THE PURSE SEINE FISHERY OF HONG KONG BASED ON AN INVESTIGATION CONDUCTED IN 1975-1976

by

R.T. Chung and M.T.L. Chiu
Fisheries Research Division
Department of Agriculture and Fisheries
Hong Kong

Abstract

The paper traces the history of the Hong Kong purse seine fishery from the early 1950s to the mid-1970s; during this time there was a gradual transformation from a large wind-driven fleet of vessels to a smaller mechanized fleet of seiners. This is basically a small boat fishery which harvests various pelagic species in shallow coastal waters. Though there were more than 800 mechanized seiners in 1964, the fleet has gradually dwindled to just over 200 boats in 1974. During the early days, purse seiners provided the main source of bait for long line boats. Today, however, the catch is used primarily by the mariculture industry for feed. The future of this fishery does not look particularly promising but suggestions are made for improvements.

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1. INTRODUCTION

Historically, the Hong Kong purse seine fishery provided the main source of bait for the bottom longline fishery, and these two fisheries are therefore interdependent. The demand for coastal pelagic fishes for fish sauce manufacturing and duck raising also contributed to some extent to the viability of the purse seine fishery. The traditional preference for certain forms of sun-dried engraulids in the consumer market was also another factor that sustained its existence.

Since the early fifties, the development of fish preservation through the increasing use of ice, coupled with the development of off-shore fishing grounds, brought about significant increases in the proportion of fresh marine fish landings and an abrupt decline in the production of salt/dried fishes. Subsequent changes in the Hong Kong-based fishing fleet as a result of mechanisation and modernisation development programmes helped to improve the overall performance characteristics and gradually led the Hong Kong fisheries into today's era.

Within these periods, the purse seine fishery experienced considerable setbacks which resulted in a significant reduction in the number of purse seine units from 2,049 in 1958 to 298 in 1979 (Fisheries Development Division, unpublished data), as well as in a rapid decline in its viability during the late 1950's.

In particular, the declining trend in the size of the purse seine fleet was associated with a number of inter-related factors inherent at the time. The most critical event was the intensification in the exploitation rate of the bottom longline fishery, which was stimulated by the increasing demand for premium quality fish and made possible by the rapid development of the bottom longliners. Since purse seining for specific fish taxa is highly seasonal, the limited and sporadic supply of purse seine catches, particularly those of certain forms of engraulids, often resulted in high prices for the bait and thus increased the operational costs of bottom longliners. This forced the longline operators to resort to alternative bait from a cheaper source. At the same time, the pressing need to resolve the problems of the shortage of longline fishermen had led to the introduction of modern-hulled vessels and the "baiting ashore" scheme. These resulted in a significant decrease in the operational costs of longliners through a 60-70% reduction in fisherman crew and the utilisation of low-cost, readily available trawl fishes as a source of cheap bait. Thus, the dependence of the longline fishery on the purse seiners for the supply of bait gradually decreased.

Apart from Lin (1940) and the brief accounts in the Annual Reports of the Director of the Agriculture and Fisheries Department since 1950, very little on the Hong Kong purse seine fishery has been documented. The most recent review of this fishery was made in 1972 (Fisheries Research Station, Department of Agriculture and Fisheries) to provide a comprehensive understanding of this sector of the Hong Kong fisheries.

Recently, the emphasis of the Department of Agriculture and Fisheries on the development of pelagic fish resources has necessitated a general survey in 1975-76 of the existing purse seine fishery.

2. METHODS

A study of the Hong Kong purse seine fishery was initiated in November 1975. The waters covered were divided into six areas according to the major ports used by local purse seiners (Fig. 1). Catch and effort information was collected in interviews with fishermen at the fish markets and at their home ports.

Fishing was usually carried out at night. From the results of a pilot project, no apparent relationship could be established between total catch and the number of hauls made during a fishing trip (Fig. 2). Total fishing time for each trip, however, was relatively constant (from dusk to dawn) and a vessel-night is considered to be a suitable unit for fishing effort assessment. The total catch per trip per vessel-night was therefore taken as the catch per unit of effort. The catch and effort information for each area were pooled to give the catch per unit of effort for that particular area. Landings of individual purse seiners and species composition by weight were derived from market sales vouchers obtainable from the Fish Marketing Organization (FMO), Hong Kong.

3. THE FISHERY

The Fishing Fleet

The early Hong Kong purse seiners, like other local fishing boats, were traditionally wind-driven. In 1948, the Government of Hong Kong initiated a mechanisation scheme for all fishing vessels and as a result, the number of mechanised purse seiners gradually increased. Table 1 gives the estimated number of purse seiners since 1951, from which it can be seen that the total number of local vessels engaged in purse seining declined after the peak year of 1957/58. This decline was caused by a reduction in the number of wind-driven vessels; whereas, the number of mechanised purse seiners continued to increase, reaching a peak in 1963/64. The wind-driven vessels were either mechanised during this period, or changed to other operations because they could no longer compete with the mechanised units. The decline in the number of mechanised purse seiners was first recorded in 1965, and following a drastic reduction in 1967, the number of purse seiners recorded in 1969 (425) was only 50% of that at the peak year of 1964 (856). The recent trend shows a further decline in the number of purse seiners and also the complete disappearance of wind-driven units.

Lin (op. cit), the first to describe the Hong Kong fisheries, provides a comprehensive account of the purse seiners and their method of fishing. He recognized two types of purse seiners differing only in size: the big purse seiners or "pa tang" ranging 47-65 ft. in length, did not take part in the

actual fishing but acted as carrier vessels for the sampans, the seine nets and other gear and equipment to the fishing ground; and the smaller purse seiners or "Ku tsai teng" measuring 16-28 ft. in length, were small boats working in pairs, from which the crew operated the net directly.

In the present study, it has been found that except for one vessel with a modern-hulled design, all the purse seiners continue to retain the traditional Chinese junk type of hull measuring from 4.9 m. (16 ft.) to 20.7 m. (68 ft.) LOA.

The fish hold capacity and engine horsepower are features that limit the productivity of Hong Kong purse seiners. The former restricts the quantity of fish catches to be brought in and therefore, the total quantity to be harvested at times of high fish density. This is found to be directly proportional to the measure of capacity (Thames tonnage x 17) used in Hong Kong for determining the size of a fishing vessel. Fig. 3 shows a scatter plot of length (LOA) against capacity for purse seiners built during 1969-74, suggesting that length and capacity are exponentially related by the following equation:

$$\text{Fish hold capacity (piculs)} = 0.0079 \times K \times \text{LOA}^{3.010}$$

where K = constant

It follows that length could be used as an index of the fish hold capacity of a purse seiner.

Engine horsepower determines the speed and operational range of a purse seiner and consequently limits its capability to fish in more distant grounds. A plot of the length of vessel against respective engine horsepower (Fig. 4) suggests a possible method of grouping the Hong Kong purse seiners into the following classes:

		Length	
Class	h.p.	metre	feet
1	18	9.00	30
2	18-100	9.00-13.41	30-44
3	100	13.41	44

Justification of this classification was tested by comparing the activities of the three classes of purse seiners with respect to their operational range as shown in Table 2. It may be seen that class 1 purse seiners are small vessels whose fishing activities are exclusively limited to close proximities to their respective home ports. Class 2 purse seiners are medium-sized vessels having over 70% of their fishing activities conducted within the home port areas with the remainder carried out in areas adjacent to their home ports. Class 3 vessels are the large purse seiners

which have the highest degree of mobility, with 33% of their fishing conducted in adjacent areas and 22% in waters as far afield as the Man Shan Islands and the Lemas (Fig. 5). In addition, factors such as the skippers' knowledge of local geographical and hydrological conditions must also play some part in determining the fishing range of these vessels.

Gear

A typical fishing unit consists of the mother boat and two to four sampans. In general, two to four bright kerosene lights hanging from one or more sampans are used to attract fish. When a sufficient quantity of fish has been concentrated, the mother boat and another sampan each working from different directions encircle the school with a seine net. Each purse seining unit carries two to four sets of seine nets, but some may have as many as eight sets. These differ in dimension and mesh size and are designed for catching specific species or species groups (Table 3). To a certain extent, smaller vessels tend to use smaller nets for a given mesh size because of manpower limitations. In the case where two purse seiners operate together to form one fishing unit, bigger nets or up to 280 m. (150 fm) may be used. In addition, most purse seiners also carry one or two sets of gillnets for catching squids, and some handlines for catching Spanish mackerels.

Grounds

Most of the fishing is conducted in inshore waters between depths of 3.27 m (2-15 fm), but fishing may be extended to over 40 m. (20 fm). Table 4 gives the proportion of fishing activities conducted at various depths, and illustrates the inshore nature of the existing purse seine fishery. In the period November 1974 to February 1975, 80% of the 387 fishing trips for which data are available were carried out in waters less than 18 m. (10 fm), of which 48% were conducted in the 11-18 m. (6-10 fm.) range and 32% in waters less than 9 m. (5 fm.) in depth. The major fishing grounds included areas north and west of Cheung Chau in the west; Tai Tam Bay and Po Toi Island in the south; Leung Sheung Wan, Kau Sai and Clear Water Bay in the east; and Tolo Harbour, Tap Mun and Ping Chau in the northeast (Fig. 1). At times, the large purse seiners operated in more offshore water near the Lemas and the Man Shan Islands (Fig. 5).

4. THE RESOURCE

Species

Resources exploited by the local purse seine fishery consist largely of small coastal pelagic fish including mostly finfishes and some invertebrates. Lin (*op. cit*) noted that the major taxa exploited were mackerel scads (*Decapterus* and *Trachurus spp.*), pouters (*Leiognathus spp.*) and some herring-like fishes, presumably the round herring (*Dussumieria hasselti*) and sardines (*Sardinella spp.*).

Estimated total landings by taxa through FMO markets by the purse seine fleet between July 1975 and June 1976 are given in Table 5. It can be seen that the most important taxa by weight in descending order were mackerel scads, sardines, gizzard shads (Clupanodon and Nematalosa spp.), rabbitfishes (Siganus spp.), pouters, the shrimp scad (Caranx kalla), mackerels (Pneumatophorus spp.), cardinal fishes (Apogon and Apogonichthys spp.), anchovies (Stolephorus and Engraulis spp.) and the black-finned scard (Caranx mate), all having estimated FMO landings exceeding 80 m. tons. Squids are the major invertebrate taxon landed (120 m. tons), although some cuttlefishes and prawns were also caught.

Large coastal pelagic fishes such as Spanish mackerels (Scomberomorus spp.) were also exploited during the peak season using hand and troll lines.

Production

The total annual landings by gear type for the period 1968-1978 sold through FMO markets are shown in Table 6 (FMO Trade Statistics). It may be seen that the annual purse seine landings fluctuated between 4,000 and 5,000 m. tons in 1973 and 1974 respectively (FMO Trade Statistics), while total landings by all gear types for the same period remained fairly constant at 75 thousand m. tons.

However, FMO landing figures for purse seiners are under-estimates of the true annual landings by this gear as it is known that significant proportions of purse seine catches are sold outside FMO markets. Estimated landing figures for purse seiners in fact showed a continual and sizeable decline from 17,000 m. tons in 1976 to only 6,000 m. tons in 1978 (Table 6). The decline in the number of purse seiners together with natural fluctuation in the resources must be responsible for this decrease in landings. In addition, losses due to spoilage including that incurred during the sun-drying process, which might involve the whole catch during bad weather, were again not included.

Seasonal trend

Purse seining activities are particularly sensitive to weather conditions compared with other gears. The activities of a number of purse seiners based at Stanley were closely followed during the period of study to estimate their fishing intensity (Table 7). It may be seen that fishing activity was, in general, low throughout the winter period due to the prevailing northeast monsoon but was generally higher for other seasons. This agrees with the pattern of distribution of the computed monthly fishing effort based on market landing figures and interview data (Table 8).

This dependence of fishing activity on local weather conditions has contributed to seasonal variations in the landings by purse seiners. From the monthly FMO purse seine landings for 1972 to 1974 (Fig. 6), it can be shown that the peak season of purse seine catches falls in the summer months. Minimum landings were consistently recorded in February due partly to poor weather conditions in this month and to the celebration of the Lunar New Year in port by the fisherman.

However, the availability of a species to the fishery must also be governed by its life cycle and the influence of environmental factors on reproduction, growth, feeding and migration. The monthly catch per unit of effort for the major taxa computed from market interviews and sales voucher processing is graphically presented in Fig. 7 to illustrate the seasonal abundance of the resource. It may be seen that catch per unit of effort for all fin fish species peaks in August and September 1975 and June 1976. The high catches in August and September resulted from a high abundance of Sardinella spp. and Decapterus spp., and to a lesser extent of Caranx kalla. The peak in June was attributed to high catches of the mackerel scads (Decapterus and Trachurus spp.). The occurrence of other taxa such as that of the anchovies, the finlet scads (Caranx mate and the cardinal fishes also showed fairly distinct but lesser peaks lasting for one to two months; whereas, the gizzard shads (Clupanodon and Nematalosa spp.), rabbitfishes (Siganus spp.) pouters (Leiognathus spp.) and mackerels (Pneumatophorous spp.) had lower but extended peak occurrences of several months.

5. DISCUSSION

Despite relatively stable purse seiner landings through FMO markets for the period 1974 to 1978, estimated total annual landings by purse seiners, also taking into account landings outside FMO markets, showed a continual and sizeable decline from 17 thousand m. tons in 1976 to 6 thousand m. tons in 1978 (Table 6). The estimated number of purse seiners also declined from 385 in 1976 to 298 in 1979. Thus, apart from natural fluctuations in the resources, the decline in total landings must be partly attributed to a decrease in the size of the purse seine fleet.

A diminishing fleet size, apart from other reasons, suggests unattractive financial return for this particular gear. Although cost-earnings studies of the purse seine fishery have not been conducted, detailed discussions with purse seine fishermen have revealed that the profit margin for this sector of the Hong Kong fisheries has remained low due to the relatively low market price for the catch compared with that for the other fisheries. The FMO figures show that the average price for purse seine catches are always considerably lower than that for the other gear (Table 9).

The low market value of purse seine landings indicate the low demand for the products resulting from the limited market for the species. As a rule, purse seine catches comprise almost exclusively small, bony pelagic fishes which are traditionally much less preferred as food fishes by the consumers. Certain taxa such as the squids and anchovies do fetch a reasonable price both in the fresh or dried state as these are among the preferred food items. However, in the case of the dried anchovies, market saturation often results during the peak season, resulting in a collapse of the price from about US$5 to only US$1.20 per kg. within one to two months. When this happens, purse seine fishermen tend to restrain their fishing effort by staying in port.

A sizeable proportion of the catch is utilized as feed for the culture of marine fish and the farming of ducks. The recent expansion of marine fish farming necessitates additional supplies of fish as feed. In this respect, however, the purse seiners are presently facing keen competition from the trawl sector bringing in trash fish that were previously discarded.

Similarly, trawlers compete with the purse seiners for the supply of bait for the bottom longline fishery. Except for pelagic species almost exclusively exploited by purse seining, other bait species such as the mackerel scads are also caught in quantity by trawlers. The development of the high opening trawl enables trawlers to catch a higher proportion of off-bottom species, including squids and mackerel scads thus increasing the supply of these species as bait for the longliners. The decline of the longline fleet in recent years has resulted in a reduction in the demand for bait and creates further constraints on the purse seine fishery.

Purse seine catches are also utilised for the manufacture of fish sauce and fish meal. However, the seasonal nature of the resource and the relatively low current annual landings do not justify large-scale development of these activities and thus fail to secure the possibility of bulk utilisation of the purse seine catches.

The decreasing landings may also be the result of the limited fish stocks in existing purse seining grounds. Although little information is available to illustrate a lower fish abundance, the loss of purse seining grounds due to land development in recent years is quite apparent. Reclamation in the Tolo area and the construction of the High Island Reservoir in the Sai Kung area are notable examples of the physical loss of purse seining grounds. The lowering of stock abundance in traditional fishing grounds due to deterioration of the environment is less apparent but is not to be overlooked. Purse seine fishermen have attributed the decreasing abundance of some pelagic species in certain areas to contamination of the environment by various types of marine dumping and land-based discharge.

The high sensitivity of the purse seiners to changes in local weather and sea conditions means that they can fish effectively for much shorter periods during the main season than, say, trawlers. This, together with the relative inefficiency of the fishing operation in terms of manpower utilisation, contributes to the lower economic return for this gear.

With increasing job opportunities on shore, fishermen of the younger generation are always tempted to leave the fishing industry to take up jobs in other industries. Although this situation is not unique to the purse seine fishery, it is however more acute in view of the lower price realised for the purse seiner catches and hence the less attractive income for the purse seine fishermen compared with that in other sub-sectors of the fishing industry. Purse seining is a labour-intensive gear as shooting and hauling are all done by hand. The average crew size of a purse seiner is comparable to that of the larger stern trawlers, gill netters or longliners. Thus the effects of labour shortage are felt more severely in the purse seining fishery than in other sub-sectors.

To maintain the competitiveness of the purse seiners in the fish industry, it is necessary to work in three directions, viz to cut operational cost, to increase catches and to stimulate demand for the catch. Cutting operational cost could be achieved through mechanisation of the fishing operation whereby the number of crew required can be minimised. Increased catch can be achieved by improving methods of concentrating and catching the fish. For the latter aspect, electric bright lights for attracting pelagic fishes have been tested by the Fisheries Development Division although conclusive results still await further experimentation. An area of development towards higher demand for the catch is to improve utilisation. In this respect, the Fisheries Development Division has been looking into the feasibility of making silage from trash fish and of utilising this silage as an additive to pig feed and fish pellets.

Faced with increasing running costs, shortage of labour, low utilisation and low market price for their catch, the outlook for the purse seiners is not bright. It is also unlikely that the existing fleet will be able to take advantage of the location of offshore pelagic resources which is being given priority in the Fisheries Branch of the Agriculture and Fisheries Department, as it is likely that new types of vessels and new technology will be required for the exploitation of these new resources. The involvement of local purse seiners in the mariculture industry is at present the only incentive for them to stay in the purse seining business. The present estimated annual production of the mariculture industry is 630 m. tonnes. Taking a conversion ratio of 10:1, a total of 6,300 tons of trash fish would be required as feed for this crop and purse seiners currently provide the bulk of this amount. It has been noted that in Stanley where no mariculture is practised because of geographical limitations, the once active and sizeable purse seine fleet based there is now almost non-existent. Purse seining has today evolved into a part-time operation associated with mariculture and is likely to remain so in the foreseeable future.

6. REFERENCES

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Table 1. The estimated numbers of purse-seiners, 1951-1974

Year	Purse Seiners		Total
	Wind-driven	Mechanised	
1951*	1811	-	1811
1952*	1687	2	1689
1953*	1695	13	1708
1954*	1673	121	1794
1955*	1568	253	1821
1956*	1604	305	1909
1957*	1496	466	1962
1958*	1254	695	1949
1959*	1051	702	1753
1960*	933	723	1656
1961*	808	739	1547
1962*	557	811	1368
1963*	489	842	1331
1964*	428	856	1284
1965*	-	833	833
1966*	264	803	1067
1967*	234	592	826
1968*	-	-	-
1969*	103	425	528
1973**	25	340	365
1974	-	228	228

* date extracted from IPFC/72/SYM 46.

** estimation by the Fisheries Development Division

Table 2. Fishing range of purse seiners categorised by engine horsepower

Vessels categorised by H.P.		Fishing at						Total no. of trips
		Home port area		Adjacent areas		Other areas		
		No. of trips(n)	%	No. of trips(n)	%	No. of trips(n)	%	n
Class 1	18	30	100	/	/	/	/	30
Class 2	18-100	96	73.28	35	26.72	/	/	131
Class 3	100	4	44.44	3	33.33	2	22.22	9
Total		130	76.47	38	22.35	2	1.18	170

Table 3. Dimensions and mesh sizes of seine nets used by local purse seiners.

Length (metres)	Length (Chinese) (fms)	Depth (metres)	Depth (Chinese) (fms)	Mesh (mm.)	Mesh (Chinese) (in)	Species of groups caught
20-50	12-30	11.7-16.7	7-10	5.50-7.50	0.15-0.20	post larval stages of anchovies
50-83.5	30-50	26.7-50	16-30	9.30-11.20	0.25-0.30	small anchovy, anchovy-like species, juvenile sardines, juvenile scad
83.5-116.9	50-70	41.8-66.8	25-40	11.20-22.30	0.30-0.60	sardines, small scad, juvenile mackerel, large size anchovies
100.2-250.5	60-150	40-116.9	24-70	22.30-44.60	0.60-1.20	sardine, scad, pouters, gizzard shad, mullet, other carangids, rabbit fish

Table 4. The proportion of purse seine: fishing conducted at various depth ranges over the period November 1974 to February 1975 inclusive

Depth range		Fishing activity	
(metres)	(fathom)	No. of trips	% of total
9.1	5	123	31.78
11-18.3	6-10	186	48.06
20.1-27.4	11-15	65	16.80
over 27.4	over 15	13	3.36
Total		387	100

Table 5. Species composition by weight (m. tons) by area for purse seiner landings according to FMO auction vouchers for the period July 1975 - June 1976

Species \ Area	1	2	3	4	5	Total
Stolephorus/Engraulis spp.	53.84	31.90	1.71	5.31	9.68	102.44
Apogon spp.	1.49	9.08	-	45.87	69.84	126.29
Caranx mate	58.45	8.01	13.04	-	3.09	82.59
Clupanodon/Nematolosa spp.	3.34	260.25	7.07	4.94	0.48	276.08
Leiognathus brevirostris	18.87	135.00	9.15	2.99	48.04	214.04
Leiognathus spp.	8.51	-	-	24.98	62.53	96.02
Mugil cephalus	7.04	32.32	5.41	11.80	3.01	59.58
Mugil spp.	8.16	22.13	8.70	5.82	36.81	81.61
Pneumatophorus japonicus	20.99	24.32	18.06	53.10	30.86	147.34
Sardinella spp.	274.76	448.54	60.85	32.77	50.60	867.52
Decapterus spp.	128.65	179.31	156.47	76.28	888.25	1428.97
Siganus spp.	28.86	162.91	25.00	10.35	30.49	257.62
Trichiurus spp.	3.00	3.14	1.86	1.50	0.49	9.99
Dussumieria hasseltii	7.66	1.90	2.19	0.13	9.61	21.48
Sphyraena spp.	1.31	1.33	0.33	-	0.04	3.01
Thrissa spp.	0.46	23.58	-	1.31	0.08	25.43
Caranx kalla	17.36	182.36	-	8.34	0.92	208.99
Hemirhamphidae	0.33	0.10	0.15	0.96	5.09	6.64
Selaroides lepitolepis	1.03	3.85	2.81	-	-	7.69
Sparidae	0.39	1.91	0.86	2.26	1.24	6.69
Therapon spp.	0.22	1.23	1.19	-	-	2.65
Atherina spp.	6.69	0.02	-	-	-	6.71
Caranx malabaricus	0.34	0.99	2.59	0.01	4.41	8.34
Chirocentrus dorab	3.82	0.98	0.32	0.04	0.02	5.17
Rastrelliger spp.	0.14	5.15	0.02	-	-	5.31
Monocanthus spp.	-	-	-	-	31.75	31.75
Stromateoides spp.	-	0.03	1.08	0.12	0.11	1.34
Thunnidae	0.16	1.14	-	-	-	1.30
Gerres spp.	0.29	7.99	0.40	-	0.06	8.74
Atropus atropus	0.03	0.08	2.45	0.04	0.32	2.92
Fish larvae	0.01	-	3.06	0.43	-	3.50
Unsorted fish spp.	44.70	319.67	60.66	3.40	13.44	441.87
Squid	35.75	15.06	39.38	6.96	24.65	121.79
Cuttle	2.12	1.66	0.38	0.03	0.98	5.17
Octopus	0.05	-	-	-	-	0.05
Shrimp	0.40	0.60	0.02	-	27.38	28.40
Vertebrate subtotal	700.91	1869.25	385.42	292.77	1301.26	4549.60
Invertebrate subtotal	38.32	17.31	39.78	69.78	53.01	115.41
Gross total landings	739.23	1886.56	425.20	362.55	1354.27	4665.01

Table 6. Landings of fresh marine fish and invertebrates sold through all FMO markets, classified by gear type

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
	'000 m tons	'000 m tons	'000 m tons	'000 m tons	'000 m tons	'000 m tons	'000 m tons	'000 m tons	'000 m tons	'000 m tons	'000 m tons
Trawler	38.6	45.6	48.5	48.0	48.3	50.5	51.1	55.5	61.1	62.1	64.8
Liners	13.3	13.0	10.9	10.4	10.0	8.2	9.3	8.7	8.7	8.2	7.0
Gill-netters	6.2	5.7	5.5	5.7	7.0	8.3	10.4	12.3	12.2	10.8	10.7
Purse seiners	5.2	4.2	5.1	4.5	4.5	2.9	3.2 12.9*	3.8 13.1*	4.7 17.0*	4.3 11.4*	3.0 6.3*
Others	3.4	4.0	3.7	3.4	4.0	4.5	4.6	4.7	1.6	1.1	1.8
Imported	1.2	1.8	2.1	1.8	1.3	1.4	1.5	0.9	0.8	0.5	0.3
Total	6 .	74.3	75.	73.	75.0	75.8	80.1	85.9	89.1	8 .	87.

* Estimated total landings (including landings outside FMO) by Economic Division, A & Γ D.

Table 7. Intensity of fishing activities for purse seiners based at Stanley (December 1974 to November 1975)

Month	Sample size (no. of vessels)	Total no. of nights fished	% vessel nights fished
December 1974	6	71	38.17
January 1975	6	97	52.15
February	5	33	23.57
March	5	94	60.65
April	5	109	72.67
May	5	86	55.48
June	5	91	60.67
July	6	136	73.12
August	5	69	44.52
September	4	46	38.33
*October	5	27	17.42
November	2	28	46.67

* fishing affected by typhoon during that period

Table 8. Monthly estimated fishing effort (trips) for purse seiners by area from July 1975 to June 1976

Estimated effort (trips) — Area / Month		1	2	3	4	5	All areas
July	1975	560	349	612	194	79	1 794
August		354	435	433	150	500	1 872
September		324	385	564	205	541	2 019
October		228	628	146	180	307	1 489
November		144	559	49	129	176	1 057
December		128	316	55	164	50	713
January	1976	128	368	89	53	118	756
February		277	190	117	66	31	681
March		182	227	313	79	355	1 156
April		231	131	364	233	426	1 385
May		186	406	259	228	450	1 529
June		380	308	228	152	648	1 716
		3 122	4 302	3 229	1 833	3 681	16 167

Table 9. Average price (HK$) per kg. by gear type of catches sold through F.M.O. markets

Year \ gear	Trawl	Gillnetter	Longliner	Purse seiner	Other gears
1974	2.02	3.74	4.48	1.17	2.96
1975	1.93	3.60	5.24	1.06	3.06
1976	2.13	3.92	6.02	1.21	3.49
1977	2.73	5.06	7.14	1.57	4.12
1978	Stern trawl 4.32 Pair trawl 2.55	5.44	7.80	1.93	4.18

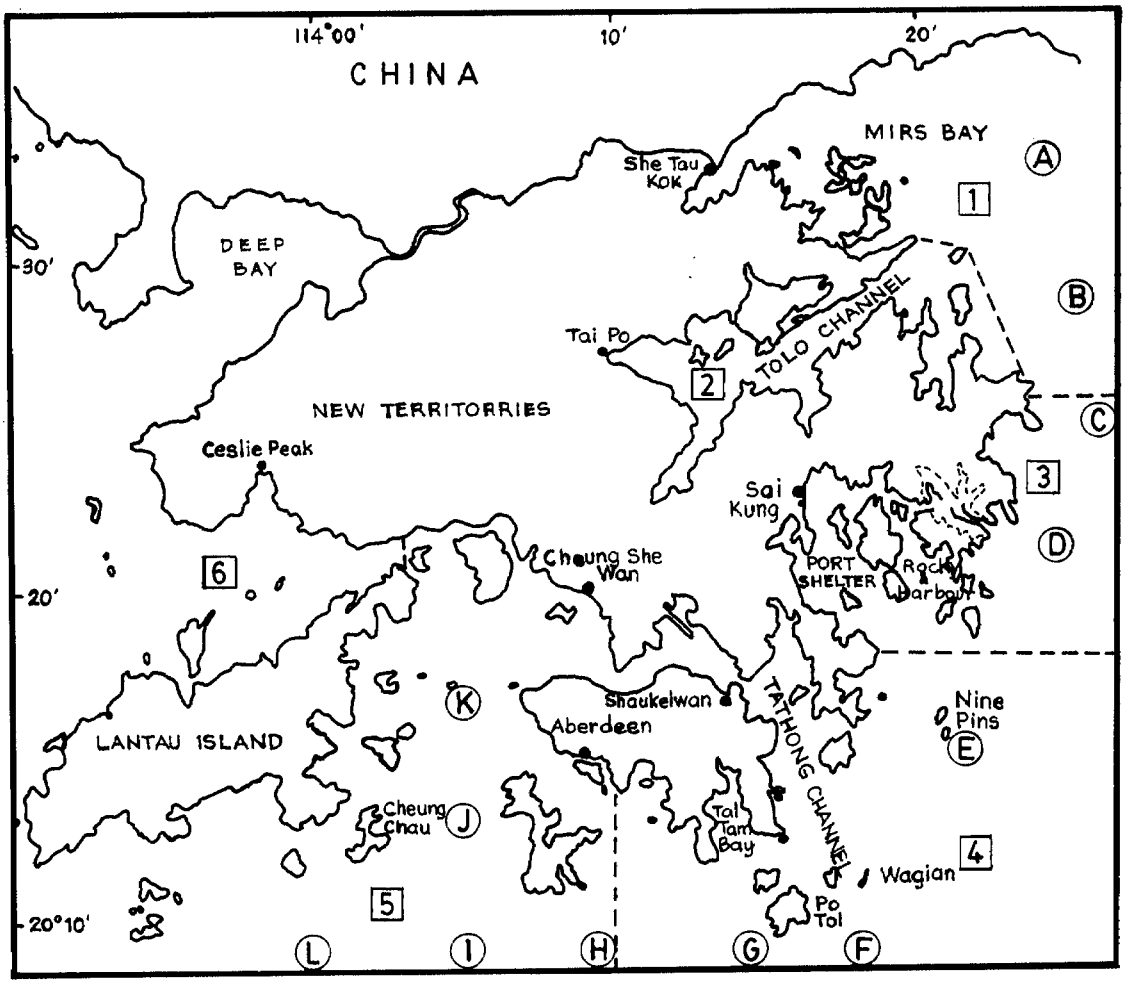

Fig.1 Inshore hydrographical stations and statistical areas for studies of purse seine activities.

□ Statistical areas
-- Area boundary
○ Standard hydrographical stations
• FMO Fish Markets

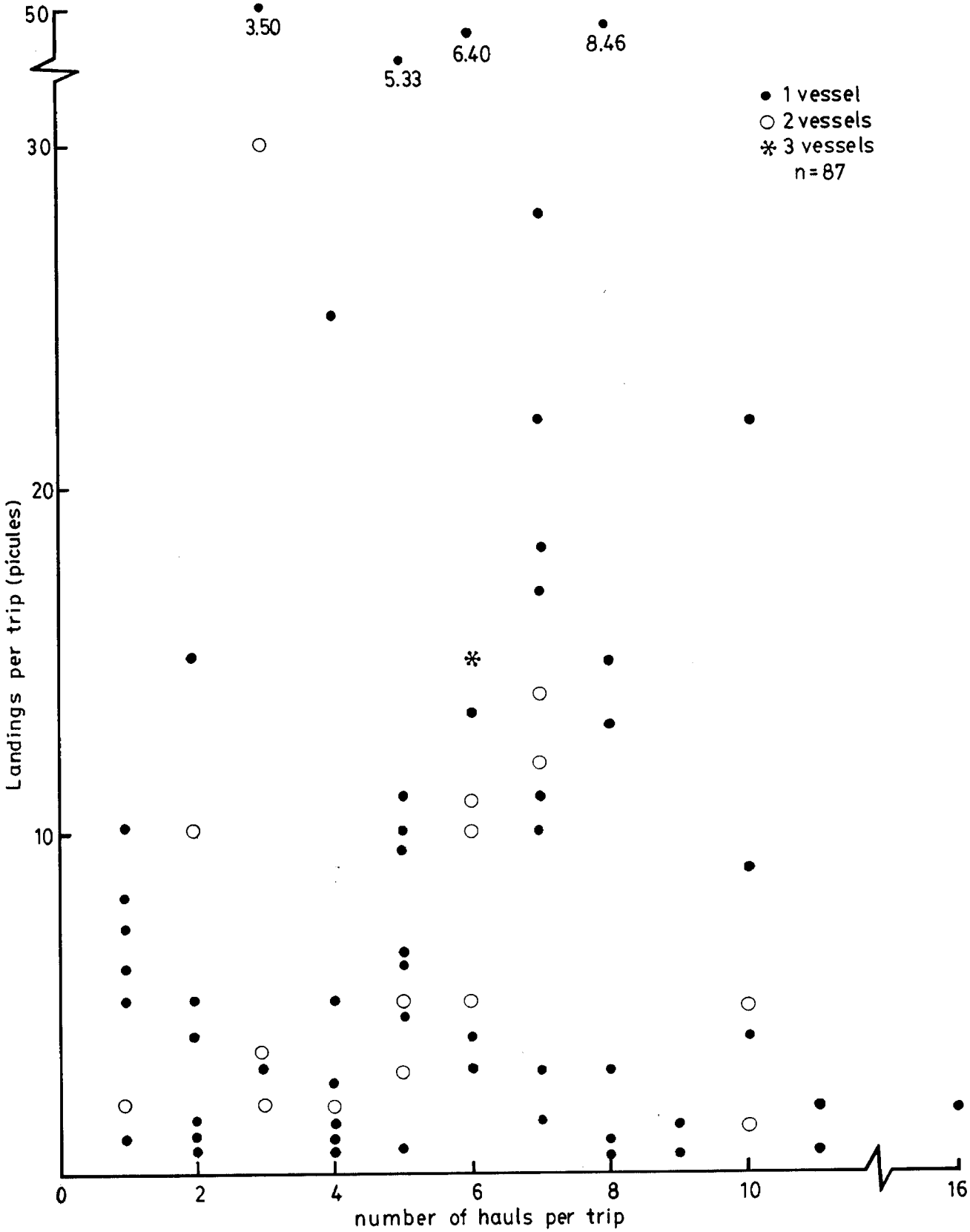

Fig.2 A scatter plot of number of hauls and total catch per fishing trip for purse seiners.

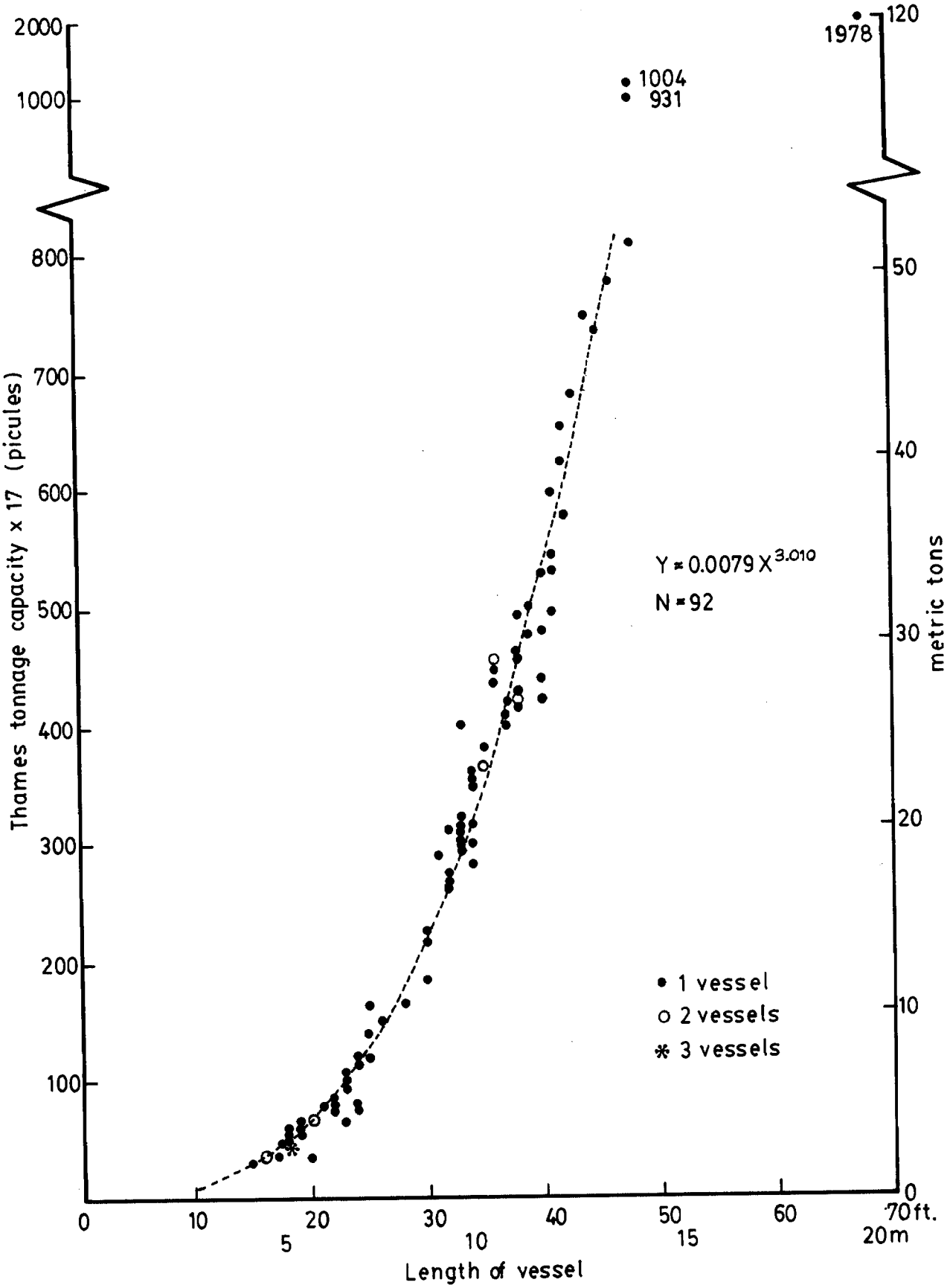

Fig. 3 Relationship of length of vessel to capacity (Thames tonnage x 17)

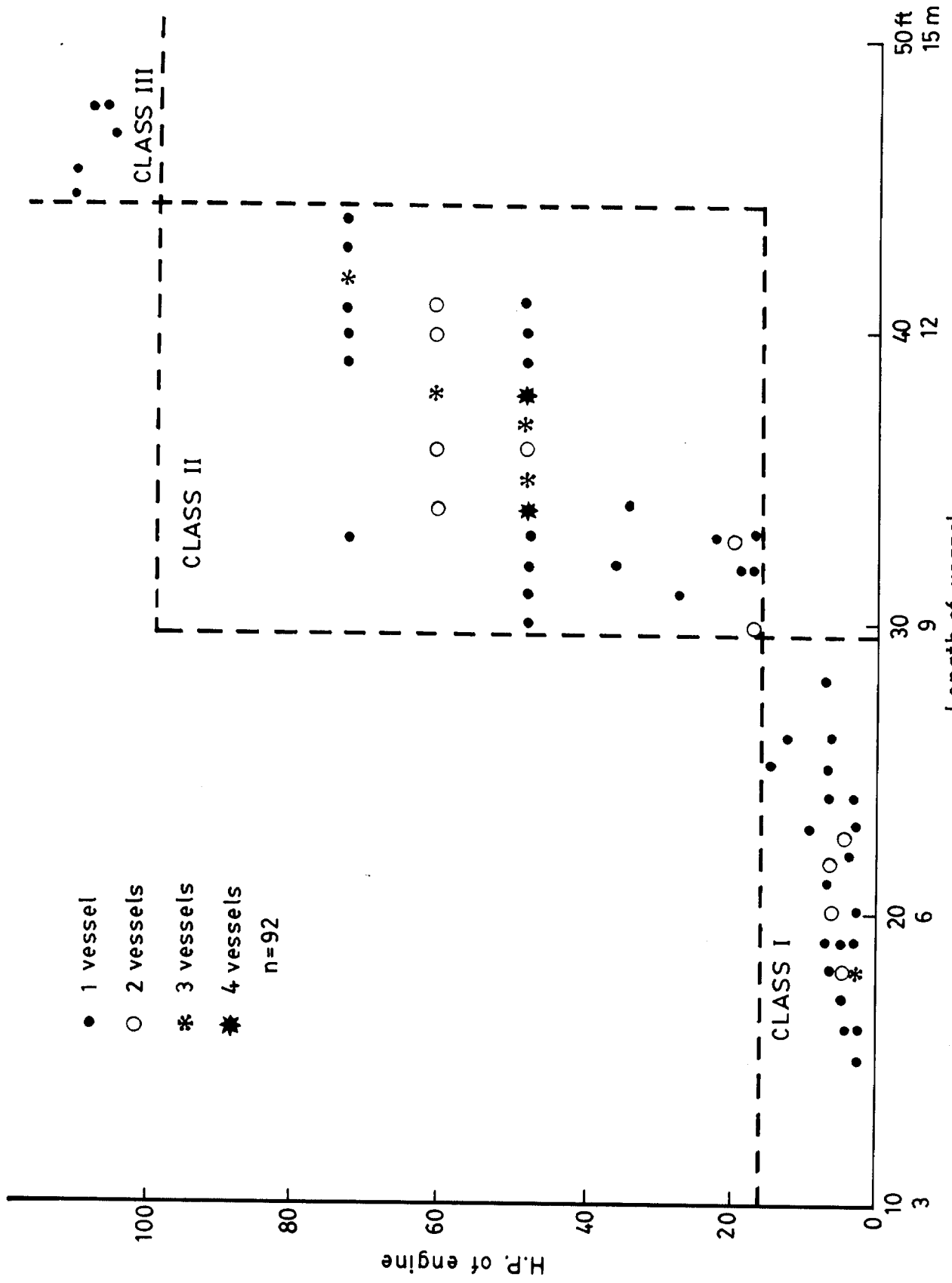

Fig. 4 Relationship of engine horsepower with length of purse seiners.

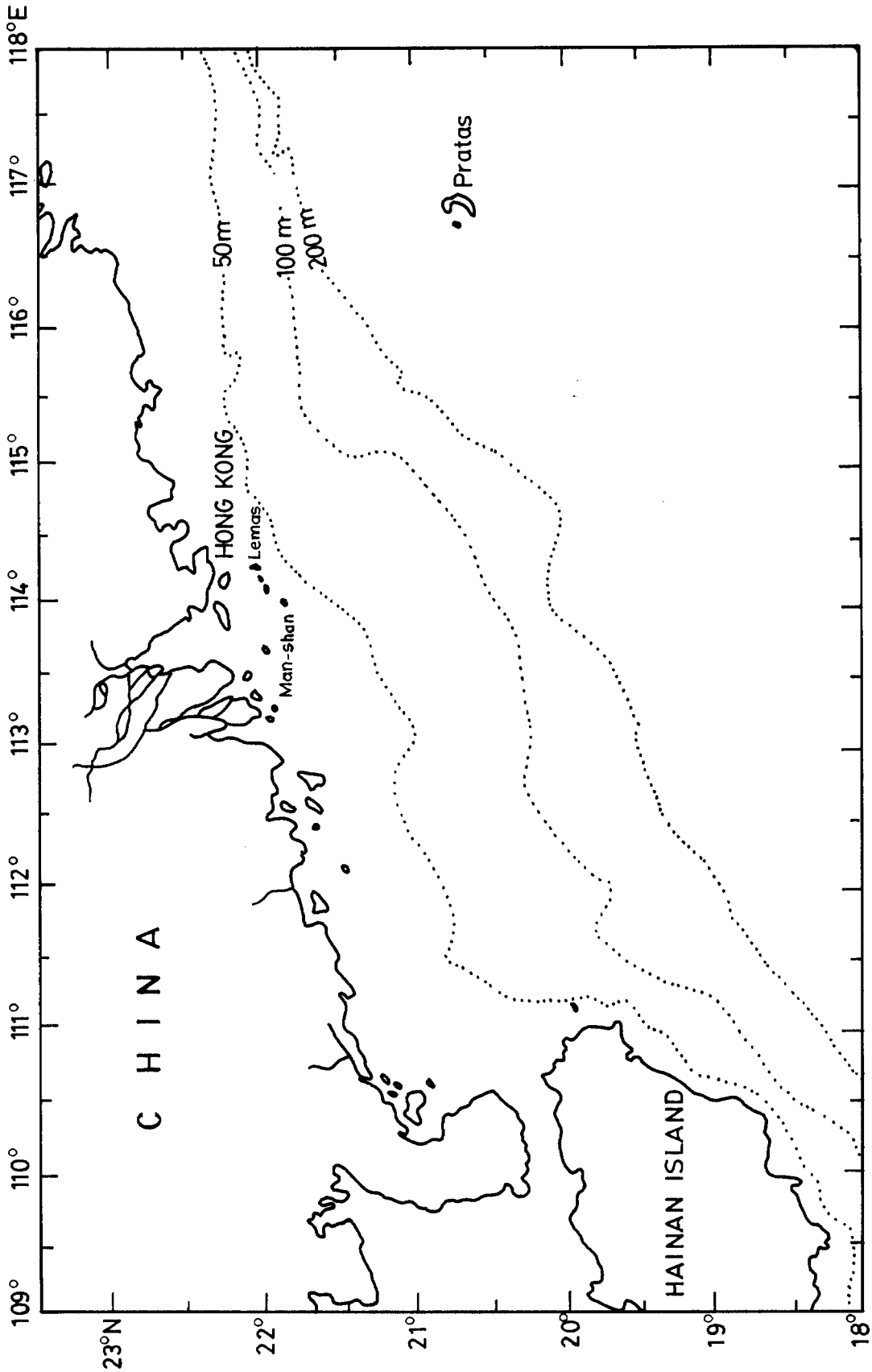

Fig. 5 Figure showing the offshore fishing grounds of purse seiners.

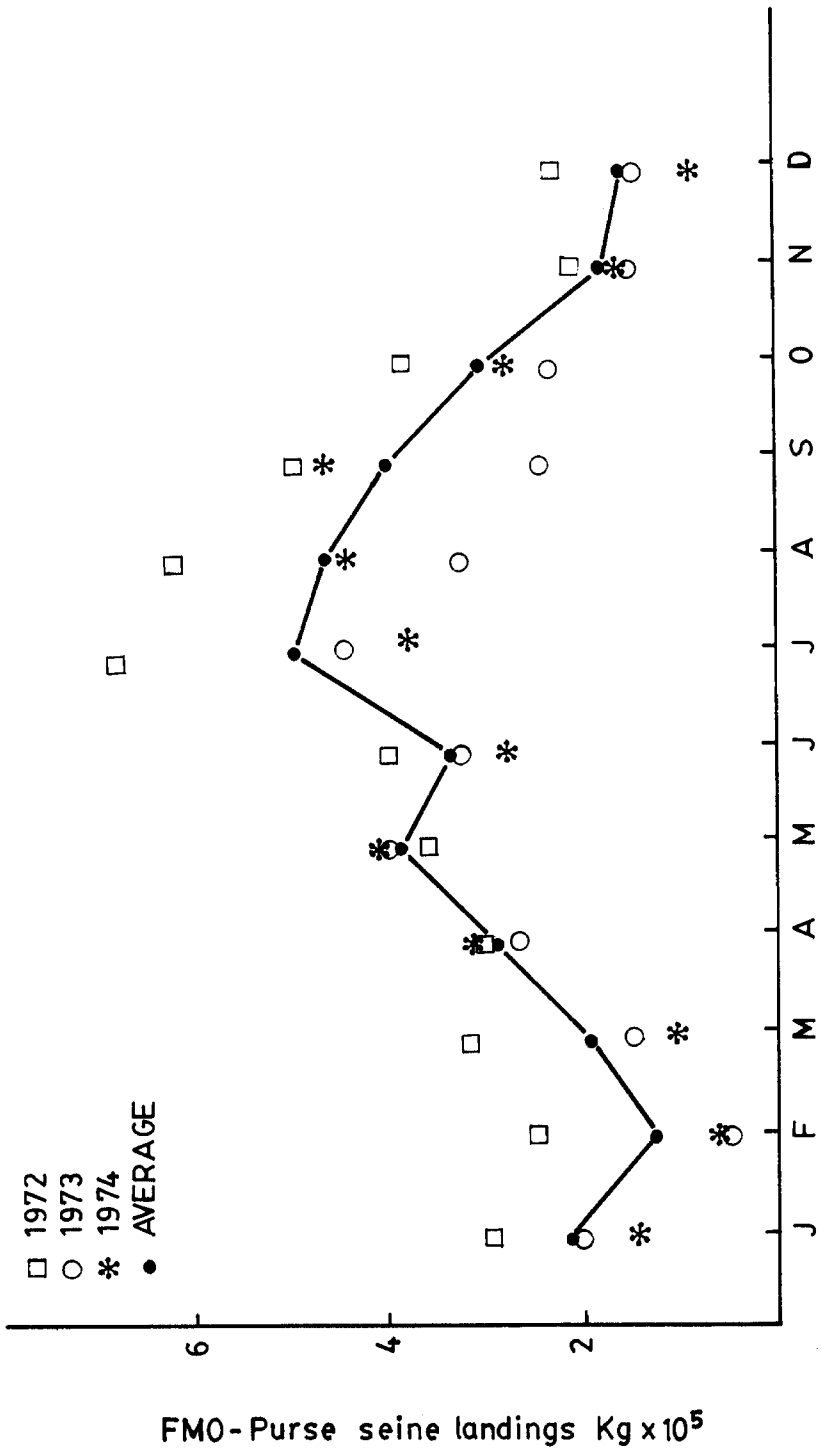

Fig. 6 Monthly variation in purse seine landings, 1972-1974.
(Based on FMO Trade Statistics)

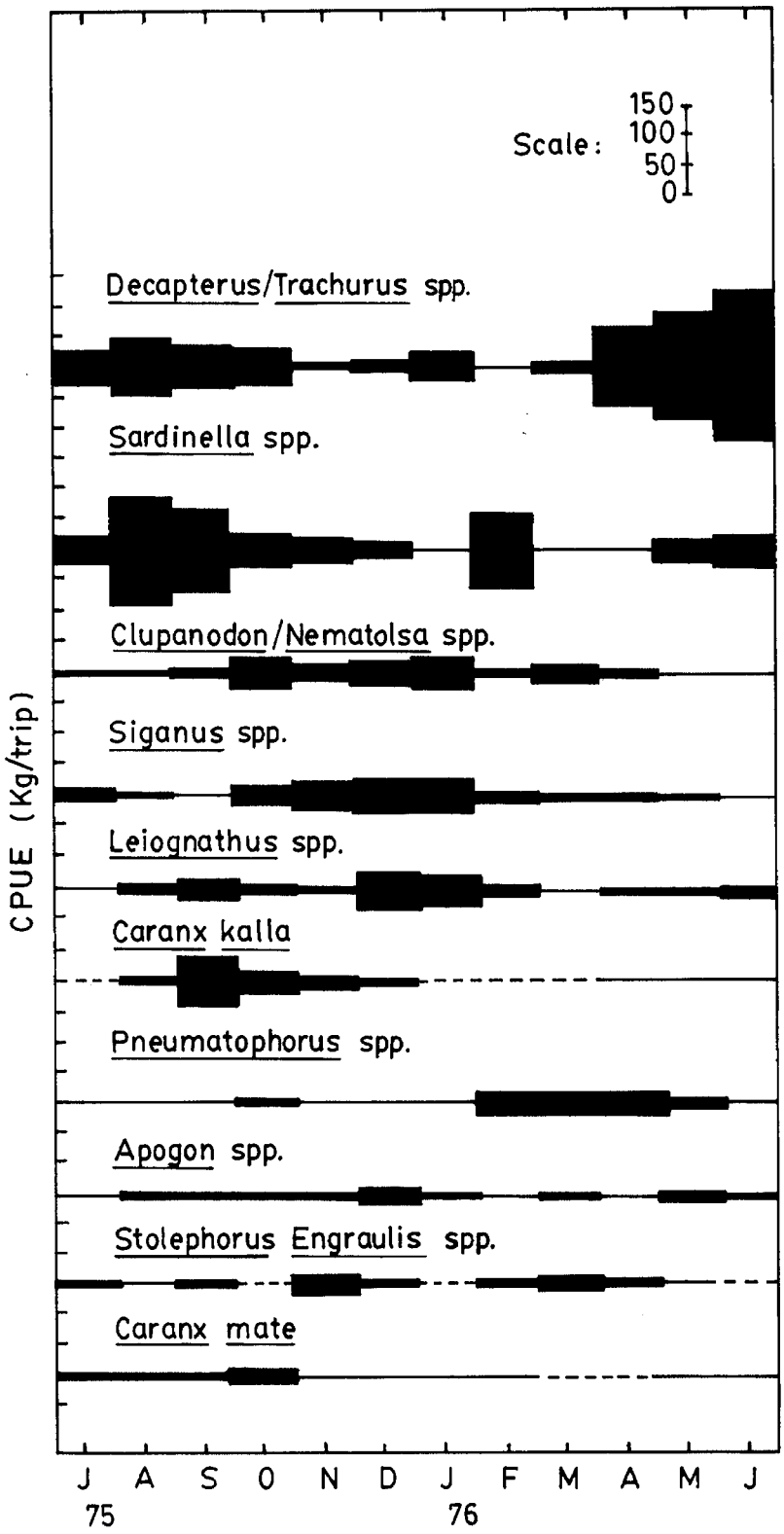

Fig.7 Catch per unit effort (CPUE) of the major taxa landed by purse seiners July 1975-June 1976.