

**Species composition and size distribution of billfish
caught by Indonesian tuna long-line vessels operating in the Indian Ocean**

By Agustinus Anung Widodo*, Budi Nugraha**, Fayakun Satria* and Abram Barata**

ABSTRACT

Billfish is generally considered as by-product in tuna long line fleets. About 871 Indonesian tuna long line vessels are fishing in the Indian Ocean. The fishing base of those fleets located in Bungus (West Sumatera), Muara Baru (Jakarta), Palabuhanratu (West Java), Cilacap (Central Java), Muara Baru (Jakarta), and Bena (Bali). Base on the data of port sampling by enumerator and onboard observation by observer in the year of 2010 in Bena, catch composition of billfish caught by tuna long line fleets were swordfish 54.89%, blue marlin 17.76% and black marlin 12.97% respectively, followed by small amount of striped marlin, sailfish, and shortbill spearfish. The length size distribution of swordfish 68–197 cm, black marlin and blue marlin 108–206 cm, striped marlin 95 – 158 cm, sailfish 114–175 cm and shortbill spearfish 124–127cm.

Keywords: long line, Indian Ocean, species composition, size distribution, billfish

INTRODUCTION

The catch of billfish is generally considered one of the tuna long line fisheries *byproduct* and it was as secondary catch which have an economic value. In the year of 2010 about 871 Indonesian tuna long line vessels registered fishing in the Indian Ocean. The principal fishing base of those fleets located in Bungus (West Sumatera), Muara Baru (Jakarta), Palabuhanratu (West Java), Cilacap (Central Java), Muara Baru (Jakarta), and Bena (Bali). The contribution of billfishes to the Indonesian fishery is significant, the recorded catch from Indonesian vessels fished in Indian Ocean was 22,548 MT in 2008 and respectively (DGCF, 2009 and DGCF, 2010), that mainly landed in port of Bena, Cilacap, Palabuhanratu, Jakarta and Bungus.

Knowledge of Indian Ocean billfish biology and fisheries especially in Indonesia, and the status of billfish species remains unclear due to lack of data and information of the fishery. This is in line what mentioned by Cambell et al. (1998) billfish is often poorly recorded, being lumped together in to single category, misidentified or the fish is discarded. Since 2003 activity of tuna fisheries catch monitoring program was extended to cover bycatch of tuna longline based in Bena, Cilacap and Jakarta. Other tuna

catch enumerator were recorded data species, number, weight and length of bycatch especially for billfish. The program is supported (finance and technical) by ACIAR, AFFA and IOTC (through OFCF).

MATERIALS AND METHODS

The data and information presented in this report was obtained mainly from:

1. Fisheries statistic reports published by DGCF year of 2010 particularly information on annual billfish catch.
2. Port sampling and observer program activity in Bena-Bali year of 2010.

Port sampling on billfish fishery is as part of tuna landing sampling program. Samplers record every day the names of the longliners unloading catches and the processing plants through which the catches unloaded go. The data record covered species and size (length) of billfish. In the year 2010, onboard observer program activity is conducted 6 trips. The data record covered include fishing tactic, position of fishing ground, hook number, number of catch, catch species and size (length) of fish.

The data and information is compiled and then presented in the table and graphs.

RESULTS

a. Fishery

Indonesia's tuna longline fleets operating in the Indian Ocean have grown dramatically in the past 20 years. The number of long line tuna fleets registered by DGCF 871 vessels in 2010. Fishing bases spread in Bena, Cilacap, Jakarta and Bungus fishing port as well as in some smaller fishing port include Pelabuhanratu (Figure 1).

Based on Capture Fisheries Statistics of Indonesia 2009 that the trend of national production of billfish was increased year by year. Before 2008, Capture Fisheries Statistics of Indonesia records production of billfish as single category as well as it was not broken down by fishing area (Table 1). Break down by species is done since 2008 and black marlin was dominant species of billfish. On the Table 1 is also presented production of billfish caught in Indian Ocean. In this case the production of Indian Ocean was part of billfish production of all Indonesian waters. The share of billfish production of Indian Ocean was about 35% in 2008 and 56% in 2009 to the billfish production of all Indonesian waters.



Figure 1 The fishing port of tuna long line fleets operate in Indian Ocean.

Table 1 Production of billfish of Indonesia year of 2004-2009

Species	Production of all Indonesian waters (MT)						Production of Indian Ocean (MT)*)	
	2004	2005	2006	2007	2008	2009	2008	2009
Sailfish	nd	nd	nd	nd	3956	6696	583	1754
Black marlin	nd	nd	nd	nd	8118	9212	4229	7500
Blue Marlin	nd	nd	nd	nd	447	248	14	175
Striped Marlin	nd	nd	nd	nd	709	1188	60	280
Swordfish	nd	nd	nd	nd	2902	4480	824	2504
Total Billfish	6273	6774	6596	9783	16132	21824	5710	12213

*) The production of Indian Ocean was part of production of all Indonesia waters and nd = no data.

Source: DGCF (2009 and 2010).

Based on the data of Indonesian Tuna Longline Association (Indonesia: Asosiasi Tuna Longline Indonesia-ATLI) the production of billfishes landed in Port of Bena-Bali during 2005 – 2010, were likely to increase which swordfish was the common commodity up to more than 3,000 ton in 2008 followed by group of marlins and sailfish were about 1,500 ton in 2010 (Table 2).

Table 2 Billfish landed in Port of Benoa during 2005–2009

Species	Production of Billfish (MT)					
	2005	2006	2007	2008	2009	2010
Swordfish	813.6	1613.6	2315.9	3016.6	2978.3	1253.6
Marlin	513.4	613.6	752.7	1594.6	1735.8	1395.5
Sailfish	753.6	1661.9	1162.6	1162.6	1593.9	394.7

Source :ATLI (2011)

Result of observer program activity year 2005-2010 show that the total hook rate of billfish fluctuates every year. Total hook rate of billfish ranged between 0,032 and 0.123. The highest of total hook rate occurred in 2009 and detail of each species hook rate presented on Table 3.

Table 3 Hook rate of billfish base on observer program activity on long line vessels.

Year	Hook Rate (fish/100 hook)						
	SWO	BLZ	BLM	SFA	SSP	MLS	TOTAL
2005	0.019	0.001	0.006	0	0	0.007	0.032
2006	0.039	0.008	0.014	0.003	0.011	0.006	0.081
2007	0.038	0.003	0.006	0.001	0.012	0.008	0.068
2008	0.022	0.005	0.006	0.003	0.016	0.002	0.054
2009	0.074	0.008	0.024	0.013	0.002	0.003	0.123
2010	0.018	0.007	0.004	0.004	0.007	0	0.041
Total	0.209	0.032	0.059	0.023	0.049	0.026	0.399
Average	0.035	0.005	0.01	0.004	0.008	0.004	0.066

SWO = Swordfish, BLZ = Blue marlin, BLM = Black marlin, SFA = Sailfish, SSP = Shortbill Spearfish, MLS = Striped marlin

Main fishing areas in the Indian Ocean for the longline fleets operating from the 3 industrial ports extend from off the northwest coast of Sumatra, waters to the west and south of Java, and waters eastwards from Bali to south of West Timor (extending as far south as 150 S). Result of observer program activity year 2010, the fishing ground of Indonesian tuna long line is as presented on Figure 2. As being explained previous that billfish was by-product of tuna long line fishery. It means also explain that fishing ground of billfish overlaps with tuna fishing ground.

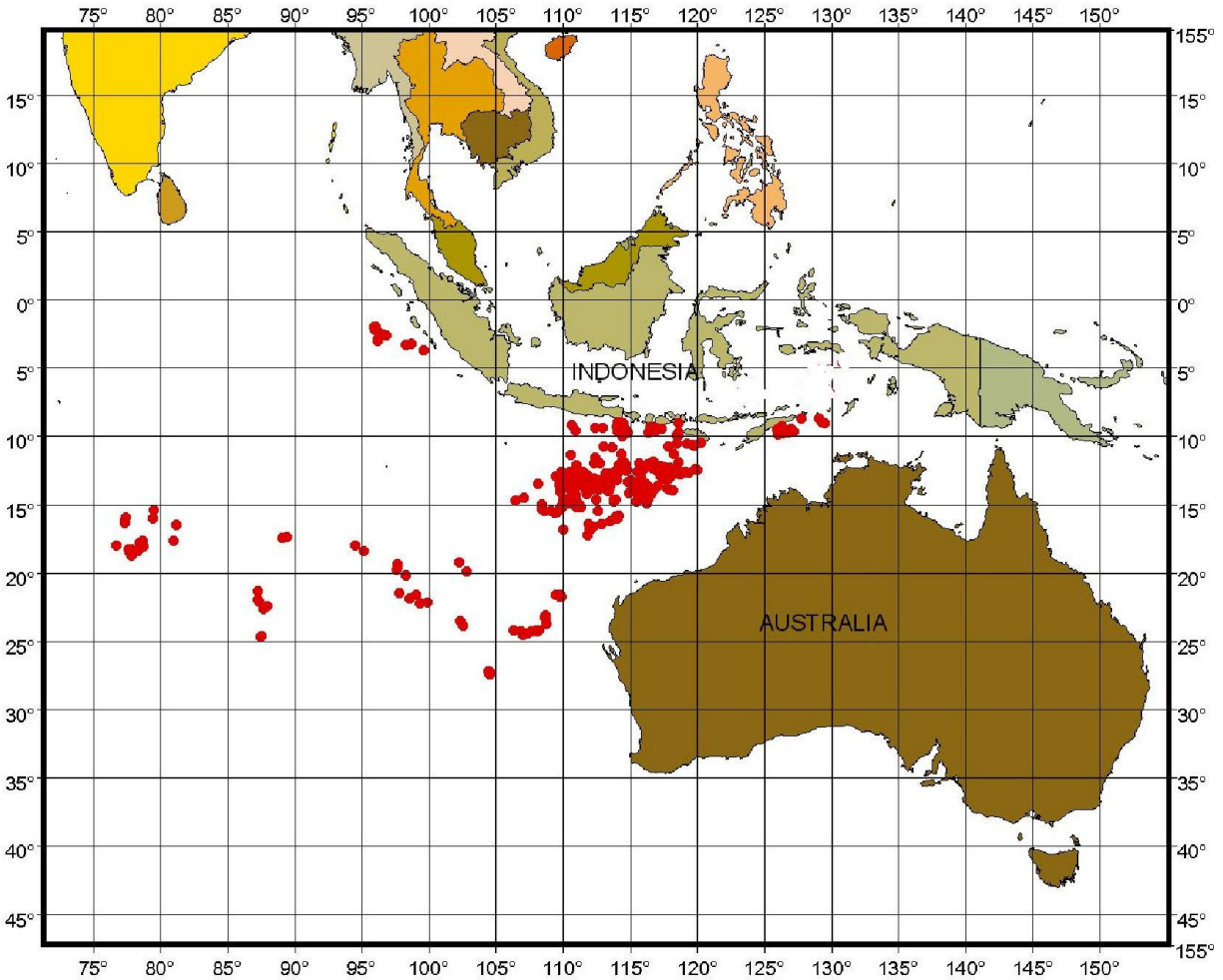
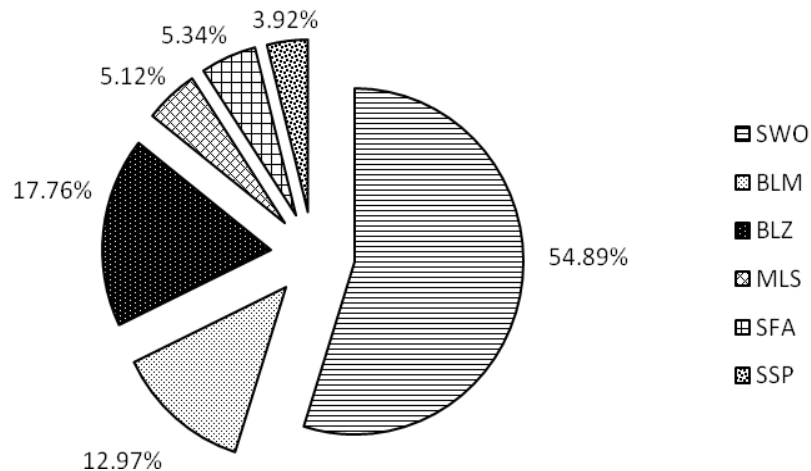


Figure 2 The fishing ground of billfish base on observer program activity year 2010.

b. Composition

Five species of billfishes have been identified from the tuna long line unloading in Benoa Fishing Port. The five of billfish species includes 3 species of marlins; black marlin (BLM) (*Makaira indica*), blue marlin (BLZ) (*Makaira mazara*), striped marlin (MLZ) (*Tetrapturus audax*), two species non-marlin species are the sailfish (*Istiophorus platypterus*) and the swordfish (*Xiphias gladius*). The average species composition of billfish caught by tuna long line based in Benoa Fishing Port during the year of 2010 through port sampling program is shown in Figure 3. Swordfish (*Xiphias gladius*) dominated the catch making about 54.89% of the total catch of billfish followed by blue marlin (*Makaira mazara*) 17.76% and black marlin (*Makaira indica*) 12.97%. The other billfish species that also caught consist of striped marlin (*Tetrapturus audax*), sailfish (*Istiophorus platypterus*) and shortbill spearfish (*Tetrapturus angustirostris*).



Note : SWO = swordfish, BLM = black marlin,

Figure 3 Total billfishes landed in Port of Benoa during February – December 2010.

Base on the data of onboard observation by observer in the year of 2010, catch composition of tuna long line fleets were dominated by albacore 29.13%, bigeye tuna 5.31%, yellowfin tuna 2.00%, billfish 1.06% and others 62.50%. The catch composition of billfish of tuna long line fleets were dominated by swordfish 55.56%, blue marlin 33.33% and black marlin 11.11%.

Size Distribution

Length frequency data sampled from Benoa fishing port year 2010 of each billfish species is presented in Figure 4. The length of billfishes range 68–206 cm, swordfish 67–197 cm, black marlin and blue marlin 108–206 cm, striped marlin 95 – 158 cm, sailfish 114–175 cm and shortbill spearfish 124–127cm. Compared to the result of port sampling activity Benoa Fishing Port year of 2007 (Mahiswara et al., 2009) show that the minimum and maximum length of billfish year of 2010 generally was decreased. Length data sampled of each species of billfish from Benoa fishing port year of 2007 as follow minimum length of black marlin, blue marlin and swordfish sampled in Benoa are 111 cm, 96 cm and 70 cm and maximum length are 235 cm, 230 cm and 245 cm respectively.

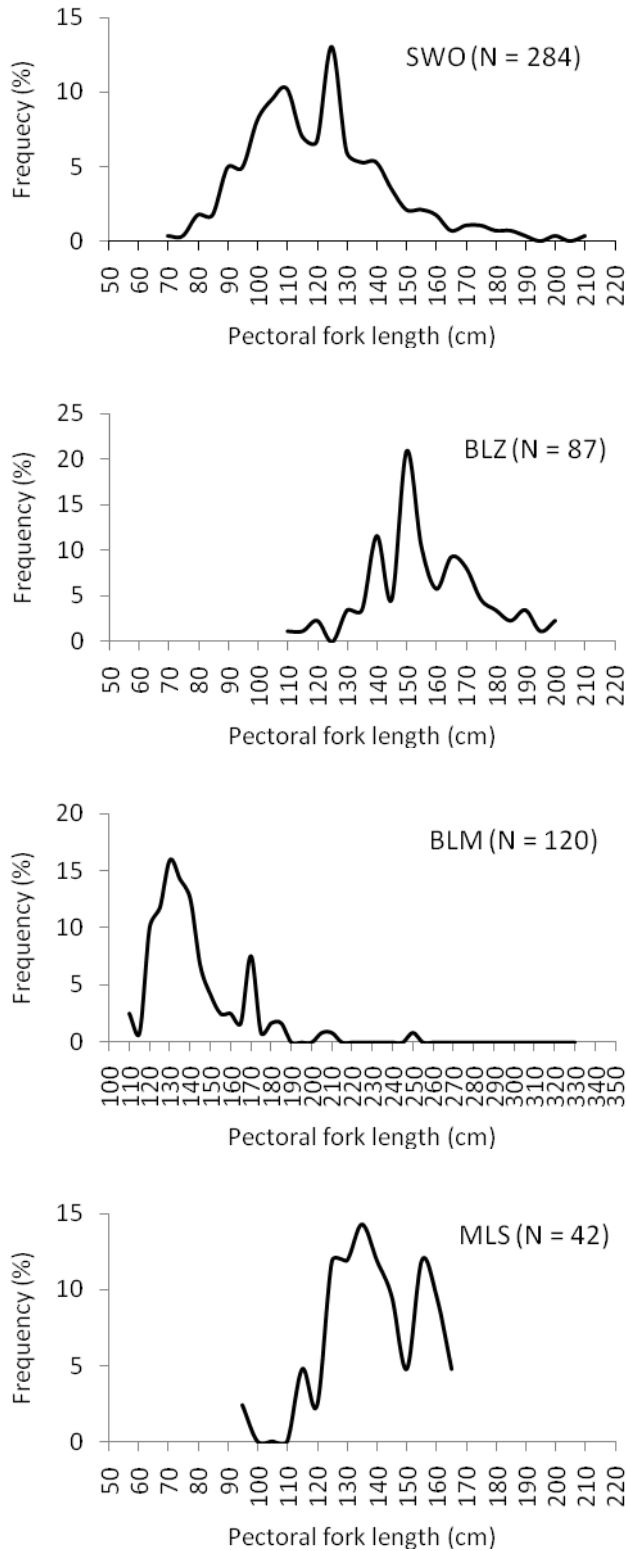


Figure 4 Size distribution of billfishes landed in Port of Benoa year 2010.

CONCLUSION

Catch composition of billfish caught by tuna long line fleets were swordfish 54.89%, blue marlin 17.76% and black marlin 12.97% respectively, followed by small amount of striped marlin, sailfish, and shortbill spearfish. The length size distribution of swordfish 68–197 cm, black marlin and blue marlin 108–206 cm, striped marlin 95 – 158 cm, sailfish 114–175 cm and shortbill spearfish 124–127cm.

References

- Campbell, R. A., G. N. Tuck, J. G. Pepperell and J.W.P. Larcombe. 1998. Synopsis on the billfish stocks and fisheries within the western AFZ and the Indian Ocean. Report to Western Tuna MAC, AFMA, Canberra. 123 pp.
- DGCF, 2010. Capture Fisheries Statistics of Indonesia 2009. Directorate General of Capture Fisheries- Ministry of Marine Affairs and Fisheries. Jakarta.
- Mahiswara & B. I. Prisantoso. 2009. Billfish fisheries in Indonesia. IOTC-2009-WPB-14. 10 pp.