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IN THE SOUTH CHINA SEA AREA**

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**STATUS OF FISHERIES AND STOCKS
OF SMALL PELAGIC FISHES IN
THE SOUTH CHINA SEA AREA**

By:

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1. INTRODUCTION

The South China Sea Area is one of the most important Areas for marine capture fisheries in the world, and the marine catches of the Area accounted for around 10% of the world grand total. Among the fisheries resources, the small pelagic fish resources are considered as important in the Area from the economical viewpoint. The purpose of this paper is to provide the baseline information on the small pelagic fish resources management. This paper, therefore, describes the catch trends and major fishing gear of 19 small pelagic fish species (groups) and stock status of 9 species (groups) among them.

On the small pelagics, 19 species (groups) were selected for this Area in this paper from the tentative list of small pelagics agreed at the First Session of Working Party on Marine Fisheries organized by APFIC (Asia-Pacific Fishery Commission) held in Bangkok, May 1997. On the catch trends, data were obtained from SEAFDEC Fishery Statistical Bulletins for the South China Sea Area from 1976 to 1994, and catch trends of the Area (data were consisted of catch quantity at countries concerned) by species (group) were shown. On the fishing gear, major fishing gears used in Malaysia, the Philippines and Thailand (Gulf of Thailand and Indian Ocean) in 1994 for each species (group) were described.

On the stock status, possible stocks in this paper followed the identification of stocks described in the report of the FAO/SEAFDEC Workshop on shared stocks in Southeast Asia 1985. As the stock limits described in the above mentioned report and available area for statistics in this paper were not exactly the same, this paper showed the differences between the limits of stocks and the available data area were shown in text and Annex-Figures, and described the catch trend and relationships of catch quantity in stocks by species.

2. MATERIALS AND METHODS

Data were obtained from the SEAFDEC Fishery Statistical Bulletin for the South China Sea Area for 1976 to 1994 published by SEAFDEC. The Bulletins cover the South China Sea, Fishing Area 71, as designated by the FAO, and the territorial waters of the Andaman Sea belonging to Malaysia and Thailand. Therefore, catch data described in this paper were obtained from Brunei, Taiwan, Hong Kong, Indonesia, Malaysia, Philippines, Singapore and Thailand. Selected species (groups) in this paper are shown in Table 1.

Table 1: Species (group) list and codes of ISSCAAP (FAO) and SEAFDEC examined in this paper

ISSCAAP (FAO)		SEAFDEC		
Group	Code	Name	Code No.	Family/Scientific name
34. Jacks, mullets, sauries, etc.	BAR	1. Barracudas	3402	Sphyraenidae - <i>Sphyraena</i> spp
	MUL	2. Mulletts	3403	Mugilidae
	SDX	3. Round scads	3405	Carangidae - <i>Decapterus</i> spp.
	TRE GLT	4. Jacks, cavalla and trevallies	3406	Carangidae - <i>Caranx</i> spp <i>Gnathanodon speciosus</i> (including <i>Alectis</i> spp., <i>Atropus atropus</i> , <i>Caranx chrysophrys</i> , <i>C. malabaricus</i> , <i>C. ignobilis</i>)
	BIS TRY	5. Selar scads	3407	Carangidae - <i>Selar crumenophthalmus</i> , <i>Selaroides leptolepis</i> (including <i>Alepes</i> spp., <i>Selar</i> spp.)
	HAS	6. Hardtail scad	3408	Carangidae - <i>Megalaspis cordyla</i>
	POB	7. Black pomfret	3410	Formionidae - <i>Formio niger</i>
	SIP	8. White pomfrets	3411	Stromateidae - <i>Pampus argenteus</i> (including <i>Pampus chinensis</i>)
35. Herrings, sardines, anchovies, etc.	SIX	9. Sardines	3501	Clupeidae - <i>Sardinella</i> spp.
	STO	10. Anchovies	3503	Engraulidae - <i>Stolephorus</i> spp
	DOB	11. Wolf Herring	3505	Chirocentridae - <i>Chirocentrus dorab</i>
36. Tunas	LOT	12. Longtail tuna	3604	Scombridae - <i>Thunnus tonggol</i>
	KAW	13. Eastern little tuna	3606	Scombridae - <i>Euthynnus affinis</i>
	FRZ	14. Frigate tuna and bullet tuna	3607	Scombridae - <i>Auxis thazard</i> <i>Auxis rochei</i>
	COM	15. Narrow-barred king mackerels	3609	Scombridae - <i>Scomberomorus commerson</i>
	GUT STS	16. King mackerels	3610	Scombridae - <i>Scomberomorus guttatus</i> , <i>Scomberomorus lineolatus</i>
37. Mackerels	RAG	17. Indian mackerels	3701	Scombridae - <i>Rastrelliger kanagurta</i> (including <i>Rastrelliger faughni</i>)
	RAB	18. Indo-Pacific mackerel	3702	Scombridae - <i>Rastrelliger brachysoma</i>
	CUT	19. Hairtails	3703	Trichiuridae

Information on stocks of each species (group) was obtained from FAO Fisheries Report No. 337, 1985 (Report of the FAO/SEAFDEC Workshop on shared stocks in Southeast Asia). Comparative table of the possible stocks described in the FAO report and their applied catch data sources (areas) are shown in Table 2. The names (areas) of stock described at above mentioned report were applied for this paper.

On catch trends of 19 species (groups), the data of 1979 were revised from the original data because of lack of Indonesian data in 1979. The 1978 catch quantities of Indonesia were applied to those of 1979 data. On status of stocks, some data also revised from the original data by applying the ratios of previous years stock catch. Regarding Malaysian data by area by species, Malaysian Annual Fisheries Statistics for from 1991 to 1994 also cited.

Table 2: Comparative table of the possible stocks described in the FAO/SEAFDEC Workshop (1985) report and their applied catch data sources (areas).

Shared stocks from the FAO Report (FAO/SEAFDEC Workshop, 1985)	Applied areas in this paper (Area name from SEAFDEC Bull)
Gulf of Thailand to Sunda Shelf	Gulf of Thailand and East Coast of Peninsular Malaysia
Malacca Strait Malacca Strait and Andaman Sea	Indian Ocean (Thailand), west coast of Peninsular Malaysia, Singapore and Malacca Straits (Indonesia)
Eastern South China Sea	Sabah, Sarawak (Malaysia), Brunei and the Philippines
North and West Borneo	Sabah, Sarawak (Malaysia) and Brunei
Gulf of Thailand	Gulf of Thailand
Sunda Shelf-Northwest of Borneo West and Northwest of Borneo	Sarawak, Labuan (Malaysia) and Brunei
Northwestern Celebes Sea	Sabah (Malaysia) and Mindanao (Philippines)
Malacca Strait (east)	Indian Ocean (Thailand), West Coast of Peninsular Malaysia and Singapore
Northeastern South China Sea	Sabah (Malaysia) and the Philippines
Western Gulf of Thailand to Singapore	Gulf of Thailand and East Coast of Peninsular Malaysia and Singapore
Palawan-Celebes Sea	Sabah (Malaysia) and the Mindanao (Philippines)

*The limits of distribution of possible shared stocks and their applied areas for catch data cited in this paper are not exactly the same.

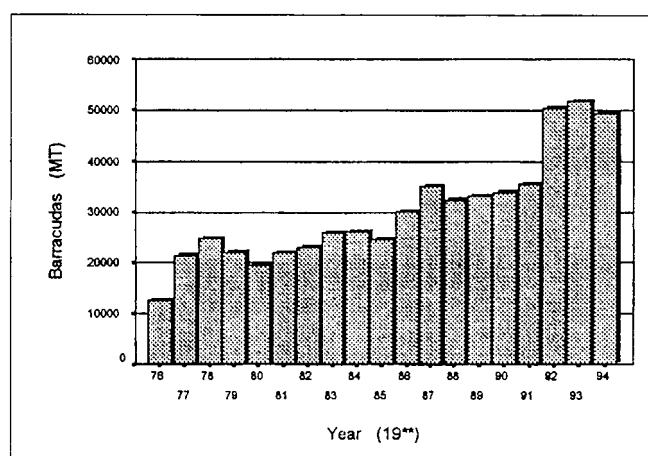
The names of the fishing gear were followed from the original ones in each country. In case of appearance of same fishing gear names, the categories of large and small-scale fishery also followed from the original identification by country.

Barracudas

Catch Trend

Barracudas catch (Fig. 1) in the Area recorded at 12,700 MT (accounted for 0.22% of the grand total) in 1976 and it showed a big increase to 21,400 MT (0.32% in 1977 and 24,700 MT (0.37%) in 1978. The catch remained constant until 1985 with slight variations, and then it increased and reached at 30,100 MT (0.41%) in 1986 and 35,000 MT (0.44%) in 1987. In 1988 the catch decreased slightly and it remained constant until 1991. Then, the catch showed a big increase to 50,400 MT (0.53%) in 1992 and remained constant around 50,000 MT until 1994.

Figure 1: Catch trend of barracudas in the Area from 1976 to 1994



Fishing Gear

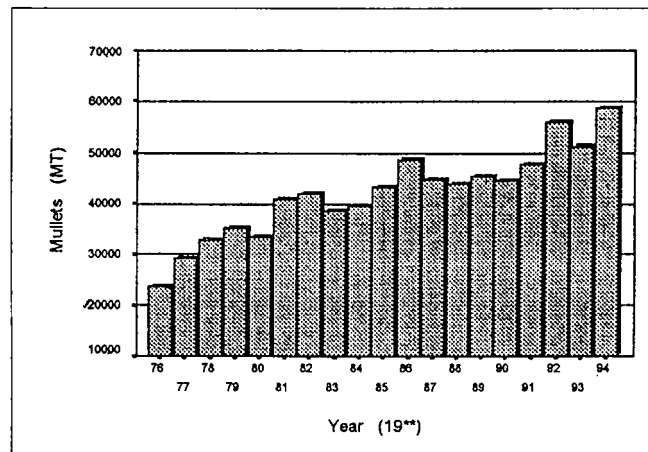
Major fishing gears for barracudas in 1994 by country and area were as followed. In Malaysia, trawl (accounted for 52.7%) was the most dominant, followed by hook-and-line (23.8%) and drift gill net (13.6%). In the Philippines, hook-and-line (35.7%) was the most dominant, followed by small-scale gill net (15.3%), otter board trawl (11.6%), one boat purse seine (10.6%) and boat seine (9.6%). In the Gulf of Thailand, otter trawl (79.8%) was the most dominant, followed by pair trawl (13.1%) and purse seine (4.8%). In the Indian Ocean (Thailand), otter trawl (56.9%) was the most dominant, followed by purse seine (23.3%) and pair trawl (18.9%).

Mulletts

Catch Trend

Mulletts catch (Fig. 2) in the Area recorded at 23,700 MT (accounted for 0.41% of the grand total) in 1976 and it increased steadily to 42,000 MT (0.63%) in 1982 with a slight decreasing in 1980. In 1983 the catch decreased slightly to 38,600 MT (0.54%), but it again increased to 48,700 MT (0.67%) in 1986. Then, the catch decreased to 43,400 MT (0.56%) in 1987 and it remained constant until 1991. After 1991 the catch recorded over 50,000 MT and it reached a peak of 58,700 MT (0.59%) in 1994.

Figure 2: Catch trend of mulletts in the Area from 1976 to 1994



Fishing Gear

Major fishing gears for mulletts in 1994 by country and area were as followed. In Malaysia, drift gill net (accounted for 85.1%) was the most dominant, followed by trawl (5.4%) and purse seine (4.1%). In the Philippines, small-scale gill net (63.5%) was the most dominant, followed by trap (11.7%) and hook-and-line (6.5%). In the Gulf of Thailand, small-scale gill net (75.6%) was the most dominant, followed by shrimp gill net (18.5%) and stationary gears (4.0%). In the Indian Ocean (Thailand), small-scale gill net accounted for 99.7% in mulletts catch.

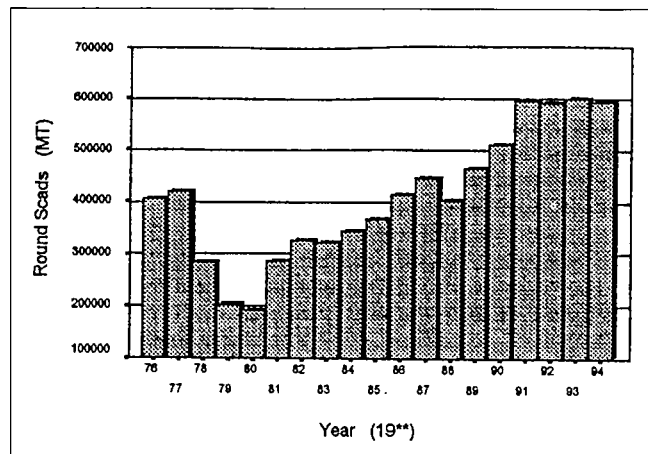
Round Scads

Catch Trend

Round scads catch (Fig. 3) in the Area recorded at 405,000 MT (accounted for 7.03% of the grand total) in 1976 and remained constant in 1977. The catch decreased drastically from 1978 and recorded at 193,000 MT in 1980 (3.15%), but it started to increase at 286,000 MT (4.48%) in 1981 and it increased steadily and reached to 446,000 MT (5.56%) in 1987. In 1988 the catch decreased slightly,

but it increased again to 596,000 MT (6.78%) in 1991 and remained constant until 1994.

Figure 3: Catch trend of round scads in the Area from 1976 to 1994

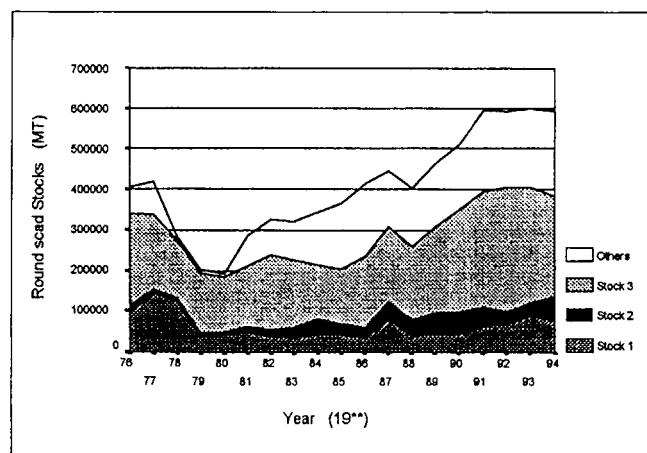


Stock Status

Four possible **round scads**, *Decapterus spp.*, stocks were identified by the Workshop 1985, but the catch trends of three of them and others were shown in this paper (Fig. 4, also refer to Annex-Fig. 1).

- Stock 1 : **Gulf of Thailand to Sunda Shelf**; Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait**: Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Stock 3 : **Eastern South China Sea**; Sabah, Sarawak, Brunei and the Philippines
- Others : Data were obtained from Taiwan (1988, 89), Hong Kong and Indonesia (excluding Malacca Strait).

Figure 4: Round scads catch by possible stock in the Area from 1976 to 1994



The catch of Stock 3 was the most dominant in the round scads catch (accounted for 49.4% of mean in the total round scads catch) followed by Stock 1 and Stock 2 in the Area. The catch from Others accounted for 27.2% of mean. The relationships between total round scads catch and catch of each stock were as followed; the catch of each stock as Stock 2 and Stock 3 with (versus) total round scads catch showed a significant correlation respectively. Also the relationships among the catches of stocks were as followed; the catches between Stock 2 and Stock 3 showed a significant correlation.

Therefore, the stock of “Eastern South China Sea” is recognized as the most dominant in round scads in the Area and catch of its ranged from 133,000 to 306,000 MT with a mean of 196,000 MT. The catch trends of stocks of “Malacca Strait” and “Eastern South China Sea” were highly correlated, but “Gulf of Thailand to Sunda Shelf” can be considered as different trend.

Fishing Gear

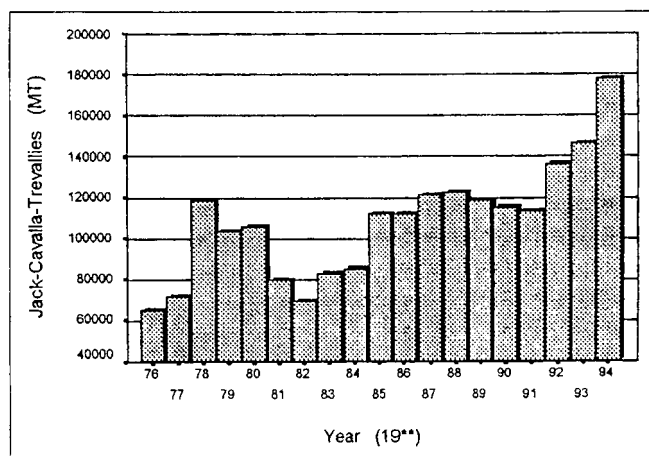
Major fishing gears for round scads in 1994 by country and area were as followed. In Malaysia, purse seine (accounted for 80.6%) was the most dominant, followed by trawl (10.2%) and lift net (8.1%). In the Philippines, one boat purse seine (75.1%), followed by lift net (10.8%) and small-scale one boat purse seine (4.2%). In the Gulf of Thailand and the Indian Ocean (Thailand), purse seine accounted for 100% in round scads catch.

Jacks, Cavalla and Trevallies

Catch Trend

Jack, cavalla and trevallies catch (Fig. 5) in the Area recorded at 65,000 MT (accounted for 1.13% of the grand total) in 1976 and slightly increased in 1977 then it increased dramatically to 118,000 MT (1.76%) in 1978. The catch showed decrease trend to 83,000 MT (1.05%) in 1982, but it increased again to 123,000 MT (1.53%) in 1988. After 1988, the catches decreased slightly and recorded at 113,000 MT (1.29%) in 1991, then increased to 147,000 MT (1.51%) in 1993, and it showed a big increase to 178,000 MT (1.77%) in 1994.

Figure 5: Catch trend of jacks-cavalla-trevallies in the Area from 1976 to 1994

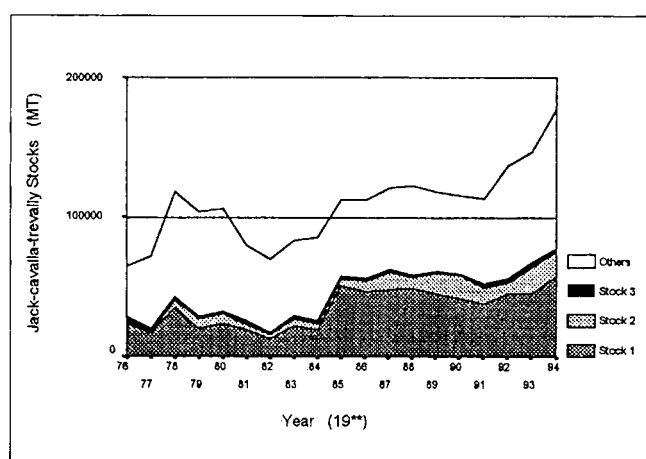


Stock Status

Four possible **trevallies (jacks-cavalla-trevallies)** stocks were identified by the Workshop 1985, but the catch trends of three of them and others were shown in this paper (Fig. 6, also refer to Annex- Fig. 2).

- Stock 1 : **Gulf of Thailand to Sunda Shelf**; Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait**; Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Stock 3 : **North and West Borneo**; Sabah, Sarawak and Brunei
- Others : Data were obtained from Taiwan (1992-94), Indonesia (excluding Malacca Strait) and the Philippines.

Figure 6: Jack-cavalla-trevallies catch by possible stock in the Area from 1976 to 1994



The catch of Stock 1 was the most dominant in the jack-cavalla-trevallies catch (accounted for 31.1% of mean in the total jack-cavalla-trevallies catch) followed by Stock 2 and Stock 3 in the Area. The catch from Others accounted for 63.2% of mean. The relationships between total jack-cavalla-trevallies catch and catch of each stock were as followed; the catch of each stock as Stock 1 and Stock 2 with (versus) total jack-cavalla-trevallies catch showed a significant correlation respectively. Also the relationships among the catches of stocks were as followed; the catches between Stock 1 and Stock 2 showed a significant correlation.

Therefore, the stock of "Gulf of Thailand to Sunda Shelf" is recognized as the most dominant in jack-cavalla-trevallies in the Area and catch of its ranged from 12,500 to 57,800 MT with a mean of 34,600 MT. The catch trends of stocks of "Gulf of Thailand to Sunda Shelf" and "Malacca strait" were highly correlated, but "North and West Borneo" can be considered as a different trend.

Fishing Gear

Major fishing gears for jack-cavalla-trevallies in 1994 by country and area were as followed. In Malaysia, trawl (accounted for 41.7%) was the most dominant, followed by hook and line (29.5%) and drift gill net (12.6%). In the Philippines, small scale gill net (26.3%) was the most dominant,

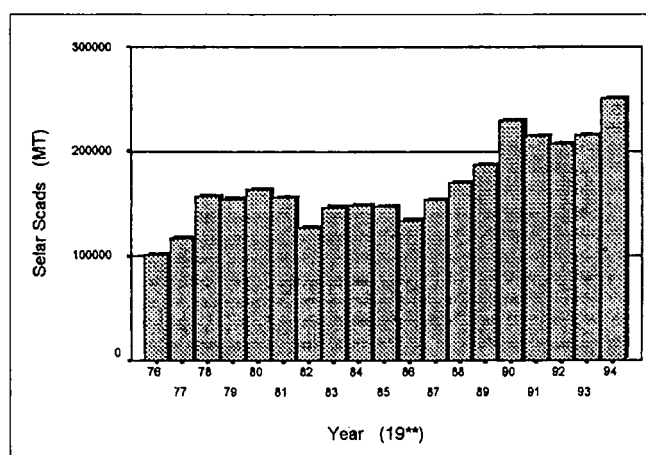
followed by hook and line (19.6%), boat seine (12.8%) and one boat purse seine (9.3%). In the Gulf of Thailand, purse seine (78.0%) was the most dominant, followed by otter trawl (15.7%) and pair trawl (4.3%). In the Indian Ocean (Thailand), purse seine (51.6%) and otter trawl (46.8%) were dominant fishing gears for jack-cavalla-trevallies catch.

Selar Scads

Catch Trend

Selar scads catch (Fig. 7) in the Area recorded at 101,000 MT (accounted for 1.75% of the grand total) in 1976 and it increased to 157,000 MT (2.34%) in 1978. The catch remained constant until 1981 and it decreased to 127,000 MT (1.91%) in 1982 but it recovered to 147,000 MT (2.05%) in 1983 and remained constant until 1985. In 1986 the catch slightly decreased to 134,000 MT (1.84%) in 1986, but it started to increase and reached at 229,000 MT (2.69%) in 1990, then slightly decreased to 207,000 MT (2.17%) in 1992 and remained constant in 1993, then increased to 251,000 MT (2.51%) in 1994.

Figure 7: Catch trend of selar scads in the Area from 1976 to 1994

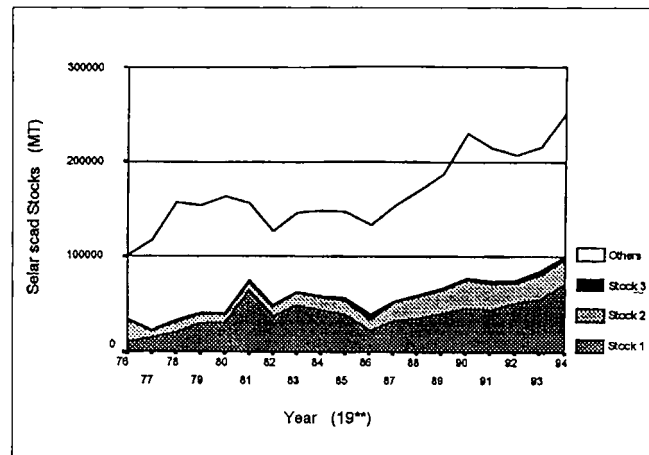


Stock Status

Four possible **trevallies (selar scads)** stocks were identified by the Workshop 1985, but the catch trends of three of them and others were shown in this paper (Fig. 8, also refer to Annex-Fig. 3).

- Stock 1 : **Gulf of Thailand to Sunda Shelf**; Gulf of Thailand and East coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait**: Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Stock 3 : **North and West Borneo**; Sabah, Sarawak and Brunei
- Others : Data were obtained from Taiwan (1990-93), Indonesia (excluding Malacca Strait) and the Philippines.

Figure 8: Selar scads catch by possible stock in the Area from 1976 to 1994



The catch of Stock 1 was the most dominant in the selar scads catch (accounted for 22.9% of mean in the total selar scads catch) followed by Stock 2 and Stock 3 in the Area. The catch from others accounted for 65.6% of mean. The relationships between total selar scads catch and catch of each stock were as followed; the catch of each stock as Stock 1 and Stock 2 with (versus) total selar scads catch showed a significant correlation respectively. Also the relationships among the catches of stocks were as followed; there were no significant correlations among the stocks.

Therefore, the stock of “Gulf of Thailand to Sunda Shelf” is recognized as the most dominant in selar scads in the Area and catch of its ranged from 10,200 to 71,200 MT with a mean of 38,900 MT. The catch trend of stock of “North and West Borneo” can be considered as a different trend from total selar scads catch.

Fishing Gear

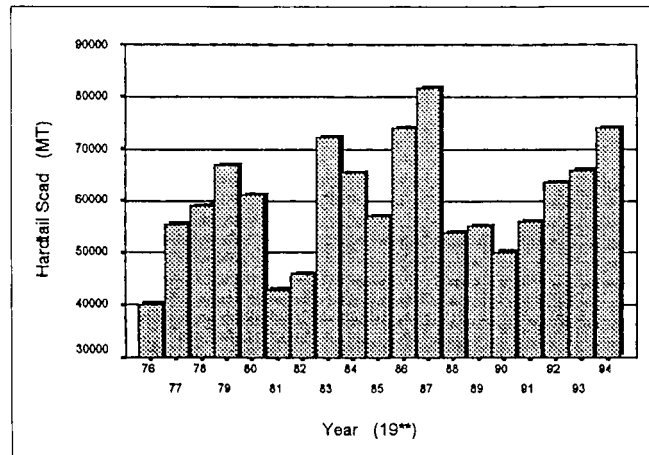
Major fishing gears for selar scads in 1994 by country and area were as followed. In Malaysia, purse seine (accounted for 55.6%) was the most dominant, followed by trawl (23.1%) and lift net (12.2%). In the Philippines, hook and line (35.7%) was the most dominant, followed by one boat purse seine (33.8%) and small scale gill net (10.3%); In the Gulf of Thailand, purse seine (93.7%) was the most dominant, followed by otter trawl (5.1%) and pair trawl (1.2%). In the Indian Ocean (Thailand), purse seine accounted for 97.0% and the other was 3.0% of otter trawl.

Hardtail Scad

Catch Trend

Hardtail scad catch (Fig. 9) in the Area showed big fluctuations, and it recorded at 40,000 MT (accounted for 0.70% of the grand total) in 1976 and increased to 67,000 MT (1.08%) in 1979, but it decreased drastically to 43,000 MT (0.67%) in 1981. The catch slightly increased in 1982 and it increased dramatically to 72,000 MT (1.01%) in 1983. Then the catch decreased to 57,000 MT (0.84%) in 1985, and it increased again and reached at 82,000 MT (1.02%) in 1987. The catch, however, decreased drastically again to 54,000 MT (0.67%) in 1988 and recorded at 50,000 MT (0.59%) in 1990. The catch showed steady increase trend again and reached to 74,000 MT (0.74%) in 1994.

Figure 9: Catch trend of hardtail scad in the Area from 1976 to 1994



Stock Status

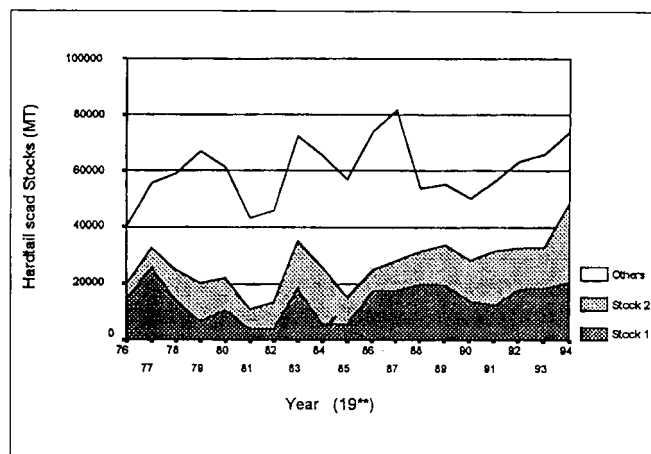
Three possible **hardtail scad**, *Megalaspis cordyla*, stocks were identified by the Workshop 1985, but the catch trends of two of them and others were shown in this paper (Fig. 10, also refer to Annex-Fig. 4).

- Stock 1 : **Gulf of Thailand**; Gulf of Thailand.
- Stock 2 : **Malacca Strait**: Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Others : Data were obtained from Taiwan (1976-87, 92, 93), Indonesia (excluding Malacca Strait), Malaysia (excluding West and East Coasts of Peninsular Malaysia) and the Philippines.

The catch of Stock 1 was a bit abundant than that of Stock 2 in the hardtail scad catch (accounted for 23.6% of mean in the total hardtail scad catch) in the Area. The catch from others accounted for 55.0% of mean. The relationships between total hardtail scad catch and catch of each stock, and among the catches of stocks showed no significant correlations.

Therefore, the stock of "Gulf of Thailand" is recognized as the most dominant (but "Malacca Strait" also similar catch quantities) in the Area and catch of its ranged from 3,800 to 25,600 MT with a mean of 14,100 MT. The catch trends of both two stocks can be considered as different trends from total hardtail scad catch.

Figure 10: Hardtail scad catch by possible stock in the Area from 1976 to 1994



Fishing Gear

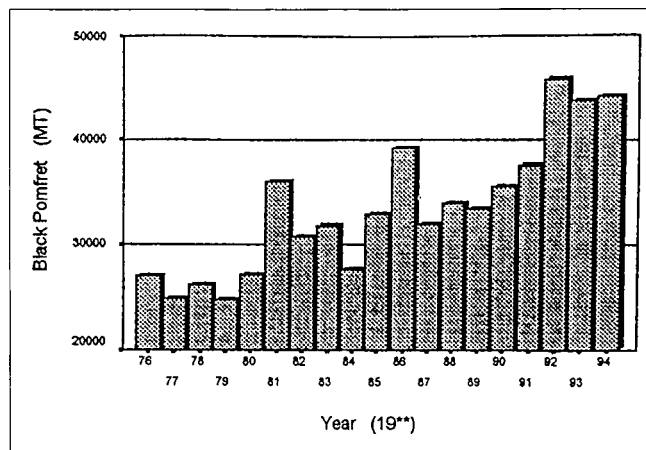
Major fishing gears for hardtail scad in 1994 by country and area were as followed. In Malaysia, trawl (accounted for 49.9%) was the most dominant, followed by purse seine (34.6%) and drift gill net-(6.9%). In the Philippines, hook and line (21.7%) was the most dominant, followed by boat seine (16.9%), small scale gill net (16.3%) and one boat purse seine (7.2%). In the Gulf of Thailand, purse seine (75.1%) was the most dominant, followed by otter trawl (16.9%) and pair trawl (5.4%). In the Indian Ocean (Thailand), purse seine (61.2%) and otter trawl (38.7%) were occupied nearly 100% for hardtail scad catch.

Black Pomfret

Catch Trend

Black pomfret catch (Fig. 11) in the Area recorded at 27,000 MT (accounted for 0.47% of the grand total) in 1976 and it remained constant until 1980. In 1981, the catch showed a big increase to 36,000 MT (0.56%), but it decreased to 27,700 MT (0.42%) in 1984. The catch showed increases again and reached to 39,200 MT (0.54%) in 1986, but it fell to 31,900 MT (0.40%) in 1987. After 1987 the catch increased slightly to 37,600 MT (0.43%) in 1991, then it showed a big increase to 45,800 MT (0.48%) in 1992 and remained constant until 1994.

Figure 11: Catch trend of black pompret in the Area from 1976 to 1994



Fishing Gear

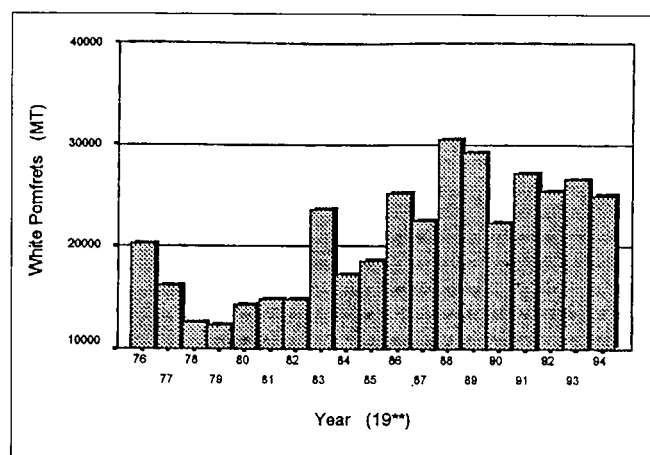
Major fishing gears for black pompret in 1994 by country and area were as followed. In Malaysia, trawl (accounted for 42.9%) was the most dominant, followed by drift gill net (37.1%) and purse seine (11.7%). In the Philippines, boat seine (27.8%) was the most dominant, followed by hook-and line (22.4%), small-scale gill net (12.9%) and otter board trawl (10.6%). In the Gulf of Thailand, purse seine (39.7%) was the most dominant, followed by otter trawl (32.6%) and pair trawl (14.9%). in the indian Ovean (Thailand), otter trawl (70.0%) was the most dominant, followed by purse seine (21.1%) and pair trawl (4.1%).

White Pomfrets

Catch Trend

White pomfrets catch (Fig. 12) in the Area recorded at 20,300 MT (accounted for 0.35% of the grand total) in 1976, and it decreased to 12,300 MT (0.20%) in 1979. Then the catch increased slightly to 14,300 MT (0.23%) in 1980 and it remained constant until 1982, but it showed a big increase to 23,600 MT (0.33%) in 1983. In 1984 the catch fell to 17,300 MT (0.26%) but it showed an increase trend and reached a peak of 30,500 MT (0.38%) in 1988. Then the catch showed a slight decrease trend to 25,000 MT (0.25%) in 1994.

Figure 12: Catch trend of white pomfrets in the Area from 1976 to 1994



Fishing Gear

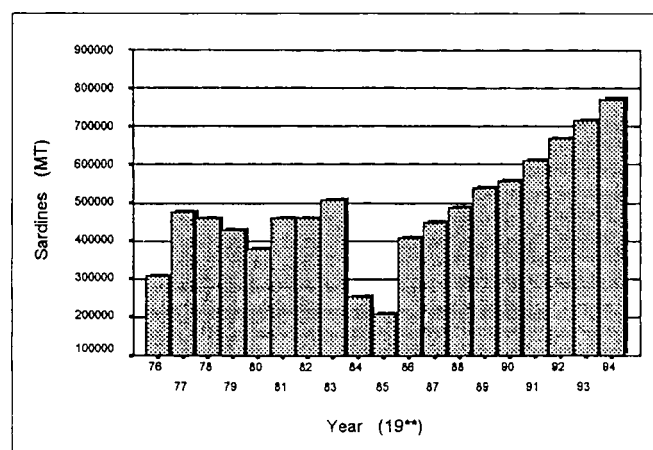
Major fishing gears for white pomfrets in 1994 in Thailand were as followed. In the Gulf of Thailand, otter trawl accounted for 90.9% and pair trawl was 8.8% for white pomfrets catch. In the Indian Ocean (Thailand), otter trawl (88.6%) was the most dominant, followed by small scale gill net (6.1%) and pair trawl (5.1%).

Sardines

Catch Trend

Sardine catch (Fig. 13) in the Area recorded at 309,000 MT (accounted for 5.35% of the grand total) in 1976 and increased to 475,000 MT (7.19%) in 1977, then it decreased slightly to 380,000 MT (6.21%) in 1981. The catch increased again to 508,000 MT (7.09%) in 1983, but it decreased drastically to 253,000 MT (3.80%) in 1984 and 208,000 MT (3.04%) in 1985. After 1985, the catch increased dramatically to 406,000 MT (5.57%) in 1986, then it increased steadily for eight years and reached to 770,000 MT (7.68%) in 1994.

Figure 13: Catch trend of sardines in the Area from 1976 to 1994

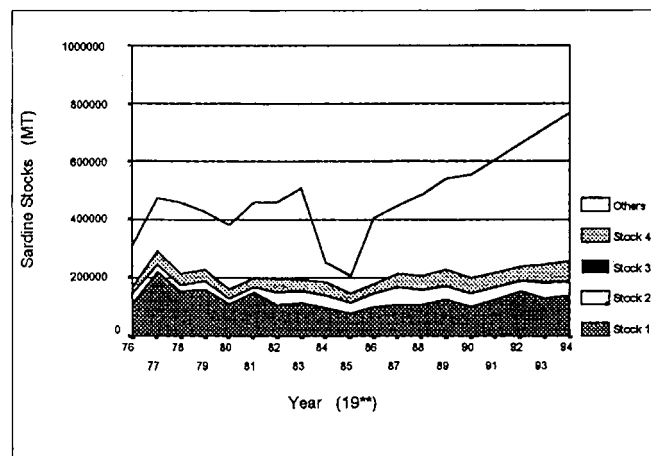


Stock Status

Five possible sardines, *Sardinella* spp., stocks were identified by the Workshop 1985, but the catch trends of four of them and others were shown in this paper (Fig. 14, also refer to Annex Fig. 5).

- Stock 1 : **Gulf of Thailand to Sunda Shelf**; Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait**; Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Stock 3 : **Sunda Shelf Northwest of Borneo**; Sarawak, Labuan and Brunei
- Stock 4 : **Northwestern Celebes Sea**; Sabah and Mindanao.
- Others : Data were obtained from Taiwan, Hong Kong, Indonesia (excluding Malacca Strait) and the Philippines (excluding Mindanao).

Figure 14: Sardine catch by possible stock in the Area from 1976 to 1994



The catch of Stock 1 was the most dominant in the sardine catch (accounted for 27.7% of mean in the total sardine catch) followed by stock 4, Stock 2 and Stock 3 in the Area. The catch from Others accounted for 53.8% of mean. The relationships between total sardine catch and catch of each stock were as followed; the catch of each stock as Stock 3 and Stock 4 with (versus) total sardine catch showed a significant correlation respectively. Also the relationships among the catches of stocks were as followed; the catches among Stock 2, Stock 3 and Stock 4 showed a significant correlation each other, and catches between Stock 1 and Stock 2 showed a significant correlation negatively.

Therefore, the stock of “Gulf of Thailand to Sunda Shelf” is recognized as the most dominant in sardine catch in the Area and catch of its ranged from 77,000 to 220,000 MT with a mean of 125,000 MT. The catch trends of stocks of “Malacca Strait”, “Sunda Shelf Northwest of Borneo” and “Northwestern Celebes Sea” were highly correlated, but “Gulf of Thailand to Sunda Shelf” can be considered as a different trend, especially from “Malacca Strait”.

Fishing Gear

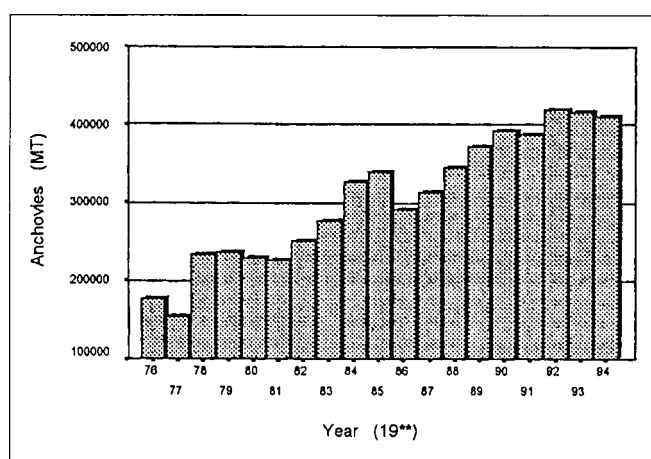
Major fishing gears for sardines in 1994 by country and area were as followed. In Malaysia, purse seine (accounted for 65.1%) was the most dominant, followed by lift net (18.8%) and drift gill net (7.9%). In the Philippines, one boat purse seine (60.4%) was the most dominant, followed by small scale gill net (15.0%) and lift net (9.2%). In the Gulf of Thailand, purse seine (95.8%) was the most dominant and few others were mackerel encircling gill net (1.6%) and small scale gill net (1.1%). In the Indian Ocean, purse seine occupied nearly 100% for sardines catch.

Anchovies

Catch Trend

Anchovies catch (Fig. 15) in the Area recorded at 177,000 MT (accounted for 3.07% of the grand total) in 1976 and decreased slightly to 154,000 MT (2.33%) in 1977 then increased to 234,000 MT (3.49%) in 1978. The catches after 1978 it remained constant until 1981 at around 230,000 MT, and it showed increase trend to 339,000 MT (4.97%) in 1985. In 1986 the catch decreased to 291,000 MT (3.98%) in 1986, but it increased steadily to 419,000 MT (4.40%) in 1992, and it remained constant at over 410,000 MT until 1994.

Figure 15: Catch trend of anchovies in the Area from 1976 to 1994

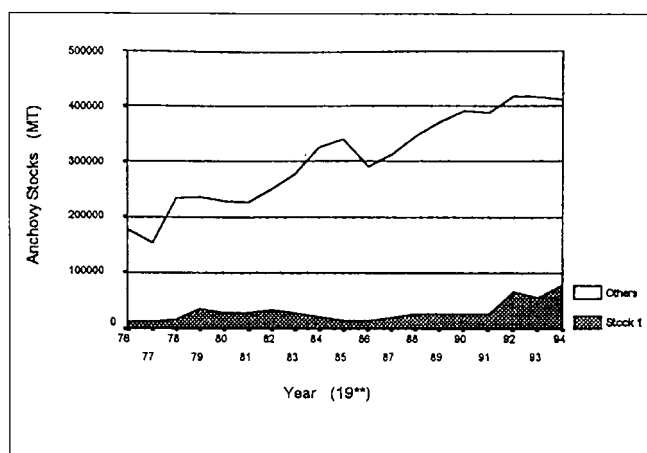


Stock Status

One possible anchovies, *Stolephorus* spp., stocks were identified by the Workshop 1985, so the catch trends of it and others were shown in this paper (Fig. 16, also refer to Annex Fig. 6).

- Stock 1 : **Malacca Strait (east)**: Indian Ocean, West Coast of Peninsular Malaysia and Singapore.
- Others : Data were obtained from Taiwan, Hong Kong, Indonesia, Malaysia (excluding West Coast of Peninsular Malaysia), the Philippines and Thailand (excluding Indian Ocean).

Figure 16: Anchovies catch by possible stock in the Area from 1976 to 1994.



On anchovies, one possible stock was identified and catch of Stock 1, “Malacca Strait (east)”, accounted for 8.7% of mean in the total anchovies catch in the Area. The catch of “Malacca Strait (east)” ranged from 11,700 to 78,800 MT with a mean of 30,000 MT. Catch from Others accounted for 86.3% of mean.

Fishing Gear

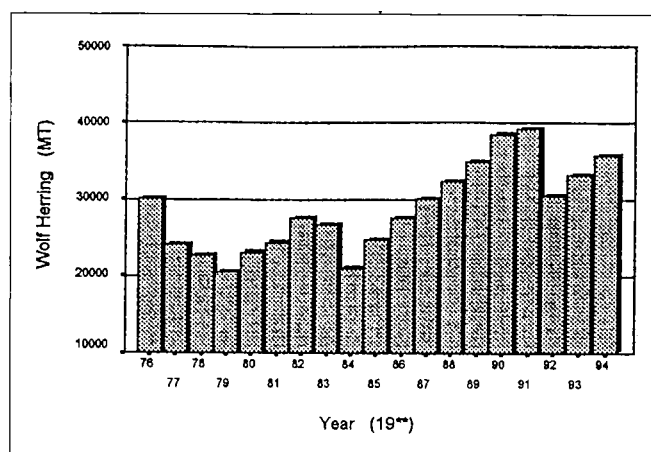
Major fishing gears for anchovies in 1994 by country and area were as followed. In Malaysia, anchovy purse seine (accounted for 81.0%) was the most dominant, followed by lift net (15.9%) and trawl (1.7%). In the Philippines, beach seine (23.5%) was the most dominant, followed by lift net (16.1%), one boat purse seine (15.6%) and small scale gill net (13.4%). In the Gulf of Thailand, anchovy purse seine (89.9%) was the most dominant, followed by squid light luring (3.4%) and otter trawl (3.1%). In the Indian Ocean (Thailand), anchovy purse seine accounted for 90.4% and purse seine was 9.6% in anchovies catch.

Wolf Herring

Catch Trend

The wolf herring catch (Fig. 17) in the Area recorded at 30,000 MT (accounted for 0.52% of the grand total) in 1976 and it showed a decrease trend to 20,500 MT (0.33%) in 1979. In 1980 the catch increased slightly to 23,000 MT (0.38%), and it increased continuously to 27,400 MT (0.41%) in 1982. The catch decreased to 21,000 MT (0.32%) in 1984, but after 1984 it showed a steady increase trend and reached to 39,200 MT (0.45%) in 1991. In 1992 the catch fell to 30,500 (0.32%), but it again increased to 35,700 MT (0.36%) in 1994.

Figure 17: Catch trend of wolf herring in the Area from 1976 to 1994



Fishing Gear

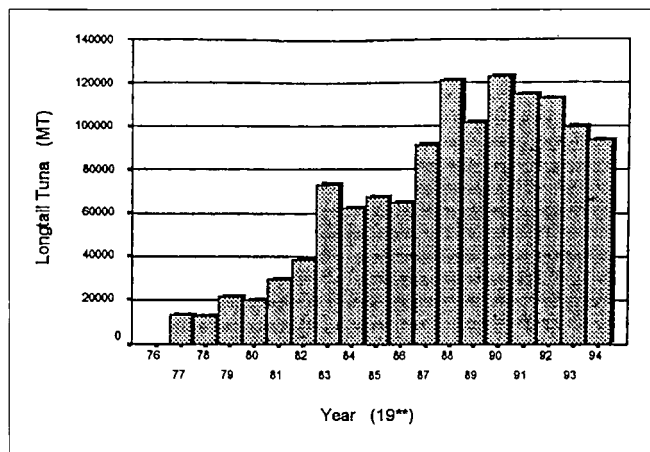
Major fishing gears for wolf herring in 1994 by country and area were as followed. In Malaysia, drift gill net (accounted for 50.9%) and trawl (45.4%) were dominant fishing gears for wolf herring catch. In the Philippines (1993), one boat purse seine (53.2%) was the most dominant, followed by small-scale gill net (18.7%) and boat seine (11.6%). In the Gulf of Thailand, otter trawl (80.6%) was the most dominant, followed by pair trawl (6.1%) and small-scale gill net (5.7%). In the Indian Ocean (Thailand), otter trawl (68.8%) was the most dominant, followed by purse seine (17.1%) and pair trawl (13.4%).

Longtail Tuna

Catch Trend

Longtail tuna catch (Fig. 18) in the Area recorded 74 MT only in 1976, then it recorded at 13,000 MT (accounted for 0.19% of the grand total) in 1977 and it increased steadily to 73,000 MT (1.02%) in 1983. The catch remained constant until 1986 and it increased dramatically to 121,000 MT (1.51%) in 1988, then it decreased in 1989, but it reached again to 123,000 MT (1.44%) in 1990. After 1990 the catch showed a decrease trend to 94,000 MT (0.93%) in 1994.

Figure 18: Catch trend of longtail tuna in the Area from 1976 to 1994



Fishing Gear

Major fishing gears for longtail tuna in 1994 by country and area were as followed. In Malaysia, purse seine (accounted for 35.0%) was the most dominant, followed by drift gill net (24.0%) and hook and line (18.2%). In the Gulf of Thailand, purse seine accounted for 91.1% and king mackerel drift gill net was 8.8%. In the Indian Ocean (Thailand), purse seine accounted for 97.7% and king mackerel drift gill net was only 2.3% in longtail tuna catch.

Eastern Little Tuna (Kawakawa)

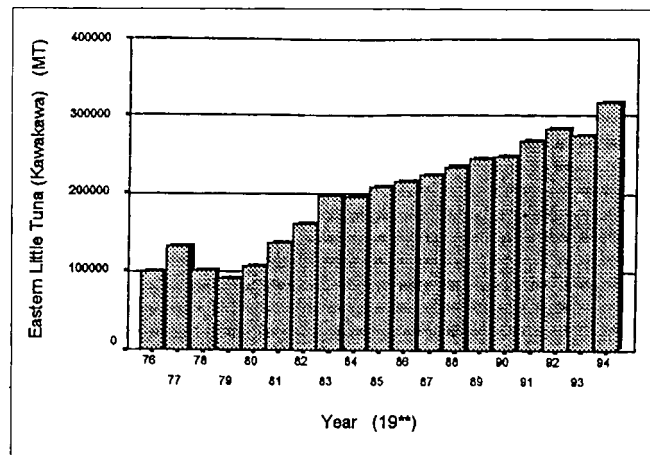
Catch Trend

Eastern little tuna catch (Fig. 19) in the Area recorded at 99,000 MT (accounted for 1.72% of the grand total) in 1976 and increased to 132,000 MT (2.01%) in 1977, but it decreased to 91,000 MT (1.47%) in 1979. After 1979 the catch showed a steady increase trend to 197,000 MT (2.75%) in 1983, and then it showed continuous slight increase to 283,000 MT (2.97%) in 1992, it remained constant in 1993, and increased to 317,000 MT (3.17%) in 1994.

Fishing Gear

Major fishing gears for eastern little tuna in 1994 by country and area were as followed. In the Philippines, one boat purse seine (accounted for 76.4%) was the most dominant, followed by small scale gill net (10.7%) and hook and line (6.9%). In the Gulf of Thailand, purse seine accounted for 91.1% and king mackerel drift gill net was 8.8%. In the Indian Ocean (Thailand), purse seine occupied nearly 100% and king mackerel drift gill net was only 0.1% in eastern little tuna catch.

Figure 19: Catch trend of eastern little tuna (kawakawa) in the Area from 1976 to 1994



Frigate and Bullet Tunas

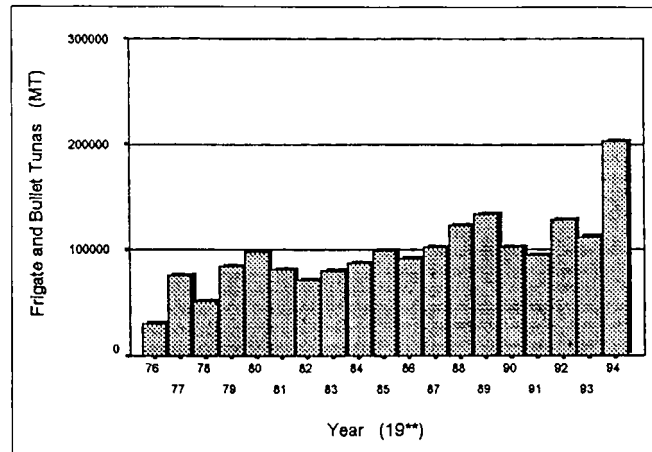
Catch Trend

Frigate and bullet tunas catch (Fig. 20) in the Area recorded at 30,000 MT (accounted for 0.53% of the grand total) in 1976 and increased dramatically to 76,000 MT (1.15%) in 1977 and then decreased to 51,000 MT (0.76%) in 1978. The catch increased again to 98,000 MT (1.61%) in 1980, but decreased to 72,000 MT (1.08%) in 1982. After 1982 the catch increased steadily to 134,000 MT (1.61%) in 1989 with a slight decrease in 1986, and then it decreased both in 1990 and 1991 at around 100,000 MT, it reached again to 128,000 MT (1.34%) in 1992. The catch decreased to 113,000 MT (1.16%) in 1993, but it showed a dramatic increase and reached to 203,000 MT (2.02%) in 1994.

Fishing Gear

Major fishing gears for eastern little tuna in 1994 by country and area were as followed. In the Philippines, one boat purse seine (accounted for 76.4%) was the most dominant, followed by small-scale gill net (10.7%) and hook and-line (6.9%). In the Gulf of Thailand, purse seine accounted for 91.1% and king mackerel drift gill net was 8.8%. In the Indian Ocean (Thailand), purse seine occupied nearly 100% and king mackerel drift gill net was only 0.1% in eastern little tuna catch.

Figure 20: Catch trend of frigate and bullet tunas in the Area from 1976 to 1994



Fishing Gear

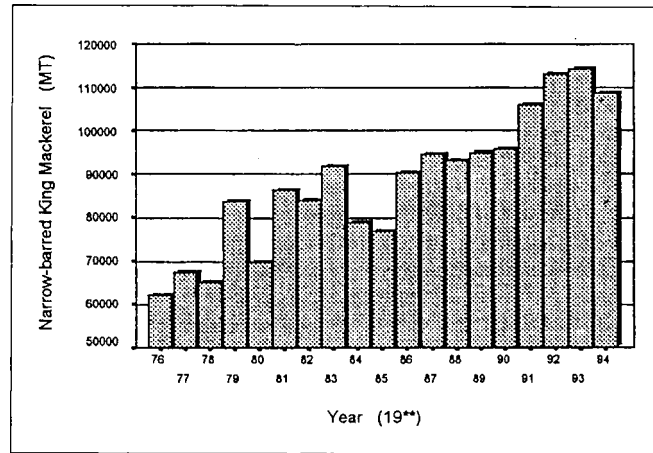
Major fishing gears for frigate and bullet tunas in 1994 in the Philippines were as followed. One boat purse seine (accounted for 46.1%) was the most dominant, followed by hook and line (28.7%) and small-scale gill net (8.4%).

Narrow-barred King Mackerel (Spanish Mackerel)

Catch Trend

Narrow-barred king mackerel catch (Fig. 21) in the Area recorded at 62,000 MT (accounted for 1.08% of the grand total) in 1976 and increased slightly to 67,000 MT (1.02%) in 1977. The catch decreased slightly in 1978 and then it increased to 84,000 MT (1.35%) in 1979, in 1980 the catch decreased again to 70,000 MT (1.14%) in 1980. After 1980 the catch increased to 86,000 MT (1.35%) in 1981, but it showed decrease trend to 77,000 MT (1.13%) in 1985 with an exception of 1983. In 1986 the catch showed increase trend to 90,000 MT (1.24%) and then it remained constant during from 1987 to 1990. The catch started to increase again from 1991 and reached at 114,000 MT (1.18%) in 1993, then decreased slightly to 109,000 MT (1.09%) in 1994.

Figure 21: Catch trend of narrow barred king mackerel in the Area from 1976 to 1994.

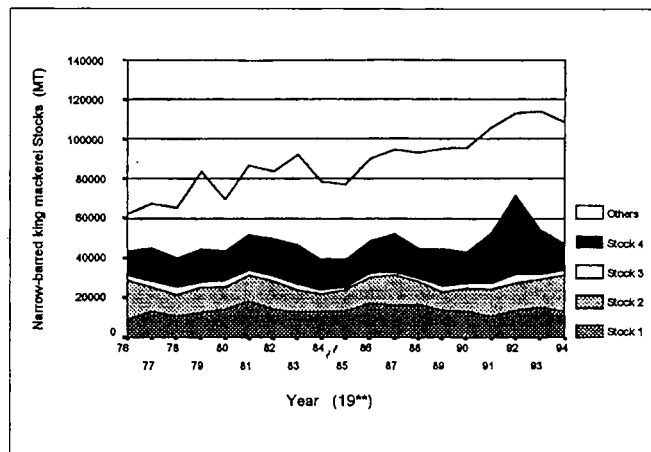


Stock Status

Five possible Spanish mackerels, *Scomberomorus* spp., (narrow-barred king mackerel, *Scomberomorus commerson*) stock identified by the workshop 1985, but the catch trends of four of them and others were shown in this paper (Fig. 22, also refer to Annex Fig. 7).

- Stock 1 : **Gulf of Thailand to Sunda Shelf**; Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait to Andaman Sea**: Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Stock 3 : **Sunda Shelf-Northwest of Borneo**: Sarawak, Labuan and Brunei.
- Stock 4 : **Northeastern South China Sea**: Sabah and the Philippines
- Others : Data were obtained from Taiwan (1976, 88-94), Hong Kong and Indonesia (excluding Malacca Strait).

Figure 22: Narrow-barred king mackerel catch by possible stock in the Area from 1976 to 1994.



The catch of Stock 4 was the most dominant in narrow barred king mackerel catch (accounted for 20.9% of mean in the total narrow barred king mackerel catch) followed by Stock 1, Stock 2 and Stock 3 in the Area. The catch from others accounted for 45.2% of mean. The relationship between total narrow barred king mackerel catch and catch of stock was as followed; the catch of stock as Stock 4 with (versus) total narrow-barred king mackerel catch showed a significant correlation. Also the relationships among the catches of stocks were as followed; the catches between Stock 3 and Stock 4 showed a significant correlation, and the catches between Stock 1 and Stock 3 showed a significant correlation negatively.

Therefore, the stock of “Northeastern South China Sea” is recognized as the most dominant in narrow barred king mackerel in the Area and catch of its ranged from 12,100 to 40,100 MT with a mean of 18,400 MT. The catch trends of stocks of “Sunda Shelf-Northwest of Borneo” and “Northeastern South China Sea” were highly correlated, but “Gulf of Thailand to Sunda Shelf” can be considered as different trend, especially from “Sunda Shelf-Northwest of Borneo”.

Fishing Gear

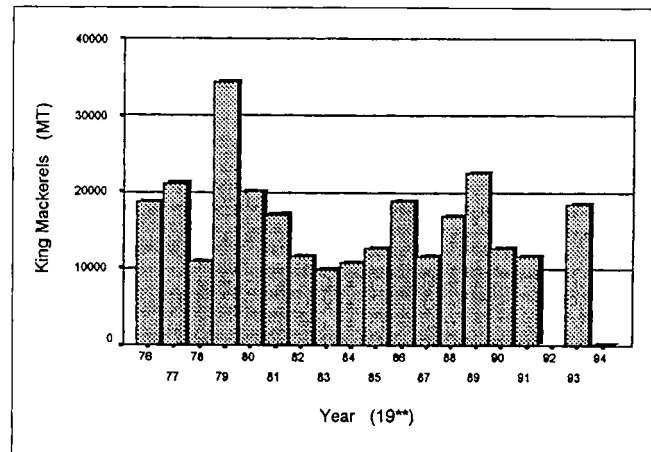
Major fishing gears for narrow-barred king mackerel in 1994 by country and area were as followed. In Malaysia, drift gill net (accounted for 53.2%) was the most dominant, followed by hook and line (21.9%) and trawl (21.4%). In the Philippines, hook and line (42.9%) was the most dominant, followed by small-scale gill net (33.0%) and one boat purse seine (9.3%). In the Gulf of Thailand, otter trawl (38.2%) was the most dominant, followed by king mackerel drift gill net (33.5%), purse seine (7.0%) and pair trawl (6.4%). In the Indian Ocean (Thailand), otter trawl (49.0%) was the most dominant, followed by purse seine (25.0%) and king mackerel drift gill net (14.9%).

King Mackerels

Catch Trend

King mackerels catch (Fig. 23) in the Area recorded at 18,700 MT (accounted for 0.32% of the grand total) in 1976 and it remained constant in 1977, but it decreased to 10,900 MT (0.16%) in 1978. In 1979 the catch showed a dramatic increase to 34,300 MT (0.55%), but it showed a decrease trend to 9,900 MT (0.14%) in 1983. After 1983 the catch showed an increase trend to 22,500 MT (0.27%) in 1989 with an exception of 1987. Then the catches of 1990, 1991 and 1993 recorded 12,700, 11,700 and 18,300 MT respectively, but those of 1992 and 1994 were 47 and 90 MT respectively.

Figure 23: catch trend of king mackerels in the Area from 1976 to 1994.



Fishing Gear

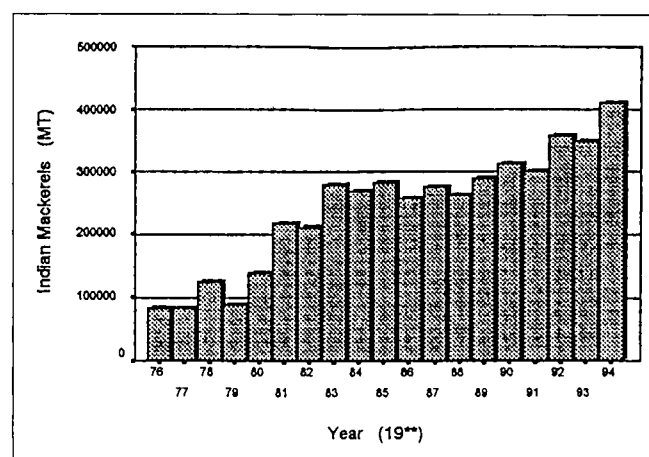
Fishing gears used for king mackerels can be considered as the similar with those for narrow-barred king mackerel.

Indian Mackerels

Catch Trend

Indian mackerels catch (Fig. 24) in the Area recorded at 84,000 MT (accounted for 1.45% of the grand total) in 1976 and it increased to 279,000 MT (3.89%) in 1983 with slight decreases in 1979 and 1982. The catches remained constant during from 1983 to 1988, then it increased to 357,000 MT (3.75%) in 1992 with a slight decrease in 1991, it remained constant in 1993, and increased to 411,000 MT (4.10%) in 1994.

Figure 24: Catch trend of Indian mackerels in the Area from 1976 to 1994.

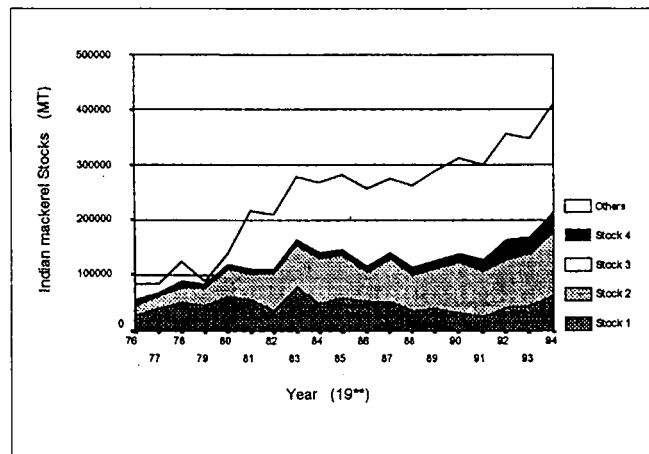


Stock Status

Seven possible mackerels, *Rastrelliger spp.*, (Indian mackerels) stocks were identified by the Workshop 1985, but the catch trends of four of them and others were shown in this paper (Fig. 25, also refer to Annex Fig. 8).

- Stock 1 : **Western Gulf of Thailand to Singapore**; Gulf of Thailand, East Coast of Peninsular Malaysia and Singapore.
- Stock 2 : **Malacca Strait**: Indian Ocean, West Coast of Peninsular Malaysia and Malacca Straits.
- Stock 3 : **West and Northwest of Borneo**: Sarawak and Brunei.
- Stock 4 : **Palawan-Celebes Sea**: Sabah and Mindanao.
- Others : Data were obtained from Indonesia (excluding Malacca Strait) and the Philippines (excluding Mindanao).

Figure 25: Indian mackerel catch by possible stock in the Area from 1976 to 1994.



The catch of Stock 2 was the most dominant in the Indian mackerels catch (accounted for 27.1% of mean in the total Indian mackerels catch) followed by Stock 1, Stock 4 and Stock 3 in the Area. The catch from others accounted for 43.2% of mean. The relationships between total Indian mackerel catch and catch of each stock were as followed; the catch of each stock as Stock 2, Stock 3 and stock 4 with (versus) total Indian mackerels catch showed a significant correlation respectively. Also the relationships among the catches of stocks were as followed; the catches among Stock 2, Stock 3 and Stock 4 showed a significant correlation each other.

Therefore, the stock of "Malacca Strait" is recognized as the most dominant in Indian mackerels in the Area and catch of its ranged from 17,800 to 115,000 MT with a mean of 65,000 MT. The catch trends of stocks of "Malacca Strait", "West and Northwest of Borneo" and "Palawan-Celebes Sea" were highly correlated, but "Western Gulf of Thailand to Singapore" can be considered as a different trend.

Fishing Gear

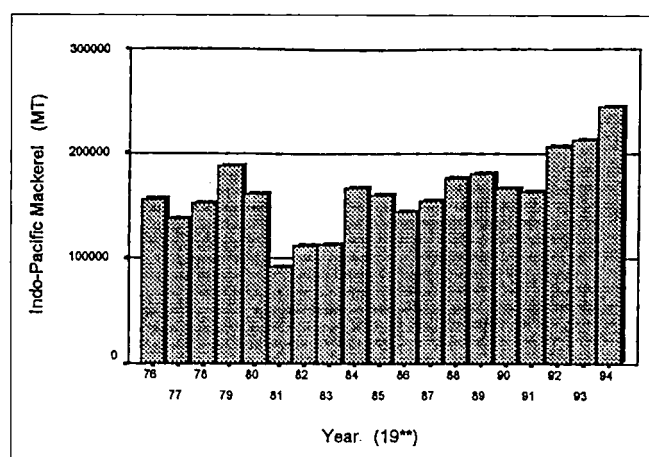
Major fishing gears for Indian mackerels in 1994 by country and area were as followed. In Malaysia, drift gill net (accounted for 39.3%) was the most dominant, followed by purse seine (32.6%) and trawl (24.5%). In the Philippines, one boat purse seine (39.5%) was the most dominant, followed by small-scale gill net (38.0%) and hook and line (7.7%). In the Gulf of Thailand, purse seine (82.5%) was the most dominant, followed by otter trawl (7.3%) and pair trawl (4.7%). In the Indian Ocean (Thailand), purse seine accounted for 87.6% and otter trawl was 12.3% for Indian mackerels catch.

Indo-Pacific Mackerel

Catch Trend

Indo-Pacific mackerel catch (Fig. 26) in the Area recorded at 156,000 MT (accounted for 2.71% of the grand total) in 1976, then it reached at 188,000 MT (3.03%) in 1979 with a slight decrease in 1977. The catch decreased drastically to 92,000 MT (1.43%) in 1981, but it increased again to 167,000 MT (2.50%) in 1984. The catch decreased slightly to 144,000 MT (1.97%) in 1986 and it increased slightly to 180,000 MT (2.17%) in 1989. The catch showed a slight decrease to 164,000 MT (1.86%) in 1991, then increasing and reached to 244,000 MT (2.44%) in 1994.

Figure 26: Catch trend of Indo-Pacific mackerel in the Area from 1976 to 1994.

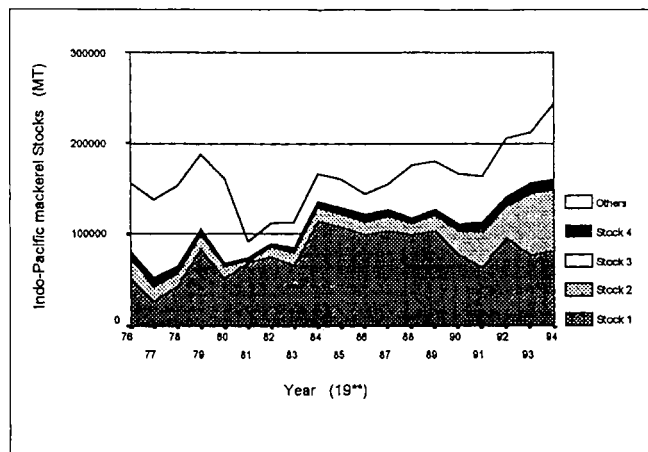


Stock Status

Seven possible mackerels, *Rastrelliger spp.*, (Indo-Pacific mackerel) stocks were identified by the Workshop 1985, but the catch trends of four of them and others were shown in this paper (Fig. 27, also refer to Annex Fig. 9)

- Stock 1 : **Western Gulf of Thailand to Singapore;** Gulf of Thailand, East Coast of Peninsular Malaysia and Singapore.
- Stock 2 : **Malacca Strait;** Indian Ocean, West Coast of Peninsular Malaysia and Malacca Straits.
- Stock 3 : **West and Northwest of Borneo;** Sarawak and Brunei.
- Stock 4 : **Palawan-Celebes Sea;** Sabah and Mindanao.
- Others : Data were obtained from Taiwan (1976, 77, 88-94), Indonesia (excluding Malacca Strait) and the Philippines (excluding Mindanao).

Figure 27: Indo-Pacific mackerel catch by possible stock in the Area from 1976 to 1994.



The catch of Stock 1 was the most dominant in the Indo-Pacific mackerel catch (accounted for 49.9% of mean in the total Indo-Pacific mackerel catch) followed by Stock 2, Stock 4 and Stock 3 in the Area. The catch from Others accounted for 32.7% of mean. The relationships between total Indo-Pacific mackerel catch and catch of each stock were as followed; the catch of each stock as Stock 2 and Stock 4 with (versus) total Indo-Pacific mackerel catch showed a significant correlation respectively. Also the relationships among the catches of stocks were as followed; the catches between Stock 2 and Stock 4 showed a significant correlation.

Therefore, the stock of “Western Gulf of Thailand to Singapore” is recognized as the most dominant in Indo-Pacific mackerel in the Area and catch of its ranged from 26,600 to 115,000 MT with a mean of 78,700 MT. The catch trends of stocks of “Malacca Strait” and “Palawan-Celebes Sea” were highly correlated, but “Western Gulf of Thailand to Singapore” and “West and Northwest of Borneo” can be considered as different trends.

Fishing Gear

Major fishing gears for Indo-Pacific mackerel in 1994 by country and area were as followed. In the Philippines, one boat purse seine (accounted for 43.9%) was the most dominant, followed by boat seine (18.9%), small scale gill net (12.6%) and otter board trawl (9.6%). In the Gulf of Thailand, purse seine (58.4%) was the most dominant, followed by mackerel encircling gill net (17.8%) and small-scale gill net (9.7%). In the Indian Ocean (Thailand), purse seine accounted for 75.5% and otter trawl was 24.0% in Indo-Pacific mackerel catch.

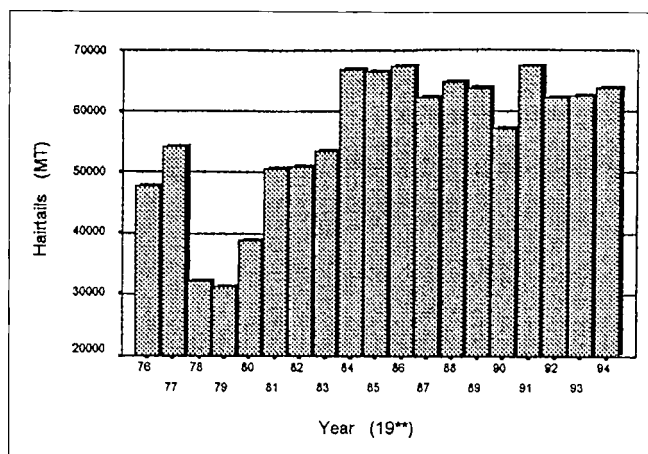
Hairtails

Catch Trend

Hairtails catch (Fig. 28) in the Area recorded at 48,000 MT (accounted for 0.83% of the grand total) in 1976 and it increased to 54,000 MT (0.82%) in 1977. But the catch showed a drastic decrease to 32,000 MT (0.48%) in 1978, and it remained constant in 1979. After 1979 the catch increasing and recovered to 51,000 MT (0.79%) in 1981 and it remained constant until 1983. After 1983 the catches

increased and remained at high level until 1994 from 62,000 MT (1987, 92 and 93) to 67,000 MT (1986) and 91) with an exception of 57,000 MT (0.67%) in 1990.

Figure 28: Catch trend of hairtails in the Area from 1976 to 1994.

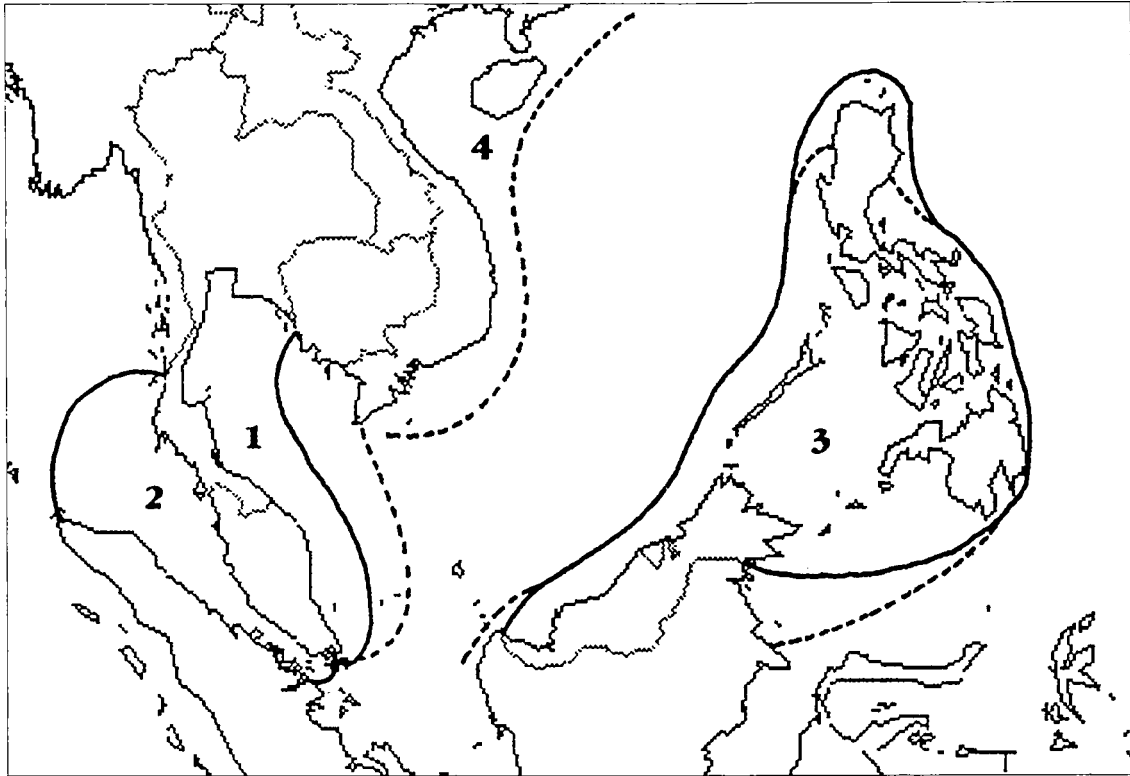


Fishing Gear

Major fishing gears for hairtails in 1994 by country and area were as followed. In Malaysia, trawl (accounted for 78.4%) was the most dominant, followed by drift gill net (15.8%) and purse seine (4.2%). In the Philippines, hook and line (36.4%) was the most dominant, followed by otter board trawl (20.4%) and small scale gill net (20.3%). In the Gulf of Thailand, otter trawl (82.1%) was the most dominant, followed by pair trawl (10.9%) and purse seine (4.3%). In the Indian Ocean (Thailand), otter trawl (77.4%) was the most dominant, followed by purse seine (14.0%) and pair trawl (8.6%).

REFERENCES OF DATA EXAMINED

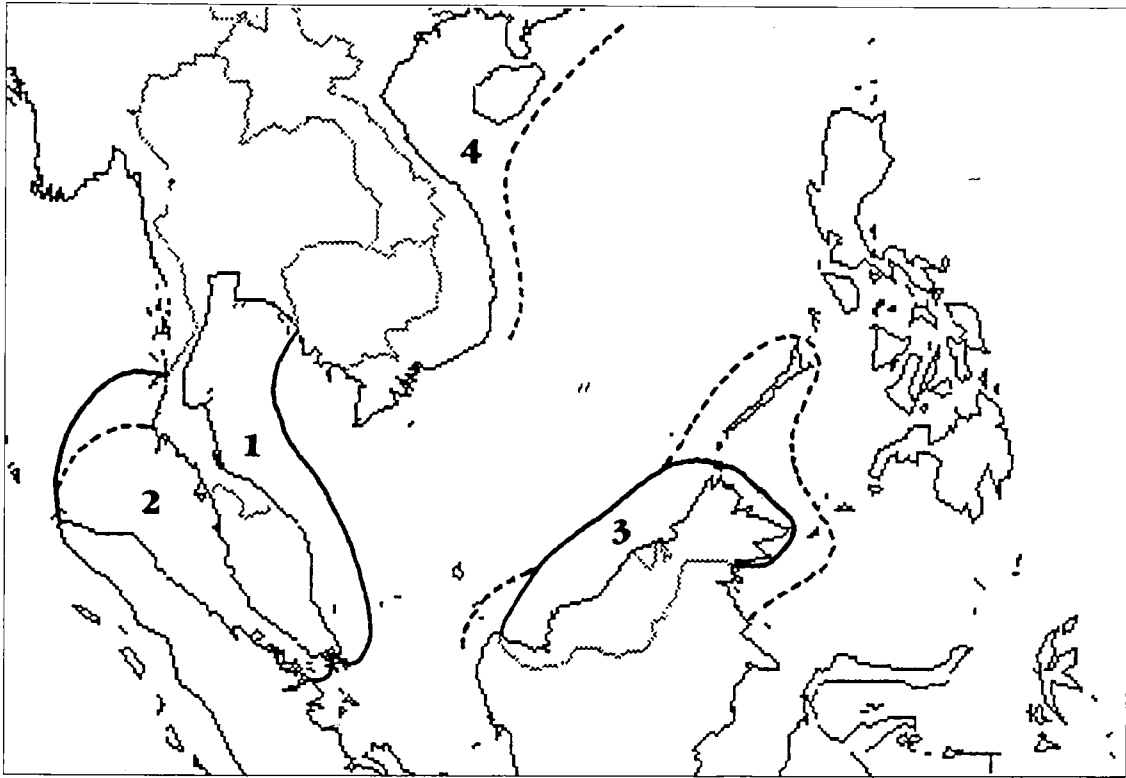
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Annex-Figure 1: Stocks of round scads, *Decapterus* spp., in the Area. The original identification of stocks was obtained from the report* of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

- Stock 1 : **Gulf of Thailand to Sunda Shelf;** Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait;** Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Stock 3 : **Eastern South China Sea;** Sabah, Sarawak, Brunei and the Philippines.
-
- Stock 4 : **Gulf of Tonkin**

* There is probably one or more stocks that are not shared in Indonesian waters.



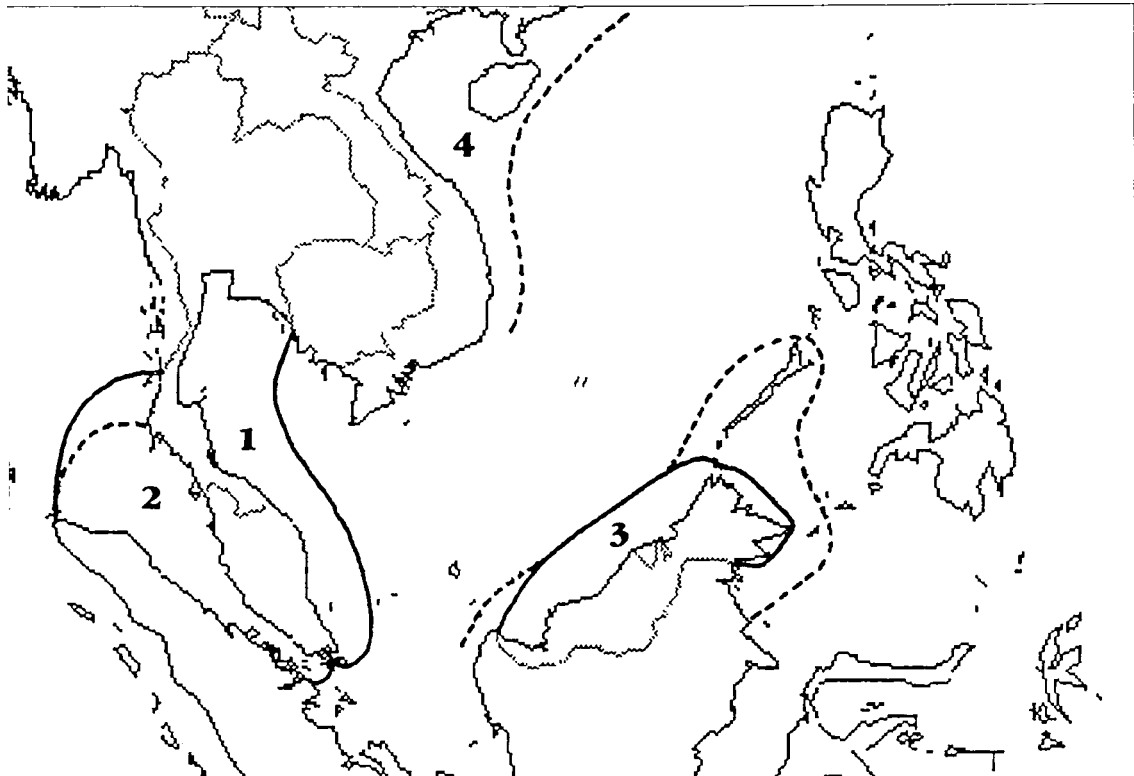
Annex-Figure 2: Stocks of trevallies (jacks-cavalla-trevallies), in the Area. The original identification of stocks was obtained from the report of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

Stock 1 : **Gulf of Thailand to Sunda Shelf; Gulf of Thailand and East Coast of Peninsular Malaysia.**

Stock 2 : **Malacca Strait; Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.**

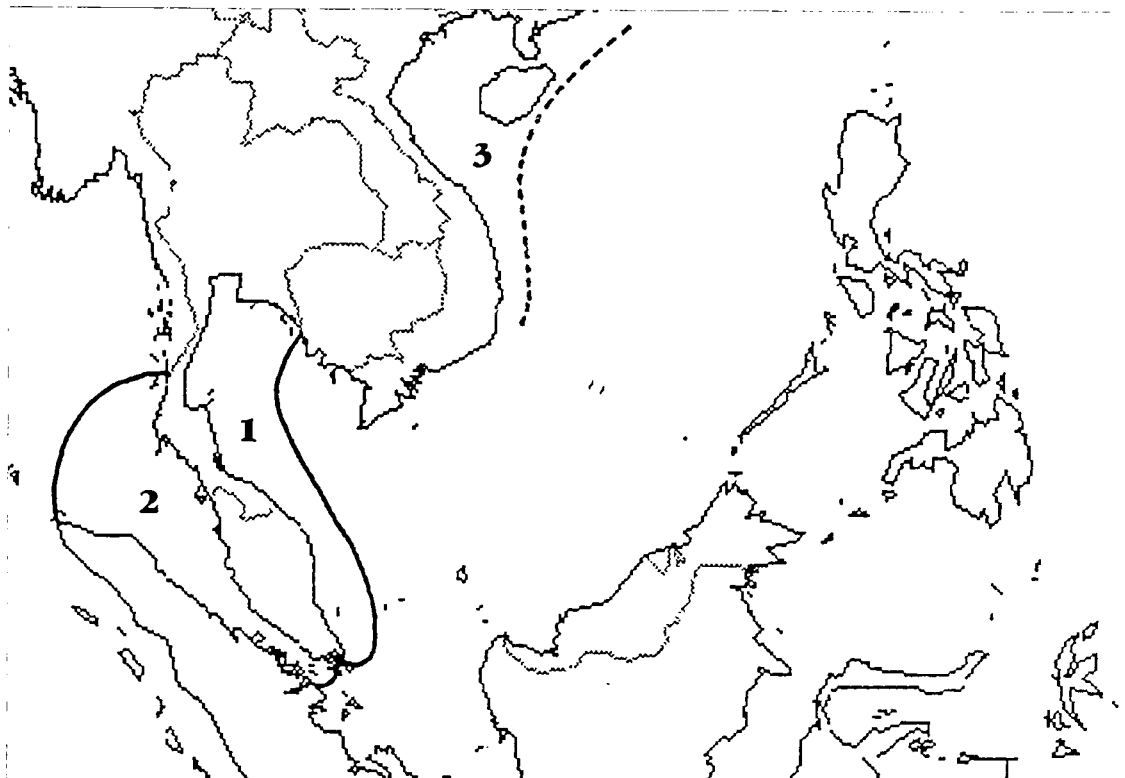
Stock 3 : **North and West of Borneo; Sabah, Sarawak and Brunei.**

 Stock 4 : **Gulf of Tonkin**



Annex-Figure 3: Stocks of trevallies (sellar scads), in the Area. The original identification of stocks was obtained from the report of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

- Stock 1 : **Gulf of Thailand to Sunda Shelf;** Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait;** Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
- Stock 3 : **North and West of Borneo;** Sabah, Sarawak and Brunei.
-
- Stock 4 : **Gulf of Tonkin**

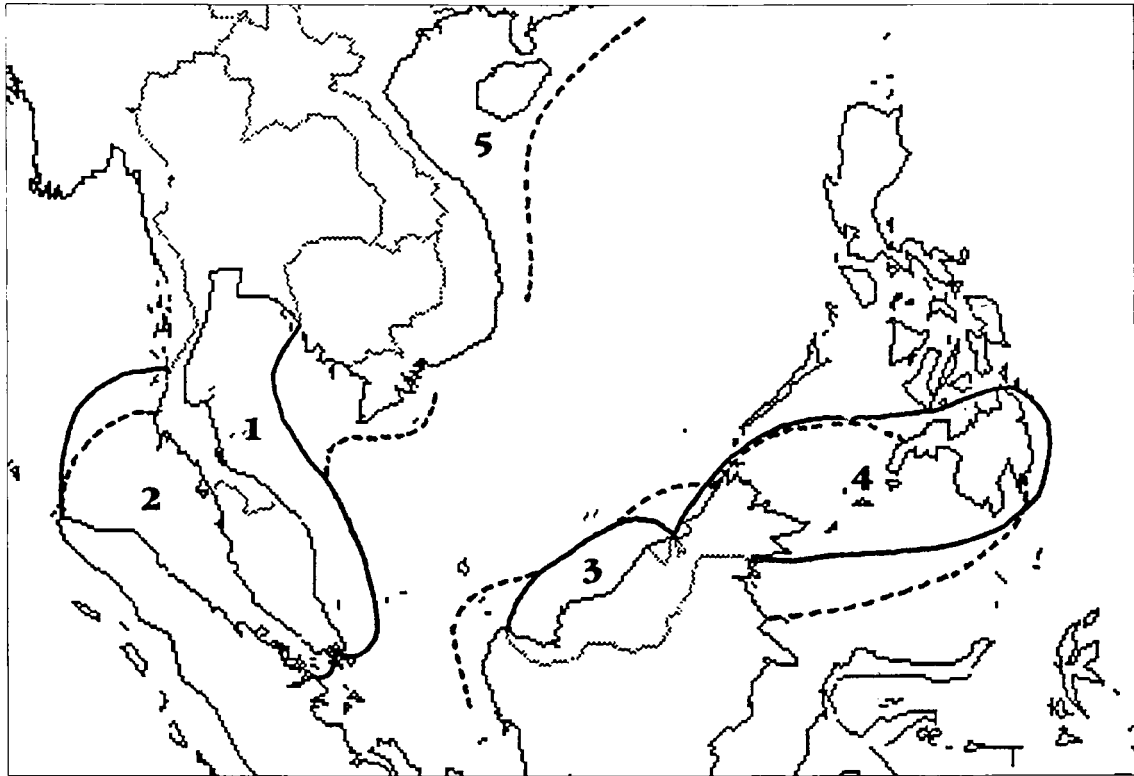


Annex-Figure 4: Stocks of hardtail scad, *Megalaspis cordyla*, in the Area. The original identification of stocks was obtained from the report of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

Stock 1 : **Gulf of Thailand;** Gulf of Thailand.

Stock 2 : **Malacca Strait;** Indian Ocean, West coast of Peninsular Malaysia, Singapore and Malacca Straits.

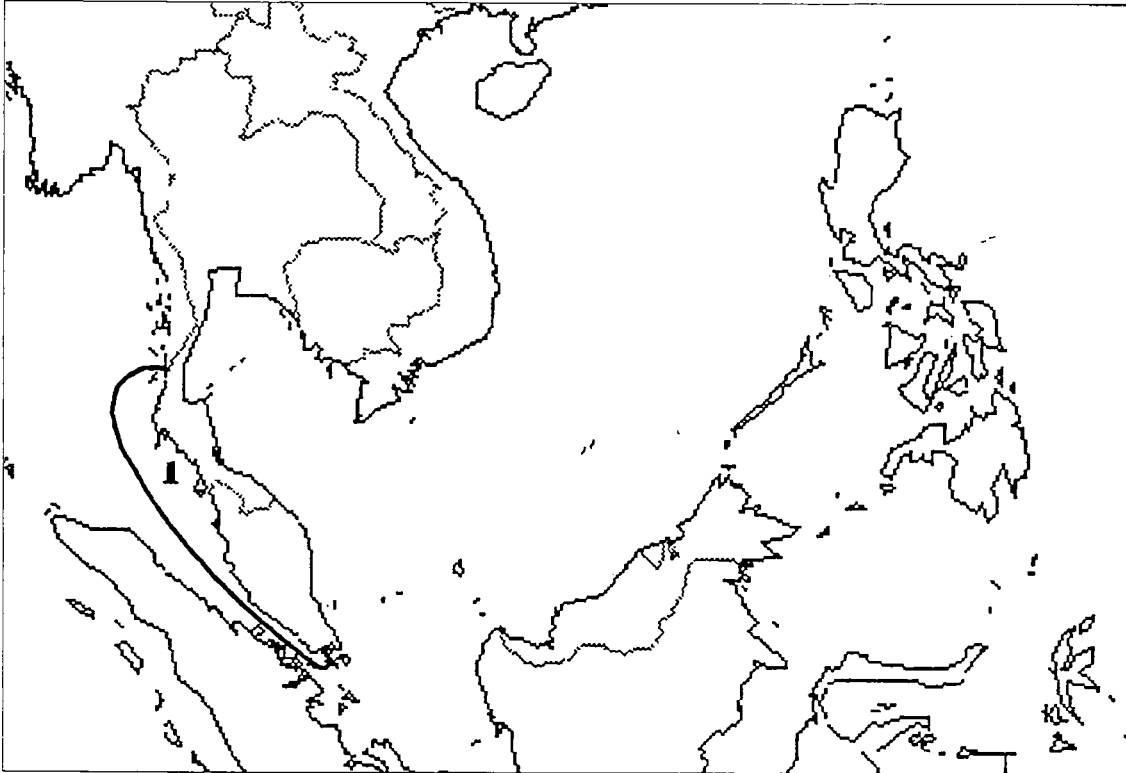
 Stock 3 : **Gulf of Tonkin**



Annex-Figure 5: Stocks of sardines, *Sardinella* spp., in the Area. The original identification of stocks was obtained from the report* of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

- Stock 1 : **Gulf of Thailand to Sunda Shelf;** Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait;** Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
* Possibly separate stocks on each side of the strait.
- Stock 3 : **Sunda Shelf-Northwest of Borneo;** Sarawak, Labuan and Brunei.
* There was considerable uncertainty about the limits of this stock.
- Stock 4 : **Northwestern Celebes Sea;** Sabah and Mindanao.
- Stock 5 : **Gulf of Tonkin**

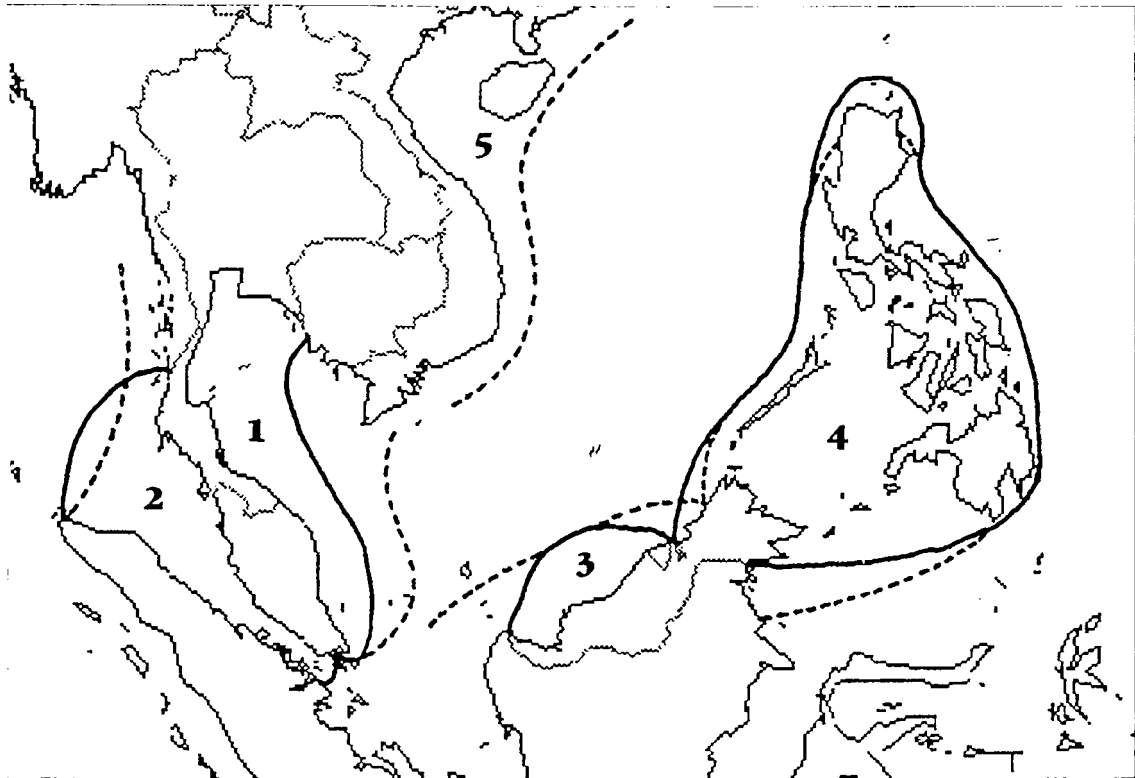
* Other stocks which are not shared are known to exist in Indonesian waters, and probably also in northern and central Philippine waters.



Annex-Figure 6: Stocks of anchovies, *Stolephorus* spp., in the Area. The original identification of stocks was obtained from the report* of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

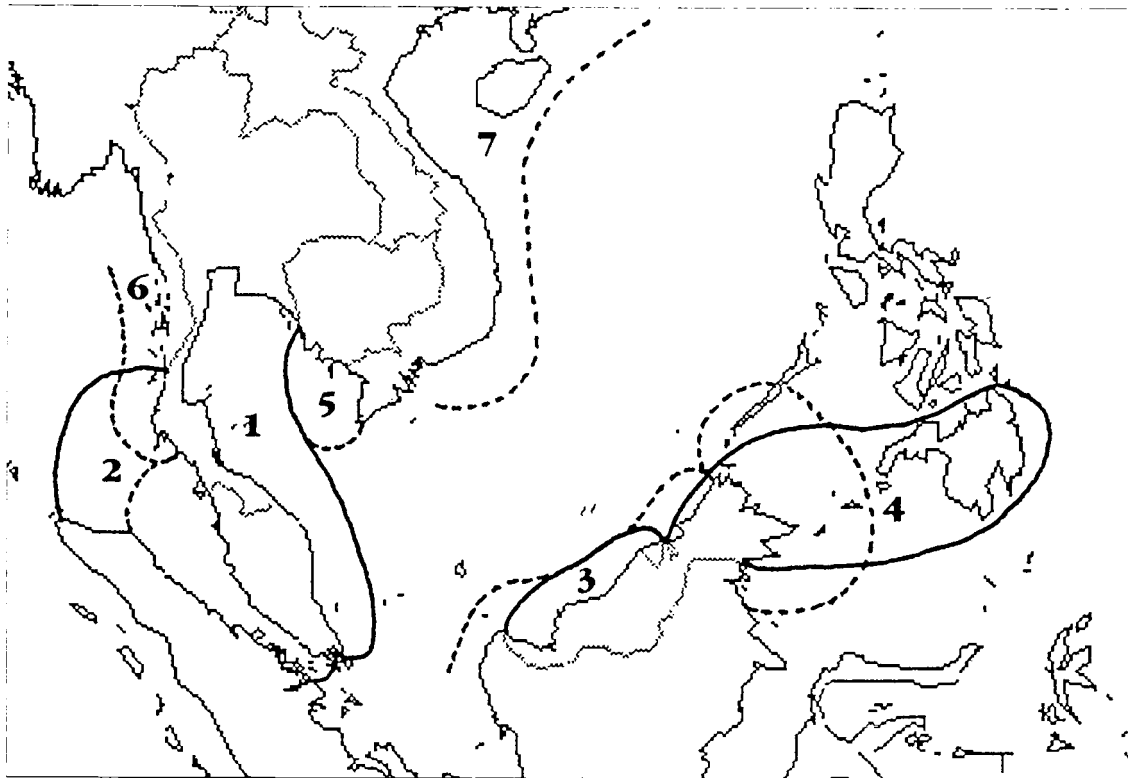
Stock 1 : Malacca Strait (east); Indian Ocean, West Coast of Peninsular Malaysia and Singapore.

* There may be several other stocks being shared in the region; however, little information is available to confirm those.



Annex-Figure 7: Stocks of Spanish mackerels, *Scomberomorus* spp., (narrow-barred king mackerel), *Scomberomorus commerson*, in the Area. The original identification of stocks was obtained from the report of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

- Stock 1 : **Gulf of Thailand to Sunda Shelf;** Gulf of Thailand and East Coast of Peninsular Malaysia.
- Stock 2 : **Malacca Strait to Andaman Sea;** Indian Ocean, West Coast of Peninsular Malaysia, Singapore and Malacca Straits.
* Possibly separate stocks on each side of the strait.
- Stock 3 : **Sunda Shelf-Northwest of Borneo;** Sarawak, Labuan and Brunei.
* There was considerable uncertainty about the limits of this stock.
- Stock 4 : **Northeastern South China Sea;** Sabah and the Philippines.
-
- Stock 5 : **Western South China Sea**



Annex-Figure 8: Stocks of mackerels, *Rastrelliger* spp., (Indian mackerels), in the Area. The original identification of stocks was obtained from the report* of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

Stock 1 : **Western Gulf of Thailand to Singapore;** Gulf of Thailand, East Coast of Peninsular Malaysia and Singapore.

Stock 2 : **Malacca Strait;** Indian Ocean, West Coast of Peninsular Malaysia and Malacca Straits.

* The view was expressed that these may be two stocks in the Malacca Strait, one on the north side and the other on the south, but the degree of mixing was unknown.

Stock 3 : **West and Northwest of Borneo;** Sarawak and Brunei.

Stock 4 : **Palawan-Celebes Sea;** Sabah and Mindanao.

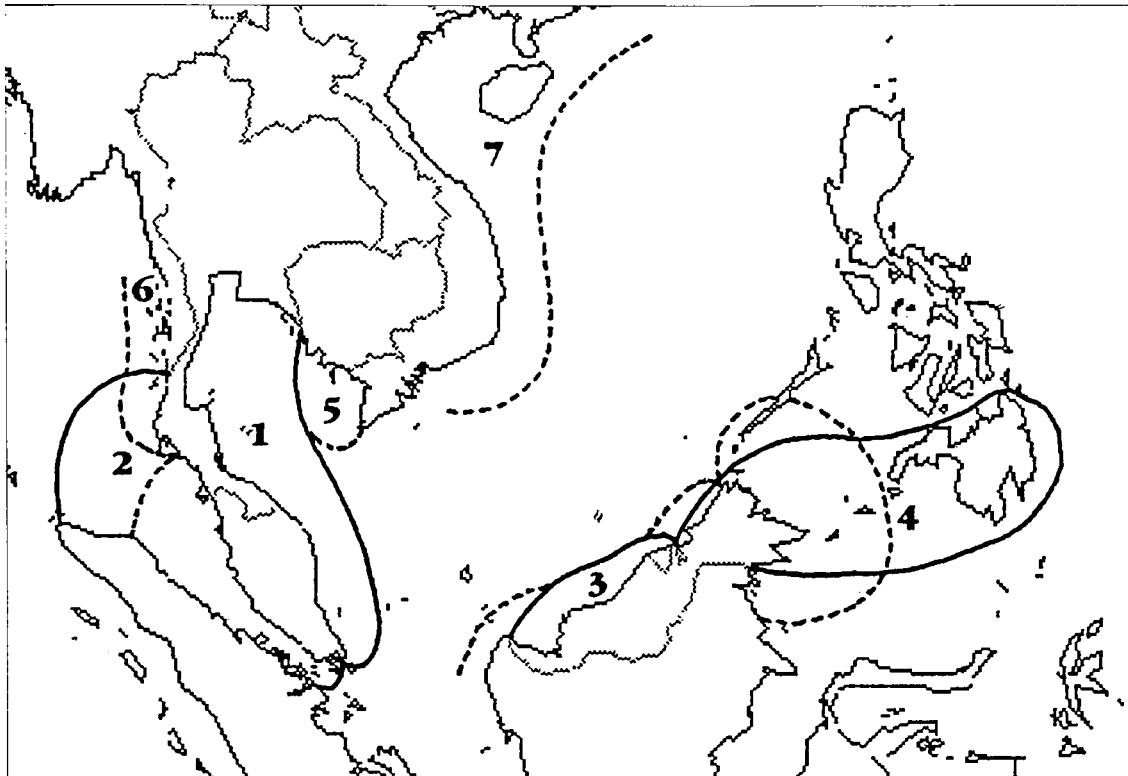
* The limits of this stock are far from clear.

Stock 5 : **Eastern Gulf of Thailand**

Stock 6 : **Andaman Sea**

Stock 7 : **Gulf of Tonkin**

* In addition, there will be stocks that are not shared in northern Philippines and in Indonesian waters.



Annex-Figure 9: Stocks of mackerels, *Rastrelliger* spp., (Indo-Pacific mackerel), in the Area.
 The original identification of stocks was obtained from the report* of the FAO/SEAFDEC Workshop in 1985 in Bangkok. Straight line shows data availability of possible stock in this paper and dotted line shows limit of stock obtained from above mentioned workshop report.

Stock 1 : **Western Gulf of Thailand to Singapore;** Gulf of Thailand, East Coast of Peninsular Malaysia and Singapore.

Stock 2 : **Malacca Strait;** Indian Ocean, West Coast of Peninsular Malaysia and Malacca Straits.

* The view was expressed that these may be two stocks in the Malacca Strait, one on the north side and the other on the south, but the degree of mixing was unknown.

Stock 3 : **West and Northwest of Borneo;** Sarawak and Brunei.

Stock 4 : **Palawan-Celebes Sea;** Sabah and Mindanao.

* The limits of this stock are far from clear.

 Stock 5 : **Eastern Gulf of Thailand**

Stock 6 : **Andaman Sea**

Stock 7 : **Gulf of Tonkin**

* In addition, there will be stocks that are not shared in northern Philippines and in Indonesian waters.