

**Fisheries Resources in PrachuapKhiri Khan and  
Chumphon Province, Thailand**

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

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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

From June 2013 - May 2014, a study of fisheries resources and commercial trawlers operating in the locality of PrachuapKhiri Khan and Chumphon Provinces was conducted by collecting data from small-sized otter board trawls (<14 m overall length; OBT1), medium-sized otter board trawls (14 – 18 m overall length; OBT2) and pair trawls (PT). Catch data were also collected from landing sites at PrachuapKhiri Khan and Chumphon fishing ports

The results show that catch per unit effort (CPUE) for OBT1, OBT2 and PT were 48kg, 28kg and 150kg, per hour respectively. The proportions of food fish and trash fish in the catch were calculated as 36:64%, 58:42%. In the food fish group, demersal fish, along with shrimp and prawn were the main components of the OBT1 accounting for 86% of the total 'food fish' catch. Demersal fish and cephalopods were the main components of OBT2 accounting for 77% of the total food fish catch, and pelagic and demersal fish were the main components of PT accounting for 83% of the total food fish catch. Juveniles of economically important species were found in high percentages of 78%, 64% and 74% respectively in the trash fish catches from these trawlers.

The sizes of the economically important species were analyzed and it was found that the mean lengths of most species were smaller than their predicted size at first maturity, particularly for pelagic and demersal species. Length analysis also showed that most individuals of the economically important species caught were smaller than their size at first maturity. Lizardfishes, purple-spotted bigeye, lattice monocle bream and short mackerel were the main species of concern, in terms of the numbers of undersized fish caught. However, length analysis of squid showed a high percentage of individuals at a mature size.

Unless adequate management measures are introduced effectively, the present situation of unsustainable harvesting of fisheries resources from trawlers will continue, leading to further declines in fish catches and fish catch quality.

## 1. Introduction

In an earlier study, the fisheries status of the Upper Western Gulf of Thailand, was described in the report “A Review of the Trawl Fisheries in PrachuapKhiri Khan and Chumphon Provinces, Thailand”. The report indicated that the fisheries resources in the area have been in a declining state. This issue is explored in more detail in the current paper that focuses on the status of fisheries resources from commercial trawlers operated in the two Provinces. The information presented in this paper is intended for use by policy makers and planners in determining effective fisheries management measures to regulate the harvesting of fisheries resources in a more sustainable manner.

## 2. Data collection and analysis

### 2.1 Sampling sites

Data were collected from three types of trawl; small-sized otter board trawls (less than 14 m overall length; OBT1), medium-sized otter board trawls (14-18 m overall length; OBT2) and pair trawls (PT). The data were collected during the period June 2013-May 2014.

The study sites were as follows

- OBT2 & PT - Ao Noi Sub-district, Muang District, PrachuapKhiri Khan Province.
- OBT1, OBT2 & PT - Pak Nam Sub-district, Muang District, Chumphon Province.

### 2.2 Sampling methods

The data were collected on a monthly basis. Two types of data collection were used in this research as follows.

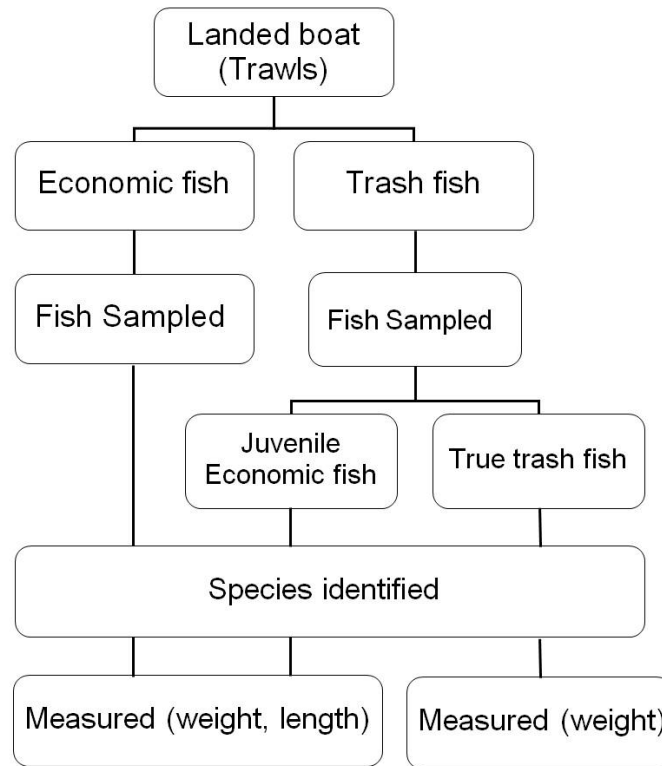
Catch sampling: The catch was sampled from fishing boats landing fish at the sampling sites, in order to identify the main species and economically important species caught., (based on Carpenter and Niem (1998, 1999a,b, 2001a,b)), to measure their weight using 500-g and 7-kg balances, and length (cm), using punching paper with 0.5 cm class intervals, The length measurement used for fish was total length whilst for squids it was mantle length and for shrimps, carapace length.

Interviews: The captains, assistant captains of the fishing boats, and/or the boat owners were interviewed. The information needed from them related to general fishery information, e.g. fishing effort, fishing grounds, weight of catches, etc.

Catch Sampling methodology: The trawler catches were sorted on board into 2 main clusters; economic fish and trash fish (Fig. 3.3). Economic fishes were sorted by species, family or group, e.g., short mackerel, etc., and by size. These fish were kept in wooden or plastic rectangular trays for transferring to the fish market. Ice was added to each tray. The trays were then stacked in the storage room. When the storage room was full, ice was poured on top of the trays before closing the room. On the other hand, trash fish, which may consist of juvenile economic fish as well as true ‘trash fish’, were sorted out but not kept punctiliously. Less ice was used in the trash fish trays.

For this study, fish samples were collected from the trays. The number of trays sampled for each economically important species depended on the evenness of their size. If fish length was varied, sampling of more trays was required. All fish were measured for length and weight. For trash fish, three to five kg was required, depending on fish size. The

juveniles of economically important fishes were measured and their length and weight taken. Other species were weighed only (Figure 1). A five hundred-gram balance was used in cases where 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 for each species was compared with its size at first maturity, gathered from available reports. The proportion of fish that were smaller or 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 PrachuapKhiri Khan and Chumphon Province were: 48.21 kg, 27.78 kg and 150.02 kg/hour respectively (Table 1). Trash fish showed a significantly high CPUE in every gear particularly OBT1 and PT, where over one half of the total catch was made up of trash fish, (64% and 54% respectively).

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

Fleet	Average	Food fish	Trash fish
Small-sized otter board trawl (OBT1)	48.21	17.39 (36.08%)	30.82 (63.92%)
Medium-sized otter board trawl (OBT2)	27.78	16.07 (57.85%)	11.71 (42.15%)
Pair trawl (PT)	150.02	68.35 (45.56%)	81.67 (54.44%)

Species/group composition of the trawler catches varied between gears (Fig 4.2). For OBT1 and OBT2, in the food fish group, demersal fish were the main component while for PT, pelagic fish were the main component. In the trash fish group, the percentage of small-sized economic species was higher than true trash fish for every gear, i.e. 78%, 64% and 74% from OBT1, OBT2 and PT respectively (Table 2). In addition, cephalopod, along with shrimp and prawn were also found in the trash fish catch in all gear in lesser percentages. For these species, even small-size individuals could be sold at 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/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 species while penaeid shrimp was the most abundant species in the shrimp/prawn group. For the cephalopod group, cuttlefishes were found at a higher percentage than squid (Appendix A, Table 1).

Trash fish: True trash fish represented 22% of the total trash fish catch. The remaining 78% of the catch was made up of juveniles of economic species (Table 2). Demersal fish, including splendid ponyfish and spinefoots, made up the highest composition of juvenile

economic species, making up 62% of the total trash fish catch. Invertebrates were found at a small percentage, 11% of total trash fish. Crabs, cuttlefishes and mantis shrimps being the main invertebrates 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 made up the highest percentage, (62%) of the catch, followed by cephalopods, (15%), and shrimp & prawn, (9%). Pelagic fish made up less than 1% of the total food fish catch (Table 2). Flatheads, lizardfishes and threadfin breams amounted to more than half of the total demersal fish catch. Squids and cuttlefishes were found at a similar percentage (5% each). Scallop made up 11% of the total food fish catch. (Appendix A, Table 3).

Trash fish. Most of the trash fish caught by OBT2 were juvenile demersal fish and true trash fish, representing 47% and 36% respectively (Table 2). Pelagic fish, cephalopod, and shrimp and prawn were rarely found in the trash fish caught by OBT2. Flatheads, spinefoots and Indian halibut made up more than one half of total demersal trash fish. Ponyfishes 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 catch components making up, 47% and 36% of the total food fish respectively. Cephalopods showed a significant percentage (17%) (Table 2), which was higher proportion than for OBT1 and OBT2. Short mackerel were the main species of pelagic fish followed by goldstripesardinella and yellowstripescad, 15%, 9% and 9% respectively. Purple-spotted bigeye and threadfin breams were the leading species of demersal fish. Squids were the major cephalopod caught (Appendix A, Table 5).

Trash fish: About three quarters of the trash fish catch was made up of juvenile economic species. Most of these were pelagic or demersal fish of which anchovies showed the highest proportion, (24%) of the total trash fish catch. Ponyfishes were the main species of true trash fish in the catch. (Appendix A, Table 6).



**Table 2** Catch composition of commercial trawls operated in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

Group	OBT1		OBT2		PT	
	% of totalcatch	% of food fish	% of totalcatch	% of food fish	% of totalcatch	% of food fish
<b>Food fish</b>						
Pelagic fish	0.61	1.68	0.63	1.09	21.25	46.64
Demersal fish	26.75	74.14	35.79	61.87	16.35	35.89
Cephalopod	3.04	8.43	8.78	15.17	7.66	16.81
Shrimp and prawn	4.22	11.70	5.31	9.19	0.01	0.02
Other invertebrate*	1.46	4.05	7.34	12.68	0.29	0.64
<b>Total economic fauna</b>	<b>36.08</b>	<b>100.00</b>	<b>57.85</b>	<b>100.00</b>	<b>45.56</b>	<b>100.00</b>
<b>Trash fish</b>	% of totalcatch	% of trash fish	% of totalcatch	% of trashfish	% of total catch	% of trashfish
Small-sized pelagic fish	1.85	2.89	2.18	5.18	23.07	42.37
Small-sizeddemersal fish	39.95	62.49	19.69	46.73	13.15	24.15
Small-sizedcephalopod	0.66	1.04	0.91	2.16	3.05	5.61
Small-sizedshrimp and prawn	0.40	0.63	1.08	2.55	0.60	1.11
Small-sizedother invertebrate	7.25	11.35	2.91	6.89	0.15	0.28
Total Small-sizedeconomic fauna	50.11	78.40	26.77	63.51	40.02	73.52
True trash fish	13.81	21.60	15.38	36.49	14.42	26.48
<b>Total trash fish</b>	<b>63.92</b>	<b>100.00</b>	<b>42.15</b>	<b>100.00</b>	<b>54.44</b>	<b>100.00</b>

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

### 3.2 Length of some economically important species

Lengths of some economically important species from the food fish and trash fish catches were analyzed separately after being sorted on board. The length distribution of each species caught by each gear, and the length data from food fish and trash fish were pooled in order to present a complete picture of the status of each species. The pooled length data were compared with size at first maturity for 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>Rastrelliger brachysoma</i>	17.95	Krajangdara et al., 2007
Indian mackerel	<i>R. kanagurta</i>	17.12	Krajangdara et al., 2007
Goldstripesardinella	<i>Sardinella gibbosa</i>	10.35	Nasuchon et al., 2010
Bigeyes cad	<i>Selar crumenophthalmus</i>	18.25	Phuttharaksa et al., 2008
Yellowstripes cad	<i>Selaroides leptolepis</i>	11.73	Yakoh and Chalee, 2008
Ornate threadfin bream	<i>Nemipterus hexodon</i>	14.57	Pinputtasin et al., 2008
Purple-spotted bigeye	<i>Priacanthus tayenus</i>	14.19	Krajangdara and Yakoh, 2005
Slender lizardfish	<i>Saurida elongata</i>	31.62	Vibunpant et al., 2012
Brush-tooth lizardfish	<i>S. undosquamis</i>	28.26	Vibunpant et al., 2011
Lattice monocle bream	<i>Scolopsis taeniopterus</i>	17.57	Krajangdara and Hemtanon, 2000
Mitre squid	<i>Photololigo chinensis</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>Metapenaeus affinis</i>	12.18	Sritakon et al., 2012
Greasyback shrimp	<i>Metapenaeus sensis</i>	11.24	Pinputtasin et al., 2012
Banana prawn	<i>Penaeus merguensis</i>	13.38	Yakoh et al., 2013

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

**Table 4** Size of some economically important species caught by small-sized otter trawls in PrachuapKhiri 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.
Yellowstripesca <sup>1</sup>	<i>Selaroidesleptolepis</i>	9.75-15.75	12.50	0.13	10.75-12.75	11.75	0.04
Deepbodysilverbidy	<i>Gerresabbreviatus</i>	10.25-19.75	12.66	0.59	-	-	-
Whipfinsilverbidy	<i>Gerresfilamentosus</i>	11.75-23.25	15.02	1.04	-	-	-
Common silverbidy	<i>Gerresoyena</i>	9.75-19.25	13.84	0.66	-	-	-
Ornate threadfin bream <sup>1</sup>	<i>Nemipterushexodon</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 <sup>1</sup>	<i>Priacanthustayenus</i>	13.25-20.25	15.39	0.17	5.75-13.25	8.02*	0.18
Slender lizardfish <sup>1</sup>	<i>Sauridaelongata</i>	13.25-30.75	18.23*	0.43	8.25-15.25	11.75*	0.28
Lattice monocle bream <sup>1</sup>	<i>Scolopsistaeniopterus</i>	10.25-26.25	15.72*	0.27	6.25-12.75	8.83*	0.09
Silver sillago	<i>Sillagosihama</i>	11.25-21.25	15.26	0.26	-	-	-
Jinga shrimp <sup>1</sup>	<i>Metapenaeusaffinis</i>	8.25-14.25	11.13*	0.18	-	-	-
Greasyback shrimp <sup>1</sup>	<i>Metapenaeusensis</i>	7.25-16.75	11.13*	0.15	-	-	-
Western king prawn	<i>Penaeuslatisulcatus</i>	8.75-20.25	14.15	0.25	-	-	-
Banana prawn <sup>1</sup>	<i>Penaeusmerguiensis</i>	12.75-22.75	15.85	0.40	-	-	-
Giant tiger prawn	<i>Penaeusmonodon</i>	16.25-28.75	20.89	0.76	-	-	-
Indian squid <sup>1</sup>	<i>Photololigoduvaucelii</i>	5.75-21.25	10.09	0.67	-	-	-
Needle cuttlefish <sup>1</sup>	<i>Sepia aculeata</i>	5.75-17.75	9.50	0.44	-	-	-
Pharaoh cuttlefish <sup>1</sup>	<i>Sepia pharaonis</i>	6.25-25.25	9.78*	2.66	-	-	-

Remark: <sup>1</sup>Itssize 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 PrachuapKhiri 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 <sup>1</sup>	<i>Atule mate</i>	10.75-23.75	14.54*	0.88	8.75-11.25	10.25*	0.02
Short mackerel <sup>1</sup>	<i>R. brachysoma</i>	14.75-19.75	17.08*	0.17	5.75-8.75**	7.15*	0.01
Indian mackerel <sup>1</sup>	<i>R. kanagurta</i>	11.75-19.75	14.87*	0.20	-	-	-
Yellowstripescad <sup>1</sup>	<i>Selaroidesleptolepis</i>	9.25-18.75	12.95	0.16	7.25-12.25	7.89*	0.02
Deepbodysilverbidy	<i>Gerresabbreviatus</i>	11.25-17.25	13.61	0.27	-	-	-
Whipfinsilverbidy	<i>Gerresfilamentosus</i>	11.25-22.75	15.74	0.38	-	-	-
Common silverbidy	<i>Gerresoyena</i>	11.25-18.75	15.73	0.30	-	-	-
Ornate threadfin bream <sup>1</sup>	<i>Nemipterushexodon</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
Mauvelip threadfin bream	<i>N. mesoprion</i>	8.25-18.75	12.31	0.08	6.25-14.25	8.67	0.11
Notchedfin threadfin bream	<i>N. peronii</i>	9.75-28.75	15.45	0.28	-	-	-
Purple-spotted bigeye <sup>1</sup>	<i>Priacanthustayenus</i>	8.75-22.25	13.89*	0.09	6.75-13.75	9.30*	0.03
Slender lizardfish <sup>1</sup>	<i>Sauridaelongata</i>	11.75-39.75	19.96*	0.37	10.25-11.25	10.84*	0.01
Shortjawsaury	<i>S. isarankurai</i>	-	-	-	5.75-13.25	9.64	0.02
Brushtooth lizardfish <sup>1</sup>	<i>S. undosquamis</i>	13.75-28.75	19.08*	0.20	-	-	-
Lattice monocle bream <sup>1</sup>	<i>Scolopsistaeniopterus</i>	8.25-28.25	14.94*	0.18	5.25-12.75	8.98*	0.04
Western king prawn	<i>Penaeuslatisulcatus</i>	11.25-19.25	13.52	0.95	-	-	-
Banana prawn <sup>1</sup>	<i>Penaeusmerguiensis</i>	11.75-19.75	15.96	0.66	-	-	-
Giant tiger prawn	<i>Penaeusmonodon</i>	16.25-26.25	20.87	1.20	-	-	-
Green tiger prawn	<i>Penaeussemisulcatus</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 <sup>1</sup>	<i>Photololigo chinensis</i>	12.25-38.25	20.39	1.07	-	-	-
Indian squid <sup>1</sup>	<i>P. duvaucelii</i>	5.75-18.25	10.54	0.11	-	-	-
Needle cuttlefish <sup>1</sup>	<i>Sepia aculeata</i>	5.75-18.25	10.00	0.17	-	-	-
Pharaoh cuttlefish <sup>1</sup>	<i>Sepia pharaonis</i>	5.25-25.75	12.97*	0.84	-	-	-

Remark: <sup>1</sup>Its 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 PrachuapKhiri 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.
Blackfin scad	<i>Alepes melanoptera</i>	9.75-27.25	17.05	0.43	6.25-7.25	7.02	0.01
Yellowtail scad <sup>1</sup>	<i>Atule mate</i>	8.75-29.25	15.51*	0.16	7.75-10.75	8.16*	0.01
Short mackerel <sup>1</sup>	<i>R. brachysoma</i>	12.25-21.75	15.62*	0.01	3.75-10.75**	6.62*	0.00
Indian mackerel <sup>1</sup>	<i>R. kanagurta</i>	11.25-23.75	18.74	0.06	-	-	-
Goldstripesardinella <sup>1</sup>	<i>Sardinella gibbosa</i>	9.75-19.25	12.99	0.01	5.75-14.25	8.92*	0.01
Bigeyes cad <sup>1</sup>	<i>Selar crumenophthalmus</i>	8.75-25.75	17.54*	0.15	4.25-12.75	5.59*	0.04
Yellowstripes cad <sup>1</sup>	<i>Selaroides leptolepis</i>	8.25-19.75	12.94	0.02	2.25-13.75	6.17*	0.01
Deepbody silverbidy	<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.
Whipfinsilverbidy	<i>Gerresfilamentosus</i>	11.25-18.75	15.30	0.28	-	-	-
Common silverbidy	<i>Gerresoyena</i>	10.75-21.25	16.11	0.22	-	-	-
Ornate threadfin bream <sup>1</sup>	<i>Nemipterushexodon</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
Notchedfin 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 <sup>1</sup>	<i>Priacanthustayenus</i>	7.75-26.25	15.44	0.05	3.25-16.25	6.22*	0.02
Slender lizardfish <sup>1</sup>	<i>Sauridaelongata</i>	12.75-41.25	21.69*	0.29	10.25-17.25	13.71*	0.06
Shortjawsaury	<i>S. isarankurai</i>	-	-	-	3.75-12.75	8.86	0.01
Brushtooth lizardfish <sup>1</sup>	<i>S. undosquamis</i>	11.75-30.75	18.00*	0.20	4.75-16.75	9.13*	0.02
Lattice monocle bream <sup>1</sup>	<i>Scolopsistaeniopterus</i>	10.75-28.25	15.85*	0.39	8.25-14.25	8.57*	0.11
Kobi squid	<i>Nipponololigosumatrensis</i>	2.75-7.75	5.50	0.01	-	-	-
Mitre squid <sup>1</sup>	<i>Photololigochinensis</i>	15.75-42.25	22.76	0.40	-	-	-
Indian squid <sup>1</sup>	<i>P. duvaucelii</i>	6.75-20.25	9.95	0.04	-	-	-
Needle cuttlefish <sup>1</sup>	<i>Sepia aculeata</i>	6.25-16.25	10.84	0.10	-	-	-
Pharaoh cuttlefish <sup>1</sup>	<i>Sepia pharaonis</i>	5.75-29.75	12.88*	0.59	-	-	-

<sup>1</sup> 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. The mean length of five species in the food fish group were smaller than size at first maturity. While, in trash fish group, four of the five species, i.e. two demersal species, two shrimp species and pharaoh cuttlefish, were smaller than size at first maturity (Table 4).

Size distribution, for four demersal fishes are presented in Figure 2-5. Most fish of the four species were smaller than size at first maturity. For instance, 91% of lattice monocle bream and 100% of slender lizardfish were smaller than size at first maturity. The size distribution of cuttlefish and greasyback shrimp were also analyzed and it was found that most of them were under size at first maturity. More than 50% of needle cuttlefish and greasyback shrimp were below size at first maturity (Figure 6-7).

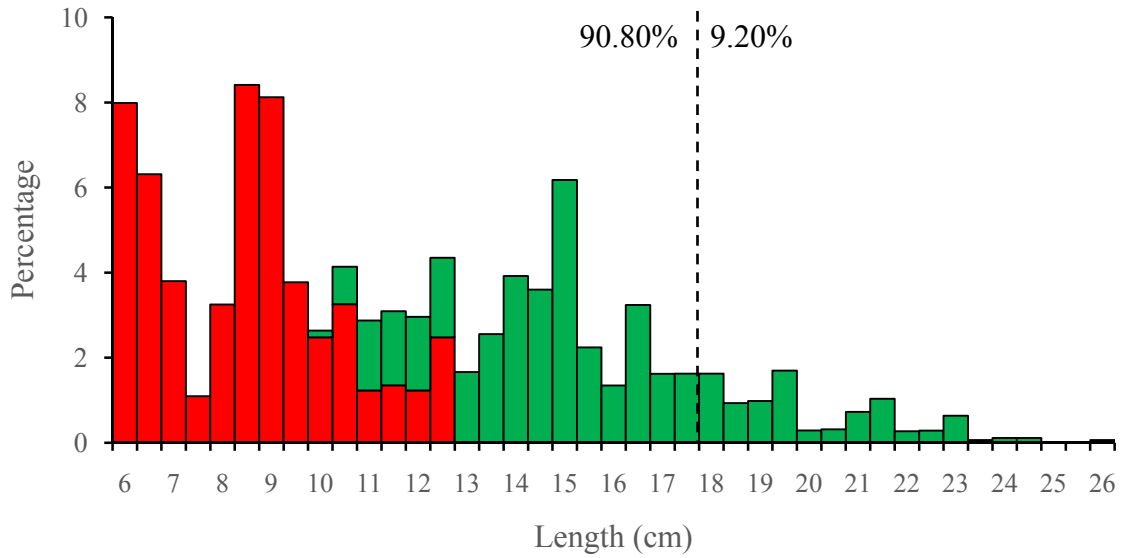
#### **B) OBT2**

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

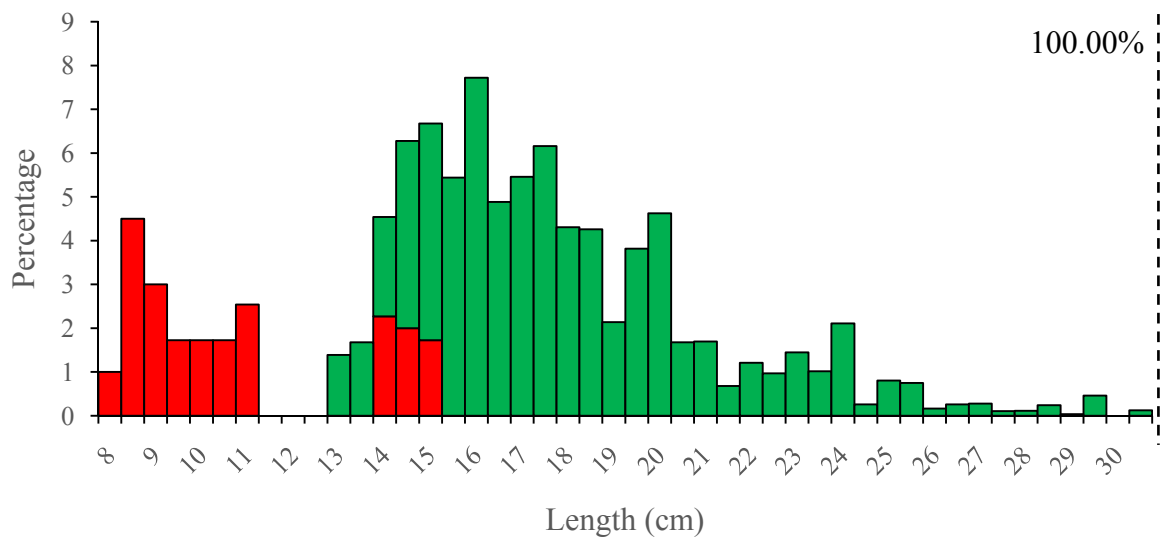
In addition, large numbers of demersal fishes were caught by OBT2. Almost 100% of slender lizardfish, 93% of lattice monocle bream, 87% of purple-spotted bigeye and ornate threadfin bream were under size at first maturity (Figure 8-11). About 62% of squids and 55% of needle cuttlefish were larger than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

#### **C) PT**

Although the mean lengths of eight of fifteen species in the food fish group were larger than size at first maturity, the mean length of all species in the trash fish group were smaller than size at first maturity (Table 6). It is important to note that almost 100% of short mackerel, one of the most economically important species in Thailand, was smaller than size at first maturity (Figure 16) and most of them appeared in the trash fish group. Other fish species caught by PT also showed that most of them were smaller than size at first maturity. However, only 28% of goldstripesardinella were smaller than size at first maturity (Figure 17) as the bigger sized individuals of this species inhabit offshore areas; the fishing grounds for PT. Most of squids were larger than size at first maturity, similar to those caught by OBT2. Conversely, most of pharaoh cuttlefish caught were smaller than size at first maturity (Figure 21-23).



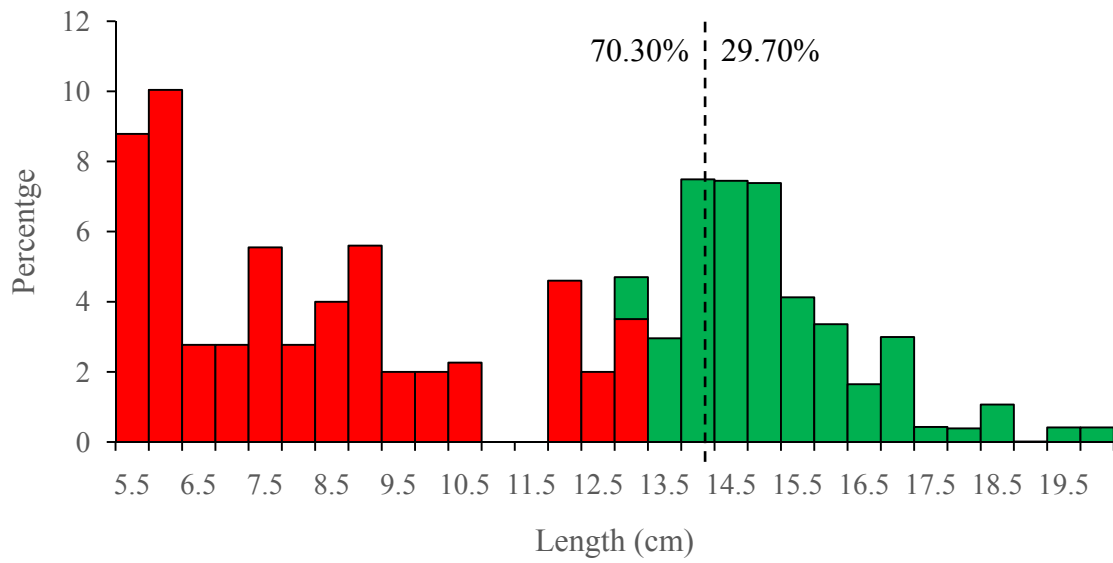
**Figure 2** Length distribution of lattice monocle bream, *Scolopsistaeniopterus*, caught by small-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



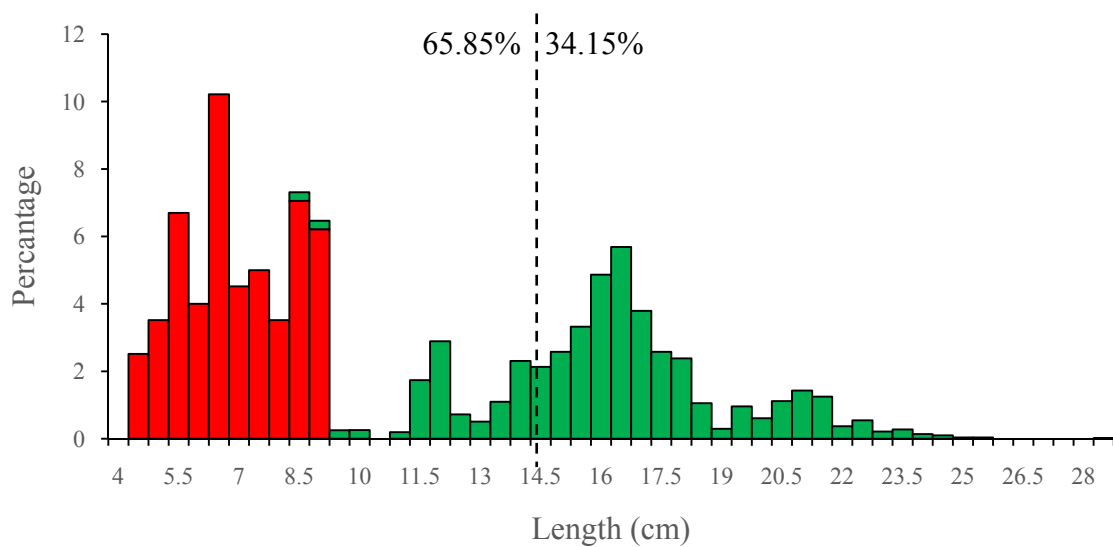
**Figure 3** Length distribution of slender lizardfish, *Sauridaelongata*, caught by small-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.

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

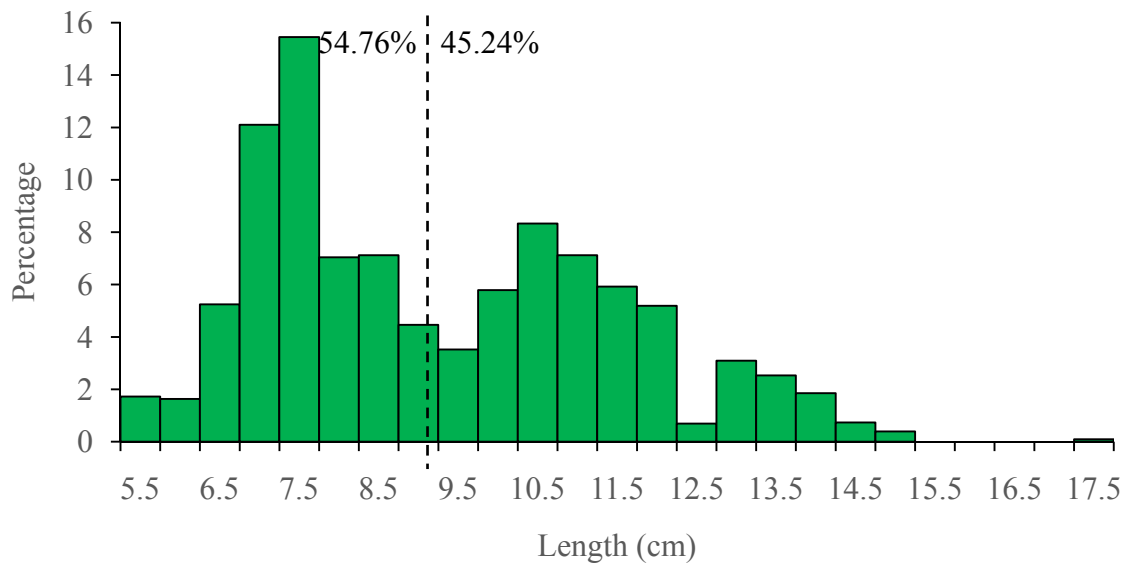




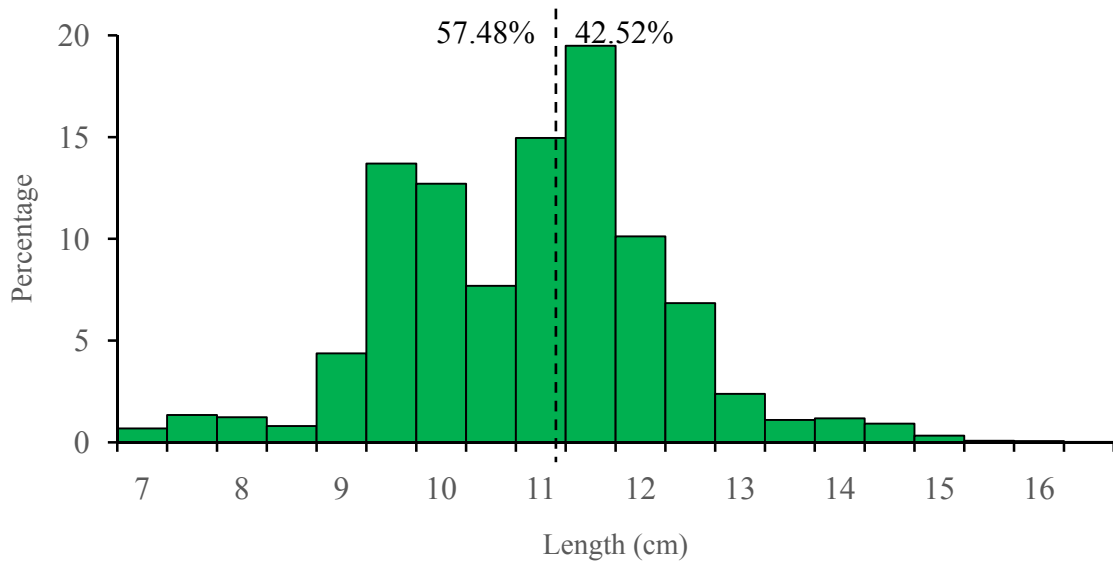
**Figure 4** Length distribution of purple-spotted bigeye, *Priacanthustayenus*, caught by small-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



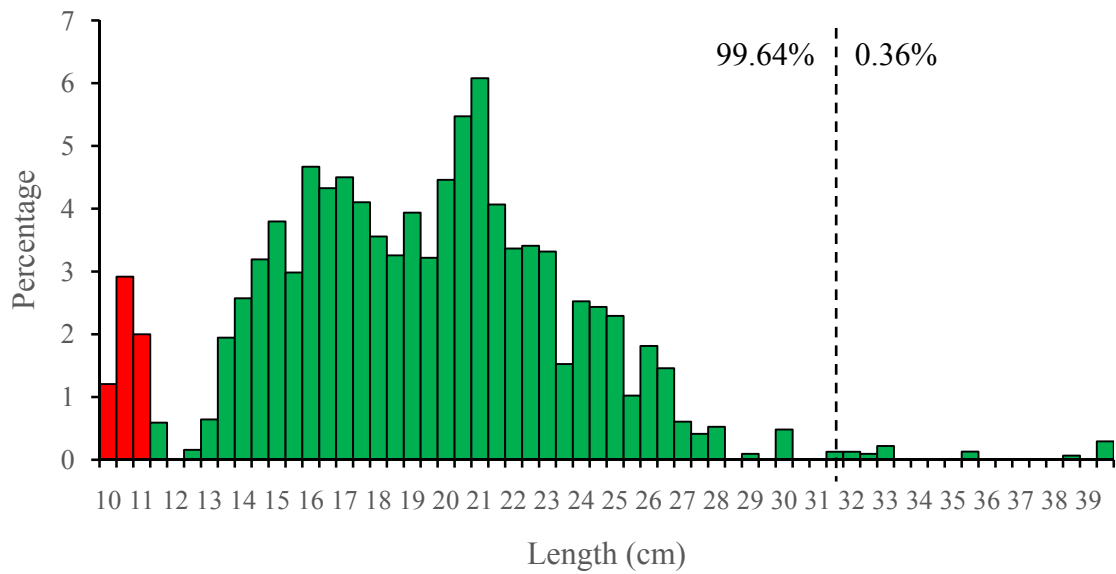
**Figure 5** Length distribution of ornate threadfin bream, *Nemipterushexodon*, caught by small-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



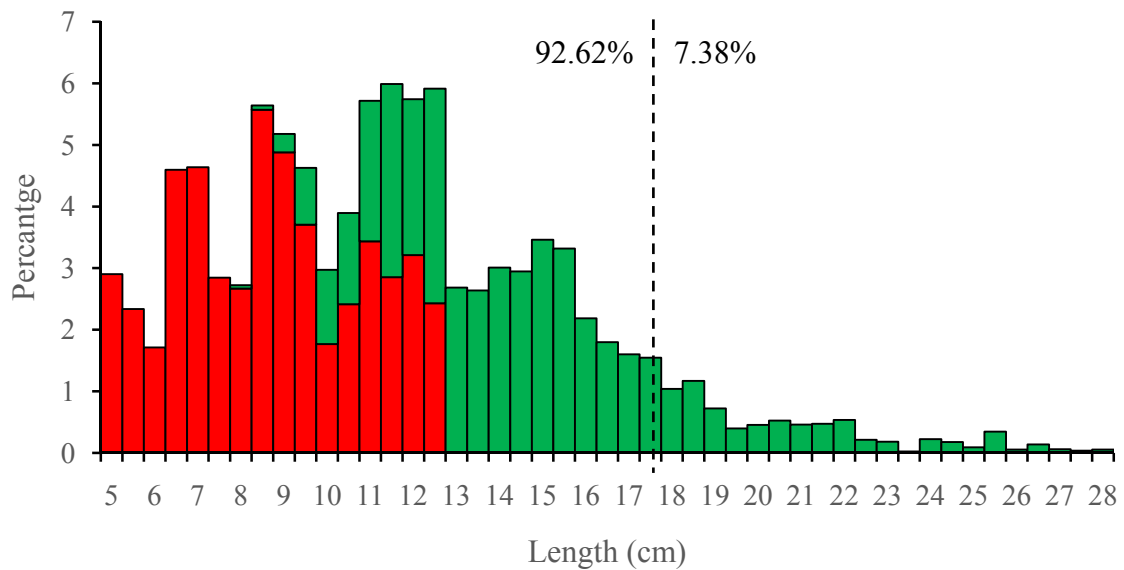
**Figure 6** Length distribution of needle cuttlefish, *Sepia aculeata*, caught by small-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



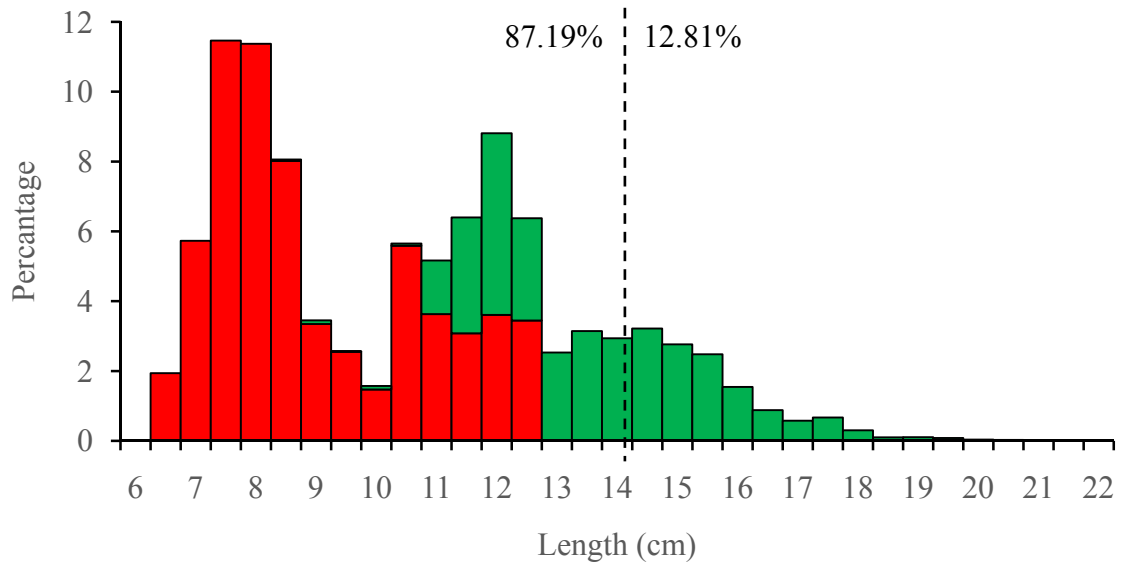
**Figure 7** Length distribution of greasyback shrimp, *Metapenaeusensis*, caught by small-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



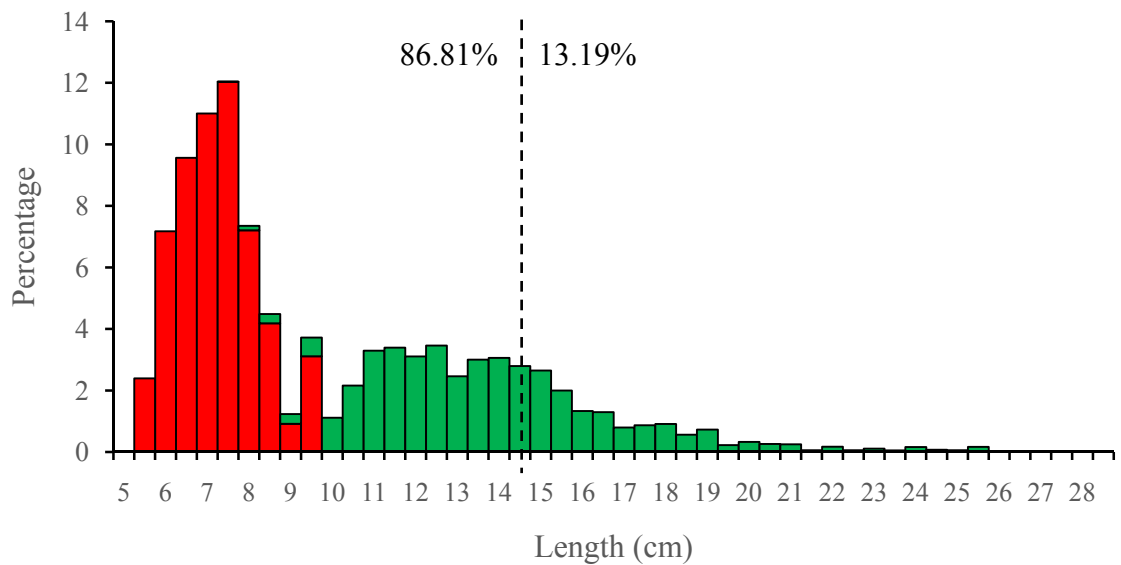
**Figure 8** Length distribution of slender lizardfish, *Sauridaelongata*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



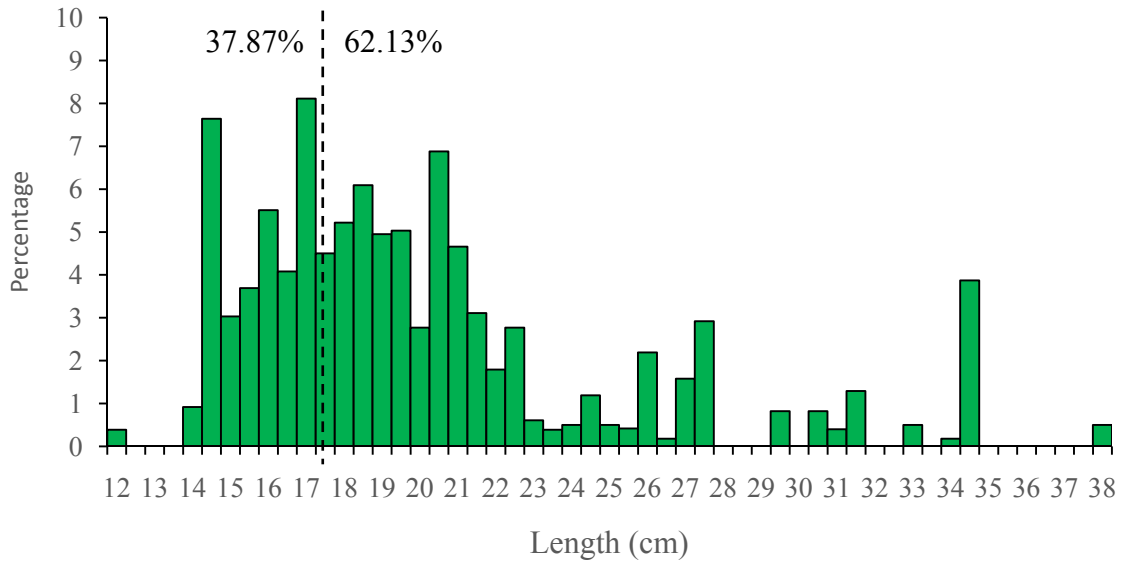
**Figure 9** Length distribution of lattice monocle bream, *Scolopsistaeniopterus*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



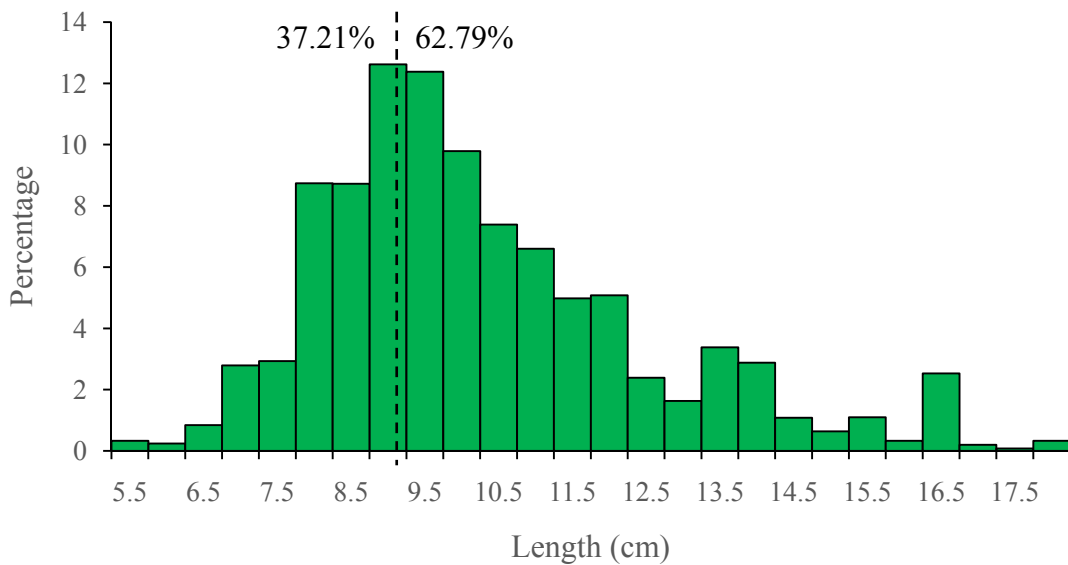
**Figure 10** Length distribution of purple-spotted bigeye, *Priacanthustayenus*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



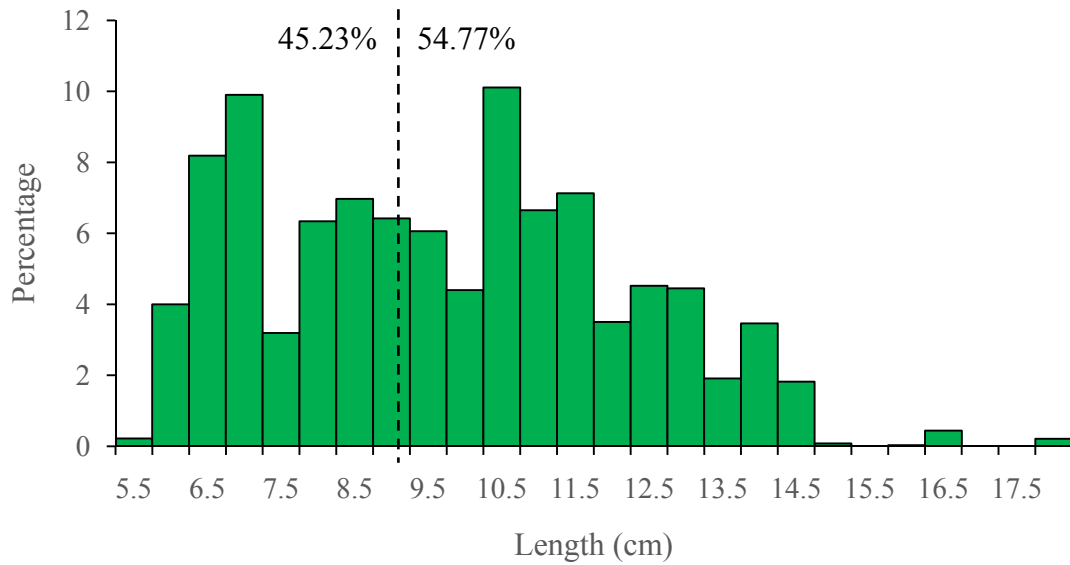
**Figure 11** Length distribution of ornate threadfin bream, *Nemipterushexodon*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014.



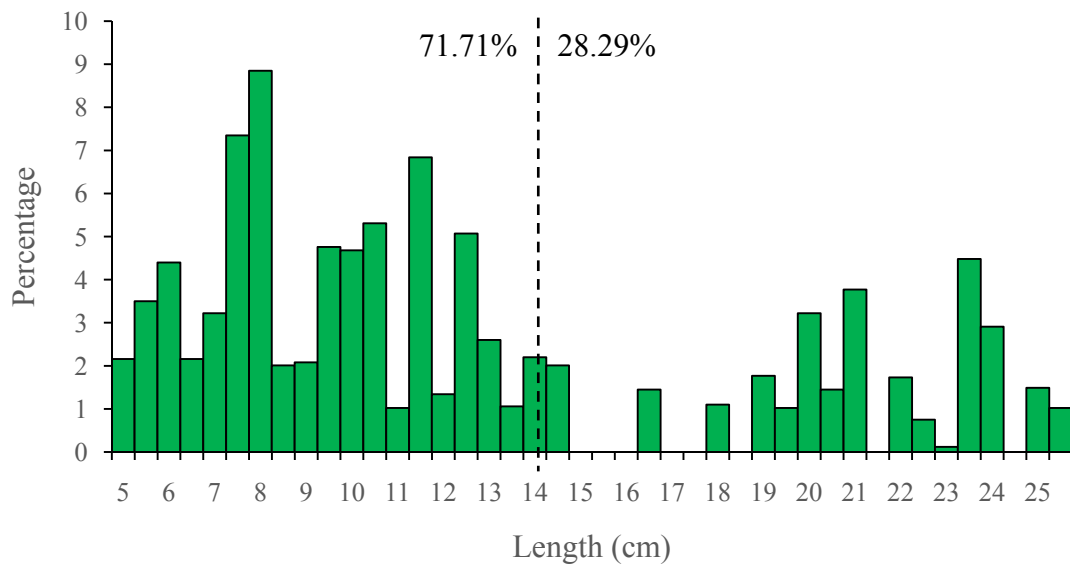
**Figure 12** Length distribution of mitre squid, *Photololigo chinensis*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 – May 2014



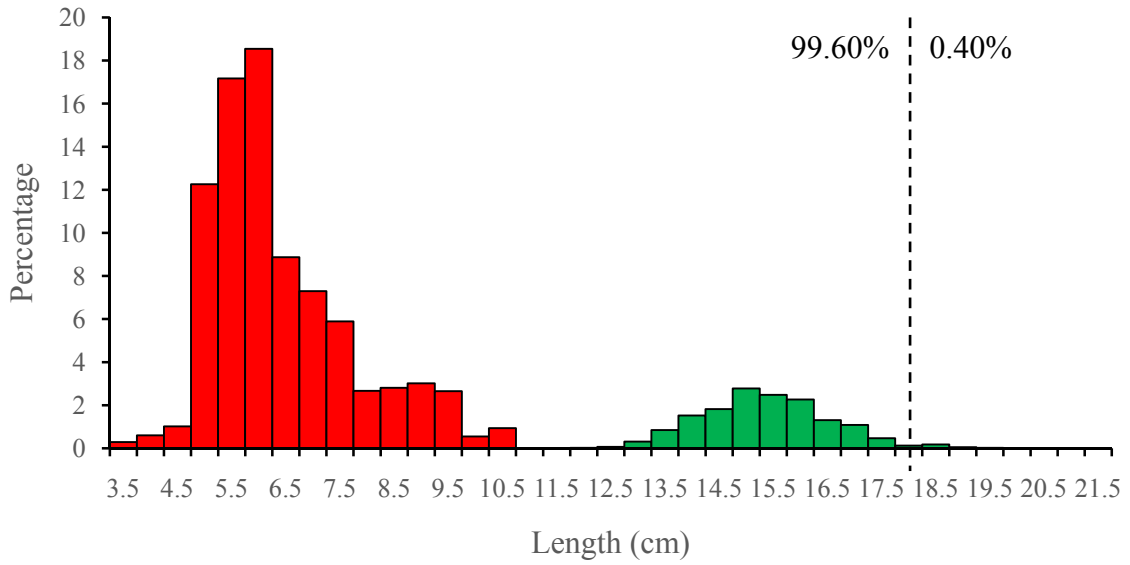
**Figure 13** Length distribution of Indian squid, *Photololigo duvaucelii*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014



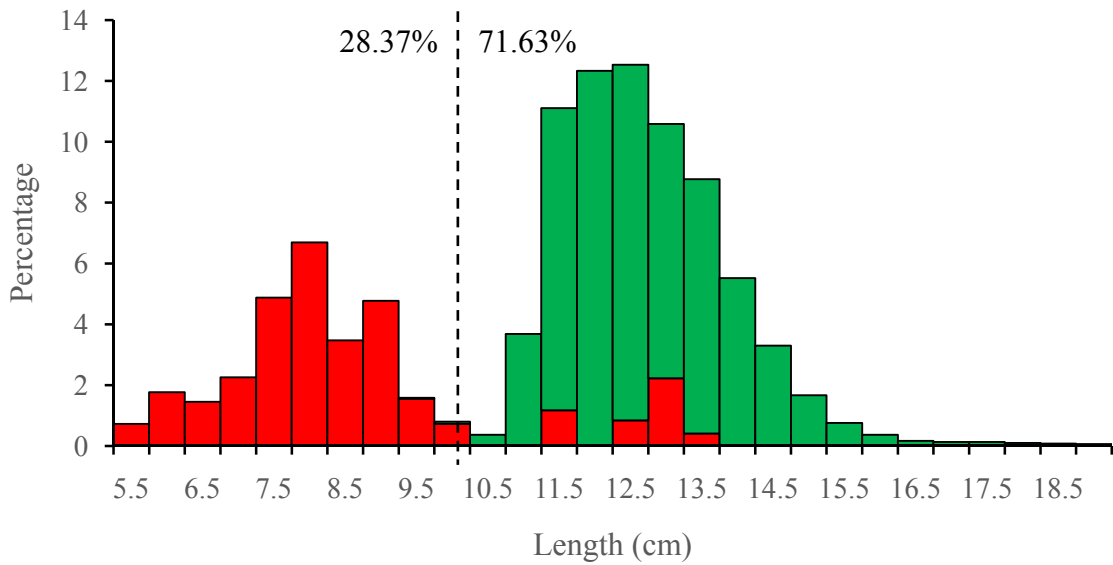
**Figure 14** Length distribution of needle cuttlefish, *Sepia aculeata*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014



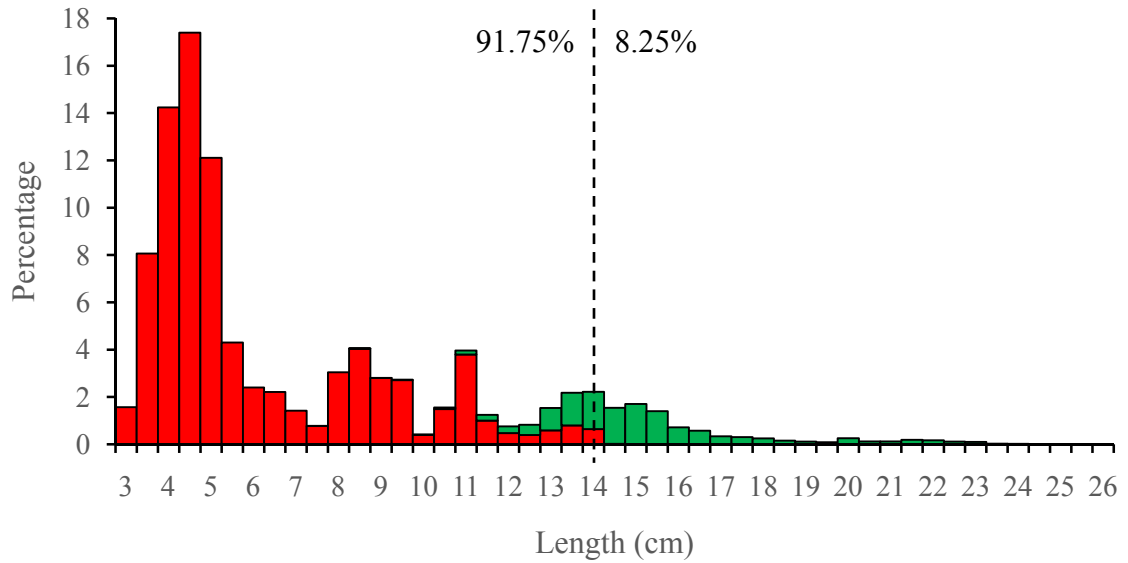
**Figure 15** Length distribution of pharaoh cuttlefish, *Sepia pharaonis*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014



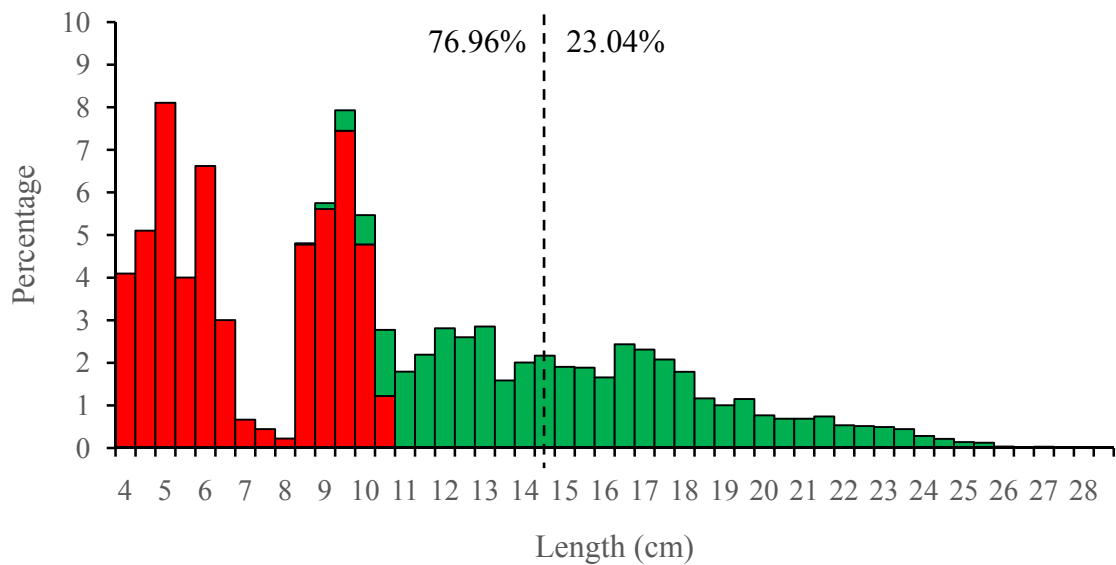
**Figure 16** Length distribution of paraohcuttlefish, *Sepia pharaonis*, caught by medium-sized otter trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014



**Figure 17** Length distribution of goldstripesardinella, *Sardinella gibbosa*, caught by pair trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

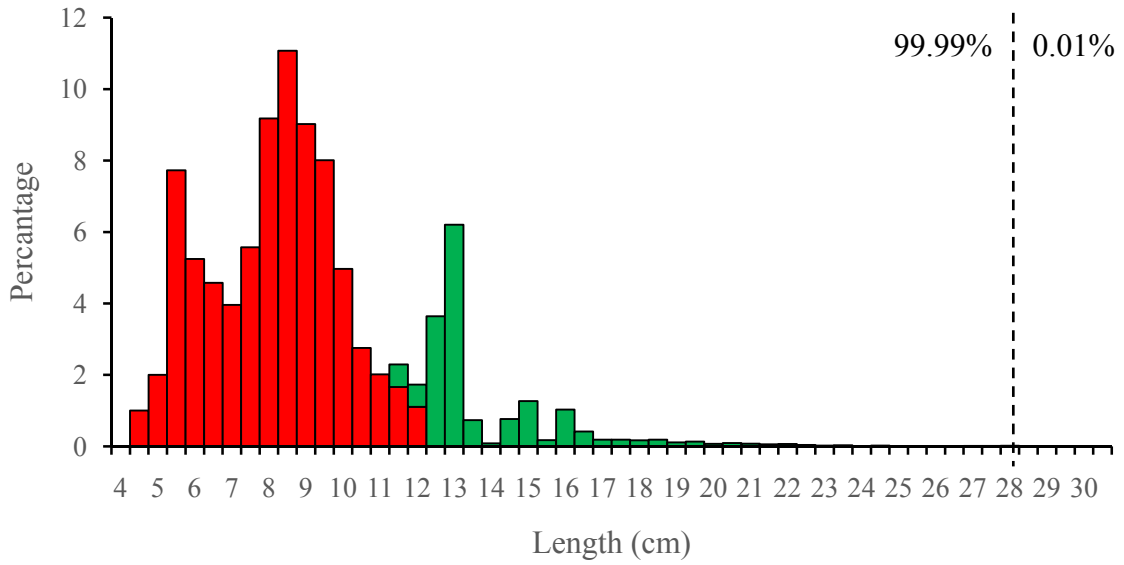


**Figure 18** Length distribution of purple-spotted bigeye, *Priacanthustayenus*, caught by pair trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

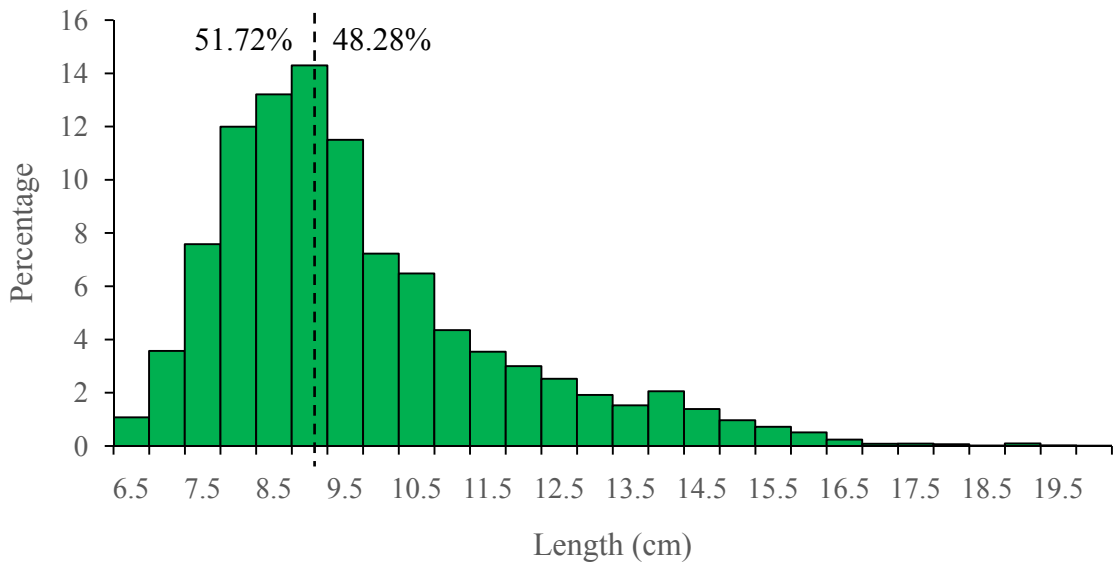


**Figure 19** Length distribution of ornate threadfin bream, *Nemipterushexodon*, caught by pair trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

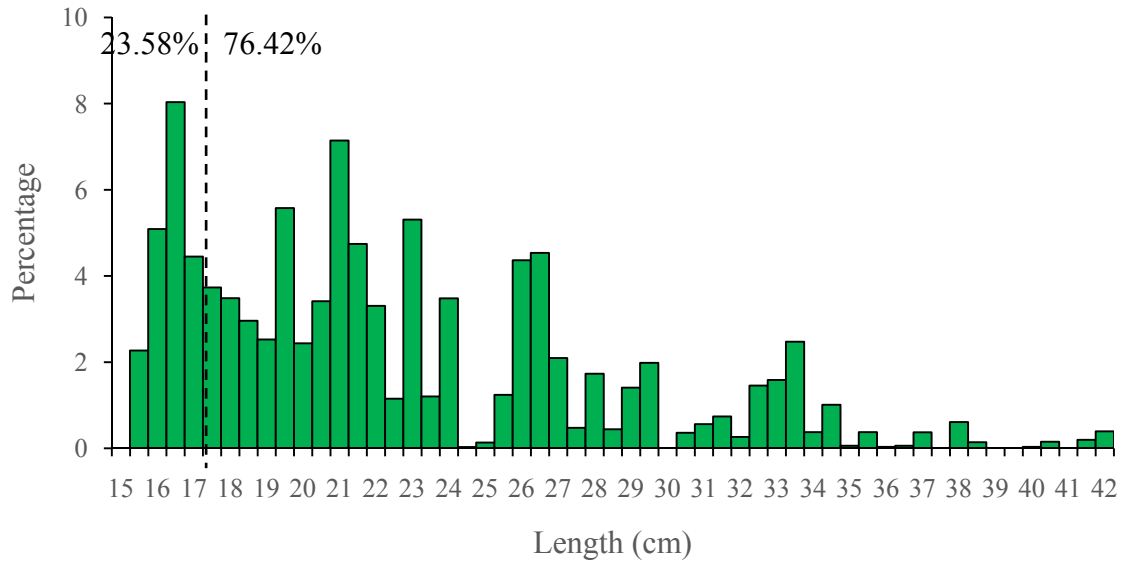




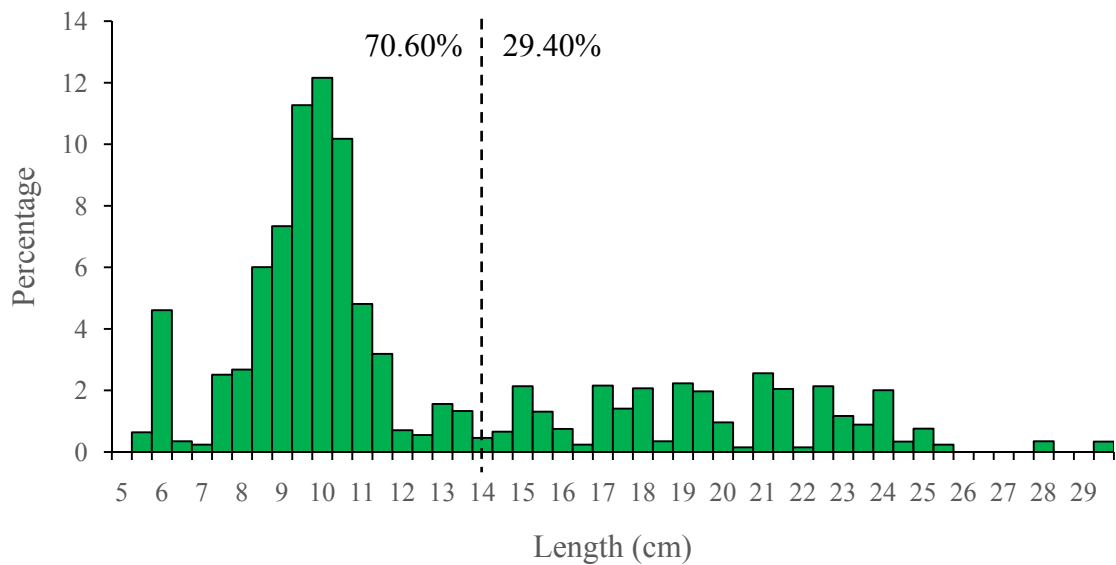
**Figure 20** Length distribution of brushtooth lizardfish, *Saurida undosquamis*, caught by pair trawls in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014



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



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



**Figure 23** Length distribution of pharaoh cuttlefish, *Sepia pharaonis*, caught by pair trawls in PrachuapKhiri 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 recorded as 48kg, 28kg and 150kg/hour respectively. The percentages of food fish caught by OBT1, OBT2 and PT were 36%, 58% and 46% respectively. Demersal fish and shrimp and prawn were the main composition of

OBT1 accounting for 86% of total food fish. Demersal fish and cephalopod were the main components of OBT2 accounting for 77% of the total catch and pelagic fish and demersal fish were the main components of PT making up 83% of the catch.

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 62% and 47% of the total trash fish respectively, while pelagic fish was the main component of PT making up to 42% of the total trash fish. The total percentages of economic species in the trash fish catches 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

The mean lengths of most species were smaller than the predicted 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 size at first maturity, in both the food fish and trash fish groups. For OBT2, the mean length of yellowtail scad, short mackerel, ornate threadfin bream, purple-spotted bigeye, slender lizardfish and lattice monocle bream in both groups were smaller than size at first maturity. While for PT, the mean lengths of yellowtail scad, short mackerel, bigeye scad, brushtooth lizardfish, slender lizardfish and lattice monocle bream in both groups were smaller than size at first maturity. Analysis of length distribution showed that most individual fish caught by all gears were smaller than size at first maturity. However, the mean lengths of squid were larger than size at first maturity, from all gears.

#### 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.

#### 6. References

- Carpenter, K.E. & Niem, V.H. (Eds.). 1998. *FAO Species Identification Guide for Fishery Purposes. The living marine resources of the Western Central Pacific. Vol. 2. Cephalopods, crustaceans, holothurians and sharks*. Rome: FAO. pp. 687–1396.
- Carpenter, K.E. & Niem, V.H. (Eds.). 1999a. *FAO Species Identification Guide for Fishery Purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae)*. Rome: FAO. pp. 1397–2068.
- Carpenter, K.E. & Niem, V.H. (Eds.). 1999b. *FAO Species Identification Guide for Fishery Purposes. The living marine resources of the Western Central Pacific. Vol. 4. Bony fishes part 2 (Mugilidae to Carangidae)*. Rome: FAO. pp. 2069–2790.
- Carpenter, K.E. & Niem, V.H. (Eds.). 2001a. *FAO Species Identification Guide for Fishery Purposes. The living marine resources of the Western Central Pacific. Vol. 5. Bony fishes part 3 (Menidae to Pomacentridae)*. Rome: FAO. pp. 2791–3380.

- Carpenter, K.E. & Niem, V.H. (Eds.). 2001b. *FAO Species Identification Guide for Fishery Purposes. The living marine resources of the Western Central Pacific. Vol 6. Bony fishes part 4 (Labridae to Latimeriidae), estuarine crocodiles, sea turtles, sea snakes and marine mammals*. Rome: FAO. pp. 3381–4218.
- Charoensombat, B., Khrueniam, U., Khongchai, T., Jindalikit, J. and Singharachai, C. 2013. *Reproductive biology of cuttlefish (Sepia aculeata and S. recurvirostra) in the Gulf of Thailand*. Technical Paper no. 4/2013. Bangkok: MFRDB, DOF.
- Krajangdara, T. and Hemtanon, S. 2000. *Growth and reproductive biology of lattice monocle bream, Scolopsistaeniopterus (valenciennes, 1830), on the Andaman sea coast of Thailand*. Technical Paper no. 14/2000. Bangkok: MFD, DOF.
- Krajangdara, T. and Yakoh, A. 2005. *Reproductive biology of bigeye, Priacanthustayenus Richardson, 1846 and P. macracanthus Cuvier, 1829 in the Andaman Sea of Thailand*. Technical Paper no. 6/2005. Bangkok: MFRDB, DOF.
- Krajangdara, T., Puntuleng, P., Chalee, P. and Hussadee, P. 2007. *Reproductive biology of short mackerel Rastrelligerbrachysoma (Bleeker, 1851) and Indian mackerel R.kanagurta (Cuvier, 1816) in Thai waters*. Technical Paper no. 19/2007. Bangkok: MFRDB, DOF.
- Nasuchon, N., Phuttharaksa, K., Sritakon, T. and Hussadee, P. 2010. *Reproductive biology of goldstripesardinella (Sardinellagibbosa (Bleeker, 1849)) in the Gulf of Thailand*. Technical Paper no. 16/2010. Bangkok: MFRDB, DOF.
- Pinputtasin, C., Hassadee, P., Sereeruk, K., Keawmun, P. and Wongtho, S. 2008. *Reproductive biology of ornate threadfin bream (Nemipterushexodon (Quoy and Gaimard, 1824)) in the upper Gulf of Thailand*. Technical Paper no. 9/2008. Bangkok: MFRDB, DOF.
- Pinputtasin, C., Saikliang, P., Sereeruk, K., Chunhapran, A. and Keawmun, P. 2012. *Reproductive biology of greasybackshrimp, Metapenaeusensis (De Haan, 1844) in the Inner Gulf of Thailand*. Technical Paper no. 33/2012. Bangkok: MFRDB, DOF.
- Phuttharaksa, K., Nasuchon, N., Kongchai, T. and Pinputtasin, J. 2008. *Reproductive biology of bigeyes cad (Selarcrumenophthalmus (Bloch, 1793)) in the Gulf of Thailand*. Technical Paper no. 16/2008. Bangkok: MFRDB, DOF.
- Premkit, W., Dowreung, A. and Sereeruk, K. 2004. *Biological aspects of one finlets cad (Atule mate) in the Upper Gulf of Thailand*. Technical Paper no. 1/2001. Bangkok: MFRDB, DOF.
- Sritakon, Y., Vibunpant, S., Chotitammo, U. and Songnui, J. 2012. *Biology of Jinga shrimp (Metapenaeusaffinis H. Milne Edwards, 1837) from KoSamui to KoKra*. Technical Paper no. 12/2012. Bangkok: MFRDB, DOF.
- Suppanirun, T., Songkeaw, N., Khrueniam, U. and Pinputtasin, C. 2011. *Reproductive biology of Indian squid, Photololigoduvaucelii (d'Orbigny, 1835) and Mitresquid,*

- P. chinensis* (Gray, 1849) in the Gulf of Thailand. Technical Paper no. 2/2011. Bangkok: MFRDB, DOF.
- Vibunpant, S., Puntuleng, P., Hussadee, P. and Yangphonkhan, B. 2012. *Reproductive biology of slender lizardfish, (Sauridaelongata (Temminck & Schlegel, 1846)), in the Gulf of Thailand*. Technical Paper no. 13/2012. Bangkok: MFRDB, DOF.
- Vibunpant, S., Hussardee, P., Puttharaksa, K. and Suppanirun, T. 2011. *Reproductive biology of brushtooth lizardfish, Sauridaundosquamis (Richardson, 1848), in the Gulf of Thailand*. Technical Paper no. 1/2011. Bangkok: MFRDB, DOF.
- Yakoh, A., Chalee, P., Jithlang, I., Lertkairatchata, T., Puewkhao, P. and Intharasuwan, T. 2013. *Biology of banana prawn (Penaeus merguensis De Man, 1888) in Phang-nga Bay*. Technical Paper no. 20/2013. Bangkok: MFRDB, DOF.
- Yakoh, A. and Chalee, P. 2008. *Reproductive biology of yellowstripescad, Selaroides leptolepis (Cuvier, 1833) in the Andaman Sea along the Coast of Thailand*. Technical Paper no. 12/2008. Bangkok: MFRDB, DOF.

**Appendix A**  
**CPUE and species composition**

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

Species/Group	CPUE( kg/hr)	Composition	
		(% of total catch)	(% of food fish)
<b>Total</b>	<b>17.39</b>	<b>36.08</b>	<b>100.00</b>
<b>Sub-total pelagic fish</b>	<b>0.29</b>	<b>0.61</b>	<b>1.68</b>
Yellowstripescad	<i>Selaroidesleptolepis</i>	0.25	1.45
Other pelagic fishes		0.04	0.24
<b>Sub-total demersal fish</b>	<b>12.90</b>	<b>26.75</b>	<b>74.14</b>
Flatheads		2.93	16.84
Lattice monocle bream	<i>Scolopsistaeniopterus</i>	2.62	15.09
Slender lizardfish	<i>Sauridaelongata</i>	1.02	5.86
Japanese threadfin bream	<i>Nemipterusjaponicus</i>	1.01	5.82
Goatfishes		0.91	5.23
Purple-spotted bigeye	<i>Priacanthustayenus</i>	0.53	3.03
Ornate threadfin bream	<i>N. hexodon</i>	0.52	2.96
Silver biddies	<i>Gerresspp.</i>	0.51	2.63
Rays		0.46	2.35
Sillagoes	<i>Sillagospp.</i>	0.41	2.94
Croakers		0.24	1.39
Barracudas	<i>Sphyraenaspp.</i>	0.24	1.38
Notchedfin threadfin bream	<i>N. peronii</i>	0.23	1.33
Tonguesoles		0.17	0.96
Mauvelip threadfin bream	<i>N. mesoprion</i>	0.17	0.96
Bigeye snapper	<i>Lutjanualutjanus</i>	0.15	0.86
Splendid ponyfish	<i>Leiognathussplendens</i>	0.12	0.72
Other demersal fishes		0.66	3.79
<b>Sub-total cephalopod</b>	<b>1.47</b>	<b>3.04</b>	<b>8.43</b>
Needle cuttlefish	<i>Sepia aculeata</i>	0.72	4.15
Indian squid	<i>Photololigoduvaucelii</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
<b>Sub-total shrimp and prawn</b>	<b>2.03</b>	<b>4.22</b>	<b>11.70</b>
Western king prawn	<i>Penaeuslatisulcatus</i>	0.42	2.42
Greasyback shrimp	<i>Metapenaeusensis</i>	0.36	2.06
Velvet shrimps	<i>Metapenaeopsisspp.</i>	0.34	1.94
Giant tiger prawn	<i>Penaeusmonodon</i>	0.22	1.28
Banana prawn	<i>Penaeusmerguiensis</i>	0.21	1.22
Rough shrimps	<i>Trachypenaeus spp.</i>	0.15	0.89
Green tiger prawn	<i>Penaeussemisulcatus</i>	0.12	0.71
Other shrimps and prawns		0.20	1.18
<b>Sub-total other invertebrate</b>	<b>0.70</b>	<b>1.46</b>	<b>4.05</b>
Asian moon scallop	<i>Amusiumpleuronectes</i>	0.52	2.99
Sentinel crab	<i>Podophthalmus vigil</i>	0.11	0.63
Other invertebrates		0.08	0.43

**Table 2** CPUE and species composition of trash fish from small-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 trash fish)
<b>Total</b>	<b>30.82</b>	<b>63.92</b>	<b>100.00</b>
<b>Sub-total pelagic fish</b>	<b>0.89</b>	<b>1.85</b>	<b>2.89</b>
Torpedo scad	<i>Megalaspiscordyla</i>	0.22	0.73
Mackerels	<i>Rastrelliger spp.</i>	0.21	0.67
Yellowstripescad	<i>Selaroidesleptolepis</i>	0.20	0.66
Other pelagic fish		0.26	0.83
<b>Sub-total demersal fish</b>	<b>19.26</b>	<b>39.95</b>	<b>62.49</b>
Splendid ponyfish	<i>Leiognathussplendens</i>	7.72	25.05
Spinefoots	<i>Siganusspp.</i>	5.60	18.16
Flatheads		0.87	2.83
Eel catfishes	<i>Plotosusspp.</i>	0.86	2.79
Purple-spotted bigeye	<i>Priacanthustayenus</i>	0.73	2.38
Lattice monocle bream	<i>Scolopsistaeniopterus</i>	0.72	2.34
Silver biddies	<i>Gerresspp.</i>	0.37	1.20
Threadfin bream	<i>Nemipteruspp.</i>	0.36	1.17
Puffers	<i>Lagocephaluspp.</i>	0.36	1.16
Toothpony	<i>Gazzaminuta</i>	0.31	0.99
Indian halibut	<i>Psettodeserumei</i>	0.27	0.89
Common ponyfish	<i>Leiognathusequulus</i>	0.27	0.86
Other demersal fishes		0.82	2.67
<b>Sub-total cephalopod</b>	<b>0.32</b>	<b>0.66</b>	<b>1.04</b>
Cuttlefishes		0.31	1.00
Kobi squid	<i>Photololigosumatrensis</i>	0.01	0.04
<b>Sub-total shrimp and prawn</b>	<b>0.19</b>	<b>0.40</b>	<b>0.63</b>
<b>Sub-total other invertebrate</b>	<b>3.50</b>	<b>7.25</b>	<b>11.35</b>
Crabs		3.41	11.07
Mantis shrimps		0.09	0.28
<b>Sub-total true trash fish</b>	<b>6.66</b>	<b>13.81</b>	<b>21.60</b>
Ponyfishes		3.73	12.09
Cardinalfishes		1.47	4.77
Triggerfishes		0.61	1.97
Silver-cheeked toadfish	<i>Lagocephalussceleratus</i>	0.32	1.05
Gobies		0.21	0.69
Scorpionfishes		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)
<b>Total</b>	<b>16.07</b>	<b>57.85</b>	<b>100.00</b>
<b>Sub-total pelagic fish</b>	<b>0.17</b>	<b>0.63</b>	<b>1.09</b>
Yellowstripescad	<i>Selaroidesleptolepis</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
<b>Sub-total demersal fish</b>	<b>9.94</b>	<b>35.79</b>	<b>61.87</b>
Flatheads		2.21	13.74
Tonguesoles		1.21	7.51
Slender lizardfish	<i>Sauridaelongata</i>	1.02	6.34
Lattice monocle bream	<i>Scolopsistaeniopterus</i>	0.93	5.77
Purple-spotted bigeye	<i>Priacanthustayenus</i>	0.89	5.52
Ornate threadfin bream	<i>Nemipterushexodon</i>	0.65	4.02
Goatfishes	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 lizardfish	<i>Sauridaundosquamis</i>	0.30	1.84
Rays		0.28	1.78
Barracudas	<i>Sphyraenas</i> spp.	0.23	1.47
Puffers	<i>Lagocephalus</i> spp.	0.22	1.38
Cutlassfishes		0.10	0.64
Silver biddies	<i>Gerress</i> spp.	0.09	0.55
Other demersal fishes		0.67	4.19
<b>Sub-total cephalopod</b>	<b>2.44</b>	<b>8.78</b>	<b>15.17</b>
Octopus		0.60	3.73
Indian squid	<i>Photololigoduvaucelii</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>Photololigochinensis</i>	0.24	1.47
Other cephalopods		0.21	1.31
<b>Sub-total shrimp and prawn</b>	<b>1.48</b>	<b>5.31</b>	<b>9.19</b>
Velvet shrimps	<i>Metapenaeopsiss</i> spp.	1.44	8.96
Penaeid shrimps	<i>Penaeus</i> spp.	0.02	0.12
Other shrimps and prawns		0.02	0.11
<b>Sub-total other invertebrate</b>	<b>2.04</b>	<b>7.34</b>	<b>12.68</b>
Asian moon scallop	<i>Amusiumpleuronectes</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 PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE( kg/hr)	Composition (%)	
		(% of total catch)	(% of trash fish)
<b>Total</b>	<b>11.71</b>	<b>42.15</b>	<b>100.00</b>
<b>Sub-total pelagic fish</b>	<b>0.61</b>	<b>2.18</b>	<b>5.18</b>
Yellowstripescad	<i>Selaroidesleptolepis</i>	0.35	3.00
Mackerels	<i>Rastrelligerspp.</i>	0.17	1.45
Other pelagic fish		0.09	0.73
<b>Sub-total demersal fish</b>	<b>5.47</b>	<b>19.69</b>	<b>46.73</b>
Flatheads		1.51	12.93
Spinefoots	<i>Siganusspp.</i>	1.15	9.80
Indian halibut	<i>Psettodeserumei</i>	0.86	7.35
Purple-spotted bigeye	<i>Priacanthustayenus</i>	0.52	4.47
Shortjawsaury	<i>Sauridaisarankuraii</i>	0.37	3.12
Goatfishes		0.23	2.00
Lattice monocle bream	<i>Scolopsistaeniopterus</i>	0.19	1.62
Dwarf flathead	<i>Elates ransonnetii</i>	0.12	1.02
Ornate threadfin bream	<i>N. hexodon</i>	0.12	1.02
Brushtooth lizardfish	<i>Sauridaundosquamis</i>	0.10	0.86
Other demersal fishes		0.30	2.54
<b>Sub-total cephalopod</b>	<b>0.25</b>	<b>0.91</b>	<b>2.16</b>
Cuttlefishes		0.15	1.33
Kobi squid	<i>Nipponololigosumatrensis</i>	0.09	0.77
Octopuses		0.01	0.06
<b>Sub-total shrimp and prawn</b>	<b>0.30</b>	<b>1.07</b>	<b>2.55</b>
<b>Sub-total other invertebrate</b>	<b>0.81</b>	<b>2.91</b>	<b>6.89</b>
Crabs		0.73	6.25
Bivalves		0.04	0.36
Mantis shrimps		0.04	0.28
<b>Sub-total true trash fish</b>	<b>4.27</b>	<b>15.39</b>	<b>36.49</b>
Ponyfishes		1.48	12.63
Triggerfishes		0.65	5.52
Lefteye flounders		0.63	5.40
Cardinalfishes		0.46	3.96
Scorpionfishes		0.27	2.30
Silver-cheeked toadfish	<i>Lagocephalusceleratus</i>	0.24	2.01
Longfinsilverbidy	<i>Pentaprionlongimanus</i>	0.21	1.83
Smooth blaasop	<i>Lagocephalusinermis</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 PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(k g/hr)	Composition (%)	
		(% of total catch)	(% of food fish)
<b>Total</b>	<b>68.35</b>	<b>45.56</b>	<b>100.00</b>
<b>Sub-total pelagic fish</b>	<b>31.88</b>	<b>21.25</b>	<b>46.64</b>
Short mackerel <i>Rastrelligerbrachysoma</i>	10.52	7.01	15.39
Goldstripesardinella <i>Sardinellagibbosa</i>	6.48	4.32	9.48
Yellowstripescad <i>Selaroidesleptolepis</i>	6.41	4.28	9.39
Indian mackerel <i>R. kanagurta</i>	1.78	1.18	2.60
King mackerels <i>Scomberomorus spp.</i>	1.45	0.97	2.12
Dorab wolf-herring <i>Chirocentrusdorab</i>	0.77	0.51	1.12
Yellowtail scad <i>Atule mate</i>	0.76	0.51	1.11
Bigeyescad <i>Selarcrumenophthalmus</i>	0.68	0.46	1.00
Black pomfret <i>Parastromateusniger</i>	0.62	0.41	0.91
Torpedo scad <i>Megalaspiscordyla</i>	0.48	0.32	0.70
Other pelagic fish	1.93	1.28	2.82
<b>Sub-total demersal fish</b>	<b>24.53</b>	<b>16.35</b>	<b>35.89</b>
Purple-spotted bigeye <i>Priacanthustayenus</i>	5.40	3.60	7.90
Goatfishes	2.70	1.80	3.95
Notchedfin threadfin bream <i>Nemipterusperonii</i>	2.51	1.67	3.67
Cutlassfishes	2.31	1.54	3.38
Ornate threadfin bream <i>Nemipterushexodon</i>	1.65	1.10	2.42
Barracudas <i>Sphyreana spp.</i>	1.44	0.96	2.10
Slender lizardfish <i>Sauridaelongata</i>	1.24	0.83	1.82
Other threadfin breams	1.07	0.71	1.57
Puffers <i>Lagocephalus spp.</i>	0.73	0.48	1.06
Croakers	0.66	0.44	0.96
Spinefoots <i>Siganus spp.</i>	0.51	0.34	0.75
Other lizardfishes <i>Saurida spp.</i>	0.49	0.33	0.72
Other demersal fishes	3.82	2.55	5.59
<b>Sub-total cephalopod</b>	<b>11.49</b>	<b>7.66</b>	<b>16.81</b>
Indian squid <i>Photololigoduvaucelii</i>	5.89	3.93	8.62
Kobi squid <i>Nipponololigosumatrensis</i>	2.07	1.38	3.03
Mitre squid <i>Photololigochinensis</i>	1.72	1.14	2.51
Pharaoh cuttlefish <i>Sepia pharaonis</i>	0.69	0.46	1.01
Other cuttlefishes	0.64	0.43	0.94
Octopuses	0.4	0.26	0.58
Bigfin reef squid <i>Sepioteuthislessoniana</i>	0.08	0.06	0.12
<b>Sub-total shrimp and prawn</b>	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>
<b>Sub-total other invertebrate</b>	<b>0.44</b>	<b>0.29</b>	<b>0.64</b>
Crabs	0.23	0.16	0.34
Asian moon scallop <i>Amusiumpleuronectes</i>	0.13	0.08	0.18
Mantis shrimps	0.05	0.03	0.07
Flathead lobster <i>Thenusorientalis</i>	0.03	0.02	0.05

**Table 6** CPUE and species composition of trash fish from pair trawl operated in PrachuapKhiri Khan and Chumphon Province during June 2013 - May 2014

Species/Group	CPUE(k g/hr)	Composition (%)	
		(% of total catch)	(% of trash fish)
<b>Total</b>	<b>81.67</b>	<b>54.44</b>	<b>100.00</b>
<b>Sub-total pelagic fish</b>	<b>34.60</b>	<b>23.07</b>	<b>42.37</b>
Anchovies	19.29	12.86	23.61
Carangids	5.53	3.69	6.78
Mackerels	<i>Rastrelligerspp.</i>	2.49	4.58
Indian mackerel	<i>Rastrelligerkanagurta</i>	1.09	2.00
Goldstripesardinella	<i>Sardinellagibbosa</i>	0.72	1.32
Other pelagic fishes	3.33	2.22	4.08
<b>Sub-total demersal fish</b>	<b>19.72</b>	<b>13.15</b>	<b>24.15</b>
Purple-spotted bigeye	<i>Priacanthustayenus</i>	2.85	5.23
Groupers	<i>Epinepheluspp.</i>	2.65	4.87
Goatfishes		1.47	2.70
Brushtooth lizardfish	<i>Sauridaundosquamis</i>	1.37	2.51
Shortjawsaury	<i>Sauridaisarankurarii</i>	1.01	1.85
Cutlassfishes		0.68	1.25
Threadfin breams	<i>Nemipteruspp.</i>	0.65	1.19
Barracudas	<i>Sphyraenaspp.</i>	0.58	1.07
Spinefoots	<i>Siganusspp.</i>	0.35	0.64
Other demersal fishes	2.32	1.54	2.84
<b>Sub-total cephalopod</b>	<b>4.58</b>	<b>3.05</b>	<b>5.61</b>
Kobi squid	<i>Nipponololigosumatrensis</i>	2.43	4.46
Cuttlefishes		0.53	0.97
Other squids		0.07	0.13
Octopuses		0.02	0.04
<b>Sub-total shrimp and prawn</b>	<b>0.91</b>	<b>0.60</b>	<b>1.11</b>
<b>Sub-total other invertebrate</b>	<b>0.23</b>	<b>0.15</b>	<b>0.28</b>
<b>Sub-total true trash fish</b>	<b>21.63</b>	<b>14.42</b>	<b>26.48</b>
Ponyfishes	13.74	9.16	16.82
Longfinsilverbidddy	<i>Pentaprionlongimanus</i>	1.38	2.54
Unicorn cod	<i>Bregmacerosmcclellandi</i>	1.28	2.34
Puffers	<i>Lagocephaluspp.</i>	1.1	2.03
Triggerfishes		0.85	1.56
Cardinalfishes		0.37	0.67
Other true trash fishes	0.42	0.28	0.52

**Appendix B**  
**Length of some economically important species**

**Table 1** Length of some economically important species caught by OBT1 in PrachuapKhiri 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>Gerresabbreviatus</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>Nemipterushexodon</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>Sauridaelongata</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>Priacanthustayenus</i>	13.25	20.25	15.39	0.17	5.75	13.75	9.75	0.09
<i>Scolopsistaeniopterus</i>	8.75	26.25	15.72	0.27	6.25	14.25	8.83	0.09
<i>Sillagomaculata</i>	12.25	22.75	15.22	0.71	-	-	-	-
<i>Sillagosihama</i>	11.25	21.25	15.26	0.26	-	-	-	-
<i>Photololigoduvaucelii</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>Sepiellainnermis</i>	5.75	9.75	7.70	0.59	-	-	-	-
<i>Metapenaeusaffinis</i>	8.25	14.25	11.13	0.18	-	-	-	-
<i>M. ensis</i>	7.25	16.75	11.13	0.15	-	-	-	-
<i>Penaeuslatisulcatus</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 PrachuapKhiri 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>Gerresabbreviatus</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>Scolopsista eniopterus</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 PrachuapKhiri 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>Rastrelligerbrachysoma</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>Rastrelligerspp.</i>	-	-	-	-	3.75	10.75	6.62	0.00
<i>Sardinellagibbosa</i>	9.75	19.25	12.99	0.01	5.75	14.25	8.92	0.01
<i>Selarcrumenophthalmus</i>	8.75	25.75	17.54	0.15	4.25	12.75	5.59	0.04
<i>Selaroidesleptolepis</i>	8.25	19.75	12.94	0.02	2.25	13.75	6.17	0.01
<i>Gerresabbreviatus</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>Nemipterushexodon</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>Sauridaelongata</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>Priacanthustayenus</i>	7.75	26.25	15.44	0.05	3.25	16.25	6.22	0.02
<i>Scolopsistaeniopterus</i>	10.75	28.25	15.85	0.39	8.25	14.25	8.57	0.11
<i>Photololigochinensis</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>Sepiellainnermis</i>	3.75	7.75	4.97	0.14	-	-	-	-