

Strategies for Trawl Fisheries Bycatch Management
(REBYC-II CTI; GCP/RAS/269/GFF)

**Trawl catch composition and quantity in Prachuap Khiri Khan
and Chumphon Province, Thailand**

By

**Pavarot Noranarttragoon
Marine Fisheries Research and Development Division
Department of Fisheries
Bangkok, Thailand**

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ACRONYMS

cm	centimeter
CPUE	Catch per Unit Effort
DOF	Department of Fisheries
FAO	Food and Agriculture Organization of the United Nations
kg	kilogram
m	meter
MFD	Marine Fisheries Division
MFRDB	Marine Fisheries Research and Development Bureau
OBT1	Small-sized otter board trawl, overall length less than 14 m
OBT2	Medium-sized otter board trawl, overall length 14-18 m
PT	Pair Trawl
S.D.	Standard Deviation

ABSTRACT

Data on catch composition and quantity was collected from small (<14 m; OBT1) and medium-sized (14–18 m; OBT2) otter board trawlers (OB) and from pair trawlers (PT) landing at Prachuap Khiri Khan and Chumphon fishing ports during June 2013 - May 2014. The catch per unit of effort (CPUE) of OBT1, OBT2 and PT was 48, 28 and 150 kg/hour, respectively. The proportion of food fish to trash fish was 36:64, 58:42 and 46:54, respectively. Demersal fish, along with shrimp and prawn, were the main component of food fish in OBT1, summing up to 86% of the total food fish. Demersal fish and cephalopods were the main food fish component in OBT2, summing up to 77%. Pelagic fish and demersal fish were the main food fish component in PT, summing up 83%. In trash fish group, juveniles of economically important species showed high percentages (64-78%) in all three trawl types. In general, the average length of economically important species was smaller than their size at first maturity. In particular, Lizard fishes, purple-spotted bigeye, lattice monocle bream and short mackerel are of concern because of small size of fish caught. There is an apparent risk of overfishing for these species. Squid species caught by the trawlers showed higher percentage of mature size of individuals. Improved management is required to reduce the unsustainable harvest of fisheries resources by the trawler fleet in the region.

1. Introduction

The status of fisheries in the Upper Western Gulf of Thailand, i.e., the locality of Prachuap Khiri Khan and Chumphon Province, has been documented in the “Review of the Trawl Fisheries in Prachuap Khiri Khan and Chumphon Province, Thailand”. This review indicated that fisheries resources in the area have been in a declining state. The current study reports the status of fisheries resources from commercial trawlers operated in Prachuap Khiri Khan and Chumphon Province. The information presented in this paper can be used by policy makers to decide fisheries management measures in order to regulate harvesting fisheries resources in a sustainable manner.

2. Data collection and analysis

2.1 Sampling sites

Data were collected from trawlers, i.e., small-sized otter board trawl (less than 14 m overall length; OBT1), medium-sized otter board trawl (14-18 m overall length; OBT2) and pair trawl (PT), during June 2013-May 2014. The study sites were as follows

- 1) Ao Noi Sub-district, Muang District of Prachuap Khiri Khan Province. The data from OBT2 and PT were collected.
- 2) Pak Nam Sub-district, Muang District of Chumphon Province. The data from OBT1, OBT2 and PT were collected.

2.2 Sampling methods

The data were collected on a monthly basis during June 2013 to May 2014. Two types of data collection were used in this research as follows.

- a) Catch sampling. The catch was sampled from the fishing boats landed at the sampling sites in order to identify the species caught, which was done based on Carpenter and Niem (1998, 1999a,b, 2001a,b), to measure the weight (g) using 500-g and 7-kg balances, and length (cm), using punching paper with 0.5-cm class interval, of the main species and economically important species caught. The length measurement used for fishes was total length, for squids it was mantle length and for shrimps carapace length.
- b) Interviewing. The captains of fishing boats, assistant captains, and/or the boat owners were interviewed. The information needed from them were fishery information, e.g. fishing effort, fishing ground, weight of catch, etc.

The catch of trawlers are sorted by species or group and selected by size on board, and was divided into 2 main clusters, economic fish and trash fish (Fig. 3.3). Economic fishes are sorted by species, family or group, e.g., short mackerel, threadfin breams (*Nemipteridae*), and lizardfishes (*Synodontidae*) and size wise. Those fish are kept in wooden or plastic rectangle trays for convenience for selling and transferring to fish market. Ice is used for keeping the fish fresh by pouring it on the fish in each tray. The trays are stacked in the storage room. When the storage room is full, ice is poured on the top before closing the room. On the other hand, trash fish, which may consist of juvenile economic fish, such as mackerel, threadfin bream, big eye and true trash fish, are sorted out from economic fish and not punctiliously kept. Most of them are also put in the trays with less ice.

The fish samples of trawlers were collected from the trays. Number of trays of each economically important species depended on the fish size. If the variety of fish length is

more varied, sampling of more trays were needed. All fish in the tray were measured for length and weigh. For trash fish, three to five kg was required, depending on the fish size, for identifying the species and measuring the length and weight. The juvenile of economically important fishes were also measured the length and weight taken. Other species were weighed only (Figure 1). Five hundred-gram balance might be used in case the size of fish was small.

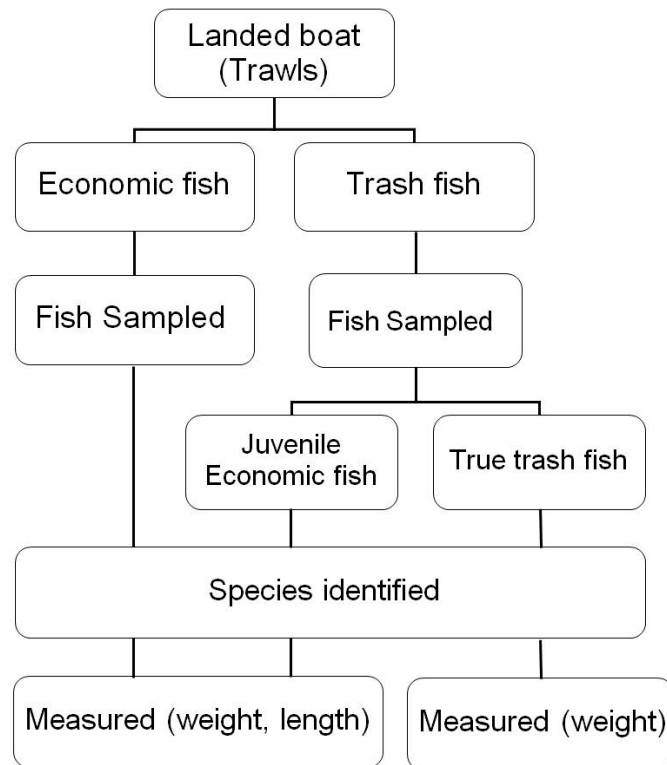


Figure 1 Sampling process of trawl fisheries

2.3 Data analysis

The catch per unit effort (CPUE), species and length composition were analyzed from the catch sample as follows.

- $CPUE \text{ (kg/hour)} = \frac{\text{Catch of each species (kg)}}{\text{Fishing effort (hour)}}$
- $\text{Species composition (\%)} = \frac{\text{Catch of each species (kg)}}{\text{Total catch}} \times 100$
- Mean, maximum and minimum length and standard deviation (cm) were analyzed from length composition of a certain species. Mean length was analyzed as follows:

$$\bar{x} = \frac{\sum_{i=1}^n x_i f_i}{\sum_{i=1}^n f_i}$$

where \bar{X} = Mean length
 x_i = Mid length of class interval i
 f_i = Frequency of class interval i
 n = Number of class interval

The length distribution of each species were compared with its size at first maturity which was gathered from available reports. Proportion of fish which was smaller and larger than the size at first maturity was also reported.

3. Results

3.1 CPUE and species composition

The average CPUE of small-sized otter board trawl (OBT1), medium-sized otter board trawl (OBT2) and pair trawl (PT) operated in Prachuap Khiri Khan and Chumphon Province were 48, 28 and 150 kg/hour respectively (Table 1). Trash fish showed a significantly high CPUE in every gear particularly OBT1 and PT where over half was trash fish, 64% and 54% respectively.

Table 1. CPUE of commercial trawls (kg/hour) operated in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2104.

Fleet	Average	Food fish	Trash fish
Small-sized otter board trawl (OBT1)	48	18 (36%)	31 (64%)
Medium-sized otter board trawl (OBT2)	28	16 (58%)	12 (42%)
Pair trawl (PT)	150	68 (46%)	82 (54%)

As mentioned in section 2.2, catch of trawls is divided into two groups, i.e., food fish and trash fish. Species/group composition of trawlers varied between gears (Fig 4.2). In food fish group, demersal fish was the main composition of OBT1 and OBT2 while pelagic fish was the main composition of PT. On the other hand, in trash fish group, the percentage of small-sized economic species was higher than true trash fish in every gear, i.e. 78%, 64% and 74% of OBT1, OBT2 and PT respectively (Table 2). In addition, cephalopod, along with shrimp and prawn in trash fish were found in all gear in lesser percentages due to their high economic value. Their small-size can be sold as food fish for a higher price than as trash fish.

Species composition by gear

A) OBT1.

- Food fish. Demersal fish made up the highest composition followed by shrimp and prawn, and cephalopod, 74%, 12% and 8% of total food fish respectively (Table 2). Flatheads and lattice monocle bream were the most common demersal fish while the penaeid shrimp was the most abundant shrimp. For cephalopod group, cuttlefishes were found at a higher percentage compared to squids (Appendix A, Table 1).

- Trash fish. True trash fish represented 22% and the remaining 78% was juveniles of economic species (Table 2). Demersal fish made up the highest composition of economic species, 62% of total trash fish. Splendid ponyfish and spinefoots were the main demersal fish found. Invertebrates were also found at a tiny percentage, 11% of total trash fish. Crabs, cuttlefishes and mantis shrimps were the main invertebrate found. (Appendix A, Table 2,).

B) OBT2. Species composition of OBT2 was slightly different from OBT1 because of its higher efficiency and broader fishing ground.

- Food fish. Demersal fish was the highest percentage, 62%, followed by cephalopod, 15%, shrimp and prawn, 9%, whereas pelagic fish was found less, 1% of total food fish (Table 2). Flatheads, lizard fishes and threadfin breams summed to up more than one half of total demersal fish. For cephalopod, squids and cuttlefishes existed in the similar percentage of 5% each. Scallop was also caught at 11% of total food fish (Appendix A, Table 3).

- Trash fish. Most of the trash fish caught by OBT2 were demersal fish and true trash fish representing 47% and 36% respectively (Table 2). Whereas pelagic fish, cephalopod, and shrimp and prawn were rarely found in trash fish caught by OBT2. Flatheads, spine foots and Indian halibut made up more than one half of total demersal trash fish. Pony fishes were the main group of true trash fish (Appendix A, Table 4).

C) PT. The composition of PT was largely different from OBT because of the difference of fishing operation.

- Food fish. Pelagic fish and demersal fish were the major composition, 47% and 36% of the total food fish respectively. Cephalopod showed a significant percentage of 17% (Table 2), which was higher fraction than OBT1 and OBT2. Short mackerel were the main species of pelagic fish followed by gold stripe sardinella and yellow stripe scad, 15%, 9 % and 9% respectively. Purple-spotted big eye and threadfin breams were the leading species of demersal fish. Squids were the major cephalopod caught (Appendix A, Table 5).

- Trash fish. About three fourths of trash fish were small-sized economic fauna. Most of them were pelagic and demersal fish in which anchovies showed the highest composition, 24% of the total trash fish. Meanwhile, ponyfishes were the main group of true trash fish (Appendix A, Table 6).

Table 2. Catch composition of commercial trawls operated in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

Group	OBT1		OBT2		PT	
	% of total catch	% of food fish	% of total catch	% of food fish	% of total catch	% of food fish
Food fish						
Pelagic fish	1	2	1	1	21	47
Demersal fish	27	74	36	62	16	36
Cephalopod	3	8	9	15	8	17
Shrimp and prawn	4	12	5	9	<1	<1
Other invertebrate*	1	4	7	13	<1	<1
Total economic fauna	36	100.00	58	100.00	46	100.00
Trash fish	% of total catch	% of trash fish	% of total catch	% of trash fish	% of total catch	% of trash fish
Small-sized pelagic fish	2	3	2	5	23	42
Small-sized demersal fish	40	62	20	47	13	24
Small-sized cephalopod	1	1	1	2	3	6
Small-sized shrimp and prawn	<1	1	1	3	1	1
Small-sized other invertebrate	7	11	3	7	<1	<1
Total Small-sized economic fauna	50	78	27	64	40	74
True trash fish	14	22	15	36	14	26
Total trash fish	64	100.00	42	100.00	54	100.00

Remark: * Other invertebrate includes mantis shrimps, flathead lobster, crabs, shellfishes, etc.

3.2. Length of some economically important species

Length of some economically important species were separately analyzed between food fish and trash fish which were obviously sorted on board. For length distribution of each species caught by each gear, the length data from food fish and trash fish were pooled in order to present the complete picture of the status of each species. The pooled length data were compared with the size at first maturity of each species gathered from available technical papers and shown in Table 3.

Table 3. Female size at first maturity of some economically important species compiled from available technical papers

Common name	Scientific name	Size at first maturity (cm)	Source
Yellowtail scad	<i>Atule mate</i>	21.25	Premkit et al., 2004
Short mackerel	<i>Rastrelligerbrachysoma</i>	17.95	Krajangdara et al., 2007
Indian mackerel	<i>R. kanagurta</i>	17.12	Krajangdara et al., 2007
Goldstripesardinella	<i>Sardinellagibbosa</i>	10.35	Nasuchon et al., 2010
Bigeyesca	<i>Selarcrumenophthalmus</i>	18.25	Phuttharaksa et al., 2008
Yellowstripesca	<i>Selaroidesleptolepis</i>	11.73	Yakoh and Chalee, 2008
Ornate threadfin bream	<i>Nemipterushexodon</i>	14.57	Pinputtasin et al., 2008
Purple-spotted bigeye	<i>Priacanthustayenus</i>	14.19	Krajangdara and Yakoh, 2005
Slender lizardfish	<i>Sauridaelongata</i>	31.62	Vibunpant et al., 2012
Brush-tooth lizardfish	<i>S.undosquamis</i>	28.26	Vibunpant et al., 2011
Lattice monocle bream	<i>Scolopsistaeniopterus</i>	17.57	Krajangdara and Hemtanon, 2000
Mitre squid	<i>Photololigochinensis</i>	17.71	Suppanirun et al., 2011
Indian squid	<i>P. duvaucelii</i>	9.04	Suppanirun et al., 2011
Needle cuttlefish	<i>Sepia aculeata</i>	9.44	Charoensombat et al., 2013
Pharaoh cuttlefish	<i>S. pharaonis</i>	14.30	Chotiyaputta, 1982
Jinga shrimp	<i>Metapenaeusaffinis</i>	12.18	Sritakon et al., 2012
Greasyback shrimp	<i>Metapenaeusensis</i>	11.24	Pinputtasin et al., 2012
Banana prawn	<i>Penaeusmerguiensis</i>	13.38	Yakoh et al., 2013

Most mean lengths of aquatic faunas in food fish group, particularly pelagic fishes, demersal fishes and shrimps, were smaller than female size at first maturity. In trash fish group, mean lengths of all species caught by all gear were smaller than female size at first maturity except yellow stripe scad caught by OBT1 for which the mean length was similar to the size at first maturity (Table 4-6).

Table 4. Size of some economically important species caught by small-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2104.

Common name	Scientific name	Food fish			Trash fish		
		Range	Mean	S.D.	Range	Mean	S.D.
Yellow stripe scad ¹	<i>Selaroides leptolepis</i>	9.75-15.75	12.50	0.13	10.75-12.75	11.75	0.04
Deep body silver biddy	<i>Gerres abbreviatus</i>	10.25-19.75	12.66	0.59	-	-	-
Whip fin silver biddy	<i>Gerres filamentosus</i>	11.75-23.25	15.02	1.04	-	-	-
Common silver biddy	<i>Gerres oyena</i>	9.75-19.25	13.84	0.66	-	-	-
Ornate threadfin bream ¹	<i>Nemipterus hexodon</i>	8.75-28.75	16.54	0.84	4.75-9.25	7.38*	0.12
Japanese threadfin bream	<i>N. japonicus</i>	8.75-22.25	11.89	0.24	9.75-11.25	10.33	0.02
Mauvelip threadfin bream	<i>N. mesoprion</i>	9.75-17.75	13.81	0.25	5.25-7.25	6.58	0.05
Notchedfin threadfin bream	<i>N. peronii</i>	11.75-24.75	16.57	0.61	-	-	-
Purple-spotted bigeye ¹	<i>Priacanthus tayenus</i>	13.25-20.25	15.39	0.17	5.75-13.25	8.02*	0.18
Slender lizardfish ¹	<i>Saurida elongata</i>	13.25-30.75	18.23*	0.43	8.25-15.25	11.75*	0.28
Lattice monocle bream ¹	<i>Scolopsis taeniopterus</i>	10.25-26.25	15.72*	0.27	6.25-12.75	8.83*	0.09
Silver sillago	<i>Sillago sihama</i>	11.25-21.25	15.26	0.26	-	-	-
Jinga shrimp ¹	<i>Metapenaeus affinis</i>	8.25-14.25	11.13*	0.18	-	-	-
Greasy back shrimp ¹	<i>Metapenaeus ensis</i>	7.25-16.75	11.13*	0.15	-	-	-
Western king prawn	<i>Penaeus latisulcatus</i>	8.75-20.25	14.15	0.25	-	-	-
Banana prawn ¹	<i>Penaeus merguensis</i>	12.75-22.75	15.85	0.40	-	-	-
Giant tiger prawn	<i>Penaeus monodon</i>	16.25-28.75	20.89	0.76	-	-	-
Indian squid ¹	<i>Photololigo duvaucelii</i>	5.75-21.25	10.09	0.67	-	-	-
Needle cuttlefish ¹	<i>Sepia aculeata</i>	5.75-17.75	9.50	0.44	-	-	-
Pharaoh cuttlefish ¹	<i>Sepia pharaonis</i>	6.25-25.25	9.78*	2.66	-	-	-

Remark: ¹Its size at first maturity was shown in Table 3. * Mean size was smaller than its size at first maturity.

Table 5. Size of some economically important species caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2104.

Common name	Scientific name	Food fish			Trash fish		
		Range	Mean	S.D.	Range	Mean	S.D.
Yellowtail scad ¹	<i>Atule mate</i>	10.75-23.75	14.54*	0.88	8.75-11.25	10.25*	0.02
Short mackerel ¹	<i>R. brachysoma</i>	14.75-19.75	17.08*	0.17	5.75-8.75**	7.15*	0.01
Indian mackerel ¹	<i>R. kanagurta</i>	11.75-19.75	14.87*	0.20	-	-	-
Yellowstripescad ¹	<i>Selaroides leptolepis</i>	9.25-18.75	12.95	0.16	7.25-12.25	7.89*	0.02
Deep body silver bidy	<i>Gerres abbreviatus</i>	11.25-17.25	13.61	0.27	-	-	-
Whip fin silver bidy	<i>Gerres filamentosus</i>	11.25-22.75	15.74	0.38	-	-	-
Common silver bidy	<i>Gerres oyena</i>	11.25-18.75	15.73	0.30	-	-	-
Ornate threadfin bream ¹	<i>Nemipterus hexodon</i>	7.75-28.75	14.06*	0.22	5.75-9.75	7.44*	0.02
Japanese threadfin bream	<i>N. japonicus</i>	7.25-23.75	12.60	0.20	8.75-9.25	9.07	0.01
Mauve lip threadfin bream	<i>N. mesoprion</i>	8.25-18.75	12.31	0.08	6.25-14.25	8.67	0.11
Notched fin threadfin bream	<i>N. peronii</i>	9.75-28.75	15.45	0.28	-	-	-
Purple-spotted bigeye ¹	<i>Priacanthus tayenus</i>	8.75-22.25	13.89*	0.09	6.75-13.75	9.30*	0.03
Slender lizardfish ¹	<i>Saurida elongata</i>	11.75-39.75	19.96*	0.37	10.25-11.25	10.84*	0.01
Short jaw saury	<i>S. isarankurai</i>	-	-	-	5.75-13.25	9.64	0.02
Brush tooth lizardfish ¹	<i>S. undosquamis</i>	13.75-28.75	19.08*	0.20	-	-	-
Lattice monocle bream ¹	<i>Scolopsistae niopterus</i>	8.25-28.25	14.94*	0.18	5.25-12.75	8.98*	0.04
Western king prawn	<i>Penaeus latisulcatus</i>	11.25-19.25	13.52	0.95	-	-	-
Banana prawn ¹	<i>Penaeus merguensis</i>	11.75-19.75	15.96	0.66	-	-	-
Giant tiger prawn	<i>Penaeus monodon</i>	16.25-26.25	20.87	1.20	-	-	-
Green tiger prawn	<i>Penaeus semisulcatus</i>	11.25-18.25	13.63	0.48	-	-	-

Table 5. (Cont.)

Common name	Scientific name	Food fish			Trash fish		
		Range	Mean	S.D.	Range	Mean	S.D.
Mitre squid ¹	<i>Photololigo chinensis</i>	12.25-38.25	20.39	1.07	-	-	-
Indian squid ¹	<i>P. duvaucelii</i>	5.75-18.25	10.54	0.11	-	-	-
Needle cuttlefish ¹	<i>Sepia aculeata</i>	5.75-18.25	10.00	0.17	-	-	-
Pharaoh cuttlefish ¹	<i>Sepia pharaonis</i>	5.25-25.75	12.97*	0.84	-	-	-

Remark: ¹Its size at first maturity was shown in Table 03

* Mean size was smaller than its size at first maturity.

** Unidentified *Rastrelliger* spp.

Table 6. Size of some economically important species caught by pair trawl in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2104.

Common name	Scientific name	Food fish			Trash fish		
		Range	Mean	S.D.	Range	Mean	S.D.
Black fin scad	<i>Alepes melanoptera</i>	9.75-27.25	17.05	0.43	6.25-7.25	7.02	0.01
Yellow tail scad ¹	<i>Atule mate</i>	8.75-29.25	15.51*	0.16	7.75-10.75	8.16*	0.01
Short mackerel ¹	<i>R. brachysoma</i>	12.25-21.75	15.62*	0.01	3.75-10.75**	6.62*	0.00
Indian mackerel ¹	<i>R. kanagurta</i>	11.25-23.75	18.74	0.06	-	-	-
Gold stripe sardinella ¹	<i>Sardinella gibbosa</i>	9.75-19.25	12.99	0.01	5.75-14.25	8.92*	0.01
Big eye scad ¹	<i>Selar crumenophthalmus</i>	8.75-25.75	17.54*	0.15	4.25-12.75	5.59*	0.04
Yellow stripe scad ¹	<i>Selar oidesleptolepis</i>	8.25-19.75	12.94	0.02	2.25-13.75	6.17*	0.01
Deep body silver biddy	<i>Gerres abbreviatus</i>	13.75-16.75	15.60	0.21	-	-	-

Table 6. (Cont.)

Common name	Scientific name	Food fish			Trash fish		
		Range	Mean	S.D.	Range	Mean	S.D.
Whip fin silverbidy	<i>Gerres filamentosus</i>	11.25-18.75	15.30	0.28	-	-	-
Common silverbidy	<i>Gerres oyena</i>	10.75-21.25	16.11	0.22	-	-	-
Ornate threadfin bream ¹	<i>Nemipterus hexodon</i>	8.75-28.75	15.69	0.12	4.25-10.75	7.70*	0.02
Japanese threadfin bream	<i>N. japonicus</i>	8.75-26.25	13.70	0.19	6.25-8.25	7.42	0.00
Mauvelip threadfin bream	<i>N. mesoprion</i>	9.25-21.75	13.27	0.10	5.75-8.75	6.74	0.01
Notched fin threadfin bream	<i>N. peronii</i>	7.75-28.25	16.93	0.09	5.25-10.25	7.58	0.01
Purple-spotted bigeye ¹	<i>Priacanthus tayenus</i>	7.75-26.25	15.44	0.05	3.25-16.25	6.22*	0.02
Slender lizardfish ¹	<i>Saurida elongata</i>	12.75-41.25	21.69*	0.29	10.25-17.25	13.71*	0.06
Short jaw saury	<i>S. isarankurai</i>	-	-	-	3.75-12.75	8.86	0.01
Brush tooth lizardfish ¹	<i>S. undosquamis</i>	11.75-30.75	18.00*	0.20	4.75-16.75	9.13*	0.02
Lattice monocle bream ¹	<i>Scolopsis taeniopterus</i>	10.75-28.25	15.85*	0.39	8.25-14.25	8.57*	0.11
Kobi squid	<i>Nipponololigo sumatrensis</i>	2.75-7.75	5.50	0.01	-	-	-
Mitre squid ¹	<i>Photololigo chinensis</i>	15.75-42.25	22.76	0.40	-	-	-
Indian squid ¹	<i>P. duvaucelii</i>	6.75-20.25	9.95	0.04	-	-	-
Needle cuttlefish ¹	<i>Sepia aculeata</i>	6.25-16.25	10.84	0.10	-	-	-
Pharaoh cuttlefish ¹	<i>Sepia pharaonis</i>	5.75-29.75	12.88*	0.59	-	-	-

¹ Its size at first maturity was shown in Table 00

* Mean size was smaller than its size at first maturity.

** Unidentified *Rastrelliger* spp.

Length of some economically important species by gear

A) OBT1

Among 20 economically important species shown in Table 4, there were 11 species for which sizes at first maturity were previously reported. Mean length of five species in food fish group were smaller than the size at first maturity. While, in trash fish group, four of five species, i.e. two demersal species, two shrimp species and pharaoh cuttlefish, were smaller than the size at first maturity (Table 4).

Regarding the size distribution, four demersal fishes were presented in Figure 2-5. Most fish of all four species were smaller than the size at first maturity. For instance, 91% of lattice monocle bream and 100% of slender lizardfish were smaller than their size at first maturity. Although some invertebrates are not found in trash fish group, size distribution of cuttlefish and greasy back shrimp were analyzed and found that most of them were under their size at first maturity as well. More than 50% of needle cuttlefish and greasy back shrimp were below their size at first maturity (Figure 6-7).

B) OBT2

In both food fish and trash groups, mean length of all pelagic and demersal fishes totaling eight species, except yellow stripe scad, were smaller than their size at first maturity. However, mean length of only one of five invertebrate species was smaller than their size at first maturity (Table 5). It is due to OBT2's fishing ground being far from the shore compared to OBT1 and targeting fish rather than shrimp and prawn.

In addition, large amount of demersal fishes were caught by OBT2. Almost 100% of slender lizardfish, 93% of lattice monocle bream, 87% of purple-spotted big eye and ornate threadfin bream were under their size at first maturity (Figure 8-11). However, about 62% of squids and 55% of needle cuttlefish were larger than their size at first maturity. Whereas 72% of pharaoh cuttlefish, the biggest-sized species in its genus found in the Gulf of Thailand, was smaller than the size at first maturity (Figure 15). On the other hand, most individuals of two species of squids was larger than their size at first maturity (Figure 12-13).

C) PT

Although mean length of eight of fifteen species in the food fish group were larger than the size at first maturity, mean length of all species on the trash fish group were smaller than the size at first maturity (Table 6). It was very important to note that almost 100% of short mackerel, one of the most economically important species in the country, was smaller than its size at first maturity (Figure 16). Most of them appeared in the trash fish group. Other fish species caught by pair trawl also showed that most of them were smaller than their size at first maturity. However, only 28% of gold stripe sardinella was smaller than its size at first maturity (Figure 17) as its bigger size inhabits offshore area, the fishing ground of pair trawl, while the smaller size inhabits in coastal areas. In addition, most of squids were larger than their size at first maturity similar to them caught by OBT2. Conversely, most of pharaoh cuttlefish were smaller than its size at first maturity (Figure 21-23).

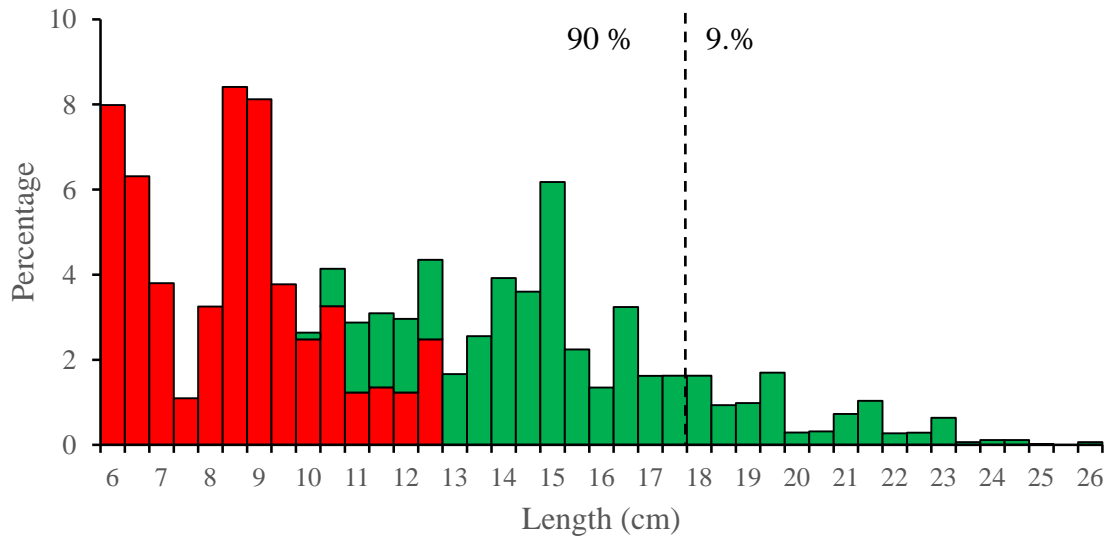


Figure 2. Length distribution of lattice monocle bream, *Scolopsistaeniopterus*, caught by small-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

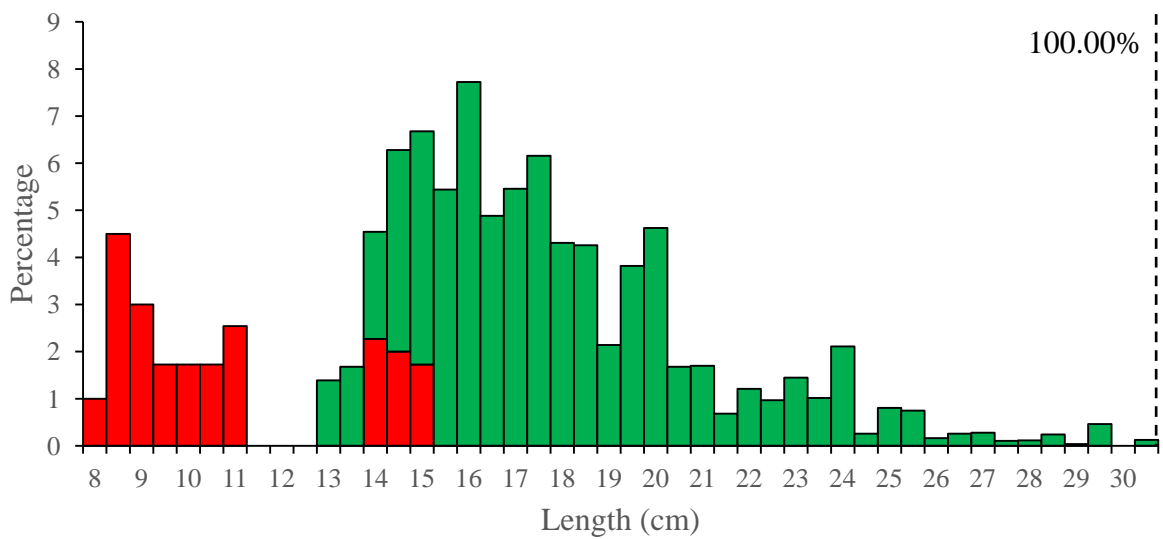


Figure 3. Length distribution of slender lizardfish, *Sauridaelongata*, caught by small-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

In Figure 2-23, red columns are length found in trash fish, green columns are length found in food fish and dotted lines are size at first maturity. The number on the left of the dotted lines represents the percentage of fish which is smaller than the size at first maturity and on the right represents the percentage of fish which is larger than the size at first maturity.

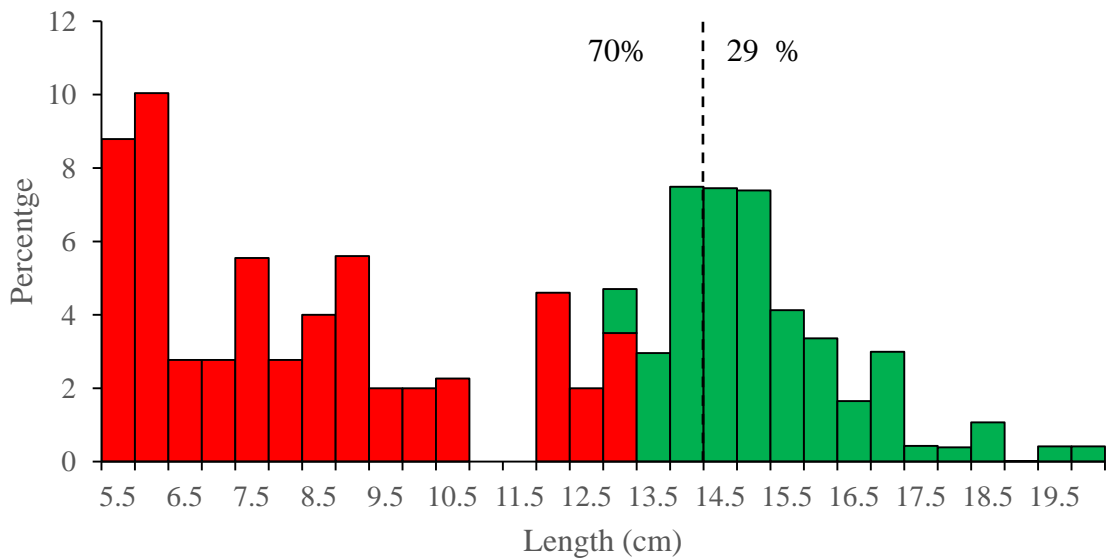


Figure 4. Length distribution of purple-spotted bigeye, *Priacanthus tayenus*, caught by small-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

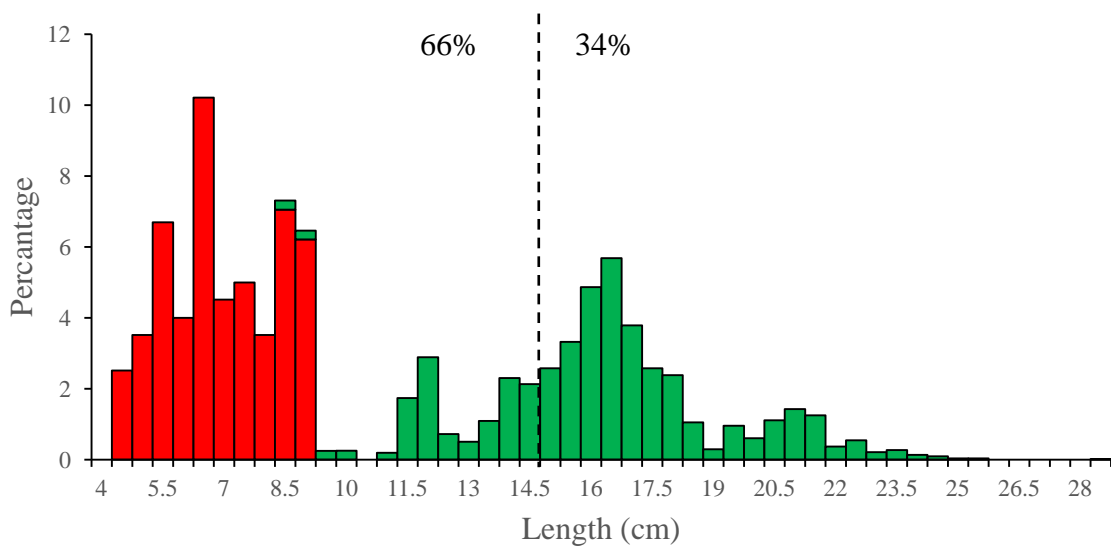


Figure 5. Length distribution of ornate threadfin bream, *Nemipterus hexodon*, caught by small-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

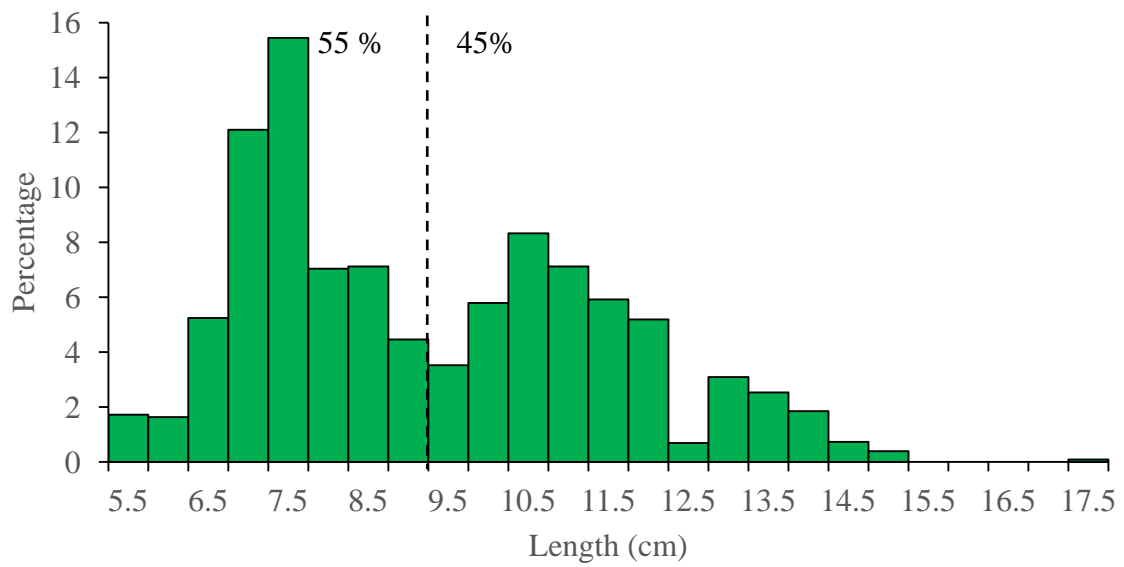


Figure 6. Length distribution of needle cuttlefish, *Sepia aculeata*, caught by small-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

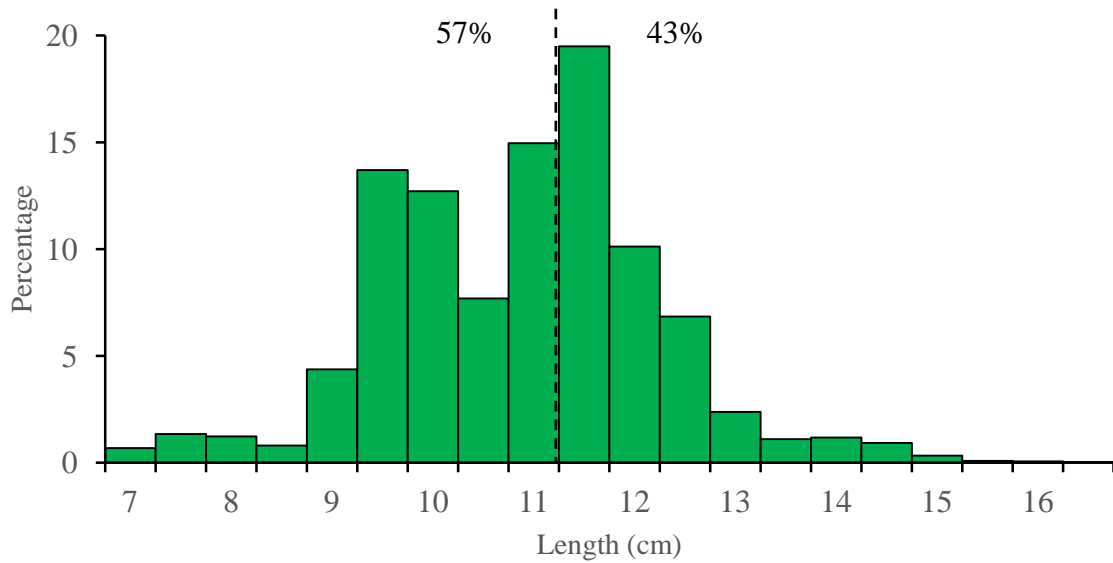


Figure 7. Length distribution of greasy back shrimp, *Metapenaeusensis*, caught by small-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

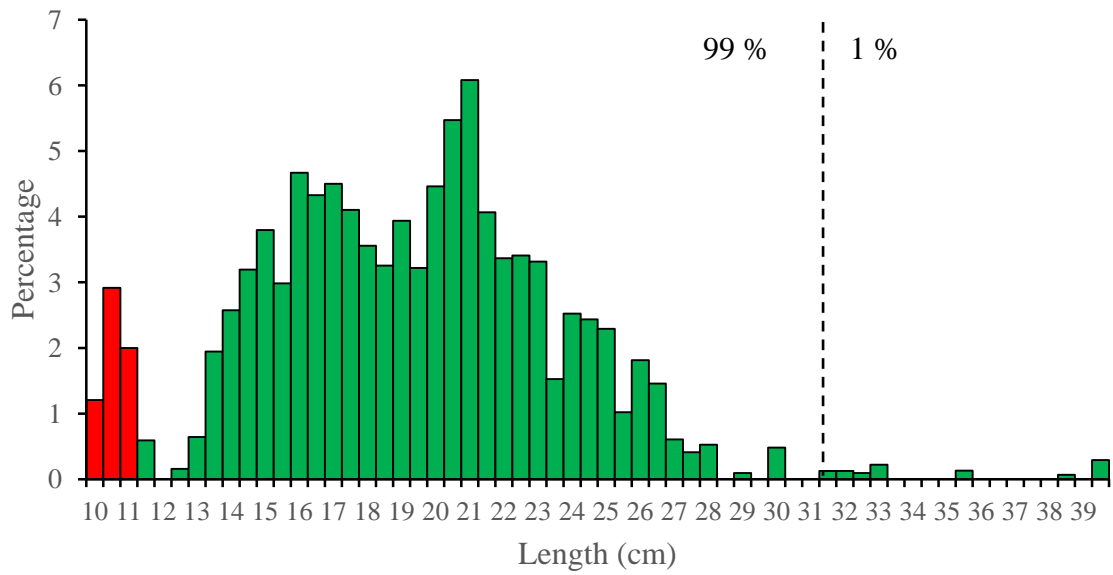


Figure 8. Length distribution of slender lizardfish, *Saurida elongata*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

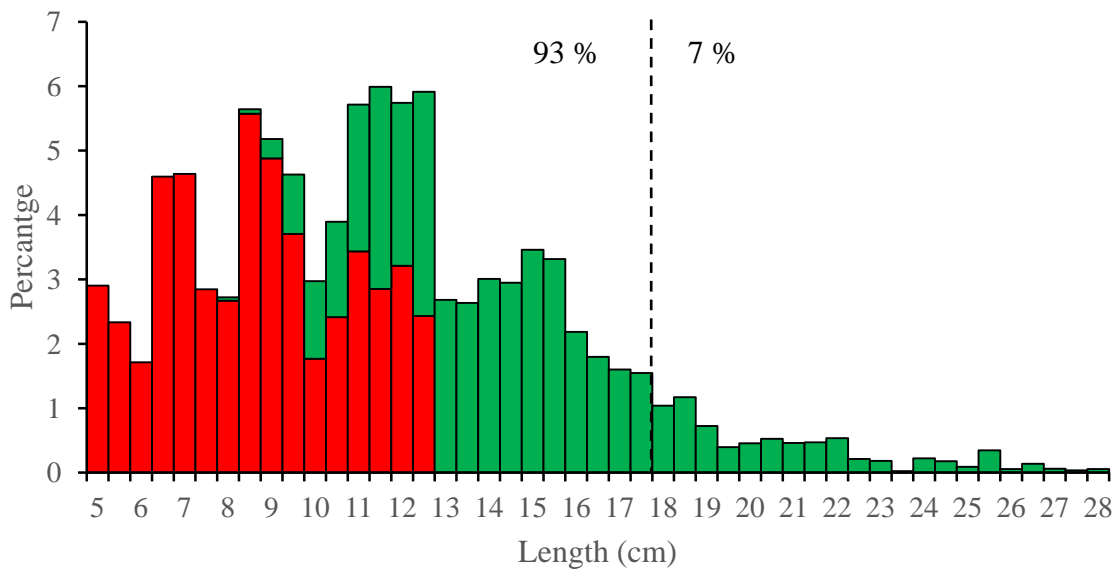


Figure 9. Length distribution of lattice monocle bream, *Scolopsis taeniopterus*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

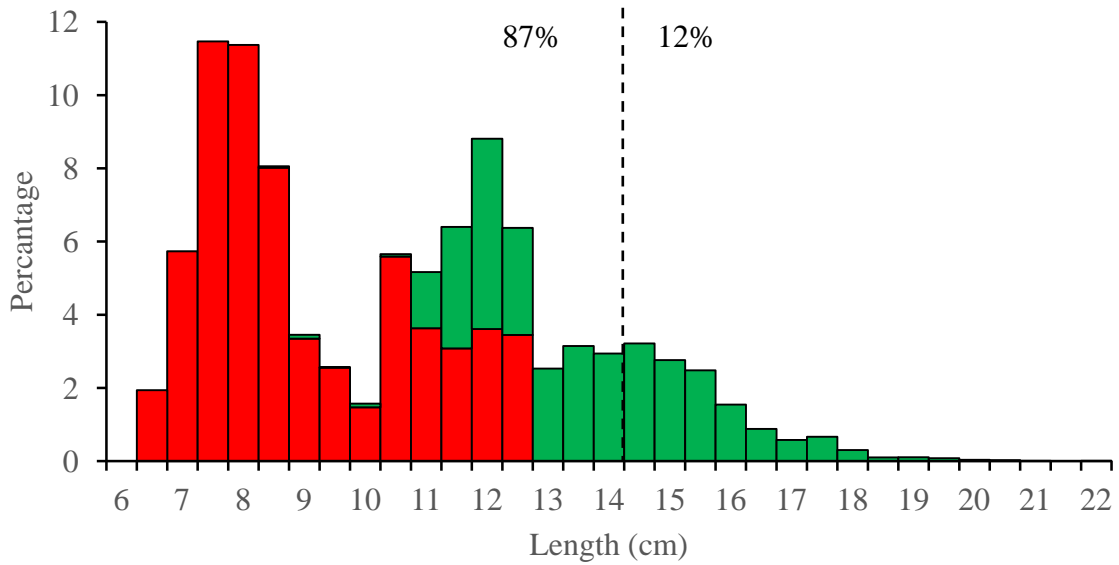


Figure 10. Length distribution of purple-spotted bigeye, *Priacanthus tayenus*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

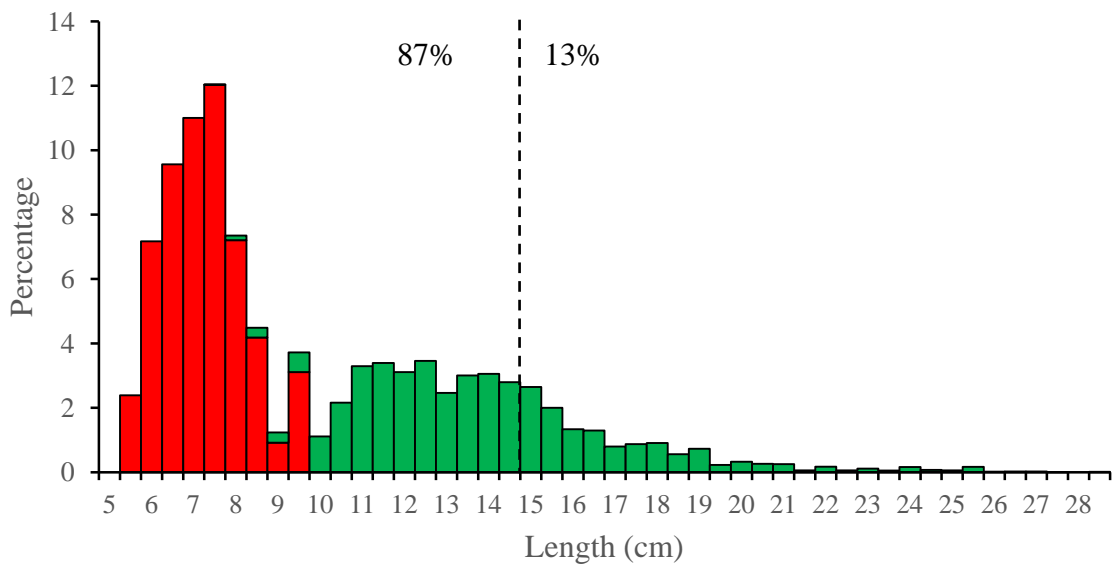


Figure 11. Length distribution of ornate threadfin bream, *Nemipterus hexodon*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

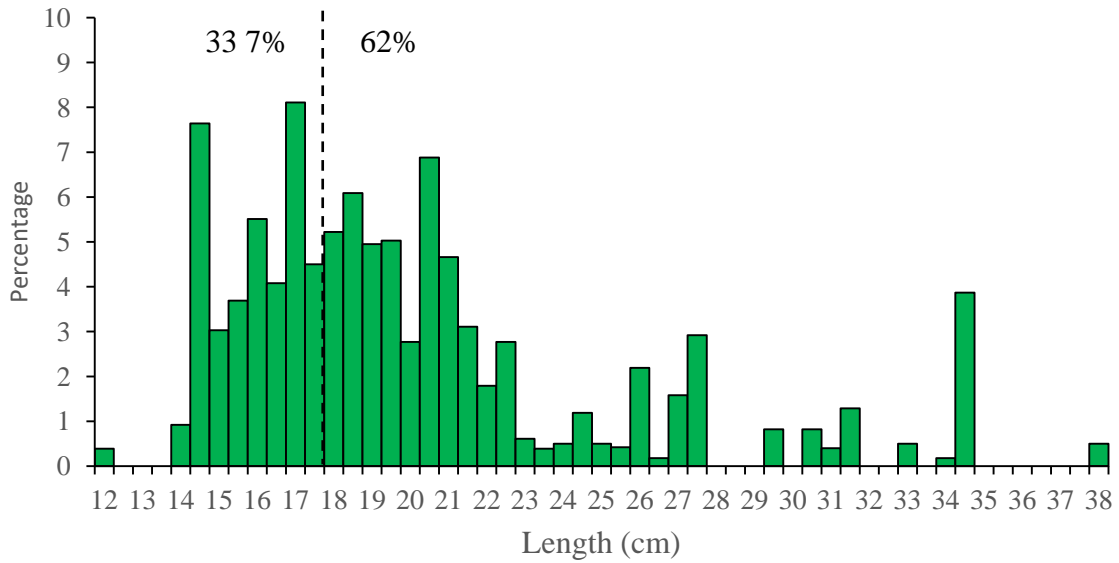


Figure 12. Length distribution of mitre squid, *Photololigo chinensis*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 – May 2014.

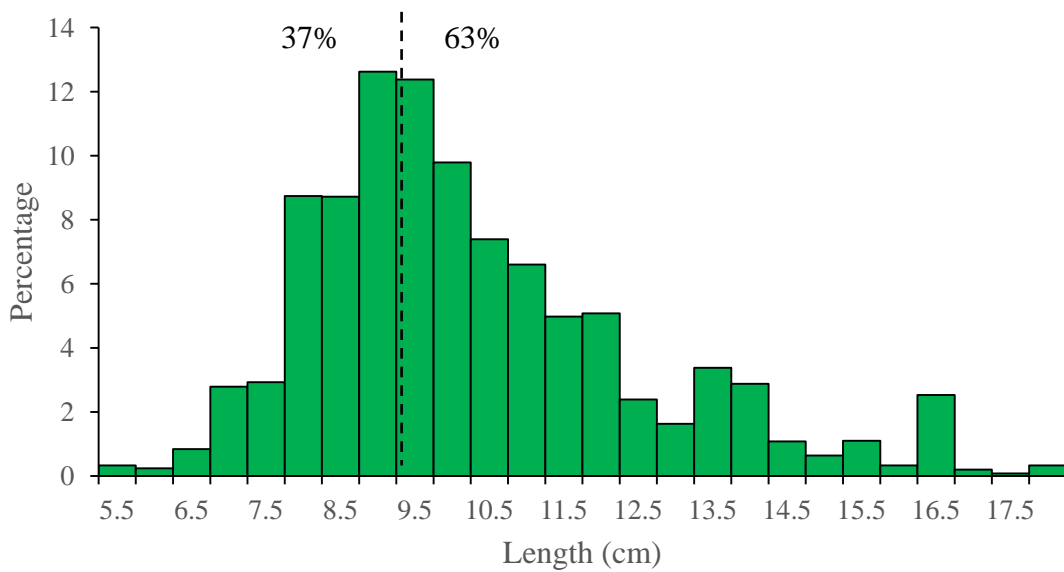


Figure 13. Length distribution of Indian squid, *Photololigo duvaucelii*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

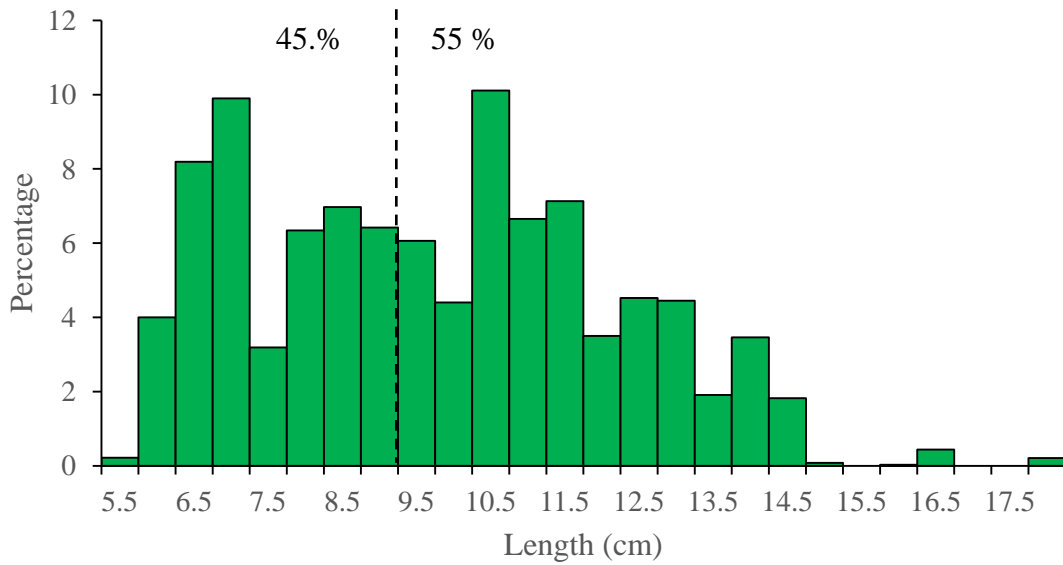


Figure 14. Length distribution of needle cuttlefish, *Sepia aculeata*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

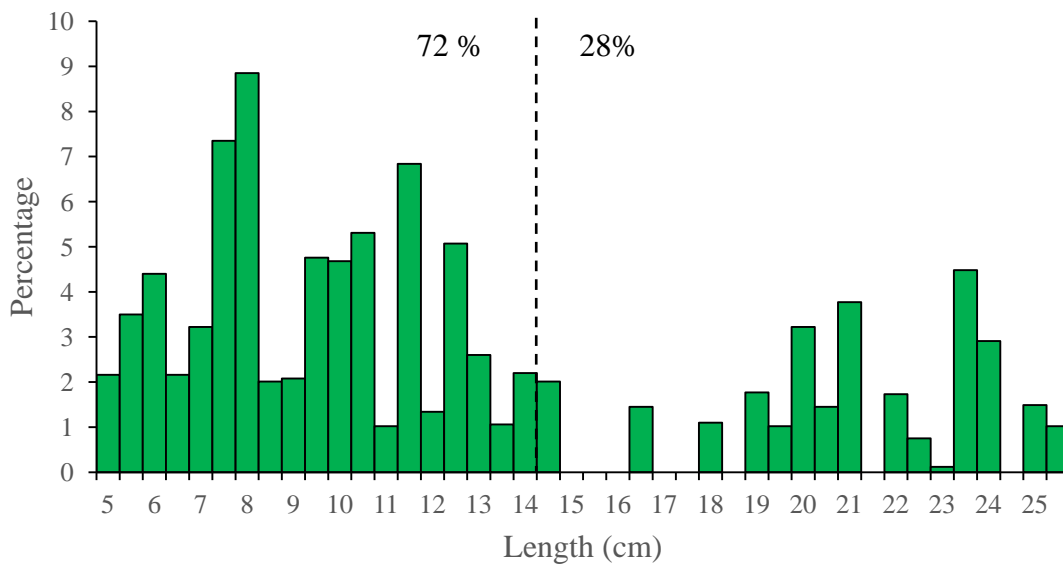


Figure 15. Length distribution of pharaohcuttlefish, *Sepia pharaonis*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

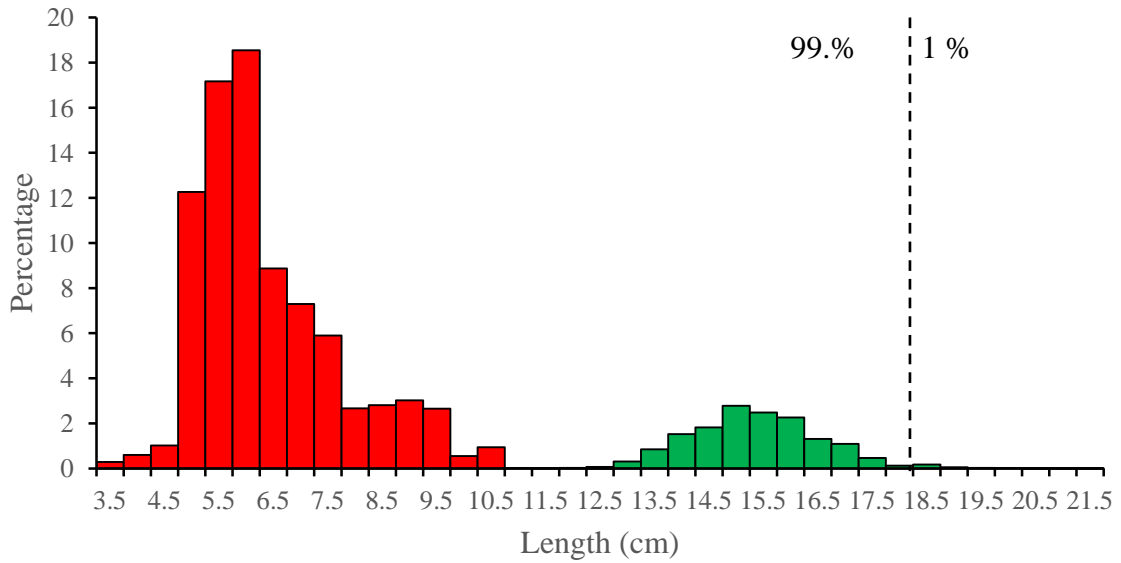


Figure 16. Length distribution of pharaoh cuttle fish, *Sepia pharaonis*, caught by medium-sized otter trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

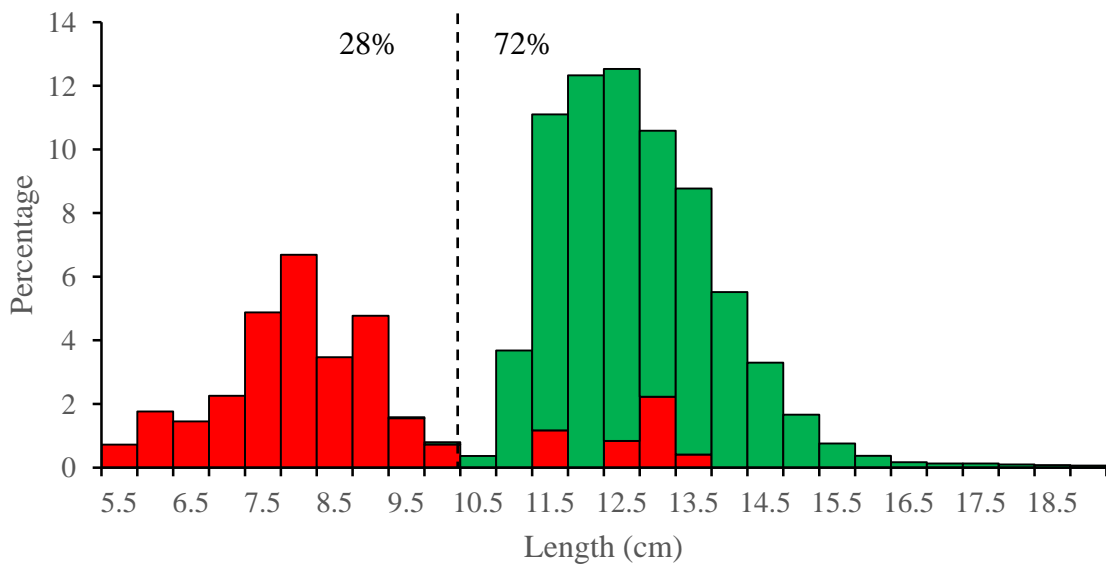


Figure 17. Length distribution of gold stripe sardinella, *Sardinella gibbosa*, caught by pair trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

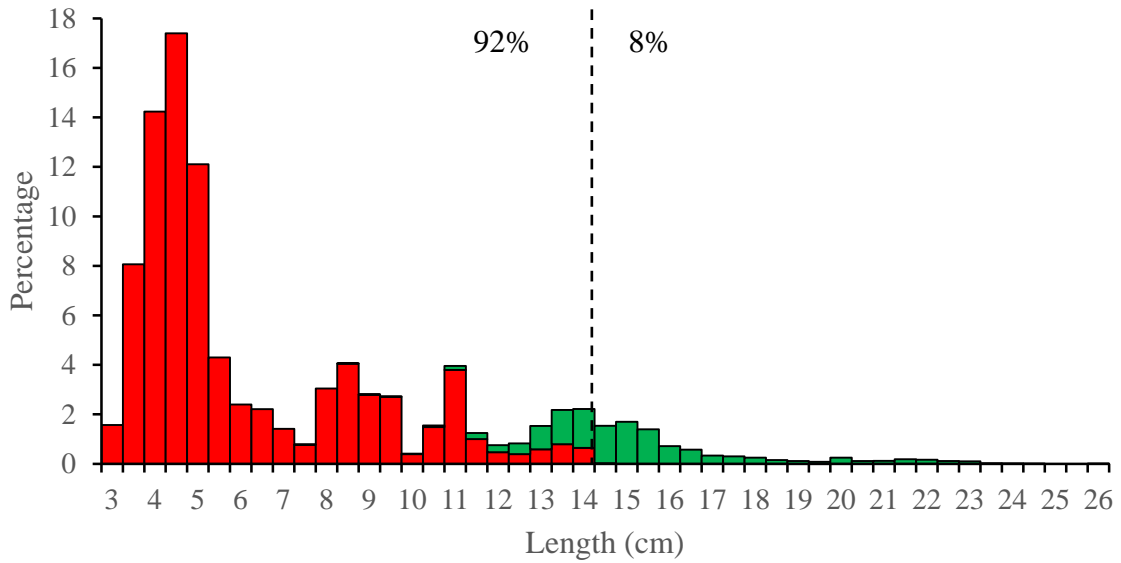


Figure 18. Length distribution of purple-spotted bigeye, *Priacanthus tayenus*, caught by pair trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

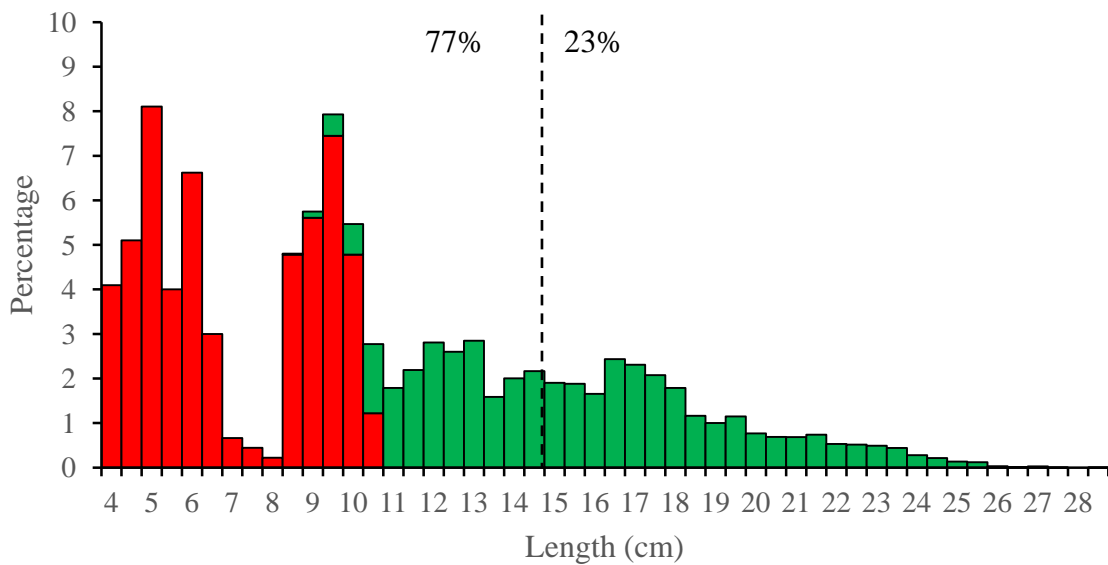


Figure 19. Length distribution of ornate threadfin bream, *Nemipterus hexodon*, caught by pair trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

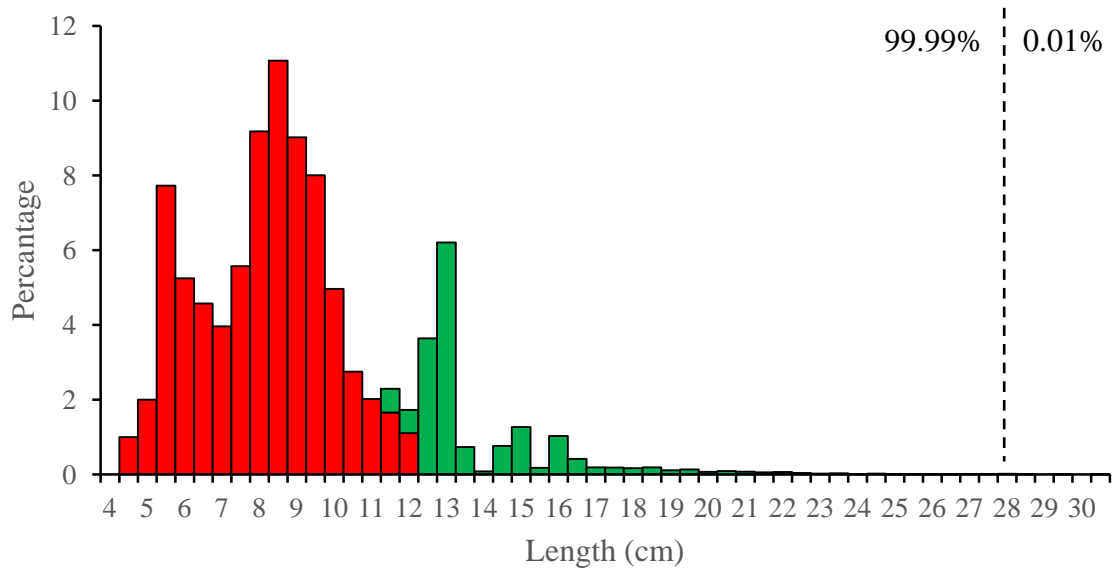


Figure 20. Length distribution of brush tooth lizardfish, *Saurida undosquamis*, caught by pair trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

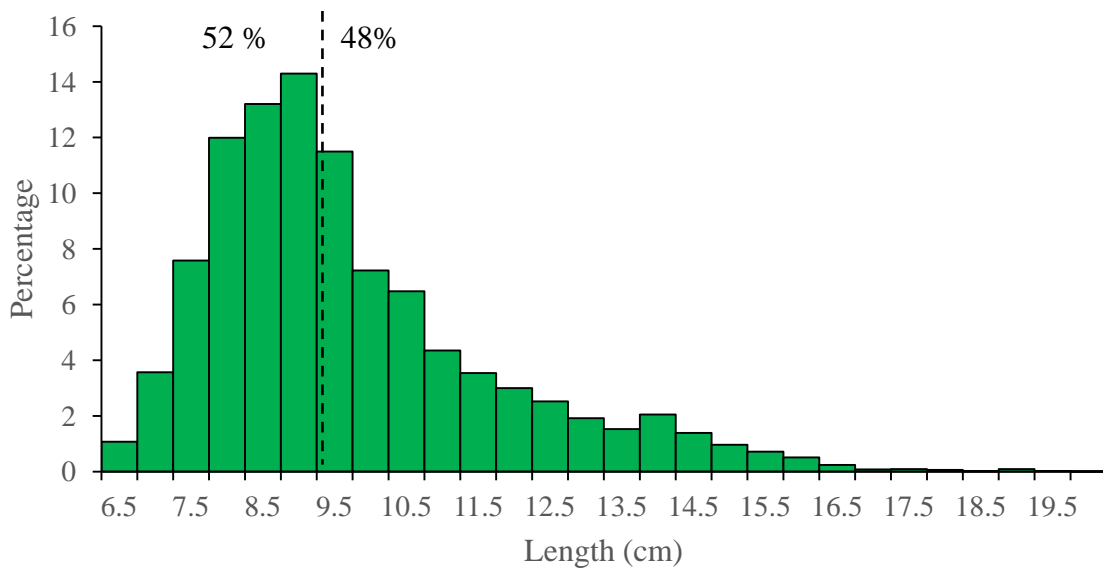


Figure 21. Length distribution of Indian squid, *Photololigo duvaucelii*, caught by pair trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

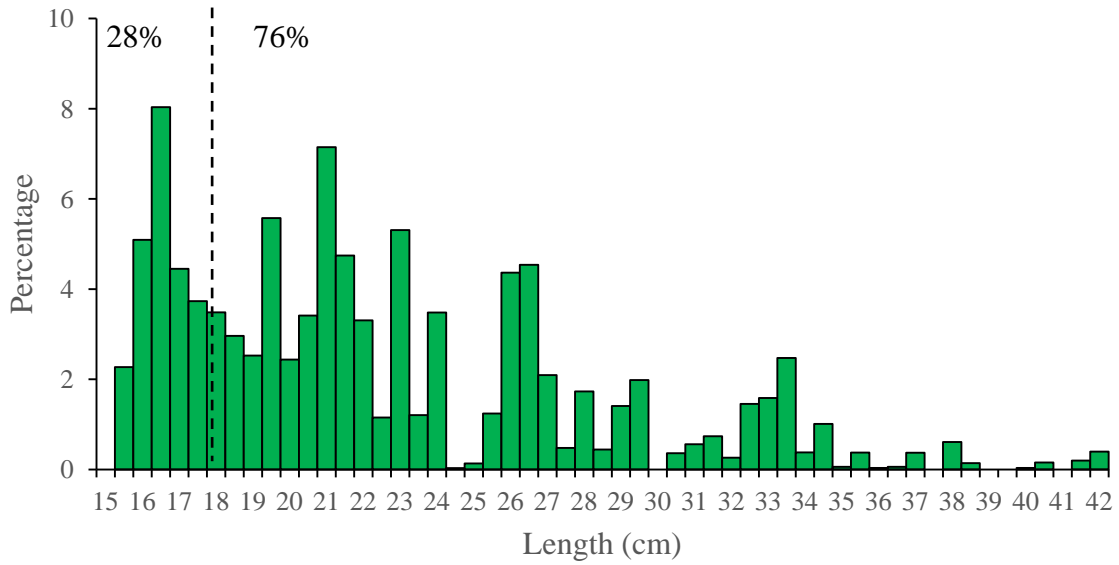


Figure 22. Length distribution of mitre squid, *Photololigo chinensis*, caught by pair trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

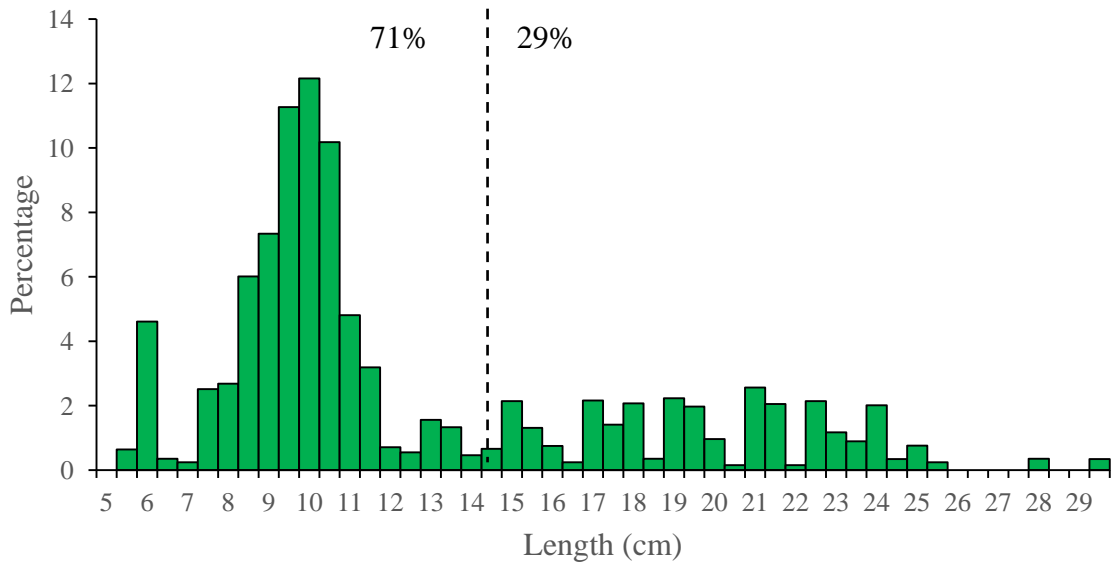


Figure 23. Length distribution of pharaoh cuttlefish, *Sepia pharaonis*, caught by pair trawls in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014.

4. Conclusion

4.1 CPUE and species composition

The CPUE of OBT1, OBT2 and PT were 48, 28 and 150 kg/hour respectively. The percentages of food fish from OBT1, OBT2 and PT were 36%, 58% and 46% of the total

catch respectively. Demersal fish and shrimp and prawn were the main composition of OBT1 summing up to 86% of total food fish. Demersal fish and cephalopod were the main composition of OBT2 summing up to 77% and pelagic fish and demersal fish were the main composition of PT summing up to 83%.

The percentages of trash fish from OBT1, OBT2 and PT were 64%, 42% and 54% of the total catch respectively. Demersal fish was the main part of the trash fish of OBT1 and OBT2 making up to 62% and 47% of the total trash fish respectively while pelagic fish was the main composition of PT making up to 42% of the total trash fish. The total percentages of economic species in trash fish were 78%, 64% and 74% of the total trash fish respectively whereas the remaining percentages were true trash fish.

4.2 Length of some economically important species

Mean length of most species were smaller than their size at first maturity particularly pelagic and demersal species caught by all gear. For OBT1, the mean length of slender lizardfish and lattice monocle bream were smaller than their size at first maturity both in food fish and trash fish group. For OBT2, the mean length of yellowtail scad, short mackerel, ornate threadfin bream, purple-spotted bigeye, slender lizardfish and lattice monocle bream in both group were smaller than their size at first maturity. While the mean length of yellowtail scad, short mackerel, big eye scad, brush tooth lizardfish, slender lizardfish and lattice monocle bream in both groups were smaller than their size at first maturity. The length distribution also showed that most of individual fish caught by all gear was smaller than their size at first maturity. However, mean length of squids were larger than their size at first maturity in all gear.

5. Acknowledgement

I am grateful to staff in the Survey and Assessment of Fishery Resources and Fishing Status Unit, Chumphon Marine Fisheries Research and Development Center (CMDEC) for their assistance with the data collection for this project.

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Appendix A
CPUE and species composition

Table 1 CPUE and species composition of food fish from small-sized otter board trawl operated in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(kg/hr)	Composition	
		(% of total catch)	(% of food fish)
Total	17.39	36.08	100.00
Sub-total pelagic fish	0.29	0.61	1.68
Yellow stripe scad	<i>Selaroides leptolepis</i>	0.25	1.45
Other pelagic fishes		0.04	0.24
Sub-total demersal fish	12.90	26.75	74.14
Flatheads		2.93	16.84
Lattice monocle bream	<i>Scolopsis taeniopterus</i>	2.62	15.09
Slender lizardfish	<i>Saurida elongata</i>	1.02	5.86
Japanese threadfin bream	<i>Nemipterus japonicus</i>	1.01	5.82
Goatfishes		0.91	5.23
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	0.53	3.03
Ornate threadfin bream	<i>N. hexodon</i>	0.52	2.96
Silver biddies	<i>Gerres</i> spp.	0.51	2.63
Rays		0.46	2.35
Sillagoes	<i>Sillago</i> spp.	0.41	2.94
Croakers		0.24	1.39
Barracudas	<i>Sphyraena</i> spp.	0.24	1.38
Notched fin threadfin bream	<i>N. peronii</i>	0.23	1.33
Tongue soles		0.17	0.96
Mauve lip threadfin bream	<i>N. mesoprion</i>	0.17	0.96
Big eye snapper	<i>Lutjanua lutjanus</i>	0.15	0.86
Splendid pony fish	<i>Leiognathus splendens</i>	0.12	0.72
Other demersal fishes		0.66	3.79
Sub-total cephalopod	1.47	3.04	8.43
Needle cuttlefish	<i>Sepia aculeata</i>	0.72	4.15
Indian squid	<i>Photololigo duvaucelii</i>	0.27	1.54
Pharaoh cuttlefish	<i>Sepia pharaonis</i>	0.19	1.08
Octopus		0.18	1.01
Other cephalopod		0.11	0.65
Sub-total shrimp and prawn	2.03	4.22	11.70
Western king prawn	<i>Penaeus latisulcatus</i>	0.42	2.42
Greasy back shrimp	<i>Metapenaeus ensis</i>	0.36	2.06
Velvet shrimps	<i>Metapenaeopsis</i> spp.	0.34	1.94
Giant tiger prawn	<i>Penaeus monodon</i>	0.22	1.28
Banana prawn	<i>Penaeus merguensis</i>	0.21	1.22
Rough shrimps	<i>Trachypenaeus</i> spp.	0.15	0.89
Green tiger prawn	<i>Penaeus semisulcatus</i>	0.12	0.71
Other shrimps and prawns		0.20	1.18
Sub-total other invertebrate	0.70	1.46	4.05
Asian moon scallop	<i>Amusium pleuronectes</i>	0.52	2.99

Sentinel crab	<i>Podophthalmus vigil</i>	0.11	0.23	0.63
Other invertebrates		0.08	0.16	0.43

Table 2 CPUE and species composition of trash fish from small-sized otter board trawl operated in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(k g/hr)	Composition	
		(% of total catch)	(% of trash fish)
Total	30.82	63.92	100.00
Sub-total pelagic fish	0.89	1.85	2.89
Torpedo scad	<i>Megalaspis cordyla</i>	0.22	0.73
Mackerels	<i>Rastrelliger spp.</i>	0.21	0.67
Yellow stripe scad	<i>Selaroides leptolepis</i>	0.20	0.66
Other pelagic fish		0.26	0.83
Sub-total demersal fish	19.26	39.95	62.49
Splendid pony fish	<i>Leiognathus splendens</i>	7.72	25.05
Spine foots	<i>Siganus spp.</i>	5.60	18.16
Flatheads		0.87	2.83
Eel catfishes	<i>Plotosusspp.</i>	0.86	2.79
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	0.73	2.38
Lattice monocle bream	<i>Scolopsis taeniopterus</i>	0.72	2.34
Silver biddies	<i>Gerres spp.</i>	0.37	1.20
Threadfin bream	<i>Nemipterus spp.</i>	0.36	1.17
Puffers	<i>Lagocephalus spp.</i>	0.36	1.16
Tooth pony	<i>Gazza minuta</i>	0.31	0.99
Indian halibut	<i>Psetto deserumei</i>	0.27	0.89
Common pony fish	<i>Leiognathus equulus</i>	0.27	0.86
Other demersal fishes		0.82	2.67
Sub-total cephalopod	0.32	0.66	1.04
Cuttlefishes		0.31	1.00
Kobi squid	<i>Photololigo sumatrensis</i>	0.01	0.04
Sub-total shrimp and prawn	0.19	0.40	0.63
Sub-total other invertebrate	3.50	7.25	11.35
Crabs		3.41	11.07
Mantis shrimps		0.09	0.28
Sub-total true trash fish	6.66	13.81	21.60
Pony fishes		3.73	12.09
Cardinal fishes		1.47	4.77
Trigger fishes		0.61	1.97
Silver-cheeked toadfish	<i>Lagocephaluss celeratus</i>	0.32	1.05
Gobies		0.21	0.69
Scorpion fishes		0.17	0.55
Lefteye flounders		0.15	0.48

Table 3 CPUE and species composition of food fish from medium-sized otter board trawl operated in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(k g/hr)	Composition (%)	
		(% of total catch)	(% of food fish)
Total	16.07	57.85	100.00
Sub-total pelagic fish	0.17	0.63	1.09
Yellow stripe scad	<i>Selaroides leptolepis</i>	0.05	0.34
Indian mackerel	<i>Rastrelligerkanagurta</i>	0.03	0.18
Short mackerel	<i>R. brachysoma</i>	0.02	0.11
Other pelagic fishes		0.07	0.46
Sub-total demersal fish	9.94	35.79	61.87
Flatheads		2.21	13.74
Tongue soles		1.21	7.51
Slender lizardfish	<i>Saurida elongata</i>	1.02	6.34
Lattice monocle bream	<i>Scolopsis taeniopterus</i>	0.93	5.77
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	0.89	5.52
Ornate threadfin bream	<i>Nemipterus hexodon</i>	0.65	4.02
Goat fishes	Mullidae	0.48	3.01
Notchedfin threadfin bream	<i>N. peronii</i>	0.36	2.26
Threadfin breams	<i>Nemipterus</i> spp.	0.30	1.85
Brushtooth lizard fish	<i>Saurida undosquamis</i>	0.30	1.84
Rays		0.28	1.78
Barracudas	<i>Sphyraena</i> spp.	0.23	1.47
Puffers	<i>Lagocephalus</i> spp.	0.22	1.38
Cutlass fishes		0.10	0.64
Silver biddies	<i>Gerres</i> spp.	0.09	0.55
Other demersal fishes		0.67	4.19
Sub-total cephalopod	2.44	8.78	15.17
Octopus		0.60	3.73
Indian squid	<i>Photololigo duvaucelii</i>	0.57	3.57
Needle cuttlefish	<i>Sepia aculeata</i>	0.56	3.46
Pharaoh cuttlefish	<i>Sepia pharaonis</i>	0.26	1.63
Mitre squid	<i>Photololigo chinensis</i>	0.24	1.47
Other cephalopods		0.21	1.31
Sub-total shrimp and prawn	1.48	5.31	9.19
Velvet shrimps	<i>Metapenaeopsis</i> spp.	1.44	8.96
Penaeid shrimps	<i>Penaeus</i> spp.	0.02	0.12
Other shrimps and prawns		0.02	0.11
Sub-total other invertebrate	2.04	7.34	12.68
Asian moon scallop	<i>Amusium pleuronectes</i>	1.69	10.53
Sentinel crab	<i>Podophthalmus vigil</i>	0.06	0.34
Other invertebrates		0.29	1.81

Table 4 CPUE and species composition of trash fish from medium-sized otter board trawl operated in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(kg/hr)	Composition (%)	
		(% of total catch)	(% of trash fish)
Total	11.71	42.15	100.00
Sub-total pelagic fish	0.61	2.18	5.18
Yellow stripe scad	<i>Selaroides leptolepis</i>	0.35	3.00
Mackerels	<i>Rastrelliger</i> spp.	0.17	1.45
Other pelagic fish		0.09	0.73
Sub-total demersal fish	5.47	19.69	46.73
Flatheads		1.51	12.93
Spine foots	<i>Siganus</i> spp.	1.15	9.80
Indian halibut	<i>Psetto deserumei</i>	0.86	7.35
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	0.52	4.47
Short jaw saury	<i>Saurida isarankurarii</i>	0.37	3.12
Goatfishes		0.23	2.00
Lattice monocle bream	<i>Scolopsis taeniopterus</i>	0.19	1.62
Dwarf flat head	<i>Elates ransonnetii</i>	0.12	1.02
Ornate threadfin bream	<i>N. hexodon</i>	0.12	1.02
Brush tooth lizardfish	<i>Saurida undosquamis</i>	0.10	0.86
Other demersal fishes		0.30	2.54
Sub-total cephalopod	0.25	0.91	2.16
Cuttlefishes		0.15	1.33
Kobi squid	<i>Nipponololigo sumatrensis</i>	0.09	0.77
Octopuses		0.01	0.06
Sub-total shrimp and prawn	0.30	1.07	2.55
Sub-total other invertebrate	0.81	2.91	6.89
Crabs		0.73	6.25
Bivalves		0.04	0.36
Mantis shrimps		0.04	0.28
Sub-total true trash fish	4.27	15.39	36.49
Pony fishes		1.48	12.63
Trigger fishes		0.65	5.52
Left eye flounders		0.63	5.40
Cardinal fishes		0.46	3.96
Scorpion fishes		0.27	2.30
Silver-cheeked toadfish	<i>Lagocephalus sceleratus</i>	0.24	2.01
Long fin silver biddy	<i>Pentaprion longimanus</i>	0.21	1.83
Smooth blaasop	<i>Lagocephalus inermis</i>	0.15	1.29
Other true trash fishes		0.18	1.55

Table 5 CPUE and species composition of food fish from pair trawl operated in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(k g/hr)	Composition (%)	
		(% of total catch)	(% of food fish)
Total	68.35	45.56	100.00
Sub-total pelagic fish	31.88	21.25	46.64
Short mackerel	<i>Rastrelliger brachysoma</i>	10.52	15.39
Gold stripe sardinella	<i>Sardinella gibbosa</i>	6.48	9.48
Yellow stripe scad	<i>Selaroides leptolepis</i>	6.41	9.39
Indian mackerel	<i>R. kanagurta</i>	1.78	2.60
King mackerels	<i>Scomberomorus spp.</i>	1.45	2.12
Dorab wolf-herring	<i>Chirocentrus dorab</i>	0.77	1.12
Yellowtail scad	<i>Atule mate</i>	0.76	1.11
Big eye scad	<i>Selar crumenophthalmus</i>	0.68	1.00
Black pomfret	<i>Parastromateus niger</i>	0.62	0.91
Torpedo scad	<i>Megalaspis cordyla</i>	0.48	0.70
Other pelagic fish		1.93	2.82
Sub-total demersal fish	24.53	16.35	35.89
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	5.40	7.90
Goat fishes		2.70	3.95
Notched fin threadfin bream	<i>Nemipterus peronii</i>	2.51	3.67
Cutlass fishes		2.31	3.38
Ornate threadfin bream	<i>Nemipterus hexodon</i>	1.65	2.42
Barracudas	<i>Sphyreana spp.</i>	1.44	2.10
Slender lizardfish	<i>Saurida elongata</i>	1.24	1.82
Other threadfin breams		1.07	1.57
Puffers	<i>Lagocephalus spp.</i>	0.73	1.06
Croakers		0.66	0.96
Spine foots	<i>Siganus spp.</i>	0.51	0.75
Other lizard fishes	<i>Saurida spp.</i>	0.49	0.72
Other demersal fishes		3.82	5.59
Sub-total cephalopod	11.49	7.66	16.81
Indian squid	<i>Photololigo duvaucelii</i>	5.89	8.62
Kobi squid	<i>Nipponololigo sumatrensis</i>	2.07	3.03
Mitre squid	<i>Photololigo chinensis</i>	1.72	2.51
Pharaoh cuttlefish	<i>Sepia pharaonis</i>	0.69	1.01
Other cuttlefishes		0.64	0.94
Octopuses		0.4	0.58
Bigfin reef squid	<i>Sepioteuthis lessoniana</i>	0.08	0.12
Sub-total shrimp and prawn	0.01	0.01	0.02
Sub-total other invertebrate	0.44	0.29	0.64
Crabs		0.23	0.34
Asian moon scallop	<i>Amusium pleuronectes</i>	0.13	0.18
Mantis shrimps		0.05	0.07

Flathead lobster	<i>Thenus orientalis</i>	0.03	0.02	0.05
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Table 6 CPUE and species composition of trash fish from pair trawl operated in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(k g/hr)	Composition (%)	
		(% of total catch)	(% of trash fish)
Total	81.67	54.44	100.00
Sub-total pelagic fish	34.60	23.07	42.37
Anchovies	19.29	12.86	23.61
Carangids	5.53	3.69	6.78
Mackerels	3.74	2.49	4.58
Indian mackerel	<i>Rastrelliger kanagurta</i>	1.63	1.09
Gold stripe sardinella	<i>Sardinella gibbosa</i>	1.08	0.72
Other pelagic fishes	3.33	2.22	4.08
Sub-total demersal fish	19.72	13.15	24.15
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	4.27	2.85
Groupers	<i>Epinephelus</i> spp.	3.98	2.65
Goat fishes		2.21	1.47
Brush tooth lizardfish	<i>Saurida undosquamis</i>	2.05	1.37
Short jaw saury	<i>Saurida isarankurarii</i>	1.51	1.01
Cutlass fishes		1.02	0.68
Threadfin breams	<i>Nemipterus</i> spp.	0.97	0.65
Barracudas	<i>Sphyraena</i> spp.	0.87	0.58
Spine foots	<i>Siganus</i> spp.	0.52	0.35
Other demersal fishes		2.32	1.54
Sub-total cephalopod	4.58	3.05	5.61
Kobi squid	<i>Nipponololigo sumatrensis</i>	3.65	2.43
Cuttle fishes		0.80	0.53
Other squids		0.10	0.07
Octopuses		0.03	0.02
Sub-total shrimp and prawn	0.91	0.60	1.11
Sub-total other invertebrate	0.23	0.15	0.28
Sub-total true trash fish	21.63	14.42	26.48
Pony fishes		13.74	16.82
Long fin silver biddy	<i>Pentaprion longimanus</i>	2.07	1.38
Unicorn cod	<i>Bregmaceros mccllellandi</i>	1.91	1.28
Puffers	<i>Lagocephalus</i> spp.	1.66	1.1
Trigger fishes		1.28	0.85
Cardinal fishes		0.55	0.37
Other true trash fishes		0.42	0.28

Appendix B
Length of some economically important species

Table 1 Length of some economically important species caught by OBT1 in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2104

Species	Food fish				Trash fish			
	Min (cm)	Max (cm)	Mean (cm)	SD (cm)	Min (cm)	Max (cm)	Mean (cm)	SD (cm)
<i>Gerres abbreviatus</i>	10.25	19.75	12.66	0.59				
<i>G.filamentosus</i>	11.75	23.25	15.02	1.04	8.25	10.75	9.53	0.02
<i>G.oyena</i>	9.75	19.25	13.84	0.66	8.75	11.25	9.81	0.04
<i>Nemipterus hexodon</i>	8.75	28.75	15.43	0.78	4.75	11.25	8.88	0.10
<i>N. japonicus</i>	8.75	22.25	11.89	0.24	9.75	11.25	10.33	0.02
<i>N. mesoprion</i>	9.75	17.75	13.81	0.25	5.25	9.25	6.97	0.08
<i>N. peronii</i>	11.75	24.75	16.57	0.61	-	-	-	-
<i>Saurida elongata</i>	13.25	30.75	18.23	0.43	8.75	15.25	10.99	0.18
<i>S. undosquamis</i>	11.25	27.25	16.09	1.36	9.75	10.25	9.79	0.01
<i>Priacanthus tayenus</i>	13.25	20.25	15.39	0.17	5.75	13.75	9.75	0.09
<i>Scolopsis taeniopterus</i>	8.75	26.25	15.72	0.27	6.25	14.25	8.83	0.09
<i>Sillago maculata</i>	12.25	22.75	15.22	0.71	-	-	-	-
<i>Sillago sihama</i>	11.25	21.25	15.26	0.26	-	-	-	-
<i>Photololigo duvaucelii</i>	5.75	21.25	10.09	0.67	-	-	-	-
<i>Sepia aculeata</i>	5.75	17.75	9.50	0.44	-	-	-	-
<i>Sepia pharaonis</i>	6.25	25.25	9.78	2.66	-	-	-	-
<i>Sepia recurvirostris</i>	5.75	9.75	8.27	0.42	-	-	-	-
<i>Sepiella innermis</i>	5.75	9.75	7.70	0.59	-	-	-	-
<i>Metapenaeus affinis</i>	8.25	14.25	11.13	0.18	-	-	-	-
<i>M. ensis</i>	7.25	16.75	11.13	0.15	-	-	-	-
<i>Penaeus latisulcatus</i>	8.75	20.25	14.15	0.25	-	-	-	-
<i>P. merguensis</i>	12.75	22.75	15.85	0.40	-	-	-	-
<i>P. monodon</i>	16.25	28.75	20.89	0.76	-	-	-	-
<i>P. semisulcatus</i>	10.25	20.75	14.78	0.45	-	-	-	-
<i>Trachypenaeus spp.</i>	5.25	8.75	6.44	0.03	-	-	-	-

Table 2 Length of some economically important species caught by OBT2 in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2104

Species	Food fish				Trash fish			
	Min (cm)	Max (cm)	Mean (cm)	SD (cm)	Min (cm)	Max (cm)	Mean (cm)	SD (cm)
<i>Gerres abbreviatus</i>	11.25	17.25	13.61	0.27	-	-	-	-
<i>G. filamentosus</i>	11.25	22.75	15.74	0.38	-	-	-	-
<i>G. oyena</i>	11.25	18.75	15.73	0.30	-	-	-	-
<i>Nemipterus hexodon</i>	7.75	28.75	14.06	0.22	5.75	9.75	7.44	0.02
<i>N. japonicus</i>	7.25	23.75	12.60	0.20	8.75	9.25	9.07	0.01
<i>N. mesoprion</i>	8.25	18.75	12.31	0.08	6.25	14.25	8.67	0.11
<i>N. peronii</i>	9.75	28.75	15.45	0.28	-	-	-	-
<i>Saurida elongata</i>	11.75	39.75	19.96	0.37	10.25	15.75	12.59	0.09
<i>S. undosquamis</i>	13.75	28.75	19.08	0.20	7.25	12.75	10.16	0.03
<i>Priacanthus tayenus</i>	8.75	22.25	13.89	0.09	6.75	13.75	9.30	0.03
<i>Scolopsis taeniopterus</i>	8.25	28.25	14.94	0.18	5.25	12.75	8.98	0.04
<i>Photololigo chinensis</i>	12.25	38.25	20.39	1.07	-	-	-	-
<i>P. duvaucelii</i>	5.75	18.25	10.54	0.11	-	-	-	-
<i>Sepia aculeata</i>	5.75	18.25	10.00	0.17	-	-	-	-
<i>Sepia pharaonis</i>	5.25	25.75	12.97	0.84	-	-	-	-
<i>Penaeus latisulcatus</i>	11.25	19.25	13.52	0.95	-	-	-	-
<i>P. merguensis</i>	11.75	19.75	15.96	0.66	-	-	-	-
<i>P. monodon</i>	16.25	26.25	20.87	1.20	-	-	-	-
<i>P. semisulcatus</i>	11.25	18.25	13.63	0.48	-	-	-	-
<i>Trachypenaeus spp.</i>	5.25	6.75	5.95	0.01	-	-	-	-

Table 3 Length of some economically important species caught by pair trawl in Prachuap Khiri Khan and Chumphon Province during June 2013 - May 2104

Species	Food fish				Trash fish			
	Min (cm)	Max (cm)	Mean (cm)	SD (cm)	Min (cm)	Max (cm)	Mean (cm)	SD (cm)
<i>Atule mate</i>	8.75	29.25	15.51	0.16	7.75	10.75	8.16	0.01
<i>Rastrelliger brachysoma</i>	11.25	21.75	15.62	0.01	10.25	16.25	10.90	0.06
<i>R. kanagurta</i>	11.25	23.75	18.74	0.06	10.25	15.25	13.35	0.01
<i>Rastrelliger spp.</i>	-	-	-	-	3.75	10.75	6.62	0.00
<i>Sardinella gibbosa</i>	9.75	19.25	12.99	0.01	5.75	14.25	8.92	0.01
<i>Selar crumenophthalmus</i>	8.75	25.75	17.54	0.15	4.25	12.75	5.59	0.04
<i>Selar oidesleptolepis</i>	8.25	19.75	12.94	0.02	2.25	13.75	6.17	0.01
<i>Gerres abbreviatus</i>	13.75	16.75	15.60	0.21	-	-	-	-
<i>G. filamentosus</i>	11.25	18.75	15.30	0.28	-	-	-	-
<i>G. oyena</i>	10.75	21.25	16.11	0.22	-	-	-	-
<i>Nemipterus hexodon</i>	8.75	28.75	15.69	0.12	4.25	10.75	7.70	0.02
<i>N. japonicus</i>	8.75	26.25	13.70	0.19	6.25	8.25	7.42	0.00
<i>N. mesoprion</i>	9.25	21.75	13.27	0.10	5.75	8.75	6.74	0.01
<i>N. peronii</i>	7.75	28.25	16.93	0.09	5.25	10.25	7.58	0.01
<i>N. tambuloides</i>	10.25	24.25	15.46	0.31	-	-	-	-
<i>Saurida elongata</i>	12.75	41.25	21.69	0.29	10.25	17.25	13.71	0.06
<i>S. undosquamis</i>	11.75	30.75	18.00	0.20	4.75	16.75	9.13	0.02
<i>Priacanthus tayenus</i>	7.75	26.25	15.44	0.05	3.25	16.25	6.22	0.02
<i>Scolopsis taeniopterus</i>	10.75	28.25	15.85	0.39	8.25	14.25	8.57	0.11
<i>Photololigo chinensis</i>	15.75	42.25	22.76	0.40	-	-	-	-
<i>P. duvaucelii</i>	6.75	20.25	9.95	0.04	-	-	-	-
<i>Sepia aculeata</i>	6.25	16.25	10.84	0.10	-	-	-	-
<i>Sepia pharaonis</i>	5.75	29.75	12.88	0.59	-	-	-	-
<i>Sepia recurvirostris</i>	7.25	9.75	8.74	0.09	-	-	-	-
<i>Sepiella innermis</i>	3.75	7.75	4.97	0.14	-	-	-	-

