Peninsular Malaysia. Of all small pelagics, the genus *Rastrelliger*, locally called "kembung" is the most important. Pelagic fish used to be caught mainly by fish purseseines but since the mid-seventies the trawl had been catching increasing quantities of these fish. The drift net is the most important traditional gear catching pelagic fish on the west coast of Peninsular Malaysia. This paper looks at the status of the pelagic fishery and its development on the west coast of Peninsular Malaysia. Trends in landings and related changes in species composition and gear dominance are discussed together with the possible reasons effecting these changes. Some recommendations for the management of the pelagic fishery are made. Emphasis is placed on the fishery for *Rastrelliger.*

INTRODUCTION

Pelagic fish harvested by commercial and traditional fishing gear had been contributing approximately 20% to 30% of the total marine landings on the west coast of Peninsular Malaysia. In 1995 pelagic fish landings totaled 159,000 tonnes which was the highest recorded annual landing of pelagic fish since 1965.

Though the pelagic fish resources have been intensely exploited, they remain the backbone of the marine fisheries on the west coast of Peninsular Malaysia. Changes in the exploitation occurred through the introduction of new technology and through the modification of fishing vessels and gear that have led to changes in efficiency of fishing gear catching pelagic fish and the catchability of pelagic fish. These changes have also led to interactions among different fishing gear fishing the same stocks of fish in the same geographical area.

Of all the small pelagic fish, the genus *Rastrelliger,* comprising three species *R. brachysoma, R. kanagurta* and *R. faughni*, is the most important. Although the local name

"kembung" is used loosely to refer to this genus of fish, a finer breakdown splits this genus into "pelaling" (*R. brachysoma*), "kembung" (*R. kanagurta/R. faughni*) and "mabung" (large size *R. kanagurta/R. faughni*).

The highest recorded annual landing of *Rastrelliger* was 101,003 tonnes and this contributed to 63% of the pelagic fish landed in 1995. Second to this, 91,003 tonnes or 79% of the pelagic fish landings were recorded in 1968. Taking the total marine landings on the west coast of Peninsular Malaysia, *Rastrelliger* contributed 19% of 528,818 tonnes in 1995 and 32% of 281,704 tonnes in 1968. This genus supported the purseseine fishery since the early sixties and has remained important until now. In fact *Rastrelliger* is the most dominant commercial food fish on the west coast of Peninsular Malaysia.

This paper looks at the status of the pelagic fishery and follows the developments in the fishing vessels, fishing gear and the pelagic fishery on the west coast of Peninsular Malaysia. Some recommendations for the management of the pelagic fishery are made. Emphasis is placed on the fishery for *Rastrelliger.*

DISTRIBUTION OF PELAGIC FISH

The Malacca Straits is the major fishing ground for fishermen on the west coast of Peninsular Malaysia. Both commercial fishing vessels and boats using traditional fishing gear operate in this area. The deepest area reaching 100m is located in the northwestern part of the Straits; other parts of the Straits are generally shallow and average 40-50m only.

In the Malacca Straits the distribution of small pelagic fish is mainly confined to the northern half, off the States of Perlis, Kedah, Penang, Perak and Selangor (Fig. 1).

Fig. 1: Map of Peninsular Malaysia

The scarcity of small pelagics in the southern half of the Straits is due to the hydrography of the Straits and the physical barrier of the shallow one-fathom bank off the coast of Selangor (Liong, 1974). While small pelagics are available only to fishermen in the north, large pelagic fish like Spanish mackerel and wolfherring, together with threadfins and pomfrets are fished all along the coast.

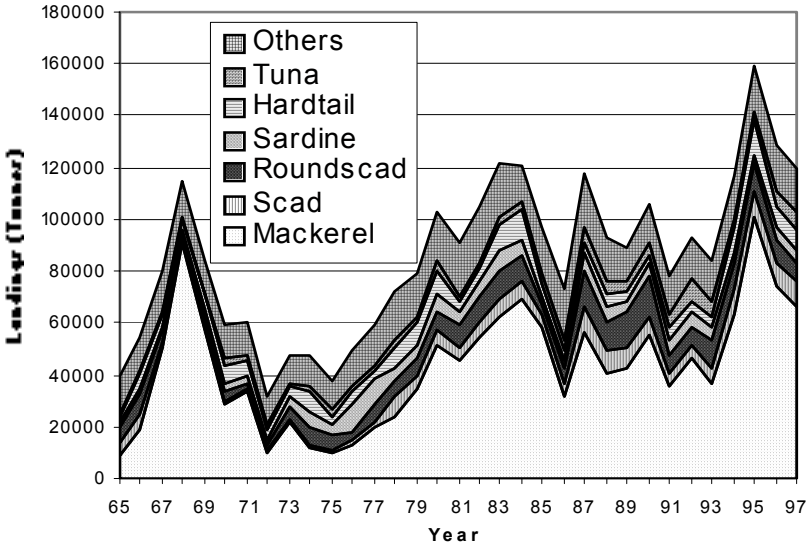
Significant spatial differences in the distribution of pelagic fish schools exist off Peninsular Malaysia where fish school densities are higher in the coastal areas compared to areas further offshore (Aglen *et al*., 1981, Edi Muljadi *et al*., 1984). In as far as *Rastrelliger* is concerned, *R. brachysoma* is distributed in the more coastal near-shore areas while *R. kanagurta* and *R. faughni* are more oceanic.

The fishing season in the Malacca Straits extends throughout the year. However during the period of the northeast monsoon from November to March annually, fishing activity especially of the fish purseseines, is reduced. This period coincides with turbulent sea conditions when pelagic and semi-pelagic fish undertake offshore migration and dispersion (Anon., 1987).

LANDINGS OF PELAGIC FISH

Fig. 2 shows the landings of pelagic fish on the west coast of Peninsular Malaysia. Landings increased from 1965 to 1968 after which there was a steep decline to 31,000 tonnes in 1972. That was the lowest annual production of pelagic fish recorded so far. After 1972 there was a steady increase till 1984. From 1985 till 1993 landings fluctuated between 73,000 tonnes and 118,000 tonnes. The highest total production recorded was in 1995 after which the landings dropped to 120,000 tonnes in 1997.

Figure 2. Landings of pelagic fish on the West Coast of Peninsular Malaysia



Landings of *Rastrelliger*

Rastrelliger as a single genus has been dominating the pelagic fishery and the overall marine fishery on the west coast of Peninsular Malaysia. The contribution by *Rastrelliger* to the total pelagic fish landings ranged from 22% to 68% with the exception of 1968 when it made up 79% of the total pelagic landings.

The highest landing of *Rastrelliger* was recorded in 1995 when 101,000 tonnes were landed. Peak landings were also recorded in 1968 and 1984 when 91,000 tonnes and 69,000 tonnes were recorded. The lowest landings of *Rastrelliger* so far at 10,000 tonnes were recorded in 1972 and 1975 (Fig. 2).

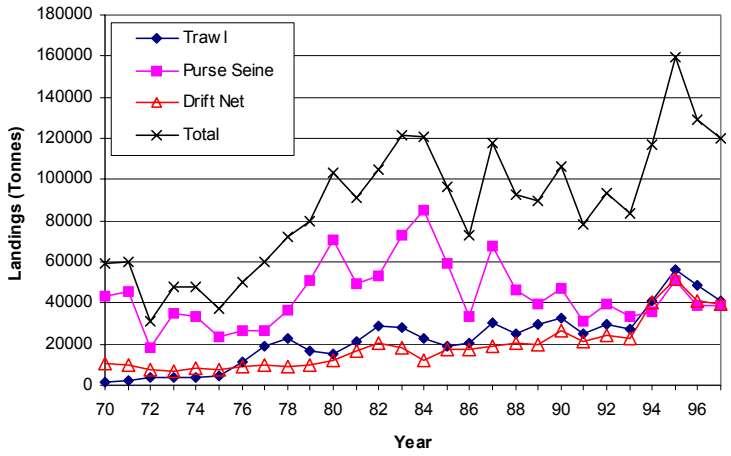
EXPLOITATION OF PELAGIC FISH

The pelagic fishery developed from the use of traditional fishing gear like drift nets operated in near-shore areas to the use of the commercial fish purseseine and trawl. Over the years the exploitation of the pelagic fishery intensified. More efficient fishing gear and larger fishing vessels were used. Fishing grounds also expanded into new and non-traditional areas within the Malaysian Exclusive Economic Zone. In Malaysia the pelagic fishery is most developed on the west coast of Peninsular Malaysia where local fishermen are fast to adopt and adapt new fishing gear and technology into the industry.

Fishing Gear

The main fishing gear for pelagic fish in terms of quantity of fish landed are the fish purseseine, trawl and drift net (Fig. 3). The fish purseseine used to be the dominant commercial fishing gear for pelagic fish until the mid-seventies when the trawl emerged as another commercial gear for fishing pelagic fish. Since the mid-eighties, the drift net became increasingly important. By the mid-nineties all three fishing gear became of equal importance and each contributed to about one-third of the total pelagic fish landings on the west coast of Peninsular Malaysia.

Fig. 3: Landings of pelagic fish by gear on the West Coast of Peninsular Malaysia



The numbers of fishing gear licensed and estimated to be in operation on the west coast of Peninsular Malaysia are shown in Table 1. The total number of licences increased steadily from 1967 till 1981 after which the number decreased. This was in line with the government's policy to reduce total fishing effort on the west coast of Peninsular Malaysia through the implementation of the Fisheries Licensing Policy in 1981.

Fish Purseseine

Around 200 to 400 units of fish purseseines were licensed annually and the same number were estimated to be operating each year from 1978. Prior to 1978, there was no breakdown of seine nets into fish purseseine, anchovy purseseine and other seines in the Annual Fisheries Statistics. After 1978 the classification of fish purseseines was introduced. Fish purseseine licences decreased by 47%, from 411 units in 1981 to 217 units in 1996 (Table 1).

Table 1. Number of fishing gear licensed and estimated to be operating on the West Coast of Peninsular Malaysia

Year	Trawl		All Seines		F. Purseseine		Drift Net		Other Gear		Total	
	Lcnsd	Oprt	Lcnsd	Oprt	Lcnsd	Oprt	Lcnsd	Oprt	Lcnsd	Oprt	Lcnsd	Oprt
1967	180	899	1478	1342			4163	3321	3592	4270	9413	9832
1968	264	1028	1527	1485			4564	3389	3228	3898	9583	9800
1969	367	1396	1694	1879			5240	3472	3303	4498	10604	11245
1970	599	2683	1754	1556			5551	3016	3992	4805	11896	12060
1971	2594	3252	1412	1460			5216	3244	3313	4267	12535	12223
1972	2846	4068	1473	1488			5319	3698	2847	3510	12485	12764
1973	2897	3267	1650	1446			6533	3530	2776	2949	13856	11192
1974	2928	3909	1814	1535			6236	4091	2957	2696	13935	12231
1975	2815	3873	2123	1687			6702	4359	3414	2701	15054	12620
1976	3039	4008	1354	1425			7475	5092	4481	2762	16349	13287
1977	3029	4195	1877	1204			8932	5951	6350	3113	20188	14463
1978	3321	4463	2004	1394	434	195	11012	6968	4646	2814	20983	15639
1979	3316	5112	1909	1542	366	236	12363	7878	4663	3380	22251	17912
1980	3347	5265	2028	1951	421	241	13260	8453	7735	4087	26370	19756
1981	3414	5266	1755	2081	411	301	13394	8525	8183	4751	26746	20623
1982	3365	5257	1726	2133	370	343	11647	8689	9418	5463	26156	21542
1983	3236	5166	929	2046	384	325	11283	9096	6485	5803	21933	22111
1984	3487	5255	1099	1167	390	361	11033	9694	4427	5361	20046	21477
1985	3281	5163	934	2047	364	377	10710	10417	5911	4878	20836	22505
1986	3281	4505	766	1449	329	251	9940	8430	2259	3061	16246	17445
1987	3336	4442	1090	1176	328	320	9371	8402	1745	3078	15542	17098
1988	3257	4547	1251	1105	305	318	8965	8660	1736	2665	15209	16977
1989	3331	4468	1308	1013	287	217	10713	8388	1985	2389	17337	16258
1990	3187	4106	1219	1004	266	202	10728	9446	1864	2143	16998	16699
1991	3224	4599	1196	1020	257	226	10465	9095	1774	2691	16659	17405
1992	3294	4185	1160	948	249	172	9723	9376	1700	2918	15877	17427
1993	3155	3939	1116	845	235	204	8518	10232	1517	3334	14306	18350
1994	3137	3951	1048	883	220	194	7818	10351	1434	3379	13437	18564
1995	3136	3933	1022	871	221	199	10826	10360	1514	3403	16498	18566
1996	3063	4032	934	843	217	189	9289	10716	1390	3713	14676	19304

Note : Lcnsd = licensed; Oprt = operating

Fish purseseines are usually operated off the northern States of Perlis, Kedah, Penang, Perak and Selangor, where the bulk of the catch consists of small pelagic fish and small tuna. In these States, fish purse seining is usually conducted in conjunction with Fish Aggregating Devices (FAD). Spotlights mounted on the fishing vessels are mainly used to aggregate fish. Coconut leaf lures are also used interchangeably with spotlights and fishermen either switch from one to the other or use both FAD in one fishing trip. This enables purseseiners to fish more efficiently at night if in the past they mainly fished in the daytime from the coconut leaf lures. If they fished at night in the past years, fish aggregation was through the use of small carbide or gas lamps placed on small floating platforms in the sea to attract fish. These small lamps were also used to displace fish aggregated from the anchored coconut leaf lures to allow the fish purseseine net to be pursed. Certain groups of fishermen still scout and catch free- swimming schools of pelagic fish on moonless nights in addition to using spotlights to aggregate fish.

Trawl

The number of trawls licensed increased from 180 units in 1967 to 599 units in 1970. From 1970 to 1971 a four-fold increase was registered. The number of trawl licences remained around 3,000 units between 1971 and 1996; the lowest was 2,594 units while the highest was 3,414 units. A decrease of 10% in the number of trawl licences was registered between 1981 and 1996. The number of trawls in operation was generally higher than the number of licences (Table 1). Many trawlers especially small ones fish illegally. The number of trawls in operation increased from 899 units in 1967 to over 5,000 units for the period from 1979 to 1985, after which the number decreased to remain around 4,000 units until 1996.

Two types of trawls are used locally. They are the shrimp trawls that are operated nearer shore and the fish trawls that are operated in deeper water further away from shore. A shrimp trawl is smaller in size and is operated from a smaller fishing vessel when compared to a fish trawl. While shrimp trawls target shrimps, they land fish as bycatch by virtue of the price difference between shrimps and fish. Pelagic fish are caught mainly by fish trawls.

Drift Nets

Drift net licences, including trammel nets, increased from 4,163 units in 1967 to peak at 13,394 units in 1981. In 1996, there were 9,289 drift net licences. While the number of drift net licences decreased from 1981 to 1996 by 31%, the estimated number in operation showed an increase of 20% during the same period (Table 1). Numbers of units in operation remain high since the drift net is not as demanding in capital and operating costs and labour when compared to the fish purseseine or even the trawl.

Drift nets and trammel nets are operated all along the west coast of Peninsular Malaysia and they are the main traditional fishing gear used. Trammel nets target shrimps and land fish as bycatch while fish nets catch mainly pelagic fish. Although it is observed that there may be a larger number of trammel nets that are being used in comparison to drift nets for fish, it is difficult to estimate the actual number of each because fishermen switch gear during specific fishing seasons or during lean fishing periods. A fisherman licensed for a traditional fishing gear is also allowed an additional licence to operate a second traditional gear. In certain fishing communities, modifications have also been made to the drift net in order to target selected species of fish. Net haulers have been installed to handle longer fishing nets.

Off the southern States of Negri Sembilan, Melaka and the west coast of Johor, the main fishing gear for pelagic fish is the drift net. No fish purseseines are used in this area. No trawls are operated off the coasts of Negri Sembilan and Melaka. Trawls that are used off the coast of west Johor fish mainly shrimps.

Fishing Vessels

All commercial fishing vessels i.e. fishing vessels using the fish purseseine and the bottom trawl, on the west coast of Peninsular Malaysia are wooden vessels. Smaller fishing boats, using a variety of traditional fishing gear, are also made of wood but there are some small fibreglass boats as well.

The majority of fishing vessels using the fish purseseine on the west coast of Peninsular Malaysia are larger than 25 Gross Registered Tonnage (GRT) and are from the 40-69.9 GRT category (Annual Fisheries Statistics, 1996). Since the fish purseseine is classified as a commercial fishing gear, it is to be operated in Zone B, the area beyond five nautical miles from shore. The area within the five nautical mile belt that is allocated to traditional fishing gear, is classified as Zone A. As stipulated in the Fisheries Act 1985, fishing vessels larger than 25 GRT using the fish purseseine are required to operate beyond five nautical miles from shore while those larger than 40 GRT are required to operate in Zone C i.e. the area beyond 12 nautical miles from shore. Most fish purseseiners perform daily fishing trips but occasionally remain out at sea for up to 3-4 days. Nearly all fish purseseiners use echo sounders and sonar to aid in searching for fish. Some have also installed sophisticated Geographical Positioning Systems (GPS) to aid in navigation and fishing. All fish purseseiners have Refrigerated Sea Water (RSW) systems in their fish holds onboard to refrigerate their catch.

Fishing vessels operating the trawl off the west coast of Peninsular Malaysia range from small vessels of less than 25 GRT to large vessels of above 70 GRT. However most fish trawlers are from the 25-39.9 GRT and 40-69.9 GRT categories while shrimp trawlers are below 25 GRT or in the 25-40 GRT category. All trawlers are required operate in Zone B or beyond since the trawl is also classified as a commercial fishing gear. Fishing vessels less than 25 GRT and operating the trawl are required to fish in Zone B or beyond, while those larger than 40 GRT are required to fish in Zone C or beyond. Most trawlers perform daily fishing trips, but there are an increasing number of the larger vessels that remain out at sea for up to a week. Fish trawlers usually use fish finders and GPS to aid in fishing. Nearly all trawlers have RSW systems in the fish holds to refrigerate their catch.

There is a large number of small fishing vessels using traditional fishing gear like the drift net to catch pelagic fish on the west coast of Peninsular Malaysia. These vessels are usually below 10 GRT. Some of these vessels have inboard engines while some use outboard engines. The majority of these vessels operate in areas very near to shore. However some drift netters that target the large pelagic fish like Spanish mackerel and wolfherring, do fish in areas beyond Zone A. Some of the larger drift net vessels use portable echosounders and GPS to aid in searching for fish and for navigation.

Trawl

The biggest change in the fishing industry in Malaysia was the introduction of the bottom trawl. Though in the initial stages i.e. in the mid-sixties, this brought about rapid development in the exploitation of demersal fish and shrimps on the west coast of Peninsular Malaysia, the mid-seventies saw the trawl effectively fishing the small pelagics. This was made possible through modification of the bottom trawl. The "high-opening" trawl with a high vertical mouth opening enabled pelagic fish in the water column to be caught together with the demersal species. This resulted in the trawl catching over 30% of the total pelagic fish on the west coast in 1977 (Fig. 4). In 1970 the trawl caught less than 5% of the total pelagic fish on the west coast of Peninsular Malaysia. From 1977 to 1993, the trawl became the second most important gear catching pelagic fish after the fish purseseine.

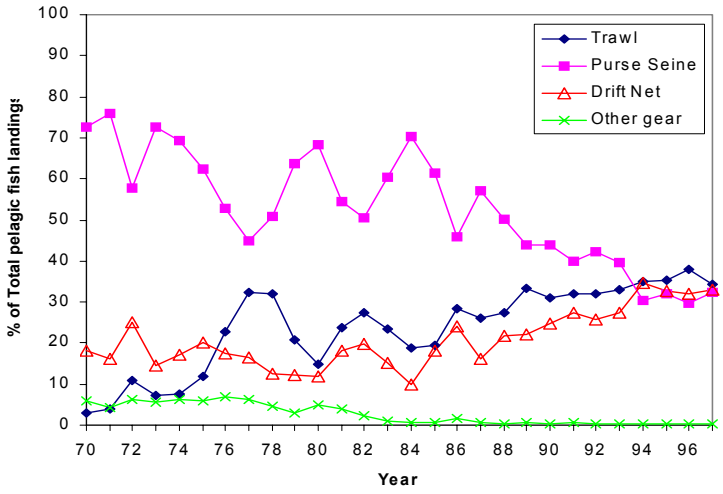
From 1994 onwards, the trawl surpassed the fish purseseine in catching pelagic fish. This period saw further modification of the "high opening" trawl that increased fishing efficiency. While the cod-end mesh size remained at 25mm (one inch), the wing meshes of the "high opening" trawl were increased many-fold. Larger and larger wing meshes had been used and it was recently observed that they could reach a size of 7m (Chen, personal communication). The large trawl nets currently used have an estimated horizontal opening of 30m and a vertical mouth opening of about 10m.

All these improvements to the trawl together with a simultaneous increase in the engine capacity, enabled fishing vessels to trawl faster thereby catching larger proportions of schooling pelagic fish like *Rastrelliger.* The catch of *Rastrelliger* per unit of trawl showed an increase (Table 2).

Fish Purseseine

The fish purseseine on the other hand showed a steady decline in its dominance as a major gear for catching pelagic fish. In 1970 the fish purseseine was dominant and caught over 70% of the total pelagic fish on the west coast of Peninsular Malaysia, but in 1997, fish purseseines only landed 30% of the total pelagic catch (Fig. 4).

Fig. 4: Changes in gear dominance in fishing for pelagic fish on the West Coast of Peninsular Malaysia



The decline in importance of the fish purseseine was contributed also by the decrease in the number of units of this gear licensed and in operation. Between 1981 and 1996 there was a 47% decline in the number of fish purseseines licensed and a 37% decline in the number estimated to be in operation. The number of fish purseseines estimated to be in operation on the west coast of Peninsular Malaysia had remained quite consistently around 200 units since 1990. The main limiting factor that controls the entry of fish purseseiners into the industry is the larger capital cost that is required to secure the fishing vessel and purseseine. Labour is an added obstacle since fish purse seining is more labour-intensive as compared to trawling. Currently at least 10-15 crew members are required onboard the fishing vessel to operate the fish purseseine while a fish trawl can be operated by only four crew members. The decline in the number of fish purseseiners could have been caused by both resource and economic problems.

In the early seventies purse seining was mainly conducted at night when free-swimming fish schools were scouted and caught or in conjunction with coconut leaf lures and small lamps.

From the mid-eighties, a major development in fish purse seining took place with the introduction of spotlights as FAD. This method of aggregating fish led to a larger catch per haul of a more diverse mix of pelagic fish, cephalopods and demersal species (Chee, 1992). When spotlights were first introduced, the average catch rate of the fleet of fish purseseiners based in Penang which started using spotlights showed sporadic increases in comparison with the purseseiners using coconut leaf lures. Unfortunately monitoring of these boats using spotlights and coconut leaf lures as FAD separately could not be sustained because the boats increasingly switched from spotlights to coconut leaf lures resulting in landings of fish caught by the use of two FAD together.

Table 2: Catch of *Rastrelliger* per unit of Trawl in operation

Year	Rastrelliger Caught Per Unit Trawl (Tonnes)
1978	2.456
1979	1.055
1980	1.269
1981	2.661
1982	3.913
1983	3.785
1984	2.806
1985	2.403
1986	2.248
1987	3.758
1988	2.608
1989	3.554
1990	4.029
1991	2.307
1992	3.488
1993	2.747
1994	4.637
1995	7.762
1996	5.717

Spotlights are now commonly used by fish purseseiners to aggregate fish on the west coast of Peninsular Malaysia. On a single fishing trip, certain fishermen use spotlights at night while in the daytime fishing can be done from the coconut leaf lures. Similarly fishermen fishing free-swimming schools of pelagic fish can, in addition, switch on spotlights to aggregate fish when no schools are detected. This additional method in fish aggregation led to an increase per unit effort of fish purseseine resulting in an overall increase in fishing effort even without increasing the number of units of fish purseseines used. Purseseines have also increased in length and depth. Purseseines currently being used stretch to 1,000m in length and 100m deep.

Drift Nets

Drift nets contributed to approximately 20% of the total landings of pelagic fish on the west coast of Peninsular Malaysia from 1970 till the mid-eighties. The percentage of pelagic fish caught by drift nets increased to 30% of the total pelagic fish landed in 1997, making it equally important to the trawl and the fish purseseine (Fig.4).

Drift nets remain the major traditional fishing gear for pelagic fish. Various mesh sizes, ranging from 25mm (one inch) to 100mm (four inches), are used depending on the fish targeted. Both monofilament and nylon nets are being used by local fishermen. Local fishermen have made many modifications to the drift net. This resulted in a diversity of fishing gear being introduced like the bottom set net, barrier nets and small purseseines. These modifications had generally not raised much concern except for the increase in lengths of drift nets. Currently drift nets being used could stretch up to 10km in total for one fishing trip. This certainly does not justify their being traditional anymore.

Fig. 5: Changes in gear dominance in fishing for *Rastrelliger* on the West Coast of Peninsular Malaysia

Drift nets accounted for the largest number of fishing gear used. The number of drift nets operating on the west coast of Peninsular Malaysia showed a steady increase even after 1981 although the number of licences decreased by 31% from 1981 till 1996 (Table 1). The low capital investment, operating costs and labour required for operating the drift net attracted

more entrants into this fishery. Even one fisherman by himself can operate a drift net although usually two to three persons work on one boat. The increase in landings of pelagic fish by drift nets was probably contributed by the increase in the number of units operating coupled with the increase in the length of nets used.

Changes In Gear Dominance In Fishing For *Rastrelliger*

Fig. 5 shows the changes in gear dominance in fishing for *Rastrelliger*. It is clear that the fish purseseine declined in its importance while drift nets became increasingly dominant. Trawls started fishing *Rastrelliger* in 1970 and have remained important since. Prior to 1970, the purseseine was the only dominant gear fishing *Rastrelliger* but currently there are three major gears which are nearly equally important.

Development and Changes In Fishing Vessels

The majority of fishing vessels on the west coast of Peninsular Malaysia are below 25 GRT. This category of fishing vessels contributed 80% to 90% of the total number of fishing vessels licensed. Since 1980, there had been a general decline in the number of this category of fishing vessels. The number of 25-40 GRT and 40-69.9 GRT fishing vessels remained around 1,000 units or 10% of the total number of licensed fishing vessels. The number of large fishing vessels of above 70 GRT increased to about 2% of the total number of fishing vessels. Prior to 1980 there were hardly any fishing vessels of this category operating on the west coast of Peninsular Malaysia (Table 3). The increase in the number of large vessels enabled longer fishing trips to be conducted farther out in the Malaysian Exclusive Economic Zone and beyond the traditional fishing grounds.

Together with the increase in the number of large fishing vessels, there was a simultaneous increase in the engine capacity of the vessels. There was a general decrease in the number of fishing vessels with engines of less than 40hp while vessels with 40-99hp engines showed an increase since 1980. There was also an increase in the number of vessels using engines greater than 250hp (Table 4). Although fishing vessels are licensed by category of horsepower, it is difficult to ascertain the actual horsepower because many of these vessels use re-conditioned engines of commercial vehicles.

These large vessels have larger fish holds with RSW systems and are also well equipped with fish detectors and navigational equipment like GPS. RSW systems which were installed on fishing vessels from the late seventies allowed more fish to be stored onboard as well as improved the handling of catch to maintain the quality. The introduction of RSW led to increased landings of lower-value fish including schools of small pelagics and trash fish, quantities of which would be otherwise discarded, to be landed and sold. In this respect the use of RSW also reduced wastage. Mechanisation of fishing vessels to reduce labour included the use power blocks on fish purseseiners and net haulers on trawlers and drift net vessels also supported the use of larger fishing nets. These in total, contributed to increased fishing efficiency and an increase per unit of fishing effort on the west coast of Peninsular Malaysia. The total fishing effort however remains difficult to quantify. Alias (1994) showed the overall increase of fishing effort on the west coast of Peninsular Malaysia in terms of GRT and horsepower of trawlers.

Table 3: Gross Registered Tonnage (GRT) of licensed fishing vessels on the West Coast of Peninsular Malaysia by categories of vessels (units)

Year	<25 GRT	25-40 GRT	40-69.9 GRT	>70 GRT	Total
1980	10852	1143	548	10	12553
1981	10746	1119	592	15	12472
1982	10024	948	755	43	11770
1983	8733	867	754	52	10406
1984	9267	791	788	73	10919
1985	8403	717	770	120	10010
1986	8073	697	685	137	9592
1987	8236	709	628	152	9725
1988	8098	726	637	167	9628
1989	8817	761	621	193	10392
1990	8794	719	577	193	10283
1991	8682	733	595	185	10195
1992	8443	721	621	184	9969
1993	7921	702	630	190	9443
1994	7391	685	626	168	8870
1995	7323	686	620	172	8801
1996	6629	688	622	167	8106

COMPOSITION OF PELAGIC FISH LANDINGS

Small pelagics, comprising six main groups/genera, constitute the bulk of the pelagic fish landings on the west coast. These are the mackerels (*Rastrelliger*), scads *(Atule, Alepes, Selar*), roundscads (*Decapterus*), sardine (*Sardinella, Dussumieria*), hardtail *(Megalaspis cordyla*) and small tuna (mainly *Euthynnus affinis, Auxis thazard, Thunnus tonggol*). These groups are fished mainly by fish purseseines.

Of the small pelagics, fish trawls land mostly *Rastrelliger*. Other pelagic fish commonly caught are pomfrets (*Pampus* and *Formio*), Spanish mackerel (*Scomberomorus*), threadfin (*Eleutheronema, Polydactylus*), wolfherring (*Chirocentrus*) and queenfish (*Scomberoides*). These are caught by both fish and shrimp trawls together with demersal fish and shrimps.

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The majority of drift nets target the large pelagic fish like Spanish mackerel (*Scomberomorus*) and wolfherring (*Chirocentrus*), white pomfret (*Pampus argenteus*) and Chinese pomfret (*Pampus chinensis*) and the threadfins (*Eleutheronema tetradactylum* and *Polydactylus indicus*). These are highly esteemed food fish that fetch very high market values. Although the target of drift netters are these valuable fish, this gear lands substantial

proportions of other small pelagic fish as bycatch, particularly in the northern States of Perlis, Kedah, Penang, Perak and Selangor. The incidence of small pelagics in the catch of drift netters however varies with seasons. During certain seasons, some drift netters switch to fishing for small pelagics in particular to the Indo-Pacific mackerel (*Rastrelliger brachysoma)* or small tuna. Trammel netters also land substantial quantities of pelagic fish as bycatch.

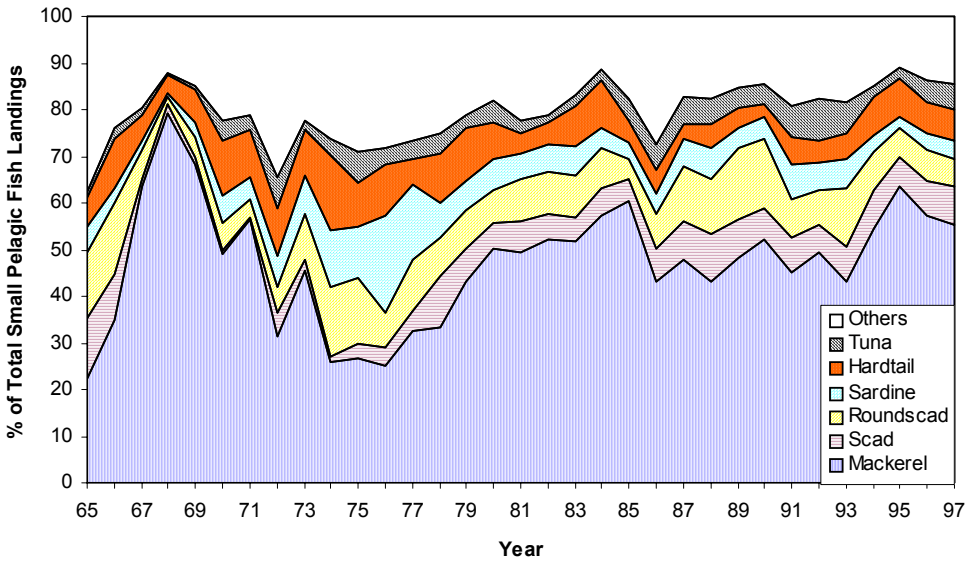
Table 4: Horse power (hp) of licensed fishing vessels on the West Coast of Peninsular Malaysia by categories of vessels (units)

Year	<40 hp	40-99 hp	100-149 hp	150-249 hp	>250 hp
1980	9451	1157	731	1142	72
1981	9363	1140	685	1210	74
1982	8497	1271	598	1339	65
1983	7057	1314	598	1369	68
1984	7383	1482	554	1400	100
1985	6288	1686	481	1382	173
1986	5665	1921	430	1351	225
1987	5184	2514	406	1296	325
1988	4687	2703	394	1231	613
1989	4880	2846	650	1227	789
1990	4601	2987	631	1200	864
1991	4374	3026	602	1257	936
1992	4092	2969	565	1303	1040
1993	3697	2784	571	1288	1103
1994	3282	2717	546	1243	1082
1995	3101	2832	516	1244	1108
1996	2685	2441	614	1261	1105

Changes in Composition of Landings

The changes in the composition of the landings of pelagic fish on the west coast of Peninsular Malaysia are shown in Fig. 6. *Rastrelliger* remains the main group of fish caught on the west coast. This dominance by *Rastrelliger* is not seen in the fishery of the east coast of Peninsular Malaysia (Fig. 7).

Fig. 6: Changes in species composition of pelagic fish landings on the West Coast of Peninsular Malaysia



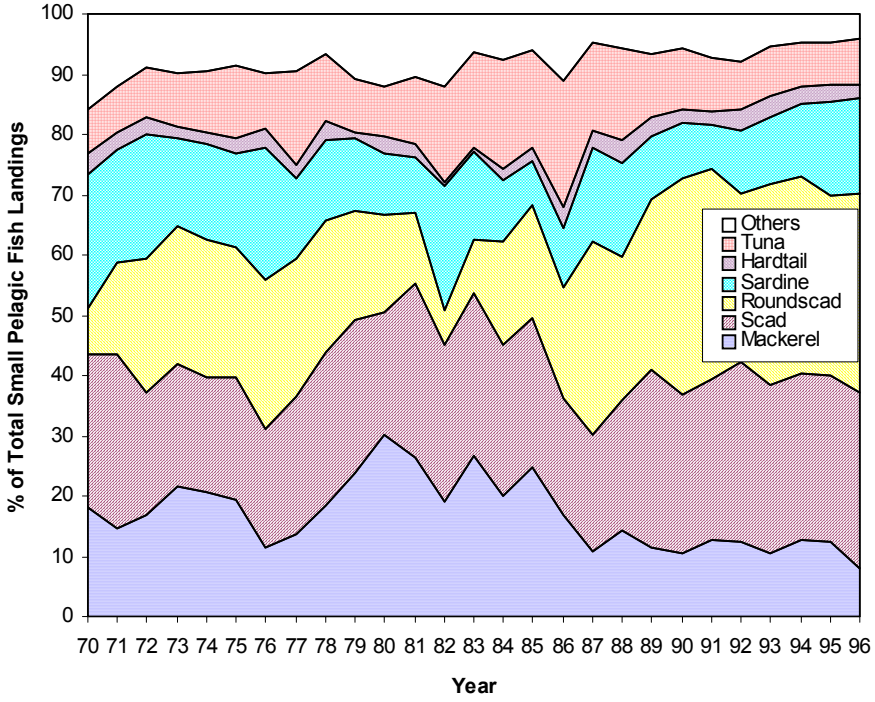
When trawls were first introduced, they targeted shrimps and demersal fish. However with modifications and improvement, trawls are now successfully fishing schools of small pelagic fish of which *R. brachysoma* is dominant. The trawl catches relatively smaller quantities of R. kanagurta.

During the time before the introduction of spotlights as FAD, the number of species caught by fish purseseines was rather limited. The main catch of night purseseiners was the Indo-Pacific mackerel (*Rastrelliger brachysoma*) and other schools of small pelagic fish. Fishing in conjunction with coconut leaf lures was practised by fishermen mainly from Kuala Perlis, Perlis, and Teluk Bahang, Penang. They caught a mix of small pelagics like Indian mackerel (*R. kanagurta*), roundscads (*Decapterus*), scads (*Atule, Alepes, Selar*), hardtail (*Megalaspis*), sardine (*Sardinella*) and black pomfret (*Formio niger*) that are aggregated around the coconut leaf lures. The main type of fish and size of fish aggregated were determined by a skilled diver before the purseseine is shot and pursed (Chee, 1980).

The use of spotlights resulted in a more diverse mix of species being caught. Besides small pelagics, some demersal fish and cephalopods are aggregated and caught (Chee, 1992). Preliminary observations showed that there were larger proportions of fish like roundscads that were caught and were smaller in size compared to those caught without the use of spotlights. However the actual composition of landings by FAD became increasingly difficult to monitor without observers onboard because of the switch in the use FAD on a single fishing trip or even from one haul to the next in one fishing trip.

Using data from Perak State for 1993-1995, the proportion of *Rastrelliger* by species was estimated at 84% *R. brachysoma* and 16% *R. kanagurta* (Chee, 1997*). R. faughni* is usually caught in small numbers together with *R. kanagurta*. This makes *R. brachysoma* the major species of *Rastrelliger* caught. However this is in contrast to the earlier report that *R. kanagurta* contributed 68% and *R. brachysoma* only 32% on the west coast of Peninsular Malaysia (Anon., 1985). It remains unclear whether *R. kanagurta* was the more dominant then

Fig. 7: Changes in the species composition of pelagic fish on the East Coast of Peninsular Malaysia



or whether there was a misidentification of the species. If indeed *R. kanagurta* had declined, the reasons for this decline should be established. *R. kanagurta* was the dominant species fished by purseseiners on the west coast in the sixties (Pathansali, 1961). Since the Annual Fisheries Statistics does not separate *Rastrelliger* by species, a more refined estimate should now be made basing on the fishing gear and the FAD used to show the actual proportions of *R. brachysoma* and *R. kanagurta* in the landings.

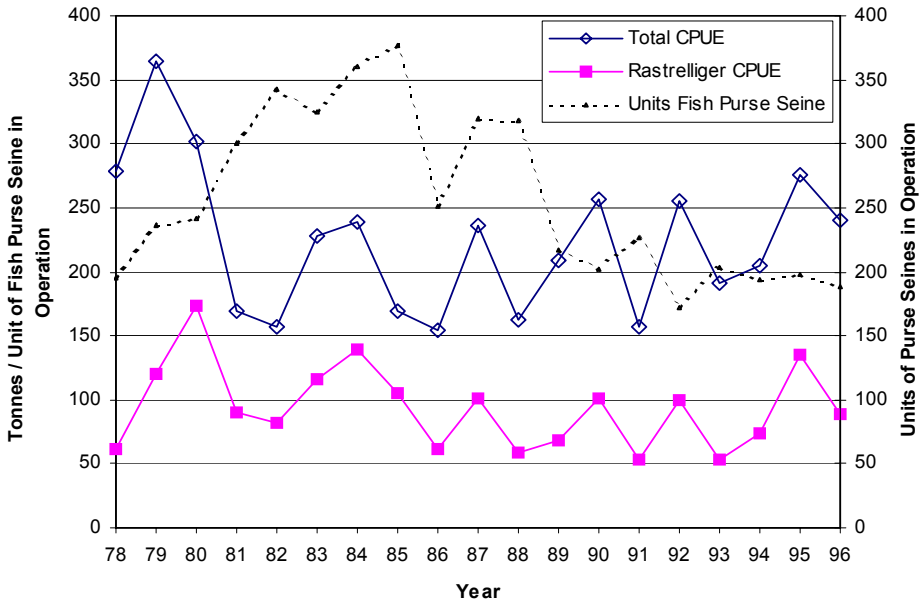
THE STATUS OF SMALL PELAGIC FISH AND *RASTRELLIGER* RESOURCES

Small pelagics have been supporting the fishery on the west coast of Peninsular Malaysia. With development, this fishery had expanded from a subsistence fishery to a commercial- scale fishery. Early estimates of potential yield of small pelagic fish including *Rastrelliger* had been made. Most of these estimates were based on trends of landings or the surplus production model. Chong (1976) estimated the potential pelagic catch on the west coast of Peninsular Malaysia as between 81,000 and 91,000 tonnes. Of this potential the maximum for *Rastrelliger* was estimated at only 41,000 tonnes. The Workshop on the Fishery Resources of the Malacca Straits estimated the total pelagic potential at 88,000 tonnes of which only 25,000 tones were *Rastrelliger* (Anon., 1976). An assessment made in 1997 estimated the Maximum Sustainable Yield (MSY) of total pelagic fish on the west coast of Peninsular Malaysia at 100,000 tonnes while that for *Rastrelliger* was estimated at between 56,000 tonnes to 70,000 tonnes (FRI, unpublished). This is in agreement with the estimated MSY for *Rastrelliger* of between 60,000 tonnes to 70,000 tonnes as reported by Mansor (1987).

Fig. 8: Landings of trash fish by fish purse seines on the West Coast of Peninsular Malaysia

Landings of pelagic fish over the last few years were well over 100,000 tonnes. The number of fish purseseines licensed and estimated to be in operation decreased. The catch of pelagic fish and *Rastrelliger* per unit of fish purseseine showed a declining trend (Fig. 9). The increases in landings of trash fish by fish purseseines also signal the unhealthy status of the pelagic fishery. It is concluded that the pelagic fishery on the west coast of Peninsular Malaysia is over-exploited.

Fig. 9: Catch per unit effort of fish purse seine on the West Coast of Peninsular Malaysia



Although it is realised that using analysis of trends and the surplus production model both provide weak assessments of fish stocks, they are still being used because of the availability of historical catch and effort data. Currently attempts at using the yield per recruit model and virtual population analysis to assess the *Rastrelliger* stock on the west coast are being made. Biological information by species is being collected for use in these models. This should help refine and improve assessments to provide better advice for the management of *Rastrelliger* and the pelagic fishery resources to ensure their sustainability. However, the major problem faced in these assessments is in the estimation of the actual fishing effort in multi-species and a multi-gear fisheries like the fishery for pelagics.

Despite these weaknesses, it is accepted that fisheries management measures should be implemented early enough in the development of a fishery and should not be delayed until sufficient scientific information is available. In line with the precautionary approach to fisheries management, more precaution should be exerted in the light of more uncertainties. At the same time regular monitoring of the pelagic fishery should be continued to provide additional information for refining assessments such that these assessments can be further incorporated into scientific advice for the management.

DISCUSSION

Strict licensing implemented by the Department of Fisheries Malaysia has succeeded in controlling the number of commercial fishing vessels on the west coast of Peninsular Malaysia. In fact the number of small fishing vessels have decreased. This is consistent with the policy of the Department to reduce fishing effort in inshore areas as a measure to manage inshore fisheries and conserve critical habitats like mangroves, coral reefs and sea grass beds to prevent unsustainable exploitation. At the same time offshore fisheries are being developed to optimally utilize the fisheries resources. Although the number of units of fishing gear can be limited, the increase in fishing effort through added technology is difficult to control.

The fishing gear dominance in the harvest of pelagic fish and *Rastrelliger* changed over the years. Trawls and drift nets have overtaken the fish purseseines in harvesting pelagic fish. Although all three fishing gear had increased fishing efficiency through additional technology and modification, the magnitude of these increases and the number of units of gear operating had contributed to this change. There are larger numbers of trawls and drift nets than fish purseseines. The more labour-intensive fish purseseine has to compete stiffly with the fish trawl that is still developing at a very fast pace. Already the number of fish purseseines had declined drastically compared to the trawl. The management of the pelagic fishery has to take into consideration the interaction of these three main gears, two commercial and one traditional, exploiting the same pelagic fish resources in a limited area.

Through zonation of fishing grounds, drift nets being classified as traditional, are allowed to fish in Zone A. It is highly probable that they are fishing the same fish stocks as the other two commercial gears since pelagic fish are migratory in nature. The management of the pelagic fishery should ensure that drift nets are maintained at a traditional level and not be developed to become commercial by merely increasing the lengths of nets used. The limited area in Zone A where the majority of drift netters operate cannot sustain too many units each operating very long nets. The number of drift nets estimated to be in operation showed an increasing trend in the last 10 years. Besides limiting the number of units of this fishing gear used, the number of pieces and lengths of drift nets including trammel nets used should also

be limited. Restricting the lengths of nets in Zone A should reduce any future social conflicts that might arise among drift netters and the other traditional fishermen who are allowed to fish in Zone A.

The changes in fish purse seining and trawling have not changed the overall commercial catch composition of the pelagic fishery but have increased the proportions of trash fish consisting of non-marketable fish for human consumption and under-sized commercial fish. This signals the deteriorating health of the fishery. The management of the pelagic fishery has therefore to address this issue. Technical measures like the use of meshes larger than 25mm in the fish purseseines and in the cod-end of trawls should be considered for implementation besides just controlling entry into the fishery through licensing. The implementation of these measures should be supported by credible scientific data to gain acceptance of fishermen and the fishing industry.

It is striking to note that mackerel of the genus *Rastrelliger* has been dominating the pelagic fish landings on the west coast. *Rastrelliger* as a single genus contributed 79% of the pelagic fish landings in 1968 and in 1997 still contributed to 55% of the pelagic fish landings. In 1995 the west coast of Peninsular Malaysia recorded the highest landing of *Rastrelliger* since 1965. The landings of other pelagic fish remained relatively unchanged. This increase in *Rastrelliger* landings was probably through good recruitment to the pelagic fishery. It is accepted that pelagic fisheries are very much influenced by uncertainties of the marine environment that causes fluctuations in their production, thus good recruitment in certain years like in 1995 could have supported the high landings. In addition the increase in fishing efficiency and fishing effort exerted mainly by drift nets and fish trawls could also have contributed to this increase. Environmental uncertainties add problems for management, thus precaution should be exerted. High landings of pelagic fish in one or two years should not be used to justify the issue of additional fishing licences. The experiences learnt from collapsed fisheries elsewhere should be used as guidelines to improve management.

The Malacca Straits, which is the main fishing ground for the west coast of Peninsular Malaysia, is limited in area and in fish resources. This area is productive and is supported by a rich belt of mangrove forest particularly in the northern region as well as areas of natural coral reefs and sea grass beds. This area that has been endowed with rich fisheries resources also faces the hub of development on the west coast of Peninsular Malaysia. The Malacca Straits is also a major shipping lane in this region. This area faces the severe threat of pollution and environmental degradation.

In fisheries management controlled exploitation of fisheries resources is of prime importance but the impact of the environment on the resources also determines their sustainability. Fisheries management has to address not only the resource issue but has to adopt an integrated approach to address the impact of land-based development activities on the resources; and since the stake-holders are the fishermen, their socio-economics should also be incorporated.

CONCLUSIONS

The pelagic fishery resources including the *Rastrelliger* resource are over-exploited on the west coast of Peninsular Malaysia, thus stringent management measures should be formulated and enforced to ensure sustainability.

The management of pelagic fisheries on the west coast of Peninsular Malaysia should focus on the interaction of the three fishing gears namely the fish purseseine, trawl and drift net since they target the same resource.

Besides just limiting the number of licences, additional technical measures like the implementation of the use of mesh sizes larger than 25mm (one inch) for the cod-end of trawls and fish purseseines should be considered.

The use of the drift nets including trammel nets should be subjected to restriction in length of net used. The number of units of drift nets allowed to operate should also be controlled. This should take into consideration the limited fishing area in Zone A where they are allowed to operate, and the increasing number of units of this traditional fishing gear being used and its possible interaction with the commercial trawl and fish purseseine.

Since the pelagic fishery is supported mainly by mackerels of the genus *Rastrelliger*, more research effort should be directed to study all aspects of the biology of this genus on the west coast of Peninsular Malaysia, their recruitment and stock dynamics, to support effective management and ensure sustainable exploitation. Stock assessment should progress towards the use of more analytical models incorporating more information besides the simple production models.

Constant monitoring of the pelagic fishery should be undertaken to regularly document changes that are taking place and to provide basic information for the formulation and modification of management measures in line with the Code of Conduct for Responsible Fisheries. This should be supported by funds from the relevant agencies.

The proposals for management should as far as possible adopt an integrated approach to incorporate biological, environmental and socio-economic aspects.

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THE MANAGEMENT OF THE *RASTRELLIGER* (KEMBUNG) FISHERY ON THE WEST COAST OF PENINSULAR MALAYSIA

by

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ABSTRACT

The basis of managing the fish resources in Malaysia has been to ensure that the resources are sustained and protected, hence assuring that the fishers and their families have a sustained income and the nation has a continuous supply of fish protein. The objective of the paper is to review the current management measures specific to the *kembung* fishery and to propose improvements for strengthening the management of the fishery in the light of the implementation of the FAO Code of Conduct for Responsible Fisheries.

INTRODUCTION

The basis of managing the fish resources in Malaysia has been to ensure that the resources are sustained and protected, hence assuring that the fishers and their families have a sustained income and the nation has a continuous supply of fish protein. The management measures taken have been incorporated in the legal framework namely the Fisheries Act 1963 that was amended in 1985. In 1981, a licensing policy was introduced aimed at conserving coastal fish resources on which the majority of the fishers depended for their income. This policy essentially demarcated specific areas of fishing to fishers who used different fishing gears and operated different sizes of vessels.

The objective of the paper is to review the management measures specific to the *kembung* fishery. And to suggest further improvements aimed at strengthening the management of the fishery in the light of the implementation of the FAO Code of Conduct for Responsible Fisheries.

INSTITUTIONAL FRAMEWORK

The Department of Fisheries was established in 1894 as the colonial Fisheries Unit. The Department is responsible to bring about changes in the country's fishery sector so as to operate in a commercial, modern, progressive and ensuring adequate supply of sources for the needs of the nation. In the organizational structure, the department is headed by the Director-General of Fisheries and it has seven divisions. The divisions associated with fisheries management are the primarily the Resources Management and Protection Division, the Marine Fishery Resources Development and Management Department (of the Southeast Asian Fisheries Development Center), the Research Division (the Fisheries Research Institute), the Corporate Planning Division and the Legal Unit. The other divisions also have their roles in the implementation of the fisheries policies. At the state level, the State Departments of Fisheries are the implementing arms of the department.

At each division the respective branches responsible for fisheries management in terms of importance are the Resources Management Branch, the Supervisory Control Branch, the Resources Protection Branch, the Resources Research Branch, Resources Assessment Branch and the Information System Unit.

CURRENT FISHERIES MANAGEMENT

The Comprehensive Licensing Policy

Prior to 1981, the fishery regulation has stipulated specific zones for fishing. Boats below 25 tons gross tonnage and equipped with engines of less than 80 horsepower were to fish in areas between 3-7 nautical miles. Boats above 25 tons gross tonnage and equipped with engines above 80 horsepower were allowed to fish beyond the 7 nautical mile limits.

In line with the precautionary principle, a new policy was formulated in 1981 with the following objectives:

1. to eliminate the competition and the ensuing conflicts between the traditional fishers and mini trawler fishers in the inshore waters;
2. to prevent the over-exploitation of the fishery resources in the inshore waters;
3. to provide a more equitable distribution of resources
4. to restructure the ownership pattern in line with the New Economic Policy (1971-1991); and
5. to promote the development of the offshore industrial fisheries.

The new policy covers the zoning system and the codification and color identification schemes.

Control of Entry into Fishery

In the *kembung* fishery, there are three main types of gears namely the purseseines, trawls and drift nets. As the fishing area in the West Coast of Peninsular Malaysia is limited to at most 100 m deep in the middle of the Straits of Malacca, most trawls are able to catch the *kembung* fish. In addition, the design of the trawl is modified to have a higher mouth opening thereby catching any pelagic fish that are swimming mid-water. The trawlers have higher-powered engines that can trawl at speeds of 4 knots thus outrunning the speed of some pelagic fish. In 1986, the purseseiners began using spotlights to lure the fish, a new technology that increased the efficiency of the vessel. In 1996, the number of licensed fishing vessels is as shown in Table in the Appendix I.

In 1986, a programme to register fishers was implemented aimed at limiting and controlling the entry of labour into the fishing sector. All fishers working only on licensed fishing boats were registered and given registration cards that were used as administrative identification documents. The cards were non-transferable and under normal circumstances, no new cards were issued after 1986. The registration program was also to census the actual number of fishers in the fishing industry as the data gathered included age, fishing boat, fishing gears operated, number of years fishing, position and responsibility in the fishing unit and base of operation.

The registration of fishers is used to limit the number of fishers working in the marine capture fisheries and only fishers having valid identification cards are allowed to operate. The registration is computerized and through this system, data on previous offences by fishers can be retrieved.

MONITORING, CONTROL AND SURVEILLANCE

The department has an MCS Unit that has good cooperation with other relevant agencies such as the Royal Navy and the Marine Police.

Monitoring

The monitoring activities involves the collection of data on biological, economic, social aspects of all the fisheries including the *kembung*, number of fishers, the number of licensed fishing vessels and the number of fishing gears licensed.

These data are used to monitor the monthly yields, catch composition and to check the effects of fishing on the fish stocks. The data are published annually in the Annual Fisheries Statistics.

Control

In the licensing policy, the Malaysian waters are divided into four zones with reference from the shore. The four zones are:

1. Zone A extending from 0 to 5 nautical miles for the traditional fisheries;
2. Zone B from 5 to 12 nautical miles for the commercial fisheries such as the trawlers and purseseiners below 40 GRT;
3. Zone C from 12 to 30 nautical miles for the commercial fisheries of boats above 40 GRT;
4. Zone C2 from 30 nautical miles and beyond for commercial fisheries of boats 70 GRT and above.

In addition to the zoning system, effective enforcement of the policy was accomplished by the use of codes and colors with reference to each state. Conditions of licence stipulated that the fishing vessels must comply with the identification schemes. The vessels must be painted with the specified colors allocated to the state where the vessels are based. The wheelhouse of the vessels must be painted with the letter A, B, C or C2 to identify the zone of authorized operation. The letter must be large enough for an aircraft or patrol surveillance vessels to spot. In addition, trawlers are required to paint a diagonal white stripe across the wheelhouse. Each vessel will have on its hull at the bow end the registration number of the vessel.

Surveillance

The air and sea surveillance are conducted using chartered and patrol vessels respectively. Department officials from the Resources Management and Protection Division will detect from the aircraft foreign fishing vessel encroachments into the EEZ waters and also other illegal fishing activities.

The sea patrols depend on the conditions. Routine patrols are made according to set schedules and in areas of frequent violations. On call patrols are made to search and arrest offences committed usually reported by fishers and the public. In the West Coast of Peninsular Malaysia, the patrol vessels are based at four command bases located in Kuala Kedah, Lumut, Port Kelang and Johor Bahru. The command bases are in constant contact with the Operations Control Center at the Headquarters in Kuala Lumpur.

The latest surveillance technique adopted is the Vessel Tracking and Management System (VTMS). The system was tried in 1998 and it is the implementation stage.

Enforcement Agencies

The relevant enforcement agencies that are empowered to enforce the related laws are the Department of Fisheries, the Marine Police of the Royal Malaysian Police Force and the Royal Malaysian Navy. The Maritime Enforcement Coordinating Center (MECC), under the supervision of the Royal Navy and located Lumut in the West Coast of Peninsular Malaysia is responsible to coordinate the functions of the three agencies. It also functions as the focal point for all emergency works such as implementing oil spill contingency plans, rescue of life at sea and assist mariners in distress.

In most cases, the arrests in zone C2 of the EEZ waters are made by the Royal Navy and all prosecution are conducted by the officials at the state department and advised by the Legal Unit of the department.

The Maritime Rescue Coordinating Center (MRCC) under the purview of the Marine Department is responsible for coordinating the search and rescue work at sea.

RESOURCE CONSERVATION AND REHABILITATION

The Department of Fisheries has gazette four islands in the West Coast of Peninsular Malaysia as the Marine Parks and Protected Areas for the conservation of fish resources. As sanctuaries for the fish to breed and grow, the marine parks are used also for eco-tourism aimed at educating the public on the importance of the reefs in the marine parks. The four islands are the Pulau Payar, Pulau Lembu, Pulau Kaca and Pulau Segantang, all located in the waters of Kedah State. Reports from the fishermen in the north indicated the constant availability of anchovy resources throughout the year since the establishment of the marine parks in 1986. It is not certain as to the contribution of the marine parks to the *kembung* fishery but if the anchovies are the food for the *kembung* then the parks will need to be expanded or new areas protected and gazette. The Pulau Sembilan in the Perak State waters is being considered for conversion into marine parks.

The construction of artificial reefs has been considered as one of the management tools for the resource management and enhancement. Until 1996, there have been three types of artificial reefs that were deployed in the West Coast of Peninsular Malaysia, namely the tire reefs, boat reefs and the concrete reefs. The reefs have been proven to protect the fish and to serve as breeding areas particularly for the groupers. Apart from increasing the surface area for coral colonisation, the reefs act as a deterrent to the trawlers that encroach into coastal waters where the reefs are mostly deployed. A major program was launched in 1987 nationwide to construct and deploy artificial reefs aimed at rehabilitating the seabed, which

have been partly damaged by the trawlers and to revive the fish stocks as the landings have dwindled.

DEVELOPMENT OF A MANAGEMENT PLAN

Scientific Information

There is yet a standard operational procedure in formulating a management plan. However, an attempt was made in the early nineties to establish a committee whose objective was to vet the state of the fishery and assess the potential stock. The committee was comprised of officials from the various sections of the department namely, the Resource Management and Protection Division, Corporate Planning Division and the Research Division. The Research Division which includes the Fisheries Research Institute and the Marine Fishery Resources Development and Management Department (MRFDMD) of the SEAFDEC will report on the status of the fishery. Decisions will be made to determine the level of effort i.e. the licence quotas for the fishing vessels taking into account the state of fish stock.

The catch of the *kembung* resources has been determined or guided by the maximum sustainable yield of the pelagic fish resources, although in this context the MSY might not be able to show much its relevance to the *kembung*.

Since the assessment of the pelagic fish started in the mid-seventies, the exploitation of the specific species has not been looked at.

Role of Stakeholders

In the past there has been limited involvement of the stakeholders in the decision as it pertained to technical matters and scientific information. However, the fishers are welcomed to assist in the implementation of the management strategies. In the vast seas and with limited capability in surveillance work and few patrol vessels, the fishers could inform the relevant authorities of any foreign encroachments, violations of regulations by other fishers and any misconduct or potential conflicts between fishers themselves.

Ancillary Activities

An important ancillary industry in the *kembung* fishery would be the boatbuilding and repairing shipyards and the net manufacturing companies. There is yet to be an updated study in these activities and it would be important to get the status of the activities so as to assess their role and contribution to the fishery.

THE IMPACT OF THE MANAGEMENT MEASURES

The effects of the management measures have not been evaluated through a scientific study. However with the introduction of the comprehensive licensing policy, there had been less reports of conflicts between fishers and there were fewer complaints received from the fishers. It has become evident that during the peaceful periods, the yield has increased through the years but without repercussions. A high percentage of the trash of the overall catch was

contained in the catch of the trawlers. A detailed study is yet to be conducted to ascertain the extent of juvenile commercial fish present. The catch of such incidental catch initially treated as trash and discards are becoming useful as processed food. If not controlled such utilization will encourage further exploitation of the juvenile fish that will eventually damage the stocks.

DISCUSSION

Future prospects

The overall policy is to maintain the present catch of the inshore waters and this includes the *kembung* resources. The National Agriculture Policy 3 (NAP3) stipulates that by 2010 the fishery sector is expected to service the consumption of the nation by increasing aquaculture production. The department thus is focussing on the development of aquaculture because this sub-sector is seen to be the best alternative to increasing food production and it has the potential for further development.

There has been optimism as to the consistent supply of the *kembung* and this has been attributed to the high turnover rate of productivity in the Straits of Malacca. The convergence of different water bodies the Andaman Sea and the Java Sea and the South China Sea may result in the increase of nutrients and thus the growth of plankton that serves as food for the small pelagic fish.

Recommendations

As the efficiencies of the fishing vessels are subjective and have the tendencies to further increase the effort levels, there is now a need to look into the types of output control as a means of preventing excessive exploitation and overfishing. Output controls can be the amount of catch (or catch limits) or length of the fish (minimum size limits) and a combination of both. As many fishers are dependant on the *kembung* fishery, it would be difficult to reduce the number of fishers suddenly as the present social and political scenarios are not favorable.

The second alternative would be to institute a form of catch limits such as the individual transferable quota (ITQ) system mainly aimed at reducing the effort. The system have been effective in states such as the Iceland and New Zealand where the landing ports are quite located at major areas. However such system needs to reveal its effectiveness in a fishery such as the *kembung* where there are many landing points located along the West Coast of Peninsular Malaysia. There is risk of fishers under-declaring their catch and that sale of catch may have occurred at sea resulting in low catch for the nation.

At the same time the gear size regulation needs to be enforced to minimize discards at sea. This is in relation to the trawl gears that are capable of catching the pelagic fish. The catch size limits will ensure that a high percentage of the fish is matured or spent. Research can indicate the appropriate size of fish that constitute the size of matured fish. Spent fish will be related to the spawning season of the fish. In this instance, catch limits of mature fish can also be considered so as to ensure the sustenance of matured fish in the spawning stock.

Purse seining using spotlights should be banned if studies show that there are substantial quantities of commercial juvenile fish. It is justified to ban the use of accessories

as the unwanted catch can be reduced or entirely eliminated. Even if there are no commercial juveniles, the mortality of these juveniles caught would reduce the amount of prey present that is necessary for their natural predators to feed on in the normal ecological state of equilibrium. If studies showed that the spotlights are damaging the juvenile population, the control will include either the ban on the use of spotlights or the adjustments of the mesh size of the seine nets.

At the regional level, the need to control the catch of discards and juvenile commercial fish by purseseiners can never be over-emphasized. The feeling of apprehensions in bordering areas towards the use of spotlights should be highlighted and the fishers then need to be informed of such moves and to understand the reasons.

As the *kembung* migrates across boundaries of coastal states, it is vital that a management by consensus between concern parties is to be undertaken.

CBFM approaches can be considered for those operating in the zones A and B.

CONCLUSIONS

The development of an effective management plan needs detailed studies in certain areas such as the catch of juvenile fish, the need to confirm of the negative effects of the use of spotlights as FADs, the positive effects of increasing mesh sizes of the trawls and or the purseseines. A more substantial research would need to be conducted to understand the interactions of the *kembung* fish in the ecosystem, its predating effects on other organisms and its supply as the prey of other predators both during the juvenile and adult stages of the life cycle.

As it is realized that the efficiencies of the fishing vessels are limitless, it is imperative to note its effects on the resource at its juvenile stage as well as the spawning stocks. Any excess landings of the spawning stocks can be prevented by imposing closed seasons and the minimum size limits of mesh sizes will ensure next year's yields.

Above all, there is a need to start an awareness program for the fishers on the need to start controlling the catch and the need to realize that today's savings are tomorrow's catch. When such initiatives are made, only then the fishers will be able to take part in the management of the resources and hence be part to shoulder the responsibilities not only of the department's but also the nation's.

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APPENDIX I

ANNUAL FISHERIES STATISTICS 1996 (DEPARTMENT OF FISHERIES)

1. Number of fishers working in licensed fishing vessels by Gear Group in the West Coast Peninsular Malaysia (Table 1.2)

	Trawl Nets		Purseseine Nets		Drift Nets		Total		Total F/V	
	No	%	No	%	No	%	No	%	No	%
Perlis	668	7.9	2628	72.4	654	4.9	3950	15.5	4008	13.2
Kedah	1829	21.6	260	7.2	1902	14.2	3991	15.7	5570	18.3
Pulau Pinang	247	2.9	253	7.0	1241	9.3	1741	6.8	1991	6.6
Perak	3004	35.5	346	9.5	2705	20.2	6055	23.8	7907	26.0
Selangor	2051	24.3	143	3.9	2403	18.0	4597	18.1	5312	17.5
Negeri Sembilan	0	0.0	0	0.0	246	1.8	246	1.0	280	0.9
Melaka	0	0.0	0	0.0	857	6.4	857	3.4	925	3.0
Johor Barat	655	7.7	0	0.0	3362	25.1	4017	15.8	4370	14.4
Total	**8454**	**100.0**	**3630**	**100.0**	**13370**	**100.0**	**25454**	**100.0**	**30363**	**100.0**
%	***33.2***		***14.3***		***52.5***		***100.0***			

2. Number of Licensed Fishing Vessels in the West Coast Peninsular Malaysia (Table 2.1)

	ZONES A+B		ZONE C		ZONE C2		TOTAL	
	No:	%	No:	%	No:	%	No:	%
Perlis	421	5.8	62	10.0	29	17.4	512	6.3
Kedah	857	11.7	116	18.6	62	37.1	1035	12.8
Pulau Pinang	341	4.7	38	6.1	2	1.2	381	4.7
Perak	2849	38.9	287	46.1	71	42.5	3207	39.6
Selangor	1819	24.9	119	19.1	3	1.8	1941	23.9
Negeri Sembilan	46	0.6	0	0.0	0	0.0	46	0.6
Melaka	130	1.8	0	0.0	0	0.0	130	1.6
Johor Barat	854	11.7	0	0.0	0	0.0	854	10.5
Total	**7317**	100.0	**622**	100.0	**167**	100.0	**8106**	100.0
%	***90.3***		***7.7***		***2.1***		***100.0***	

3. Number of Licensed Fishing Gear on the West Coast Peninsular Malaysia (Table 3.1)

	Trawl Nets		Purseseine Nets		Drift Nets		Total	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Perlis	193	6.3	108	49.8	307	3.3	608	4.8
Kedah	488	15.9	15	6.9	898	9.7	1401	11.1
Pulau Pinang	96	3.1	27	12.4	1011	10.9	1134	9.0
Perak	1277	41.7	51	23.5	1989	21.4	3317	26.4
Selangor	742	24.2	16	7.4	1439	15.5	2197	17.5
Negeri Sembilan	0	0.0	0	0.0	160	1.7	160	1.3
Melaka	0	0.0	0	0.0	664	7.1	664	5.3
Johor Barat	267	8.7	0	0.0	2821	30.4	3088	24.6
Total	**3063**	100.0	**217**	100.0	**9289**	100.0	**12569**	100.0
%	***24.4***		***1.7***		***73.9***		***100.0***	

4. Total Landing of Marine Fish and Kembong by Gear type and States on the West Coast Peninsular Malaysia (Tables 4.1 and 4.4)

	Trawl Nets		Purseseine Nets		Drift Nets		Total		Kembong	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Perlis	12562	4.0	22823	50.3	4749	6.2	40134	9.3	12753	17.3
Kedah	41409	13.3	8065	17.8	10670	14.0	60144	13.9	11132	15.1
Pulau Pinang	20587	6.6	3284	7.2	9210	12.1	33081	7.6	7779	10.5
Perak	158493	50.8	9016	19.9	36616	48.1	204125	47.1	37533	50.9
Selangor	68471	21.9	2146	4.7	6193	8.1	76810	17.7	4583	6.2
Negeri Sembilan	0	0.0	0	0.0	299	0.4	299	0.1	0	0.0
Melaka	0	0.0	0	0.0	1576	2.1	1576	0.4	0	0.0
Johor Barat	10516	3.4	0	0.0	6797	8.9	17313	4.0	1	0.00
Total	**312038**	100.0	**45334**	100.0	**76110**	100.0	**433482**	100.0	**73781**	100.0
%	***72.0***		***10.5***		***17.6***		***100.0***		***17.0***	

THE SOCIO-ECONOMIC PROFILE OF THE SMALL PELAGIC FISHERY IN THE WEST COAST OF PENINSULAR MALAYSIA

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Small pelagic fish which accounted for about one-fifth of the total fish caught in the West Coast of Peninsular Malaysia were found mainly in the states of Perak, Perlis, Kedah, Selangor and Penang. Indo-Pacific and Indian mackerels accounted for more than half of the total small pelagic fish caught in the West Coast of Peninsular Malaysia. The main types of gear which were involved in the fishing of these small pelagic fish were fish purseseine, trawl net and drift net. Majority of the fishermen in the five states which were involved in the fishing of these small pelagic fish were literate. Only a small number of these fishermen were involved in other economic activities. The poverty rates of fishing households in these states were generally low. Most of the small pelagic fish caught are collected by fish merchants and sold to local markets for fresh consumption. Processing of these small pelagic fish are mainly confined to backyard processing such as salting and drying. However, of late, there has been a shift towards higher value-added activities and an increased utilization of low-valued fish for the production of fish-based products.

INTRODUCTION

The landings of small pelagic fish which stood at 354,710 tonnes in 1997, accounted for about 30% of the total marine fish landed in Malaysia. The East Coast of Peninsular Malaysia recorded the highest landings at 137,689 tonnes (39%), followed by the West Coast of Peninsular Malaysia at 120,119 tonnes (34%) and the waters off Sabah and Sarawak at 96,902 tonnes (27%). These small pelagic fish which accounted for about 23% of the total fish caught in the West Coast of Peninsular Malaysia were found mainly in five states with Perak accounting for the bulk of the landings followed by Perlis, Kedah, Selangor and Penang. Indo-Pacific and Indian mackerels accounted for more than half (55%) of the total small pelagic fish caught in the West Coast of Peninsular Malaysia.

Only three types of gear are involved in the fishing of these small pelagic fish in the West Coast of Peninsular Malaysia. In 1997, trawlnets accounted for about 34% of the total catch in the West Coast while driftnets and fish purseseines each accounted for 33% and 32% respectively. These pelagic fish formed about 86% of the total catch of fish purseseiners, 53% of driftnetters and only 13% of trawlers. However, not all fish purseseiners and trawlers catch these pelagic fish in substantial quantities. The ones that catch these fish in relatively large quantities are those with a gross tonnage of between 25 to 70 tons.

SCOPE OF STUDY

The study on the socio-economics of the small pelagic fishery was confined to three types of gear namely driftnets, fish purseseines and trawlnets operating in the states of Perlis, Kedah, Penang, Perak and Selangor. The data and information for this study were obtained mainly from the Annual Fisheries Statistics published by the Department of Fisheries (DOF), costs and earnings surveys conducted by the DOF and a socio-economic survey of fishermen conducted by the Fisheries Development Authority (FDA) in 1995.

The survey conducted by FDA covered all categories of fishermen in Malaysia. Most of the results of the survey were presented according to states in two broad categories of gear i.e. commercial and non-commercial or traditional. Trawlnets, fish purseseines, shrimp trawlnets and anchovy purseseines were classified as commercial gear while driftnets and the other traditional gear such as hooks and lines, traps and liftnets were classified as non-commercial. The fishermen involved in the fishing of these small pelagic fish were well represented in the survey. Of the total number of 932 commercial vessels surveyed in the five states, 601 vessels or 64% were operating trawlnets or purseseines (Table 1). The number of vessels operating driftnets surveyed was 4,241 representing 83% of the total sample size of 5,116 non-commercial vessels surveyed in the five states.

A total of 9,584 local fishermen were surveyed in the five states of which 2,154 (22%) were commercial fishermen while the rest (7,430 or 78%) were traditional fishermen (Table 2). About 80% or 7,650 fishermen who were surveyed were heads of household. Majority of the heads of household (78%) surveyed were involved in traditional fishing. Therefore, the information obtained from this survey provided quite a good indication of the socio-economic status of this small pelagic fishery.

SOCIO-ECONOMIC PROFILE

Fishing Fleet

The fishing fleet of these five states has declined from 12,167 vessels in 1992 to 10,106 vessels in 1997 (Table 3). This is in line with the Government's policy to eliminate excess fishing capacity to ensure that the levels of fishing effort commensurate with the sustainable use of the fishery resources. About 68% of the fishing vessels were powered with inboard engines, 30% with outboard engines and the remaining 2% were non-powered.

There were 2,845 trawlers, 221 purseseiners and 5,420 driftnetters operating in these states in 1997 (Table 4). Only these vessels are involved in the fishing of these small pelagic fish in the West Coast of Peninsular Malaysia. However, only trawlers and fish purseseiners of between 25 to 70 gross registered tonnage (GRT) caught these fish in relatively large quantities. In 1997, there were 179 purseseiners and 1,140 trawlers of size between 25 to 70 tons operating in these five states.

Fishing Gear

Besides obtaining licences for the vessels, fishermen are also required to obtain licences for their fishing gear. Generally there has been a decline in the number of licensed fishing gear through the years. The three important types of gear which were involved in the

fishing of this pelagic fish also registered a decline from 10,036 in 1987 to 9,987 in 1992 and subsequently to 8,486 in 1997 (Table 5). In terms of percentage, purseseine registered the highest decline at 33% from 328 in 1987 to 221 in 1997. However, in terms of number, driftnet was the highest from 6,686 in 1987 to 5,420 in 1997.

Fishermen

In 1997, there were 7,908 fishermen involved in trawling, 3,741 in purseseining and 8,498 in driftnetting (Table 6). In fact the number of fishermen involved in these fishing activities in the five states has declined as compared to 5 years ago.

Purseseining requires the most manpower and for some vessels in Perlis, there were more than 30 crew members in a vessel. Trawling requires between 3 to 5 crew members (including skipper) to operate depending on the size of the vessel while driftnetting only requires about 2 to 3 persons.

In the survey conducted by FDA in 1995, it was found that majority of the fishermen were aged between 31 to 50 years. About 57% of commercial fishermen were in this age group while for the traditional fishermen, this age group accounted for almost 53% of the total traditional fishermen surveyed (Table 7 and 8). The percentage of fishermen above 50 years were higher in the traditional fishery (27%) as compared to the commercial fishery (17%).

Literacy Rate

Literacy is defined as the ability of fishermen to read newspapers and write simple letters. In the survey conducted by FDA on the heads of fishing households, it was found that the literacy rate among commercial fishermen was 83.8% which was slightly higher than the rate for traditional fishermen at 81.4% (Table 9). Eventhough the percentage of fishermen who did not attend any formal or informal schooling was low (7% for commercial fishermen and 10% for traditional fishermen), the relatively high illiteracy rate might be due to the fact that some fishermen stopped schooling even before they acquired the ability to read and write.

Size of Fishing Household

The size of a traditional fishing household was larger at 5.5 persons per household as compared to 5.3 for the commercial fishing household (Table 10). The size of a fishing household was generally larger as compared to the national average of 4.8 persons per household (Population Census, 1991).

Dependency Ratio of Fishing Household

The ratio of non-working to working members was higher in the commercial fishing household (1.7:1) as compared to the traditional fishing household (1.5:1) (Table 11). The non-working members comprised mainly of children below 18 years of age, spouses of fishermen and their aged parents or relatives.

Occupational Status of Head of Household

In any fishing operation, the duties and occupational status of fishermen are determined according to their experience, skill and capital ownership. The occupational status

of fishermen can be broadly classified in four categories namely skipper, owner, owner-cum-skipper and crew member. The skipper who acts as captain of the vessel make decisions regarding the fishing operation. Skippers are either employed by owners of vessels or they can be owners of vessels themselves. If they are owners, then they are called owner-operators or owner-cum-skippers. Owner or towkay is a vessel-owner who does not go out to fish but hires other fishermen to operate his vessel or allows other fishermen to operate his vessel with some attached conditions. An owner can also be a fish wholesaler or fish merchant. Crew members are workers in the fishing units and they are mainly unskilled.

Of the total 1,645 heads of commercial fishing households surveyed, about half (51%) were crew members (Table 12). Owner-cum-skippers represented about 32% while skippers and owners each formed about 11% and 6% respectively.

In traditional fishing, the majority of the fishermen (66%) were owner-operators (i.e. owner-cum-skippers). This is mainly due to the condition in the licence which requires traditional fishing to be operated by owners themselves. However, there were also a small number (about 3%) of owners who did not operate their vessels but allowed their vessels to be operated by their children or relatives.

Income of Fishermen From Fishing

The average monthly income of commercial fishermen (RM1,080) was about 63% higher than that of traditional fishermen (RM662) (Table 13). In both the categories of fishermen, owners of vessels received the highest income, followed by owner-cum-skippers, skippers and crew members. Skippers of commercial fishing vessels received an average monthly income of RM1,181 while that of traditional fishing received only about half of that amount at RM625. Crew members of both categories of fishermen received almost the same monthly income i.e. RM591 for commercial fishing and RM504 for traditional fishing.

Involvement of Fishermen In Other Economic Activities

Besides fishing, a small percentage of the fishermen were involved in other economic activities. In the commercial fishing, only 2.1% of the total 1,645 fishermen surveyed were involved in retailing i.e. operating sundry shops (Table 14). Only 1.7% were involved in fish processing while 0.2% in aquaculture.

The involvement of the traditional fishermen in other economic activities was higher as compared to the commercial fishermen. Some 6.8% of the total 6,005 traditional fishermen surveyed were involved in farming and 5% were involved in contract works (Table 15). However, the participation of traditional fishermen in aquaculture and fish processing was also low involving only about 2% and 1% respectively of the fishermen surveyed.

Returns From Other Economic Activities

Fish processing provided the highest side income for commercial fishermen at RM1,130 per month while in traditional fishing, aquaculture was the highest at RM350 per month (Table 16). Farming, which was the most important side occupation of traditional fishermen, gave a return of about RM200 per month to these fishermen.

Income of Fishermen From Other Sources

Income of heads of fishing households from other sources included incomes from other economic activities, remittance, interest, dividend, rental and retail value of fish for own consumption. The average monthly income of the head of a commercial fishing household from other sources was slightly higher (RM207) than that of a traditional fishing household (RM192) (Table 17). Owners of vessels or towkays who did not operate their own vessels received the highest monthly income from other sources as compared to other categories of fishermen. This category of fishermen usually had more time to involve themselves in other economic activities and were therefore able to generate more incomes from other sources.

Income of Fishing Household

The income of fishing household is defined as the total income of head of household from fishing and other sources and the incomes of other members in the household. The average monthly income of commercial fishing household was higher at RM1,604 as compared to the traditional fishing household at RM1,210 (Table 18). Towkays' households in both categories had the highest income followed by households of owner-cum-skipper, skipper and crew member.

Even though the average monthly household income of fishermen were above the poverty line of RM405, a high percentage (20.9%) of commercial fishermen in Kedah were living below the poverty line (Table 19). The high poverty rate was mainly due to the large percentage (83%) of crew members' households being surveyed in this state. The state of Kedah also had the highest percentage (11.3%) of traditional fishermen living below the poverty line. However, the poverty rates of fishing households in other states were low i.e. below 3%.

ECONOMICS OF FISHING OPERATIONS

This study focussed on driftnetters and the commercial trawlers and purseseiners using fishing vessels of 25 to 70 GRT. The data and information on the landings, costs and earnings of the fishing operations were obtained from two surveys conducted by DOF. The survey on the costs and earnings of traditional gear in Peninsular Malaysia was conducted in 1988 while a similar survey on commercial vessels of below 70 GRT was carried out in 1989.

Fishing Operations

On the West Coast of Peninsular Malaysia, fishing activities can be carried out throughout the year. From the surveys conducted by DOF in 1988 and 1989, it was found that the number of fishing days per year usually exceed 200 for driftnetters and commercial fishing vessels of 25 to 70 GRT. The number of fishing trips per year varies depending on the duration of the fishing trips.

Trawlers from Kedah and Selangor conducted longer fishing trips (3 to 4 days) as compared to trawlers from other states (1 day) (Table 20). Fish purseseiners from all states made daily trips except for purseseiners of 40-69.9 GRT in Kedah which had on average of 2 days fishing trips (Table 21). Most driftnetters on the West Coast of Peninsular Malaysia performed daily trips (Table 22).

Landings

Among the types of vessels surveyed, purseseiners of 40-69.9 GRT had the highest annual landings at 386,100 kilograms with a value of RM403,278. This was followed by trawlers of 40-69.9 GRT with 236,936 kilograms valued at RM217,392. Purseseiners and trawlers of size between 25-39.9 GRT landed almost the same quantity of fish at 173,473 kilograms and 173,781 kilograms respectively. Even though drift netters had the lowest annual landings at 5,765 kilograms, their catches fetched higher values as compared to the other gear. The average price of fish landed by driftnetters was about RM3.66 per kilogram which was high in comparison to those caught by purseseiners and trawlers which was below RM1.20 per kilogram.

Capital Cost

It was found that the average cost of a trawler and a purseseiner of between 25 to 69.9 GRT were about the same i.e. around RM100,000. However, the actual cost varies from vessel to vessel depending on the level of sophistication of the equipment on board. The average investment cost for a driftnetter in the West Coast of Peninsular Malaysia was about RM12,000.

Operational Cost

Cost of fuel was the main operational cost for trawlers and purseseiners. About 58% of the total operational cost of a trawler of size 25-39.9 GRT was for fuel (Table 20). For a purseseiner of the same size category, cost of fuel constituted about 37% of the total cost of operation (Table 21). Wages formed the bulk (29%) of the operational cost of driftnetters (Table 22).

The average annual operational cost of purseseiners of size 40-69.9 GRT was the highest at RM330,592. This was followed by trawlers of the same size category with RM160,229. The annual cost of operation of driftnetters was the lowest at RM13,100.

Earnings

Purseseiners of size 40-69.9 GRT gave the highest returns among the types of vessels surveyed with an average annual net earning of RM63,562 (Table 20). Trawlers of size 40-69.9 GRT were the second highest with an average annual income of RM43,601 (Table 21). The average annual net earning of diftnetters in the West Coast of Peninsular Malaysia was RM6,636 (Table 22).

MARKETING AND POST HARVEST ACTIVITIES

There are no statistics on the disposition of small pelagic fish. However, the Annual Fisheries Statistics does provide some information on the general disposition of marine fish landed. In 1997 about 61.3% of the marine fish caught in the five states were disposed fresh, 5.8% dried, salted or smoked and 5.5% fermented (Table 23). The amount disposed in frozen and steamed (or boiled) forms was small at 0.6% and 0.1% respectively.

Most of the small pelagic fish caught are collected by fish towkays or merchants and sold to local markets for fresh consumption. Some of these fish are chilled or frozen and

exported to countries like Singapore and Brunei. In times of glut, some small pelagic fish are sold in steamed or boiled forms. Some of the low-valued pelagic fish are also sold as feed for aquaculture operations.

There is not much fish available for processing due to the high demand of fish for fresh consumption. Processing of these small pelagic fish are mainly confined to backyard processing such as salting and drying. However, of late, there has been a shift towards higher value-added activities and an increased utilization of low-valued fish for the production of fish-based products like surimi, fish fingers, fish nuggets, fish balls, fish cakes and fish crackers.

CONCLUSION

Even though the information obtained from secondary sources provides quite a good insight of the socio-economic status of the small pelagic fishery in the West Coast of Peninsular Malaysia, a more detailed study on the community of fishermen who are directly involved in the catching of these small pelagic of fish is recommended. This is to provide a better understanding of the nature of this fishing community before any new measures to manage and conserve this fishery resources can be effectively introduced.

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Table 1 : Number of Vessels Surveyed by States

State	Commercial					Traditional						
	Trawlnet	Purse-Seine	Anchovy Purse-Seine	Shrimp Trawlnet	Sub - Total	Drift Net	Lift Net	Trap	Hooks & Lines	Others	Sub - Total	Grand Total
Perlis	17	50	0	0	67	147	1	0	1	1	150	217
Kedah	54	4	18	1	77	731	11	3	6	44	795	872
Penang	16	16	0	7	39	913	8	5	19	71	1,016	1,055
Perak	115	11	5	299	430	1,367	5	96	111	232	1,811	2,241
Selangor	316	2	1	0	319	1,083	5	13	41	202	1,344	1,663
Total	518	83	24	307	932	4,241	30	117	178	550	5,116	6,048

Source : FDA's Survey, 1995

Table 2 : Number of Local Fishermen Surveyed by Status in Household

State	Commercial			Traditional			
	Head of Household	Not Head of Household	Sub Total -	Head of Household	Not Head of Household	Sub-Total	Grand Total
Perlis	58	6	64	201	42	243	307
Kedah	426	146	572	1,109	174	1,283	1,855
Penang	160	34	194	1,202	254	1,456	1,650
Perak	717	173	890	2,221	600	2,821	3,711
Selangor	284	150	434	1,272	355	1,627	2,061
Total	1,645	509	2,154	6,005	1,425	7,430	9,584

Source : FDA's Survey, 1995

Table 3 : Total Number of Vessels by States in 1987, 1992 and 1997			
State	**1987**	**1992**	**1997**
Perlis	644	723	589
Kedah	1,731	2,090	1,340
Penang	2,164	1,877	1,518
Perak	4,671	4,657	3,949
Selangor	2,874	2,820	2,710
Total	14,071	14,159	12,103

Source : DOF's Annual Statistics

Table 4 : Number of Vessels by State and Gear Group, 1997

State	Trawl - net	Purse seine	Anchovy Purse seine -	Seine Other	Drift Net	Lift Net	Stationary Trap	Portable Trap	Hooks & Lines	Bag Net	Push Net	Barrier Net	Shellfish Collection	Fish Carrier	Misc	Total
Perlis	186	111	0	0	280	3	0	2	7	0	0	0	0	0	0	589
Kedah	467	15	39	13	754	14	1	1	9	0	0	19	0	0	8	1,340
Penang	99	25	0	98	1,171	0	0	3	57	0	4	38	0	0	23	1,518
Perak	1,297	52	10	398	1,717	1	0	32	103	4	0	81	114	59	81	3,949
Selangor	796	18	0	5	1,498	1	0	3	58	167	0	19	5	132	8	2,710
Total	2,845	221	49	514	5,420	19	1	41	234	171	4	157	119	191	120	10,106

Source : DOF's Annual Statistics

Table 5: Number of Licensed Gear 1987, 1992 and 1997

State	1987				1992				1997			
	Trawlnet	Purse-Seine	Driftnet	Total	Trawlnet	Purse-seine	Driftnet	Total	Trawlnet	Purse-seine	Driftnet	Total
Perlis	263	118	300	681	219	113	376	708	186	111	280	577
Kedah	508	21	948	1,477	514	17	1,379	1,910	467	15	754	1,236
Penang	120	56	1,638	1,814	106	35	1,465	1,606	99	25	1,171	1,295
Perak	1,645	103	1,752	3,500	1,500	66	1,817	3,383	1,297	52	1,717	3,066
Selangor	486	30	2,048	2,564	655	18	1,707	2,380	796	18	1,498	2,312
Total	3,022	328	6,686	10,036	2,994	249	6,744	9,987	2,845	221	5,420	8,486

Source : DOF's Annual Statistics

Table 6 : Number of Local Fishermen By Gear Group 1987, 1992 and 1997

State	1987				1992				1997			
	Trawlnet	Purse-Seine	Driftnet	Total	Trawlnet	Purse-Seine	Driftnet	Total	Trawlnet	Purse-Seine	Driftnet	Total
Perlis	1,034	2,091	708	3,833	809	2,671	794	4,274	670	2,683	587	3,940
Kedah	1,768	298	1,788	3,854	1,926	312	2,780	5,018	1,720	246	1,572	3,538
Penang	417	628	2,858	3,903	363	390	2,511	3,264	268	225	1,581	2,074
Perak	3,592	1,093	2,984	7,669	3,742	640	3,291	7,673	3,061	425	2,244	5,730
Selangor	1,202	270	3,555	5,027	1,774	158	3,024	4,956	2,189	162	2,514	4,865
Total	8,013	4,380	11,893	24,286	8,614	4,171	12,400	25,185	7,908	3,741	8,498	20,147

Source : DOF's Annual Statistics

Table 7 : Number of Commercial Fishermen by Age Group

State	Age Group (years)							Total
	< 15	15 - 20	21 - 30	31 - 40	41 - 50	51 - 55	> 55	
Perlis	0	0	3	15	22	9	15	64
Kedah	2	67	150	141	140	43	29	572
Penang	0	0	24	46	69	27	28	194
Perak	0	33	156	273	256	91	81	890
Selangor	2	20	115	157	99	33	8	434
Total	2	100	333	475	487	203	161	2,154
Source : FDA's Survey, 1995								

Table 8 : Number of Traditional Fishermen by Age Group

State	Age Group (years)							Total
	< 15	15 - 20	21 - 30	31 - 40	41 - 50	51 - 55	> 55	
Perlis	0	5	50	58	66	27	37	243
Kedah	1	40	179	347	360	152	204	1,283
Penang	0	25	180	311	421	255	264	1,456
Perak	4	58	519	784	720	347	389	2,821
Selangor	1	41	359	427	443	198	158	1,627
Total	5	128	928	1,500	1,567	979	1,052	7,430
Source : FDA's Survey, 1995								

Table 9 : Literacy Rate of Head of Household

(unit %)

State	Commercial	Traditional
Perlis	96.6	84.5
Kedah	90.4	82.0
Penang	88.7	82.6
Perak	75.2	80.3
Selangor	89.8	81.0
Overall	83.8	81.4
Source : FDA's Survey, 1995		

Literacy rate = Percentage of fishermen who can read newspaper And write simple letter

Table 10 : Size of Fishing Household

State	Commercial	Traditional
Perlis	5.7	5.1
Kedah	4.7	5.4
Penang	5.3	5.5
Perak	5.5	5.6
Selangor	5.9	5.5
Overall	5.3	5.5

Source : FDA's Survey, 1995

Table 11 : Dependency Ratio of Fishing Household

State	Commercial	Traditional
Perlis	1.4	1.4
Kedah	1.8	1.7
Penang	0.9	1.0
Perak	1.9	1.8
Selangor	1.7	1.4
Overall	1.7	1.5

Source : FDA's Survey, 1995
Dependency ratio = Non-working member over Working Member

Table 12 : Number of heads of Household by Occupational Status

State	Commercial					Traditional				
	Skipper	Owner	Owner cum Skipper	Crew	Total	Skipper	Owner	Owner cum Skipper	Crew	Total
Perlis	2	46	9	1	58	11	50	80	60	201
Kedah	35	16	22	353	426	161	42	567	339	1109
Penang	14	11	17	118	160	21	7	887	287	1202
Perak	113	9	269	326	717	151	30	1451	589	2221
Selangor	15	10	219	40	284	102	67	960	143	1272
Total	179	92	536	838	1,645	446	196	3,945	1,418	6,005

Source : FDA's Survey, 1995

Table 13 : Average Monthly Income of Head of Household from Fishing

Unit : RM

State	Commercial					Traditional				
	Skipper	Owner	Owner cum Skippe	Crew	Overall	Skipper	Owner	Owner cum Skipper	Crew	Overall
Perlis	3,800	4,551	3,100	350	4,227	547	1,897	573	446	863
Kedah	1,031	4,533	1,089	450	684	461	457	454	381	433
Penang	1,643	3,209	2,391	809	1,215	848	764	790	611	748
Perak	1,132	1,256	1,343	660	998	738	802	736	534	683
Selangor	1,123	961	1,268	646	1,162	681	751	746	478	711
Overall	1,181	3,675	1,365	591	1,080	625	989	707	504	662

Source : FDA's Survey, 1995

Table 14 : Percentage of Heads of Commercial Fishing Household Who Were Involved in Other Economic Activities

State	Aqua-culture	Fish Processing	Farming	Animal Husbandry	Tourism	Capentry	Repairing Workshop)	Contract Works	Retailing
Perlis	0	3.4	1.7	0	1.7	1.7	1.7	3.4	24.1
Kedah	0.2	0.9	0.9	0.2	0.2	0.5	0	0	1.6
Penang	1.9	0	1.3	0	0	0	0	0	2.5
Perak	0	0.3	1.1	0	0.3	0	0.4	0.4	0.8
Selangor	0	7.0	1.1	0	1.8	0	0	0.4	1.4
Overall	0.2	1.7	1.1	0.1	0.5	0.2	0.2	0.4	2.1

Source : FDA's Survey, 1995

Table 15 : Percentage of Heads of Traditional Fishing Household Who Were Involved in Other Economic Activities

State	Aqua-culture	Fish Processing	Farming	Animal Husbandry	Tourism	Capentry	Repairing(Workshop	Contract Works	Retailing
Perlis	0.5	0	9.5	1.0	1.5	2.0	2.5	9.0	2.5
Kedah	2.2	0.2	11.8	0.3	3.2	1.6	0.7	3.0	3.6
Penang	4.2	0.4	2.9	0.3	0.1	0.5	0.3	4.5	3.1
Perak	2.1	0.5	5.5	0.3	1.9	0.9	0.2	5.0	2.1
Selangor	0.2	3.4	7.9	0.6	0.9	0.5	0.6	6.6	3.0
Overall	2.0	1.0	6.8	0.4	1.6	0.9	0.5	5.0	2.8

Source : FDA's Survey, 1995

Table 16 : Monthly Returns From Other Economic Activities

State	Commercial					Traditional				
	Aqua-culture	Fish Processing	Farming	Animal Husbandry	Tourism	Aqua-culture	Fish Processing	Farming	Animal Husbandry	Tourism
Perlis	-	2,600	1,000	-	200	400	-	400	75	97
Kedah	1,000	180	238	50	50	196	200	185	60	128
Penang	483	-	275	-	-	596	196	185	350	100
Perak	-	1,525	371	-	10	362	208	118	62	74
Selangor	-	214	163	-	260	195	197	176	53	178
Overall	742	1,130	409	50	130	350	200	213	120	115

Source : FDA's Survey, 1995

Table 17 : Average Monthly Income of Head of Household From Other Sources

State	Commercia					Traditiona				
	Skipper	Owner	Owner cum Skipper	Crew	Overall	Skipper	Owner	Owner cum Skipper	Crew	Overall
Perlis	2,150	888	556	60	868	255	304	209	209	236
Kedah	143	1,380	171	118	175	153	34	154	135	155
Penang	423	1,127	359	314	388	304	512	294	318	301
Perak	130	722	150	140	150	130	290	149	133	146
Selangor	185	163	141	258	160	225	268	180	249	196
Overall	183	907	161	161	207	171	239	191	186	192

Source : FDA's Survey, 1995

Note : Income from other sources include income from other economic activities, remittance, interest, dividend, rental and retail value of fish for own consumption.

Table 18 : Average Monthly Income of Fishing Household

Unit : RM

State	Commercial					Traditional				
	Skipper	Owner	Owner cum Skipper	Crew	Overall	Skipper	Owner	Owner cum Skipper	Crew	Overall
Perlis	6,925	5,858	4,113	410	5,530	941	2,460	1,166	860	1,384
Kedah	1,219	6,865	1,568	643	972	817	1,070	849	655	794
Penang	2,901	6,536	3,689	1,686	2,338	1,771	1,804	1,756	1,320	1,652
Perak	1,588	2,989	1,806	1,023	1,431	1,087	1,468	1,173	889	1,095
Selangor	1,725	1,452	1,851	1,443	1,773	1,216	1,727	1,326	1,244	1,329
Overall	1,690	5,355	1,913	976	1,604	1,048	1,736	1,295	955	1,210

Source : FDA's Survey, 1995

Note : Income of fishing household include income of head of household and other members in the household

Table 19 : Percentage of Fishing Household Living Below Poverty Line

State	Commercial	Traditional	Overall
Perlis	0	6.5	1.7
Kedah	20.9	11.3	16.1
Penang	0	0.7	0.5
Perak	0.3	4.4	2.7
Selangor	0.4	0.9	0.7

Source : FDA's Survey, 1995
Note : Poverty Income Level = RM405 per month

Table 20 : Average Cost and Earnings of Trawlers by State and Size of Vessel

Size of Vessel	25-39.9 GRT					40-9.9GRT			
State	Kedah	Penang	Perak	Selangor	Average	Penang	Perak	Selangor	Average
No. of days per trip	4	1	1	3	2	1	1	4	2
No. of trips per month	7	22	18	9	14	22	18	5	15
No. of trips per year	84	264	216	108	168	264	216	60	180
No. of workers	5	3	3	3	4	3	3	3	3
Annual Landings									
Quantity (kg)	107,520	277,464	111,743	198,396	173,781	304,128	183,600	223,080	236,936
Value (RM)	176,046	200,310	126,270	243,000	186,407	212,784	187,272	252,120	217,392
Annual Operational Costs									
Fuel (RM)	84,000	82,632	33,238	125,323	81,298	80,900	54,076	94,088	76,355
Ice (RM)	13,440	14,784	5,400	0 *	8,406	16,800	5,400	0 *	7,400
Food for workers (RM)	8,400	4,000	3,240	2,916	4,639	4,000	3,240	2,100	3,113
Wages (RM)	26,130	45,023	37,773	32,854	35,445	50,519	68,705	74,896	64,707
Maintenance cost (RM)	17,880	8,436	8,436	3,672	9,606	9,363	9,636	4,800	7,933
Others (RM)	83	411	411	1,575	620	411	411	1,340	721
Total (RM)	149,933	155,286	88,498	166,340	140,014	161,993	141,468	177,224	160,229
Ann. gross earnings (RM)	26,113	45,024	37,772	76,660	46,393	50,791	45,804	74,896	57,163
Monthly gr. earnings (RM)	2,176	3,752	3,148	6,388	3,866	4,233	3,817	6,241	4,764
Annual depreciation (RM)	11,329	8,137	8,137	11,890	9,873	9,932	9,932	20,822	13,562
Annual net earnings (RM)	14,784	36,887	29,635	64,770	36,520	40,859	35,872	54,074	43,601

Source : DOF's survey, 1989

Note : * These vessels use Refrigerated Sea Water (RSW) system

Table 21 : Average Costs and earnings of Purseseiners By State and Size of Vessel

Size of Vessel	25-39.9 GRT				40-69.9 GRT		
State	Kedah	Penang	Selangor	Average	Kedah	Penang	Average
No. of days per trip	1	1	1	1	2	1	2
No. of trips per month	22	21	15	19	13	18	16
No. of trips per year	264	252	180	232	156	216	186
No. of workers	20	12	10	14	17	13	15
Annual Landings							
Quantity (kg)	134,265	244,944	141,210	173,473	381,888	390,312	386,100
Value (RM)	154,374	178,920	245,729	193,008	458,796	347,760	403,278
Annual Operational Costs							
Fuel (RM)	38,042	70,000	53,325	53,789	186,420	118,920	152,670
Ice (RM)	2,640	26,000	27,000	18,547	46,800	22,680	34,740
Food for workers (RM)	10,560	8,000	2,880	7,147	31,200	6,480	18,840
Wages (RM)	44,286	30,120	85,374	53,260	97,773	107,421	102,597
Maintenance cost (RM)	17,892	13,480	4,788	12,053	22,200	20,000	21,100
Others (RM)	75	1,200	2,511	1,262	645	645	645
Total (RM)	113,495	148,800	175,878	146,058	385,038	276,146	330,592
Annual gross earnings (RM)	40,879	30,120	69,851	46,950	73,758	71,614	72,686
Monthly gross earnings (RM)	3,407	2,510	5,821	3,913	6,147	5,968	6,057
Annual depreciation (RM)	4,541	4,339	11,664	6,848	9,124	9,124	9,124
Annual net earnings (RM)	36,338	25,781	58,187	40,102	64,634	62,490	63,562

Source : DOF's survey, 1989

Table 22 : Average Costs and earnings of Driftnetters in the West Coast of Peninsular Malaysia

No. of days per trip	1
No. of trips per month	17
No. of trips per year	204
No. of workers	2
Annual Landings	
Quantity (kg)	5,765
Value (RM)	21,095
Annual Operational Costs	
Fuel (RM)	3,529
Ice (RM)	950
Food for workers (RM)	1,681
Wages (RM)	3,734
Maintenance cost (RM)	3,192
Others (RM)	14
Total (RM)	13,100
Annual gross earnings (RM)	7,995
Monthly gross earnings (RM)	666
Annual depreciation (RM)	1,359
Annual net earnings (RM)	6,636

Source : DOF's survey, 1989

Table 23 : Disposition of Marine Fish Landings, 1997

	State					Total	
Disposition Channel	**Perlis**	**Kedah**	**Penang**	**Perak**	**Selangor**	**Quantity**	**%**
Fresh	53,763	46,989	35,530	111,701	58,082	306,065	61.3
For Freezing	0	0	0	2,933	0	2,933	0.6
For Curing:							
Dried / Salted / Smoked	30	16,004	1,147	5,421	6,409	29,011	5.8
Steamed/Boiled	0	0	0	422	0	422	0.1
Fermented	69	3,169	165	12,572	11,237	27,212	5.5
Others	3	143	0	480	0	626	0.1
For reduction	0	21,515	600	49,389	42,652	114,156	22.9
Others	408	42	90	18,294	28	18,862	3.8
Total	53,865	66,305	36,842	133,529	75,728	366,269	100.0

Source : DOF's Annual Statistics

KEMBONG/TEMENONG FISHING INDUSTRY IN KEDAH

by

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1. Introduction

The fishing industry in Kedah is an important industry that has contributed to the livelihood of about 12,000 fishermen and their families. With landings of 87,863 tonnes valued at RM 342 million for the year 1997, it cannot be doubted that this industry is important for the economic development of Kedah and Malaysia.

2. Kembong Resource Management and Conservation

i) According to data from the Fisheries Department, the number of licensed vessels is 1,626 units. Although this is so, the number of vessels operating is almost twice this number. This is especially so for small vessels using traditional fishing gear.

ii) Kembong are caught using various methods such as drift nets, trawls and purseseines. The main contributors are drift nets.

iii) There have been reports from a number of researchers stating that river mouths in Kedah especially at Kuala Sungai Merbok are breeding grounds for kembong/temenong. The mangrove forest in these areas are now being threatened by development and as such there is a possiblity that the kembong/temenong resources may be threatened.

iv) "Pukat Lohong" activities that catch kembong/temenong fry as trash fish are not profitable and also can destroy the fish resource. There should be control on the use of this gear.

3. Landings of Kembong/Temenong

i) In the year 1996, 76,269 tonnes of fish were landed in Kedah of which 11,383 tonnes were of species of kembong/temenong. In 1997, 13,008 tonnes of kembong/temenong were landed out of a total of 87,863 tonnes of fish landed. The main fishing gear used to catch this fish are drift nets followed by trawls and purseseines. From information provided by the Fisheries Department, 1,064 drift net licences were issued followed by 485 trawl licences and 12 purseseine licences.

ii) Kembong/temenong landings by vessels involved in catching these fish are satisfactory and stable as the landings for the years 1990 – 1997 ranged between 10,000 – 13,000 tonnes. However, it should be pointed out that these total landings have to be shared out among an increasing number of fishermen, especially for the fishermen using traditional gear and specifically in Langkawi District.

iii) The use of more effective net designs and sophisticated electronic equipment has helped to increase the amount of fish caught by the big vessels although the number of operators are far fewer compared to fishermen using tradtional gear. Traditional fishermen do not have the capital to use sophisticated equipment so their individual catch is not high. Also the resource has to be shared among the number of fishermen using traditional gear.

4. **Catch Handling and Processing**

i) Most vessels operating in Zone B, C and C2 in Kedah have been fitted with Refrigerated Sea Water (RSW) systems. There are three ice factories which have the daily output capacity of 180 tonnes to support the needs of vessels without RSW to freeze their catches while at sea and on land in normal situations. This is further supported by the existence of 40 units of cold rooms with a capacity of storing 389 tonnes of fish and 455 tonnes of ice at any one time.

ii) The production of ice and the existence of cold rooms as stated above have been able to support the needs of fishermen in normal situations. However, since kembong/temenong have peak landings seasonally each year, the storage capacity is not sufficient during these peak seasons. ***The construction of cold rooms, infrastructure and marketing logistics have to be increased if already existing, or if not in existence, should be built by government agencies to provide the storage capacity needed.***

iii) Besides that, extension units of the Fisheries Department should from time to time **expose to the operators the latest, cheapest and most effective handling techniques**. Considering that kembong/temenong have a high body oil and fat content they are not suitable to be processed into fish balls or fish cakes. **New methods for utilising these fish have to be experimented on** by the relevant government agencies, specifically MARDI. For the time being, excess kembong/temenong are mainly processed into dried/salted fish and also boiled.

iv) Maybe from this, a ***one village one product concept*** based on kembong/temenong can be initiated, and with support from the government, an industry based on kembong/temenong can be further developed to support local demands as well as supply international markets.

5. Conserving and Ensuring Resource Sustainability

i) As a species of fish that migrates seasonally and has specific, spawning and egg hatching seasons, it important for research to be conducted to identify these areas for closure so that fish laying eggs and young fish are not caught from these areas. Currently there is no control on fishing for spawning fish and young fish. The sad thing is that thousands of tonnes of small fish are caught and since they have no market value, they are only used as trash.

ii) The limitation of ***mesh sizes of nets*** and the gazetting of ***restricted areas*** during certain seasons can help sustain this resource. The setting up of ***artificial reefs*** as breeding grounds also have to be increased to add to the natural breeding areas.

6. Problems and Issues in Monitoring and Conservation of Resources (That are Related to Kembung Fishing and Problems Faced by Fishermen in General)

i) Monitoring/Conservation problems are sensitive and are often brought up at forums, dialogues, workshops or even seminars that involve fishermen. The same problems are repeatedly brought up. The Fisheries Department as a department that ***carries the inspiration and looks after the interests of fishermen*** has to be more sensitive and proactive in carrying out their monitoring activities. ***This is because the Fisheries Department is not an authoritarian monitoring/enforcing agency***. As said above, the Fisheries Department is a department that carries the inspiration and looks after the interests of fishermen.

ii) Laws or regulations that ***squeeze or jeopardise the growth of the fishing industry*** such as confiscating vessels that commit offences should be reviewed in order to further encourage further growth of this industry.

iii) It is undeniable that managing such a big number of vessels needs a high degree of courage and grit for the responsible agency, specifically the Department of Fisheries Malaysia. Considering this industry has been a large contributor to the economy of Kedah and Malaysia for so long, a different and more proactive approach is necessary.

iv) At this time, vessel licence renewals take quite some time and goes through many levels of bureaucratic processes. The relevant agency, specifically the Fisheries Department, should review this licensing system currently in use and come up with a method of licensing which is easier but does not compromise any existing laws and regulations. It is not wrong to take the licensing system of the Road Transport Department (JPJ) as an example where the process to renew vehicle licences has been made easier and vehicle inspections have been privatized. It also is good if **PUSPAKOM** is set up for the Fisheries Department where the inspection of vessels is conducted by more professional and qualified people. Officers from the Fisheries Department can then concentrate on their administrative duties.

v) The Headquarters of the Fisheries Department of Malaysia should decentralize some of its powers to state level. Powers such as renewal of deep-sea vessel licences and the transfer of vessel ownership are still under the Headquarters of the Fisheries Department. This creates an **'element of delay'** in the implementation of these processes.

7. CONCLUSION

The importance of kembong/temenong fishing in Kedah and Malaysia cannot be denied. As such, it is important that both parties involved in this industry, the operators and the Fisheries Department as well as other relevant government agencies, play more proactive roles to ensure the stability of this industry and the sustainability of this resource in order to contribute more meaningfully to the development of the country's economy in this new millennium.

KEMBONG FISHERY IN MANJUNG DISTRICT, PERAK

by

Beh Wong King
Purseseine fishermen
Perak, Darul Radzam

1. Introduction

I have been in the fishing industry for 20 years. Specifically I operate the fish purseseine and the anchovy purseseine. Initially in 1978, I owned only one boat but now I have three Zone C fish purseseine boats. One of these three was converted from an anchovy purseseine. In 1993, there were 15 anchovy purseseiners in Pulau Pangkor but now there are only eight left because the anchovy resources have declined.

2. Landings of Fish Purseseines at Manjung District, specifically at Pulau Pangkor

In 1998, the total production from fish purseseines was 8,778 tonnes as compared to 4,900 tonnes in 1997. The landings increased because the number of boats increased from 28 units in 1997 to 40 units that are currently in use. Sonar is also used. On an average 40% of landings by fish purseseines are kembong while the rest consists of tuna, hardtail, roundscad and sardine. Although landings have shown an increase, measures have to be taken by the industry and the Fisheries Department to ensure the sustainability of these resources.

3. Proposal for Resource Conservation to Ensure Sustainability

Fish Purseseine Boat Operators

- At this time fish is caught irrespective of size. Small fish that do not have commercial value are caught by fish purseseiners. This attitude should be changed and small fish that are pursed should be released to allow them to grow bigger.

4. Proposals to Fisheries Department

- Zone A should be strictly controlled because this zone is the breeding area for fish.

- More reefs like boat reefs should be built in Zone A and also in Pulau Jarak. At this time, Zone B boats are not allowed to fish within five nautical miles and Zone C boats are not allowed to fish within 12 nautical miles from Pulau Jarak. It is proposed that these regulations be imposed for Pulau Sembilan but removed for Pulau Jarak.

5. The Benefits for Replacing Pulau Jarak by Pulau Sembilan

- Commercial fishing boats like trawlers that are currently allowed to fish within five nautical miles from Pulau Sembilan will not be allowed to do so. There are nine islands in the Pulau Sembilan group and the imposition of regulations here instead of in Pulau Jarak will be good for resource conservation. If this proposal is accepted, then the restrictions on fishing areas for Pulau Jarak should be replaced by Pulau Sembilan.

- It is proposed that a few boat reefs with fish aggregating devices made from old polyethylene nets and new floats be built in the area about 1.5 nautical miles from Pulau Jarak to provide breeding areas for fish. These reefs can also deter trawling activities and protect available resources.

- It is also proposed that a station be built at Pulau Jarak where relevant authorities can be based. The presence of authorities at Pulau Jarak will provide confidence to fishermen of Perak who fish in the waters around Pulau Jarak. This will also deter foreign boats from fishing in our waters.

Table 1. Landings of small pelagic fish in Pangkor

Year	Total catch of small pelagic fish (tonnes)	Total catch of kembong (tonnes)	Kembong as percentage of total small pelagic fish
1988	7,688.94	2,969.46	38.62
1989	5,262.79	1,727.07	32.82
1990	9,880.30	4,695.56	47.52
1991	5,783.03	2,294.96	39.68
1992	7,948.86	3,055.48	38.44
1993	4,946.46	789.72	15.97
1994	3,718.28	1,651.43	44.41
1995	6,271.63	3,781.83	60.30
1996	5,589.92		
1997	4,901.24		
1998	8,778.23		

KEMBONG/TEMENONG FISHING INDUSTRY IN PERLIS

by
Lee Yen Leong
Fish Traders and Boat Operators Association
Kuala Perlis

1. Introduction

The fish landing site in Kuala Perlis is one of the largest and oldest fish landing sites. It is also one of the oldest fishing villages in Perlis state and specifically in northern Peninsular Malaysia. Besides Kuala Perlis, there are also a number of smaller fish landing sites such as Kuala Sanglang and Sungai Baru.

Kuala Perlis is a small town, which is developing at a fast rate and has a population of roughly 23,000 residents and has sufficient infrastructure such as industrial, residential and commercial areas as well as a fish landing complex run by LKIM (Fisheries Development Authority), a ship and boat repair dock and also a ferry terminal. Many other basic facilities have also been provided including the construction of the Kuala Perlis – Changlon expressway. It is also an entry and exit point for tourists to Langkawi and Thailand and vice-versa.

The fishing industry and it's downstream industries provide jobs for the majority of inhabitants at Kuala Perlis since the establishment of this village hundreds of years ago. As such, it is not surprising that till today the industry has been passed down for generations since geographically, Kuala Perlis is situated next to the sea. The socio-economic development is supported by fishing activities of inshore to deep sea fishermen.

Now there are about 180 vessels that are involved in catching kembong/temenong. Fishing is done by local fishermen who use purseseines and trawls. Vessels that are involved are the coconut leaf luring purseseine (Fish aggregating device/Night) for Zone C-2 / C and Zone B vessels. The total investment cost of vessels and equipment is about RM45 million. This industry is considered successful and has continued developing from time to time as can be seen through the increase in vessel numbers and increase in yield and production to meet the demand.

2. Management and Conservation.

Vessel operators have always been proactive and they work hard to increase yield and income from fishing activities. Besides that, fishermen also protect their resources and take steps to ensure this industry is controlled and sustainable. They also invest in new technology to increase productivity from time to time. It is important for the fishermen to play a positive role and cooperate with authorities especially the Department of Fisheries Malaysia.

From experience, this industry needs a lot of commitment to be successful. As such it is believed that the best approach would be to help and understand one another and support each other through the sharing of information and problems in an effort to achieve success and the real objective. Among these are:

(a) Limited fishing areas

(b) Enforcement and monitoring is too strict

(c) Identifying and understanding problems as well as systematic management

(d) Technological, research, processing, product and marketing support

Until now, vessel operators have faced problems while fishing for kembong/temenong only in designated areas because of regulations and enforcement even though there is a lot of resources to be harvested.

(a) Limited fishing area for the vessels specifically purseseines in Zone C2, C and B.

(b) Banning of fishing activities in the breeding and nursery grounds of kembong/temenong that are located in inshore areas or around islands which are fully protected.

(c) The use and effectiveness of cuboid fish aggregating devices/reefs or concrete culverts and old tyres, which are not systematically arranged and without proper demarcations, to create attractive habitats for marine organisms should be studied. This has not taken into consideration the optimal harvesting of kembong/temenong in areas which are bountiful with this fish.

(d) Banning of fishing and preventing the migration of resources (temenong) from breeding grounds mainly around islands into the waters of a neighbouring country (Thailand).

3. Yield

Based on 1993-1997 statistics that were produced by the Department of Fisheries Malaysia, the total catch of kembong/temenong is satisfactory and consistent especially in Perlis.

Total kembong/temenong catch are as follows :-

Year	Equipment Used	Total catch (tonnes)
1993	Purseseine	19,236
1994	Purseseine	21,345
1995	Purseseine	26,316
1996	Purseseine	22,823
1997	Purseseine	25,609

The total catch only decreased in 1996 because of the pollution caused by the oil spill from **'Nagasaki Spirit'** in the breeding and nursery grounds of these fish. The ecological effect was minor and only temporary, thanks to the efforts of the Department of Environment and other agencies involved in cleaning up the oil spill.

In 1998, and until today, fishing is encouraging and the catch has increased even more than in the previous years. Besides being able to supply the local market, fish can also be exported to Thailand.

The market price of these two fish is stable and is between RM1.50 and RM5.50 per kg. This depends on specific seasons, quality and excess catch. These fish are the prime choice of local consumers because of factors such as cost and supply that is easily available either in the fresh or frozen form.

4. Handling and Processing

Currently, Kuala Perlis only has seven small and medium industries, which are involved in frozen fish with a processing capacity of around 180 tonnes and provide jobs to around 100 local residents. Most of the frozen fish is for the local and export markets. Only 30% of the fish are frozen while the rest is sold fresh.

Processing and packaging quality is constantly being improved as well as the distribution. Each package contains no more than 25 kg.

There is no effort made to vary the products such as canning or processing into other types of food because there is a lack of confidence and also because this industry cannot develop further as there are very strict rules and regulations on the limited fishing area, foreign crew and licensing conditions.

For the operators, this industry has the potential to be further developed if steps are taken to update or relax current laws to allow this sector to develop.

Because of this lack of confidence, there is insufficient investment interest in downstream industries to diversify the production of kembong/temenong-based products.

Observations made show that vessel and fishing industry operators in Southern Thailand are more successful and they get the full support from their authorities to develop this sector. This is also seen in the increasing number of vessels as well as the existence of downstream industries. Currently there are small and medium industries in Thailand that have the capability to process kembong/temenong for international markets in the form of quality packages of five fish besides freezing and canning.

ISSUES PERTAINING TO KEMBUNG FISHERY IN PENANG WATERS

by
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Penang Inshore Fishermen's Welfare Association
Pulau Pinang

A) GENERAL

1) Areas where there are a lot of Temenung are from Pulau Betong and Balik Pulau, Penang to Yan, Kedah.

2) Fishing activities for Kembung are at
   a) Kuala Muda and Penaga
   b) Sungai Udang

3) Temenung is a mid ocean fish, which is found roughly 5 nautical miles from shore.

4) The presence of this fish in the waters of Penang is dependent on the north wind.
   Most fish : January till May
   Less fish : June till December

5) Temenung is found in waters 5 – 50 meters deep.

B) PRICE, QUALITY AND MARKETING OF KEMBUNG

1) The qualities of kembung caught using different nets are different:

Example :
A) Temenung net
   Mesh size : 1.58" – 2"
   Quality : Good
   Price : High (RM 3.50 per kg)
   Identification : Fish with mouths closed

B) Trawl, Purseseine and other Seines
   Mesh size : 2" and above
   Quality : Not too good
   Price :
   Identification : Fish with bruised bodies and open mouths

2) Fishermen who use the temenung net (drift net for *Rastrelliger*) also use scanners.
   a) Good season : 2 to 3 tonnes
   b) Lean season : Less than 200 kg

C) MARKETING

White Temenung (refers to Indo-Pacific mackerel) that are caught here are sent to Thailand and Black Temenung (refers to Indian mackerel) caught in Thailand are imported.

a) Type A fish : Sold Wholesale at the jetty : RM2.40 – RM3.50 per kg
b) Type B fish : Frozen : RM1.20 per kg
c) Type C fish : Salted : RM0.80 per kg
d) Type D fish : Trash fish : RM0.60 per kg

3) Processing of fish crackers is not done in Sungai Udang where the main activity is the catching of kembung

4) The best fish are estimated at 11 to 12 fish per kilo.

5) Kembung is not fished in Pulau Betong because
   a) Ice is expensive
   b) There is no ice factory in this area

D) ATTITUDE OF TRAWLER AND PURSESEINE BOAT OWNERS TOWARDS MANAGEMENT AND CONSERVATION

1) Small purseseines from Kg. Gajah and Bagan Ajam, Butterworth are involved in kembung fishing besides operating the trawl and their nets interfere with the activities of inshore fishermen.

2) Interference by the trawl is when the net is hauled in and yield temenung that are of poor quality and fish fry are also destroyed.

3) Trawlers and purseseine boats are not bothered about the constantly declining stock of fish. The presence of a number of trawlers and purseseine boats in Penang has made the lives of inshore fishermen harder. One trawler is estimated to catch 3 tonnes of fish at a certain time. There are no less then 20 boats intruding this zone when there is a lot of fish. It is estimated that 60% of the fish caught are trash fish, which have low commercial value.

4) Recently, the catch of kembung has gone down albeit not drastically. A few reasons have been identified as threats to the temenung net
   a) Overfishing by trawlers
   b) Prawn culture ponds release untreated waste into the sea
   c) Small purseseines that bring in a lot of fish

Other than the reasons stated above, development has also caused coastal waters to become shallower, forcing kembung to migrate to deeper waters.

Catch handling and processing

There are no problems as buyers are waiting at the landing site when temenung boats land around 3.00 p.m.

E) THE BEST WAYS TO CONSERVE AND MONITOR RESOURCES SO THAT THEY ARE SUSTAINABLE

I. Banning of trawlers or reduction in number in phases

II. Small purseseines are changed to temenung nets or senangin (threadfin) nets

III. Temenung netters from Perak and Penang should be warned to be careful and to reduce their speed and set up a voluntary fund to compensate for any collisions of nets.

IV. The departments responsible should ensure that nearby factories do not release affluents and untreated water and especially waste from prawn culture ponds.

V. The Fisheries Department has to enforce laws so that only temenung nets are allowed to carry out fishing activities.

TOWARDS DEVELOPING A MANAGEMENT PLAN FOR THE SMALL PELAGIC FISHERY OFF THE WEST COAST OF PENINSULAR MALAYSIA

by
Barry Pollock
FAO Consultant

The second phase of this workshop involved group activities. The workshop divided into three State-based groups to demonstrate how fishery management plans can be developed in and inclusive process involving all stakeholders. The outcomes of this process were a draft fishery management plan, covering all relevant aspects; a list of all problem issues presently facing the fishery; and an experience by all involved of "hands-on" fishery management planning in a working group of stakeholders. I believe that this procedure was one of the highlights of the workshop. All participants became actively involved and produced the outcomes expected. This would be a powerful experience about how fishery management planning could occur in a collective and positive framework. The involvement of fishermen from the various areas of the fishery was particularly important.

Prior to the commencement of the three working groups, the concepts of a fishery management plan were given, together with the advantages of such a plan. An overview of what the workshop expected to achieve in this phase was presented (see Table 1).

Table 1. A list of expected outcomes and the process to be followed in the Workshop

OUTCOMES
(Wednesday & Thursday)

- *Fishery management plan(s)*
- *Issues/problems identified and ranked*
- *Actions proposed to improve fishery management*

PROCESS
(Wednesday)

- *Background and introduction (by Dr. Pollock)*
- *State groups draft plan and list issues*
- *State groups present findings to whole workshop*

(Thursday)
Issues Listed and Ranked

- *Actions suggested to improve fishery management*

A listing of the common question about fishery management planning were raised and answered (see Table 2).

Table 2. Some common questions about fishery management planning

QUESTIONS

Why prepare a Fisheries Management Plan?

ANSWERS

- Integrates all aspects
- Demonstrates organization
- Accountability and Transparency

QUESTIONS

Who should be involved in preparing the plan?

ANSWERS

- Stakeholder inclusion produces commitment and ownership

QUESTIONS

Should we start our plan now?
Do we have enough information
Is it too difficult?
Is there a PERFECT fisheries management plan?

ANSWERS

- Always remember the continuous principle
- Outstanding issues identified, priorities set, actions formulated and responsibilities assigned

QUESTION

What are the possible contents of a fishery management plan?

ANSWERS

(see Table 3)

The contents of a Fishery management Plan were also presented and discussed (see Table 3).

Table 3. Fishery Management plan – possible contents

TITLE : Management Plan for Small Pelagic Fisheries off the West Coast of Peninsular Malaysia

1. Description of the fishery
    - Area
    - Species
    - Fishing methods
    - Socio-economic information
2. Jurisdiction
    - Government and their agencies with roles in the fishery
    - Formal or informal agreements between governments on fishery management
    - Roles of all responsible agencies
3. Objectives of fisheries management
    - Biological
    - Social
    - Economic
4. Operational management
    - Access arrangements including licensing and non-licensed access
    - Input/output controls
    - Pricing policy/licence costs
5. Research and stock assessment
    - Current research and stock assessment programme
    - On-going data collection
    - Socio-economic studies
    - Environmental issues
    - Implications for management
6. Monitoring, Control and Surveillance
    - Regulations/rules to be enforced
    - Description of existing capacity
    - On-going data collection
7. Consultation with stakeholders and extension
    - Stakeholders
    - Consultation processes
    - Provision of information
8. Post-harvest sector
    - Description of post-harvest sector
    - Management implications
9. Review of the Plan
    - How and when will the plan be reviewed
    - Who has responsibility for the plan and its review

The initial tasks of the three working groups were also explained (see Table 4).

Table 4. Guide for State Working Group

Information for the State Working Groups on the Management Plan and on Associated Issues

The (4) State Working Groups (Perlis & Kedah, Perak, Selangor, Penang) are requested to meet separately and complete the following tasks :

Task 1 :

- Prepare details of the **current** situation under all headings of the fishery management plan. This should be done briefly, using headlines or bullet points on OHP transparencies.

- Prepare separately on paper a list of any **issues** such as problems, deficiencies or unresolved matters presently associated with the management plan.

Task 2 :

- Report back to the whole workshop on the result of the fishery management plan only. Whole workshop discusses these results and a consensus is obtained on the contents of the fishery management plan.

- The list of issues is provided to Dr. Purwito Martosubroto for collation and further discussion on Thursday.

The application of the "Principle of Continuous Improvement" in fishery management planning was emphasised. This principle recognises that fishery management plans can be compiled immediately, based on current knowledge and the existing situation. Such plans are not perfect. At the same time all issues (problems) affecting the fishery management plan need to be identified and actions formulated for their resolution. It also recognises that all issues cannot be resolved in the short term and hence priorities need to be set and agreed to by all stakeholders.

All issues identified by the three working groups were recorded, prioritised by a total group process and action agreed as to how the priority issues might be addressed.

Another important outcome of the working group procedure was to demonstrate in a practical way that PROCESS (that is the involvement of stakeholders in an inclusive way to develop a fishery management plan and agree on issues) is equally, if not more important than the actual OUTPUT (that is the fishery management plan and priority issues).