Annex 14

THE SECOND REGIONAL WORKSHOP ON SHARED STOCK IN THE SOUTH CHINA SEA AREA

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STATUS ON FISHERIES EXPLOITATION AND POTENTIAL YIELD OF NERITIC TUNAS IN THE REGION

By

RAJA BIDIN BIN RAJA HASSAN
and
MOHD TAUPEK BIN MOHD NASIR

Marine Fishery Resources Development and Management Department,
South East Asian Fishery Development Centre
Kuala Terengganu, Malaysia

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1. INTRODUCTION

The South China Sea comprised the waters of Vietnam, Thailand, east coast of Peninsular Malaysia, Sabah and Sarawak (East Malaysia), the west coast of the Philippines, and some parts of Indonesia (**Figure 1**). FAO categories this area, which is on the western part of the Western Pacific Ocean, as FAO Statistical Area Number 71. This paper described in general the status of the tuna fishery in this region with emphasis, however, given on the tuna fishery on the east coast of Peninsular Malaysia.

Tuna catching on the east coast of Peninsular Malaysia is still predominantly a traditional activity (since some 70% of total catch comes from trolling) with some inputs coming from commercial gears. Emphasis at present is given to the development of tuna fisheries both in the coastal waters as well as in the offshore waters within the Exclusive Economic Zone (EEZ) of Malaysia (Rumpet and Raja Bidin 1992). A new fishing technique may be introduced soon for the exploitation of skipjack and yellowfin tuna resources, especially off Sarawak and Sabah. However, on neritic tuna, not much development regarding their fishing gears might be expected for perhaps the next ten years.

Fishing for neritic tunas such as *Euthynnus affinis, Thunnus tonggol* and *Auxis thazard* are confined to the east and west coast of Peninsular Malaysia, with only slight activities in Sabah and Sarawak waters. This is due to the continental shelf areas being quite limited in both of these states, which however comprised of vast areas of deep waters housing oceanic tunas such as *Katsuwonus pelamis* and *Thunnus albacares.*

A fishery resource survey, conducted by R.V. Rastrelliger in 1986, has estimated the annual potential yield of tuna in waters of the east cost at around 50,000 tonnes. The highest tuna landing for the whole of Malaysia recorded in 1993, however, was only at around 36,000 tonnes. Since landing of tuna at present is still below the expected potential yield, expansion of this fishery, especially on the east costs, is still possible and should be seriously considered.

Tuna fishing in Thailand in the early 1970s was mostly obtained as by-catches caught incidentally from purse seines and gill nets. However, due to a rapid development in the fish canning industry, tuna became more important than other groups of pelagics like mackerels, scads and sardines. As a result, tuna production increased drastically (by about 47 times) during a 20 year period from 1971 to 1990.

2. TUNA RESEARCH PROGRAMME

Research into tuna carried out in Malaysia may be divided into a number of project activities, which can be categorised as national and regional.

2.1 National Projects

2.1.1 Tuna Tagging Programme

A tuna tagging programme was implemented during May-October 1994, in waters off Terengganu, which is on the east Coast of Peninsular Malaysia. Five trips were undertaken to obtain live samples. A total of 10,000 coastal tunas were tagged during this period. Results showed that for a time of liberty of 106 days, tagged *Euthynnus affinis* can obtain a growth increment of up to 10 cm. They were generally shown to migrate towards the coastal waters after being tagged and released out on the open sea some distance away (**Figure 2**). The bulk of recaptures were however obtained within the first week after released, and this was probably due to a local purse seiner operating in the vicinity of the releasing area. Results also showed that the routes taken by migrated tuna gave some kind of semblance to the pattern shown by surface water currents in the South China Sea. In the middle of the year, tagged tuna moved towards the south, but turned north towards the end of the year. Some movement of tuna towards inshore areas were also observed during the monsoon season, and this could perhaps be related to the availability of food supply from upwelling and movement of massive water bodies during this period.

2.1.2 Tuna sighting

In 1994, a small aircraft was employed to help in an air surveillance of tuna fishing grounds on the east cost of peninsular Malaysia. A total of 11 hours of flight time was recorded covering a stretch of coastal waters up to 40 nautical miles from shore. The survey managed to spot a tuna school near one of the island. However, it was difficult to identify the school's swimming direction.

2.2 Regional Projects

2.2.1 Application of the Satellite Technology

In 1994, MFRDMD was installed with a High Resolution Picture Transfer (HRPT) satellite receiving system which has the ability to determine sea surface temperature (SST) through the Stars routine programs. The information obtained can then be compared to actual fishing grounds (ground truth) for pelagic species such as tuna. Information on productive fishing areas can then be directly relayed to local fishermen via facsimile or other electronic devices. In a number of major fishing countries, sea surface temperature maps, determined directly from satellite derived data, have been used by tuna fishing fleets to locate tuna since it is now well known that some tuna species feed on the warm seaward side of the thermal fronts (Laurs, 1984).

Fiuza (1990) concluded that application of remote sensing methods to fisheries may be considered under two aspects: as a tool for fisheries research, and through the operational support to fishing activities. The general aim in fisheries research is to understand the response of fish to their environment and to ensure the maintenance of sustainable fish and marine stocks, while obtaining high yields. The operational support to fisheries can be defined as the provision of services to minimize search time and to direct fishing vessels to the fishing grounds under different environmental conditions.

2.2.2 Stock Identification

Another important research activity planned to be carried out is to establish the origin of tuna stock shared by neighboring countries, as for example between Thailand and Malaysia or Brunei and Malaysia. Morphometric studies and DNA analyses on particular species will be conducted in the countries concerned. Comparison of results derived from the above analyses would help to clarify the tuna stock as either a common or separated one.

3. TUNA FISHERIES IN THE REGION

3.1 The Fishing Season

In Sarawak, neritic tunas were caught from March of June and the highest catches were recorded in May, while for seerfish and oceanic tuna, in September to November annually. The fishing season throughout the year was dependent and controlled by two monsoons: South-West Monsoon (March to July) and North-East Monsoon (August to February). Catches are poor and efforts are at a minimun from November to February (the North-East Monsoon) each year when strong winds and rains prevented fishermen from going out to sea.

3.2 Fishing Gears

The type of fishing gear used to catch tuna varies from one geographical area to another (Mahyam and Kamarrudin, 1990). Purse seine and troll-line are the major fishing gears used on the east coast of Peninsular Malaysia, while gillnet is dominant in Sarawak. Purse seine fishing using lures will mainly catch small pelagics such as mackerels or scads and some tuna, and is quite common on the west coast of Peninsular Malaysia.

In Thailand, the major type of tuna fishing gear are purse seine and Spanish Mackerel drift gill net, while other type of commercial fishing gears and traditional gears are considered minor in reference to the quantities of tuna caught. Purse seiners operating in the Gulf of Thailand can be divided into two types: Thai purse seine and luring purse seine. No tuna was caught by luring purse seiners after 1983 (Somsak, 1995) and this could be due to the preference by local fishermen on using the former gear.

3.3 Species Composition

In the early 1980s, catches of tuna on the east coast of Peninsular Malaysia would normally show *Thunnus tonggol* as being most dominant. This, however, changed in 1992 when *Euthynnus affinis* showed the greater abundant and led in the species composition. *Auxis thazard*, on the other hand, was only found occasionally and showed some form of association to oceanic species such as *Katsuwonus pelamis* and *Thunnus albacares*. This change in the species composition was probably related to the change in the major fishing gears employed for catching tuna. Purse seine was more widely used than trolling after 1987, and differences in the selectivity of this gear as well as changes in the overall number of fishing efforts probably led to this change (in species composition).

Thunnus tonggol, in 1990, was the dominant species among small tunas caught by local fishermen in Sarawak and may account up to 75% of the catch. Its composition, however, decreased to around 55% in 1991. *Euthynnus affinis* was the second most dominant species.

In the Philippines, the dominant tuna species were the frigate and bullet tuna, which may normally account up to 45% of the catch (Barut, 1995). This is followed by skipjack tuna (28%), Yellowfin and Bigeye (16%) and the Eastern little Tuna (10%).

In Thailand, the dominant tuna species was *Thunnus tonggol* and followed by *Euthynnus affinis* and lastly *Auxis thazard.* In 1991, the percentage of *Thunnus tonggol* in purse seine catches was 58.5% and only 39.8% in gillnet catches (Somsak, 1995).

3.4. Biological Parameters

Length frequency analyses using the Compleat ELEFAN showed L_∞ and K for *Euthynnus affinis* as 87.0 cm and 0.48, respectively. Similar analyses carried out on *Thunnus tonggol* put its L_∞ at 73.5 cm, and K at 0.44.

The growth *increment of Euthynnus affinis* under the tuna tagging programme was estimated at around 2.2 cm per month. Growth is normally faster at the begining of the animal's life cycle and may even exceed 3 cm per month.

The instantaneous natural mortality coefficient M, and total mortality Z, estimated for *Euthynnus affinis* were 0.852 and 2.228 per year, respectively. *Thunnus tonggol* showed a comparatively higher value of Z (2.278) but lower value of M (0.839) (Raja Bidin and Richard, 1992).

4. STATUS OF TUNA STOCK AND ITS EXPLOITATION

A preliminary analysis using the surplus production model on the historical data of tuna collected from the east cost of Peninsular Malaysia showed its maximum sustainable yield (MYS) as ranging from 14,000 – 16,000 tonnes. A similar analysis on tuna caught in Sarawak waters provided the estimated MSY values of 15,000 to 28,000 tonnes (Raja Bidin and Taupek, 1995).

Prior to 1987, exploitation of tuna on the east coast of Peninsular Malaysia was mainly from trolling and gill nets. In 1987, however, there was change in tuna fishing when offshore purse-seine boats were introduced. These boats were able to carry out fishing in the waters of the Malaysian Exclusive Economic Zone. Each boat was equipped with purse-seine nets of around 1.6 km in length (Raja Bidin, 1993).

The trend of tuna landings in Malaysia is given in **Figure 3**. Annual landings within the period 1984 to 1993 showed an increase from 24,611 to 35,980 tonnes, but decreased to 25,000 tonnes in 1994 (Annual Fisheries Statistics, 1993). The bulk of this landing, in recent years, was actually obtained from the state of Sabah (**Figure 4**). Tuna landing in Sabah for the year 1994 was estimated at 11,564 tonnes, decreasing due to a lesser fishing effort by about 32% when compared to the landing of 17,136 tonnes of the previous year. Tuna fishing off Sabah and Sarawak became more important, especially in the last two years, after foreign fisherman introduced tuna longline fishing around the Luconia Shoals and the Sprately Islands.

Exploitation rate (E) of *Euthynnus affinis* on the east coast of Peninsular Malaysia was calculated at 0.641, suggesting the species as being exploited near to (or slighty exceeding) the maximum level. In Sarawak, rate of exploitation was very much lower (0.15) which showed the possibility of expanding the fishery. This is hardly surprising considering only traditional gears (such as drift gillnets and trollers) are currently deployed to exploit the tuna resources (Hadil and Richard, 1991).

Tuna landings in the Philippines was estimated at around 9.054 tonnes in 1970, but rose significantly to 124,984 tonnes in 1976 after payao was introduced in 1975 (Barut, 1995). Landing continued to increase and reached a peak of around 339,074 tonnes in 1991, after which it began to decline. The landings for 1992 and 1993 were estimated at 285,803 and 243,306 tonnes, respectively. Reason for this decline is not yet known.

In Thailand, the rapid development of tuna fishing has resulted in the marked increase of tuna catches from 3,300 tonnes in 1971 to 156,206 tonnes in 1990. Up to 1982, tuna was one of the main target species of the Thai fishermen because of the great demand within the canning industry which offered good prices for tunas. This encouraged the Thai fishermen to improve their fishing gears and expand their fishing ground, in search for tuna, further offshore.

5. RECOMMENDATION

Preliminary results have indicated the existence of a relationship between good fishing grounds and oceanographic factors such as sea surface temperatures. An indepth study to accurately determine oceanographic and catch data within the South China Sea should next be undertaken so as to be able to forecast the potential distributions of commercially important pelagic species (such as tuna) for the benefits of all fishermen working in this region.

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FIGURE 1 : FAO STATISTICAL AREA – 71

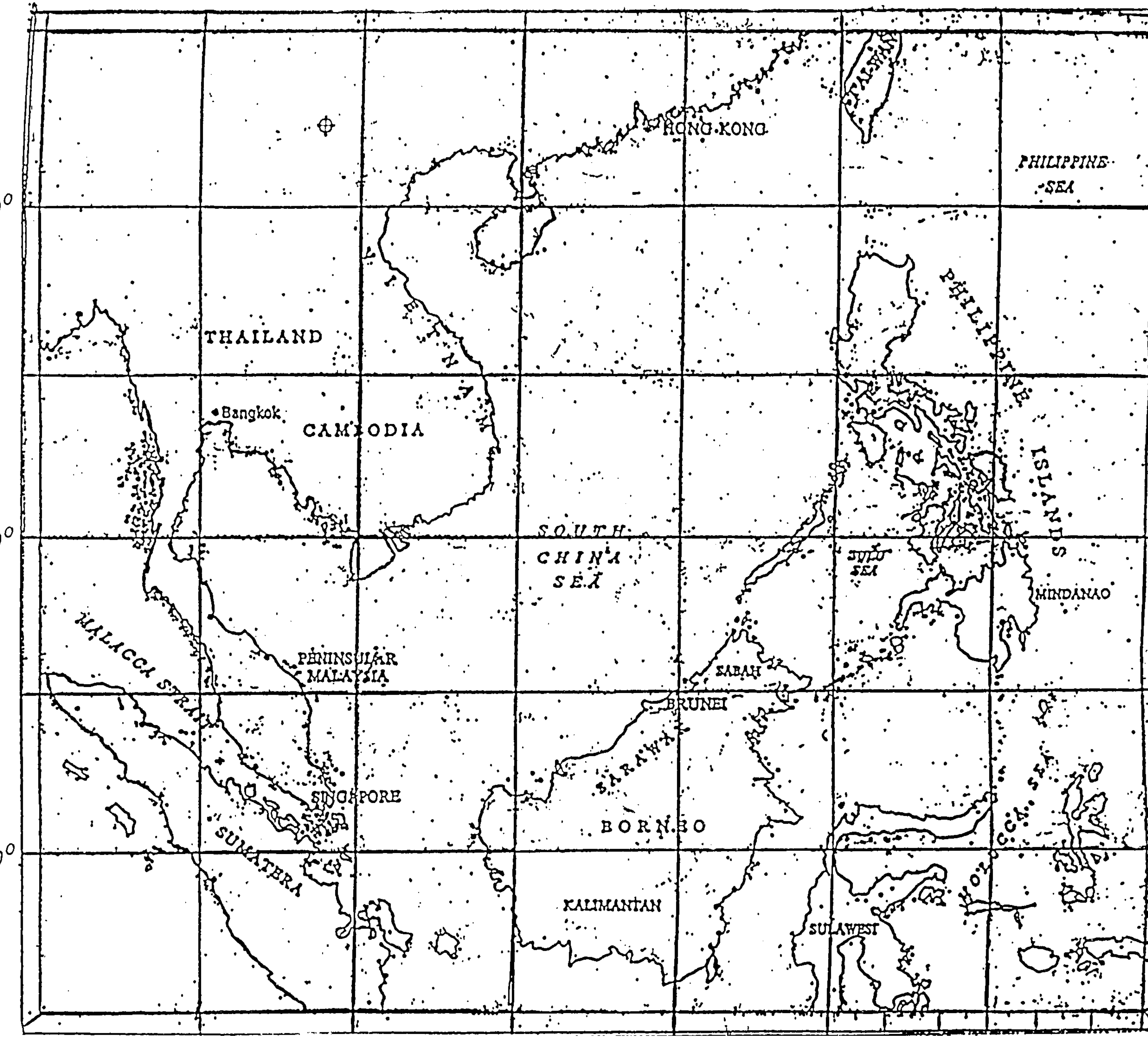


FIGURE 2: TUNA MIGRATION IN THE SOUTH CHINA SEA

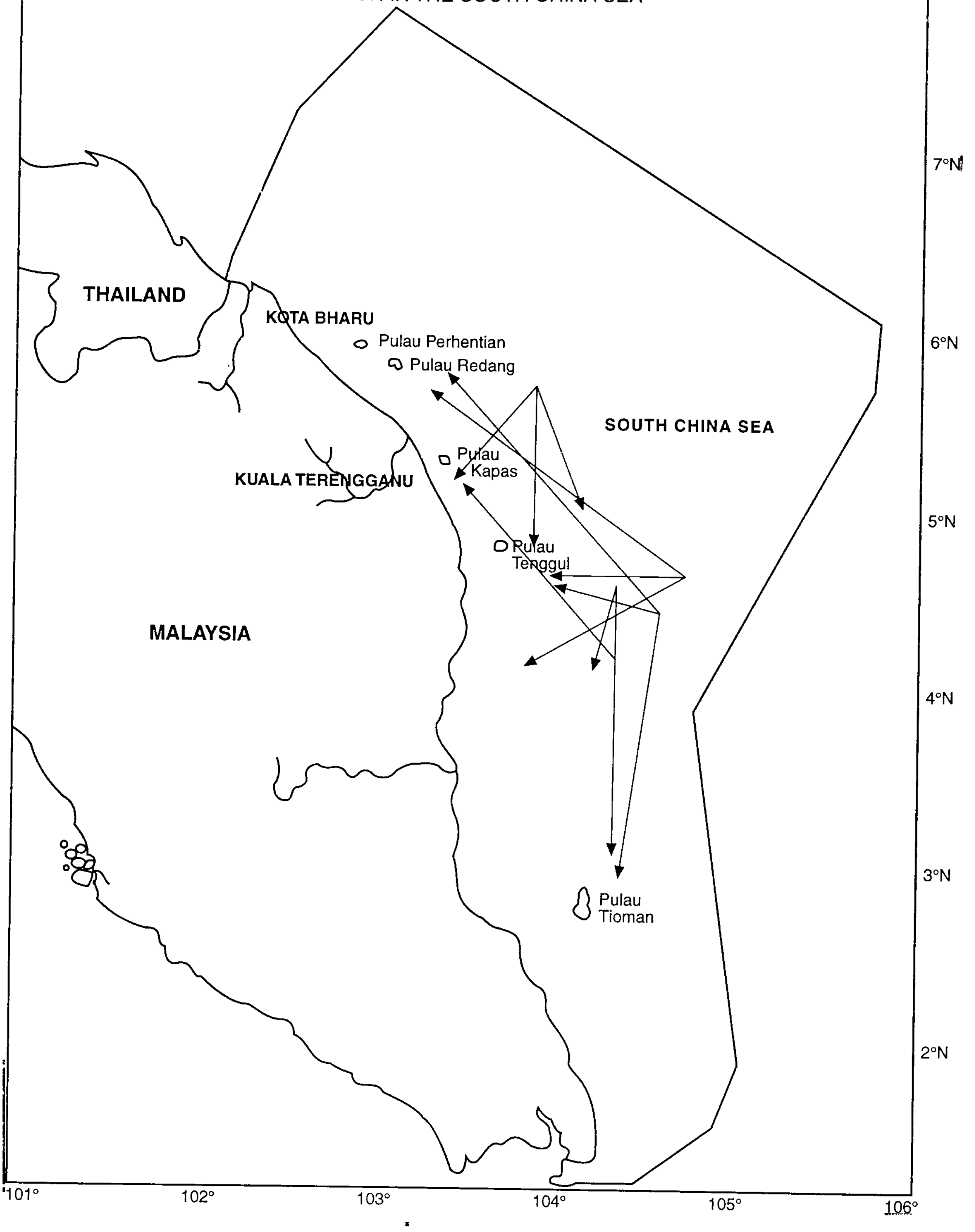
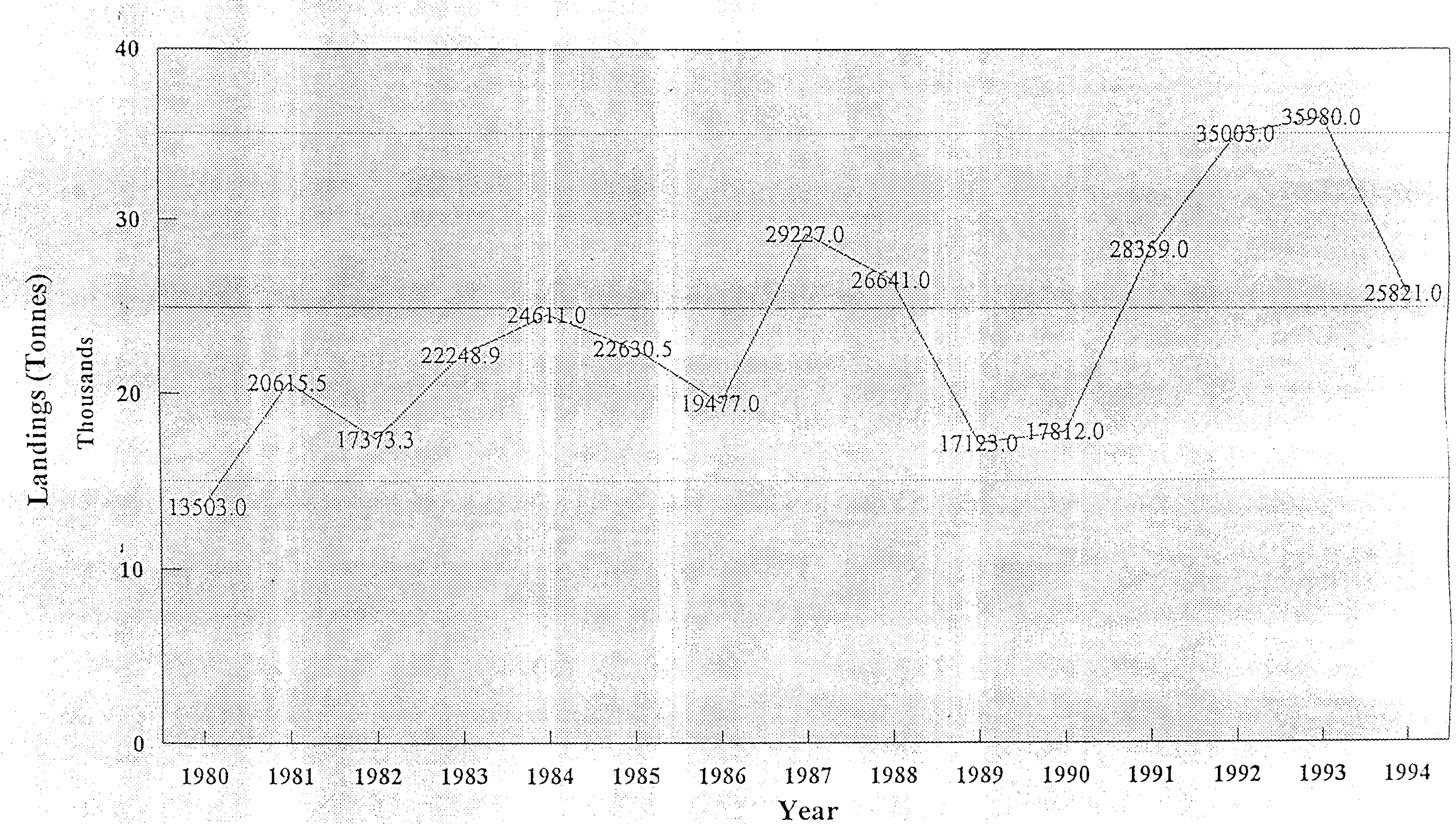


Figure 3: Trend Of Tuna Landings In Malaysia



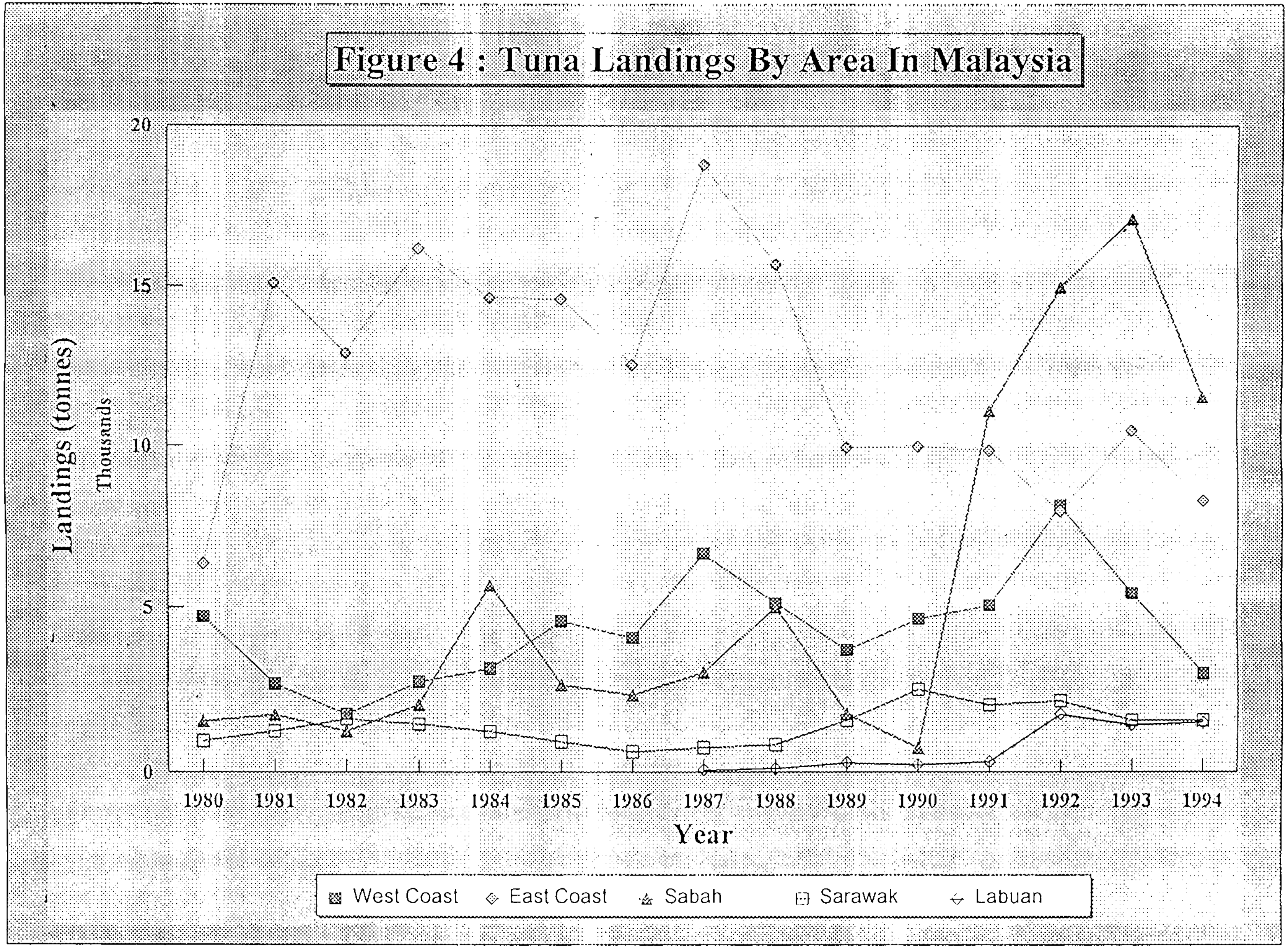


Figure 4 : Tuna Landings By Area In Malaysia

7. REFERENCES

Annual Fisheries Statistics, 1993. Ministry of Agriculture Malaysia, Kuala Lumpur.

Barut, N.C. 1995. The Relationship Of Philippine Yellowfin Handline Fishery To Other Local Fisheries. Paper Presented At The Second FAO Expert Consultation On Interaction Of Pacific Tuna Fisheries, Shimizu Japan 23–31 January 1995.

Fiuza A.F.G., 1990. Application of Sattelite Remote Sensing To Fisheries. Operation Research and Management In Fishing. Kluwer Academic Publisher Group. Nederland: 257–280 pp.

Hadil R. and Richard R. 1991. Distribution and Biological Status Of Pelagic Resources Off Sarawak Malaysia. Fisheries Bulletin No. 68 Department of Fisheries Malaysia.

Laurs, R.M., 1984. Albacore Tuna Catch Distribution Relative To Enviromental Features Observed From Satellite. Deep Sea Res., 31 (9): 1085–1089.

Raja Bidin R H and Richard R., 1992. Some Aspect On Longtail and Kawakawa In Malaysia. Paper Presented at The Fifth Southeast Asian Tuna Conference, General Santos Philippines 1–4 September 1992.

Raja Bidin 1993. Exploitation of The Tuna Resources In Malaysia. Paper Presented At The International Conference On Fisheries and Environment: beyond 2000, UPM Serdang Malaysia 6–9 December 1993.

Raja Bidin and Taupek, 1995. Interaction and Migration Of Small Tuna In Malaysia Waters. Paper Presented at The Second FAO Expert Consultation On Interactions Of Pacific Tuna Fisheries, Shimizu Japan 23–31 January 1995.

Richard R and Raja Bidin R H, 1992. Status Report For The Tuna Fishery Of Malaysia. Peper Presented at The Fifth Southeast Asian Tuna Conference, General Santos Philippines 1–4 September 1992.

Somsak C., 1995. Interaction Of Thai Tuna Fisheries: Problem, Research and Development. Paper Presented at The Second FAO Expert Consultation On Interactions Of Pacific Tuna Fisheries, Shimizu Japan 23–31 January 1995.