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**COUNTRY STATUS REPORT  
THAILAND**

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# Status of Small Pelagic Fish Resources and Fisheries in Thai Waters

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### Abstract

The status of the pelagic fisheries and resources in Thai Waters are provided basing on the Fisheries Statistic of Thailand for 1980 -1995 period. An attempt is also made to assess the current status found among major small pelagic stocks, namely Indo-Pacific mackerel, Indian mackerel, round scad, small tunas, anchovies and sardines. Other technical reports pertaining to pelagic fisheries and resources are also reviewed. In the Gulf of Thailand, most of small pelagic fish have been over-fished, except hardtail scad and king mackerel. In the Andaman Sea, the stock of Indo-Pacific mackerel, which located in the lower part of the coast, and banded trevally show indication of overfishing. To date the recovery of these stocks seems to have improved. For Indian mackerel, round scad, sardines, small tunas, hardtail scad, and bigeye scad, no drastic changes in their catches imply sustenance these resources.

### 1. Introduction

Rapid development of Thailand's fisheries in the past two decades has promoted the country into the world's frontrunner in fishery industry. In 1996, marine fishery accounted for 78% of the total fishery production, of which 70% was the contribution from the Gulf of Thailand and the Andaman Sea shared the rest. Nevertheless, the leap and bound of fishery development has led to over exploitation of fishery resources, particularly demersal fishes and invertebrates. At the same time, the catch of pelagic populations has increased significantly as well. The share of pelagic catch accounted for 33%-38% of the total marine fishery yield during 1991-1996, whereas this portion was only 24%-28% from 1979-1982. During the period of 1972-1982, the pelagic catch from the Gulf of Thailand and Andaman Sea were 313,000-379,000 metric tonnes (mt) and 30,000-44,000 mt, respectively. These catches had marked increased from both regions in recent years as shown by the catch data during 1989-1996: 559,000-707,000 mt and 100,000-288,195 mt from the Gulf and the Andaman Sea, respectively.

Small pelagic fishes such as Indo-Pacific mackerel, small tunas, scads, king mackerel, etc, are gaining more important economically. They had become the main target species for Thai fishermen since 1975 because of attractive prices offered by domestic consumer and fish canneries. According to the Fisheries Statistics, the total catches of small pelagic fish in Thailand was 917,550 mt in 1996 and increasing up to three times compared with 395,540 mt in 1982 (Department of Fisheries (DOF), 1984b and 1999). At present, Thailand is the main supplier of canned fish and other fish products to foreign markets throughout the world. Anyhow, the rapid fisheries development may lead to the deterioration of small pelagic stocks

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in Thailand. Thus, studies on small pelagic stocks are urgent in finding out the current problems, situation and status.

## **2. Development of Small Pelagic Fisheries**

Development of pelagic fisheries in Thailand was resulted from adoption of high efficiency purse seines (84 % of total pelagic catch in 1995 (DOF, 1995b)), expansion of new fishing ground both inshore and offshore, and also the development of new fish-luring techniques. For example, Payao or fish aggregating device (FAD) are applied for day-time catching while lighting techniques especially for light luring purse seine (LPS) were developed in 1973 by installing a power generator on board. The technique has become a predominant fishing gear for mixed target pelagic species since 1982. Anchovies purse seine (APS) which commonly used to catch anchovies in coastal areas have also been developed to operate with light luring for attracting the fish school at night time as well as extending operation range offshore. Besides from catching the target species, the technique is applicable to catch mixed small pelagic fish at night. Subsequently, larger purse seine boats (Tuna purse seine, TUN) were developed as to increase their fishing capacity for catching coastal tunas in deeper water. Since 1985, the vessels have been fitted with electronic equipment such as depth recorder, sonar, and other equipment. In 1990, an installation of labor saving devices on board has been very popular among fishing vessels. The development resulted in a spectacular increase in small pelagic captures more three times in 1996 than in 1982.

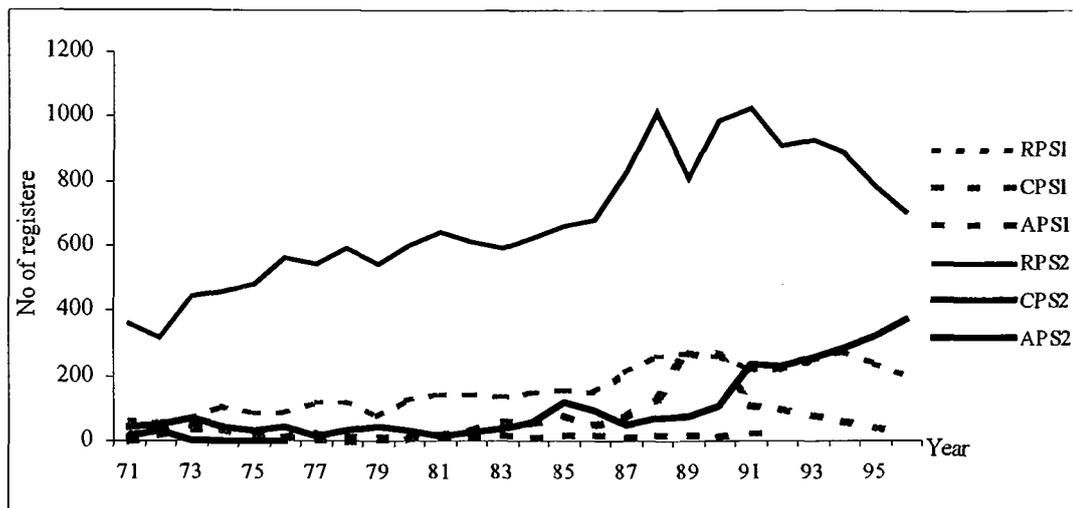
## **3. Fishing gears**

Purse seines are basically classified into regular purse seines (RPS), anchovy purse seine (APS) and Chinese purse seine (CPS). RPS consist of Thai purse seine (TPS), green purse seine (GPS), fish aggregating device (FAD), light luring purse seine (LPS) and tuna purse seine (TUN). Appendix 1 shows the fishing operation methods of purse seines (Munprasit and Muttavee, 1986).

In general, the common mesh size used in TPS, LPS, FAD are approximately 2.5 cm; the length and depth of the net range in between 300-1,200 m and 40-150 m, respectively, and number of crew is in the range of 25-40 persons. For CPS, the mesh size is about 2.5 cm, 300-500 m in length and 50-70 m in depth and number of crew is about 20-30 persons. The length, depth and mesh size of GPS net are 500-1,300 m, 60-140 m and 3.8-4.3 cm respectively, and number of crew ranges between 25-40 persons. For APS, the mesh size is about 1 cm, 200-500 m in length and 15-80 m in depth, and number of crew is about 5-30 persons. For the TUN, the boat length is longer than 24 m; the length of the net is between 1,200-1,600 m with the depth of 120-150 m and the mesh size is 9.4 cm. The number of crew is between 35-45 persons. The gear is substitutable to both LPS and TPS for catching other pelagic species in either coastal or offshore areas by using the net with mesh size of 2.5 cm.

RPS, CPS and APS are largely registered gears along the Gulf of Thailand and the Andaman Sea. The registered RPS showed a steady increase from 361 and 63, Gulf of Thailand and Andaman Sea, respectively in 1971 and reached the peak of 1,026 in 1991 (Gulf of Thailand) and 273 in 1994 ( Andaman Sea). There was a slight decrease between 1992 to 1996 (909 to 707) in the Gulf and 1994 to 1996 (237 to 198) in the Andaman Sea. The number of registered CPS was between 1- 34 units from 1971-1976 in the Gulf and 12-50 units from 1971-1992 in the Andaman Sea. The number of the gear showed a steep decline and there was no record in CPS registered number since 1977 in the Gulf and 1993 in the Andaman Sea. The registered APS indicated a continuously increase from 42 in 1971 and reached 370 in 1996 in the Gulf and shown fluctuated in the range of 2-272 units from 1971-1996 in the Andaman

Sea. Trend of registered showed abruptly decreased from 272 units in 1989 to 30 units in 1996 (Fig. 1).



**Fig.1** Number of registered of purse seiners (RPS, CPS and APS) in the Andaman Sea (dash line,1) and the Gulf of Thailand (thick line,2) during 1971-1996.

Source: Thai Fishing Vessels Statistics, DOF 1972a-1998a.

#### 4. Species Composition

The main pelagic fishes caught by commercial fishing gear during 1980-1995 consists of Indo-Pacific mackerel (*Rastrelliger brachysoma*), Indian mackerel (*R. kanagurta*), round scad (*Decapterus maruadsi*, *D. macrosoma* and *D. macarellrus*), small tunas (*Thunnus tonggol*, *Euthynnus affinis*, *Auxis thazard*, *Katsuwonus pelamis* and *Sarda orientalis*), anchovies (*Encrasicholina* spp. and *Stolephorus indicus*) and sardines (*Sardinella gibbosa* and *Amblygaster sirm*). Nearly sole catch of certain species (i.e., *Katsuwonus pelamis*, *Sarda orientalis* and *D. macarellrus*) are yielded merely from the Andaman Sea. In the total pelagic catch from each region, these resources share about 78-87% in the Gulf and 65-89% in the Andaman Sea (Saikliang and Boonragsa, 1997). Other pelagic fish species are bigeye scad (*Selar crumenophthalmus*), hardtail scad (*Megalaspis cordyla*), and king mackerel (*Scomberomorus* spp.) of which their contribution to the total catch is about 13-22 % and 11-35 % in the Gulf and the Andaman Sea, respectively.

#### 5. Fishing Ground and Seasons

Fishing ground of small pelagic fish have been expanded extensively over inshore and offshore along the coast, where the water depth is more than 20 m in the Gulf and up to 40 m in the Andaman Sea. In the Gulf of Thailand, the fishing ground of Indo-Pacific mackerel is along the western coast and the upper part of the Gulf. For Indian mackerel and sardine, the fishing ground is mainly located within the depth range of 30-70 m. Round scads distribute in offshore area (depth of water more than 50 m) while small tunas have widespread distribution in the whole Gulf, especially in the central part. Anchovies are mainly caught in coastal water along the western and eastern coast of the Gulf. The fishing season is all year round with the major peak during June to October ( Southwest Monsoon) and a minor peak during November to May (Saikliang and Boonragsa, 1997). In the Andaman Sea, the main fishing ground of Indo-Pacific mackerel is located in the lower part along the coast. The fishing ground for Indian mackerel is scattering along the coast. The fishing ground for round scad is more or less widespread along the coast. Sardines and anchovies are widely distributed in the inshore and

offshore along the coast. The fishing seasons is apparent with the peak confined to Northeast Monsoon during November to May (Saikliang and Boonragsa, 1997).

## **6. Production and Catch Rate**

Gulf of Thailand: The annual productions of small pelagic fish caught by commercial fishing gears from 1980-1994 indicated the increasing trend from 286,109 mt in 1980 to 534,599 mt in 1991. The trend rises up to the peak of 675,904 mt in 1992 then drops to 583,895 mt in 1993 and increases again during 1994-1995 (614,814-661,686 mt) (Fig. 2 and Table 2). The trend is conformable with that of the number of registered purse seines (Fig. 1).

Annual catch of Indo-Pacific mackerel fluctuated and slight decreased from the peak of 99,638 mt in 1984 to 73,727 mt in 1994 and increased again in 1995 (105,323 mt). By using mackerel gill net (MEN) as standard gear, the CPUE shows the same fluctuation as that of production, except and unusual low CPUE in 1986 and 1995.

Production of Indian mackerel increased from 29,827 mt in 1984 to 38,803 mt in 1986 then decreased to the lowest catch of 16,256 mt in 1991. The catch increased again to the peak of 49,231 mt in 1994. Purse seiner is a standard gear. Trend of catch rate indicated the same pattern to that of the production.

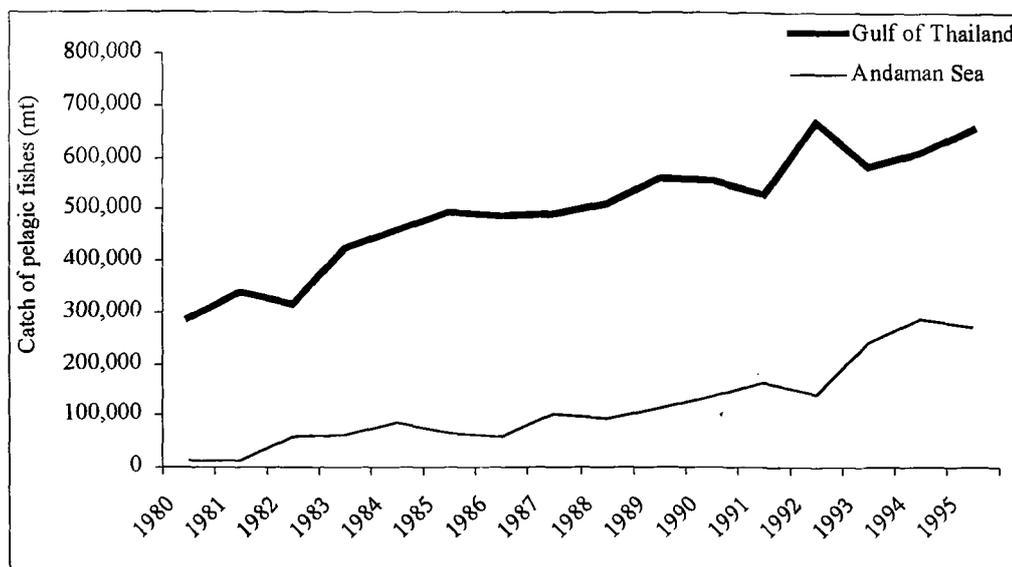
The round scads catch slightly decreased from 27,475 mt in 1984 to 23,947 mt in 1986 then increased abruptly to 41,838 mt in 1987, after that it expresses sharply decreased to the lowest point of 10,676 mt in 1990. It increased again up to the peak of 54,633 mt in 1995. Catch rate fluctuates with decreasing trend from 1984 to 1990. The increasing trend is apparent from 1990 46 kg/day to 1995 260 kg/day.

Small tunas production increased from 69,355 mt in 1984 to 156,208 mt in 1990. The highest peak of catch was 157,163 mt in 1992 and tend to decrease in the following years. The catch rate shows similar trend as compared to the production. The minimum and maximum of catch rate are 330 kg/day in 1984 and 846 kg/day in 1991, respectively.

The catches of anchovies markedly increased during 1988 -1992 (from 66,675 mt to 120,211 mt) and then declined to 115,718 mt in 1995. Catch rate of this species fluctuated during the period of 1984 to 1995, with the lowest rate of 1,569 kg/day in 1987 and the peak of 6,282 kg/day in 1992.

Production of sardine slightly increased from 83,814 mt in 1984 to 137,965 mt in 1995 with the peak of catch of 141,422 mt in 1992. The trend of catch rate was similar to that of catch, except from 1994 to 1995.

The production and catch rate of other pelagic fish species are presented in the Table 1.



**Fig. 2 Total catch of pelagic fish caught by the main fishing gears in the Gulf of Thailand and Andaman Sea, Thailand, from 1980 to 1995.**

Andaman Sea: The production and catch rate of pelagic species caught by commercial fishing gears show the increasing trend during the period of 1984-1995 (Fig. 2 and Table 2). Annual catch fluctuates within a range of 59,960 - 309,834 mt. By using purse seines as standard gears, annual CPUE showed a fluctuation between 1,790 and 4,011 kg/day.

Production of Indo-Pacific mackerel increased from 18,675 mt in 1984 to the peak of 66,985 mt in 1993 and decreased down to 46,945 mt in 1995. Catch rate showed an increasing trend but fluctuated in some period from the lowest of 237 kg/day in 1988 to the peak of 994 kg/day in 1993.

Round scad catch in overall view showed increasing trend but greatly fluctuated between 2,464 mt (in 1986) and 35,994 mt (in 1994). The annual CPUE showed a same fluctuation as the production trend, which varied from 102 to 646 kg/day during 1984 to 1995.

The annual production and CPUE of small tunas showed an increasing trend with a great fluctuation in some period, and production and catch rate shot up nine times in 1995 than in 1988.

Production of sardine showed slightly decreased from 41,641 mt in 1987 to 20,893 mt in 1992 and then increased abruptly to the peak of 54,849 mt in 1995. Annual CPUE indicated a same trend as production. Range of CPUE varied from 337 to 1,162 kg/day during 1984 to 1995.

**Table 1: Total catches and catch rates of commercial important pelagic fish in the Gulf of Thailand from 1994 - 1995.**

Species name/year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Standard gear
Indo pacific mackerel													
Total catch (mt)	99,638	97,852	88,768	92,155	88,822	92,688	68,160	55,186	88,308	68,025	73,727	105,323	
Catch rate (kg/day)	731	1,067	275	1,076	1,019	1,142	612	1,450	1,242	400	1,338	574	MEN
Indian mackerel													
Total catch (mt)	29,827	32,862	38,803	36,259	18,653	26,498	20,844	16,256	29,337	33,882	49,231	43,697	
Catch rate (kg/day)	187	240	213	185	61	122	58	86	108	140	278	165	SEINE
Round scads													
Total catch (mt)	27,475	25,667	23,947	41,838	14,015	17,267	10,676	22,747	42,525	46,286	38,394	54,633	
Catch rate (kg/day)	185	206	144	259	73	102	46	149	181	237	254	260	SEINE
Small tunas													
Total catch (mt)	69,355	81,200	90,225	96,131	141,274	124,899	156,208	137,869	157,163	106,797	99,811	86,863	
Catch rate (kg/day)	330	489	426	495	651	681	626	846	617	491	600	355	SEINE
Anchovies													
Total catch (mt)	88,804	103,101	57,959	55,466	65,675	94,315	118,727	110,020	120,211	116,648	97,343	115,718	
Catch rate (kg/day)	2,722	2,100	1,808	1,569	1,895	1,814	1,754	2,119	6,282	4,677	2,680	1,219	APS
Sardines													
Total catch (mt)	83,814	68,447	92,527	83,633	89,077	114,310	90,789	114,465	141,422	112,620	123,700	137,965	
Catch rate (kg/day)	494	520	523	430	410	624	360	730	583	575	795	634	SEINE
King mackerel													
Total catch (mt)	8,099	8,380	10,978	11,924	12,050	9,181	9,153	6,110	6,711	9,563	8,537	9,258	
Catch rate (kg/day)	89	93	99	92	82	78	83	87	83	94	98	84	KMG
Bigeye scad													
Total catch (mt)	23,061	17,174	18,728	22,978	11,931	12,063	19,972	15,451	21,851	19,581	37,080	36,449	
Catch rate (kg/day)	152	136	112	135	52	60	74	90	87	95	230	163	SEINE
Source: 1984 to 1994 (Saikliang and Boonragsa, 1997); 1995 (DOF, 1998 b)													

**Table 2: Total catches and catch rates of commercial important pelagic fish in the Andaman Sea 1984 - 1995**

Species name/year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Standard gear
Indo pacific mackerel													
Total catch (mt)	18,675	13,757	13,766	15,029	12,044	17,487	25,127	38,616	32,863	66,833	65,499	46,945	
Catch rate (kg/day)	507	593	548	362	237	366	378	461	667	994	715	731	SEINE
Round scads													
Total catch (mt)	16,777	8,025	2,464	14,276	17,747	22,330	22,559	23,982	8,434	8,984	35,994	22,981	
Catch rate (kg/day)	646	373	102	336	359	494	352	335	194	143	520	443	SEINE
Small tunas													
Total catch (mt)	7,369	5,594	3,392	6,261	4,845	4,695	6,883	14,256	11,903	40,784	31,182	42,611	
Catch rate (kg/day)	269	251	124	146	89	94	99	187	247	634	440	802	SEINE
Sardines													
Total catch (mt)	30,563	27,545	26,604	41,641	32,619	29,186	27,375	24,167	20,893	38,440	29,455	54,849	
Catch rate (kg/day)	995	1,162	1,098	905	660	632	427	337	450	596	418	1,041	SEINE
Total Pelagic													
Total catch (mt)	90,846	67,852	59,960	120,563	98,912	121,646	146,281	176,794	140,969	243,176	309,834	277,957	
Catch rate (kg/day)	2,812	2,754	2,316	2,263	1,790	2,397	2,152	1,888	2,029	2,835	2,916	4,011	SEINE

Source: 1984 to 1994 (Saikiang and Boonragasa, 1997); 1995 (DOF, 1998 b)

## 7. The Status of Pelagic Resources and Fisheries

The pelagic fishes resources in Thai Waters have been intensely fished during the past two decades. This is particular for the situation of both Indo-Pacific mackerel and small tunas, ones among the most economically important species caught in the Gulf of Thailand and the Andaman Sea. Purse seine is the most effective gear used for catching these target species, whereas it is also the multipurpose gear used for catching pelagic fishes in general. Therefore, this causes different effect on each stock and fishing ground. From the Gulf of Thailand, Chullasorn (1998) reported on the annual production, catch rate of standard gear, and standard fishing effort for small pelagic fish during 1972-1994. By applying Schaefer and Fox model to estimate the maximum sustainable yield (MSY) and the optimum fishing effort, the results

showed that mostly small pelagic fish have been over-fished, except hardtail scad and king mackerel (Table 3). For the latter species, this may be because they are widely migratory species while there is no high effective gear for catching them. As notified in the registration of CPS, the number of gears decreased in 1973 and there was no more record since 1977. This is because the fishermen have made changes and subsequently registered their gears in another type of purse seine. Including fishing ground of this gear has also been diminished by other gears destruction. Chullasorn (1998) reported on the situation of fisheries and showed overfishing tendency as respect to the number of fishing effort (number of vessel) of TPS, LPS and FAD. Toward the solution of this crisis, Chullasorn (1998) suggested that permission of the new license for purse seiner should be limited and enforcement a decreasing of number of vessel is 20 percent from to be registered at present. In the Andaman Sea, the stock of Indo-Pacific mackerel, which located in the lower part of the coast, and banded trevally (*Atule mate*) indicated overfishing. At the same time, the recovery of this stock seems to be improved. For Indian mackerel, round scad, sardines, small tunas, hardtail scad and bigeye scad have no definite the sign of over-fished (Table 4). Besides the former results that showed be useful considered concerning the status of pelagic resources and fisheries in the Andaman Sea such as the limited of fishing knowledge and efficiency of gear for Thai fisher into offshore fishery. And, changing of target species of pelagic fisheries have controlled by the status of resources and economic demand. The decreasing of fishing effort during Southwest monsoon is a result of rough sea. In addition, small pelagic fish are widely migratory species. They have a better chance to escape from one fishing ground to another. Base on these evidences, the statuses of pelagic resources are satisfactory in the Andaman Sea (Boonragsa and Boonsuk, 1998).

**Table 3** Catches and maximum sustainable yield of important pelagic species in the Gulf of Thailand.

Species	Catch from 1984-1995 (mt)	Average (mt)	MSY (mt)
Indo-Pacific mackerel <sup>1</sup>	55,186-105,323	84,888	84,500
Indian mackerel <sup>2</sup>	16,256-49,231	31,346	32,000
Round scads <sup>2</sup>	10,676-54,633	30,456	49,000
Small tunas <sup>2</sup>	69,355-157,163	112,316	111,000
Anchovies <sup>2</sup>	55,466-120,211	95,416	106,000
Sardines <sup>2</sup>	68,447-137,965	104,397	117,400
King mackerel <sup>2</sup>	6,110-12,050	9,162	12,400
Bigeye scads <sup>2</sup>	11,931-37,080	21,360	21,500
Pelagic fish <sup>2</sup>	286,109-661,686	500,247	594,400

Remark: <sup>1</sup> = Chullasorn, 1998 and MEN is standard gear by Schaefer's model.

<sup>2</sup> = Chullasorn, 1998 and PS is standard gear by Schaefer's model.

**Table 4** Catches and maximum sustainable yield of important pelagic species along the Andaman Sea.

Species	Catch from 1984-1995 (mt)	Average (mt)	MSY (mt)
Indo-Pacific mackerel <sup>1</sup>	12,044-66,833	30,553	23,765
Round scads <sup>1</sup>	2,464-35,994	17,046	15,728
Small tunas <sup>1</sup>	4,695-42,611	14,982	8,651
Sardines <sup>1</sup>	19,874-54,849	31,945	31,641
Pelagic fish <sup>1</sup>	56,474-286,509	154,566	136,602

Remark: <sup>1</sup> = Bhatuyasevi, 1997 and PS is standard gear by Schaefer's model.

## **8. MANAGEMENT OF THE PELAGIC FISHERIES**

Many groups of small pelagic fish have been subjected to fully exploitation and may be over-fished. This is because the rapid development and expansion of pelagic fisheries have been in the Gulf of Thailand and the Andaman Sea during the last two decades. It seems that the room for further fishery development is very scarce. Many scientists have reported their status and proposed to set up an appropriate measure to conserve, manage and control fishing operation with a view to harmonize fishing activities for the available potential resources. It is a known fact that without systematic management, monitoring, control, surveillance and rehabilitation, it will lead to greater conflict in their use. In order to conserve the marine fishery resources, the DOF of Thailand has set up various management measures through the Fisheries Act of 1901 which was consequently revised in 1947 and 1982 (Saikliang and Boonragsa, 1997). The regulations have been issued, with the objective of conserving marine fishery resources, include: determination of the size and kinds of fishing implements that are permitted in fisheries; prohibiting the use of certain types of fishing methodology in certain areas; establishing spawning and nursing seasons and areas of marine resources and prohibiting the use of certain types of fishing gear during there season and areas; mesh size regulation for purse seining, gill netting and lift netting; limiting the new entry of trawl and pelagic fisheries and ceasing to grant new trawl and purse seine licenses.

In the case of Phang-nga Bay, the conservation measures have established for the prohibit fishing of trawlers and push netters within a distance of 3,000 m in all year since 1979. For the breeding of Indo Pacific mackerel have been protected by closed seasons since 1985. In addition, the fisheries patrol have strictly on guard and fisher folk who alive surrounding in the Bay have also established the self-enforcement and implement since 1993(Chantawong *et al.*, 1996). After that the production of marine resources, especially Indo Pacific mackerel, has increasing from 300 kg/day in 1992 to 916 kg/day in 1997 caught by purse seiner (Boonragsa *et al.*, 1998).

## **8. CONCLUSION AND RECOMMENDATION**

The annual production of small pelagic fish in the Gulf of Thailand and the Andaman Sea varies from 286,109 to 675,904 mt and 10,800 to 309,834 mt, respectively during 1980-1995. It shared about 33 percent in total catch of both Coasts. Today, the productions of small pelagic fish are up 2 times in the Gulf and 26 times in the Andaman Sea, which compared from the pelagic production in 1980. Main species of small pelagic fish caught in Thai Waters are Indo-Pacific mackerel, Indian mackerel, round scad, small tunas, anchovies and sardines. Purse seine is the main fishing gears for catching small pelagic fish in Thai Waters, that consisted of LPS, TPS, TUN, GPS, FAD, CPS and APS operated extensively over the inshore and offshore along the coast. The fishing grounds are average depth of sea is more than 20 m in the Gulf and more than 40 m in the Andaman Sea. The fishing season have caught over the whole year, which the peak considered to be high during the Southwest Monsoon in the Gulf and Northeast Monsoon in the Andaman Sea.

Resulting from the rapid development and expansion of pelagic fisheries, it has effected a great pressure on the available resources in Thailand. It is clear that almost all of pelagic fish stocks have been fully exploited and some stock are subjected to overfishing. The catch composition is changing toward smaller size of fishes and less in values as clearly observed in sardine stock that over 40% have been used for fish meal production due to small size and unacceptable for caning factories (Saikliang and Boonragsa, 1997). It is anticipated that this situation will be continued in the future if an adequate countermeasure for fishery management, resource conservation and utilization have not been undertaken.

It is recommended that urgent management measure, including limitation of fishing effort through licensing system, mesh size regulation, fishing efficiency reduction regulation (such as light intensity limitation for luring purse seine), closed area and seasons during spawning and nursing season, quota system (such as limitation on quantity and size of fish that can be allowed to land) have to be issued and implemented. In order to receive a good success, monitoring, control and surveillance of those management has to be strictly practiced.

It is recognized that appropriate research used for generating management advises to the decision maker is very necessary. There are gap in knowledge on biological information still remained in many subjects of many species. It is noted that information on spawning areas, season, size at first maturity, life span, food and feeding, growth and mortalities of many species are still lacking. Besides, information on stock identification through various mean (morphometric, meristics, DNA analysis and tagging) of important pelagic species that are also very sparse. The study should focus on it is well known that the most important basic requirement in stock assessment is the statistics especially time series of catch and effort and size composition by species. Although the statistics particularly catch by species/group of species and its associated effort are available, its reliability is still the question. In using of such information, careful examination and cross check should be taken into consideration.

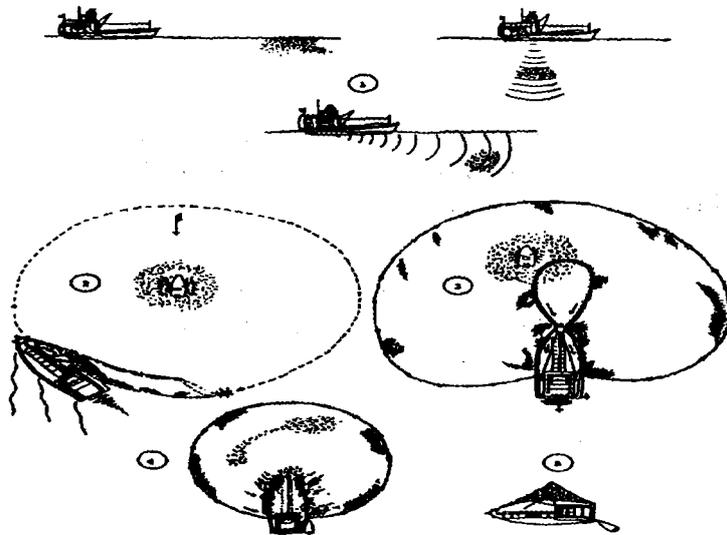
It is recommended that this problem has to be solved as soon as possible in order to have proper research plan in the right way.

## **9. References**

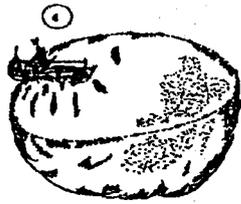
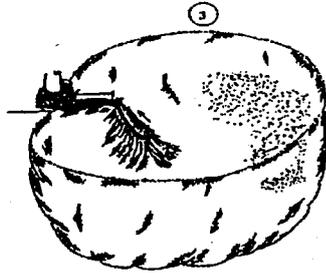
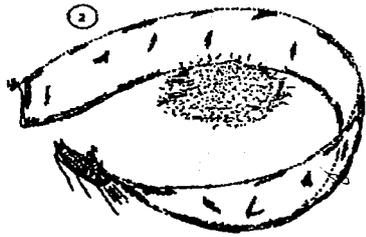
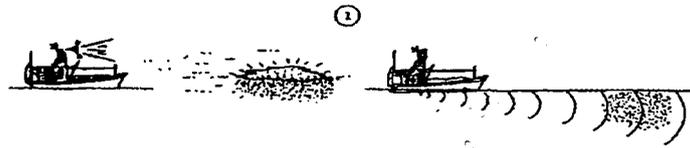
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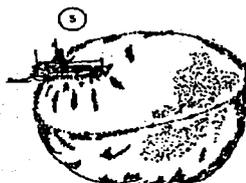
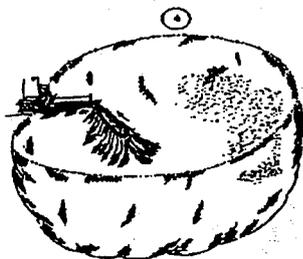
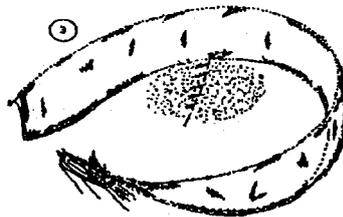
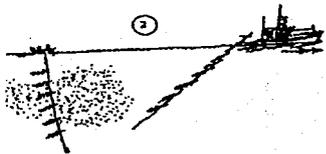
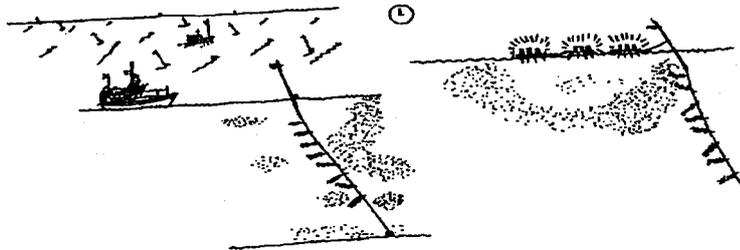
**Appendix 1. Fishing operation method of TPS (A), GPS (B), FAD (C), LPS (D), TUN (E) CPS (F) and APS (G) in Thai Waters (Munprasit and Muttavee, 1986).  
Symbol: 1-6 = step of fishing method of purse seine.**



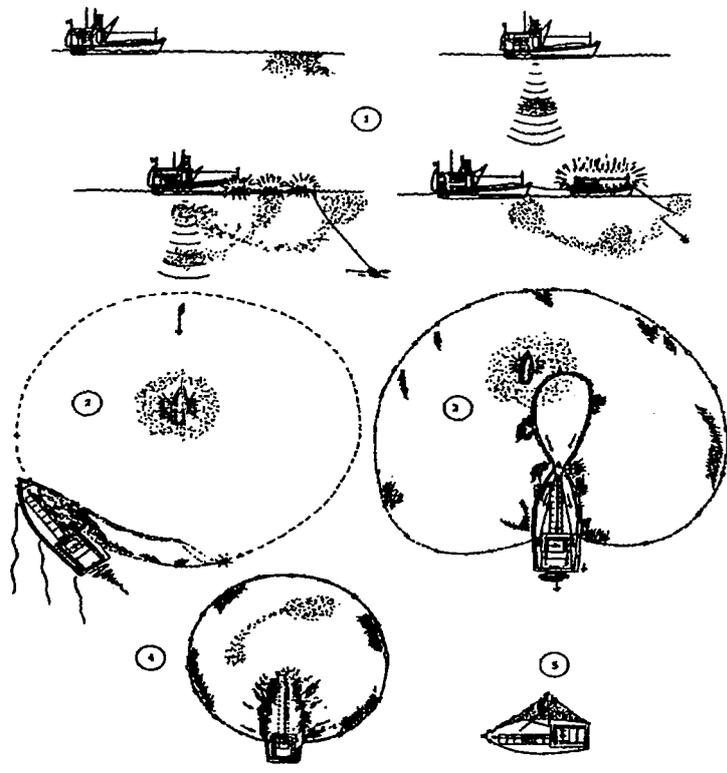
A



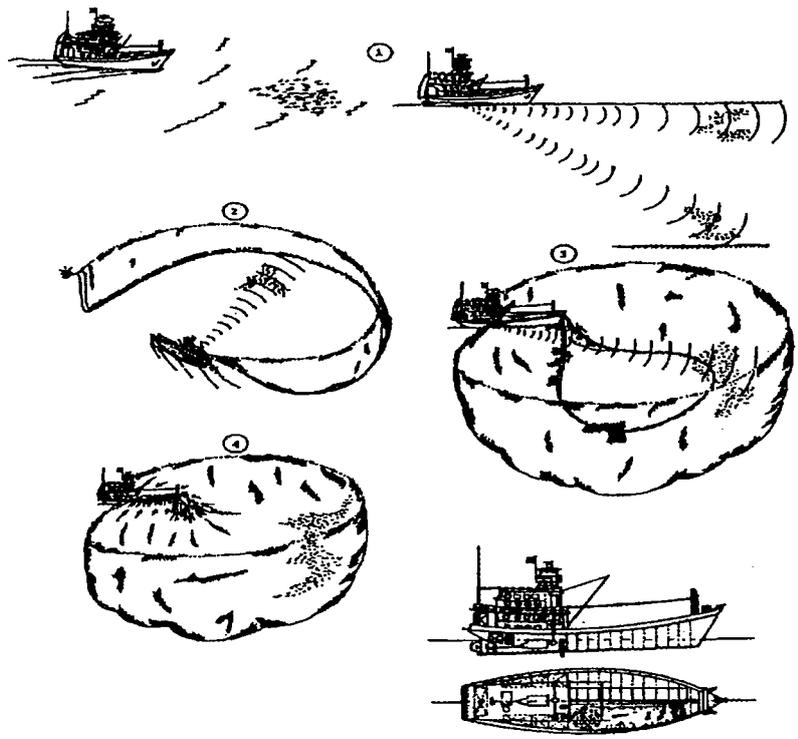
B



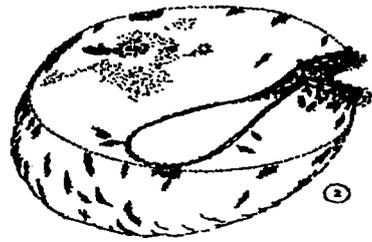
C



D



E



F



G