



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien



NERITIC TUNA SPECIES CAUGHT DRIFTING GILLNET IN INDIAN OCEAN BASED IN CILACAP-INDONESIA¹⁾

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ABSTRACT

Drifting gillnet is one of the tuna fishing gears which developed in Cilacap since tens year ago. The drifting gillnets was nylon multifilament with mesh size 5 inch and operated by wooden boat 20-30 GT. Each gillnetter operates about 50-60 piece of net. In order to obtain data and information in regard to the fishery and fish biology aspect, Balai Riset Perikanan Laut (Research Institute for Marine Fisheries) Jakarta was carried out research through a serial onboard observation in the year 2008, 2009 and 2010. Result of the research shows that: drifting gillnet for tuna caught neritic tuna and sheerfish as by product about 9 % of total catch. The neritic tuna and sheerfish consist of longtail tuna (*Thunnus tonggol*), frigate tuna (*Auxis thazard*), bullet tuna (*Auxis rochei*), narrow-barred Spanish mackerel (*Scomberomorus commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus*). Catch rate decreased from 285.60 kg/setting in 2008 to 170 kg/setting in 2009 and continued decreased to 106.31 kg/setting in 2010. The decreasing trend was caused by many purse seiners start fishing in the fishing ground where gillnet fishing.

Key word : neritic tuna, gillnet, Indian ocean, cilacap

INTRODUCTION

There are 6 species of neritic tuna and sheerfish under IOTC management i.e. longtail tuna (*Thunnus tonggol*), frigate tuna (*Auxis thazard*), bullet tuna (*Auxis rochei*), kawakawa (*Euthynnus affinis*), narrow-barred

Spanish mackerel (*Scomberomorus commerson*) and Indo-Pacific king mackerel (*Scomberomorus guttatus*) (Herrera, et al., 2009). National Fisheries Statistic of Indonesia (Anon., 2005; 2006; 2007; 2008; 2009; and 2010) noted those the six species were caught in Western Sumatera and Southern Java Indian Ocean. The six species generally are part of the catch of purse seine, drifting gillnet, hand lining and trolling gear.

Drifting gillnet was developed in Cilacap since tens year ago. Cilacap was located in the Southern coastal of the Central Java. The fishing area of the drifting gillnet based in Cilacap was Indian Ocean. The main target of the drifting gillnet is tuna and tuna like including neritic tuna and sheerfish. There were about 162 gillnetters in Cilacap in 2010 based in Cilacap Fishing Port. In order to get information of the fishery aspect of the drifting gillnet based in Cilacap, Balai Riset Perikanan Laut (Research Institute for Marine Fisheries) carried out a serial onboard observation in 2008, 2009 and 2010. This paper presents the result of the onboard observation.

MATERIALS AND METHODS

Two types of data (primer and secondary) data were analyzed in this paper.

1. The primer data come from onboard observation that was conducted ~~on~~ in April, July and October in the year 2008, 2009 and 2010. The onboard observation was carried out in some commercial gillnetters ranged between 26-28 GT. Each gillnetter operated 57-60 pieces of net with mesh size 5 inch. The data cover fishery aspect and fish biology aspect. Data of fishery aspect consist of information on technical aspect of gear, fishing tactic, fishing area, and catch rate. The fish biological data consist of species and size (fork length-FL) of fish. Due to the data limitation, the biological aspect only comes from three species i.e. *Auxis thazard*, *A.rochei* and *Scomberomorus commerson*. Number of samples was 30% of total catch weight of those species.
2. The secondary data come from National Fisheries Statistics year 2005-2009 published by DGCF and Cilacap Fishing Port Statistic year 2006-2010.

RESULT AND DISCUSSION

1. Fishery

The drifting gillnet constructed by large-meshed synthetic netting with a line of float (corks) at the top and a series of weight (leads or concrete) at the bottom to maintain it vertical in midwater, in general, not far below the surface. It is normally set at dusk and hauled at dawn or in the morning. The length of drifting gillnet deployed by fishermen targeting tuna or other large pelagic fish such as swordfish, is commonly several kilometers whereas the height ranges from 18 to 30 m. One piece of drifting gillnet in Cilacap has length 38-40 m and height 18-20 m. Webbing material is nylon multifilament type d-21 and mesh size 5 inch. Floats are synthetic rubber type Y-15 as much as 6 floats and 4 weights from concrete 0.5 kg each weight. Each piece of gillnet is equipped 2 plastic buoy \varnothing 30 cm and buoy line 6 m in length for keeping the position of gillnet about 5-6 m below the sea surface. Technical specification of one piece gillnet based in Cilacap is presented in Fig. 1. One gillnetter is generally operating 50-60 piece gillnets.

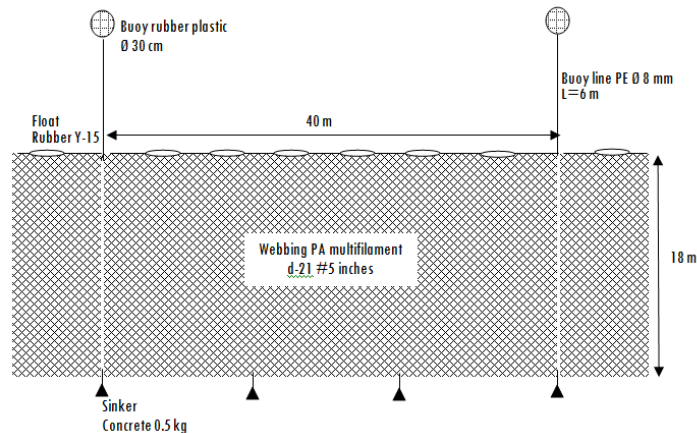


Figure 1 Technical specification of one piece drift gillnet based in Cilacap.

Gillnetters are, in general, medium-size, ranging from around 10 m to more than 20 m long vessels. Their wheelhouse may be aft but, more often forward to leave enough space for storing nets. The shooting is, in general, from the stern and the hauling by the side. In general these vessels setting and hauling operations are performed by hydraulic, and in Indonesia mostly of gillnetter hauling by hand. Most of gillnet fleets based in Cilacap were wooden boat size 20-30 GT with the main engine 120-160 HP and generator engine 24-30 HP. Fish

hold in the gillnet fleets were not equipped with refrigeration machine, the freshness of catch is preserved with the ice. Gillnet fleets generally equipped by compass and GPS for the navigation purpose and SSB radio for communication. Number of crew each boat about 12-14. Fishing trip duration is 18-22 days per trip with the effective days 16-20. Figure 2 presents the profile of gillnetter in Cilacap (Photograph is taken in October 2010).



Figure 2 Profile of gillnetter in Cilacap (2010).

Based on onboard observation conducted in 2008, 2009 and 2010 the gillnet fleet based at Cilacap have similar fishing ground pattern in those year. In April they operate in the offshore waters, whereas in July and October they operate in the inshore waters. Figure 3 shows that the fishing position of gillnet in April 2008 ranged 10.0° - 11.0° S and 107.0° - 108.0° E, as for July and October the fishing positions more close to the coastal.

In 2009, the situation was relatively similar with the previous year. Since 2010 gillnet fishery experienced fishing pressure by the operation of purse seiners those are fishing in the gillnet fishing ground. The purse seiners deployed FADs in the conventional gillnet fishing area and since that time most gillnet fleets moved to the inshore waters.

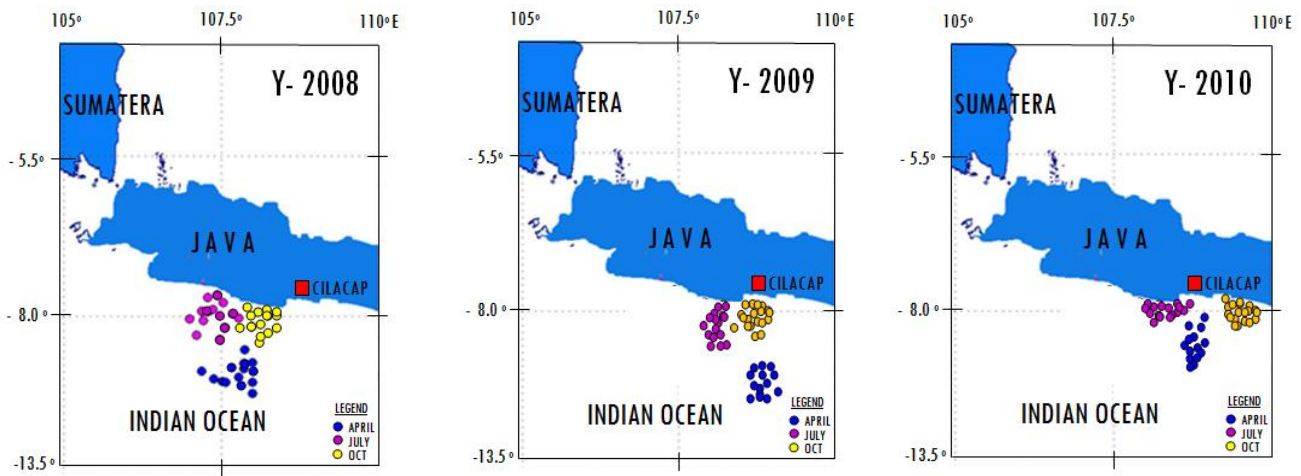


Figure 3 The fishing position of gillnet based at Cilacap collected by the onboard observation in April, July and October 2008, 2009 and 2010.

2. Production of Neritic Tuna

There are large commercial fisheries for tunas and billfish throughout the Indian Ocean, including fleets from coastal states and distant water fishing nations, operating in coastal state EEZs and on the high seas. Until 2003, in Indonesia's fisheries related reports (National Fisheries Statistic), "Tuna" usually includes all of the large tunas (*Thunnus* spp. – yellowfin, bigeye, SBT, and albacore), and the tuna-like species (marlins, sailfish, swordfish). Skipjack tuna are usually reported as a separate group "cakalang". "Tongkol" generally includes eastern little tuna (*Euthynnus* spp.), the frigate and bullet tunas (*Auxis* spp.), and longtail tuna (*Thunnus tonggol*). "Tenggiri" includes the larger species of mackerel (*Scomberomorus* spp.) – narrow barred king mackerel and Indo-Pacific king mackerel. Since 2004 there has been an improvement of tuna data statistic where the tuna has been broken down by species. IOTC stated that Indonesia is considered to be among the most important tuna fishing countries in the Indian Ocean (Proctor, et al., 2003). Estimated in 2009 Indonesia's catch from Indian Ocean (FMA 572 and 573, Figure 4) was 89,404 tons tuna (albacore, yellowfin tuna, bigeye tuna and southern bluefin tuna) and 76,292 tons neritic tuna and sheefish (Table 1).

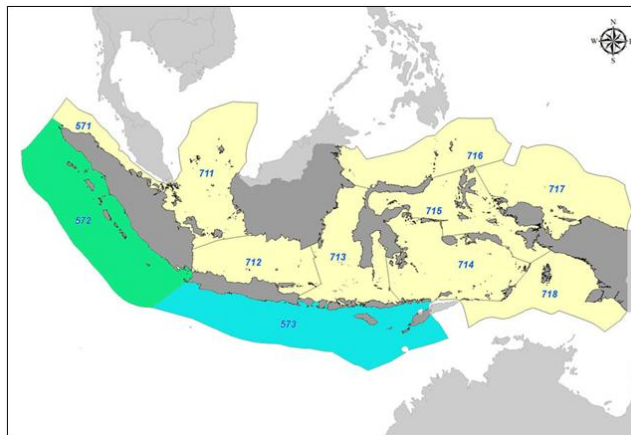


Figure 4 Fisheries Management Area (FMA) of Indonesia, green and blue color indicated FMA 572 and FMA 573.

Table 1 Production of neritic tuna of Indonesia which has come from Indian Ocean (FMA 572 and 573).

YEAR	Landing Place	Catch Landing by Species (ton)					Total (ton)	
		FRI	BLT	LOT	KAW	COM		
2009	West Sumatera	16 691	2 869	12 925	7 507	2 358	7 916	50 266
	South Java	2 891	897	361	19 514	2 358	5	26 026
	Total	19 582	3 766	13 286	27 021	4 716	7 921	76 292
2008	West Sumatera	19 251	936	8 183	29 380	8 010	7 351	73 111
	South Java	4 202	982	476	18 417	30	2 571	26 678
	Total	23 453	1 918	8 659	47 797	8 040	9 922	99 789
2007	West Sumatera	20733	10	11622	8599	7676	9220	57 860
	South Java	5439	3304	374	15124	11175	64	35 480
	Total	26172	3314	11996	23723	18851	9284	93 340
2006	West Sumatera	4460	3	6251	16771	6737	4488	38 710
	South Java	13257	530	3626	228	2885	45	20 571
	Total	17717	533	9877	16999	9622	4533	59 281
2005	West Sumatera	3929	3	3057	15038	4456	2992	29 475
	South Java	6912	0	1682	2108	2358	36	13 096
	Total	10841	3	4739	17146	6814	3028	42 571
2004	West Sumatera	3237	6	11216	9963	4555	3480	32 457
	South Java	31	0	8127	6068	2737	1	16 964
	Total	3268	6	19343	16031	7292	3481	49 421
		TONGKOL (Eastern Litle Tuna)			COM	GUT	Total (ton)	
2003	West Sumatera	26312			6147	6034	38 493	
	South Java	10009			2775	23	12 807	
	Total	36321			8922	6057	51 300	
2002	West Sumatera	18210			4315	3745	26 270	
	South Java	26609			3855	24	30 488	
	Total	44819			8170	3769	56 758	
2001	West Sumatera	22409			6522	4471	33 402	
	South Java	6875			3160	105	10 140	
	Total	29284			9682	4576	43 542	

Neritic tuna and sheerfish in the Indonesian Indian Ocean were caught by various of fishing gears including 'drifting gillnet' and landed in various fishing port in along coastal of west Sumatera (Banda Aceh, Pariaman, Bungus/Padang and Painan) as well as south Java (Muarabaru/Jakarta, Pelabuhanratu, Cilacap, Kedonganan and Benoa). In Cilacap, especially tuna drifting gillnet fishery produces neritic tuna and sheerfish as by product. Result of onboard observation showed that the catch rate of drifting gillnet year 2008, 2009 and 2010 were 285.60, 170.65 and 106.31 kg/setting respectively (Table 1) and about 9 % was neritic tuna and sheerfish. Table 2 shows that the catch rate decreasing year by year caused by plenty of purse seiners start fishing in the fishing ground where gillnet fishing.

Table 2 Catch rate of drifting gillnet base on onboard observation in Cilacap year 2008, 2009 and 2010.

Year	Month	Number of setting	Catch (kg)						Catch Rate (kg/setting)	Average of catch rate (kg/setting)
			FRI	BLT	COM	GUT	LOT	TOTAL		
2008	April	18	151	103	87	34	35	410	22.78	25.32
	July	16	115	96	97	49	27	384	24.00	
	October	17	150	105	124	80	37	496	29.18	
2009	April	19	114	78	95	72	28	387	20.37	15.56
	July	20	96	66	71	35	24	292	14.60	
	October	18	60	45	55	28	23	211	11.72	
2010	April	20	71	34	31	26	23	185	9.25	10.05
	July	19	67	59	36	32	18	212	11.16	
	October	16	69	32	26	17	12	156	9.75	

3. Catch Composition

About 29 species have been identified from the onboard observation on gillnetter based at Cilacap during 2008 to 2010 (Tabel 3). From 30 species, 3 species was tuna (skipjack, yellowfin and big eye tuna), whereas 5 species was neritic tuna (bullet tuna, frigate tuna, narrow barred Spanish mackerel, Indo Pacific king mackerel

and longtail tuna) and remain was others those consist of billfish, shark and other pelagic fishes. The catch composition about 46 % tuna, 9 % neritic tuna and 35 % others (Fig. 5)

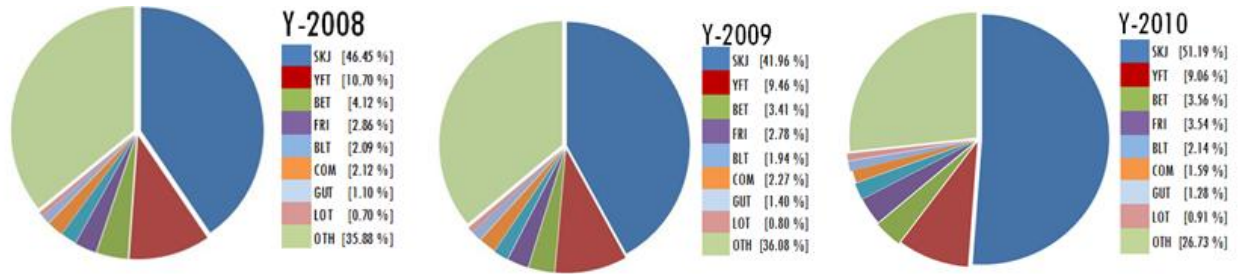


Figure 5 Catch composition of drifting gillnet based onboard observation in Cilacap year 2008, 2009 and 2010.

Table 3 Species caught by gillnet based onboard observation in Cilacap year 2008, 2009 and 2010.

Group	No.	English Name	Local Name
Tuna	1	Skipjack tuna	Cakalang
	2	Big Eye tuna	Tuna Mata Besar
	3	Yellowfin tuna	Madidihang
Neritic tuna and sheerfish	4	Bullet tuna	Tongkol lisong
	5	Frigate tuna	Tongkol lurik
	6	Narrow-barred Spanish Mackerel	Tenggiri
	7	Indo Pacific king mackerel	Tengiri papan
	8	Longtail tuna	Tongkol abu-abu
Other	9	Swordfish	Ikan Pedang
	10	Black marlin	Setuhuk hitam
	11	Indo facific blue marlin	Setuhuk loreng
	12	Sailfish	Layaran
	13	Striped marlin	Setuhuk putih
	14	Shortbill spearfish	Tumbuk
	15	Tiger shark	Cucut macan
	16	Shortfin mako shark	Cucut cakilan
	17	Scalloped hammerhead shark	Cucut Martil
	18	Oceanic whitetip shark	Cucut koboy
	19	Silky shark	Cucut lanjaman
	20	Bigeyed thresher shark	Cucut monyet
	21	Blue shark	Cucuct selendang
	22	Western angel shark	Cucuct sorah
	23	Smalltooth thresher shark	Cucut tikusan
	24	Squid	Cumi
	25	Common dolphinfish	Lemadang
	26	Manta birostris	Pari kasab
	27	Slimy mackerel	Slengseng
	28	Rainbow runner	Sunglir
	29	Big eye trevaly	Kuwe

4. Size Distribution

Result of the onboard observation shows that the size (fork length-FL) of neritic tuna species caught by gillnet mesh size 5 inch varied corresponds to month and fishing area. Due to data limitation, there are only three species presented in this paper as follows:

Frigate Tuna

Result of onboard observation informed that on April 2008 fishing area of gillnet was in offshore, size (fork length-FL) of frigate tuna caught ranged 30-50cm with the mode 41cm. In July the size ranged 30-50 cm with the mode 37cm, whereas in October the size ranged 30-46cm with the mode 37cm. In the year 2009 and 2010, the situation was relatively the same with the previous year (Figure 5). From the information it can be estimated that the catch was mostly immature fish. Males and females frigate tuna were found to attain maturity at slightly different length. Males attained maturity at slightly smaller length than females. Males attain maturity at 30.8 cm while females at 32.8 cm (Jude at al., 2002). Frigate tuna is probably cosmopolitan in warm waters, it is an epipelagic, neritic as well as oceanic species (Anon., 2006).

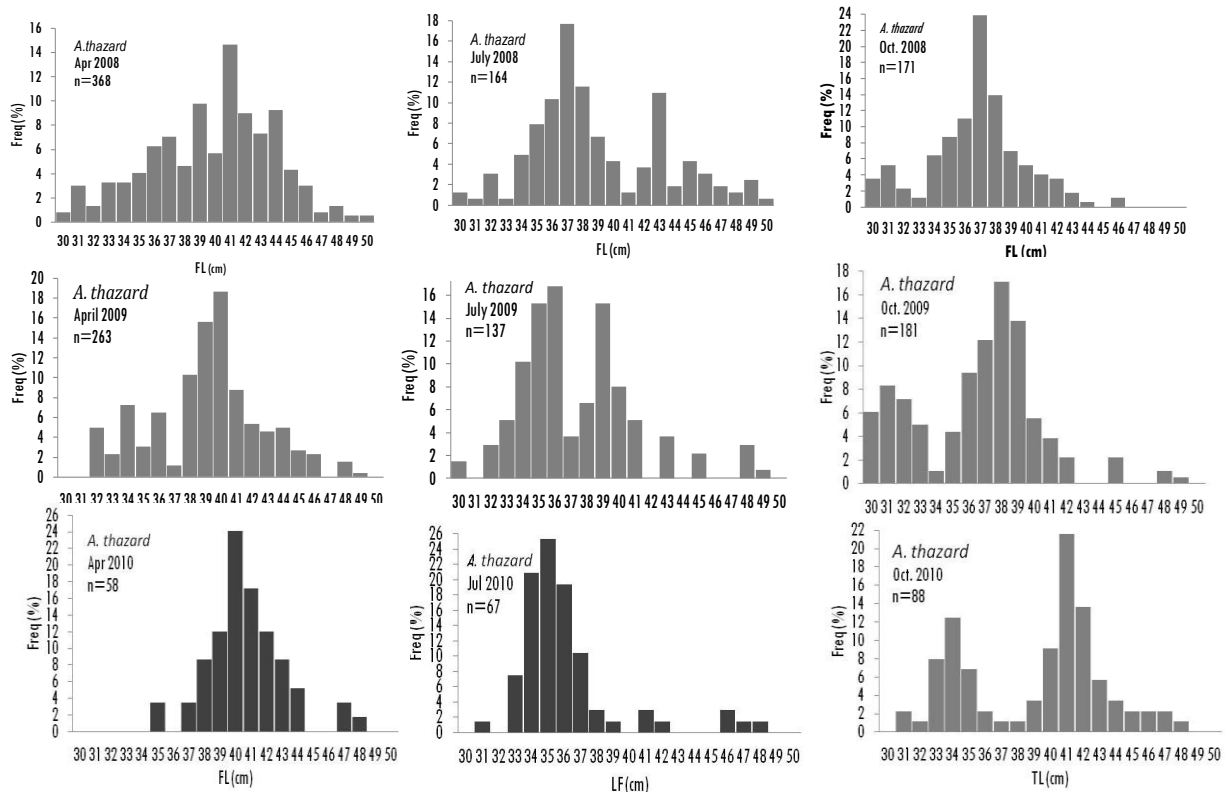


Figure 5 Size (FL) distribution of frigate tuna (*Auxis thazard*) caught by gillnet base on onboard observation year of 2008, 2009 and 2010.

Bullet Tuna

Size (FL) of bullet tuna caught on April 2008 ranged between 20-38 cm with the mode 26 cm, whereas on July the catch seem bigger than the fish caught in April with range 24-45cm with the mode 39 cm. Size of the fish caught on October 2008 ranged between 31-45 cm with mode 42 cm. In the year 2009 situation was relatively similar with the catch size in year 2008 where on the April the size distribution ranged between 23-40 cm with mode 33 cm and on July and October ranged 25-45 cm with mode 37 cm and 32-55 cm with mode 40 cm respectively (Figure 6). Size distribution of the catch on April 2010 ranged 26-32 cm with mode 38 cm, whilst in July and October the size ranged between 21-45 cm with mode 41 cm and 32-45 cm with mode 41 cm respectively (Figure 4). Except catch on April 2008 and April 2009, the mode of FL size range was > 35 cm which estimates that the catch mostly matured. The first maturity size has been stated as 35 cm (FL), when the fish is two years old (Rodriguez-Roda, 1983 in Kahraman, 2010) that was in line with result of the research by Kahraman et al. (2010) which determined that sexually mature bullet tuna specimens were always well over 35 cm FL. The result of research was in line with the behavior of bullet tuna. The bullet tuna is an epipelagic, neritic as well as oceanic species with strong schooling behavior. Adults are principally caught in coastal waters and around islands (Anon., 2006).

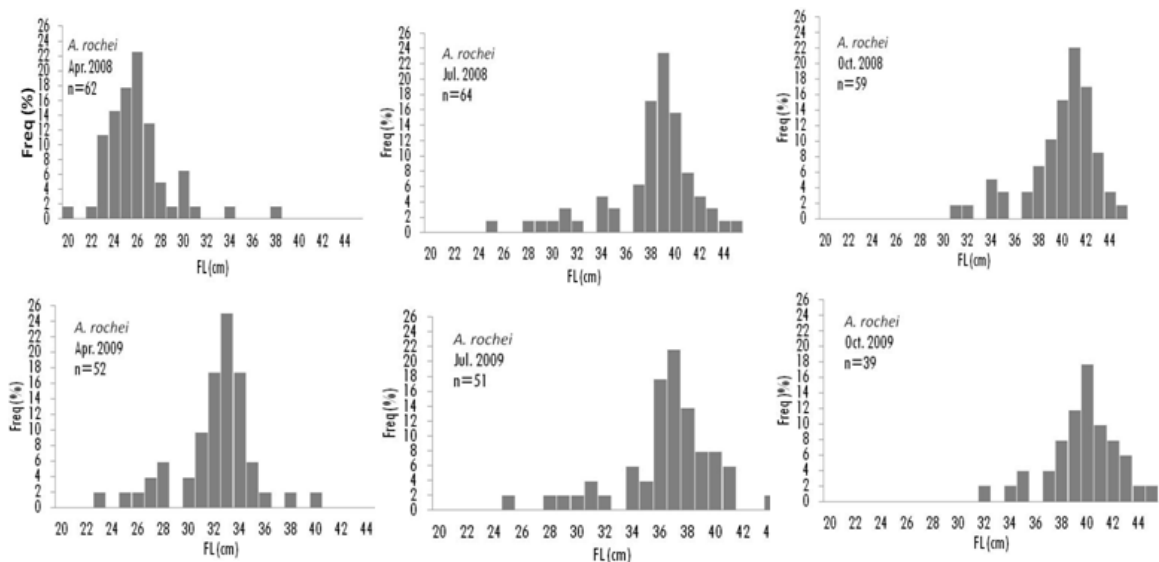


Figure 6 Size (FL) distribution of bullet tuna (*Auxis rochei*) caught by gillnet base on onboard observation year of 2008, 2009 and 2010.

Continue of Fig. 6.

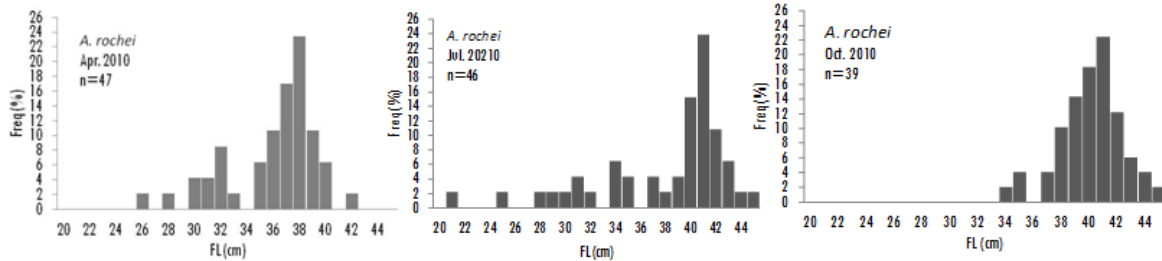


Figure 6 Size (FL) distribution of bullet tuna (*Auxis rochei*) caught by gillnet base on onboard observation year of 2008, 2009 and 2010.

Narrow-barred Spanish mackerel or Kingfish

Base on the onboard observation, size of Narrow barred Spanish mackerel which caught by gillnet in 2008 ranged 40-120 cm with mode 100 cm. In the 2009 and 2010 the size seem decreased with range 40-120 cm but the mode was 90 cm and 40-100 cm with mode 80 cm (Figure 7). Juveniles of narrow-barred Spanish mackerel inhabit shallow inshore areas whereas adults are found in coastal waters out to the continental shelf. Adults are usually found in small schools but often aggregate at particular locations on reefs and shoals to feed and spawn (Anon., 2006). It is estimated that most of the narrow barred Spanish mackerel caught in 2008 and 2009 were mature. The estimation refers to Mc Pherson (1993) that in the eastern Australian stock first mature at 79 cm, whereas the northern population of the same country is slightly longer when it first matures 82 cm.

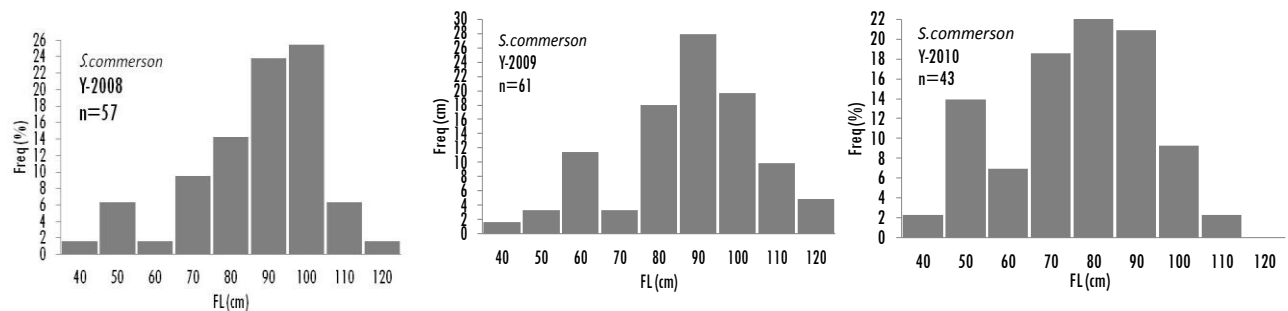


Figure 7 Size (FL) distribution of Spanish mackerel inhabit (*S. commerson*) caught by gillnet base on onboard observation year of 2008, 2009 and 2010.

CONCLUSION

Drifting gillnet fishery in Cilacap produce 5 neritic tuna species are bullet tuna, frigate tuna, narrow barred Spanish mackerel, Indo Pacific king mackerel and long tail tuna as by product. The catch rate of drifting gillnet was decreasing year by year recently as follows in 2008, 2009 and 2010 were 285.60, 170.65 and 106.31 kg/setting where about 9 % of those is neritic tuna. The catch of frigate tuna in 2009 and 2010 was mostly immature fish, whilst the catch of bullet tuna mostly matured and catch of narrow-barred Spanish mackerel or Kingfish mostly mature as well. The status of other neritic tuna species in this paper is not clear yet.

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APPENDIX

Table 1 Catch of MV Sempurna Baru 02 (Gillnetter 28 GT) base onboard observation April 2008.

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	"	°	'	"											
1	8	31	44	107	52	20	58	152	34	11	8	0	9	0	0	171	385
2	8	22	31	107	28	48	58	107	26	19	12	7	13	0	0	55	239
3	8	10	57	107	33	26	58	126	31	12	14	11	0	0	0	129	323
4	8	43	55	107	59	55	58	113	29	18	7	9	11	0	0	121	308
5	8	57	59	107	41	12	58	77	22	9	11	0	7	5	0	76	207
6	8	40	41	107	26	11	58	198	19	7	0	6	0	7	8	93	338
7	8	55	22	107	18	32	58	104	29	17	9	12	6	4	0	48	229
8	8	34	44	107	51	49	58	181	33	16	13	4	3	0	6	52	308
9	8	51	59	107	11	32	58	131	37	13	8	6	4	0	0	79	278
10	9	42	51	107	17	53	58	97	23	0	5	2	4	0	9	108	248
11	9	32	11	107	19	18	58	102	38	14	10	8	0	0	7	172	351
12	9	1	42	107	31	46	58	109	30	8	4	0	9	0	0	126	286
13	8	58	55	107	22	52	58	91	27	0	9	7	12	5	0	88	239
14	8	49	31	107	51	20	58	121	33	12	13	9	5	3	0	71	267
15	9	2	56	108	0	10	58	103	35	11	6	4	0	3	0	106	268
16	9	12	26	107	59	41	58	109	23	15	0	4	0	0	0	103	254
17	8	57	12	107	46	32	58	86	21	13	9	8	0	0	5	92	234
18	9	2	17	107	34	57	58	107	29	18	13	6	4	7	0	137	321
Total Catch (Kg)							1044	2114	519	213	151	103	87	34	35	1827	5083
Catch Rate (Kg/Setting)							58	117.44	28.83	11.83	8.39	5.72	4.83	1.89	1.94	101.50	282.39
Percentage (%)							-	41.59	10.21	4.19	2.97	2.03	1.71	0.67	0.69	35.94	100

Table 2 Catch of MV Maju Setia 02 (Gillnetter 26 GT) base onboard observation July 2008.

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	"	°	'	"											
1	8	11	32	106	59	48	56	117	27	9	11	4	12	6	8	163	357
2	8	15	41	107	12	31	56	121	32	16	7	9	9	2	0	67	263
3	8	6	53	107	55	57	56	104	41	14	6	13	8	4	0	105	295
4	8	22	31	107	41	44	56	99	29	22	9	0	12	4	9	99	283
5	8	26	44	107	13	12	56	82	34	11	14	4	0	0	0	131	276
6	8	55	37	107	11	10	56	173	21	6	8	11	5	0	0	102	326
7	8	42	59	107	17	54	56	120	29	18	0	8	9	0	0	73	257
8	8	13	21	107	19	14	56	133	38	15	0	7	4	5	0	96	298
9	8	47	10	107	31	53	56	109	32	12	10	6	5	4	0	81	259
10	8	53	38	107	22	43	56	102	25	9	7	5	5	4	0	91	248
11	8	44	44	107	51	51	56	115	31	0	6	9	6	8	0	166	341
12	8	2	32	107	0	8	56	124	26	0	13	9	0	5	0	128	305
13	8	10	11	107	59	22	56	88	21	11	0	4	11	0	0	108	243
14	8	1	45	107	46	26	56	147	36	9	8	7	3	0	10	93	313
15	8	4	39	107	13	3	56	96	30	12	10	0	4	0	0	121	273
16	8	18	2	107	6	11	56	101	28	13	6	0	4	7	0	163	322
Total Catch (Kg)							896	1831	480	177	115	96	97	49	27	1787	4659
Catch Rate (Kg/Setting)							56	114.44	30.00	11.06	7.19	6.00	6.06	3.06	1.69	111.69	291.19
Percentage (%)							-	39.30	10.30	3.80	2.47	2.06	2.08	1.05	0.58	38.36	100

Table 3 Catch of MV Sapma 06 (Gillnetter 26 GT) based onboard observation October 2008.

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	''	°	'	''											
1	10	0	41	105	44	12	60	102	39	12	9	5	18	0	0	177	362
2	10	1	53	106	16	55	60	98	21	11	14	7	11	0	0	81	243
3	9	55	31	105	19	40	60	114	43	9	12	18	7	8	8	103	322
4	10	2	44	105	23	37	60	105	48	17	11	4	13	0	0	88	286
5	10	2	37	105	50	2	60	92	22	18	6	0	9	5	12	49	213
6	9	58	17	105	37	0	60	143	28	0	13	9	4	9	0	69	275
7	10	1	13	105	19	42	60	107	37	22	7	6	8	8	0	101	296
8	9	8	16	105	22	19	60	139	32	8	5	11	5	0	0	91	291
9	9	4	30	106	58	28	60	122	40	16	10	7	12	6	0	102	315
10	9	0	44	106	21	24	60	117	24	13	0	8	3	0	0	47	212
11	9	11	32	106	49	11	60	95	33	17	8	0	3	8	7	81	252
12	9	34	11	106	29	18	60	121	31	14	11	13	9	6	0	135	340
13	8	57	45	106	17	33	60	91	36	0	9	0	0	8	0	108	252
14	8	44	39	106	20	31	60	128	29	8	12	4	4	9	10	54	258
15	8	21	22	105	12	27	60	112	27	19	0	9	6	7	0	113	293
16	8	13	25	105	41	36	60	97	23	16	15	0	12	6		118	287
17	8	5	18	105	20	49	60	162	42	10	8	4	0	0	0	92	318
Total Catch (Kg)							1020	1945	555	210	150	105	124	80	37	1609	4815
Catch Rate (Kg/Setting)							60	114.41	32.6	12.4	8.8	6.2	7.29	4.7	2.2	94.65	283.24
Percentage (%)							-	41.75	11.91	4.51	3.22	2.25	2.66	1.72	0.79	34.54	100

IOTC-2011- WPNT01-21

Table 4 Catch of MV Samudera Jaya (Gillnetter 28 GT) base on observer program April 2009

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	''	°	'	''											
1	8	7	41	106	23	28	58	71	21	9	7	4	9	3	7	92	223
2	8	9	33	106	50	24	58	64	18	10	6	0	4	3	0	66	171
3	8	21	13	106	37	11	58	88	14	5	6	9	6	0	0	90	218
4	8	10	16	106	19	18	58	77	20	11	10	6	3	0	0	69	196
5	8	38	33	106	22	33	58	82	15	9	8	11	5	5	0	31	166
6	8	4	53	106	58	31	58	93	19	4	7	7	3	0	0	33	166
7	8	32	27	106	19	27	58	79	11	6	0	6	8	8	6	54	178
8	8	11	21	106	22	36	58	65	18	9	6	8	6	0	0	66	178
9	8	4	18	106	58	21	58	101	22	13	9	0	7	6	0	75	233
10	8	31	41	107	22	11	58	78	18	10	3	7	3	0	6	41	166
11	8	22	33	107	58	18	58	83	16	9	6	0	3	8	0	52	177
12	8	10	13	107	21	33	58	81	12	8	5	4	9	6	0	77	202
13	8	43	16	107	49	31	58	92	26	6	8	0	0	8	0	68	208
14	8	57	33	107	29	27	58	86	17	7	10	4	4	9	0	40	177
15	8	40	53	107	17	36	58	72	13	12	3	9	6	7	0	79	201
16	8	55	27	107	20	49	58	91	24	10	6	0	6	6	9	66	218
17	8	34	21	107	12	58	58	64	16	7	4	0	5	3	0	75	174
18	8	52	22	107	17	21	58	76	13	4	4	0	4	0	0	82	183
19	8	45	11	107	22	49	58	103	20	12	6	3	4	0	0	73	221
Total Catch (Kg)							-	1546	333	161	114	78	95	72	28	1229	3656
Catch Rate (Kg/Setting)							-	81.37	17.53	8.47	6.00	4.11	5.00	3.79	1.47	64.68	192.42
Percentage (%)							-	42.29	9.11	4.40	3.12	2.13	2.60	1.97	0.77	33.62	100

Table 5 Catch of MV AP (Gillnetter 28 GT) base on observer program July 2009.

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	"	°	'	"											
1	8	12	21	105	44	12	60	67	14	8	4	0	7	0	0	31	131
2	8	31	10	105	16	55	60	55	16	11	3	6	5	0	5	72	173
3	8	22	38	105	19	40	60	59	16	7	0	0	3	0	0	84	169
4	8	15	44	105	23	37	60	71	15	0	11	5	5	0	0	61	168
5	8	42	32	105	50	2	60	93	20	14	7	5	4	3	0	44	190
6	8	55	11	105	37	0	60	62	18	0	5	6	4	2	0	32	129
7	8	10	45	105	19	42	60	78	16	0	2	0	7	0	6	48	157
8	8	27	55	105	22	19	60	69	27	0	0	7	2	2	0	41	148
9	9	11	10	105	58	28	60	77	11	6	7	4	0	5	0	68	178
10	9	8	38	105	21	24	60	64	19	5	7	4	0	3	4	51	157
11	9	17	44	105	49	11	60	72	22	5	5	4	4	0	0	49	161
12	9	33	32	105	29	18	60	77	21	0	11	0	6	0	0	69	184
13	9	9	11	105	17	33	60	46	19	3	9	6	6	5	0	73	167
14	9	41	45	106	20	31	60	69	20	5	0	8	0	0	3	47	152
15	9	22	55	106	12	27	60	71	15	0	5	0	0	0	0	46	137
16	9	24	59	106	41	36	60	69	21	0	4	3	9	4	0	63	173
17	9	51	41	106	10	23	60	72	18	5	0	3	0	6	3	71	178
18	9	26	22	106	55	18	60	58	14	3	8	3	5	2	3	79	175
19	9	18	14	106	21	35	60	73	10	0	8	0	4	0	0	47	142
20	9	29	44	106	20	49	60	64	19	6	0	2	0	3	0	43	137
Total Catch (Kg)							-	1366	351	78	96	66	71	35	24	1119	3206
Catch Rate (Kg/Setting)							-	68.30	17.55	3.90	4.80	3.30	3.55	1.75	1.20	55.95	160.29
Percentage (%)							-	42.61	10.95	2.43	2.99	2.06	2.21	1.09	0.75	34.90	100

IOTC-2011- WPNT01-21

Table 6 Catch of MV Mitra Sejati (Gillnetter 22 GT) base on observer program October 2009

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	"	°	'	"											
1	8	55	41	107	10	28	57	66	17	7	4	3	6	0	0	92	195
2	8	57	33	107	18	24	57	69	13	8	3	2	5	0	0	66	166
3	8	54	13	107	37	11	57	77	10	6	4	2	3	0	0	90	192
4	8	49	16	107	21	18	57	58	12	8	6	1	3	0	0	69	157
5	8	52	33	107	49	33	57	56	11	8	0	5	3	4	0	31	118
6	8	58	53	106	29	31	57	47	16	6	5	0	4	0	5	33	116
7	8	51	27	106	17	27	57	44	16	4	4	4	0	0	6	54	132
8	8	48	21	106	20	36	57	63	14	3	0	3	5	0	0	66	154
9	8	47	18	106	12	21	57	81	19	8	0	3	5	4	0	75	195
10	8	56	41	106	41	11	57	68	12	7	4	0	0	0	6	41	138
11	8	50	33	106	10	18	57	75	15	7	4	0	0	0	0	52	153
12	8	11	13	106	55	33	57	62	11	0	3	0	7	4	0	77	164
13	8	8	16	106	49	31	57	83	14	0	0	3	4	3	0	68	175
14	8	10	33	106	29	27	57	80	10	6	7	3	0	0	0	40	146
15	8	1	53	106	17	36	57	61	9	0	8	8	0	5	0	79	170
16	8	32	27	106	20	49	57	68	15	0	0	4	0	4	6	66	163
17	8	21	21	106	12	58	57	57	13	9	5	2	4	0	0	75	165
18	8	13	22	106	17	21	57	55	9	6	3	2	6	4	0	82	167
Total Catch (Kg)							-	1170	236	93	60	45	55	28	23	1156	2866
Catch Rate (Kg/Setting)							-	65.00	13.11	5.17	3.33	2.50	3.06	1.56	1.28	64.22	159.22
Percentage (%)							-	40.82	8.23	3.24	2.09	1.57	1.92	0.98	0.80	40.33	100

Table 7 Catch of MV Bandar Nelayan 1 (Gillnetter 22 GT) base on observer program April 2010

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	"	°	'	"											
1	8	22	49	108	53	21	58	42	9	5	4	2	5	0	0	49	116
2	8	15	29	108	27	36	58	47	14	6	4	1	6	4	0	33	115
3	8	42	17	108	21	53	58	51	6	4	3	4	0	3	0	51	122
4	8	55	20	108	18	27	58	44	8	4	2	0	0	2	0	14	74
5	8	10	12	108	41	21	58	73	8	6	2	0	3	0	6	16	114
6	8	27	41	108	33	18	58	55	10	7	5	0	0	0	7	19	103
7	8	11	10	108	13	41	58	64	7	4	6	3	0	0	0	22	106
8	8	8	55	108	16	33	58	52	5	3	4	3	0	3	0	26	96
9	8	17	49	108	33	13	58	49	13	7	4	2	0	6	0	17	98
10	8	4	29	108	54	16	58	45	7	3	7	0	9	0	3	19	93
11	8	31	33	108	27	33	58	74	7	0	3	0	0	0	0	24	108
12	8	22	13	108	22	17	58	63	9	0	0	4	4	0	4	20	104
13	8	10	16	108	58	19	58	58	11	0	0	2	4	0	0	18	93
14	8	43	36	108	21	31	58	54	6	6	3	0	0	3	0	25	97
15	8	57	21	108	49	22	58	77	6	4	6	0	0	3	0	12	108
16	8	40	11	108	29	51	58	46	17	6	6	0	0	0	0	29	104
17	8	21	18	108	17	0	58	49	15	6	6	3	0	0	0	47	126
18	8	13	33	108	31	12	58	57	12	5	0	3	0	0	3	21	101
19	8	16	31	108	22	40	58	52	9	3	0	4	0	2	0	32	102
20	8	33	27	108	41	13	58	41	9	0	6	3	0	0	0	17	76
Total Catch (Kg)							-	1093	188	79	71	34	31	26	23	511	2056
Catch Rate (Kg/Setting)							-	54.65	9.40	3.95	3.55	1.70	1.55	1.30	1.15	25.55	102.80
Percentage (%)							-	53.16	9.14	3.84	3.45	1.65	1.51	1.26	1.12	24.85	100

IOTC-2011- WPNT01-21

Table 8 Catch of MV AP (Gillnetter 28 GT) base on observer program July 2010.

No. Setting	POSITION						Piece number of net	Catch (Kg)									
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL
	°	'	"	°	'	"											
1	8	18	7	107	12	18	60	34	8	6	5	0	6	0	0	28	87
2	8	41	17	107	41	33	60	55	5	6	3	0	0	0	0	42	111
3	8	33	5	107	10	31	60	73	9	5	3	0	0	0	0	31	121
4	8	13	31	107	55	27	60	52	9	0	3	6	0	3	0	27	100
5	8	16	22	107	49	36	60	74	6	0	3	4	3	0	6	24	120
6	8	33	10	107	29	23	60	45	8	7	0	4	5	0	0	63	132
7	8	54	43	108	17	18	60	51	17	0	8	5	0	4	0	22	107
8	8	8	57	108	58	35	60	64	11	4	0	3	0	4	0	34	120
9	8	17	49	108	22	49	60	77	14	0	3	0	0	0	0	23	117
10	8	4	29	108	54	16	60	49	13	6	0	0	0	0	0	15	83
11	9	10	33	108	27	16	60	62	8	4	0	8	7	0	0	47	136
12	9	55	13	108	10	33	60	33	8	4	0	3	0	0	0	85	133
13	9	49	16	107	58	53	60	35	12	1	11	0	4	3	7	33	106
14	9	29	33	107	21	27	60	47	7	0	9	7	0	0	5	42	117
15	9	33	53	107	49	21	60	41	8	8	7	9	0	0	0	31	104
16	9	13	22	107	29	17	60	63	7	6	0	0	0	13	0	24	113
17	9	16	21	107	17	0	60	58	5	7	9	0	4	0	0	29	112
18	9	33	17	107	31	12	60	54	13	0	3	6	4	0	0	16	96
19	9	20	14	107	32	44	60	42	11	4	0	4	3	5	0	23	92
Total Catch (Kg)							-	1009	179	68	67	59	36	32	18	639	2107
Catch Rate (Kg/Setting)							-	53.11	9.42	3.58	3.53	3.11	1.89	1.68	0.95	33.63	110.89
Percentage (%)							-	47.89	8.50	3.23	3.18	2.80	1.71	1.52	0.85	30.33	100

Table 9 Catch of MV Samudera Jaya (Gillnetter 28 GT) base on observer program October 2010

No. Setting	POSITION						Piece number of net	Catch (Kg)										
	Lat (S)			Lon (E)				SKJ	YFT	BET	FRI	BLT	COM	GUT	LOT	OTHER	TOTAL	
	°	'	"	°	'	"												
1	8	24	11	107	12	33	58	41	17	5	4	3	0	0	0	26	96	
2	8	41	33	107	41	36	58	55	13	5	3	2	3	0	0	33	114	
3	8	33	13	107	10	53	58	47	21	0	3	0	0	0	0	41	112	
4	8	13	16	107	55	27	58	49	11	9	4	2	7	0	0	29	111	
5	8	16	33	107	49	21	58	52	9	0	7	0	4	0	0	25	97	
6	8	33	54	107	29	18	58	51	9	7	0	3	0	3	0	19	92	
7	8	54	8	108	17	41	58	65	12	6	0	4	0	3	0	22	112	
8	8	8	17	108	58	33	58	47	16	5	5	0	0	0	0	18	91	
9	8	17	4	108	22	13	58	61	19	8	4	0	5	0	8	24	129	
10	8	4	10	108	54	16	58	60	3	0	4	0	0	0	0	23	90	
11	8	10	55	108	27	33	58	64	0	6	7	6	0	0	0	17	100	
12	8	55	49	108	10	17	58	57	7	0	5	4	0	7	0	28	108	
13	8	49	16	107	58	19	58	59	8	5	6	4	0	2	0	35	119	
14	8	29	33	107	21	31	58	68	12	5	9	0	7	0	4	26	131	
15	8	33	53	107	49	22	58	53	6	0	5	2	0	0	0	29	95	
16	8	13	27	107	29	51	58	62	0	0	3	2	0	2	0	18	87	
Total Catch (Kg)							-	891	163	61	69	32	26	17	12	413	1684	
Catch Rate (Kg/Setting)							-	55.69	10.19	3.81	4.31	2.00	1.63	1.06	0.75	25.81	105.25	
Percentage (%)							-	52.91	9.68	3.62	4.10	1.90	1.54	1.01	0.71	24.52	100	