

DATA COLLECTION ON SHARK FISHERIES IN THAILAND

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1. INTRODUCTION

The growing concern of international community focuses on the control of shark harvesting in the global fisheries. Recently, FAO has adopted the International Plan of Action for the Conservation and Management of Shark (IPOA of shark). FAO urged the coastal states to adopt management measures on shark fisheries and other fishing activities i.e. gillnet, trawl, longline, purse seine, etc. These capture fisheries have been recognized that sharks and their relatives (skates, rays and chimeras) were found as by-catches or incidental catch.

To strengthen the conservation on the utilization of shark for sustainable fisheries based on the IPOA of shark 2002, Department of fisheries has initiated to establish the draft National Plan of Action for the shark security and harmonized with this International Plan of Action. But not yet finished.

However, the unprogressive of shark conservation and management policy is due to current status of shark fisheries in Thailand are limit. Information on catch composition, catch, effort, landing and some biological data such as distribution, maturity stage, etc. are scarce and inadequate.

To formulate appropriate policy for shark management in Thailand and to maintain the food security policy for regional people, effective implementation on shark data collection is needed to be done which aiming to provide preparation of the accurate basic information for shark management.

Three fishing areas have been chosen as sampling sites. The selected sampling sites in the Gulf of Thailand were Samut Prakhon province and Songkhla province and in The Andaman Sea was Phuket province. Data collection has been carried out by the research centers under Marine Fisheries Research and Development Bureau, Department of Fisheries. The expected outcome of this project is to gather and analyze data for figure out the present situation of shark. These all of comprehensible knowledge about shark will be used as a basic tool for establishment of the National Policy on Shark Conservation and Management that has to be harmonized and relevant to the IPOA of shark 2002 and CITES COP13.

2. OBJECTIVES

1. To conduct the surveys on shark capture fishing gears and methods, including the incidental catch in Thailand.
2. To build up dataset of shark fisheries in Thailand including landing site .
3. To investigate sexual maturity of shark species in Thailand.
4. To study on shark utilization processes since capture from the sea to post harvest step including market mechanism on shark trading in Thailand.

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3. METHODOLOGY

In order to collect the information data on current status of shark fisheries in Thailand, three main landing sites has been chosen. Project timeframe was set up to 1 year. Progress of the project had to be report every quarter. Final report would be sent to committee in the last quarter. Data collection and scientific research will be conducted in four quarters. Project activities have been divided into 2 parts:

Part 1: Establishment of study frame work and survey method.

Consultation meeting between the core staffs, i.e. national coordinator, project coordinator, project advisor and fisheries scientist who take responsible for the data collection at the selected site will be conducted at phase I. Outcome of the consultation meeting are in following:

- 1.1 Developing and publishing standard method of shark classification in taxonomic level and field sheet on identification of shark species, as a manual for fisheries scientists who in charge with this project and fishermen.
- 1.2 Training program of shark biology and classification by experts from Kasetsart University will be held for training project's enumerators and fisheries scientist.

Part 2: Conduct of survey and data collection

The survey and data collection will be managed by fisheries scientists and enumerators from the 3 marine fisheries research and development centers i.e. 1) the Upper Gulf Marine Fisheries Research and Development Center 2) Southern Marine Fisheries Research and Development Center and 3) Andaman Sea Marine Fisheries Research and Development Center. Fisheries scientists and enumerators will be assigned to collect the data and cooperate with the fishermen. Landed shark will be sampled for biological investigation.

4. CURRENT MANAGEMENT POLICY

Department of Fisheries of Thailand has implemented various regulations through the Fisheries Act of 1947, revised in 1953 and 1985. However, there are no existing management policies which concerning to shark, except a whale shark species (*Rhincodon typus*). The important regulations of this Act are as follows:

- The Department of Fisheries of Thailand has established the regulations to prohibit fishing by trawlers and push netters within a distance of 3,000 m from the shoreline and within a perimeter of 400 m of any stationary gear.
- The number of new entry trawler is limited and push netter is banned.
- A conservation area in the Gulf of Thailand about 26,000 km² is declared to protect fish during their spawning and breeding seasons from February 15 to May 15 each year. This regulation prohibits all types and sizes of trawlers except beam trawlers, all type of purse seiner and encircling gill netters with less than 4.7 cm mesh size in area along the coastline of Prachuap Khirikhan Chumphon and Surat Thani as well as Khanom District in Nakhon Sri Thamarat. And this regulation was extended to the Andaman Sea by declaration of 1,800 km² in Phangnga and Krabi

5. RESULTS

5.1 General Description

The biggest shark landing sites in the gulf of Thailand are Samut Prakhon province and Songkhla province while Phuket province is the biggest landing site in The Andaman sea (Fig.1).

Although, there were many kinds of the fishing boats landed in sampling site such as pair trawler, otter board trawler, gill netter, push netter and purse seiner, but the data collection on shark fisheries in Thailand were only recorded from otter board trawler and pair trawler which are the main fishing gears for catching shark. However, Sharks caught from these two gears are only 0.19 percent of total fish landing.

Otter board trawler is operated both in day time and night time consisting of 2 hauls of day time and 2 hauls of night time operation. (Table1) Each haul take 5 hours in a period. Pair trawler also operated both in day time and night time which operated 2 hauls in day time and 1 haul in night time operation. Hauling period of pair trawler take 5 hours per haul in day time and 8 hours per haul in night time. While enumerators collected data at the landing site, biological investigation of shark were also collected.(Fig 2-3).

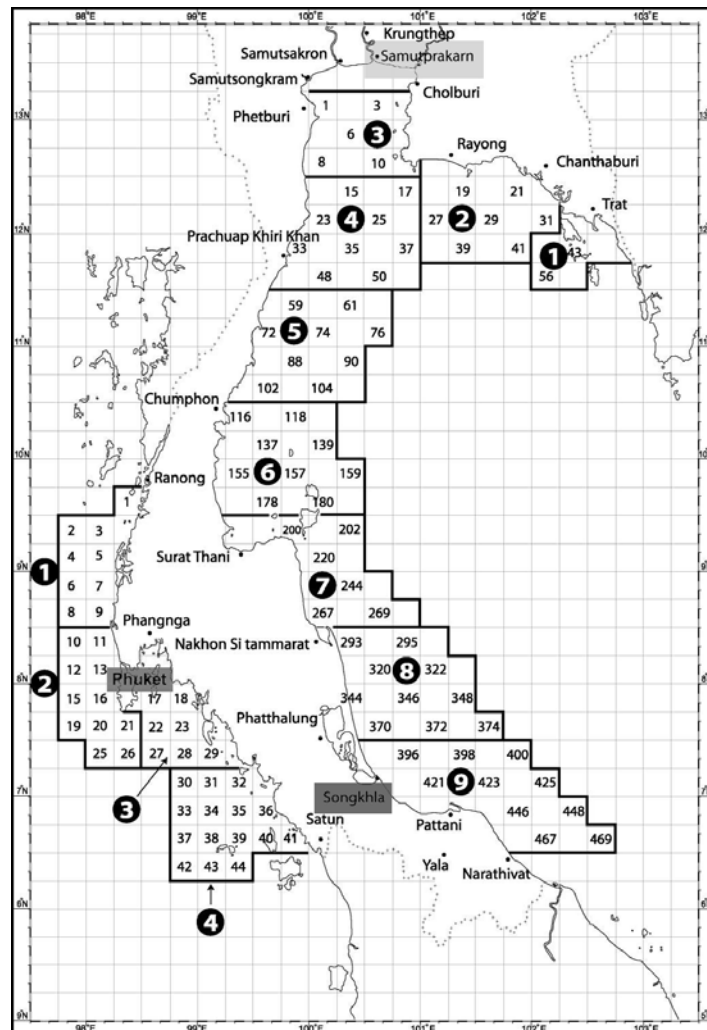


Figure1. Landing site

Table 1 Fishery structure and landing site description

Fishing gear	Size of boats (m)	No. of Crews	Fishing grounds	Landing site	Characteristics of fishing
Pair trawl - Samut Prakhan	16-23	16-20	Phetchaburi, Prachuap Khirikhan	Klong Dan sub-district Bang Poo district Samut Prakhan	Operated - day: 2 haul (5 hr./haul) - night:1 haul (8 hr./haul)
- Songkhla	12-18	10-12	Songkhla, Pattani, Nakhon Sithammarat	Songkhla, Pattani, Nakon Srihammarat	Operated - day: 3 haul (4 hr./haul) - night:1 haul (7 hr./haul)
- Phuket	16-22	16-20	Ranong, Phangnga, Phuket and Kabi	Ratsada subdistrict Muang district Phuket	Operated - 4-5 haul/day (4 hr./haul)
Otter Board Trawl - Samut Prakhan	-	-	-	-	-
- Songkhla	12-18	4-6	Songkhla, Pattani, Nakhon Sithammarat	Songkhla, Pattani, Nakhon Sithammarat	Operated - day: 2 haul (5 hr./haul) - night:2 haul (5 hr./haul)
	16-22	6-7	Off shore Indonesia, Malaysia	Songkhla, Pattani, Nakhon Sithammarat	Operated - day: 2 haul (5 hr./haul) - night:2 haul (5 hr./haul)
- Phuket	19-22	10	Ranong, Phangnga, Phuket and Krabi	Ratsada subdistrict Muang district Phuket, and Fish Marketing Organization	Operated - 4-5 haul/day (4 hr./haul)

During the first to fourth quarter of this project, enumerators had collected data from 823 fishing boats in the Gulf of Thailand (587 pair trawlers, 226 otter board trawlers, 5 gill netters, 3 hook and line, 1 push netter and 1 purse seiner) and 295 fishing boats in the Andaman Sea (127 pair trawlers and 168 otter board trawlers). Annual data showed the shark catch in the Gulf of Thailand were 8,315.82 kg or 0.10 percent whereas in the Andaman Sea were 13,547 kg or 0.44 percent of the total catch. From the result it could be concluded that the catch of shark was only 0.19 percent of the total landing in Thai waters (Table 2). In general, it could be implied that shark is not the target species of fisheries in Thai waters.

For the offshore fisheries, two types of fishing gears i.e. pair trawler and otter board trawler were selected as target fishing gear for shark's data collecting as well as in near shore fisheries. Both kinds of fishing gears are operated in the Arafura Sea (southern part of Indonesian) under Indonesian government license. There are about 440 vessels of fishing vessel size more than 20 m in this area. Fishing vessels do not land all catch themselves. Therefore carrier vessels have an important role in transportation of catch from fishing boat to market. There are 40 carrier vessels with capacity 1,000-3,000 ton per vessel. These can be classified to carrier vessels not more than 1,000 ton which engaged to 5-6 fishing boats while carrier vessels more than 1,000 ton engaged to 10-15 fishing boats. One trip for carrier vessel is 30 days long. Enumerator had collected data from 16 carrier vessels and 51 fishing boats; the data showed that shark catch were 16,234.50 kg or 0.39 percent of total catch. (Table 2)

Table 2. Shark production from variety fishing gears

	Production (in kg)												number of boats
	Shark		Ray		Shark+Ray		Non-Shark Catch		Shark and non-shark		%		
	production	%	production	%	production	%	production	%	production	%			
Gulf of Thailand													
Pair Trawl	6,534.40	0.09	3,984.30	0.05	10,518.70	0.14	7,592,789.50	99.86	7,603,308.20	100	587		
Fish Gill Net	86.50	0.52	-	-	86.50	0.52	16,480.50	99.48	16,567.00	100	5		
Otter Board Trawl	982.92	0.14	3,460.80	0.48	4,443.72	0.62	715,217.98	99.38	719,661.70	100	226		
Hook and Line	211.00	9.05	-	-	211.00	9.05	2,120.00	90.95	2,331.00	100	3		
Push Net	1.00	0.52	0.60	0.31	1.60	0.83	190.40	99.17	192.00	100	1		
Purse Seine	500.00	4.76	-	-	500.00	4.76	10,000.00	95.24	10,500.00	100	1		
sub-total Gulf	8,315.82	0.10	7,445.70	0.09	15,761.52	0.19	8,336,798.38	99.81	8,352,559.90	100	823		
The Andaman Sea													
Pair Trawl	471.00	0.03	628.00	0.04	1,099.00	0.07	1,568,773.00	99.93	1,569,872.00	100	127		
Otter Board Trawl	13,076.00	0.87	46,265.00	3.08	59,341.00	3.95	1,443,996.00	99.05	1,503,337.00	100	168		
Sub-total The Andaman Sea	13,547.00	0.44	46,893.00	1.53	60,440.00	1.97	3,012,769.00	99.03	3,073,209.00	100	295		
Total in Thai water	21,862.82	0.19	54,338.70	0.48	76,201.52	0.67	11,349,567.38	99.33	11,425,768.90	100	1,118		
Otter board trawl	1,317.00	0.21	4,855.00	0.79	6,172.00	1.00	608,750.00	99.00	614,922.00	100	51		
Carrier vessel	14,917.50	0.42	24,131.50	0.68	39,049.00	1.10	3,516,827.76	98.90	3,555,876.76	100	16		
Total outside Thai water	16,234.50	0.39	28,986.50	0.69	45,221.00	1.08	4,125,577.76	98.92	4,170,798.76	100	67		
Total	38,097.32	0.24	83,325.20	0.53	121,422.52	0.78	15,475,145.14	99.22	15,596,567.66	100	1,185		

5.2 Catch of Shark and ray from fisheries statistic in 1995-2002

Total catch of sharks in Thai waters from fisheries statistical gazette, Department of Fisheries (year 1995-2002) showed catch of shark in the Gulf of Thailand up to 55.73% and 44.27% in the Andaman Sea.(Table 3) Average catch in the Gulf of Thailand were 5,201 tons. Otter board trawler is the maximum shark fishing gear (4,765 tons) followed with pair trawler (275 tons) and other fishing gears (153 tons). Average shark catch in the Andaman Sea was 4,132 tons. Otter board trawler is the maximum shark fishing gear with 3,209 tons followed with pair trawler (898 tons) and other fishing gears (28 tons).

Ray's production in the Gulf of Thailand was 59.66% and in the Andaman sea was 40.34%. Otter board trawler is the maximum rays fishing gear 6,353 tons followed with pair trawler 511 tons and other fishing gears 142 tons. Average ray catch in the Andaman Sea was 4,736 tons. Otter board trawler is the maximum shark fishing gear with 3,433 tons followed with pair trawler 796 tons and other fishing gears 508 tons. .(Table 4)

From sharks and rays fisheries statistical year 1995-2005 showed main fishing gears of shark and rays were otter board trawler and pair trawler.

Table 3. Catch of Shark (ton) from fisheries statistic in the Gulf of Thailand and Andaman Sea (1995-2002)

Year	Gulf of Thailand				Andaman				Total in Thai water
	OBT	PT	Other	Total	OBT	PT	Other	Total	
1995	2,429	233	150	2,812	1,873	648	4	2,501	5,313
1996	2,781	294	85	3,160	2,873	1,738	4	4,615	7,775
1997	2,640	279	75	2,994	2,847	1,776	-	4,623	7,617
1998	2,945	268	93	3,306	3,601	742	88	4,431	7,737
1999	6,060	174	68	6,302	3,008	773	35	3,816	10,118
2000	6,834	254	45	7,133	3,346	548	12	3,906	11,039
2001	5,938	267	580	6,785	3,848	470	43	4,361	11,146
2002	8,558	430	130	9,118	4,278	487	35	4,800	13,918
Avg.	4,765	275	153	5,201	3,209	898	28	4,132	9,333
Percent	51.06	2.95	1.64	55.73	34.38	9.62	0.3	44.27	100

Note: OBT: Otter board trawler, PT : Pair trawler

Table 4. Catch of ray (ton) from fisheries statistic in the Gulf of Thailand and Andaman Sea (1995-2002)

Year	Gulf of Thailand				Andaman				Total in Thai water
	OBT	PT	Other	Total	OBT	PT	Other	Total	
1995	5,692	446	310	6,448	2,400	672	448	3,520	9,968
1996	4,247	464	192	4,903	3,004	1,287	784	5,075	9,978
1997	4,628	441	45	5,114	2,973	1,319	946	5,238	10,352
1998	3,708	345	51	4,104	2,979	632	574	4,185	8,289
1999	7,140	370	81	7,591	3,373	776	539	4,688	12,279
2000	8,108	558	140	8,806	3,817	626	401	4,844	13,650
2001	7,214	677	156	8,047	4,364	524	197	5,085	13,132
2002	10,089	786	159	11,034	4,555	530	171	5,256	16,290
Avg.	6,353	511	142	7,006	3,433	796	508	4,736	11,742
Percent	54.11	4.35	1.21	59.66	29.24	6.78	4.32	40.34	100



Figure 2. Shark landing at the landing sites



Figure 3. Weighing and measuring of catch in laboratory and in field survey

5.3 Quantity and value of shark import-export

From Customs Department's statistics indicated that shark frozen flesh export was not conducted every years. Since year 2001-2004, Thailand exported shark frozen flesh only in year 2001 and 2002. During 4 years, Total amount of shark frozen flesh export from Thailand was 114,131 kg. This exported value was 1,671,851 Baht. All of shark frozen flesh was only export to Singapore. Shark frozen was imported from 8 countries. Import quantity and value were 509,890 tons and 23,911,980 Baht respectively. Major shark importer is USA (37.09%) followed with Spain (23.20%) and Norway (19%)..(Table 5,6).

For dried shark fins import and export statistics from Customs Department since year 1997 to September 2004, Thailand has exported dried shark fins to 22 countries over the world with 467,488 kg in quantity and 419,833,623 Baht in value. .(Table 7,8) Hong Kong is the main importer of dried shark fins from Thailand 54.82% both in quantity and value follow with Sri Lanka 26.25% Singapore 12.05%. Thailand has also imported dries shark fins from 30 countries with 620,428 in quantity and 269,105,588 Baht in value. Hong Kong was the main dried fins exporter to Thailand 60.60% in quantity and 64.10% in value. The other exporters to Thailand were China (11.79%) and Canada (4.19%). Therefore, this report indicated that Thailand has import value more than export value. At present, there are no study about difference in quality and type of export and import dried shark fins. Thailand has export less quality of dried shark fin than import at 152,940 kg. But when considered with value export value was more than import value 150,728,035 Baht.

Table 5. Thai exports of frozen dogfish and other shark, excluding livers roes (Quantity in kilogram, value in Thai baht, From Customs Department)

Country	2001		2002		2003		2004		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Singapore	9,910	201,054	104,221	1,470,797	-	-	-	-	114,131	1,671,851
Total	9,910	201,054	104,221	1,470,797	-	-	-	-	114,131	1,671,851

Table 6. Thai imports of frozen dogfish and other shark, excluding livers roes (Quantity in kilogram, value in Thai baht, From Customs Department)

Country	2001		2002		2003		2004		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Japan	-	-	-	-	-	-	10	2,043	10	2,043
Italy	-	-	-	-	-	-	6,792	208,760	6,792	208,760
Malaysia	-	-	20,238	920,312	14,000	325,500	-	-	34,238	1,245,812
Spain	-	-	8,035	564,658	20,157	1,432,991	18,825	1,436,834	47,017	3,434,483
New Zealand	-	-	-	-	16,024	527,049	-	-	16,024	527,049
Norway	29,343	1,131,088	34,253	1,267,717	-	-	15,414	531,362	79,010	2,930,167
U.S.A.	136,768	6,447,963	101,566	4,263,779	48,367	2,500,856	30,098	1,652,398	316,799	14,864,996
Taiwan	-	-	-	-	-	-	10,000	698,670	10,000	698,670
Total	166,111	7,579,051	164,092	7,016,466	98,548	4,786,396	81,139	4,530,067	509,890	23,911,980

Table 7. Thai export of shark fins, dried, whether or not salted (Quantity in kilogram, value in Thai baht, From Customs Department)

Country	1997		1998		1999		2000		2001		2002		2003		2004		Total		
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	
Australia	355	161,836	295	215,025	420	437,154	12	65,386	-	-	485	155,242	305	179,313	480	126,067	2,352	1,340,023	
Belgium	-	-	-	-	-	-	175	86,015	-	-	-	-	-	-	-	-	-	175	86,015
Russia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	3,667	-	43	3,667
Canada	60	87,648	160	307,831	500	37,639	-	-	-	-	-	-	130	13,522	140	10,877	600	159,646	
China	-	-	330	135,247	-	-	-	-	-	-	-	-	-	-	45	25,622	-	45	458,740
France	-	-	-	-	-	-	325	182,088	18	133,808	239	939,882	-	-	-	-	-	582	1,255,778
Hong Kong	73,532	103,934,498	19,617	18,981,574	20,918	3,725,550	55,450	88,507,221	40,496	44,988,068	17,779	21,617,735	17,021	20,266,661	11,467	13,284,113	256,280	315,305,420	
Indonesia	-	-	-	-	-	-	-	-	-	-	325	450,399	-	-	-	-	-	325	450,399
India	2	14,743	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	14,743	
Japan	680	1,335,203	519	1,591,877	-	-	418	2,487,807	410	1,875,177	330	1,720,214	400	2,550,972	382	2,384,059	3,139	13,945,309	
Cambodia	50	12,530	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	12,530	
Macao	-	-	500	139,558	-	-	-	-	-	-	-	-	-	-	-	-	500	139,558	
Malaysia	-	-	193	577,534	80	5,035	604	299,243	1,245	861,319	1,611	1,381,045	1,756	720,735	782	188,933	6,271	4,033,844	
New Zealand	100	163,863	291	715,136	107	214,105	-	-	100	221,556	-	-	-	-	-	-	598	1,314,660	
Singapore	3,805	5,656,852	853	1,468,744	7,082	9,087,467	7,459	7,011,461	8,699	8,718,207	13,361	15,347,193	8,805	13,703,015	6,289	8,898,420	56,353	69,891,359	
Sri Lanka	-	-	116,500	2,900,076	9,500	216,691	-	-	-	-	-	-	-	-	-	-	-	126,000	3,116,767
Sweden	-	-	8	1,600	-	-	-	-	-	-	-	-	-	-	-	-	8	1,600	
Switzerland	-	-	10	1,608	-	-	-	-	-	-	-	-	-	-	-	-	10	1,608	
U.S.A.	4	1,553	-	-	-	-	25	19,607	-	-	-	-	-	-	-	-	29	21,160	
Taiwan	-	-	-	-	-	-	2,835	2,824,993	5,754	662,426	153	44,301	300	70,525	842	189,855	9,884	3,792,100	
Greece	-	-	-	-	-	-	-	-	-	-	-	-	2	16,468	-	-	2	16,468	
Vietnam	-	-	-	-	120	146,488	2,324	2,407,710	1,076	1,918,031	-	-	-	-	-	-	3,520	4,472,229	
Total	78,588	111,368,726	139,276	27,035,810	38,727	13,870,129	69,627	103,891,531	57,798	59,378,592	34,283	41,656,011	28,719	37,521,211	20,470	25,111,613	467,488	419,833,623	

Table 8. Thai imports of shark fins, dried, whether or not salted (Quantity in kilogram, value in Thai baht, From Customs Department)

Country	1997		1998		1999		2000		2001		2002		2003		Jan. 04-Mar. 04		Total	
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
Argentina	-	-	-	-	-	-	10,472	5,707,845	-	-	-	-	-	-	200	94,472	10,672	5,802,317
Australia	-	-	-	-	-	3,041	-	-	-	-	-	-	-	-	1,549	770,921	1,552	773,962
Austria	-	-	-	-	-	3,347,318	-	-	-	-	-	-	-	-	-	-	4,263	3,347,318
Canada	6,925	2,153,138	-	-	13,889	6,094,601	-	-	2,585	1,341,767	1,572	819,080	998	522,522	-	-	25,969	10,931,108
China	-	-	-	-	-	674,331	1,644	674,331	4,837	1,342,373	18,925	4,223,289	29,743	6,923,942	17,982	5,126,308	73,131	18,290,243
Hongkong	55,766	20,567,091	30,953	15,296,643	61,403	28,350,969	55,334	26,328,863	38,180	18,723,517	28,561	12,953,951	58,712	28,191,704	47,084	22,084,226	375,993	172,496,964
Indonesia	5,050	2,318,581	2,800	732,848	3,105	1,597,799	212	91,795	7,926	3,611,852	2,501	2,532,654	609	317,735	1,447	763,608	23,650	11,966,872
India	-	-	10	9,076	-	-	-	-	10,423	3,934,194	-	-	-	-	-	-	10,433	3,943,270
Japan	-	-	2,169	943,869	-	-	-	-	-	-	1,765	900,186	6,405	4,243,204	3,727	3,652,993	14,066	9,740,252
Madagascar	-	-	-	-	-	-	175	88,847	526	282,472	1,020	535,467	1,091	535,995	1,768	837,668	4,580	2,280,449
Myanmar	-	-	-	-	2,300	644,000	600	865,811	-	-	-	-	-	-	-	-	2,900	1,509,811
New Zealand	-	-	-	-	2,950	1,312,585	-	-	-	-	-	-	-	-	-	-	2,950	1,312,585
Norway	-	-	1,848	916,927	7,019	3,091,771	1,050	467,746	-	-	-	-	-	-	10,275	1,001,767	20,192	5,478,211
Pakistan	2,771	853,573	-	-	2,000	892,097	2,540	1,225,902	3,516	1,736,536	-	-	-	-	-	-	10,827	4,708,108
Philippines	4,350	1,671,381	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,350	1,671,381
Turkey	-	-	2,310	1,170,474	1,085	485,602	-	-	-	-	1,670	806,338	2,088	1,084,379	512	246,833	7,665	3,793,626
Singapore	-	-	-	-	-	-	-	-	176	163,610	1,266	434,739	1,991	955,161	93	46,344	3,526	1,599,854
U.S.A.	8,601	2,847,085	2,368	966,650	4,474	1,707,372	-	-	233	128,413	639	329,628	720	297,699	49	97,627	17,084	6,374,474
Spain	-	-	-	-	-	-	-	-	-	-	500	305,000	-	-	-	-	500	305,000
United Arab Emirates	-	-	-	-	-	-	-	-	-	-	403	192,786	-	-	-	-	403	192,786
Taiwan	-	-	3	7,431	-	-	-	-	1,984	923,349	316	163,591	-	-	-	-	2,303	1,094,371
Bangladesh	-	-	-	-	-	-	-	-	-	-	200	106,360	100	52,171	-	-	300	158,531
Tanzania	-	-	-	-	-	-	-	-	124	66,968	185	96,641	365	179,716	90	42,721	864	427,580
Yemen Republic	-	-	-	-	-	-	-	-	-	-	26	2,554	-	-	-	-	26	2,554
Monaco	-	-	-	-	-	-	-	-	-	-	-	-	40	20,012	220	104,413	260	124,425
Bulgaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	708	338,781	708	338,781
Morocco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	98,836	200	98,836
Mauritania	-	-	-	-	-	-	-	-	-	-	-	-	-	-	113	56,314	113	56,314
New Caledonia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	550	84,662	550	84,662
Vietnam	-	-	-	-	-	-	278	138,007	120	62,936	-	-	-	-	-	-	398	200,943
Total	83,463	30,410,849	42,461	20,043,918	98,225	44,176,796	66,199	33,273,195	81,102	38,025,832	59,549	24,402,264	102,862	43,324,240	86,567	35,448,494	620,428	269,105,588

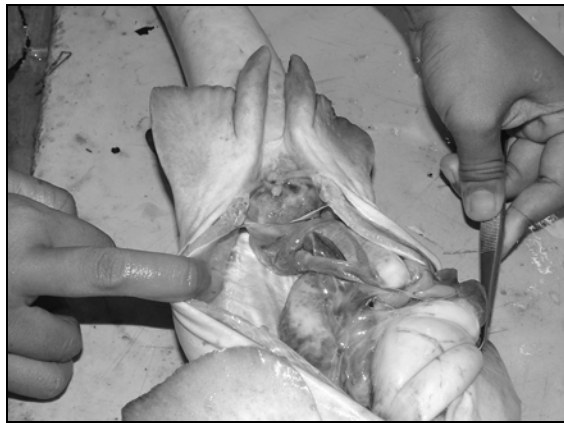
5.4 Biological Study

Biological studies of shark were done with 900 samples of individual shark. Result found 25 species of shark in Thai waters (table 3) which could be classified to 10 families i.e. Heterodontidae (1 species), Hemiscylliidae (4 species), Stegostomatidae (1 species), Alopiidae (2 species), Scyliorhinidae (1 species), Hemigaleidae (1 species), Carcharhinidae (12 species), Sphyrnidae (1 species), Triakidae (1 species) and Orectolobidae (1 species). The shark species *Mustelus* sp.B and *Orectolobus* are the new record in Thai waters. However incomplete biological data of shark in Thai waters is due to uncover sample sized of shark. In study period, there were small size and small number of sharks in each species had landed. Not only small number of sample size but limited budget was also an obstacle of this project. The study has encountered the difficulty in gaining and accessing to the large size of sharks. Because price for the whole shark is rather high and most of them are already sold to the middle man. Most shark samples were in immature stage. Only specimen in family Hemiscylliidae could be collected all size. The result of biological study in the Gulf of Thailand and the Andaman Sea showed in Table 9.

Table 9. Biological data of sharks in Thai waters

No	Species	Areas	Number of specimens	Size (cm)		% Sex		% Mature	
				min-max	male	female	male	female	
1	Heterodontidae <i>Heterodontus zebra</i>	Gulf of Thailand	10	46-91	50	50	0	20	
2	Hemiscylliidae <i>Chiloscyllium plagiosum</i>	Gulf of Thailand	133	36-100	63	37	44	63	
3	<i>C. griseum</i>	Gulf of Thailand, Andaman Sea	53	30-81	55	45	48	58	
4	<i>C. hasselti</i>	Gulf of Thailand	4	50-78	75	25	100	0	
5	<i>C. punctatum</i>	Gulf of Thailand, Andaman Sea	454	16-98	62	38	62	46	
6	Stegostomatidae <i>Stegostoma fasciatum</i>	Gulf of Thailand, Andaman Sea	6	98-220	50	50	33	100	
7	Alopiidae <i>Alopias superciliosus</i>	Andaman sea	6	260-310	33	67	100	100	
8	<i>A. vulpinus</i>	Gulf of Thailand	10	130-322	70	30	71	100	
9	Scyliorhinidae <i>Atelomyxterus marmoratus</i>	Gulf of Thailand	15	49-69	40	60	50	100	
10	Hemigaleidae <i>Hemipristis elongatus</i>	Gulf of Thailand, Andaman Sea	5	84-180	0	100	0	80	
11	Carcharhinidae <i>Gleocerdo cuvier</i>	Gulf of Thailand, Andaman Sea	7	100-170	71	29	50	100	
12	<i>Triaenodon obesus</i>	Andaman sea	1	173	0	100	-	100	
13	Rhizoprionodon <i>acutus</i>	Andaman sea	1	83	100	0	100	-	
14	<i>Carcharhinus sorrah</i>	Gulf of Thailand, Andaman Sea	52	47-145	56	44	21	22	
15	<i>C. altimus</i>	Gulf of Thailand	8	67-100	75	25	50	50	
16	<i>C. melanopterus</i>	Gulf of Thailand, Andaman Sea	34	35-124	47	53	69	67	
17	<i>C. amboinensis</i>	Andaman sea	1	229	0	100	0	100	
18	<i>C. dussumieri</i>	Gulf of Thailand, Andaman Sea	10	50-67	60	40	0	0	

19	<i>C. leucas</i>	Gulf of Thailand, Andaman Sea	15	62-185	67	33	50	100
20	<i>C. amblyrhynchos</i>	Gulf of Thailand	12	68-95	67	33	63	100
21	<i>C. amblyrhynchoides</i>	Gulf of Thailand, Andaman Sea	4	110-197	50	50	100	100
22	<i>C. obscurus</i>	Andaman sea	1	95	0	100	-	0
	Sphyrnidae							
23	<i>Sphyrna lewini</i>	Gulf of Thailand, Andaman Sea	48	26-180	38	62	33	43
	Triakidae							
24	<i>Mustelus sp.B ...</i> (New recorded)	Andaman sea	5	95-102	100	0	100	0
	Orectolobidae							
	<i>Orectolobus maculatus..</i>							
25	(New recorded)	Gulf of Thailand	5	60-89	67	33	33	50
	Total		900					

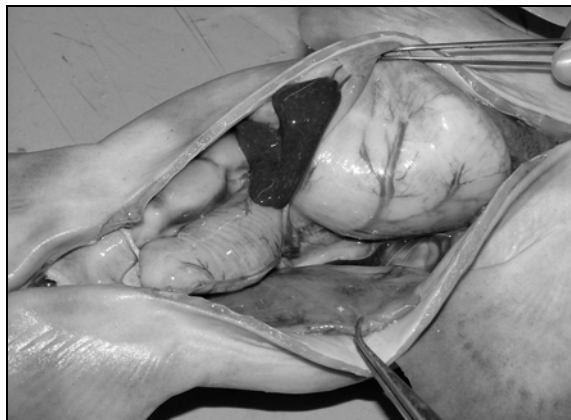


A. male shark at maturity stage 4.

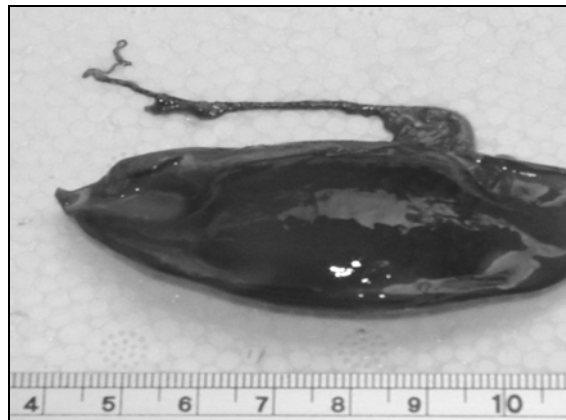


B. female shark at maturity stage 6

Figure 4. Mature stage of gonad in *Ch. punctatum*.

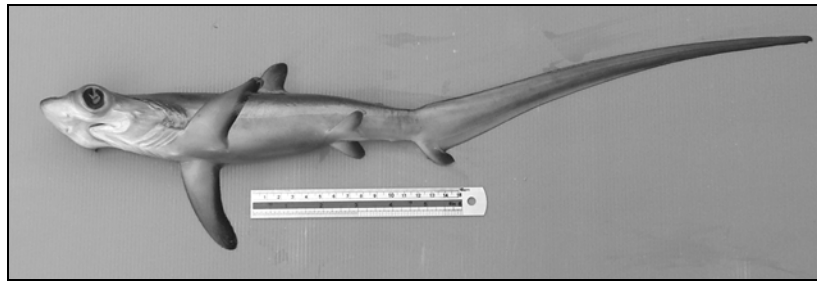


A. female shark at maturity stage 6

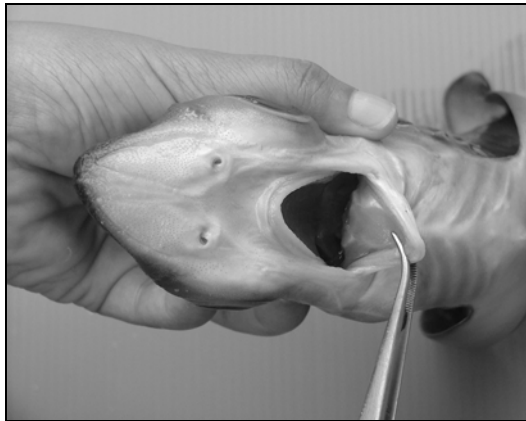


B. Egg case (membrane removed)

Figure 5. Mature stage of gonad in female *Ch. griseum*.



A. superciliosus's embryo

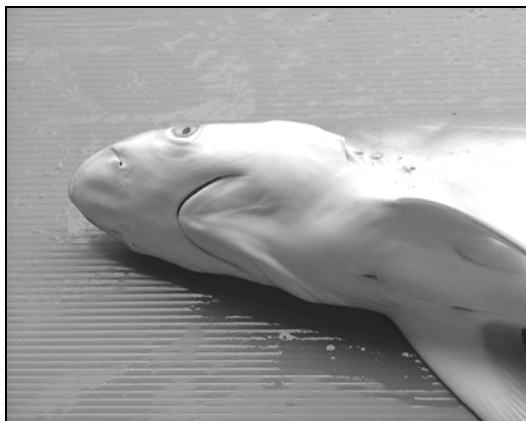


A. Mouth without teeth

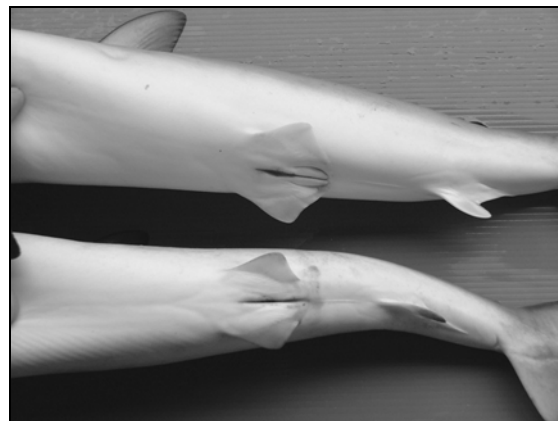


B. Trunk

Figure 6. *A. superciliosu*'s embryo found in uterus.



A. Head



B. Trunk

Figure 7. Young Spottail shark; *Ca. sorrah*



Figure 8. Young Scalloped hammerhead shark; *Sp. lewini*.

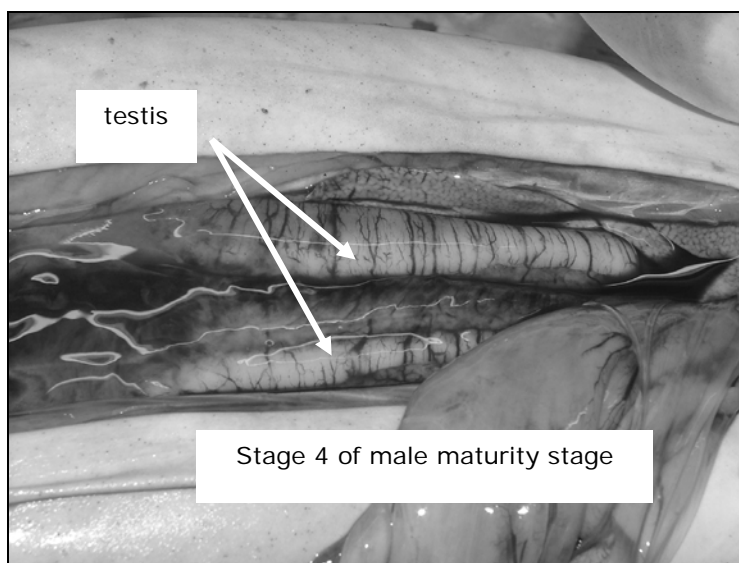


Figure 9. Mature stage of gonad in male *Mustelus* sp.B.

5.5 Marketing and Usage

Marine fishing ground within Thailand exclusive economic zone lie in part of the Gulf of Thailand and part of the Andaman Sea. The collection of landing data from sampling sites in Thailand had been done from 1,118 fishing boats. Shark are caught by almost all kinds of gears (pair trawl, otter board trawl, fish gill net, hook and line, push net, purse seine and other fishing gears) as incidental target or secondary target (by-catch). The total marine fishery production was 11,425,768.90 kg of which included 76,201.52 kg of shark and ray (0.67 %) shark only 21,862.82 kg (0.19 %) and ray 54,338.70 kg (0.48 %) from total fisheries production (Table 2).

The most catch of shark and ray in Thai waters was consumed fresh or processed into products such as dried salted meat and fish balls. Price of the auctioned fresh sharks and ray at the fish markets is rather low. Average price for shark is 15 to 60 Baht/kg in landing price and local or domestic market price is 30 to 80 Baht/kg. However, the price is varies by size and species; for example, the price of grey bamboo shark *Chiloscyllium griseum*, slender bamboo shark *Chiloscyllium indicum*, Brown-banded bamboo shark *Chiloscyllium punctatum*, white-spotted bamboo shark *Chiloscyllium plagiosum* were lower than the price of grey reef shark *Carcharhinus amblyrhynchos*, big nose shark *Carcharhinus altimus*, blacktip reef shark *Carcharhinus melanopterus*, scallop hammerhead *Sphyrna lewini*. A small number of shark's jaws, and even teeth, are sold as rare souvenir items to collectors (Fig 12). Discarded part of the

fish such as head and cartilage are used as bait for fish and crab traps or sold to fish mill factories for fertilizers.(Fig 13) In Thailand the first middle men (purchaser) at landing site will gather all of total catches of sharks and sale to the second middle men (purchaser). For rays are mostly consumed fresh and salted, average price at landing site is 10 to 15 Baht/kg (Table 10).

Table 10. Local usage and marketing of shark

Species	Part	Local consumed (C), Discarded (D), Traded (T), Processed (type of processing)	Local price per Kg US\$	Market destination	Landing price per Kg US\$	Total sam. for Q1 Q2 (kg)
Gulf of Thailand						
1. <i>Chiloscyllium punctatum</i>	Whole	C,T	1.25	C:Samutprakan	0.30-1.00	649.34 196.51
	"	C,T	1.25	C, T:Songkhla	0.5	
2. <i>C.plagiosum</i>	"	C,T	1.25	T:fish processing at Samutsakorn	0.30-0.75	40.34
3. <i>C.griseum</i>	"	C	1.25	T:fish processing at Samutsakorn	0.45-1.00	18.24
	"	C,T	0.75	C, T:Songkhla	0.5	
4. <i>C.hasselti</i>	"	C	1.25		0.45-0.75	0.65
5. <i>Alopias vulpinus</i>	Whole	C,T	0.75	C, T:Songkhla	0.4	99
6. <i>Atelomycterus marmoratus</i>	"	C,T	1.25	C, T:Songkhla	0.81	3.27
7. <i>Carcharhinus amblyrhynchos</i>	"	C	4.38	C, T:Songkhla	2.5	14.8
8. <i>Carcharhinus amblyrhynchoides</i>	"	C	1.75	C, T:Songkhla	1.3	9.6
9. <i>Carcharhinus altimus</i>	"	C,T	1.75	C, T:Songkhla	1.3	8.8
10. <i>Carcharhinus leucas</i>	"	C,T	1.75	C, T:Songkhla	1.3	8.42
11. <i>Carcharhinus melanopterus</i>	"	C	1.88	C, T:Songkhla	1.3	44.36
12. <i>Carcharhinus sorrah</i>	"	C	1.88	C, T:Songkhla	1.3	48.95
13. <i>Chiloscyllium indicum</i>	"	C,T	1.25	C, T:Songkhla	0.75	30.97
14. <i>Hemipristis elongatus</i>	"	C,T	1.75	C, T:Songkhla	1.3	5.9
15. <i>Sphyrna Lewini</i>	"	C	2.13	C, T:Songkhla	1.5	95.53
16. <i>Stegostona fasciatum</i>	"	C,T	0.75	C, T:Songkhla	0.5	24
The Andaman Sea						
1. <i>Chiloscyllium punctatum</i>	Whole	C	0.35-1.0	C: Phuket	0.17-0.50	633.8 36.87
2. <i>C.griseum</i>	"	C	0.35-1.0	T: fish processing at Phuket	0.17-0.50	10
3. <i>Hemipristis elongatus</i>	"	T	1.8		1.25	50
4. <i>Carcharhinus amboinensis</i>	"	T	4.5		2.5	110
5 <i>C.sorrah</i>	"	C	1.65		1.25	1.95
6. <i>Mustelus</i> sp.B (New Record in Thai water)	"	C	0.8		0.4	17.6
7. <i>Alopias superciliosus</i>	"	T	1.88		1.03	221
8. <i>Sphyrna lewini</i>	"	C	1.5		0.8	7.87
9. <i>C.leucas</i>	"	T	1.5		0.75	12.00
10. <i>Triaenodon obesus</i>	"	T	1.5		0.75	53.70
11. <i>Rhizoprionodon acutus</i>	"	T	1.5		0.75	2.81
11. <i>Carcharhinus amblyrhynchoides</i>	"					110.00
Total						1283.14

Exchange rate: 1US\$=40 Baht

In the Gulf of Thailand landing site at Sumut Prakhan, middlemen are buying fish directly from the fishermen and selling them to the wholesale markets in Sumut Prakhan, Sumut Sakhon and Bangkok province. Production of shark is fresh meat. The market price is 60-80 Baht/kg, major market was used as locally consumption in province and adjacent area. The preferred species products of shark by the middle man is spot-tail shark *Carcharhinus sorrah*

In the southern Gulf of Thailand landing site at Songkhla, Songkhla province the first middlemen are buying fish directly from the fishermen and selling them to the wholesale markets in Songkhla province. The preferred species products of shark in the market is grey bamboo shark *Chiloscyllium griseum*, slender bamboo shark *Chiloscyllium indicum*, Brown-banded bamboo shark *Chiloscyllium punctatum*, white-spotted bamboo shark *Chiloscyllium*

plagiosum. Production of shark meat is dried salted meat of which market price is 150 Baht/kg, the major market was used locally consumption in province near shore. For dried fins, market price is 500 to 15,000 Baht/kg. The preferred species products of shark in the market is spot-tail shark *Carcharhinus sorrah*, grey reef shark *Carcharhinus amblyrhynchos*, big nose shark *Carcharhinus altimus*, blacktip reef shark *Carcharhinus melanopterus*, scallop hammerhead *Sphyrna lewini*, thresher shark *Alopias vulpinus*, snaggletooth shark *Hemipristis elongates*. The major markets are Bangkok before export to China, Hong Kong and Singapore.

In the Andaman Sea of Thailand landing site at Phuket province, middleman are buying fish directly from the fishermen and selling them to the wholesale markets in Phuket province. Production of shark meat is dried salted meat of which market price is 150-200 Baht/kg, the major market was used locally consumption in province and adjacent area. The preferred species by the middle man is grey bamboo shark *Chiloscyllium griseum*, Brown-banded bamboo shark *Chiloscyllium punctatum*, for dried fins; market price is 500 to 15,000 Baht/kg. The preferred species by the middlemans is spot-tail shark *Carcharhinus sorrah*, graceful shark *Carcharhinus amblyrhynchoides*, scallop hammerhead *Sphyrna lewini*, Bigeye thresher shark *Alopias superciliosus*, snaggletooth shark *Hemipristis elongates*.The major market is Bangkok before export to China, Hong Kong and Singapore

The shark trade in Thailand neither well documented have not been recorded nor information is difficult to obtain. There are no specific information on shark meats, fins and shark fin trades available in the fisheries statistics except for the import and export statistics conducted by Customs Department.



Figure 10. Processing: dried salted.



Figure 11. Production : dried shark fins



Figure 12. Tooth and jaws of sharks were sold in Phuket souvenir shops

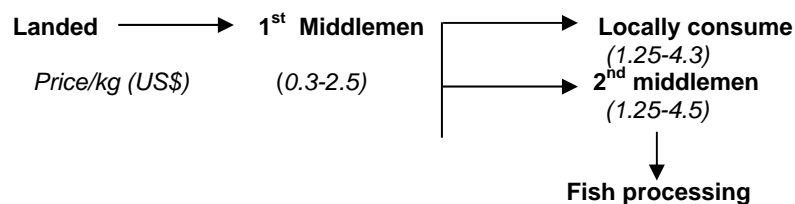


Figure 13. Marketing channel of shark landed in Thai

The utilization of shark product in Thailand are

1. Fresh meat are locally consumed in their province and it adjacent area.
2. Dry salted
3. Fish ball
4. Dried fins especially for export and some of them marketed locally.
5. Head skin and stomach are processed for fishmeal.
6. livers are use for feeding in shrimp culture.
7. Teeth for decoration

We can say that all of the shark part was used.

Table 11. Utilization of shark products

Part	Product type	Market
Meat	Fresh meat, Dry salted meat, Fish ball	Mainly locally used
Fin	Dried fin	Mainly export
Liver	Shrimp culture	Mainly locally used
Head	fishmeal	Mainly locally used
Skin	fishmeal	Mainly locally used
Stomach	fishmeal	Mainly locally used
Bone	fishmeal	Mainly locally used
Jaw	Dried jaw (for souvenir)	Mainly locally used
Teeth	Dried teeth (for souvenir)	Mainly locally used

6. PROBLEM

With regard to the collection of samples to identify their maturity, the study has encountered the difficulty to gain access to the large size of shark due to the fact that their price for whole shark is rather high and most of them are already sold to traders.

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