REVIEW OF TUNA FISHING IN THAILAND

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Introduction

Thai pelagic fisheries originally used small purse seines and traditional fishing gears to fish the small pelagic fish species in coastal areas. The pelagic fisheries developed after the Chinese purse seine (CPS) targeting on school of pelagic fish such as Indo-Pacific mackerel was introduced in 1925. The two main fishing grounds are the Gulf of Thailand and the Andaman Sea. In 1973, the total pelagic fish production reached about 199,198 t, of which 77.35 % from the Gulf of Thailand and 22.65 % from the Andaman Sea (Department of Fisheries, 1979). The production from the Gulf of Thailand averages about 75 % of the total. The trend of total pelagic fish production has been increasing rapidly and peaked at 512,542 tonnes in 1977, then dropped to 328,182 t in 1980 and showed an increasing trend again in 1981. It is obvious that the trend of total pelagic fish catches from the Gulf of Thailand has largely influenced the total pelagic fish production. New fishing gears and techniques, including the introduction of several kinds of luring techniques such payao with coconut leaves and kerosene lamp, developed at that time.

In addition, from the early eighties, the pelagic fisheries, especially for small tunas, expanded into the offshore waters to the deeper parts of the Gulf of Thailand, the Andaman Sea and distant-water fishing grounds. This boosted the marine fishery production of Thailand, resulting in the increased share of pelagic fish in the total marine pelagic production from 13.24 % (199,798 t) in 1973 to 30.28 % (963,907 t) in 1994, with pelagic fisheries playing a more important role in the marine fisheries (Department of Fisheries, 1979 and 1 997a) and in the economy, particularly in food production and consumption, employment and exports.

Small tunas an important pelagic species and have become the main target species for Thai fishermen since 1982 because of the high price offered by the tuna canneries. The total catches of small tunas in Thailand increased from 49,307 t in 1982 to 163,195 t in 1990 (Department of Fisheries, 1985 and 1992a). Presently, Thailand is the main supplier of canned tuna to foreign markets throughout the world. However, this rapid development may lead to the deterioration of tuna fisheries in Thailand. Thus, the studies on tuna stocks are needed in order to determine the situation.

Fishing grounds and seasons

Small tunas are distributed throughout the whole Gulf of Thailand. The main fishing grounds for tuna purse seine and the areas of most abundance are in the central part of the Gulf. Longtail tuna are distributed more abundantly in the deeper water than kawakawa and frigate tunas, especially in the middle of the Gulf. The movement of tuna fishing fleets indicate that the catches are affected by the two monsoon seasons (Southwest and Northeast monsoons). The fisheries for small tunas in the Gulf of Thailand occur throughout the year, with no prominent peaks (Figure2a).

The fishing areas in the Andaman Sea are scattering along the coast in the upper part (Figure2b) where the catch is good from January to May as from the late northeast monsoon (Fig3).

Fishing gears

The main fishing gears for small tuna fisheries are the Thai purse (TPS), luring purse seine (LPS) and king mackerel drift gill net(KMN). In Thailand, purse seines (PS) fisheries (TPS and LPS combined) were developed initially to catch small pelagic fish other than small tunas and started to target small tunas in 1982 with expansion of the tuna canned industry. The purse seiners are labour intensive with 30 - 40 crew members working on vessels ranging in size from 20 - 30 meters. The nets range from 800 1,500 meters long, with depths ranging from 70 - 150 meters and mesh sizes ranging from 2.5 - 9.7 centimetres. The purse seiners are equipped with radar, echo-sounder, sonar and satellite navigation instruments.

However, it is difficult to separate Thai purse seine from luring purse seine because the identification of these two types of purse seines is not clear and the final gear designation is left to the fishermen's discrimination during registration. Thus, the purse seines may consist of Thai purse seine (TPS) and luring purse seine (LPS). The total number of pelagic fishing gears increased from 510 units in 1972 to a peak of 1,728 units in 1988, then fluctuated with a declining trend.

In the Gulf of Thailand, the number of purse seiners registered increased from 318 units in 1972 to 1,013 units in 1988. Afterwards the annual registered number of fishing boats fluctuated and reached a peak of 1,026 units in 1991 then again showed a declining trend. In the Andaman Sea, the registered number of purse seiners increased from 56 units in 1972 to 264 units in 1989, then fluctuated with a peak of 273 units in 1994. The registered number of king mackerel drift gill netters in the Gulf of Thailand fluctuated with an increasing trend, while the registered number of king mackerel drift gill netter in the Andaman Sea showed a slightly increasing trend.

King mackerel drift gill nets are less important than purse seines for capturing small tunas. The fishing boats using this type of gear are mostly small to medium sized, ranging from 14 - 18 meters in length. The nets vary from 5 - 12 kilometres in length and 7.5 meters in depth. The stretched mesh size is rather large, ranging from 9 - 10 centimetres. Generally, the gear has not changed except for an increase in the length of nets result from the adoption of mechanised haulers.

Catches

The total pelagic and small tuna catches

During the pre-developed period (1971 - 1980) of small tunas fisheries in Thailand, the annual production of small tunas

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varied from 6,548 to 16,845 t. This production came from both within the EEZ of Thailand and waters of neighbouring countries. In the catch statistics, small tunas were classified as "bonito" without a species breakdown. The catches of the tuna group showed a slightly increasing trend throughout the period of 1971 - 1980 (Figure 5).

Until 1981, Thai purse seine fishermen developed their fishing gears by increasing the size of net and mesh size and changed the target fish species from small pelagic fish to catch small tunas or tuna-like fish using accessory equipment. Thus, the catches of small tunas showed rapidly increasing trend from 22,273 t in 1981 to 163,195 t in 1990. After that, it fluctuated, showing the highest peak of 169,071 t in 1992, then it showed a slightly decreasing trend in the following year. During this period, whilst small tunas catches in the Gulf of Thailand had showed a rapidly increasing trend, the catches in the Andaman Sea showed a slightly increasing trend until 1990, then jumped to a peak of 40,784 t in 1993 (Figure 6).

The small tunas caught in Thailand during the period of 1971-1980 amounted to about 2.53 to 7.66 % of the total pelagic catch (fig.7). After that, the proportion increased from 6.32 % in 1981 to 14.98 % in 1985 and reached 23.09 % in 1988. In 1994, small tunas provided about 13.73 % of total pelagic catches. The catches of the later period were used in the assessment of the potential yield.

Catch by type of gears

In Thailand, small tuna resources were exploited by variety of gears. The main fishing gears used for catching small tunas were the king mackerel drift gill net (KMN) and purse seines which consisted of Thai purse seine (TPS) and luring pure seine (LPS). The total catches of small tunas in Thailand during the period of 1971 - 1979, obtained through all types of gears, ranged from 6,551 to 16,845 t with an average of 10,310 t, with 55.49 % caught by purses seine (TPS and LPS) and 24.05 % caught by king mackerel drift gill gears (KMN) and some traditional gears of small scale fisheries, respectively. The average catches of small tunas by all types of gears throughout the period of 1984 - 1994 were 127,272 t, of which 85.93 % were contributed by purse seine and 12.37 % were contributed by king mackerel drift gill net.

Only 1.12 % and 0.58 % of the small tunas were caught by the other commercial fishing gears and small scale fisheries respectively. It may be possible that, prior to 1980, purse seines played an important role on some small pelagic fishes such as sardines, Indo-Pacific mackerel and Indian mackerel other than small tunas. After 1980, the target species of purse seines had changed to tuna species, the catch of which increased from 6,324 t in 1980 to 151,740 t in 1990, then fluctuated and reached a peak of 154,321 t in 1992 and slightly declined in the year after. The average catch of small tuna by purse seines throughout the period of 1984 - 1994 was 111,922 t. In 1994, purse seines contributed 92.32 % and king mackerel drift gillnets only 7.55 %. The rest was contributed by other gears. The catches of small tunas by type of fishing gear in the Gulf of Thailand and the Andaman Sea are shown in Figures 9 and 10.

Tuna landings

There are 657 fish landing sites in Thailand locate in 17 provinces along the coast of the Gulf of Thailand and 6 provinces of the West coast of Thailand (the Andaman Sea). They can be classified as 14 landing sites of Fish Marketing Organizations (FMO) and 643 private sector landing sites of. The major landing sites for small tunas along the west coast of Thailand were located in Ranong, Phangnga, Phuket; Krabi, Trang and Satun provinces. Songkhla and Phuket province were also the landing base of tuna by foreign fishing vessels.

According to a survey of 37 marine fish landing places in 1994, the total landings were about 1,739,184 t (Department of Fisheries, 1996d), with 107,383 t of small tunas or 6.17 % of total fish landings. About 46.0 % of small tuna landings (or 49,387 t) were landed at Amphoe Muang, Pattani province; 20.8 % (or 22,377 t) were landed at Amphoe Muang and Amphoe Klang, Rayong province; 12.5 % (or 13,413 t) were landed at Amphoe Muang, Songkhla province; and 10.0 % (or 10,708 t) were landed at Amphoe Muang, Phuket province. Only 10.7 % (or 11,498 t) were landed at the other landing places (Table 1). The biggest landing sites for small tunas in Thailand was Pattani province.

Species composition

The small tunas are pelagic species which are widely distributed throughout the tropical waters. The species commonly found both in the Gulf of Thailand and the Andaman Sea are longtail tuna (*Thunnus tonggol*), kawakawa or eastern little tuna (*Euthynnus affinis*) and frigate tuna (*Auxis thazard*). The relatively large tuna species merely found in the Andaman Sea are skipjack tuna (*Katsuwonus pelamis*), dogtooth tuna (*Gymnosarda unicolor*) and bullet tuna (*Auxis rochei*). Yellowfin tuna are also occasionally caught in a less quantity by tuna purse seine and luring purse seine in the Gulf of Thailand.

Longtail tuna, kawakawa and frigate tuna are dominant species both in the Gulf of Thailand and the Andaman Sea. Catches often include the three species, particularly from mixed schools of kawakawa and frigate tuna. Prior to 1979, catch statistics of Thailand classified small tunas as "bonito" without breakdown into species. The average catch was about 10,310 t, of which 80.35 % and 19.65 % came from the Gulf of Thailand and the Andaman Sea.

From 1980 onwards, tuna were separated into two groups, longtail tuna and “bonito” which consisted of kawakawa and frigate tuna. During the period from 1980 to 1994, the average catch of small tunas in Thailand was 105,072 t, which consisted of longtail tuna and bonito (kawakawa and frigate tuna) about 54.2 % and 45.79 % respectively. Of this total, 90.35 % came from the Gulf of Thailand and only 9.65 % came from the Andaman Sea. Only a small amount of skipjack and bullet tuna from king mackerel drift gill nets, troll lines and sport fishing were reported. The percentage of longtail tuna was generally higher than those of bonito both in the Gulf of Thailand and the Andaman Sea (Table 2).

Length Frequency distribution

Length frequency data collected from the main fishing gears (luring purse seine, Thai purse seine and king mackerel drift gill net) during March to December 1990 in the Gulf of Thailand have been analysed. The fork lengths (FL) of longtail caught by luring purse seine varied from 12.50 to 48.50 centimetres while the lengths from Thai purse seine and king mackerel drift gill net varied from 15.50 to 58.50 cm and 20.50 to 58.50 cm, respectively. The lengths of kawakawa varied from 10.50 to 48.50 cm from luring purse seine catches, 13.50 to 55.50 cm from Thai purse seine catches and 18.50 to 57.50 cm from king mackerel drift gill net catches. The lengths of frigate tuna varied from 11.50 to 42.50 cm from luring purse seine catches, 13.50 to 50.50 cm from Thai purse seine catches and 22.50 to 58.50 cm from king mackerel drift gill net catches. The average mean lengths of longtail tuna, kawakawa and frigate tuna captures by luring purse seine (LPS), Thai purse seine (TPS) and king mackerel drift gill net (KMN) were 23.05, 38.81, 37.48; 23.64, 39.00, 38.33 and 29.54, 33.83 cm, respectively.

Deep sea fishing in the Indian Ocean

Tuna Resources in the Indian Ocean

The production of tuna-like species varies considerably between the Western Indian Ocean which has nearly three times the catch of the Eastern Indian Ocean. This is due to purse seine fishery, which is concentrated in the west.

According to an ITPT report, resources of small tropical oceanic tunas, skipjack and juvenile yellowfin and bigeye, may be under exploited in the Eastern Indian Ocean. IPTP also mentioned the sudden increase of longline catches in the Western Indian Ocean, suggesting that this fishery could produce more, if effort were to rise. Whether these increased catches are sustainable, however, will presumably be seen in the future, as Indian Ocean coastal countries are becoming increasingly interested in longline fishing.

Tuna Purse Seine Survey by DOF

DOF has carried out tuna fishing surveys in the Andaman Sea and eastern and western part of the Indian Ocean by survey vessels Chulabhorn and Mahidol.

Thai Tuna Oceanic Fisheries Cooperatives (TOTFIC)

Under the DOF policy to promote deep sea fishing, fishermen interested in deep sea fishing organised a fishermen's group to engage in tuna fishing in the Indian Ocean, known as the Thai Tuna Oceanic Fishery Cooperatives (TOTFIC) in May 1996.

Conclusion and discussion

The annual production of small tunas in Thailand varied from 6,548 to 16,845 t during 1971 – 1980constituting about 4 percent of the total pelagic catch. After 1981, the production increased rapidly from 22,273 to 163,195 t in 1992 and fluctuated after that. The percentage of small tunas in pelagic catches during 1984 - 1994 was about 18 percent.

The three main species of small tunas commercially caught in Thai Waters are longtail tuna (*Thunnus tonggol* Bleeker, 1951); kawakawa (*Euthynnus affinis* Cantor, 1850) and frigate tuna (*Auxis thazard* Lacépède, 1803). Longtail tuna was found to be more abundant than other two species. The other species of large tunas that include skipjack tuna, dogtooth tuna and bullet tuna were occasionally found in the Andaman Sea (Boonragsa, 1986 and 1990) while yellowfin tuna was also occasionally caught in a less quantity in the Gulf of Thailand (Ceunpan and Saikliang, 1991). This study was corresponded to the study on species composition of small tunas taken in the Gulf of Thailand by Klinmuang (1981). Cheunpan (1988 and 1993) and Supongpan and Saikliang (1987) also reported that the percentage of longtail tuna was generally higher than those of kawakawa and frigate tuna. Chamchang and Chayakul (1990) reported that tunas larvae were found abundantly in June, when longtail tuna was dominant and mostly found in the deeper water station. These studies also indicated that the larger sizes of small tunas were found in the deeper waters, while these resources seemed to be limited in the shallow waters.

Longtail tuna, kawakawa and frigate tuna caught by luring purse seine were smaller size than those caught by Thai purse seine and king mackerel drift gill net.

Boonragsa (1990) reported that small tunas caught by luring purse seines appeared to be smaller than those caught by Thai purse seine which was similar to this study. From this study, the biggest species of small tunas was kawakawa and frigate tuna was the smallest. The result was contrary to Klinmuang (1981) which showed that longtail tuna was the biggest but the smallest was the frigate tuna. It is possible that the structure of tuna stock that has been heavily utilized may have changed.

The two main fishing gears for catching small tunas in Thailand are king mackerel drift gill nets and purse seines, which consist of Thai purse seine and luring purse seine. Purse seine fisheries were developed initially to catch small pelagic fish other than small tunas and targeting on small tunas started since 1982 with the expansion of the tuna canning industry. The peaks of catches are affected by the monsoon seasons. The good fishing season for small tunas in the Gulf of Thailand and the Andaman Sea occur during Northeast monsoon period. This was opposite to the fishing season in the east coast of Peninsular Malaysia which has a limited time of fishing (Yasin and Chee, 1987).

According to the trend of small tunas catches, it may be possible that the increase in catch of small tunas since 1982 was due mainly to the movement further offshore of fishing fleets of drift gill nets and purse seiners. Tuna catching was made attractive by higher prices offered from tunas canning industries and also improvements of purse seine fishing technique, as well as the increase in fishing effort (see Annex 2). Thus, catches of small tunas increased rapidly, especially in the Gulf of Thailand. It is noticeable that purse seine catches increased in the areas off Pattani and Songkhla provinces and in the central Gulf of Thailand from 1985 as compared to the previous year (Cheunpan, 1987).

Table 1 Total catch and landings of small tunas in Thailand, 1990 - 1994.

Landing place	1990	1991	1992	1993	1994
Total catches	163,195	152,246	169,071	147,582	131,015
37 landing places	124,293	66,327	79,861	95,829	107,383
Pattani province	42,020	32,345	46,339	48,259	49,387
Rayong province	23,523	9,467	15,028	23,591	22,377
Songkhla province	48,897	15,862	11,142	9,470	13,413
Phuket province	554	2,034	1,812	4,354	10,708
Other provinces	9,299	6,619	5,540	10,155	11,498

Sources: Department of Fisheries, 1992b; 1993; 1995b; 1995c; and 1996d.

Table 2 Total small tunas catches (tonnes) and percentage of small tunas caught in the Gulf of Thailand and the Andaman Sea, 1971 - 1994.

	Grand total			Gulf of Thailand (%)			Andaman Sea (%)		
Year	**tonnes**	**1(%)**	**2(%)**	**Sub-total**	**1**	**2**	**Sub-total**	**1**	**2**
1971	6,548	-	-	71.18	-	-	28.82	-	-
1972	6,551	-	-	74.19	-	-	25.81	-	-
1973	7,914	-	-	78.46	-	-	21.54	-	-
1974	9,925	-	-	87.81	-	-	12.19	-	-
1975	12,004	-	-	74.87	-	-	25.13	-	-
1976	9,719	-	-	81.20	-	-	18.80	-	-
1977	12,932	-	-	88.32	-	-	11.68	-	-
1978	10,353	-	-	79.76	-	-	20.24	-	-
1979	16,845	-	-	87.34	-	-	12.66	-	-
Avg.	**10,310**			**80.35**			**19.65**		
1980	13,683	40.54	59.46	94.24	36.12	58.12	5.76	4.42	1.34
1981	22,273	48.08	51.92	90.68	45.97	44.71	9.32	2.11	7.21
1982	49,307	52.50	47.50	80.44	47.36	33.08	19.56	5.14	14.42
1983	85,820	37.30	62.70	95.54	36.75	58.79	4.46	0.55	3.91
1984	76,838	42.24	57.76	90.41	40.34	50.07	9.59	1.90	7.69
1985	88,078	45.50	54.50	93.21	41.45	51.76	6.79	4.05	2.74
1986	95,250	49.29	50.71	96.08	47.36	48.72	3.92	1.93	1.99
1987	103,855	36.53	63.47	93.73	32.22	61.51	6.27	4.31	1.96
1988	147,324	36.93	63.07	96.63	34.44	62.19	3.37	2.49	0.88
1989	130,547	37.10	62.90	96.35	34.62	61.73	3.65	2.48	1.17
1990	163,195	37.23	62.77	95.78	33.65	62.13	4.22	3.58	0.64
1991	152,246	44.27	55.73	90.64	38.60	52.04	9.36	5.67	3.69
1992	169,071	55.97	44.03	92.96	50.21	42.75	7.04	5.76	1.28
1993	147,582	59.07	40.93	72.36	45.67	26.69	27.64	13.40	14.24
1994	131,015	64.32	35.68	76.20	51.77	24.43	23.80	12.55	11.25
Av .	**105,072**	**45.79**	**54.21**	**90.35**	**41.10**	**49.25**	**9.65**	**4.69**	**4.96**

Sources : Department of Fisheries, 1973a; 1974;1975a;1977; 1979; 1981; 1982b; 1983; 1984; 1985; 1986a;1986b; 1987; 1988a; 1989; 1990; 1991; 1992a; 1994; 1995a; 1996a and 1996b.

Remarks: 1 = Little tuna and Frigate tuna and
2 = Longtail tuna
= Not defined

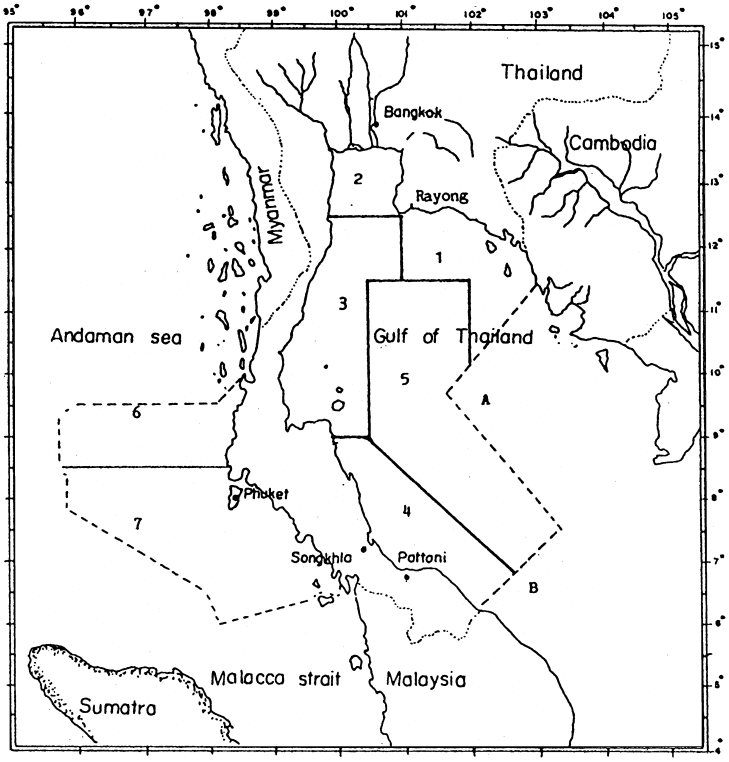

Figure 1 Thai Waters, Gulf of Thailand and Andaman Sea

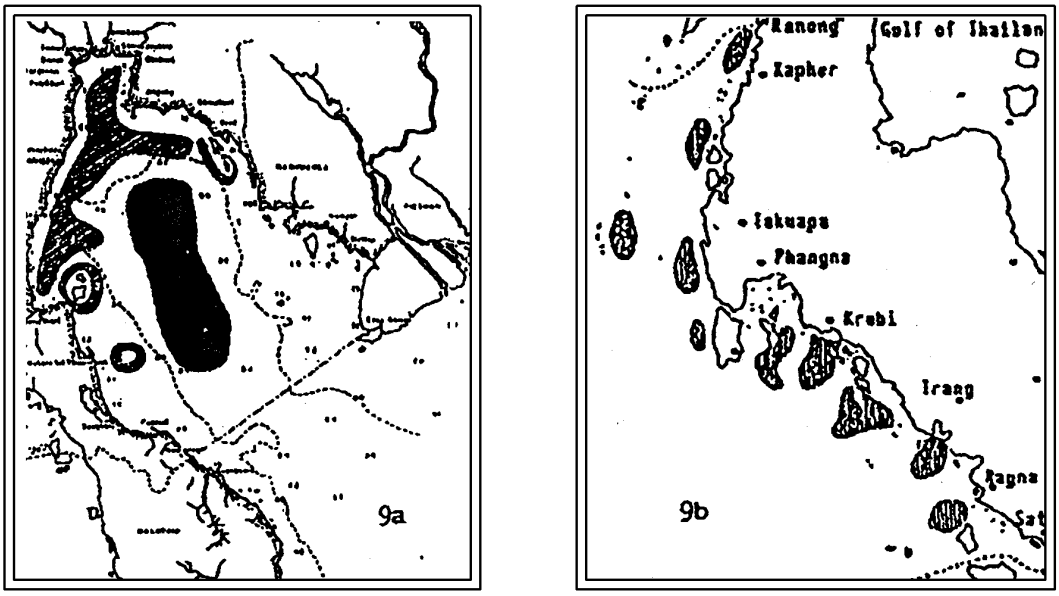

Figure 2. The main fishing grounds for small tunas in the Gulf of Thailand (2a) and the Andaman Sea (2b).

heavy fishing **moderate fishing**

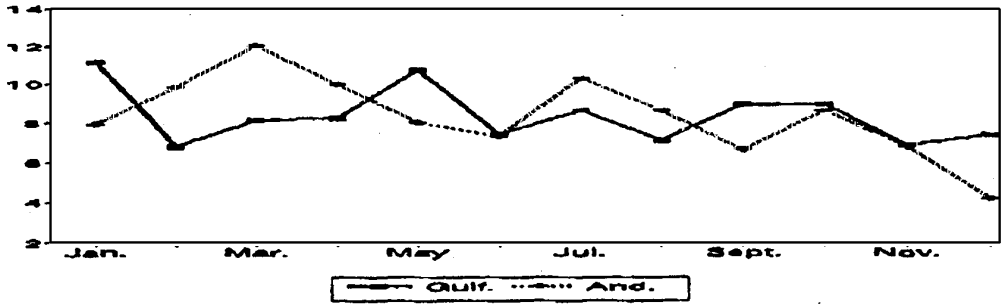

Figure 3. Percentage monthly catches of small tunas by main fishing gears in the Gulf of Thailand and the Andaman Sea, 1990.

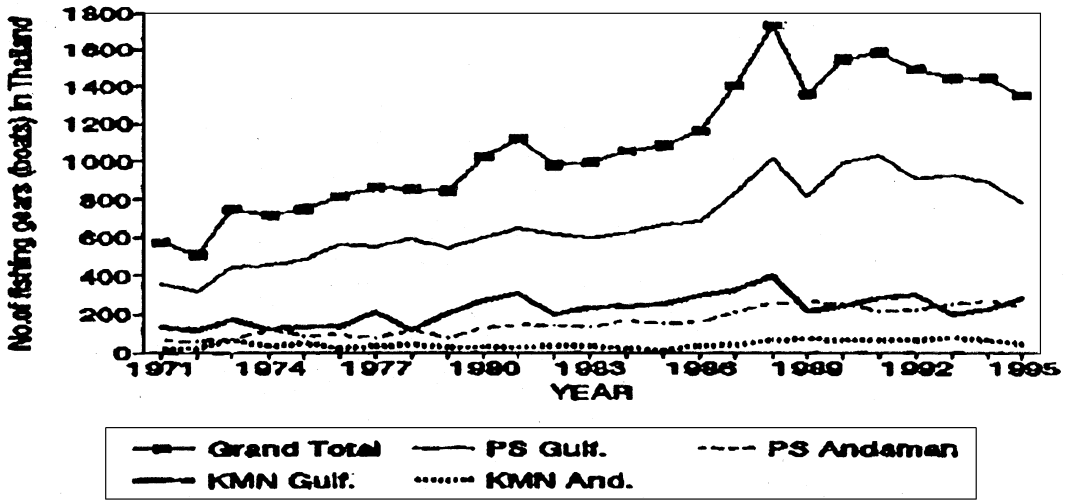

Figure 4. Number of small tuna fishing boats registered in the Gulf of Thailand and the Andaman Sea, 1971 - 1995 (Department of Fisheries, 1973b; 1975b; 1978; 1988b; 1996c and 1997b)

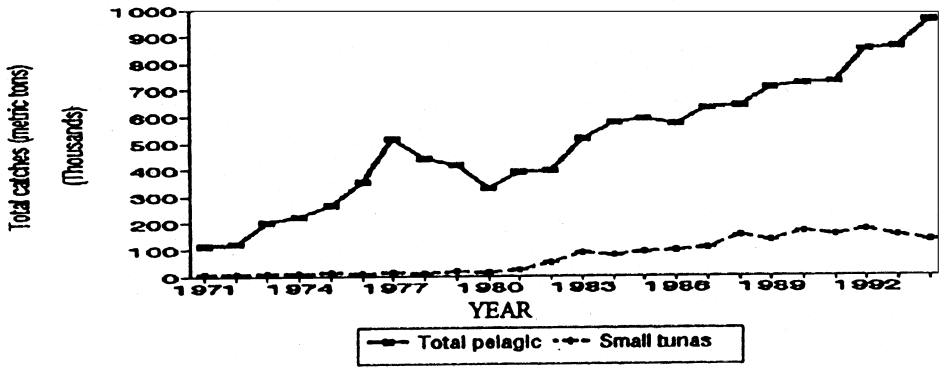

Figure 5 Total pelagic fish and small tunas caught in Thai waters, 1971 - 1994.

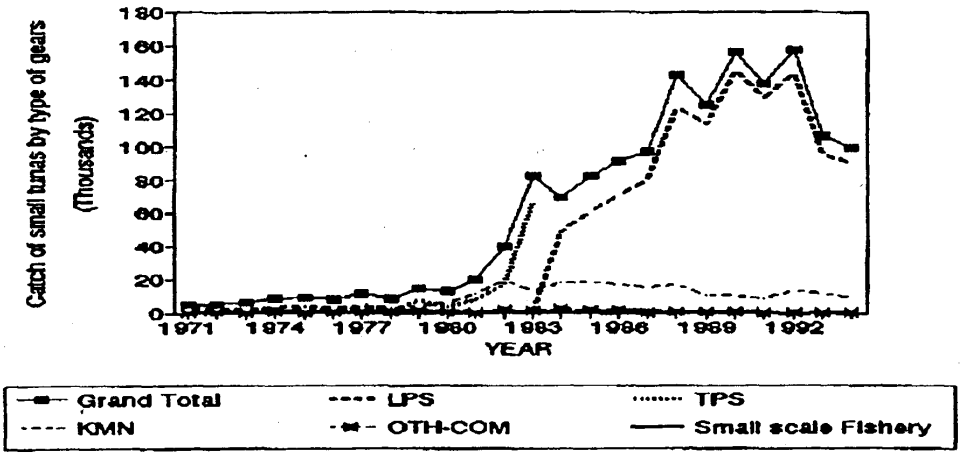

Figure 6 Catch of small tunas in the GULF OF Thailand and the Andaman Sea, 1971-1994.

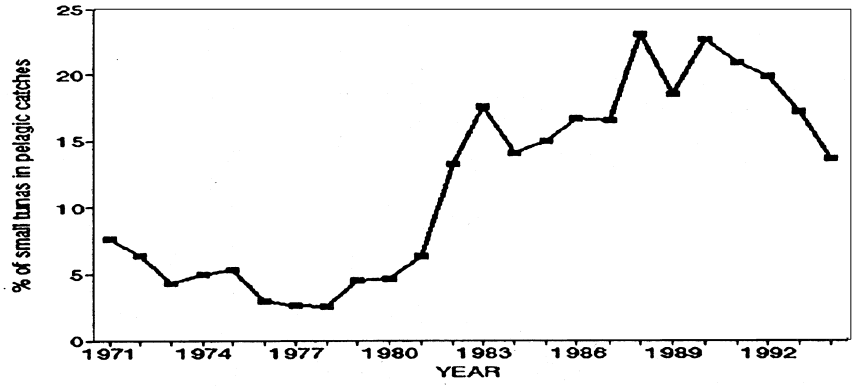

Figure 7 Percentage of small tunas in total pelagic catches in Thailand, 1971-1994.

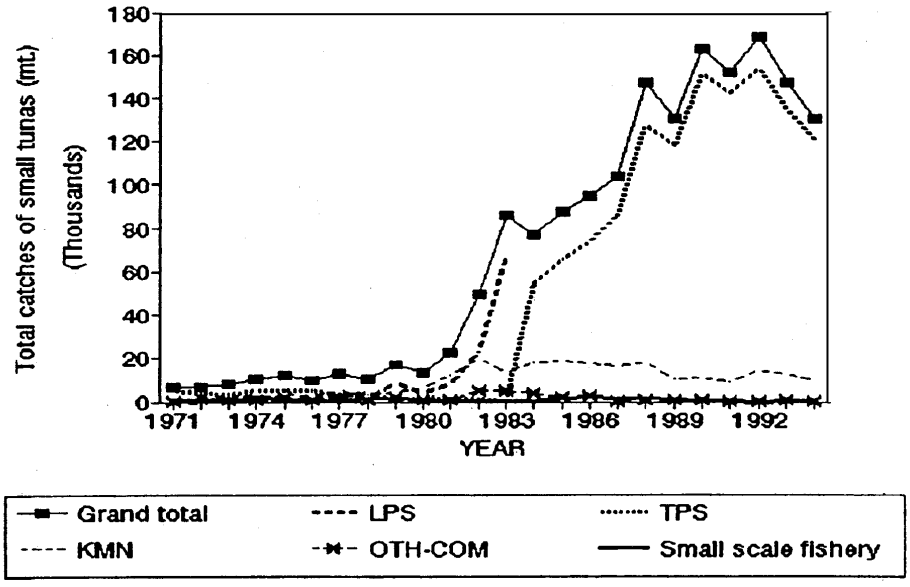

Figure 8 Catch of small tunas by type of fishing gears in Thailand, 1971 - 1994.

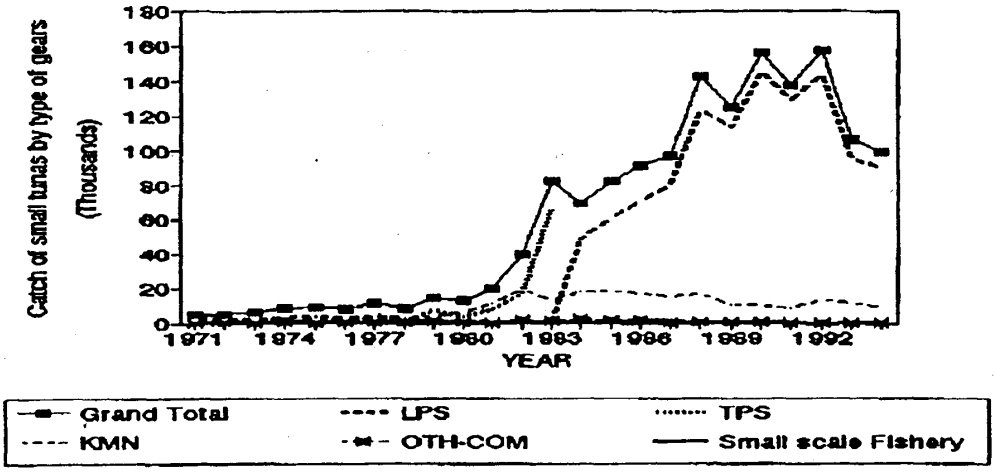

Figure 9 Catch of small tunas (t) by type of fishing gears in the Gulf of Thailand, 1971- 1994.

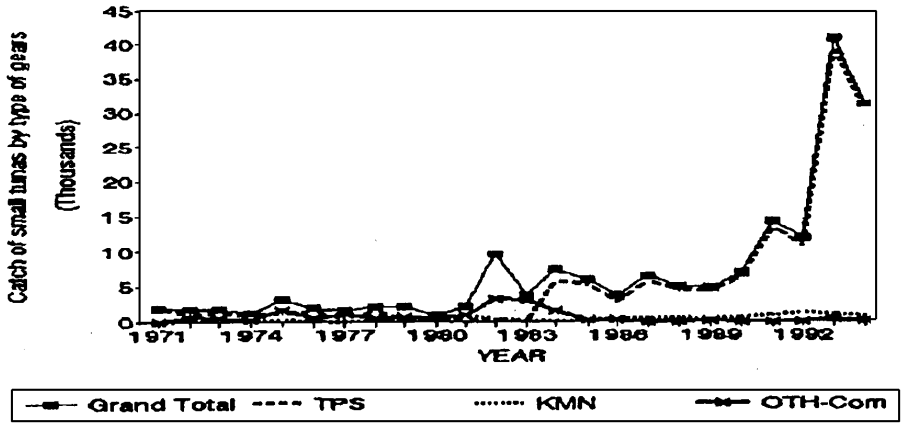

Figure 10 Catch of small tunas (t) by type of fishing gears in the Andaman Sea. 1971 - 1994.

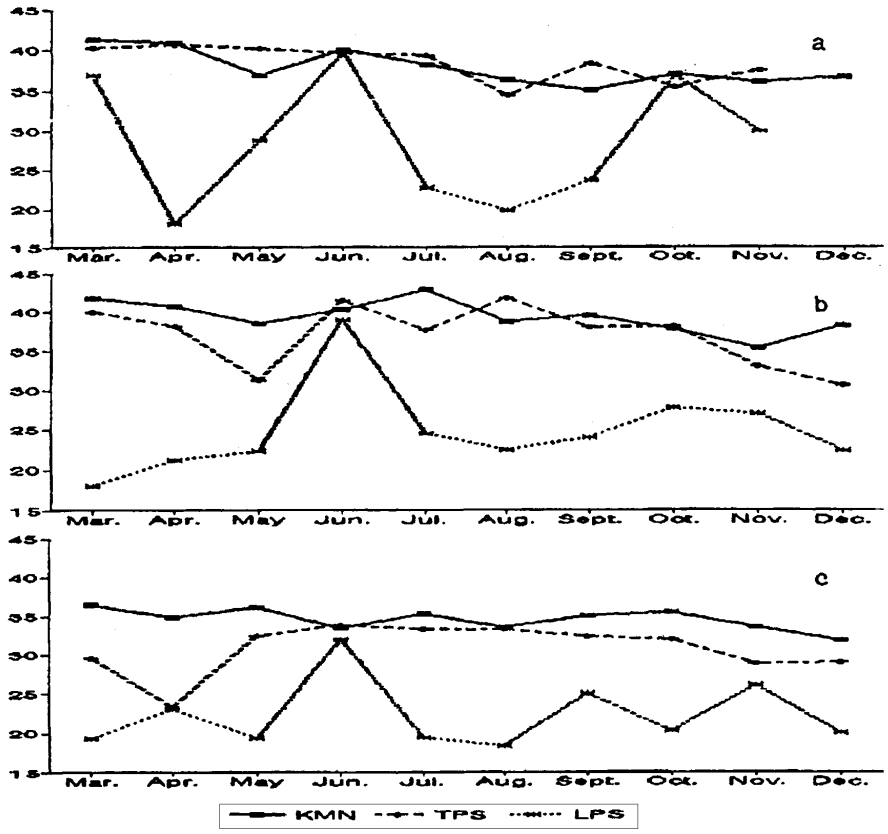

Figure 11 Monthly mean fork lengths (cm) of longtail tuna (a), kawakawa (b) and frigate tuna (c) caught by main fishing gears in the Gulf of Thailand, 1990.