PORT-BASED MONITORING REPORT OF ALBACORE (*Thunnus alalunga*) BENOA PORT, BALI-INDONESIA 2013

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INTRODUCTION

The objectives of this program is collection, presentation, and statistic information of tuna fisheries. This statistical improvement is to fulfill its obligation as a member of RFMO (Regional Fisheries Management Organization) to report the tuna production to the organization. One of the organization is IOTC (*Indian Ocean Tuna Commission*).

An integrated Port-based Cacth Monitoring Program at three major Indonesian port, where tuna and billfish caught by Indonesian tuna longline fleets operating in Indian Ocean are landed and processed, was establish in mid 2002 (Prisantoso *et al*., 2009). This was a collaborative research program between Indonesia's Research Centre for Capture Fisheries/Research Institute for Marine Fisheries (RCCF/RIMF) and Directorate General for Capture Fisheries (DGCF), CSIRO Marine and Atmospheric Research, Australia's Department of Agriculture of Fisheries and Forestry (DAFF), Australian Centre for Internasional Agricultural Research (ACIAR), Indian Ocean Tuna Commission (IOTC) and Overseas Fisheries Cooperation Foundation of Japan (OFCF) (Prisantoso *et al*., 2009). The aim of the monitoring program was to monitor the cacthes of all tuna species landed, and also to record the number of landings by Benoa-based longline vessel (Davis *et al*., 2003, Proctor *et al*., 2006)

METHODS

Cacth Estimation by enumerating

The data analyzed were part of the result of daily observation at processing plant in Port of Benoa, Bali in 2013. The data taken cover Fork Length (cm FL) and Fork Length Tape (cm FLT), weight, name and number of vessel. The estimation of the total cacth based on following formula (IOTC, 2002).

CM=LM*AVM

Where:

CM   =Total cacth per Month (Ton)

LM   =Total Landing Per Month (Ton)

AVM   =Average cacthes per month (Cacth sample/Landing Sample)

Growth Parameter

The estimation of growth parameter was using Von Bertalanffy method ie Asymptote total length (L_∞), growth coefficient (K), length at the first capture (L_{50}), total mortality (Z), natural mortality (M), exploitation rate (E), optimum exploitation (E_{50}) and maximum exploitation (E_{max}) were calculated using *Elefan 1* in FISAT II computer program package (Gayanillo *et al*., 1995). The estimation of t_0 (age at length of 0 cm) calculated using Pauly (1983) ie :

Log (-t0)=-0.3922-0.2752Log L_∞-1.0380

Where :
L_∞=Asymptote total length
K=growth coefficient
t0=fish age at length of 0 cm

RESULT

Enumeration on Tuna Longline Fleets

The number of tuna longline vessels which were landed in 2013 as many as 753 units, while a total of 431 units (57.24%) were successfully enumerated by enumerator. Most of the vessels that landed are carrier vessels where that vessels landed frozen and fresh fish (both the local and exsport). Carrier vessel was used to reduce the operational cost which was transfered the fish in the sea.

Generally, the activity of enumerators in data collection has been met with the IOTC criteria, ie minimum sampling coverage 30%.

Table1. Monthly landing vessels and sampling activities (enumeration) in 2013

Month	Landing Vessel (Units)	Enumerated Vessel (Units)	Percentage (%)
January	55	35	63.64
February	71	46	64.79
March	53	30	56.60
April	42	30	71.43
May	59	34	57.63
June	62	32	51.61
July	86	50	58.14
August	58	34	58.62
September	51	35	68.63
October	67	35	52.24
November	74	34	45.95
December	75	36	48.00
Total	753	431	57.24

Cacth Composition

The cacth composition of tuna longline vessel which was landed in Benoa Port devided into 3 category ie export, local (*reject*), and frozen (*by cacth*). Export category consist of bigeye (*Thunnusobesus*), yellowfin tuna (*Thunnusalbacares*), southern Bluefin tuna (*Thunnusmaccoyii*),

swordfish (*Xipias gladius*) and marlin (*Makaira spp*) with a good quality. Local category is as the same as export but in poor quality. By cacth category is all kind of fish which was landed in frozen form. According to the enumeration, the total export in 2013 amounted 35.832 fish (1.646.384 kg), local (*reject*) 29.439 fish (1.401.618 kg) and frozen (*by cacth*)   17.116 fish (814.619 kg).

Cacth composition of tuna longline effort which was landed in Benoa port consist of bigeye (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), southern Bluefin tuna (*Thunnus maccoyii*), albacore (*Thunnus alalunga*), swordfish (*Xipias gladius*), black marlin (*Makairaindica*), blue marlin (*Makairamazara*), striped marlin (*Tetrapturusaudax*), sailfish (*Istiophorus platypterus*), shortbill spearfish (*Tetrapturus anguistirostris*), barracuda (*Sphyraena sp*.), blue shark (*Prionace glauca*), common dolphinfish (*Corypaema hippurus*), escolar (*Lepidocybium flavobrunneum*), oilfish (*Ruvettus pretiosus*), moonfish (*Lampris guttatus*), mako shark ((*Isurus oxyrinchus*), oceanic whitetip shark (*Carcharhinus longimanus*), thresher shark (*Alopias superciliosus*), skipjack (*Katsuwonus pelamis*), pomfret(*Taractesru bescen*), black pomfret (*Taractich steindachneri*) and wahoo (*Acanthocybium solandri*).

The cacth composition dominated by yellowfin tuna 38.01% (3.122.629kg) followed by bigeye tuna 32.66% (2.683.529 kg), albacore 10.35% (850.655 kg) and southern bluefin tuna 9.71% (798.179 kg). Swordfish was dominated for billfish with 3.50% (287.753 kg) followed by blue marlin 1.23% (100.778 kg), black marlin 0.40% (32.758 kg), stripped marlin 0.16% (12.749 kg), sailfish 0.13% (10.978 kg) and shortbill spearfish 0.03% (2.174 kg). The others species which were landed in Benoa port consisted of 16 species with the total production reach 312.248 kg. Escolar was dominated with production of 1.79% (147.177 kg) and followed by the others species Figure 1.
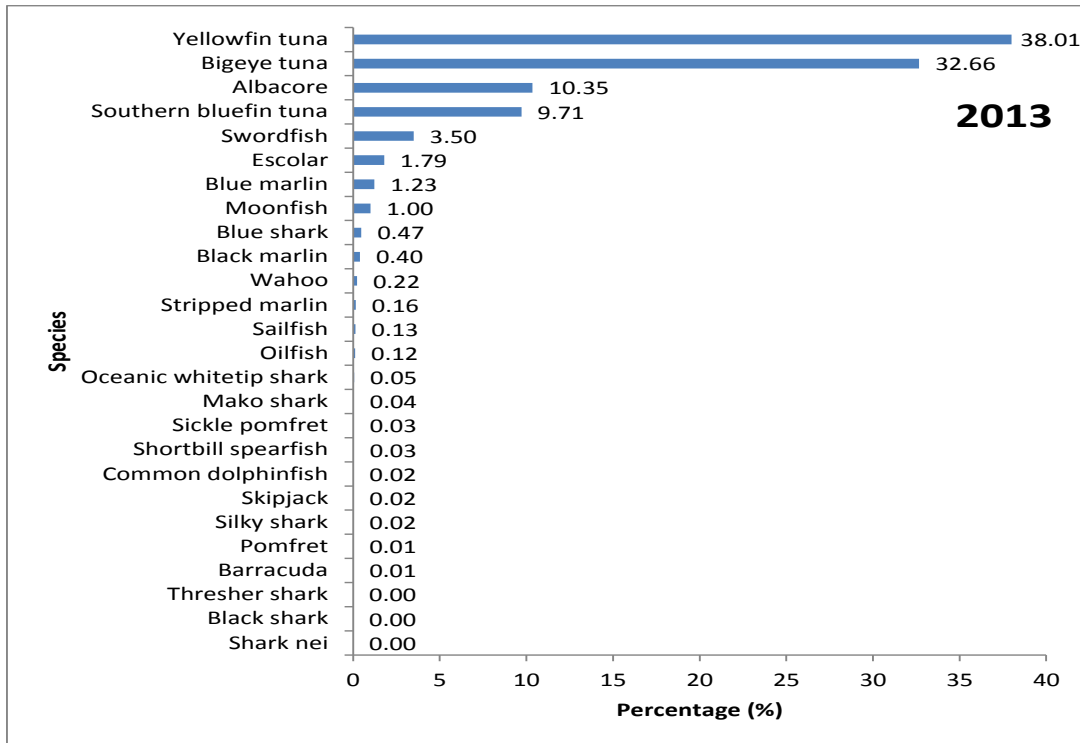
Figure 1.Cacth composition of tuna longlineeffort landed at Benoa port in 2013

Albacore size distribution

Total ALB samples that could be analyzed were 1828 which were taken from enumerator in 2013. ALB length (cm FL) distributed from 62-122 cm FL (median=93 cm FL, mode=86 cm FL, mean=90.81 cm FL) and dominated at size 86 cm FL (Fig 2).
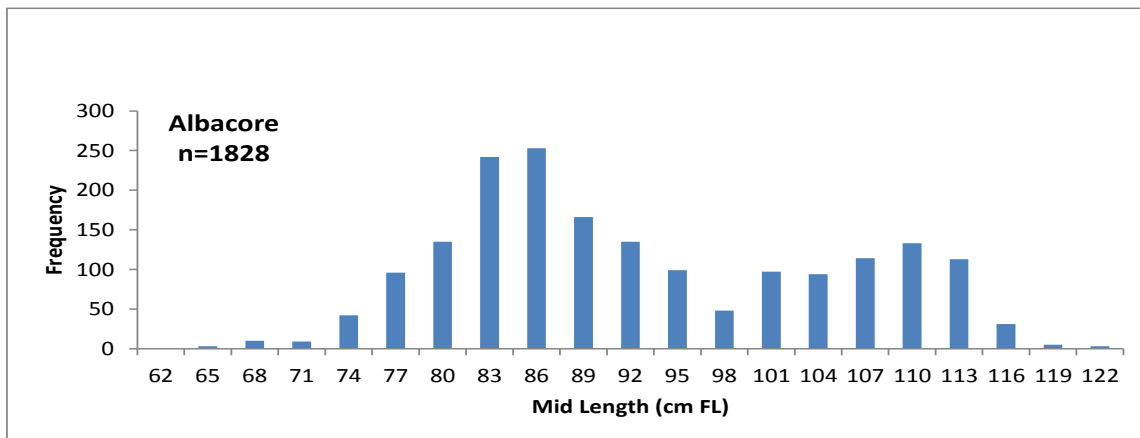

Figure 2. Length frequency of ALB landed at Benoa port in 2013

Length at the first capture (L$_{50}$)

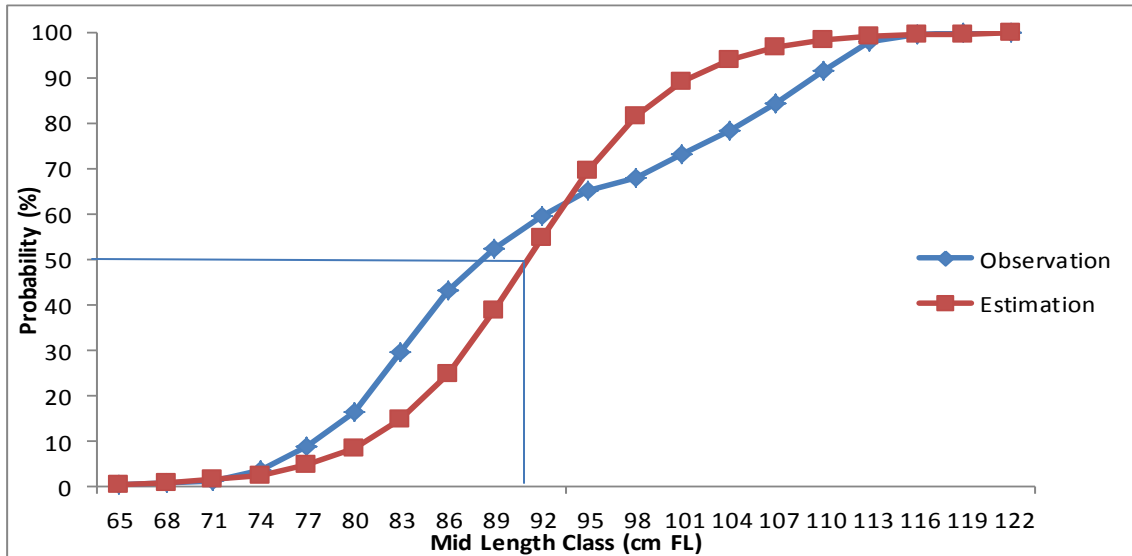The calculation result of length at the first capture (L$_{50}$) of ALB was 91.15 cm FL Figure 3.

Figure 3.Length at the first capture of ALB landed in Benoa port in 2013

Estimation of population parameter

Growth Prameter

The analysis using FISAT II for ALB, we obtained that length infinitive L$_\infty$=128.50 cm FL, growth coefficient (K)=1.50 (year^{-1}) and theoretical age (t$_0$)=-0.10652 (Figure 4).
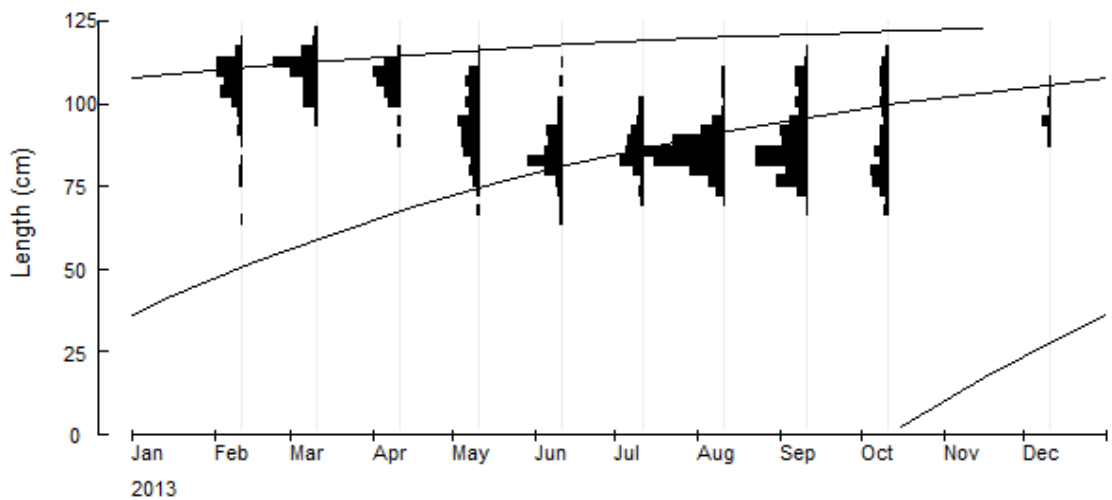

Figure 4. Growth estimation of ALB landed in Benoa Port in 2013

According to the growth estimation above, we arranged the relationship between length (cmFL) and age (years) Figure 5.
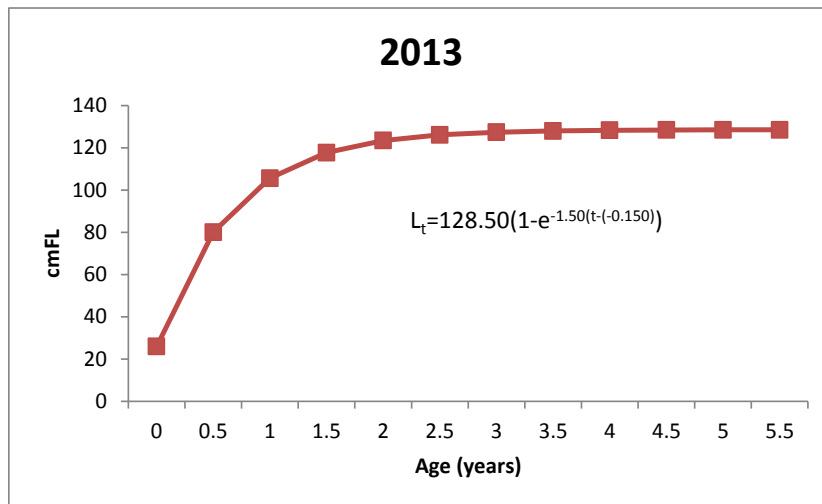
2013

$$L_t=128.50(1-e^{-1.50(t-(-0.150))})$$

Figure 5.Albacore growth curve at different times

Mortality and Exsploitation Rate

The calculation of total mortality (Z), natural mortality (M) and capture mortality (F) values using length converted cacth curve plots (FISAT II) showed the different values over time. The ALB port-based data obtained in 2013 showed that total mortality (Z) was 6.68 (year^{-1}), natural mortality (M) 1.55 (year^{-1}) ,capture mortality (F) 5.13 (year^{-1}) and exploitation rate 0.77 (year^{-1}) (Coefficient correlation 0.9493) Figure 6.

Length-Converted Catch Curve
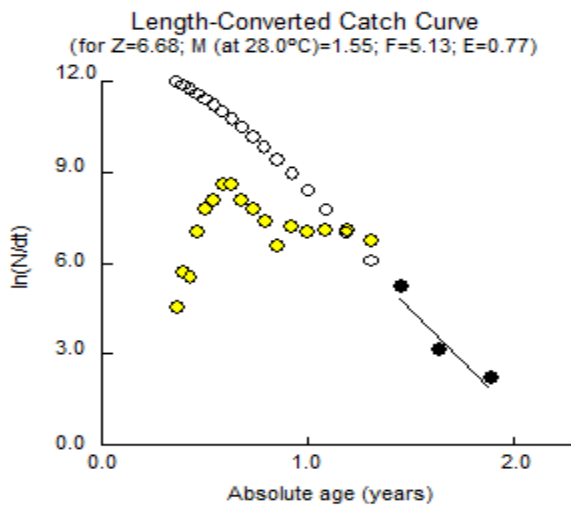(for Z=6.68; M (at 28.0°C)=1.55; F=5.13; E=0.77)

Figure 6. Linier cacth curve of ALB based on port-based enumeration data.

CONCLUSION

The enumeration activities of tuna longline effort which was landed at Benoa port has exceeded the IOTC targets. The cacth composition dominated by yellowfin tuna followed by bigeye tuna, albacore, southern bluefin tuna, billfish and bycacth fish. The length composition of ALB ranged from 65-122 cmFL and length at the first capture (L_{50}) was 91.15 cmFL. The ALB has rapid growth with growth coefficient (K)=1.50 (year^{-1}).

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