Tuna Landings in Phuket, Thailand, from 1993 to 1998.

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Introduction

Industrialised tuna fisheries were initiated in the Indian Ocean in 1952 by Japanese tuna longliners. These were followed by Korean and Taiwanese longliners. French, Spanish, Japanese, Mauritian and Russian purse seiners as from the mid-80s. A Japanese commercial purse seine fleet with 10 vessels, which formerly operated in the western Indian Ocean, moved to the eastern Indian Ocean in 1991. Their catches have been landed at Phuket deep-sea port since 1993. In addition, the Taiwanese longline fishery has developed remarkably in recent years in the eastern Indian Ocean. Large tuna caught by longline have fetched high prices on the Japanese sashimi market. These fleets landed their catch in Singapore, Malaysia and Indonesia before 1994. From 1994 onwards, the fleets moved their landings to Phuket fishing port in Thailand. Changes in their ports of landing were motivated by economic reasons, as Thailand has become the main frozen tuna market of the world. Advantages include a convenient infrastructure for transportation between the deep-sea port and the international airport.
Under these circumstances, updated evaluation of tuna fisheries data collection in Phuket, Thailand, is considered to be important and is reviewed below.

Data collection

Port-sampling and landing surveys have been conducted by the staff of Andaman Fisheries Development Center (AFDEC) on a monthly basis at two landing ports, namely Phuket deep-sea port since 1993 and Phuket fishing port since 1994 to collect fishing and biological data on tunas, including catch, effort, individual fork length and weight. Fishing effort is measured in number of days fished (purse seine) and number of trips (purse seine and longline). Landing data consist of information regarding the catch unloaded from the vessel. They usually include information concerning the vessel (name, flag, and registration number), the port of unloading, the vessel's agent in the port of unloading, the dates of unloading, and the amount unloaded (in number of fish and metric tonnes (t) for longline and t for purse seine), by species. Port sampling data include species composition and length samples taken as the catch is unloaded.

Pattern of tuna landing and transshipment

The total landings and value during 1994 were estimated to be 25,108 t and US$ 26.36 million. There was a slight decrease during the period from 1995 to 1997 and then a sharp increase to 34,032 t and US$ 41.32 million in 1998 (Table 1 and Fig 1). The increase in 1998 was due to European Community (EC) purse-seine fleets which unloaded at Phuket deep-sea port following a shift in their fishing grounds to the eastern Indian Ocean. The landings and value of the purse-seine fishery (including unloading by purse seiners, carrier and transhipment vessels) represented 82 to 98 percent of the total landings and 50 to 92 percent of the total value from 1994 to 1998. The pattern of landings and value for purse seiners was therefore similar to the total landing and value. The longline fleets have represented 3 to 18 and 7 to 50 percent of total landings and total value respectively. Longline landings and value showed a slight increase from 1994 to 1998.

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Table 1. Total landings (t) and value (US$ million) for purse seine and longline fleets in Phuket

Year	Total	Value	Purse seine		Longline		Period
			Total catch	Value	Total catch	Value	
1993	1,750	1.88	1,750	1.88			December
1994	25,108	26.36	24,486	24.29	622	2.07	PS (Jan-Dec)&LL(Aug-Dec)
1995	18,123	17.64	16,707	14.04	1,415	3.60	January-December
1996	16,599	23.06	13,697	12.85	2,903	10.21	January-December
1997	14,573	27.01	11,941	13.49	2,632	13.52	January-December
1998	34,032	41.32	31,017	29.32	3,015	12.00	January-December

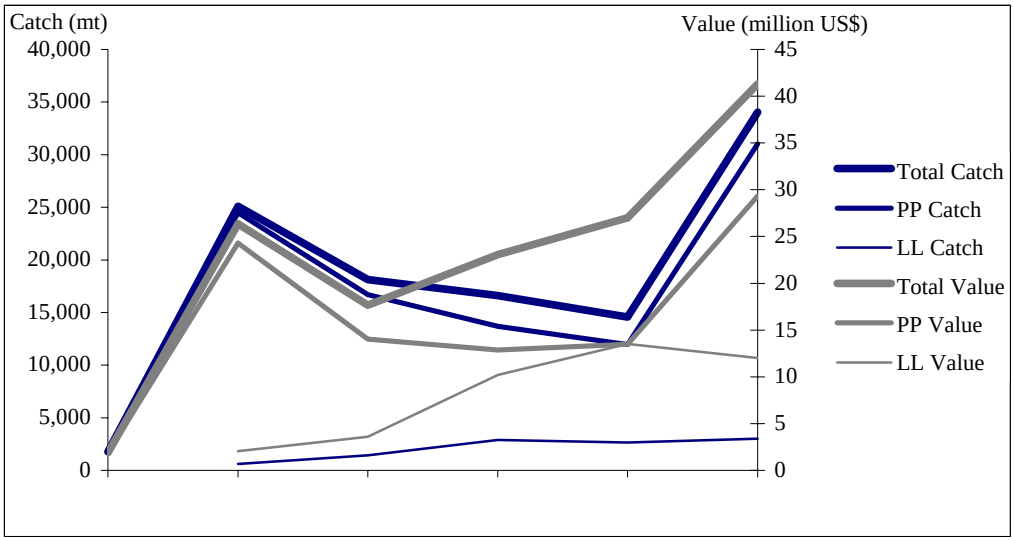

Fig 1. Total landings and value for purse seine and longline fleets in Phuket Province, Thailand.

PURSE SEINE

Japanese commercial purse-seine fishing started with 10 vessels in 1991 and became more concentrated in the Eastern Indian Ocean in 1993. Seven vessels used Phuket as their primary port of landing in 1993–1994 and three vessels did so in 1995. The vessels were steel hulled and 56-79 m in length. The dimensions of the seine net were 1,500-1,800 m long and 180-290 m deep. The fishing ground was roughly located from longitude 77°E to 98° E and from latitude 8° N to 12° S (Fig 2).

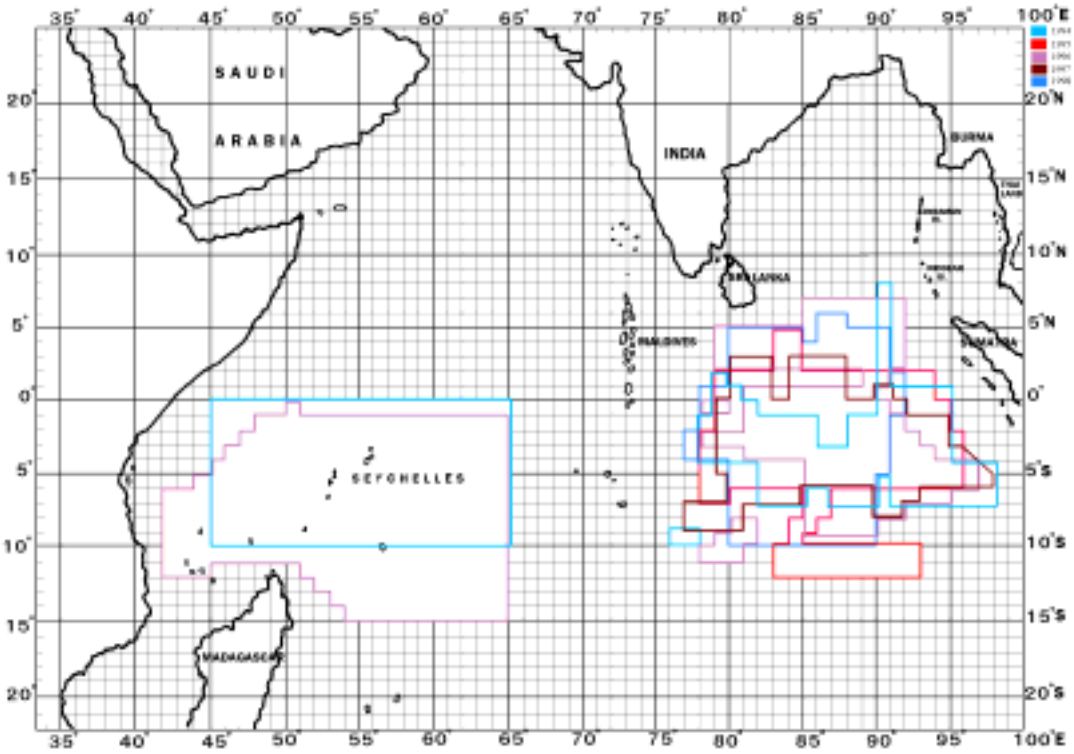

Fig. 2 Fishing ground of tuna purse seine fleets in the Eastern Indian Ocean.

Total catch, fishing effort and catch per unit effort (CPUE) during 1994 were estimated to be 22,748 t, 1,166 days and 19.51 t/day, respectively. The pattern of these indices showed a slight decrease from 1995 (16,707 t, 814 days and 20.52 t/day) to 1998 (6,884 t, 434 days and 15.86 t/day) in Table 2. Both monthly CPUE and fishing effort peaked from October to May, in the northeast monsoon season (Fig 3). The monthly catch and fishing effort in Fig. 3 show a peak from February to April in 1994 and November in 1994 to June in 1995. At that period, 7 purse seiners operated in the eastern Indian Ocean and landed at Phuket deep-sea port. Since 1996 only 3 vessels have been operated and landed in Phuket, giving a slight decrease in monthly catch and effort since then. The monthly variation of CPUE shows a similar trend to that of catch and effort during 1994 to 1996. This trend showed the highest peak from November in 1997 to February in 1998 that might be linked to the last ENSO phenomenon.

Table 2 Total catch (t), effort (days) and CPUE (t/day) for Japanese purse seiners landing at Phuket.

Month	1994			1995			1996			1997			1998		
	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE
Jan	1,717	81	21.20	3,314	115	28.82	2,115	114	18.55	1,360	99	13.74	450	20	22.50
Feb	1,568	123	12.75	2,570	108	23.80	1,700	75	22.67	564	76	7.42	2,050	90	22.78
Mar	2,855	150	19.03	1,600	58	27.59	1,744	90	19.38	1,101	64	17.20	1,859	96	19.36
Apr	1,073	80	13.41	-	-	-	625	74	8.45	-	-	-	500	21	23.81
May	1,340	80	16.75	2,411	152	15.86	-	-	-	175	25	7.00	350	41	8.54
Jun	1,807	102	17.71	760	27	28.15	520	31	16.77	880	52	16.92	705	56	12.59
Jul	1,052	84	12.52	1,350	69	19.57	350	38	9.21	841	80	10.51	-	-	-
Aug	1,022	81	12.62	250	29	8.62	180	23	7.83	-	-	-	-	-	-
Sep	1,060	50	21.20	939	50	18.78	1,100	70	15.71	-	-	-	-	-	-
Oct	3,340	115	29.04	1,791	93	19.26	1,320	72	18.33	1,100	80	13.75	225	34	6.62

Nov	3,155	110	28.68	550	23	23.91	1,428	62	23.03	1,270	42	30.24	-	-	-
Dec	2,759	110	25.08	1,172	90	13.02	2,015	75	26.87	2,160	60	36.00	745	76	9.80
Total	22,748	1,166	19.51	16,707	814	20.52	13,097	724	18.09	9,451	578	16.35	6,884	434	15.86

Symbol:' - ' = no landing.

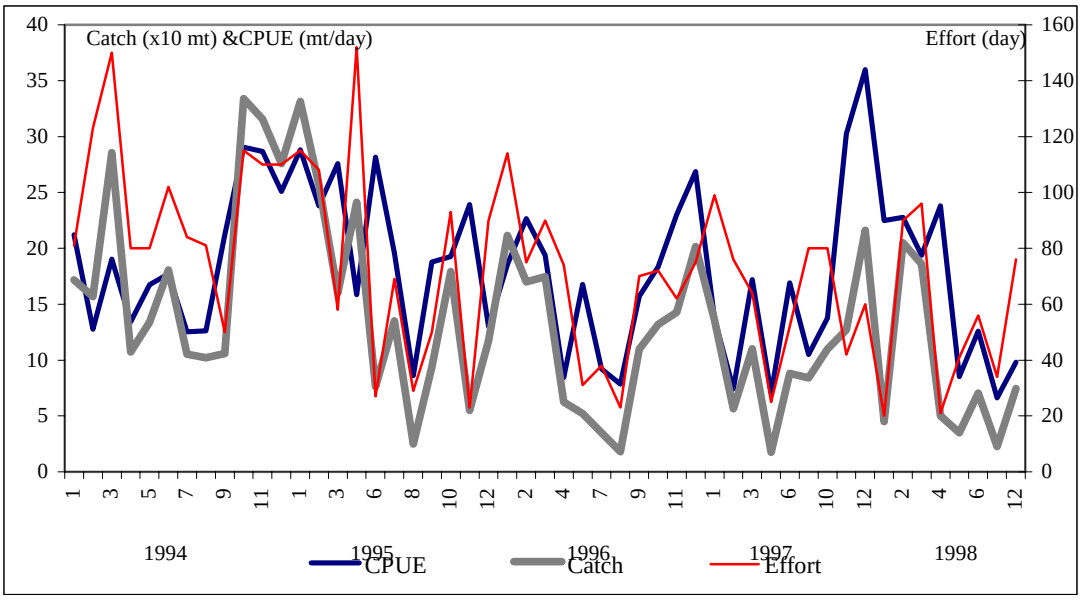

Fig. 3 Changes of total catch, effort and CPUE of Japanese tuna purse seine from 1994 to 1998.

The species composition of the Japanese purse seine catch was approximately 60 percent skipjack (*Katsuwonus pelamis*), 23 percent yellowfin tuna (*Thunnus albacares*) and an estimated 17 percent bigeye tuna (*T. obesus*). Chantawong (1998) reported the production peaks of skipjack tuna appeared in January, May and November while yellowfin was in February, June, September and October, and bigeye was in March and April and from June to October. An obvious increase of yellowfin and bigeye tuna production was observed in purse seine catches from 1995 to 1996 (Fig 4), because fish aggregating devices (FADs) were extensively used in fishing and shift of fishing ground from the Western Indian Ocean to the Eastern Indian Ocean (Okamoto *et al*, 1998). The trend of skipjack catch increased again during 1997 and 1998.

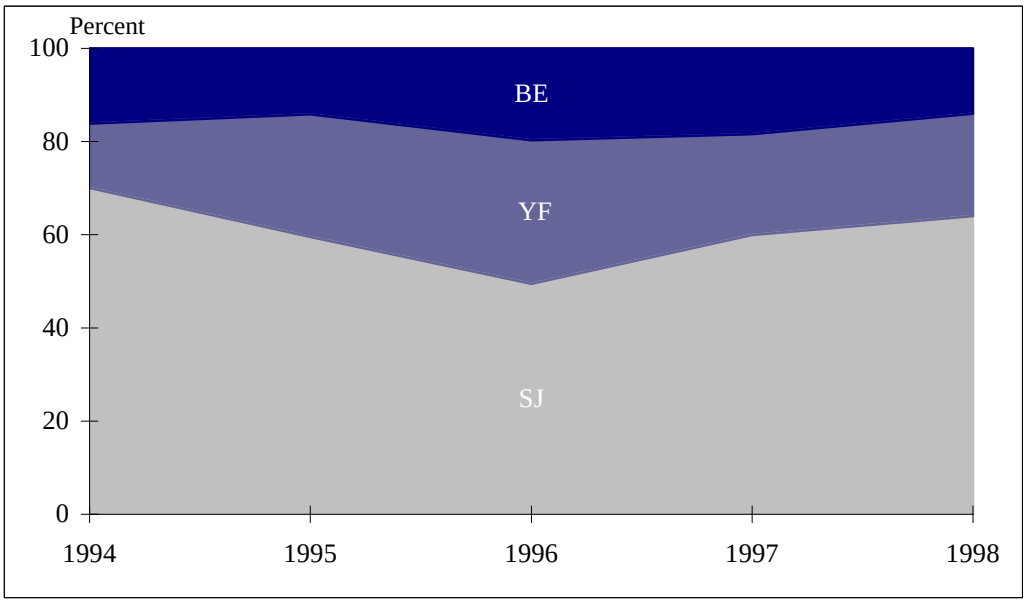

Fig. 4 Percentage of tuna catches by tuna purse seine fleet from 1994 to 1998.

EC and Flag of Convenience purse seine fleets landed fish by carrier vessels at Phuket deep-sea port in April and July 1994 (1,740 t), May 1996 (600 t) and September 1997 (1,100 t). The fishing ground was mostly located in the western Indian Ocean (Fig 2). In the period to December 1997, EC and Flag of Convenience purse seine fleets operated in the western Indian Ocean. Since then, 24 vessels have concentrated in the eastern Indian Ocean, in accordance with the movement of warm waters from the Pacific Ocean to the eastern Indian Ocean. During the latest ENSO, the collapse of CPUEs in the western Indian Ocean pushed the boats to survey the eastern basin where very good catches were recorded in relation to an abnormal rise of the thermocline induced by the ENSO (Marsac & Le Blanc, 1998). These tuna fleets have moved in and out the area depending on resource availability. An economic reason comes from savings in transportation costs as the catch which was landed at Phuket deep-sea port was sold to the southern Thai canneries, whereas those to Bangkok canneries or other overseas ports would have to be transhipped to carrier vessels. Table 3 illustrates the total landed catch. The transhipment of these fleets were 3,057 t and 20,751 t in 1998 from carrier and fishing vessels respectively. The fishing vessels were steel hulled, 61-82 m in length. The dimension of seines net were 1,500-2,500 m long and 200-450 m deep.

Table 3. Total catch (t) by European and Flag of Convenience purse seine fleets landed and transhipped at Phuket deep-sea port.

Year	Total landing	Total catch	Transhipmen	Total
1994	1,740	-	-	1,740
1995	600	-	-	600
1997	1,100	240	1,150	2,490
1998	241	2,816	20,751	25,064

Symbol:' - ' = no data.

The species composition of the catch of these fleets was estimated from port sampling and reported to the vessel agents. Species composition comprised mainly skipjack and small size (<10 kg) yellowfin and bigeye, although, these fleets targeted both on free swimming schools and fish associated with floating objects (such as logs and FADs). The large sized (> 10 kg) yellowfin and bigeye might have been separated on board. The small size of yellowfin and bigeye unloaded at Phuket deep sea port was that delivered to Thai canneries. The large sizes were transhipped to other canneries in Europe because of higher value than in Thailand

Thai commercial purse seine, Mukmanee, started and operated in the eastern Indian Ocean in November 1998 (Fig 2). The vessels were steel hulled, 61.51 m in length. The dimension of seine nets were 1,800 m long and 280 m deep. The first trip caught 325 t, from sets on FAD-associated schools. The fishing area was located from longitude 88° to 94°E and latitude 3° to 9°S (Fig 2). The species composition of the catch was 54 percent skipjack, 41 percent yellowfin and 5 percent bigeye.

LONGLINE

In 1994, a total of 200 Taiwanese conventional longliners fished in the eastern Indian Ocean and landed their catch at Phuket fishing port. The vessel size ranges were: about 85 % between 20-50 GRT, the rest ranging between 50-100 GRT. The carrying capacity (CC) recorded 4-15 t. The vessels were made of wood and fibreglass, 13-21 m in length. Monofilament lines were used with 600 to 1,500 hooks, depending on the size of the fishing boats and fishing conditions. The average number of hooks per basket was 4 and live milk fish and frozen squid were used for bait. Since 1996, a total of 20 Chinese longliners relocated from Micronesian waters to the eastern Indian Ocean and landed their catch at Phuket fishing port. These vessels were over 120 GRT and 7 t CC. The vessel are

45-50 m in length, made of steel and cement (deck made of wood).The mainline and branchlines are made of monofilament, the average number of hooks per basket was 4 to 10 and type of bait were same as Taiwanese fleet. The catches of these fleets are stored in ice. Their fishing grounds were located from latitude 14°N to 3°S and longitude 80° to 95°E (Fig 5).

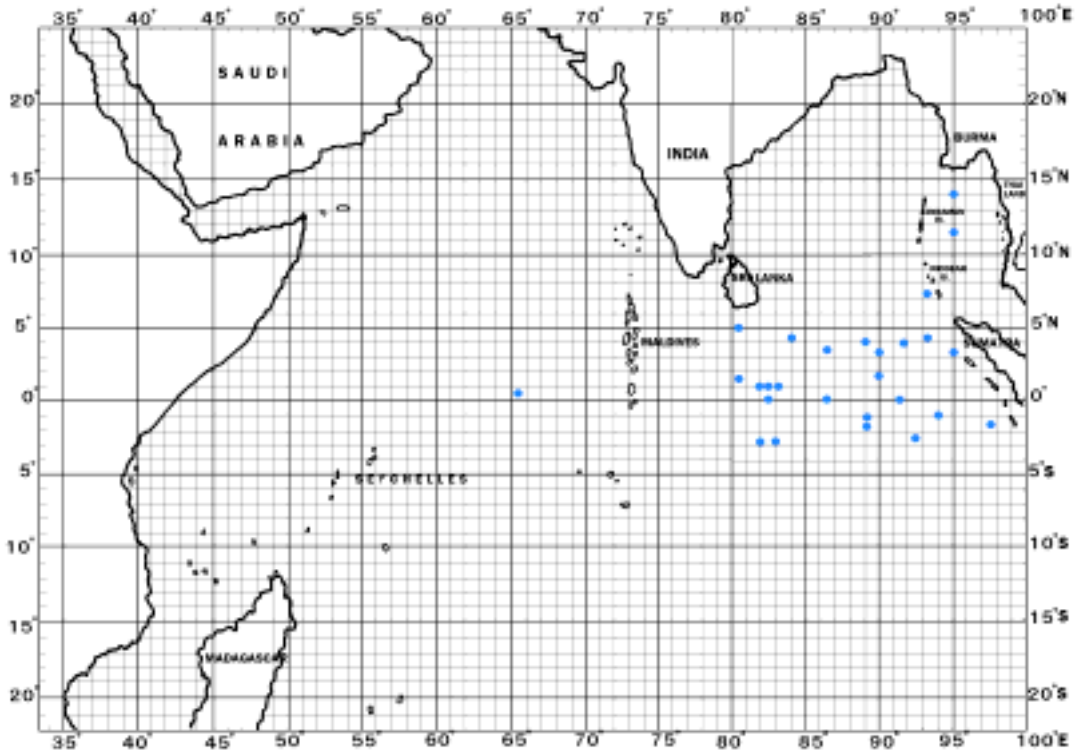

Fig. 5 Fishing ground of tuna longline fleets in the Eastern Indian Ocean.

The total catch during 1994 was estimated to be 622 t , which increased to 3,015 t (Table 1, Fig 1) landed from Taiwanese and Chinese longliners in 1998. The number of Taiwanese longliners increased from 66 vessels in 1994 to 95, 101, 152, 191 vessels by 1998. The number of Chinese longliners increased from 20 vessels in 1996 to 90 in 1997, then decreased to 33 in 1998. The monthly variations of CPUE, catch and fishing effort are reported in Table 4 and Fig. 6 from 1994 to 1998. The trend of monthly catch was at similar levels from 1995 to 1998, with an increases in fishing effort but a decrease in CPUE. These monthly indices indicated that the northeast monsoon season is the best fishing season for this gear.

Table 4 Fishing effort (no. of trips), catch (t) and CPUE (t/trip) for longliners landing in Phuket province from 1994 to 1998.

	Month	Effort	Total	YFT	BET	BILL	SWO	SHA	CPUE
1994	Aug	2	6	-	-	-	-	-	3.20
	Sep	1	4	-	-	-	-	-	4.00
	Oct	-	-	-	-	-	-	-	-
	Nov	14	89	-	-	-	-	-	6.38
	Dec	55	523	254	127	56	66	20	9.50
	Total	**72**	**622**	**254**	**127**	**56**	**66**	**20**	**8.64**
1995	Jan	25	295	204	43	29	20	0	11.81
	Feb	16	161	133	2	13	13	0	10.07
	Mar	5	24	20	1	2	1	0	4.84
	Apr	7	41	33	3	3	2	0	5.88
	May	6	25	20	1	2	2	0	4.18
	Jun	5	23	17	3	1	2	0	4.71
	Jul	6	36	21	7	3	5	0	6.08
	Aug	9	57	38	5	8	6	0	6.29
	Sep	7	21	11	1	6	3	0	2.94
	Oct	18	161	136	14	6	5	0	8.95
	Nov	35	223	149	22	25	22	5	6.38
	Dec	48	348	176	98	35	31	8	7.24
	Total	**187**	**1,415**	**958**	**200**	**133**	**113**	**13**	**7.57**
1996	Jan	49	561	201	270	35	45	10	11.44
	Feb	49	439	161	172	39	50	17	8.96
	Mar	50	287	144	79	31	28	5	5.75
	Apr	30	221	65	102	26	22	6	7.35
	May	17	53	35	7	7	3	1	3.11
	Jun	26	103	55	22	8	18	0	3.92
	Jul	31	111	71	10	24	6	0	3.62
	Aug	58	167	87	44	28	8	0	2.89
	Sep	53	138	31	32	23	52	0	2.58
	Oct	58	100	41	12	17	20	10	1.72
	Nov	64	226	39	83	50	54	0	3.54
	Dec	82	497	108	132	138	119	0	6.06
	Total	**567**	**2,903**	**1,038**	**965**	**426**	**425**	**49**	**5.12**
Year	Month	Effort	Total	YF	BE	BILL	SWO	SHA	CPUE
1997	Jan	100	499	192	73	123	111	0	5.00
	Feb	90	522	202	143	91	86	0	5.80
	Mar	77	394	135	119	77	63	0	5.11
	Apr	50	309	88	91	66	64	0	6.17
	May	34	110	59	42	3	6	0	3.24
	Jun	8	34	21	11	2	0	0	4.17
	Jul	6	32	20	6	4	2	0	5.37
	Aug	12	35	21	11	3	0	0	2.96
	Sep	14	37	14	18	2	3	0	2.58
	Oct	44	114	76	15	14	8	1	2.59
	Nov	46	179	129	25	9	16	0	3.91
	Dec	77	367	181	122	31	24	9	4.77
	Total	**558**	**2,632**	**1,138**	**676**	**425**	**383**	**10**	**4.72**
1998	Jan	54	362	231	118	9	3	1	6.70
	Feb	97	492	271	194	21	6	0	5.07
	Mar	86	445	408	22	11	4	0	5.17
	Apr	51	232	195	28	6	3	0	4.54
	May	28	113	103	8	1	1	0	4.01
	Jun	23	90	86	3	0	1	0	3.92
	Jul	38	156	148	8	0	0	0	4.14
	Aug	48	177	163	11	2	1	0	3.69
	Sep	28	137	110	5	8	14	0	4.87
	Oct	29	109	82	2	7	18	0	3.80
	Nov	55	269	238	10	14	7	0	4.89
	Dec	118	433	400	23	5	5	0	3.67
	Total	**655**	**3,015**	**2,435**	**432**	**84**	**63**	**1**	**4.60**

Symbol:' - ' = no data; YFT = yellowfin, BET = bigeye; BILL = billfish; SWO = swordfish; SHA = sharks

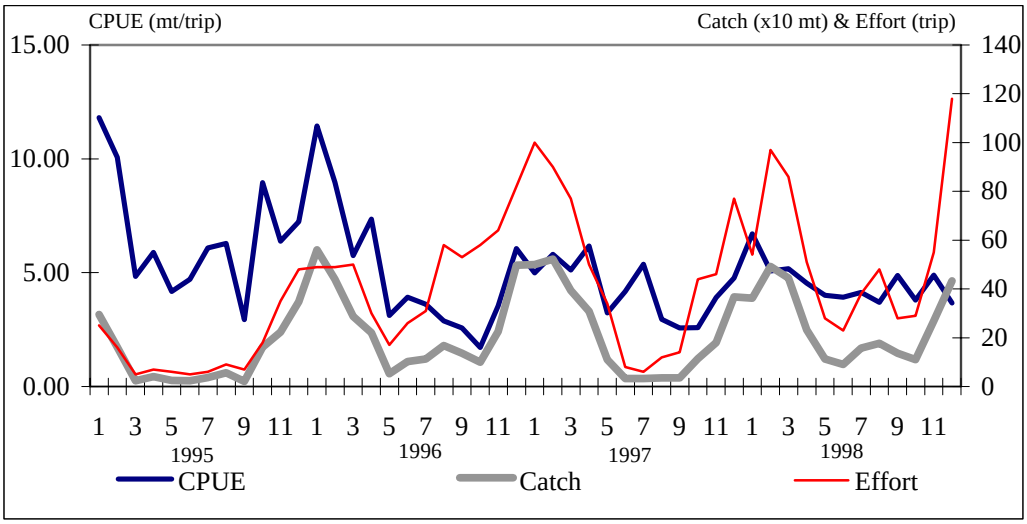

Fig.6 Changes of CPUE (t/trip), catch (t) and fishing effort (trips) of the longline fleets from 1995 to 1998.

The overall species composition from 1995 to 1998 of the catch was 56 percent yellowfin, 23 percent bigeye, 20 percent bill fish (*Makaira* spp., *Tetrapturus* spp, *Istiophorus* spp.) and swordfish (*Xiphias gladius*) and 1 percent requiem sharks(*Carcharhinus* spp). Tuna composition showed a decreasing trend in yellowfin tuna from 1995 to 1996, while an increasing trend was observed in bigeye tuna, billfish and swordfish. An increasing trend of yellowfin catch showed again during 1997 and 1998 (Fig 7). The production peaks for yellowfin appeared in March, May and October, bigeye in December, January, April, June and September, billfish in July, August and December and swordfish in September, December and June (Changtawong *et al*, 1998).

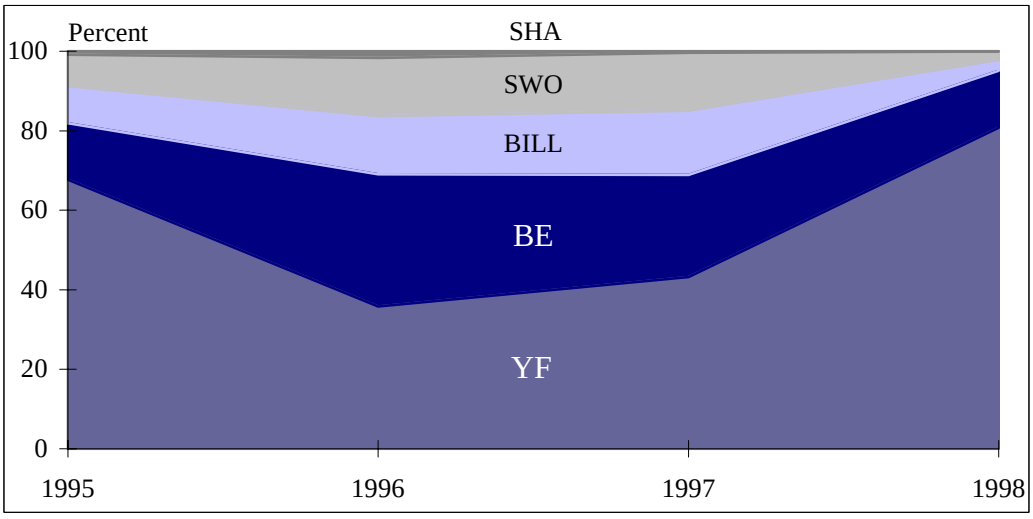

Fig. 7 Percentage of tunas and bill fish catch by longline fleets in 1995 to 1998.

Conclusion

Since the start of industrial purse seine fishery landings at Phuket deep-sea port in December 1993 and the start of conventional longline fishery landings at Phuket fishing port in August 1994, catch, effort and CPUE have expanded considerably. Landing surveys were made to collect fishing and biological data for tunas.

PROBLEMS ENCOUNTERED AND RECOMMENDATION

However, there seem to have been some problems in connection with data collection and statistics which include:

1. Difficulties in obtaining the length-frequency data for some months due to time limitation for sampling at the fishing ports (such as tuna and billfish for foreigner fleet, etc.).
2. Possible errors in identifying the tuna species due to many different local names being recorded in the vessel agent and transhipment documents (such as small size (<10 kg) of yellowfin and bigeye for foreigner fleets, etc.).
3. The confusion for the species identification of billfish (such as *Makaira* spp., *Tetrapturus* spp. and *Istiophorus* spp.) for foreigner longliners.
4. The lack of logsheet of foreigner longliner unloading at Phuket fishing port; only interview data have been taken from the export company and masterfishermen. The data collection system for longliners has to be better established, so that all data users (such as IOTC) researchers and fishermen may be satisfied.
5. The need for cooperation in data collection and statistics between the flag country and country of the port where the fish are unloaded or transhipped (such as the supply of logsheet for foreigner tuna purse seine and longliner fisheries in the eastern Indian Ocean).

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