TUNA PURSE SEINE LANDINGS IN PHUKET, THAILAND, FROM 1993 TO 2001[1]

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ABSTRACT

Since the start of the industrial purse seine and longline fishery landed at Phuket fishing port in 1993 and in 1994 have expanded considerably in terms of catch, effort and CPUE. Landing surveys were made to collect fishing and biological data of tunas.

The annual landing and value of tunas at Phuket, Thailand, varied from 1,750 mts and 1.88 million US$ to 34,032 mts and 41.32 million US$ during 1993 to 2001. The trend of catch and value were a slight decrease during 1995 to 1997 when was a sharp increase in the 1998, and was an acute decrease during 1999 to 2001, whereas changed number of purse seiner and tuna resource available in the Eastern Indian Ocean.

The pattern of catch, effort and CPUE for Japanese surface fisheries were the slight decrease from 1995 (16,707 mts, 814 day and 20.52 mts/day) to 2001 (2,620 mts, 216 day and 15.86 mts/day). The peaked of fisheries pronounced to be in the North-East monsoon season. The monthly variation of CPUE showed a similar trend as that of catch and effort during 1994 to 1996. And this trend showed the highest peak from November in 1997 to February in 1998 that should be linked to the last ENSO phenomenon. EC and convenient purse seine fleets landed and unloaded at Phuket deep-sea port by carrier vessels during 1994 to 2000. In 1998, number of 24 vessels had concentrated in the East Indian Ocean, which is in accordance with the ENSO phenomenal. The species composition of purse seine fleets catch comprise skipjack (62 % of Japanese fleet, 63 % of EU fleet) as the main target, followed by yellowfin (22 % and 30 % of Japanese and EU fleets, respectively) and bigeye (16% and 7 % of Japanese and EU fleets).

Thai commercial purse seine, Mukmanee, had operated with FAD-associated schools in the Eastern Indian Ocean during 1998 to 2001, which estimated total catch and CPUE as 1,566 mts, 7.99 mts/day; 1,713 mts, 24.47 mts/day and 762 mts, 15.24 mts/day, respectively. Skipjack (68%) was also the main composition of her, followed by yellowfin (20%) and bigeye (12%).

INTRODUCTION

Tuna fisheries in the Indian Ocean was initiated in 1973 by tuna longliners, tuna purse seiners and pole-and-line vessels operated by the French, Russian, Japanese and Taiwanese. A Japanese commercial purse seine fleet with 10 vessels, which formerly operated in the Western Indian Ocean, started to operate in the Eastern Indian Ocean in 1991. Their catches have been landed at Phuket deep-sea port since 1993. Change in their ports of landing were desired due to economic reasons, 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, especially tuna purse seine in Phuket, Thailand, is considered to be important and is reviewed below.

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MATERIAL AND METHOD

Port-sampling and landing surveys have been conducted to collect fishing and biological data of tunas, e.g. catch, effort, species composition, 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. The amount unload was collected in whole weight for purse seine and processed weight for longline in metric tonnes(mts) and value of all production was reported in million US$. Fishing effort of purse seine is collected in number of days-fished, landing data consist of information regarding the catch unloaded from the vessel during 1993 to 2001. 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 total catch.

Logsheet data for purse seine have been established and developed since 1999. This data include information related to fishing trips and fishing operation. The trip data can include details about the vessel to the dates and ports of departure and return, and also to effort (such as the number of set per trip for purse seine, etc.). The operational data includes the data and time of the operation, the location, the retained catch of target species and other information relating to the operation (such as the school association for purse seine set, etc.).

The data of landing survey, port-sampling survey and logsheet used together to estimate annual catches by the purse seine fleet.

Nominal catch and value, catch by species and effort were analyzed and illustrated by Excel, Access and ArchView software.

RESULT AND DISCUSSION

Pattern of tuna landing and transshipment

The total landings and value of tuna fisheries (purse seine and longline) during 1994 were estimated to be 25,108 mts and 26.36 million US$. There was a slight decrease during the period from 1995 to 1997 and then a sharp increase to 34,032 mts and 41.32 million US$ in 1998, since then, the trend of total landing and value were decreased again during 1999 to 2001 (Table 1 and Fig 1). The increasing of total landing 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 transshipment vessels) represented 82 to 98 percent of the total landings and 50 to 92 percent of the total value from 1994 to 1998. Since then, the trends of total landing and value decreased to 7,642 mts and 14.68 million US$ in 2001. Cause of number of vessel and trip decreasing were 7 vessels and 19 trips in 1999 to 2 vessels and 7 trips in 2001. The pattern of landings and value for purse seiners was therefore similar to the total landing and value. The longline fleets have represented 2 to 56 and 8 to 82 percent of total landings and total value respectively. Longline landings and value showed a slight increase from 1994 to 2001.

Table 1. Total landings (mts) and value (million U$) for purse seine and – longline fleets in Phuket Province, Thailand.

Symbol:' PP ' = Purse seine, 'LL'=Longline.

			Purse seine		Longline		
Year	Total	Value	Total catch	Value	Total catch	Value	Period
1993	1,750	1.88	1,750	1.88	-	-	December
1994	25,108	26.36	24,486	24.29	622	2.07	PP (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
1999	13,404	21.01	9,031	6.55	4,373	14.46	January-December
2000	9,423	13.58	6,305	3.77	3,118	9.81	January-December
2001	7,662	14.69	3,382	2.62	4,280	12.07	January-December

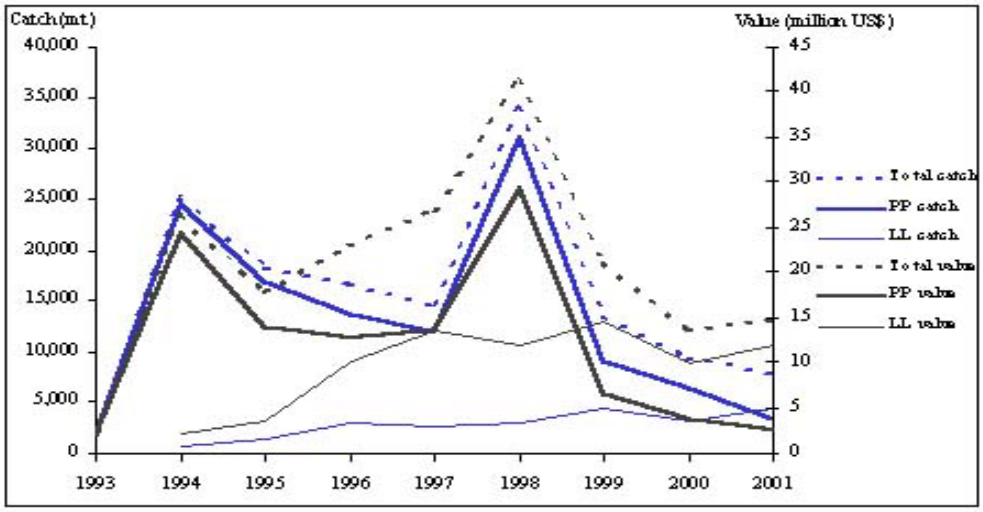
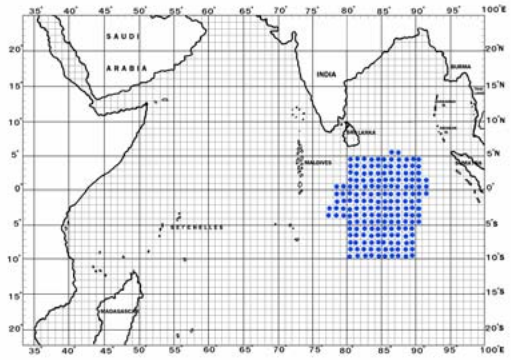


Fig. 1. Total landings and value for purse seine and longline fleets in Phuket Province, Thailand.

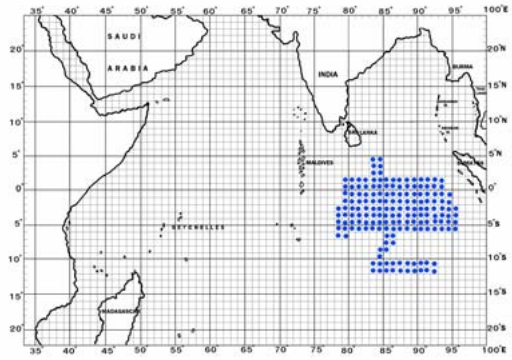
Japanese fleet

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, three vessels did so in 1995. The vessels were steel body 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 during 1994 to 1997 was roughly located at Eastern Indian Ocean from longitude 77°E to 98° E and from latitude 8° N to 12° S (Fig 2).

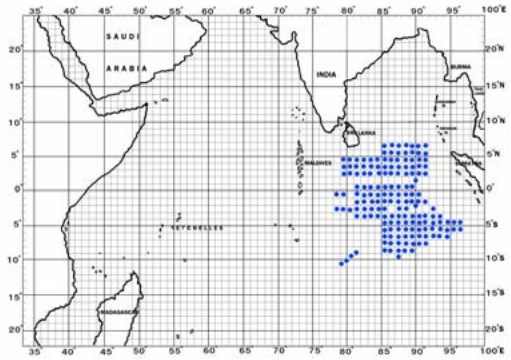
1994



1995



1996



1997

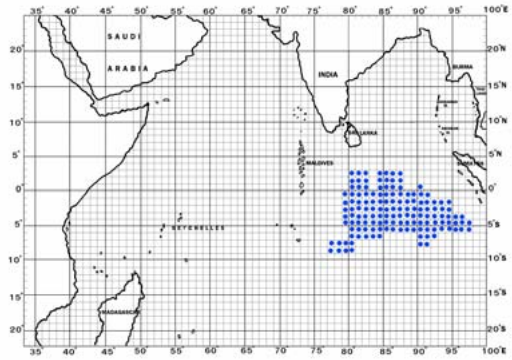
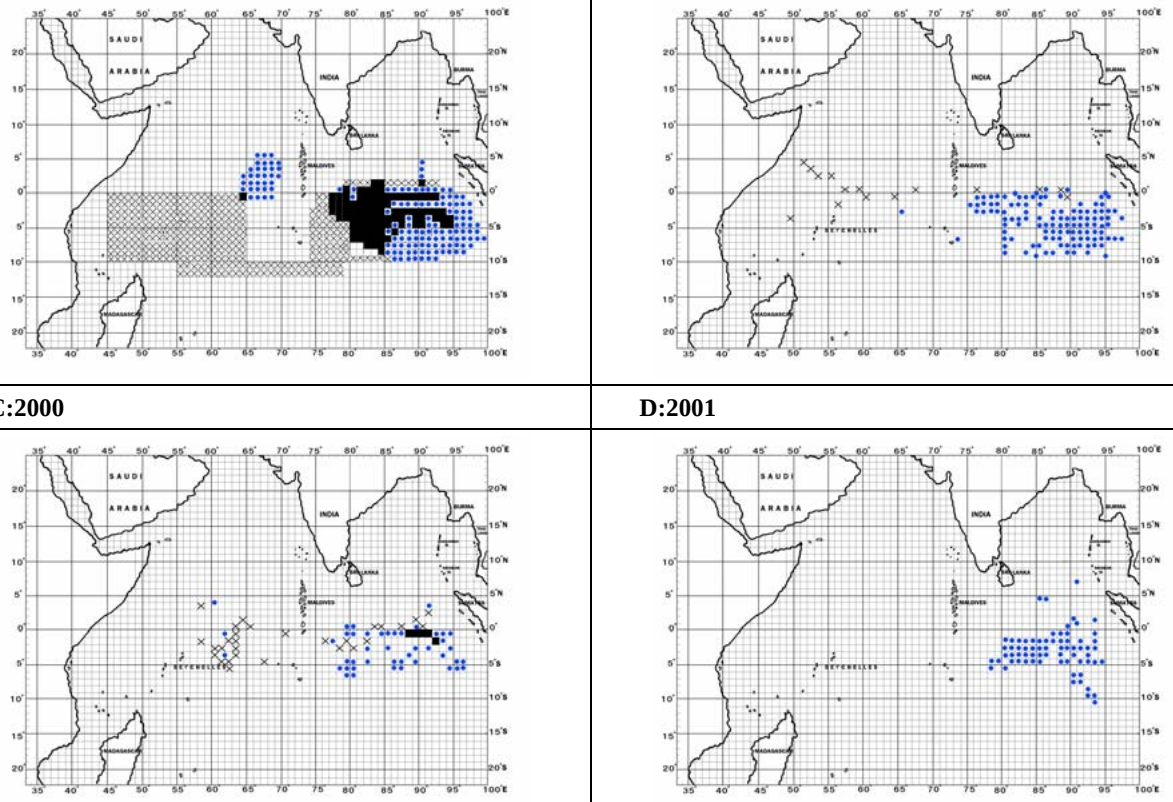


Fig.2 Fishing ground of purse seiners in the Indian Ocean during 1994-1997.

Total catch, fishing effort and catch per unit effort (CPUE) during 1994 were estimated to be 22,748 mts, 1,166 day and 19.51 mts/day, respectively. The pattern of these indices were the slight decreased from 1995 (16,707 mts, 814 day and 20.52 mts/day) to 2000 (3,747 mts, 297 day and 12.62 mts/day) however in 2001, only CPUE (15.86 mts/day) increased again (Table 2). Furthermore, number of vessel decreased from 3 vessels in 1995 to 1 vessel in 2001. Fig 3 showed fishing ground of Japanese purses seine during 1998 to 2001, mostly have operating in the Eastern Indian Ocean and rarely in the Western Indian Ocean during 1999-2000. Regarding the monthly variation of catch and fishing effort in Fig 4 showed the higher peak from February to April in 1994 and November in 1994 to June in 1995 than those forward years, cause of decreasing number of vessel during 1995 -1996. And this trend showed the highest peak from November in 1997 to February in 1998 that was linked to the last ENSO (El Nino-Southern Oscillation) phenomenon in the Indian Ocean (Marsac and Le Blanc, 1998; 1999). Since then, the indices showed the decreasing trends until January 2000, only CPUE increased as 27.63 mts/day after that the trends decreased again as catch, effort and CPUE in December 2001 equaled 700 mts, 45 days and 15.56 mts/day, respectively. Talking in to account, monthly variation of catch indices show the higher peak during October to March (North-East monsoon) that confirmed a previous study and reported similar result (Chantawong *et al.*, 1998).

A:1998 **B:1999**



C:2000 **D:2001**

Fig.3 Fishing ground of tuna purse seiner fleets (cycle = Japanese fleet, cross =EU fleets, black square = Japanese and EU fleets) in the Indian Ocean from 1998 to 2001 (A to D)

Table 2 Total catch(mts) effort (days) and CPUE (mts/day) by Japanese purse seiner landed at Phuket Province, Thailand.

Year	Catch (mts)	Effort (days)	CPUE (mts/day)
1994	22,748	1,166	19.51
1995	16,707	814	20.52
1996	13,097	724	18.09
1997	9,451	578	16.35
1998	6,884	434	15.86
1999	5,562	380	14.64
2000	3,747	297	12.62
2001	2,620	216	15.86

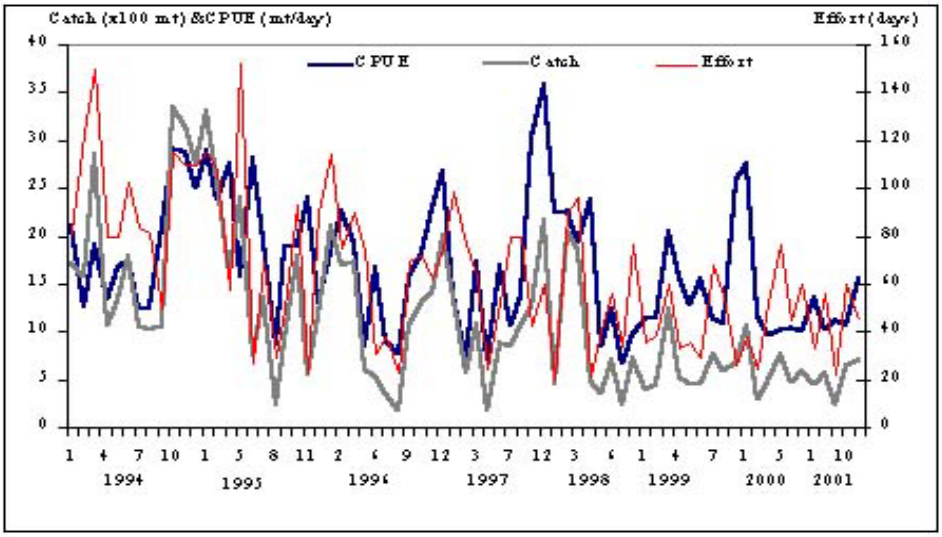


Fig. 4 Monthly changes of total catch, effort and CPUE of Japanese purse seiner from 1994 to 2001.

The species composition of Japanese purse seine catch was approximately 62 percent for skipjack (*Katsuwonus pelamis*), 22 percent for yellowfin tuna (*Thunnus albacares*) and an estimated 16 percent for 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 to October, and bigeye was in March, April and June to October. Tuna composition showed a decreasing trend of skipjack when an increasing trend of yellowfin and bigeye tuna occurred and vice versa. An obvious increase of yellowfin and bigeye tuna production was observed in purse seine catches from 1995 to 1996 (Fig 5), 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). And, the trend of skipjack catch was increased again during 1997-1999 and in 2001.

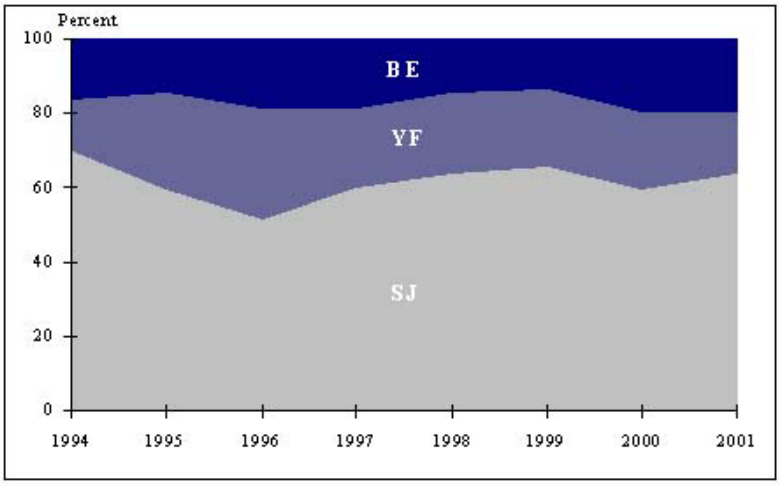


Fig. 5 Catch composition (SJ=skipjack,YF=yellowfin, BE=bigeye) by Japanese purse seiner from 1994 to 2001.

EU fleet

EC and convenient fleets landed and unloaded at Phuket deep-sea port by carrier vessels in April and July 1994 (1,740 mts), May 1996 (600 mts) and September 1997 (1,100 mts). Fishing ground was located roughly in the Western Indian Ocean. Period to December 1997, EC and convenient purse seine fleets had operated in the Western Indian Ocean. Since then, a number of 24 vessels has concentrated in the East Indian Ocean, fishing ground illustrated in Fig. 3A. The collapse of tuna production in the Western Indian Ocean pushed the boats in surveying the

Eastern basin where very good catches were recorded in relation to an anomalous thermocline and upwelling condition induced by the ENSO (Marsac and Le Blanc, 1998; 1999). These tuna fleets have moved in and out the area depending on resource availability. Including, economic reason is transportation expenses. In case of the expenses is concerned, the catch had been sold to the southern part of Thai canneries which were landed at Phuket deep-sea port, whereas those to Bangkok canneries or other overseas ports, they would be transshipped at sea through carrier vessels. The fishing vessels were steel body with 61-82 m in length. The dimension of seines net were 1,500-2,500 m long and 200-450 m deep. Table 3 illustrated their total landing catch (such as carrier and fishing vessels) and transshipment of these fleets are 3,057 mts and 20,751 mts in 1998. After that period, the tuna production found only total catch from fishing vessels during 1999-2000 as 2,158 and 900 mts, respectively. Mostly, their vessels moved to fishing in the Eastern Indian Ocean during November to March where fishing ground showed in Figs 3B and 3C. In 2001, no landing was recorded at Phuket. Species composition of EU fleet from 1999-2000 as skipjack (63%) was the main target species, followed by yellowfin (30 %) and bigeye (7 %).

Table 3. Total catch (mts) by EC and convenient fleets and carrier landed and transshipped at Phuket deep-sea port, Thailand.

Symbol:' - ' = no data.

Year	Total landing	Total catch	Transshipment	Total
1994	1,740	-	-	1,740
1995	600	-	-	600
1997	1,100	240	1,150	2,490
1998	241	2,816	20,751	23,808
1999	-	2,158	-	2,158
2000	-	900	-	900

Tuna composition comprised mainly skipjack and small size (<10 kg) of yellowfin and bigeye during 1997-1998. Although, these fleets have targeted on free swimming schools and fish associated with floating objects (such as logs and FADs). Then the large size (> 10 kg) of yellowfin and bigeye might be separated on board after post harvest. The small size of yellowfin and bigeye unloads at Phuket as deep-sea port as that supported and delivered to Thai canneries. As for the large size transshipped to other canneries in Europe, cause of the higher price than Thai canneries. Species composition of this fleets reported skipjack (51.18 %) as target species, followed by yellowfin (19.17%) and bigeye (3.49%) from 1999 to 2000.

Thai Fleet

Thai commercial purse seine, Mukmanee, had operated in the Eastern Indian Ocean during November 1998 to June 2001. Since then, this vessel haven't operated, cause of suffering loss in business. The vessels were steel body with 61.51m in length. The dimension of seines net were 1,800 m long and 280 m deep. The formal fishing method used purse seine with fish aggregating devices (FADs). Total catch, fishing effort and CPUE from 1999 to 2001 reported as 1,566 mts, 196 days, 7.99 mts/day; 1,713 mts, 70 days, 24.47 mts/day; 762 mts, 50 days, 15.24 mts/day, respectively. Fig 6 showed distribution of catch rate (mts/set) each successful cruise of Mukmanee where fishing ground located from longitude 79° to 98° E and from latitude 5° N to 11° S, in the Eastern Indian Ocean. Cruise no 9 caught the highest tuna production while cruise no 10 showed the lowest tuna catches. Monthly catch rate fluctuated with out any trend of fishing season, which due to changing of master fishermen and uncompleted condition of vessel. The species composition of catch was 68 % (60-77%) skipjack, 20% (12-27 %) yellowfin and 12% (11-13%) bigeye from 1999 to 2001.

CONCLUSION

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

The annual landing and value of tunas at Phuket, Thailand, varies from 1,750 mts and 1.88 million US$ to 34,032 mts and 41.32 million US$ during 1993 to 2001. The trend of catch and value were fluctuated during 1993 to 2001 whereas total landing of purse seine unloaded at this port, mostly their fleets had fishing ground in the Eastern Indian Ocean. Usually, in this area has abundance of tuna less than in the Western Indian Ocean. Rare free swimming school of tuna, FADs will be properly for catching in this area. Even though, during ENSO phenomenal occurred, the Eastern Indian Ocean was the higher productive area than the Western Indian Ocean, the fleets caught tuna with FADs as a typical fishing method. The main composition of tuna is skipjack, follow by yellowfin and bigeye, respectively. Regarding, catch indices (catch, effort and CPUE) of each fleet can plot out EU fleet which is the highest efficiency than Japanese and Thai fleets, their will move and operate around the Indian Ocean upon available of tuna resource abundance. Including this fleet has good experience for free school tuna catching. The result in present study, the peak of tuna purse seine fishing in the Eastern Indian Ocean pronounces during North-East monsoon.

PROBLEMS ENCOUNTERED AND RECOMMENDATION

However, it seems to have some problems in connection with data collection and statistics these include.

1. Difficulties in obtaining the length frequency data for some months due to time limitation at the fishing ports(such as tuna for foreigner fleet, etc.).

2.The data collection and statistics address of tuna should have cooperated between the nation fleet and the nation port have been unloaded or transshiped (such as logsheet for foreigner tuna purse seine fishery in the Eastern Indian Ocean).

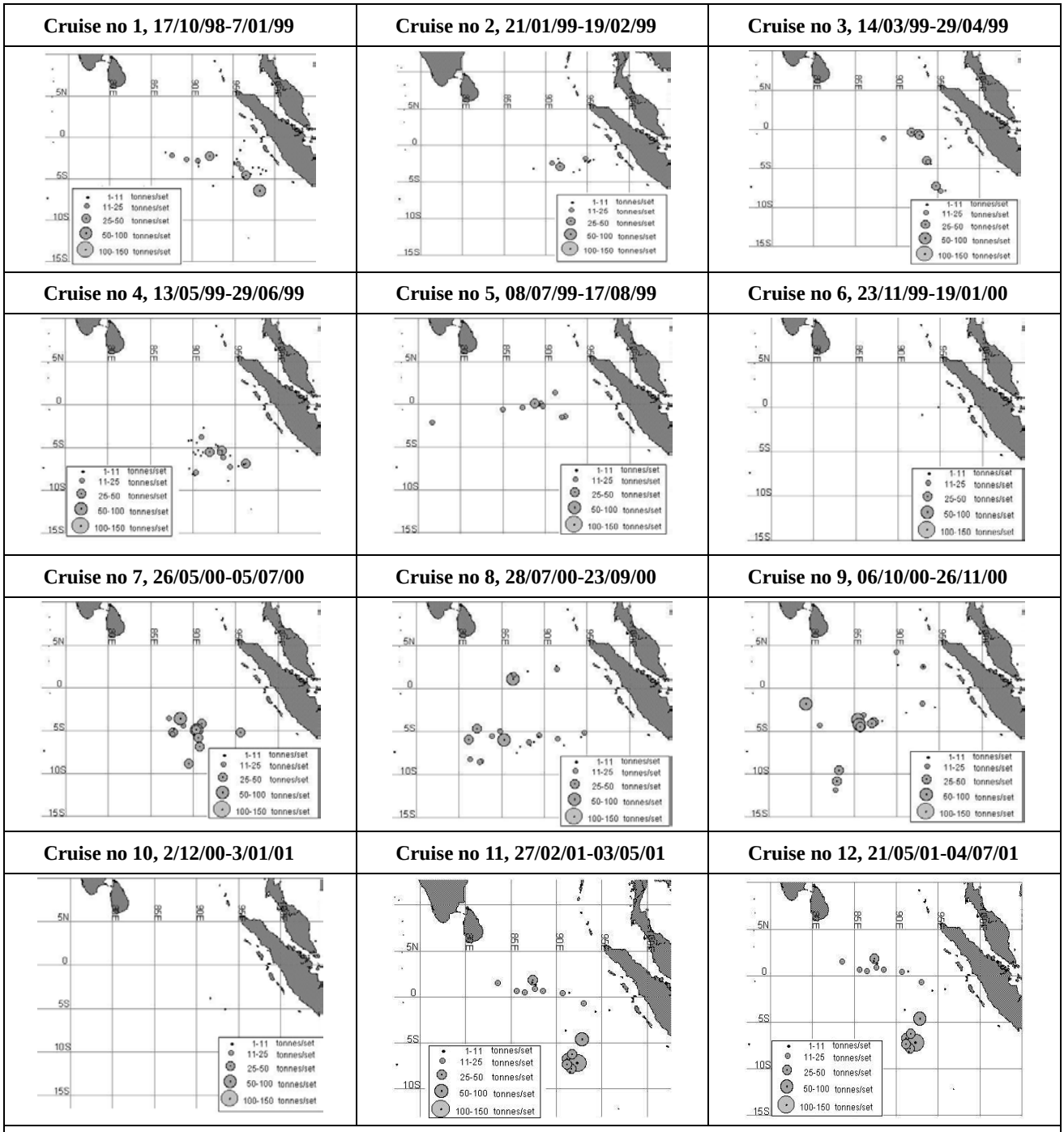


Fig. 6 Fishing ground of Thai tuna purse seiner in the Eastern Indian Ocean from 1998 to 2001.

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