Update on SBT monitoring program in Benoa port, Bali, Indonesia 2018

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Summary

This paper will provide update information about the SBT monitoring program in Benoa port, Bali Indonesia 2018 presented in the CCSBT-ESC 2018 (CCSBT-ESC/1708/Info 03). The sampling coverage was decreasing from 75.05% in 2017 to 53.69% in 2018. The SBT number observed were also falling in 2018 with only 1,733 individuals compare to 2017 (2,444 individuals). Conversely, the SBT size increased from 111-210 to 121-210 cmFL.

Indonesian tuna monitoring program

SBT monitoring program commenced since 1993 through the series collaboration between Indonesia's marine fisheries research institutes[2] within the Ministry of Marine Affairs and Fisheries (MMAF) and Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Farley et al. 2017). The development of this program occurred in mid-2002, a monitoring program in three major Ports of Indonesia Benoa (Bali), Muara Baru (Jakarta), and Cilacap (south cost Central Java) was established (Farley *et al.* 2014). The monitoring program aims to monitor the catch of all landing species and record the number of tuna longline vessel landings. Since 2011, the monitoring activities have been submitted to the Research Institute for Tuna Fisheries (RITF) as an institution that specializes in research on tuna resources in the Indian Ocean.

Sampling methods

Sampling

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[2] Indonesian collaborating institutions, in chronological order: Central Research Institute for Fisheries Indonesia (CRIFI), Research Institute for Marine Fisheries (RIMF), Research Centre for Capture Fisheries (RCCF), Research Centre for Fisheries Management and Conservation (RCFMC), and currently Centre for Fisheries Research (CFR) in Jakarta, and Research Institute for Tuna Fisheries (RITF) in Bali.

The SBT data collection conducted in 2018 (January-December) by enumerators from RITF at tuna fish processing company in Benoa port. In this period, there are nine companies that routinely organize tuna fish processing. The enumeration unit applied is the number of tuna longline vessels that perform SBT catch landings in Benoa port. The data collected, including the number of catch, fish weight, fish length, fish destination (export/reject/ bycatch), vessel name and company name.

The most important thing to verify is that every individual fish that represents all the fish caught from the tuna longline vessels must be recorded. If the weight per individual of tuna cannot be recorded, it is not allowed to make an estimate of the data itself. Registration of individual weights for all tuna longline vessel catches, will ensure that there is no bias in terms of sorting data by weight or by species (Jatmiko *et al.* 2017). Length measurements are conducted using callipers that have a precision of up to 0.5 cm. Length sizes are shown in order of priority according to international measurement standards. If not possible to measure the length of all fish catches, then measuring the length of the rejected fish can already be recorded as a random sampled (Jatmiko *et al.* 2017).

Statistical analysis

Estimation of total production can be calculated using formula modification from IOTC (2012):

$$CM = LM * AVM$$

Where:

CM : Estimation of total production per month (ton)

LM : Number of landed vessels per month which landed SBT (unit)

AVM : Production from sampled vessels per month which landed SBT (ton)/number of total vessels per month per processing plant which landed SBT (unit)

The relationship between fish length and weight was obtained using a multiplicative regression model ($y = ax^b$) (King 2013).

Registered vessels

The total number of longline vessels landed in Benoa port, sampled by RITF enumerator were 233 units in 2018. These vessels landed in 9 processing plants in Benoa port. In average, the number of longline vessels landed were about 36 ships per month with the total sampling

coverage in 2018 is 53.69% (Appendix 1). This percentage resulted from the calculation on how many total vessels landed either one or more divide by the number of vessels that sampled.

SBT catch categories

The SBT catch of tuna longline vessels landed at Benoa port is divided into 2 categories of quality i.e. export and non-export. The enumeration program in 2018 reported that the SBT classified into the non-export category accounted for 99%, while the export SBT is 1% (Appendix 2).

Bycatch composition

A total 22 species of bycatch recorded in the longline vessels monitoring program at Benoa port in 2018. The catch composition is dominated by *Prionace glauca* with 42.56%, followed by *Lampris guttatus* 28.05%. Whereas, the bycatch composition which was less than 0.1% consist of 4 species, including *Taractichthys steindachneri*, *Katsuwonus pelamis*, *Taractes rubescens* and *Lophotus capellei* (Appendix 3). The bycatch composition of tuna longline vessels based on fish number sampled provided in Appendix 4.

SBT length frequency and length-weight relationship

The length frequency of southern blue fin tuna (SBT) landed in Benoa port, Bali in 2018 is presented in Appendix 5. A total 1,773 SBT were measured in fork length (FL), ranged from 121 - 210 cm with the domination length is between 156 and 160 cm. While the relationship between SBT length and weight, showed the strong correlation, with the high R value, 0.8489 (Appendix 6).

References

Farley, J., Nugraha, B., Proctor, C., and Preece, A. (2014) Update on the length and age distribution of SBT in the Indonesian longline catch. *CCSBT-ESC/1509/14*.

Farley, J., Sulistyaningsih, R.K., Proctor, C., Grewe, P., and Davies, C.R. (2017) Update on the length and age distribution of SBT in the Indonesian longline catch and close-kin tissue sampling and processing. *CCSBT-ESC/1708/09*.

Jatmiko, I., Zulkarnaen, F., Setyadji, B., and Rochman, F. (2017) Indonesian tuna protocol sampling, case study on catch monitoring in Benoa port, Bali, Indonesia. *CCSBT-ESC/1708/Info 03* **ESC Agenda item 4.1**.

King, M. (2013) 'Fisheries biology, assessment and management.' (John Wiley & Sons)

Appendices

Appendix 1. Number of sampled and landed vessels and its proportion at Benoa Port in 2018

Month	Landed	Sampled	%
January	35	24	68.57%
February	33	20	60.61%
March	35	22	62.86%
April	43	24	55.81%
May	34	14	41.18%
June	35	10	28.57%
July	26	17	65.38%
August	27	17	62.96%
September	39	18	46.15%
October	44	22	50.00%
November	40	22	55.00%
December	43	23	53.49%

Appendix 2. Catch condition of SBT production landed in Benoa port, Bali in 2018

1%

99%

- Export
- Non export
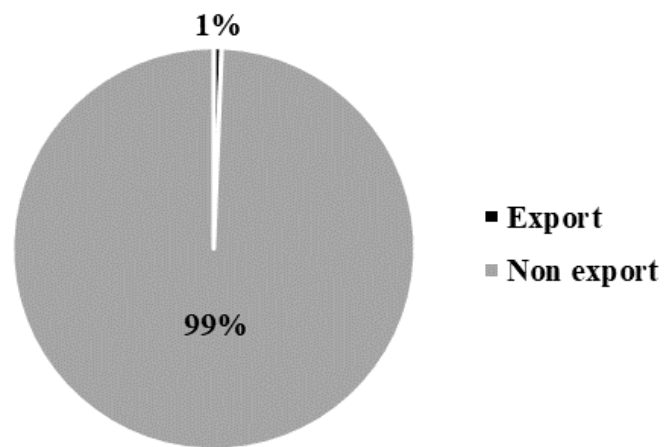
Appendix 3. Bycatch composition (%) based on fish weight percentage landed in Benoa port, Bali in 2018
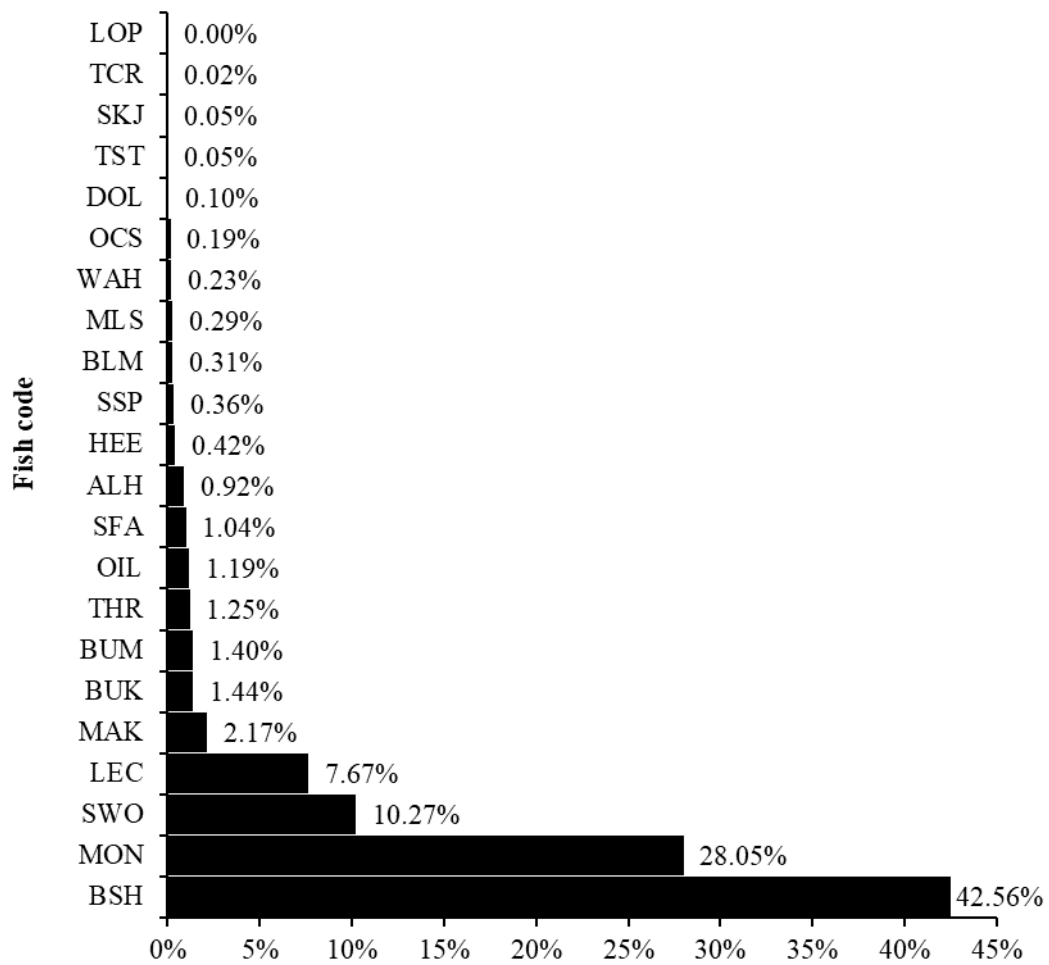
Appendix 4. Bycatch composition of tuna longline vessels based on fish number sampled at Benoa port, Bali in 2018

Code	Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Des	Total
ALH	Slickheads nei	*Alepocephalus spp*	6		10	4	118		200	64	122		48	4	576
BLM	Black Marlin	*Makaira indica*	1	1	2	7	4	5							20
BSH	Blue shark	*Prionace glauca*	2,415	329	3,106	213	1,010		812	699	752	1,028	272	808	11,444
BUK	Butterfly king fish	*Gasterochisma melampus*	2			20	71		116	9	10		1		229
BUM	Blue marlin	*Makaira mazara*	2		5	35	4	2	1	1	1	3	5	23	82
DOL	Common dolphinfish	*Coryphaena hippurus*			25	18	17			28					88
HEE	Long nose chimaeras	*Harriotta spp*	27	4	8				6	7	25	6	5	3	91
LEC	Escolar	*Lepidocybium flavobrunneum*	351	95	506	657	772		931	525	398	6	191	36	4,468
LOP	Crestfish	*Lophotus capellei*							2						2
MAK	Mako sharks	*Isurus* spp.	13	2	30	12	8		13	44	55	40	6	4	227
MLS	Striped Marlin	*Tetrapturus audax*				13	11		4		1			7	36
MON	Moon fish	*Lampris guttatus*	189	16	173	30	1,241		1,603	740	568	463	175	53	5,251
OCS	Oceanic whitetip shark	*Carcharhinus longimanus*	2	1	5	4			1			1			14
OIL	Oilfish	*Ruvettus pretiosus*	102	18	58	11	52		102	50	64		48	7	512
SFA	Sailfish	*Istiophorus platypterus*	21	23	103	142	11		15	3	3		5		326
SKJ	Skipjack tuna	*Katsuwonus pelamis*				1	22								23
SSP	Shortbill Spearfish	*Tetrapturus angustirostris*		7	16	40	36			13	9	1		3	125
SWO	Swordfish	*Xiphias gladius*	81	29	141	286	126	1	144	100	83	110	81	39	1,221
TCR	Pomfret	*Taractes rubescens*	7						1						8
THR	Thresher Shark	*Alopias* spp.	7	2	7	14				4	6	7	9	7	63
TST	Sickle pomfret	*Taractichthys steindachneri*	14		2		3			18				2	39
WAH	Wahoo	*Acanthocybium solandri*		2	2	32	8		23	6	1				74

Appendix 5. Length frequency of southern blue fin tuna (SBT) landed in Benoa port, Bali in 2018
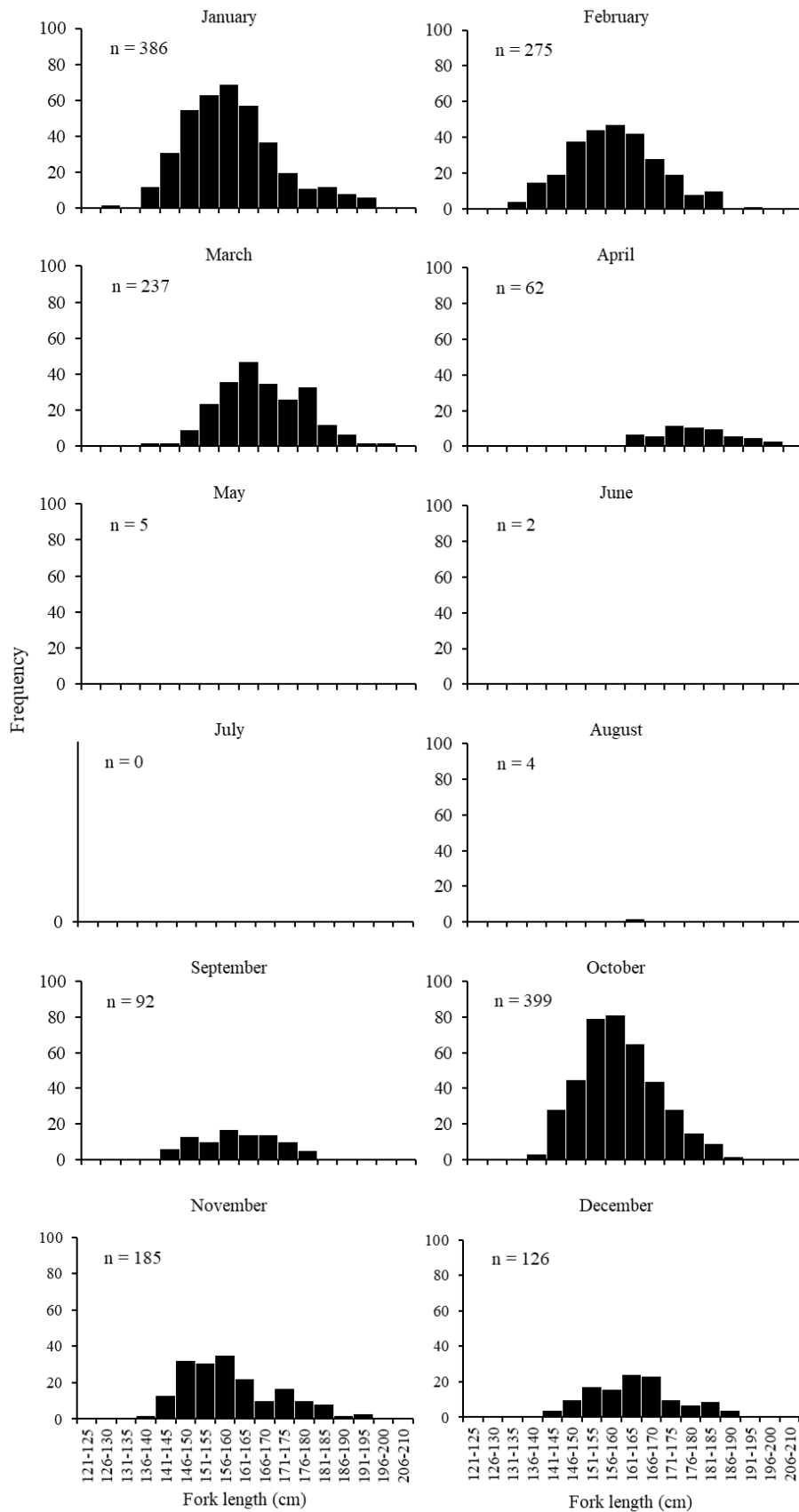
Appendix 6. Length-weight relationship of southern blue fin tuna (SBT) landed in Benoa port, Bali in 2018

$$W = 1E\text{-}05L^{3.0857}$$
$$R^2 = 0.8489$$
$$n = 1,773$$