ECONOMICS OF AQUACULTURE, SEA-FISHING AND COASTAL RESOURCE USE IN ASIA

Edited by

Aida R. Librero
William L. Collier

Proceedings of the
Second Biennial Meeting
of the
Agricultural Economics Society of Southeast Asia
November 3– 6, 1977
Tigbauan, Iloilo, Philippines

Agricultural Development Council
Philippine Council for Agriculture and Resources Research
October 1979

FISHERIES DEVELOPMENT ON THE WEST COAST OF PENINSULAR MALAYSIA

Yap Chan-Ling [1/]

Introduction

In recent years on the west coast of Peninsular Malaysia the trawl became established as among the most important of all fishing gear accounting for 32% of the total in operation in 1974. It provides 48% of the total fish landing in the west coast of Peninsular Malaysia. Next in importance in terms of its contribution to total fish landing is the purse-seine, contributing 19% of the total landing of the west coast though representing only 13% of the total fishing gear in operation. [2/] However its importance as a source of employment far exceeds that of the trawler. A purse seine unit in the west coast employs from 10 fishermen to as many as 22. On the other hand, a small trawler employs only 2 fishermen while a large trawler employs 5. Thus, the number of fishing posts made available by the operation of the purse seine is approximately 4 to 5 times that offered by trawlers. However, taking into account the larger number of trawlers in use, the ratio of the total employment offered by purse seine units versus the total employment offered by trawlers, would approximate to about 2·1

Drift nets (pukat hanyut), representing 33% of the fishing gear in operation, is next in popularity to the trawl. However, it is relatively insignificant in terms of its contribution to total landings accounting for only 4% of the total. As a source of employment it is of some importance. Although a drift net is operated by two fishermen only their accumulative number, 4,091 fishing boats were found operating the drift net in 1974, [3/] means that a considerable number of fishermen are involved in this fishery In fact 18% of the total employed fishermen in the west coast are employed in the operation of the pukat hanyut.

1/ Faculty of Economics and Administration, University of Malaya

2/ All estimates are based on figures obtained from the *Annual Fisheries* Statistics 1974, Ministry of Agriculture and Fisheries

3/ Annual Fisheries Statistics, 1974, op. cit

Besides these three main types of fishing gear, there are numerous miscellaneous fishing gear such as bag nets, push nets, lift nets, fishing stakes and portable fish traps called bubu. These are relatively less significant both in terms of their numbers and their contribution to fish landings. Fishing stakes account for only 1.4% of the total landings in the west coast, and 2% of the total fishing gear in operation.

However, the economic importance of the different fishing gear has not always been the same. In the early twentieth century fishing stakes are the most significant fishing gear in the west coast. Prominent among these fixed-entrapping structures were the jermal, kelong, and the ambai. These were built of nibong poles and wood and are still used. Fishermen operating these traps do not continuously seek out the fish. Once the location of the trap is decided and the trap constructed, the catch will depend on the migrating habits of the fish. 4/

However, by the 1930's there was a definite shift of preference from fixed-entrapping structures to more mobile methods of fishing which permitted fishermen to actively pursue the fish. Drift nets and purse seines grew in popularity from the 1930's onwards. A temporary set back to the technological development of the fishing industry was experienced in the war years and also in the initial post war period, but by the 1950's the industry was well again on the road to recovery. The purse seine became the main fishing gear in this period. It was not until 1965, and in particular after 1970 with the introduction of the trawl, that the purse seine was relegated to a place of second importance. Examining the events that led to this change in the pattern of fishing, this paper attempts to divide the history of technological development in the fishing industry in the twentieth century into roughly 4 periods:

The first period, around 1900 to 1930, saw the beginnings of a decline in importance of fixed entrapping structures.

The second period from 1930 to 1940 was important for the emergence of the purse seine as the major fishing gear in the industry.

The third period, from 1940 to 1965, saw an initial setback to the fishing industry due to the second world war, its recovery and the continued importance of the purse seine.

The fourth period from 1965 onwards has been marked by the rise in importance of the trawler industry.

Period 1 (1900-1930)

Between 1900 to 1930, the kelong, jermal and the ambai were the major fishing gear used in Perak, Selangor and Negeri Sembilan. 5/ The kelong predominated in the southern end of the peninsula, especially around the Straits of Johore and also along the

---

4/ T.W. Burdon, *The Fishing Gear of the State of Singapore*, Fisheries Survey Report, No. 2, Government Printers, 1959.

5/ Statistics in this period were available mainly from the Federated Malay States comprising of Perak, Selangor and Negeri Sembilan. There was no single Department of Fisheries covering the West Coast of Malaya. The Fisheries of Malacca, Penang and Singapore were separately administered under separate harbour masters. Statistic for the States of Perak, Selangor and Negeri Sembilan in the early twentieth century were mainly in terms of the revenue derived from the issue of licenses in the various districts of Krian, Matang, Dingdings, etc. However, in 1923 the fisheries of the Straits Settlements and the Federated Malay Stateswere amalgamated.

Table 1. The productivity and employment generation status of the 3 main fishing gear on the West Coast of West Malaysia.

Fishing Gear	Numbers in operation	Percentage of the total number of fishing boats (nearest %)	Fish Landings	Percentage of the total fish landings (nearest %)	Number Employed per Boat			Estimated Total Employment			Percentage of the Total Employed Fishermen on the West Coast		
					Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
			(piculs) a/							*nearest per cent*			
Pukat Jerut (purse seiners)	1,535	13	976,497	19	10	22	16	15,350	33,770	24,560	34	74	54
Pukat Tunda (trawlers)	3,909	32	2,526,044	48	2	5	3.5	7,818	19,545	13,682	17	43	30
Pukat Hanyut (drift netters)	4,091	33	207,435	4			2			8,182			18

a/ 1 picul = 133 lbs.

Source: Estimated based on data obtained from the *Annual Fisheries Statistics 1974*.

coast of Selangor and Malacca. In the northern part of the west coast of Malaya, where the currents were much stronger and the coast more exposed to the south westerly monsoon, the jermal and the ambal were predominant. The whole of the west coast was dotted by either one of these fishing stakes. In 1911, in the state of Perak alone, there were 3,420 fishing stakes of which 3,333 were ambai and 87 were kelong and jermal. 6/

There were several reasons for the popularity of fishing stakes in this period. Firstly, their operation was very profitable especially in the early 1900's. The cost and earnings investigations that were carried out on the jermal and kelong in 1914 and 1917 all concluded that the revenue earned by fishermen operating the jermal and the kelong was far higher than those earned by drift nets. The average monthly net profit, after deduction of cost and depreciation, of each fisherman was estimated to be M S60.80 in the kelong fishery. The average monthly net profit of those operating the drift nets was calculated to be MS37.45. 7/ In addition, there were other advantages attached to the use of fishing stakes.

Most owners of kelong, ambai and jermal were Chinese fishermen. Fishing to them was an important but subsidiary occupation to pig rearing and poultry farming. The use of fish traps provided them with the time necessary for pig rearing and poultry farming, time which would otherwise not be available if other types of fishing gear were used. The catch of these traps unselective in nature, could be used to produce fish meal for feeding the pigs and hens. In turn, profits from the sale of pigs and poultry were used to maintain the fishing stakes. Thus, the use of fishing stakes were a complementary and an integral part of the Chinese fishermen livelihood. In fact, the bilis, small shrimps and prawns were the basis of the Chinese owned bilis and *belacan* industry of the country. In the state of Perak, fishing centres like Kuala Kurau, Tanjong Piandung, Kuala Larut, Londang, Bagan Datoh and Kuala Bernam were also centres of belacan production and pig rearing.

On the other hand, the mobile methods of fishing in this period such as the drift net, operated under several handicaps. firstly, their mobility was limited. Most of the boats used for these fishing gears were sailing boats and junks. The boats of each district differed from the other. They were usually, however, small in size and propelled either by sail or by oars. Their use were limited to the immediate waters of the coast within the 10 fathom line. Most of them were not intended for long trips. They had to be beached between each fishing trip being shallow of draught and without keels of any appreciable depth. 8/ The lightness of the boats meant that the first sign of a slightly turbulant sea would send them scurrying back to the shore. The Chinese sampan - khotak (flat bottomed boats) were studied but were difficult to manuever except in the calmest of water. Therefore fishing with these boats depended on the state of the sea and wind and there was an almost total reliance on nature. The mobility of fishing boats in pursuit of fish was accordingly limited. This circumstance and the fact that the catch of the fishing stakes was invaluable as animal food, (it is estimated that three-quarters of the Perak fishermen were also pig rearers, contributed to the popularity of the fishing stakes.

However, reliance on stakes in the fishing industry was not to remain as between 1910 - 1930 several factors collectively contributed to a decline in their use. Fishing

---

6/ Report on the Fisheries Department of the year 1911, F.M.S. Supplement to the F.M.S. Government Gazette, August 1912, page 1

7/ *Report on the Fisheries Department* for the year 1914. See also the Annual Report of the Fisheries Department 1917, Government Printers.

8/ Gibson-Hill, "The Fishing Boats Used on the Coast of Malaya", *Malayan Fisheries* Methodist Publishing House 19, p. 59.

stakes were repeatedly reported to have been destroyed; a series of prohibitive measures were levied against their use; wages of labour shot up; and most important of all, another type of fishing gear rose to prominence namely the purse seine which possessed advantages not enjoyed by other types of fishing gear hiherto employed.

Destruction and Replacement

The destruction of the kelong, ambai and the jermal were common occurrences. These fishing stakes, once constructed, were unprotected. The destruction of a fishing stake involved the owner in considerable loss of opportunities of earning and cost of replacement. However, spells of bad-weather well spaced out, could afford the owners the necessary time to raise the capital required for reconstruction and to recover loss. However, the time necessary for the recovery of losses was not available in the period between 1913 to 1928. Repeated destructions of fishing stakes, due to bad weather, were reported in the years 1913, 1915, 1916, 1919, 1920, 1927 and 1928. Furthermore fishing stakes were not only destroyed by bad weather; but also by the sudden insurgence of ikan lambok jelly fish. The kelong, ambai and jermal, being non-selective fishing gear, net in all fish that swim into the net, so that a sudden insurgence of a fish like ikan lambok could lead to a large scale destruction of the fish trap.

Running concurrently to these physical set-backs to the fishing industry was the constraints created by the newly introduced policy of the Forestry Department.

The main item required in the construction of fishing stakes was wood, preferably nibong wood. The scarcity of wood had been a persistent problem since the early 1900's. In 1909, however, the Forestry Department put forward its new working plan for the exploitation of mangrove swamps, coupes of mangrove forests made available to the fishermen being generally located a great distant from the place of need. 9/ This, however, was merely the first of a series of difficulties in procuring wood faced by operators of fishing stakes. In 1916, the problem cropped up again but in a more acute form following the policy of forest conservation of the Forestry Department. There was also a lack of clear direction. There was indecision as to whether it was more important to maintain the fishing industry or to conserve the forest. The whole industry was in fact in a state of languish'. The post of inspector of Fisheries was not filled, and little specialized economic work was carried out in this period. The fishermen resented the restrictions placed on them, and complained of the difficulty of penetrating coupes set aside for their use so far from their place of need. The distance involved made it impossible to transport wood especially when these coupes could not be reached by water transport. As the price of wood increased, especially in the Krian district of Perak, the profitability of operating fishing stakes became increasingly questionable. There were insufficient stakes of various sizes to suit the differing requirement of the different fishing sites. Although total prohibition was not implemented, because it would have meant the elimination of some fishing villages, the scarcity of wood was sufficiently acute to cause a large decrease in the number of large fishing stakes. 10/ Many jermals were abandoned in Kuala Larut. In 1919, many fishermen in Malacca had shifted from the use of 5 fathom stakes to 3 fathom stakes because of the difficulty of procuring poles; still others abandoned them altogether. The policy of restricting the size of the poles to be cut made it difficult to extend fishing activities to deeper waters and overcrowding in the inshore areas became a problem.

9/ Annual Report of the Fisheries Department, 1909 Government Printers.

10/ Report on the Fisheries Department for the year 1919, FMS.

Prohibitive Measures

Official attitudes towards the use of fishing stakes were not consistent. The alleged destructiveness of fishing stakes led to a series of investigations on the selectiveness of the gears's catch. The findings of these investigations were frequently conflicting and measures of prohibition alternated with measures of liniency. This caused considerable confusion and loss to owners of the stakes.

For example, in 1904, R J Wilkonson, H. Bekerly and H.C. Robinson were appointed to inquire into the general economic conditions of the fisheries on the west coast of the peninsular. [11/] Among the major items that they investigated was the necessity of prohibitory measures to be taken against the use of fishing stakes, or alternatively the rules that should govern their operations. The findings of their investigation led to the prohibition of fish traps like the ambai and the gombang. Fines for their usage were increased. While the use of large fishing stakes was not prohibited, licence fees for their use were made exorbitantly high. They were at least 3 to 6 times the licence fees of drift nets. The committee maintained that tax rate imposed on such fixed equipment was not high, because the profitability of the equipment was due to its location and hence was an unearned increment. [12/] In other words, it was treated as an economic rent, a surplus over and above what was necessary to keep the factor of production in its present occupation.

The years subsequent to this report saw a gradual slackening of the measures against stakes. However, in 1920 steps were again taken to reduce the operation of the ambai. Their use was initially abolished in Perak. However immediate abolition would have thrown large numbers out of employment, and the policy was subsequently amended and replaced with an arrangement to reduce the operation of ambai so that by 1922 it should cease to operate altogether. [13/] The conservative fishermen rebelled against this ruling. Even after this proclamation, very few took up other methods. Others, rather than bow to this rule, emigrated to Sumatra, some returned to China while the remainder continued to fish illegally.

However several dissenting views on the destructiveness of fishing stakes emerged. Many were of the opinion that the young fish catch of these stakes, if not caught, would in any case be devoured by their natural enemies. As a result of these conflicting opinions, D.C. Stead was appointed to investigate into the use of ambai and other allied gear. In his report he recommended that prohibition of such equipment should be relaxed, but its usage was not to be encouraged. Although not exactly prohibitory, the general opinion of the department was definitely unfavorable to fishing stakes.

High Labour Cost and the Low Price of Fish

The general economic condition during the period 1900-1930, and also in the early 1930's was one of upheaval. This short time embraced two periods of depression, the effects of which were conveyed directly to the fishing stake industry.

In 1920, two years after the first world war, a general rise in the prices of all commodities occurred. The prices of nets and other imported fishing apparatus rose consider-

---

11/ R.J. Wilkinson, H Bekerly and H.C. Robinson, *Report on the Fishing Industry of the Straits Settlements and Federated Malay States of the West Coast of the Peninsular*. Government Printers, 1904.

12/ Ibid.

13/ D.G. Stead, *General Report Upon the Fisheries of British* Malaya with Recommendations for future Development N.S.W. 1923

ably. Although fishing methods using locally produced materials such as timber bamboo and rattan should have fared better, the enhancement of the popularity of fishing stakes did not materialize. These were also the years of the forest conservation policy. Moreover, with the rise in the general price level, labour required to construct the fishing stakes became very expensive. At the same time in constrast to the price trend of other commodities the price of pigs fell Chinese pursuing both fishing and pig rearing were hard hit. There was a general reluctance by financiers to advance and support such a declining industry. In 1931, There was a further restriction of capital advances because of the fall in the price of rubber. Many fishing stake operators returned to China while the Malay fishermen shifted back to paid farming. This unstable condition continued until 1933 when the price of fish slightly improved following the increase in the price of rubber. Thus the economic conditions of this period made investment in fishing stakes more costly while on the other hand their profitability even in gross terms was reduced with the fall in the price of pigs and fish.

Other sectors of the fishing industry were also affected during these depression years, but fishermen operating mobile fishing methods were relatively better off. The Japanese drift net operators, for example, were also badly hit by poor prices. However, by landing in bulk and opening up new fishing grounds in the Mergui Archipelago, they were able in fact to compensate for the low prices. The newly introduced purse seiners also fared better because of their bulk landings.

Thus the period 1900-1930 produced a series of adverse factors hampering the progress and use of fishing stakes. A summary of the difficulties faced by the fishing stakes industry in chronological order would illustrate that there were very few years where the industry did not suffer some handicaps or other Allowing for the unfavourable attitudes toward the use of fishing stakes and the increasingly favourable attitudes the use of the more mobile methods of fishing, the fall in importance of the former was inevitable. Anxiety over the destructiveness of the fishing stakes had not only brought about negative measures against their use it had also led to positive measures encouraging the use of other fishing gear of which drift nets, purse seines and trawl nets ranked in importance.

Period 2: (1930-1940)

The Purse Seine

The purse seine was introduced into Malaya in the late nineteenth century by a group of Chinese from Pakhoi in South China, who first settled in Siam and then later moved down to Kedah and finally to Pankor in the State of Perak. The popularity of this net, hitherto foreign to Malaya, became firmly established soon after 1932 the year in which salt fish was made a duty-free commodity.

There were several factors that contributed to the firm establishment of the purse seine as the leading fishing gear in this decade. The most obvious was the duty-free status accorded to salt fish. Kembong, the main catch of the purse seine, was landed in bulk. The amount landed at any one time cannot be absorbed fully by the fresh fish market Since the use of ice and refrigeration facilities was not widespread, the catch had to be salted and sold in its processed form. Hence, when salt fish was declared a duty-free commodity, the operation of the purse seine became an extremely profitable venture.

However, besides the obvious contribution that the duty-free status of salt fish made to the encouragement of the development of the purse seine fishery, there were other complimentary factors that also encouraged its development. These were the enlargement of the market for fish, and the technological progress made within the purse seine fishery itself.

Establishment of a Market

In the early years, the purse seine fishery catered mainly for the salt fish market. However, this did not imply that a market for fresh fish did not exist. The fresh fish market that existed in that period was supplied mainly by Japanese fishermen operating the *moro ami* (bream net) around the vicinity of the Malay Peninsula and Singapore. The Japanese, with characteristic energy and enterprise, managed to sell their fish at a very low price. New fishing grounds were opened up in the southern part of the Mergui Archipelago. Some of the choicest fish in local waters were reported to have been caught by the Japanese moro ami. [14/] In fact three quarters of the fish sold in the markets were imported. The Japanese fishermen with their fleet of 37 sailing boats caught more fish than the rest of the local fishermen combined. The monopoly of the Japanese fishermen as the main suppliers of fish to the fresh fish market reduced the demand available for fish landed by the newly introduced purse seine. Moreover, the purse seines were located mainly in the north western part of Peninsular Malaya with the highest concentration in Pangkor and Kedah, while the main fresh fish market was located in the south at Singapore. [15/] The geographical distance involved in transporting fish from Pangkor to Singapore, the lack of ice and refrigeration facilities, and the rapid deteriorating rate of an oily fish like the kembong which is landed in bulk (thus making fish-handling less selective), made it difficult to ensure a supply of fish which was truly fresh. However, by 1937, political developments in the international scene made rapid changes to the local demand for fish. The Sino-Japanese war in the Far East led to a general reluctance amongst the Chinese to buy fish landed by Japanese fishing vessels. There was a definite bias against Japanese fishermen because prices for fish landed by local fishermen improved during that year, while the prices for fish landed by the Japanese fishermen fell. As a consequence, the number of Japanese fishermen operating in this area declined [16/] A further measure of assistance for the local fishing industry was the confinement of licenses to local fishermen only. Japanese fishermen formerly permitted were now excluded. This left a vacuum in the fresh fish market for the local fishing industry A marked increase of local interest in developing a fresh iced fish market emerged. New ice factories were constructed primarily for the purpose of providing ice for the fishing industry. As a result of the increase in the supply of ice and competition amongst the ice factories the price of the commodity fell from $2.60 per 220 lb. block to $1.60 per 220 lb. block. [17/]

Technological Development in the Purse Seine Fishery

The increased demand for fresh fish led to the establishment of an experimental refrigeration vessel, 'The Kembong'. The main objectives of this vessel were:

1) to land kembong in a sufficiently good condition to command a higher price and,

2) to supply kembong in bulk to the Singapore market.

To achieve these objectives, the 'Kembong' collected fish as they were caught by the Chinese purse seiners who operated off the Pangkor island. This was to prevent the de-

---

14/ *Annual Report of the Fisheries Department of the Straits Settlements and the Federated Malay States, 1931.*

15/ Other population centres were adequately served by their local fishing boats and hence cannot absorb further amounts of fresh fish.

16/ See *Annual Report of the Fisheries Department of the Straits Settlement and the Federated Malay States for the year 1937*

17/ See *Annual Report of the Fisheries Department of Perak for the year 1936*

terioration of fish. Experiments in brine freezing, bulk packing and packing with crushed ice were made with these landings. As a result of the demonstration and encouragement of the 'kembong' the fleet of sailing crafts employed by Chinese ring netters at the Dindings was replaced by powered – boats. Diesel-engined crafts about 25 to 35 feet length, driven by engines of 8 to 20 horse-power became more common. With the 'Kembong' as the parent ship, the fishermen were induced to stay at sea for longer periods of time. Fishing trips undertaken by Chinese fishermen lengthened from 2 to 5 days. In that year alone, an increase of 1127 tons of Kembong landed was recorded – the number of purse seines in operation increased by 10.[18/] All these were made without foreign injection of capital from outside the industry. A steady pace of progress of the purse seine fishery was maintained throughout the remainder of that decade. In 1938, landings of Kembong in Pangkor reached 5500 tons. At the same time, the system of marketing became better organized. The landings of Perak and Malacca were consigned directly to fresh fish markets. Despite the difficulty of organizing fresh fish-trade, it was observed in the Annual Report of The Fisheries Department of Selangor for the year 1938 that the 'present organization is well run, progressive and closely cooperative particularly among the Hylams in Port Swetenham who accidentally are share holders in local ice factories and therefore use their own ice.[19/]

Drift Nets

The Progress of the local drift net industry was less marked than that of the purse seine. The prevalence of barracudas and sharks and the land configuration made it impossible for drift netting to be carried on the commercial scale of the north sea. Several experiments with drift nets using the steam launch 'The Shark' failed. It was found that the operation of the drift net was greatly hampered by the south east winds, and that the smaller sized drift nets operated by the Chinese were more successful. However, the success of the local small scaled drift netters was inconsequential compared to the Japanese drift netters operating in the Malaysian waters. The Japanese fleet consisted of 28 sailing boats of 38 feet length each and seven 50 horse-powered boats, each measuring 50 feet in length. The number of drift nets operated totalled 28. Each drift net measured around 500 fathoms. While the drift nets operated were not of the size of the drift net operations of the north sea, they were highly successful. Each boat averaged around 150 katties of fish per day. In comparison, the local drift net fishermen, using kolek of 18 to 25 feet length and drift nets of 60 to 220 fathoms, could net in an average of 15 katties each.[20/] This demonstrated that the operation of drift nets could be profitable. In 1937 experiments were again attempted. The 'Kembong' was used as a base for a fleet of drift netters on the east coast off Cherating in Pahang. The experiment found that an expert drift-netter with a sufficiently large net could get about 2 piculs (266 lbs) of fish a night. However, the promotion of the use of drift net was hampered by several factors. Most fishermen did not care to be absent from their kampongs for a long time. The existence of a large number of sharks led frequently to severe damage of the net. However before further development could be made, World War II broke out and between the years 1945 no records were available because of the Japanese occupation of Malaya. During these war years the supply of fish drastically declined. Like other sectors, development in the fishing industry stood still.

18/ Annual Report of the Fisheries Department of the Straits Settlements and the Federated Malay States for the year 1937.

19/ *Annual Report of the Fisheries Department of Selangor for the year* 1933 page 45.

20/ See Annual Report of the Fisheries Department of the Straits Settlements and the Federated Malay States 1932.

Period 3: (1940's-1960's)

Development in the Post War Years

The fishing industry was at its lowest ebb under the Japanese regime and the immediate post war years were a period of rehabilitation for the fishing industry as it was for the economy as a whole. The destruction and damage could not be eliminated at once especially when public attention was focused on other important developments, namely the formation of the Malay Union, and the economy of the rubber and tin industry. However, by 1948, the fishermen of Malays had more or less adjusted themselves to 'post war normality', notwithstanding, before the industry could take-off another set of complications set in, namely the emergency. Although the Report of the Fisheries Department for the years 1948 and 1949 maintained that the industry was 'not greatly affected',[21] a number of incidences were evident to the contrary. A large exodus was recorded of young fishermen, to other occupations especially among Malays. Topping the list of these 'other occupations' was the special constabulary, set up during the emergency, and the Royal Air Force. Many others were absorbed into the rubber and tin industry. Moreover, there was a serious shortage of materials required for the fishing industry. Capital equipment in the form of cotton and ramie yarn were deficient. Although the immediate policy of the Fisheries Department was to remove as quickly as possible the wartime controls which affected the fishing industry adversely, and to provide, through the normal channels of trade, the essential materials for rehabilitation, this became an increasingly more difficult task than had been expected. There was a world shortage cotton yarn. None was forthcoming from Japan and China, the main suppliers. Some were imported from United Kingdom, but this consisted of 'standard' grades not in conformity to the requirements of the local fishermen. The supply of sail cloth was also no longer obtainable from prewar sources. The shortage of sail cloth was so acute that ex-army tents had to be used to relieve this shortage. The use of motor engines was also seriously hampered by World War II as the ability to go out to sea had led to the deterioration of equipment. After the war there was a widespread demand for the re-equipment of boats, but like other goods, engines, spares etc. were in short supply. The local fishermen with their small capital resources were not able to compete with these demands. Moreover, the price of petrol and ice had increased tremendously. The shortage of ice was a result of the wartime destruction of ice plants, although many of these were repaired by 1947, the cost of ice did not fall. The shortage of transport and the increase in the number of intermediaries that dealt with ice led to a 15 fold increase in its price. In 1936 a 220 lb. block of ice costs M$1.60. In 1947 it costs M$32.[22]

Equipment for the fishing industry arrived in 1949, but only slightly alleviated the conditions of the fishermen. There was a marked decline in fish landing. Those who had invested their savings for the purchase of equipments were impoverished. Fishermen of seine boats did not catch enough to feed their families, and many abandoned fishing. Communal unrest occurred in Pangkor. The crews demanded more pay but the owners refused because many of them were operating at a loss. The period of poor catches did not last long. But the fact that it occurred at a time when an abundance of good catches was most needed led to a slowing down of the process of mechanization. New ventures into

---

21/ *Report of the Fisheriesth Department of the Federation of Malays and Singapore for the year 1948 and 1949.*

22/ *See Annual Report on the Malay Union, 1947.* Government Printers 1948. pp. 7.

the fishing industry also failed. Attempts by private companies to conduct trawling and seine netting on a large commercial scale were unsuccessful. Instead of studying the local situation and adapting methods to it, one firm brought to Malaya at great expense – 2 power driven vessels of 70 and 50 feet long,respectively. Within a short period the venture was abandoned at great loss.

However, in spite of the set-backs experienced by the fishing industry in these years, there was one favourable aspect, namely the continued development of the purse seine.

The Purse Seine

The decade between 1930 to 1940 had seen a rapid expansion in the use of purse seine. There were 50 purse seine boats which were reduced to 20 after the war. But the years following 1946 saw a revival, if at a speed less remarkable than would have been the case if there had been none of the hampering factors already discussed. Expansion of the purse seine fishery in Perak was particularly rapid. Purse Seine boats in this state accounted for near 3% of the total number of powered boats in Malaya. In 1950 the number of purse seine in Perak had increased to 303 i.e. approximately 9% of the total number of powered boats and 6 times the number found in 1939.[23] Besides expansion in numbers, several technological and operational developments took place.

Before the war, the purse seine operated only at night, and hence were known as pukat jerut malam (malam = night). The catch of these purse seine consisted mainly of the Kembong. The sighting of these fish depended on the phosphorescence they threw up by their movements. The depth of these shoals can be gauged from the intensity of the luminance they produce.[24] However, the phosphorescence they threw up could only be clearly seen during moonless nights. This meant that the number of fishing days was restricted to certain days in the lunar calendar. No fishing could be carried out during the period around the full moon, i.e. from the 11th to the 21st day of the lunar month. Within the limited number of fishing days that remained, a further limitation of fishing time was observed. In the early part of the season the fishermen started around 5 a.m. and returned to base at 1 p.m.[25] This allowed for only 8 hours of fishing, taking account of the journey to and from the fishing ground, the actual fishing time was even shorter.

However, in 1948 a new development took place in the purse seine fishery. This was the use of the tuas or the unjang. The tuas or the unjang was previously used in conjunction with the life net. It was merely a bundle of palm leaves tied together and weighed down at some depth with a huge stone. A rope connected the lure to a bamboo float, the float serving as a land mark for the purse seine.

The main purpose of the tuas was to attract a large number of small sea animals. The collection of these sea animals on the tuas in turn attracted shoals of fish. After sometime these lures would be visited by the purse seine boats. The jurumalam of the purse seine boat would dive into the sea to observe whether a sufficient amount of fish had gathered around the lure. If a sufficient amount of fish were found, then a fresh new lure would be lowered into the water. Meantime, the old lure would be gently removed. The fish would then swim to the new lure which would be drawn slowly to the catcher boat. The pursing operation then started. The name of 'pukat jerut tuas' was used to describe this operation.

23/ *Report of the Fisheries Department* 1949, pp. 2.

24/ K. Gopinath The Malayan Purse Seine (Pukat Jerut) Fishery Journal of the Branch of the Royal Asiatics Society Vol. XXIII, PL 3 1960, pp. 77

25/ Note that there are no fish carriers like the Kembong to carry the catch back to the base so that daily fishing trips have to be made.

By the early 1950's lights were employed in conjunction with its purse seine. The light was a bright electric bulb enclosed in a watertight glass case, and attached by a flexible wire to a dry battery. This was lowered one to two fathoms in the water at the junction of the two ends of the net. Its main purpose was to prevent fish from escaping during the pursing of the net. The use of the light, however, proved less popular than the use of the tuas.

Meantime the operation of the purse seine also underwent a tremendous change. The early Chinese purse seine units consisted of 4 boats, comprising a mother boat, two small sampans and a dinghy The two small sampans were in charge of laying out the net. As soon as large shoals of fish were sighted the mother boat was brought to a stand still. The dinghy was lowered into the water to ascertain the direction of the movement of fish, and the information signalled to the mother boat. The two sampans securely tied together, were then lowered into the water. They were then propelled to the vicinity of the shoals. The ropes fastening the sampans together were then untied, the sampans being moved out in opposite directions in a pincer formation. When the shoal had been completely surrounded, the sampans were then set side by side and retied together. The two pursing ropes were then drawn in.

The purse seine operations of Malay fishermen differed slightly from these. A purse seine outfit consisted of 3 boats, i.e. a mother boat and 2 sampans. The sampans were not carried on board and the mother boat but were towed alongside it. When a shoal of fish was sighted the sampans were untied. One sampan remained stationary, holding one end of the net, while the other boat moved quickly around the shoal of the fish, paying out the net as it went. The purse strings were immediately drawn when the 2 sampans came together, and the catch was then hauled on board the mother boat.

Thus, the original method of purse seine fishing in Malaya did not make use of powered boats to lay out the net. Even in the early 1930's the postwar year, when large number of tongkangs were fitted with engines, no use was made of these boats for the actual purse seine operation. The powered boats were used mainly for the transport of the sampans out to sea and to transport the catch back to the base. The disadvantage of such a status quo became obvious to some fishermen. Sampans, paddled frequently by hand, did not have the speed necessary to encircle the shoals of fish, and large amounts of fish were allowed to escape. The realization of this led to a change in the method of fishing. Powered boats took over the laying of the net. With this change the number of boats needed for the purse seines was reduced to two i.e. a powered mother boat and a sampan. The latter was used to hold one and of the net securely while the powered boat lay the net. This increased greatly the number of successful hauls.

The success of the purse seine led to the adaptation of its use for the catching of the bilis. The bilis was previously caught by means of dragnets hauled from the beach. However the use of this method was possible only if the shoals of bilis moved sufficiently close to the shore to be encircled. With the use of the purse seine the bilis fishermen were no longer restricted to inshore areas. Hence a third type of pursue seine fishery was introduced, namely the pukat jerut bilis. The use of the pukat jerut bilis spread slowly from Kemanan in Pahang to Trengganu. In 1960 the first synthetic net for bilis was developed. By 1962 this method of fishing had spread to Pangkor, Teluk Bahang, Bagan Datoh, Kuala Bessut and Telok Anson.[26/]

Besides the expansion of the purse seine fishery and improvements in its administration, another development also took place, namely the use of synthetic nets. Prior to the use of synthetic nets, cotton or ramie yarn were used. These nets had to be cutched in a mangrove solution and then dried. The whole process took from 3 to 4 days. With

---

26/ G.R. Elliston, *A Survey of the Economics of the West Malaysia Pukat Jerut (Purse Seine) Industry in 1966* (mimeographed).

the use of synthetic nets, cutching became unnecessary, thus allowing for a larger number of fishing days. In addition to more economical maintenance cost and use of time, synthetic nets also provided for a more economical use of manpower. Cotton or ramie nets absorbed water and a water logged net was 3 to 4 times its original weight. The use of the lighter nylon nets therefore helped to provide more economical use of manpower, and additional time was made available for the pursuit of the fish.

However, while technological developments were necessary in promoting more efficient operation and larger landings, a demand must exist for the efforts to increase supply to be worthwhile. Such a demand did exist in the postwar years. The recovery of the rubber industry led to an increase in the demand for fish. Several rubber estates contracted for a regular supply of fresh kembong from Pangkor, because the relative cheapness of this fish, coupled with its high protein value, made it possible for these estates to buy in bulk. These same attributes of the kembong, low price and high protein value led the army also to contract for a regular supply. The fresh fish market in Singapore was also placed within the reach of the purse seine fisheries in Pangkor, when the Malayan Railways Department agreed to transport the fish in insulated vans from Ipoh to Singapore. The problem of transport eased further when, as a result of cooperation and consultation between the Road Transport Company and the Fisheries Department, fish dealers were given lorry haulage permits to transport their fish from the landing point directly to the inland markets without intermediate handling. The improved system of transport enlarged the market outlets for fresh fish. The enlarged fresh fish market in turn gave greater impetus to the development of the purse seine. The dominance of the purse seine remained until the mid 1960's when yet another gear rose to challenge its supremacy as the chief contribution to the total landings of fish in the county. This was the trawl net.

Period 4: (1935 to the present)

Evidence of attempts to introduce trawling into the Malaysian fishing industry dated back to the 'Preliminary Report on the Economic Position of the Fishing Industry of the Straits Settlements and the Federated Malay States in 1927'. The recommendations of that report included the abolition of fishing traps such as the ambai, pompang and gombang – 'All nets of the ambai type i.e. pompang, gombang, langgai were equally destructive of immature fish and should eventually be abolished', – and a recommendation for the establishment of a trawl fishery. [27]

However, it was not until 1926, with the arrival of the experimental vessel S.T. Tongkol, that serious attempts were made to experiment with the trawl. The findings of the S.T. Tongkol on the prospects of introducing commercial trawling on a large scale were not bright. A vessel the size of the S.T. Tongkol could not pay its way. 'In Malaysian waters of over 10 fathoms in depth, the otter trawl with its various modifications did not promise commercial success.' [28] The reason for its failure was the lack of fish. In 1926 it was observed that the annual total running costs of trawling were MS157,300. The sales receipts from the landings totalled MS84,000. [29] Other experiments with the trawl – Green and Birtwistle (1927 and 1928) the Kembong (1964) and the Manihinne (1956) – were also made. These were mainly ocean-going vessels over 200 gross tons and

---

27/ *Preliminary Report on the Economic Position of the Fishing Position of the Fishing Industry of the Straits Settlements and the Federated Malay States. 1921.* pp 3.

28/ *Report of the Fisheries Department of the Straits Settlements and the Federated Malay States for the 1927.* pp. 122.

29/ *Annual Department Report of the Straits Settlements for the year 1976.* Government Printing Press, pp. 106.

powered by engines from 200 to 400 horsepower. The general conclusion of these experiments were similar. The available trawling grounds did not justify a vast expenditure on trawlers. Trawling outside the 20 mile limit was uneconomical. The demersal fish resources of the surrounding waters were limited and tended to concentrate around the inshore muddy grounds considered unsuitable for trawling. Thus despite experiments with various types of trawls – the Vigneron Dahl and the parejo net – trawling on a large scale was still considered unsuitable. In fact as early as 1927 it was realized that in 'areas within the 10 fathom line, small locally built motor boats, manned and commanded by Asiatics promise to revolutionize the inshore fishing of the peninsula.[30/] However, it was only in the 1960's with the example set by the Thai fishermen, that trawling along the lines indicated in the 1927 report was taken.

In the mid 1960's Thai fishermen, using smallboats of 21 to 23 metres, demonstrated that trawling with small boats allowed for a rapid recuperation of capital. Subsequent to this, a Demersal Fish Investigation Unit was set up in Thailand. Experiments were made with the pelagic pair trawl, mid water trawl, bottom pair trawl and other trawls led 60 to 70% of the existing users of purse seines in Thailand to convert to trawlling.[31/] Fish landing in Thailand nearly trebled from 146,000 metric tons in 1969 to 498,000 metric tons in 1962. [32/] The success of the Thai fishermen became the pattern for the Malaysian fishermen.

In July 1966, following the visit of Thai fishermen to Pangkor in 1965, 10 boats in Pangkor converted to trawling. By December 1966 there were 40 operating in the Pangkor waters. The large fish landings of trawlers, in turn attracted more boat owners to convert their boats to trawling. Regulations like the prohibition of trawling within inshore grounds were not complied with by the fishermen. Regulations confining trawling to boats above 50 tons gross tonnage were observed by the fishermen by simply raising the deck of the boats to achieve the necessary tonnage. The failure to restrict trawling to large boats and to prevent trawlers from encroaching into the inshore areas, coupled with the profitability of the venture and demands from other fishermen to be allowed a share of the profit, led to a gradual relaxation of the rules. In 1967, small boats were allowed to trawl. The schedule of the Fisheries (Maritime) Regulation of 1967 prescribed that trawl nets used by vessels

- of 100 tons (101.4 metric tons) gross tonnage and above, with engines of 200 horsepower and above should be used only in waters beyond 12 miles or
- of 25 tons (25.4 metric tons) gross tonnage and above with engines of 60 horse-power and above, should be used only in waters beyond miles, of
- of less than 25 tons (25.4 metric tons) gross tonnage, with engines less than 60 horsepower should be used only in waters beyond 3 miles.

Thus smaller boats were not only included, but were also allowed to fish in the inshore grounds. This led to a proliferation of small trawlers. Expansion was most rapid in 1970/1971 when the number of licences issued, especially in the state of Perak, reached phenominal proportions. Within less than a year (22nd February to 31st August, 1971) a total of 1709 trawl licences were issued to Perak.[33/] By 1974 they accounted for 34% of the total number of fishing gear in operation. Instead of progressing towards the use of larger and more specialized boats there was a trend towards the use of smaller general purpose

---

30/ *C.F. Green, Report of the Fisheries Department of the Straits Settlements and the Federated Malay States for the year 1927*, pp. 24.

31/ Andhi Sarankura and G. Kuhlmorgen – Jule, Demersal Fish Resources Investigations in the Gulf of Thailand, IPFC Technological paper 12th Session, 1967

32/ Ibid.

33/ Figures obtained from the Fisheries Department, Ipoh, Perak

craft. These were so designed as to be able to operate several types of gear. The fishing industry in particular the fishing industry on the west coast, could be best described as having over-expanded.[34/] In 1970, 67,623 metric tonnes were landed by an estimated number of 2,595 trawlers. This landing figure was about the maximum obtainable from the present areas of fishing.[35/] Yet, the number of trawlers continued to increase so that by 1973 fish landings totalled 276,234 tons, of which a considerable proportion consisted of ikan baja.[36/]

Conclusion

From the above account of the rise and fall in importance of different methods of catching fish, we could identify 3 main factors which had modelled their growth and development. They were namely, the profitability of the gear, the general condition of the economy and official attitude and policies towards the use of fishing gear.

The Profitability of the Gear. This was by no means totally dependent on the size of the catch. The price of fish and the cost of production were also important determinants. In this respect it was related to the second factor, namely the general economic condition of the economy.

The General Condition of the Economy was important because a boom period generally helped to promote the development of the industry as more capital was available and the demand for fish was augmented alongside the demand for other goods. However a favorable economic environment by itself was not sufficient to determine the growth and development of a gear. Favourable conditions must be accompanied also by, what was presented here as the third factor, namely a favorouble official attitude towards the gear.

Official Attitude towards the development of a gear are frequently reflected by the regulatory and prohibitory measures used in the guidance of the use of a gear.

It was not completely correct to postulate that the development of a fishing method was determined by official attitudes towards it. As illustrated by the development and changes that had occurred in the period from the early 1900's to 1970's, official attitudes were modified by and frequently adjust themselves to environmental demand. Although the official attitude towards the use of fixed entrapping structures was unfavourable the measures implemented were neither rigid nor consistently against them. Programmes of prohibition were spaced out, and frequently even relaxed. In the same way, the initial aim in the mid 1960's was to permit only large boats to trawl, but because of the persistent demand by fishermen and inability to control the infringement of regulations, measures prohibiting trawling by small boats had to be relaxed.

The fact that official attitudes frequently change does not mean that their influence on development is less. What may be concluded from these two examples was that over-fishing (the problem which had prompted measures against fixed entrapping structures and trawlers alike) and other related problems would recur so long as there was no definite and guided policy in resource-use and technological development, or in other words if policies allowed themselves to be determined by external factors unrelated to resource availability, instead of assuming the role of a determining force. While in the first example chaos did not follow as a result of inconsistent rules regarding the use

---

34/ Yap Chan Ling 'Overexpansion of the Trawler Industry with Specific Reference to the Dindings District of West Malaysia', *Kajian Ekonomi Malaysia.* No. 2 1973.

35/D. Pathansali, G. Rauck, A.A. Jothy, Mohd. Shaari, S.A Latiff and T.B. Cutin, Demersal Fish Resources in Malaysian Waters, (Trawl Survey of the Coastal Waters of the East Coast of West Malaysia) Fisheries Bulletin, Ministry of Agriculture and Fisheries Malaya, 1974.

36/Asian Development Bank Fisheries Consultant Mission, Final Draft Feasibility Study East Coast of Peninsular Malaysia, Fisheries Development Project Vol. 1, page 20.

of fixed entrapping structures, this does not mean that these inconsistent regulations had no ill effects on the industry In the first example over-fishing did not persist because, though the measures taken against the use of fishing stakes were inconsistent, there were other factors that were able to bring about a decline in the use of fishing stakes. The lack of wood due to the forest conservation policy of the Department of Forestry was one the other was the decline in the profitability of the gear. Profits earned from the operation of fishing stakes declined because the cost of acquiring wood had increased and the price of fish (because of the unfavourable economic climate) and the size of the catch were poor The last was a result of overcrowding in the inshore areas, because the range of fishing activities was reduced as a result of the lack of wood. Moreover, over-fishing was confined to the 3 to 5 fathom waters, as dictated by the length of the nibong poles available. Thus, when another gear (the pukat jerut) having greater mobility and fishing range was introduced, the over-fished areas could be relieved. All these conditions did not exist in the case of the second example. Inconsistent rules poorly defined policies and inadequate attempts to relate technology to resource use and resource availability had led to a situation of gross over-fishing. The latter had occurred because, in contrast to the period between 1900 and the early 1936's the price of fish had been sufficiently high to offset the effects of a fall in the size of the catch. In fact with the enlarged external market for prawns the price of prawns, the main catch of trawlers, had risen sharply. Moreover with the gradual inclusion of small boats into the trawl fishery, investment in trawlers had been made cheap. Small trawler boats cost on the average one-third the cost of a large trawler. Instead of engines of above 100 horse-power with 120 horse-power engines being the most common group used for trawling, engines of 24 horse-power had became popular. Instead of large boats of 30 to 40 tons gross tonnage boats of less than 10 tons were used. Net profits per boat necessarily soared in the initial years A high proportion of fishermen wanted a share of the profit and further expansion occurred. Over-fishing intensified.

The problem of over-fishing caused by the excessive numbers of trawlers fishing in grounds never considered rich, must be traced to the gradual relaxation of measures governing the use of the trawl. This dated back to the 1967 Fisheries (Maritime) Regulations. Instead of adopting a stronger stand against infringements of regulations governing trawling in the initial years, when the problem was not to today's proportions the measured implemented were attempts to accomodate on an ad hoc basis to the problem of illegal trawlers in the industry. It should be realized that the problems today are not caused by the high price of fish and the behavior of the fishermen, because these two are products of circumstances. The price of fish rose because the size of the population had grown and the supply of fish was unable to meet the demand. In the same vein, fishermen were to be expected to clamour for a share of a common property resource. These two conditions were inevitable, but they were conditions which could also be controlled or regulated. By failing to control these two variables by allowing the initial profitability of the gear and the demands of the fishermen to influence policy measures the problem of overexpansion had been accentuated. Unlike the early years, there was no alternative fishing gear which could be depended upon to eliminate over-fishing of the inshore areas. Traditional fishing gear like the pukat kenka and the puka hanyut had been suggested as alternatives to the pukat tunda. Yet such fishing gear operated also in the inshore areas. To convert from trawling would merely create overexpansion in the use of another set of gear, as the number of boats operating in the inshore areas were not decreased. In fact the number of small boats would not fall because their numbers were continually

replaced and supplemented. Thus in 1976, the Federal Government had approved a subsidy of $51,000 for fishermen to purchase fishing gear and outboard motors.[37] The same help was being extended to fishermen on the east coast, a total of $121,450 being given to the Kuantan fishermen for the purchase of outboard motors and gear.[38] This was part of their overall plan to pay $70 million in subsidies to the fishing industry under the Third Malaysian Plan. Unlike the transition from the use of fishing stakes to the use of the pukat jerut, over-fishing in the inshore areas would not be remedied by the removal of fishermen and boats. The number of boats and the number of fishermen remained. Such measures as had been taken to eliminate these problems were ad hoc. To reduce over-expansion, boats less than 25 tons gross tonnage were not allowed to trawl, yet no alternative means of employment were provided for the fishermen. To eliminate poverty, fishermen were given subsidies to buy small boats and outboard motors. The first created even more poverty because fishermen who had trawled for the past ten years were prevented from trawling, and fishermen made poor by small catches were required to invest in large boats. On the other hand, the second increased over-crowding. Certainly a more definite and precise policy was needed. Technology should not be adopted for the sake of new technology. New fishing methods should be related to the optimum use of fish resources available to the industry. Fish meal solution, despite their good intentions served only to compound the problem.

Table 2. A Comparison of Cost

Item	Pukat Tunda Ikan (large trawlers)			Pukat Tunda Udang (small trawlers)		
	Size	Estimated % falling within the category of size	Average Cost	Size	Estimate % falling within the category of size	Average Cost
Net	8 fathoms	n.a.	$ 600	12 fathoms	n.a.	$1200
Engine (marine)	100-120 horse-power	68%	$18300	29-29 (horse-power	40%	$4800
Boats	30-40 tons	65%	$ 5000	less 10 tons	91%	$1500

Source: Survey data collected in 1971/1972 on the West Coast of Peninsular Malaysia.

37/ New Straits Times, 31 March 1976.

38/ New Straits Times, 3 March 1975.

References

Reports

1. Government – *Report on the Fishing Industry of the Settlements and Federated Malay States of the Peninsula 1904*, Government Printers.

2. –do– – *Annual Report of the Fisheries Department for the year 1908*, F.M.S. Government Printing Office.

3. -do– – *Annual Report of the Fisheries Department for the year 1909.*

4. –do– – *Report of the Fisheries Department for the year 1911.* Supplement to the F.M.S. Government Gazette of 1912.

5. –do– – *Report of the Fisheries Department for the year 1912.* Supplement to the F.M.S. Government Gazette of 1913.

6. –do– – *Report of the Fisheries Department for the the year 1913, F.M.S. Report of the Fisheries Department for the year 1914.*

7. –do– – *F.M.S. Report of the Fisheries Department for the year 1914.*

8. –do– – *F.M.S. Report of the Fisheries Department for the year 1915.*

9. -do– – *F.M.S. Annual Report for 1917, Government Printers.*

10. –do– – *F.M.S. Report of the Fisheries Department for the year 1919.* Supplement to the F.M.S. Government Gazette of 1920.

11. –do– *F.M.S. Report of the Fisheries Department for the year 1920,* Supplement to the F.M.S. Government Gazette 1921.

12. Maxwell Charlton *Preliminary Report on the Economic Position of the Fishing Industry of the Straits Settlements and Federated Malay States, 1921* Eastern Pamphlet no. 179.

13. Government *Report of the Fisheries Department of the Straits Settlements and the Federated Malay States, 1921* found in the Annual Report for the year 1921.

14. Stead David General Report Upon the Fisheries of British Malaya with recommendations for Future Development, N.S.W. 1923.

15. Government – *Annual Departmental Report of the Straits Settlements for the year 1923.*

16. –do– – *Annual Report of the Fisheries Department for the year 1924.* Supplement to the Federated Malay State Government Gazette 1925.

17. –do– – *Perak Administrative Report for the year 1926.* Federated Malay State Government Printing Office 1927.

18. –do– – *Perak Administrative Report for the year 1927.* Federated Malay States Government Printing Office 1928.

19. –do– – *Report of the Fisheries Department of the Straits Settlements and the Federated Malay State,* in the Annual Departmental Report of the Straits Settlements for the year 1926.

20. –do– – *Report of Fisheries Department of the Straits Settlements and the Federated Malay States* in the Annual Departmental Report of the Straits Settlements for the year 1927.

21. –do– – *Report off the Fisheries Department of the Straits Settlements and the Federated Malay States* in the Annual Departmental Report of the Straits Settlements for the year 1928.

22. –do– – *Report of the Fisheries Department of the Straits Settlements and the Federated Malay States* in the Annual Department Report of the Straits Settlements for the year 1929.

23. –do– – *Report of the Fisheries Department of the Straits Settlements and the Federated Malay States* in the Annual Departmental Report of the Straits Settlements for the year 1930.

24. –do– – *Report of the Fisheries Department of the Straits Settlements and the Federated Malay States* in the Annual Departmental Report of the Straits Settlements for the year 1931.

25. –do– – *Annual Report of the Fisheries Department, Straits Settlements and the Federated Malay States 1932.*

26. –do– – *Annual Report of the Fisheries Department, Straits Settlements and the Federated Malay States, 1933.*

27. –do– – *Annual Report on the Social and Ecnomic Progress* of the People of Perak for the year 1933. Federated Malay States Press 1934.

28. Government – *Annual Report of the Fisheries Department of the Straits Settlements and the Federated Malay States,* 1935.

29. –do– – *Annual Report of the Fisheries Department of Perak for the year 1936.*

30. –do– – *Annual Report of the Fisheries Department, Straits Settlements and the Federated Malay States for the year 1936,* Government Printing Office.

31. –do– – *Annual Report of the Fisheries Department of Straits Settlements and Federated Malay States for the year 1937*

32. –do– – *Annual Report of the Secretary for Chinese Affairs in Malaya for the year 1938.*

33. –do – *Annual Report of the Fisheries Department of Perak for the year 1938.*

34. –do – *Memorandum on the working of the Motor Vessel Kembong* Straits Settlements and Federated Malay States Fisheries Department, Publications 1938.

35. –do – *Annual Report of the Fisheries Department, 1938.*

36. –do – *Annual Report on the Malay Union, 1947,* Government Printers, Kuala Lumpur, 1948.

37. –do – *Annual Report of the Fisheries Department, Federation of Malaya and Singapore for the year 1948,* Government Printing Office.

38. –do – Report of the fisheries Department of Malaya, 1949, Government Printing Office

39. –do – *Annual Report on the Federation of Malaya, 1950,* Government Printers, Kuala Lumpur

40. –do – *Annual Report 1951.*

41 *do*– *Annual Report 1952.*

42. –do– *The Fishing Industry and Trade 1951,* mimeographed.

43. –do– *Fisheries Departmental Annual Report, 1953.*

44. do *Annual Report 1954.*

45. –do *Annual Report 1955.*

46. Government — *Annual Report 1956.*

47. —do— — *Status Report 1957, Fisheries of Federation of Malaya*

48. —do— — *Annual Report 1958.*

49. —do— — Federation of Malaya Year Book Fisheries Department 1957.

50. —do— — Annual Fisheries Statistics of the Ministry of Agriculture and Fisheries.

Others

51. Burdon T.W. — *The Fishing Gear of the States of Singapore,* Fisheries Survey Report No. 2, Government Printers 1959.

52. Gibson-Hill — "The Fishing Boats Used on the Coast of Malaya" Malayan Fisheries, Methodist Publishing House, 19 page 59.

53. K. Gopinath — "The Malayan Purse Seine (Pukat Jerut) Fishery" Journal of the Branch of the Royal Asiatics Society, Vol. XXIII Pt. 3, 1950.

54. Elliston G.R. — *A Survey of the Economics of the West Malaysia – Pukat Jerut (Purse Seine) Industry in 1966* (mimeographed).

55. Saran Kura Andhi and G. Kuhlmorgan-Hule — "Demersal Fish Resources Investigations in the Gulf of Thailand", *IPPC Technological Paper* 12th Session 1967

56. Pathansali, D.G. Rauck, A.A. Jothy, Mohd. Shaari, S.A. Latiff and T.B. Curtin — *Demersal Fish Resources in Malaysian Waters (Trawl Survey of the Coastal Waters of the East Coast of West Malaysia).* Fisheries Bulletin, Ministry of Agriculture and Fisheries Malaya, 1974.

57. Yap, Chan Ling — "Overexpansion of the Trawler Industry with Specific Reference to the Dindings District of West Malaysia", *Kajian Ekonomi Malaysia* Vol. X No. 2, 1973.

58. Yap, Chan Ling — "Trawling Its Impact on Employment and Resource-Use on the West Coast of Peninsular Malaysia, Paper presented in the Meeting on Small Scale Fisheries Development, Honolulu, Hawaii, 6th Sept. - 11th Sept. 1976.

Glossary

Names of Fishing Gear

Pukat	-- Net
Pukat hanyut	-- Drift net
Pukat jerut	-- Purse seine
Pukat jerut malam	-- Purse seine used at night (Malam = night)
Pukat jerut tuas	-- Puse seine used in conjunction with a fish lure (Tuas = fish lure)
Pukat jerut bilis	-- Purse seine for catching anchovy (Bilis=anchovy)
Pukat tunda	-- Trawl net
Pukat tunda ikan	-- Fish trawl (Ikan = trawl)
Pukat tunda udang	-- Prawn trawl (Udang = prawn)
Bubu	-- Portable fish trap
Ambai	-- Fixed entrapping structures (refer to T.W. Burdon *Fishing Gear of the State of Singapore, Fisheries Summary* Report No. 2 Government Printers 1959.)
Jermal	-- As above
Gombang	-- As above
Pompang	-- As above

Types of Boat

Khotak	-- Flat bottomed boats
Kolek	-- Small fishing boat used mainly by Malay fishermen
Sampan	-- Small fishing boat

Note: For more detailed description of these boats read Gibson-Hill, 'The Fishing Boats used on the Coast of Malaya', *Malayan Fisheries*, Methodist Publishing House, 19

Types of Fish

Kembong	-- Mackeral
Bilis	-- Anchovy
Ikan Lambok	-- Jelly fish
Belacan	-- Prawn paste