Indonesian Tuna Protocol Sampling

Case Study on Catch Monitoring in Benoa Port, Bali, Indonesia

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Introduction

Indonesia plays an important role in the world's tuna fisheries. In 2011, the world's tuna production amounted to 6.8 million tons and in 2012 it increased to more than 7 million tons (ISSF, 2015). The average production of tuna, skipjack and neritic tuna in Indonesia from 2005-2012 amounted to 1,033,211 tons. Thus, Indonesia supplies more than 16% of the world's tuna production. Furthermore, in 2013, the export volume of tuna, skipjack and neritic tuna reached about 209,410 tons with a value of USD $ 764.8 million (P2HP, 2014). In addition, Indonesia is also the largest contributor of production among 32 member countries of the Indian Ocean Tuna Commission (IOTC) with an average production from 2009-2012 at 356,862 tons/year (25.22%) (IOTC, 2015).

Moreover, the production of tuna has contributed significantly to Indonesian capture fishery production. With total tuna, skipjack and neritic tuna species production from 2005-2012 with average of 1,033,211 tons/year tuna fishery contribute about 20% of total national fishery production (DGCF, 2015).

Fishery data is an important aspect for understanding basic biology, species distribution and fish stock population dynamics. According to the source, data can be divided into two types, dependent data and independent data. Dependent data can be collected from ship logbooks, interviews, company records processing, port inspections, etc. While independent data is collected from systematic scientific samples such as: scientific monitoring program, underwater visual census, acoustic method etc. The advantages of each data may differ in terms of quality, quantity and cost. The key benefit of fisheries data is to provide information for decision makers to manage sustainable fisheries management strategies (King, 2010).

As a member of the world food organization Food and Agricultural Organization (FAO), Indonesia adopted the Code of Conduct for Responsible Fisheries (CCRF). One of the purposes of this code of conduct is to implement national policies in the context of responsible fisheries resources management and conservation (FAO, 1995). This goal is implemented by the Indonesian government into the national fisheries law No. 45/2009 which states that the utilization of fisheries is based on the principles of benefit, justice, partnership, equity, integration, openness, efficiency and sustainable conservation (Fisheries Act, 2009). Therefore, it is essential to provide tuna fishery protocol sampling to collect information and monitoring to support proper management strategy for tuna fisheries.

Protocol Sampling

The enumerator (data collector) shall be obliged to monitor and record in detail coverage all the basic information of each landing vessel. All tuna landing from catcher or a collecting vessels were observed in the following way:

1. Enumerator cooperates with the local Marine and Fisheries Resources Control Officer (PSDKP) to obtain data on the vessels name and its catch;

2. Enumerator cooperate with fishing company (processing plant);

3. Enumerator directly monitors and records the vessels name, the total number of landed vessels and total catch per vessel per day.

During measurement, enumerator should record the total catch data of each species (the number and weight of all species including non-tuna species) and information on the fishing effort of all landed tuna longline. Data on catches and fishing efforts can be obtained from Marine and Fishery Resources Control Officers (PSDKP) or from interview with captains or fishermen of fishing companies. Such information should be recorded on the Vessel Landing Form.

Data on the total number of catches of each tuna must be obtained regardless of whether the vessel is sampled or not. This data is required to provide important and accurate information on the total volume of catches of tuna longline vessels and will be used to obtain accurate estimates of catch per species when combined with sampled data.

The following instructions are used to enumerate tuna longline fishing vessels and collecting vessels that landed their catch at the fishing port:

1. Record the number of all vessels and the vessels name which landed their daily catches into the Vessels Landing Form;

2. In the planning to sampled catch of tuna longline, the target coverage is at least 30% of the number of landed longline tuna in each fishing company. The unit of recording of catches of tuna longline vessel is one ship unit. For example, if within one month there are 12 vessels landed their catch, then 3 vessels should be sampled their catches of the fishing company;

3. Determined a longline tuna longline vessel to be sampled. The sampling priority is the lowest percentage of the number of landed vessels divided by the number of sampled vessels in each fishing company;

4. The most important thing to verify is that every individual fish that represents all the fish caught from the tuna longline 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 catches, will ensure that there is no bias in terms of sorting data by weight or by species;

5. Length measurements are conducted using calipers 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 (IOTC, 2002).

Several data collected are important to monitor and support management strategies, i.e.:

1. Number of landed and sampled vessels (Appendix 1). This information can be used to estimate the total production.
2. Information about catch condition (Appendix 2).
3. Catch composition per species (number) (Appendix 3).
4. Length and weight information that used to determine percentage of length distribution (Appendix 4), length distribution (Appendix 5) and length-weight relationships (Appendix 6).
5. Length information can also be used to determine some population parameters such as length infinity, growth coefficient and natural mortality etc. using data-limited tools approach.

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)

References

Directorate General Capture Fisheries (DGCF). 2015. *Fisheries Management Plan: Tuna, Skipjack, Neritic tuna*. Directorate General Capture Fisheries, Ministry of Marine and Fisheries Affairs. Jakarta, Indonesia.

Food and Agricultural Organization (FAO). 1995. *Code of conduct for responsible fisheries*. Rome, Italy. 41 pp.

Indian Ocean Tuna Commission (IOTC). 2002. *Field manual for data collection on tuna landings from longliners*. Secretariat of IOTC. Seychelles. 21pp.

Indian Ocean Tuna Commission (IOTC). 2015. Report of the 18th Session of the IOTC Scientific Committee. Bali, Indonesia, 23-27 November 2015. *IOTC-2015-SC18-R[E]*.

International Seafood Sustainability Foundation (ISSF). 2015. ISSF Tuna Stock Status Update, 2015: Status of the world fisheries for tuna. ISSF Technical Report 2015-03A. International Seafood Sustainability Foundation, Washington, D.C. USA.

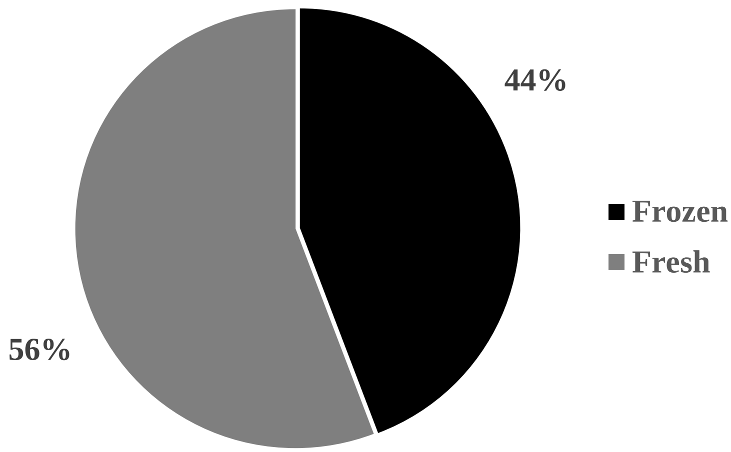
King, M. (2010). *Fisheries Biology, Assessment and Management, Second Edition* (p. 381). Oxford, England: Blackwell Publising Ltd.

Undang-Undang Republik Indonesia. 2009. *Undang-Undang Republik Indonesia Nomor 45 Tahun 2009 tentang Perubahan Atas Undang-Undang Nomor 31 Tahun 2004 tentang Perikanan.*

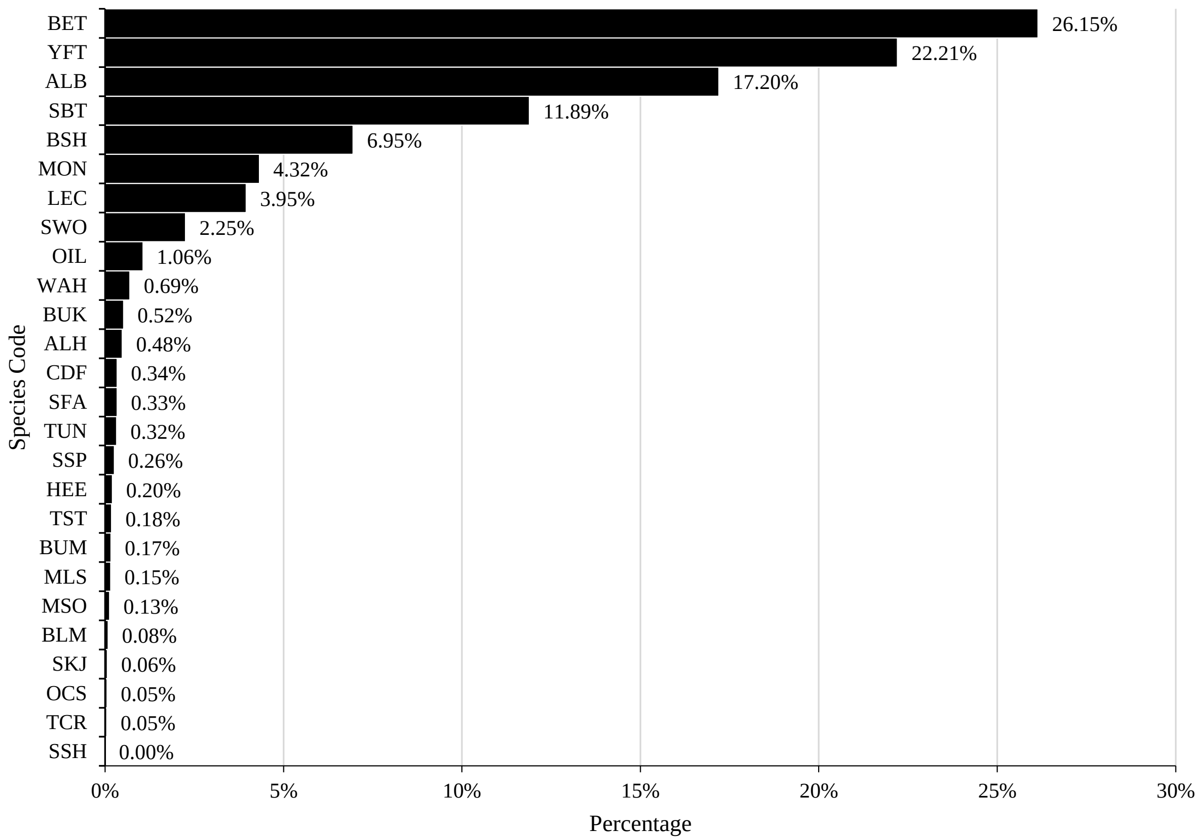
Appendix 1. Number of sampled and landed vessels and its proportion at Benoa Port in 2016.

Month	Landed vessels	Sampled vessels	Percentage (%)
January	50	34	68.00
February	46	26	56.52
March	72	37	51.39
April	66	37	56.06
May	54	36	66.67
June	98	47	47.96
July	47	29	61.70
August	63	38	60.32
September	64	35	54.69
October	87	59	67.82
November	42	33	78.57
December	31	23	74.19

Appendix 2. Catch condition of SBT production at Benoa Port in 2016.



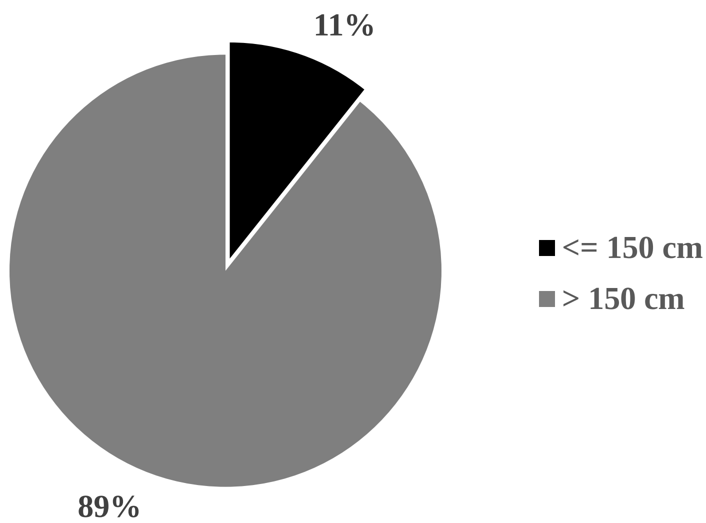
Appendix 3. Catch composition at Benoa Port in 2016.



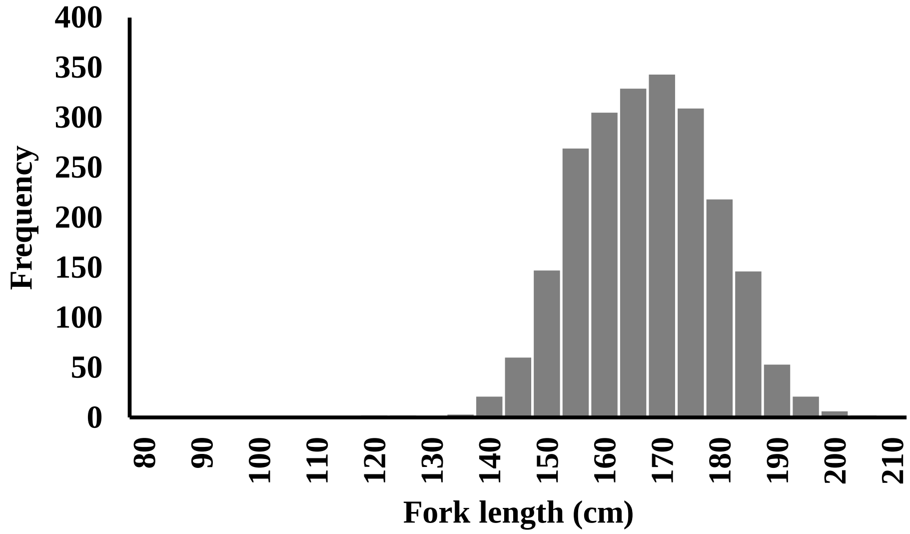
Number of fish

														Unit: Number of fish	
Code	**Common name**	**Scientific name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
BET	Bigeye	*Thunus obessus*	2,524	2,440	2,423	2,918	2,621	2,711	2,057	4,237	3,675	4275	2466	2068	34,415
YFT	Yellowfin	*Thunnus albacares*	1,337	670	2,029	4,150	4,804	4,368	3,864	2,563	1,036	2384	1156	868	29,229
ALB	Albacore	*Thunnus allalunga*	81	240	1,375	3,206	2,924	2,596	935	628	4,583	4834	863	378	22,643
SBT	Southern bluefin tuna	*Thunnus maccoyii*	1,146	1,276	1,956	1,181	194	42	125	71	1,750	3723	1416	2773	15,653
BSH	Blue shark	*Prionace glauca*	273	2	254	1,044	672	150	311	9	2,171	2356	630	1276	9,148
MON	Moon fish	*Lampris guttatus*	380	10	33	168	391	392	564		2,090	1401	86	175	5,690
LEC	Escolar	*Lepidocybium flavobrunneum*	277	61	302	503	221	86	415	361	1,212	1435	136	192	5,201
SWO	Swordfish	*Xiphias gladius*	124	72	276	270	179	87	172	306	581	564	126	209	2,966
OIL	Oilfish	*Ruvettus pretiosus*	46	93	57	76	34	25	64	31	370	384	132	82	1,394
WAH	Wahoo	*Acanthocybium solandri*	39	25	99	100	65	46	99	119	98	183	3	37	913
BUK	Butterfly king fish	*Gasterochisma melampus*				49	278	32	40	9	117	118	38	2	683
ALH	Slickheads nei	*Alepocephalus spp*			2	57	53	43	127		204	99	45	6	636
CDF	Common dolphinfish	*Coryphaena hippurus*		8	31	26	13	9	47	70	120	107	6	8	445
SFA	Sailfish	*Istiophorus platypterus*	10	1	64	44	44	4	56	37	77	50	14	39	440
TUN	Juvenile tuna	*Thunnus sp.*	38		21	11	295	1			5	21	28	2	422
SSP	Shortbill Spearfish	*Tetrapturus angustirostris*	3	22	4	4			13	37	48	202		4	337
HEE	Long nose chimaeras	*Harriotta spp*	4		5	8	39		3		70	106	12	18	265
TST	Sickle pomfret	*Taractichthys steindachneri*	2		2	9	5	10	35	12	39	107	7	10	238
BUM	Blue marlin	*Makaira mazara*	9	15	58	36	17	4	14	18	19	16	1	12	219
MLS	Stripped Marlin	*Tetrapturus audax*	35		23	15	2	3	4	31	21	34	2	31	201
MSO	Mako sharks	*Isurus oxyrhynchus Is*			4	11	23	2	4		26	61	8	27	166
BLM	Black Marlin	*Makaira indica*	15	14	10	24	8	1	5	10	15	7		2	111
SKJ	Skipjack tuna	*Katsuwonus pelamis*		3	3	1			53	11	2	6			79
OCS	Oceanic whitetip shark	*Carcharhinus longimanus*	13		13	11	2	3	9	1	1	4	8	1	66
TCR	Pomfret	*Taractes rubescens*				5	1	5	26		2	16	4	3	62
SSH	Silky Shark	*Carcharinus falciformis*		2								0			2

Appendix 4. Percentage of length distribution of southern bluefin tuna (*T. maccoyii*) landed at Benoa Port in 2016.



Appendix 5. Length frequency of southern bluefin tuna (*T. maccoyii*) landed at Benoa Port in 2016.



Appendix 6. Length-weight relationship of southern bluefin tuna (*T. maccoyii*) landed at Benoa Port in 2016.