The Coastal Fisheries of Peninsular Malaysia

By

Dr. Khoo Khay Huat
Biological Sciences
University Sains Malaysia
11800 Penang, Malaysia

Abstract:

The coastal fisheries of Malaysia are a very rich and diverse marine resource. This review briefly outlines the biodiversity of this marine biological resource from both taxonomic and ecological perspectives. It reviews the current utilization of this coastal marine resource by a variety of artisanal fishing gears. The fishing power of some of these traditional gears needs to be carefully studied and defined for their proper management, as some of these gears exert excessive pressure on the coastal marine resources. It highlights the need for proper management of these artisanal gears as well as environmental factors to ensure sustainable utilization of this resource.

The Coastal Fisheries of Peninsular Malaysia

By

Dr. Khoo Khay Huat
Biological Sciences
University Sains Malaysia
11800 Penang, Malaysia

Introduction

The Malaysian coastal fisheries as in other countries within the South East Asia region, is a very diverse biological resource. Over two thousand species of fishes have been described from the coastal waters of Malaysia (Cantor, 1849; Maxwell, 1921; Fowler, 1938; Scott, 194;, Mohd. Shaari, 1971; Weber & de Beaufort, 1961; Lui et al. 1994). This great biodiversity in taxonomic status and variety of the fisheries resources arise out the great ecological diversity and niches that exist within the marine tropical environment.

Taxonomic Diversity

Fisheries resources include a variety of organisms, from the bony fishes which is taxonomically of the family Pisces, to the shellfish and jellyfishes which are not taxonomically within the group Pisces, but are considered "fish" from the point of the fishing industry and in Malaysia they meet the legal definition of fish.

The jellyfish of the phylum Coelenterata are an important specialized fishery in many parts of Malaysia. This fishery concentrate on the collection and processing of jellyfishes especially those with large medusa such as *Mastigias papua.*

Echinodermata (seacucumbers) have traditionally been collected from the Malaysia coastal environment. As the jellyfish they form a small specialized

fishery as the collectors not only harvest but also process them. A large portion of the catch is for the dried seacucumber market but there is also a specialized market for processed seacucumbers, *Stichopus* sp. in the northern part of Peninsular Malaysia.

Mollusca has always been a very important marine resource. From the squids *(Sepia sp. & Loligo sp.)* living in the open waters to the blood cockles *(Anadara granosa)* living and thriving in the mudflats, the Mollusca as a group have been a very important marine coastal resource. Other bivalves may have a much higher economic value such as the oysters *(Ostrea)* by the cockles have traditionally provided the highest landing of marine mollusca in Malaysia.

The Crustaceans especially the prawns has always been the driving stimulus and objective of most of the coastal fishermen in Malaysia. This because the economic value of prawn landings are the highest in the industry. In fact the coastal trawl fishery in Malaysia arose out of the prime objective of catching and landing prawns and fish is only a secondary target. There well over 30 species of prawns that are economically important in the Malaysian coastal fisheries (Hall 1962; Lee, 1972). As in many countries in this region *Penaeus monodon* has the highest unit price but the white banana prawns *(Penaeus merguiensis)* is more important to the capture fishery because of their high value and numerical abundance. In addition to the various species of prawns, the coastal fishermen harvest two main species of crabs, *Portunus pelagicus* and *Scylla serrata* and a few species of spiny lobster of the genus *Panalurius.* Recent some coastal fishermen have shifted their efforts towards the harvest of life mantid shrimp of the genus *Squilla* because of their high demand and price in the life fish trade.

The Chondrichthyes consisting mainly of sharks & rays form an important fishery in Malaysia. There is a big local demand for rays in the local food market and they usually fetch a much higher price than the sharks.

The bony fishes, Osteichthyes, forms the major portion of the fisheries in Malaysia. Over two thousand species of bony fishes have been described from the Malaysian coastal environment. Of these, about two hundred species of teleost are commercially important (Lui et al., 1994; Mohd. Shaari 1971) and forms the major portion of the marine fish landings.

ECOLOGICAL DIVERSITY

The coastal fisheries are a very diverse biological resource. This diversity is not only in taxonomic variety but also in ecological diversity. The fishes occupy a variety of ecological niche in the coastal environment. Some of these fishes stay within the coastal environment for their whole life history but many enter and occupy the coastal environment for only part of their life cycle. Many of the fishes uses the coastal environment as their main feeding ground. They move into the coastal environment on a daily basis to feed because the coastal environment is a very important nursery area with lots of juvenile fishes. There are fishes that use the coastal environment as a spawning area and subsequently as a nursery area. There are fishes that spawn in the open sea and their pelagic eggs drift into the coastal area where they hatch and the juvenile develop.

The coastal environment is not a uniform environment but one with a great diversity of niches and subcomponents of environment. In fact this diversity of environment give rise to the great biodiversity within the environment. Broadly the coastal environment can be subdivided into the open sea, estuaries, mangroves, mudflats, seagrass and reefs.

The inshore open sea is very important fishing area for the artisanal fishermen. This is a area with large number of small fishes, the juveniles of some fishes as well as those that are by nature small such as *Sardinella fimbriata* and other small clupeids. This is also where the halfbeaks, *(Hemiramphus far)* and Garfish *(Tylosaurus* sp.) live their whole life. The open sea is also the main fishing ground for many of the small mullets such as *Velamugil sehali* and *Liza vaigiensis.* Within the inshore open sea slipmouths, *(Leiognathus sp. and Secutor sp.)* are caught. These small fish do not have a high economic value. Similarly at the bottom of the inshore open sea are numerous small Sciaenidae.

A highly prized fish that comes into the inshore open sea to breed is the threadfin fish, *Eleutheronema tetradactylum.* This fish which has a androgynous breeding pattern spawns in the inshore open sea where their young develops. The local fishermen catch large numbers of juvenile threadfins using gillnets throughout the year.

Rastrelliger brachysoma breeds in the open sea but its pelagic eggs drift towards the shore where they hatch and their young develops. The inshore open sea forms an important nursery for these fishes. They much more coastal than *Rastrelliger kanagurta.*

Of the sharks, the dogfish *(Chiloscyllium indicum)* and the black shark *(Eulamia melanoptera)* are common in the coastal waters and caught regularly by fishermen both by trawlers and artisanal gear, especially gillnets. Large as well as small species of stingrays are also common in the inshore open sea. These include the butterfly ray *(Gymnura poecilura)* and the stingray *(Dasyatis zugei).*

The common blue crab, *(Portunus pelagicus)* move in and out with the tides at the near shore water in search for food. Most local fishermen have observed and know this behavioral pattern very well. They set their barrier nets to catch the crab base on this behavioral pattern. *Portunus pelagicus* breeds and complete their life history within the inshore zone.

The estuaries in the marine tropical environment provide a very rich and diverse habitat to the marine coastal organisms. It is extremely rich in nutrients brought down by the river. It is an important habitat for many species of fish. Some of the outstanding examples of the marine fauna living the coastal estuary included the sawfish *(Pristis cuspidatus)* . It use to be common but it is extremely rare these days.

Another fish that frequent the coastal estuary is *Chirocentrus dorab.* A large predatory fish which occurs within the estuary in search for food. The estuaries is a very important nursery ground for many of the commercially important food fishes, these include the mackeral *(Scoberomorus* sp.), the ribbonfish *(Trichiuris* sp.) and the pomfrets *(Pampus chinensis).*

The estuaries are also very important breeding grounds for a number of important food fishes such as *Lates calcarifer,* which migrates into the estuaries to breed every year. Some fishermen are aware of their migratory route and have set gillnets targeted at them during their spawning migration. These large *Lates* spawners with ovulated eggs fetch a very high price from those operating hatcheries to provide *Lates* frys to the aquaculture industry. While *Lates* breeds

within the estuary, there are other fish which migrate into the estuary and proceed upriver to breed. These include *Hilsa toli & H. macrura.*

Many species of prawns occur within the major estuaries, especially on the west coast of Peninsular Malaysia. The nutrients brought down by the river provide a very rich environment for these coastal prawns. In addition to the various species of prawns, many coastal fishermen are currently target the mantid shrimp, *Squilla* sp. Life *Squilla* sp. currently fetch a very high price.

The mangroves ecosystem is a very specialized ecosystem where over 200 species of fish are associated with (McNae, 1971; Khoo, 1989; Sasekumar, 1989). In addition to the common mudskippers *(Periothamodon sp. & Perithalmus sp.)* which do not have a high economic value in Malaysia other species of fish occur within the mangrove environment. The common catfishes found within the mangrove ecosystem are *Plotosus canius* and *Arius sagor.*

The mangrove crab *(Scylla serrata)* is very widespread with the mangrove ecosystem. There is a fishery for them using baited traps. In addition to the crabs, many species of mullusca are harvested from the mangrove habitat. These include *Cerithidea* and a few other species.

Extensive mudflats exists in Malaysia. They are mainly associated with mangroves and estuaries. They are extensions of these habitats and in most cases share the same biological diversity. There are some important differences for example the extensive mudflats are very important habitats for the bivalves, *Anadara granosa* or blood cockles. Large and extensive harvest of cockles are obtained from the mudflats in an semi-intensive aquaculture system. There natural cockles beds where seeding is not done. In addition to the cockles, other bivalves such as *Paphia undulata* and *Placuna placenta* are also harvested. These bivalves are not seeded and thus forms part of the capture fishery. Another fishery which is associated with the mudflats and the coastal environment is the *Acetes* fishery which harvest a number of crustaceans of the *Acetes* genus (Omori, 1980).

Fishes that are associated with the mudflats are the marine catfishes *(Arius sp.& Plotosus anguillaris).* In addition to the marine catfishes, flatfishes such as

Psettodes erumei, Pseudorhombus malayanus & Cynoglossus lingua are found and caught within the mudflats.

Seagrass are very limited in its distribution in Malaysia, there are some in the southern part of Peninsular Malaysia. Where they are present they are important nursery grounds for many species of fish.

The coral reefs are home to a very wide variety of fish and other marine organisms. It is not the intention of this paper to describe this fully here but to highlight some of this great biodiversity that exist in this interesting coastal habitat. I am sure other will discuss this habitat in greater detail.

The coral reefs are home to the very beautiful Wrass (Labridae), the coral eating Parrotfish (Scaridae), Surgeonfish (Acanthuridae), Butteryfly fish (Chaetodontidae), Moray eel (Muraenidae). The poisonous but beautiful Scorpion fish (Scorpaenidae) is also found here together with very many other fishes which are sometime collected for the marine aquarium trade. In addition to the very many beautiful species of fish in the coral reef, there are also many species of commercial food fish that occurs within the coral reef environment. These include the reef snappers *(Lutjanus johni & Lutjanus malabaricus)* and many species of Groupers of the genus *Epinephelus* .

Within the coral reef are found spiny lobsters *(Panulirus* sp.) which are harvested by local fishermen. Within the reef habitat are many species of holothurian which are also an important resource. Giant clams *(Tridacna sp.)* still occurs in some reefs as well as many species of ornamental cowries, and other mollusca. These are harvested in small specialized fisheries.

The Fisheries

This great diversity of marine biological resources support the very important coastal fisheries in Malaysia. The Peninsular Malaysia coastal fisheries develop from one which depended on a very diverse artisanal gear (Burdon & Perry, 1954). Subsequently a small purse fishery was introduced in the late 1950's. Up to about 1960 the artisanal fishing gear accounted for about two-thirds of the

marine coastal landings and about one-third by purse seiners. With the introduction of coastal trawlers in 1965, it has gradually increase its importance in the Malaysian coastal fisheries. By 1990 about two-thirds of the marine catch was landed by the coastal trawlers, with 20 % by the purse seiners and only about 18 % by the artisanal gear (Fig. 1).

While the proportion of the landings by artisanal gear has greatly reduced since the introduction of trawlers into the coastal fisheries, the actual landing by the artisanal gear has not change significantly. The landing by artisanal gear as shown in Fig. 2 has stabilize around the level of slightly over 100,000 tons per annum. The quantum of annual landings have not change significantly since 1960 when proper fisheries statistics in Malaysia were compiled.

In 1990 trawlers accounted for 63 % of the total marine landings in Peninsular Malaysia, while the artisanal fishery accounted for 18 % and the purse seine fishery accounted for the final 19 % (Fig. 3). Of the various artisanal gear in operation, gillnets are the most important type of gear. Gillnets account for 42 % of the artisanal gear landings. The contribution and importance of the various artisanal gear are presented in Fig. 4.

Unfortunately too many fisheries biologists within the region are overly concern and thus overemphasize the importance of the determination of growth parameters. This overemphasis on the estimation of growth parameters of fish has resulted in the poor allocation of effort and financial resources on other important parameters of fish population dynamics such as fishing and natural mortality. In spite of the extensive research on growth parameters of many species of fish, no single effective management model have been evolved to manage the sustainable utilization of the very diverse tropical fisheries.

All too often the main objectives of quantitative studies on tropical fish is just to determine their growth parameters and no effort is made to move beyond that. The present management systems for sustainable utilization of tropical fisheries resource in the region are dependent on the traditional catch and effort methods. The extremely diverse fisheries resources in the tropics is not easily amendable to the single species methodologies evolved for temperate fisheries with limited biological diversity.

With this great biodiversity within the tropical fisheries, it is important that effective and sustainable utilization of the marine coastal resources occurs and not exploitation at the expense of its sustainability. There have been very many examples of exploitation. The jellyfish fishery on the west coast of Peninsular Malaysia is one. It was a thriving industry in the 1970's and early 80's but today the fishery has collapse because of over-exploitation and excessive fishing pressure on the limited resource. There are many other examples of specific fishery which has collapse because of overfishing in Peninsular Malaysia, they include the *Hilsa* sp. fishery as well as that of *Lactarius lactarius*.

Overall the current fisheries policy in Peninsular Malaysia has successfully protected the interest of the artisanal coastal fishermen. Their overall catch has not been affected by the development of the trawl fishery. This to a large extend is a result of the zonation of the coastal fisheries, where in Zone A (0-5miles) only artisanal gear are permitted. It is only in Zone B (5-12 miles) and Zone C (12-EEZ) where trawlers and other advanced gear are permitted.

While the zonation system has successfully protected the interest of the artisanal fishermen against competition and the fishing power of the trawlers, there are clear signs that modification to artisanal gear to increase their fishing power has an adverse effect on the biological resource. The biggest and greatest challenge is within the gillnets fishery. It is a very diverse fishery with gillnets made to target at specific fish. All too often artisanal fishermen are expanding and extending their gillnets to increase their fishing power and hence increasing their catch. Up to early 1980's the average length of gillnets in the coastal zone was about 2 km but now it is very common to come across gillnets much longer than 10 km in the coastal zone. For each fisherman they are still operating one gillnet each but because of the great modification and extension to the gillnets its fishing power is greatly increase. This cause a corresponding increase in the fishing mortality and thus contribute towards overfishing within the coastal zone. We should not forget that the very controversial "Wall of Death" in the oceanic tuna fishery is also a gillnet but a very large one. Unfortunately the technology for this method of fishing is slowly entering the coastal artisanal fishery. Thus, there is an urgent need to define and limit the extend and expanse of gillnets operating in the coastal zone. There is a need to study their operations in greater detail and to define and then limit their fishing power to

ensure that overfishing does not occur. There is a need to promote the sustainable utilization of the marine coastal resource and not its exploitation.

References

Burdon, T. W. & Parry M. L. (1954) Malayan fishing methods. J. Royal Asiatic Soc. (Malayan Branch) Vol. 27.

Cantor, T. E. (1846) Catalogue of Malayan Fishes. Asher, Amsterdam (reprinted 1966)

Fowler, H. W. (1938) A list of the fishes known from Malaya. Fisheries Bulletin No. 1

Hall, D. N. F. (1962) Observations on the taxonomy and biology of some Indo-West-Pacific Penaeidae (Crustacea, Decapoda). Colonial Office Fishery Publication No. 17 H. M. S. O., London 229 pp.

Khoo, K. H. (1989) The fisheries in the Matang and Merbok mangrove ecosystem. Proc. 12th. Annual Seminar of the Malaysian Society of Marine Sciences. Kuala Lumpur

Lee, S. S. (1972) Commercial species of Penaeid Prawns (Crustacea, Decapoda) in West Malaysia. Malay. Agri. J. 48; 264-277.

Lui, Y. P., Chee, P. E. & Yeap, T. S. (1994) Major commercial marine fishes of Malaysia. Dept. Fisheries, Ministry of Agriculture, Malaysia. 113 pp.

Maxwell, C. N. (1921) Malayan Fishes.

McNae, W. (1968) A general account of the fauna and floraof mangrove swamps and forest in the Indo-west Pacific Region. Adv. Mar. Biol. 6;73-270.

Mohd. Shaari, S. A. L. (1971) A Guide to trawl species in Penang waters. Ministry of Agriculture and Lands, Malaysia. 150 pp.

Sasekumar, A., Chong, V. C. & Leh, C. (1989) Fishery resources in mangrove and inshore waters of Selangor. Proc. 12th. Annual Seminar of the Malaysian Society of Marine Sciences. Kuala Lumpur

Scott, J. S. (1959) An introduction to Sea Fishes of Malaya. Government Printer, Kuala Lumpur. 180 pp.

Weber, M. & de Beaufort, L. F. (1911-1962) The fishes of the Indo-Australian Archipelago. Vol 1-XI, E. J. Brill, Leiden.

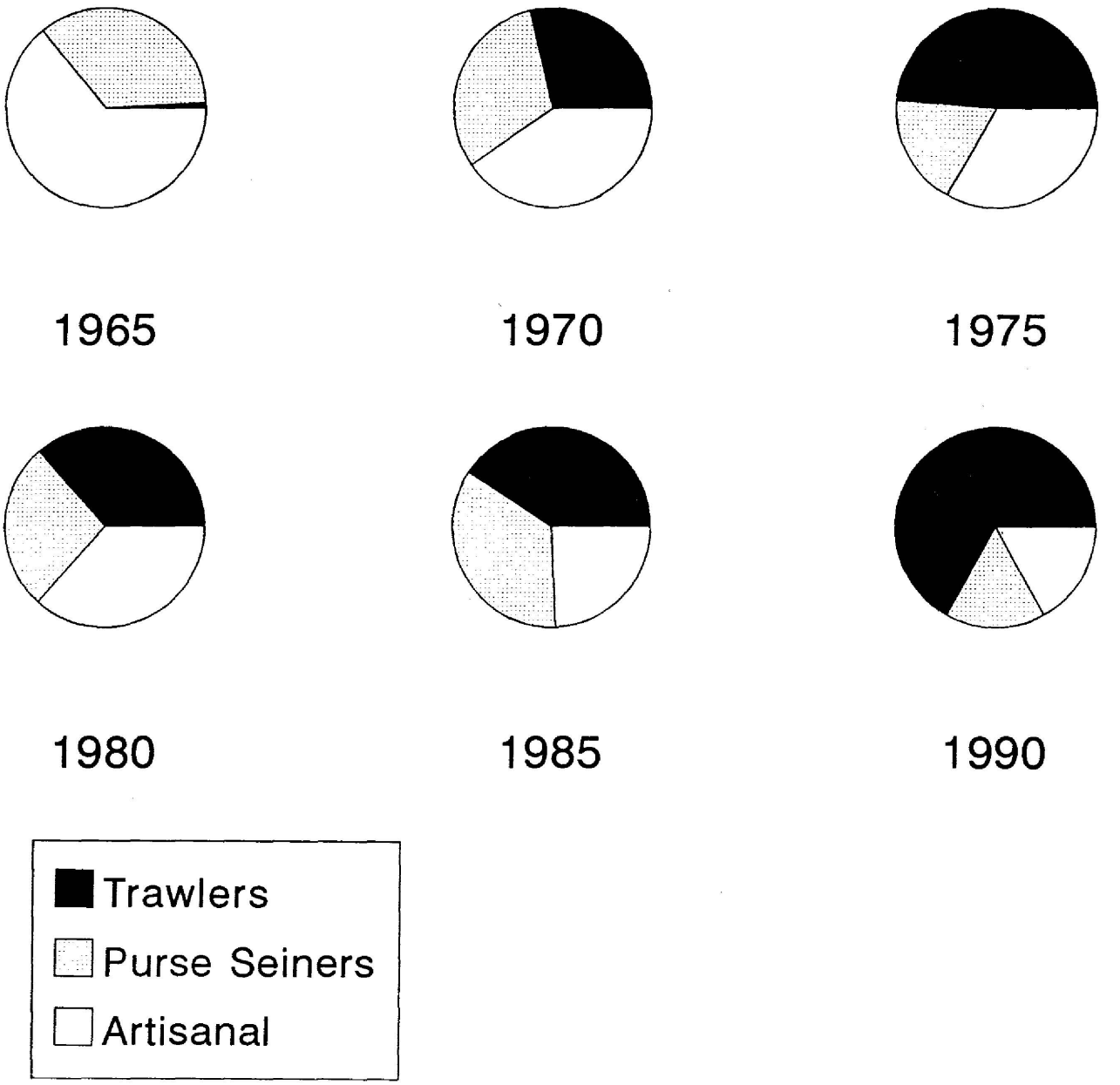

Fig. 1 : Precent landings of marine fish in Peninsular Malaysia by various gear groups at five year intervals between 1965 and 1990.

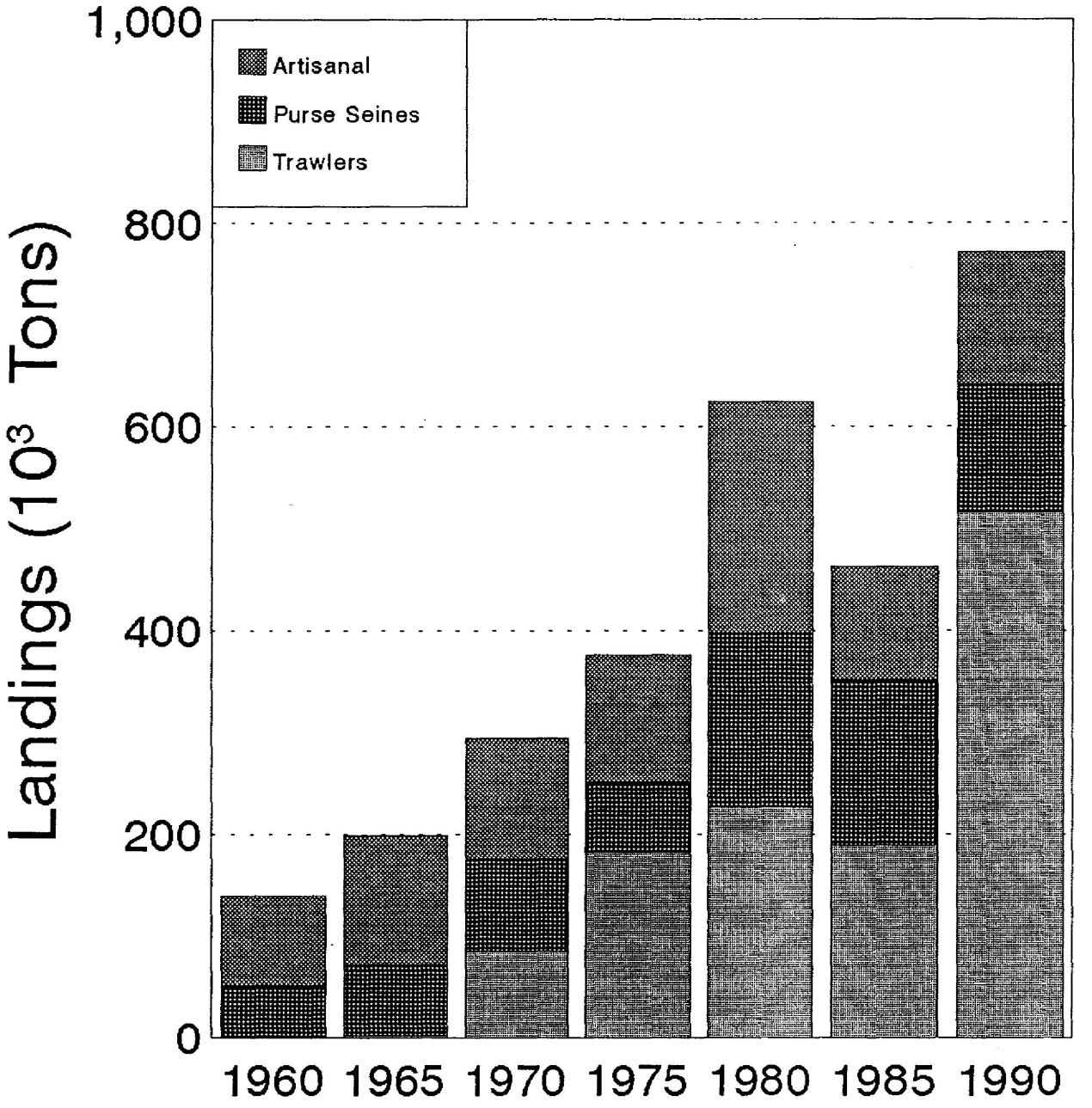

Fig. 2 : Landings of marine fish in Peninsular Malaysia by various gear groups at five year intervals between 960 and 1990.

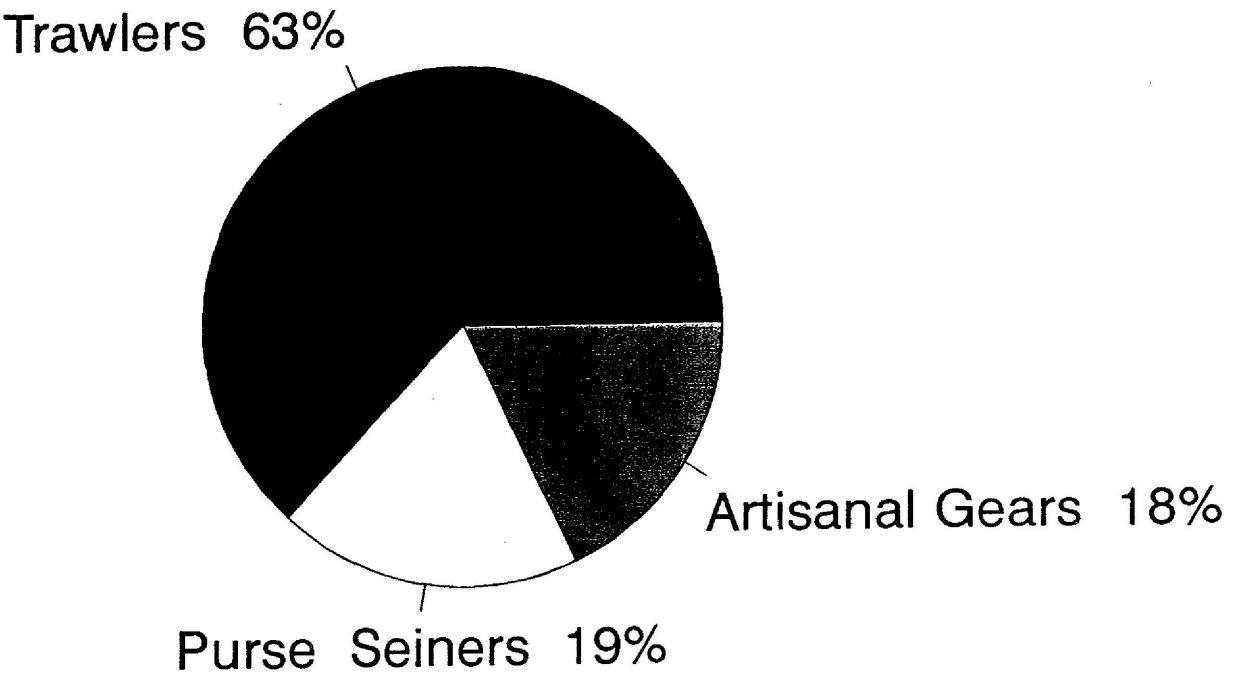

Fig. 3 : Precent landings of marine fish in Peninsular Malaysia by the various gear groups in 1990 (Total landings: 819,900 tons).

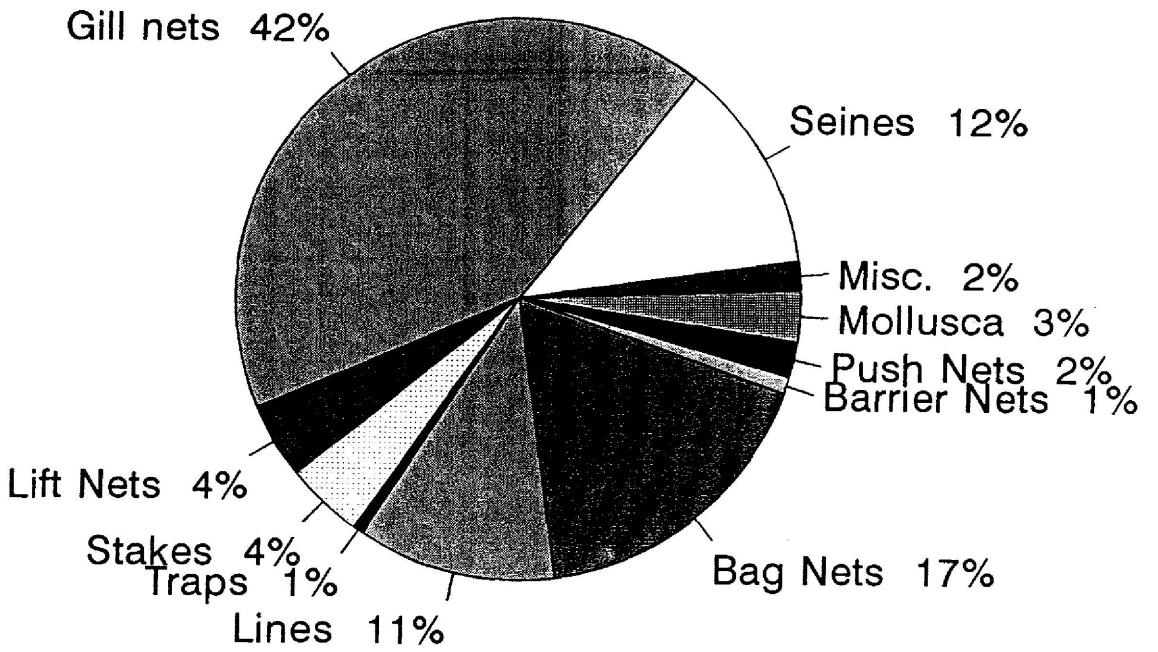

Fig. 4 : Percent landings of marine fish in Peninsular Malaysia by the various artisanal gear in 1990 (Artisanal landings: 130,000 tons).

LIPI-JSPS JOINT SEMINAR
Jakarta, 15 - 18 November 1994

SCHEDULE

Day 1, 15 November 1994

08.00 - 09.00	Registration Venue - LIPI
09.00 - 09.45	- Opening Ceremony - Report by the Organizer - Address by Indonesian National Coordinator - Address by JSPS Representative (Dr. Y. Ohwada) - Opening by the Chairman of LIPI
09.45 - 10.15	Refreshment

SESSION 1

Chairing: Mulia Purba
Rapporteur: Othman Ross

10.15 - 10.40	Sei-ichi Saitoh Application of satellite remote sensing to fisheries oceanography
10.40 - 11.05	Sunee Suvapepun Ecology in the inner gulf of Thailand
11.05 - 11.30	X. Zhang, Y. Okada, N. Kimura, H. Fujushima, Y. Sugimori and M. He. Comparison of pigment concentration between CZCS estimation and ship observation in the waters around Japan: Test of an improved atmospheric correction method.
11.30 - 11.55	Alfian Noor Nutrient diffusion of orthophosphate and ammonium ions from calcium carbonate sediments into seagrass ecosystem.

SESSION 2

Chairing Alfian Noor
Rapporteur : Sunee Suvapepun

13.30 - 13.55 T. Awaji, T. Miyama, K. Akitomo and N. Imasato
Seasonal transport variations in the Indonesian seas.

13.55 - 14.20 Suchint Deetae and Suwat Tanyaros
Distribution of nutrients in Khumpuan estuary

14.20 - 14.45 Mulai Purba
Evaluation of Upwelling South of West Java coast during southeast monsoon

14.45 - 15.10 K. H. Khoo
The Coastal Fisheries of Peninsular Malaysia

SESSION 3

Chairing Katsumi Tsukamoto
Rapporteur: Khoo, K. H.

15.30 - 15.55 Rokhmin Dahuri
The role of environmental factors in the dynamics of fish stocks.

15.55 - 16.20 Agus Sediadi
Vertical stucture of chlorophyll a and temperature in North Pacific ocean.

Day 2, 16 November 1994
SESSION 4

Chairing: Jeffry K. Y. Low
Rapporteur: Ngurah Windnyana

08.30 - 08.55 Tsuyoshi Uehara
Speciation of five species of the sea urchin genus *Echinometra* in Indo-Pacific

08.55 - 09.20 Y Arakaki
Distribution and characteristics of Indonesian four species of sea urchins, genus *Echinometra*

09.20 - 09.45 C. Dechsakulwatana, K. Okamoto and K. Ohwada
Inhibition of settlement of barnacle larvae, Balanus amphitrite, by marine bacteria.

09.45 - 10.10 Gunzo Kawamura
Simple field techniques for the investigation of fish behaviour and coastal current

SESSION 5

Chairing K. Ohwada
Rapporteur: M.A. Juinio-Menez

10.30 - 10.55 Takashi Matsui
Recent studies on marine toxins .

10.55 - 11.20 Jeffry K Y Low and L. M. Chow
Coral reef fish communities in sediment-stressed environment.

11.20 - 11.45 Hisao Kamiya
Marine bioactive biopolymers: new biochemical resources from marine organisms.

11.45 - 12.10 Hideo Sekiguchi
Larval dispersal and recruitment processes of marine benthic invertebrates.

SESSION 6

Chairing M. Zaki bin M. Said
Rapporteur: Wanda S. Atmadja

13.30 - 13.55 Rachmaniar Salari
Antimicrobial activity of some sponges from Lombok coastal waters.

13.55 - 14.20 Hiroshi Saito
Comparison of the chiton fauna (Mollusca: Polyplacophora) between Indonesian and Japanese waters.

14.20 - 14.45 K. Ohwada, H. Matsui, T. Sakiyama and Won-Jae-Lee
Growth of psychrophilic and/or barophilic marine bacteria isolated from Japanese coastal areas and the Japan trench.

14.45 - 15.10 W, Kastoro
Soft bottom benthic community in Angke estuary, Jakarta bay.

SESSION 7

Chairing Gunzo Kawamura
Rapporteur: Kurnaen Sumadhiharga

15.30 - 15.55 Othman Ross
Distribution of Pontellid Copepods in Peninsular Malaysia

15.55 - 16.20 Idris A. Ghaiii
Meiobenthos studies in Malaysian coastal waters.

Day 3, 17 November 1994
SESSION 8

Chairing M. Hutomo
Rapporteur: Hideo Sekiguchi

08.30 - 08.55 Suharsono
Coral and coral reef of Pari Island complex and their uses.

08.55 - 09.20 M. A. Juinio-Menez and C. Vilanoy
Sea urchin recruitment studies for management considerations.

09.20 - 09.45 Agus M Hatta, K. Yulianto and H. Arafah
Growth rate and carrageenan character of *Kappaphycus strialum* (Schmitz) Dotty in field culture.

09.45 - 10.10 Katsumi Tsukamoto
Life history of the Japanese eel and human impact on the resources.

SESSION 9

Chairing Ebonia B. Seraspe
Rapporteur: Idris A. Ghani

10.30 - 10.55	Prapto Darsono Resource enhancement of sea cucumber.
10.55 - 11.20	Atchara Vibhasiri A review of penaeid prawn fisheries in the gulf of Thailand.
11.20 - 11.45	M. Hutomo and S. R. Suharti Indonesian seagrass fish resources and their contribution to local fisheries.
11.45 - 12.10	Wanda S. Atmadja and Sulistijo Agar yields of *Gracilaria edillis* (Gmel.) Silva and *G. foliifera* (Forssk.) Boergesen (Rhodophyta)

SESSION 10

Chairing Suharsono
Rapporteur: W. Kastoro

13.30 - 13.55	Ebonia B. Seraspe The reproductive cycle of holothuriid sea cucumber (Holothuroidea: Aspidochirata), *Holothuria* (Bohadschia) *marmorala marmorata* Jaeger.
13.55 - 14.20	Kurnaen Sumadhiharga Some reproductive biology of skipjack tuna *(Katsuwonus pelamis)* in Banda sea, Indonesia.
14.20 - 14.45	Sri Juwana A pilot plant to mass production of crab seed *(Portunus pelagicus).*
14.45 - 15.10	M. Zaki bin M. Said Some aspect of fisheries and population dynamics of *Siganus canaliculatus* from Port Dickson waters, Strait of Malacca.
15.30	Closing