SOME BIOLOGICAL PARAMETERS OF INDO-PACIFIC SAILFISH (*Istiophorus platypterus* Shaw, 1792) CAUGHT BY INDONESIAN LONGLINERS IN EASTERN INDIAN OCEAN

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ABSTRACT

This paper present some biological parameters of Indo-Pacific sailfish (*Istiophorus platypterus*) caught by Indonesia longliners in eastern Indian Ocean. The parameters cover size distribution, length to length relationship, length to weight relationship, and sex ratio. Data used for analysis comprised of daily monitoring data tuna and tuna-like species from 2002-2014 and scientific observer data from 2006-2014, courtesy of Research Institute for Tuna Fisheries (RITF). The result showed that most (73.63%) of the sailfish caught were distributed at size range from 155-210 cmLJFL. Due to insufficient data on sex, the length-to-length relationship was calculated using pooled sex. The linear regression equation models were LJFL=1.1456PFL+21.089; LJFL=1.04EFL+13.772; and EFL=1.099PFL+7.3534. The non-linear regression analysis (power function) was also executed to study the length-weight relationship; the 'r' value was found to be 0.80013 and the regression equation $W_{GGT} = 0.0009PFL^{2.048}$. The sex ratio (proportion of female to total of male and female) was 0.63 (equal with 1:1, $X^2=3.31<X^2_{(0.05)}=3.84$).

Keywords: Size distribution, length to length, length-weight, sex ratio, Indo-Pacific sailfish, eastern Indian Ocean.

1. Introduction

Billfishes (Xiphiidae and Istiophoridae) are the second largest catch in the world after tunas, including Indonesia. About 90% of the world's landings of billfishes are taken as bycatch of the tuna longline fishery (Prager *et al*., 1995), since there is no specific fishery targeting this group of species especially in Indonesia. The estimated catch of tuna and tuna-like species of the tuna fisheries in the Indian Ocean more than doubled from 405,929 tonnes (t) in 1983 to 1,106,518t in 1995. During this same period the estimated catch of billfish nearly tripled, from 14,568t to 52,221t (IOTC

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1995, 1997). Contribution of billfishes to tuna fishery in Indonesian considered significant, which up to 95,652 metric tonnes from 2004 to 2010 (DGCF, 2011).

Indo-pacific sailfish is rarely caught by Indonesian longliners and only contributes around 5% of total catch production in the eastern Indian Ocean (IOTC, 2013). Gillnet catches are currently estimated to comprise approximately 77% of the total estimated Indo-Pacific sailfish catch in the Indian Ocean with I.R. Iran (25%); Pakistan (18%); India (17%) and Sri Lanka (14%) are likely to be the major player. Despite of its importance in some south Asian countries many of its biological parameters are still unknown, including morphometric relationship (length-length and length-weight), sex ratio, nominal CPUE, fish size trends and catch-at-size (IOTC, 2013).

The present paper has two objectives. The first is to present equations for predicting from non-standard measurements into standard lengths (pectoral fork length; PFL & eye orbit fork length; EFL to lower jaw fork length; LJFL). Equation for predicting PFL to EFL also presented in this paper. The second objective is to present length-weight relationship based on daily monitoring data of billfishes landed in Port of Benoa, Bali. In addition, we also include sex ratio and length frequency distribution in our analysis.

2. Methods

Size data including LJFL, EFL and PFL which were obtained from Research Institute for Tuna Fisheries (RITF) through daily tuna and tuna-like monitoring program from 2002 – 2012 and scientific observer program from 2005 – 2014, this also include data requirement for length to length conversion which taken from March 2011 to date for Indo-Pacific sailfish. The linear regression equation (where a and b are parameters) was implemented for females and males, respectively. If there is no significant difference between them, the relationship between LJFL – EFL, LJFL – PFL, and EFL – FL was calculated again by using all data of both sexes to obtain the pooled linear regression equation. The length-weight relationship (between

PFL and dressed carcass weight) was calculated using power function. Sex ratio was expressed as the proportion of females to total numbers of females and males.

3. Results

The number of Indo-Pacific sailfish data collected from scientific observer program from 2005-2014 was only 102 samples, while from the daily monitoring program were 15.365 samples. Most of the landing data were unusable due to several factors, i.e. the data contain either weight or length information; several fishes with the approximately similar weight were lumped into a single data; unrealistic weight data (>100 kg).

The main fishing grounds of Indo-Pacific sailfish from the Indonesian longliners are shown in Fig. 1. It showed that the catch of billfishes concentrated between 8^0 – 17^0 S and 112^0 – 125^0 E. The trend of CPUE for Indo-Pacific sailfish relatively stable over the years although the nominal CPUE never exceed 0.20 (Fig. 2). Higher CPUE occurred in west of Sumatra and south of Nusa Tenggara waters (Fig. 3). For morphometric analysis purpose (length-length relationship), only 15 specimens were successfully observed from March 2011 to date. Most of them lack of sex data, thus LJFL, EFL and PFL data were combined and pooled. The linear regression equation models were shown in Fig 3.

Most (73.63%) of the indo-Pacific sailfish caught were distributed at size range from 155-210 cmLJFL (Fig. 4). Length-weight (length; PFL and dressed weight, HDD) relationship of Indo-Pacific sailfish was shown in Fig. 5. The data analysed comprise only 34 specimens from 2002 – 2013, due to many unused data. This happened because some of the specimens (especially in between 2002-2010) with the approximately same weight were lumped together into single data. The sex ratio (proportion of female to total of male and female) for was 0.63 (equal with 1:1, $x^2=3.31<x^2_{(0.05)}=3.84$).

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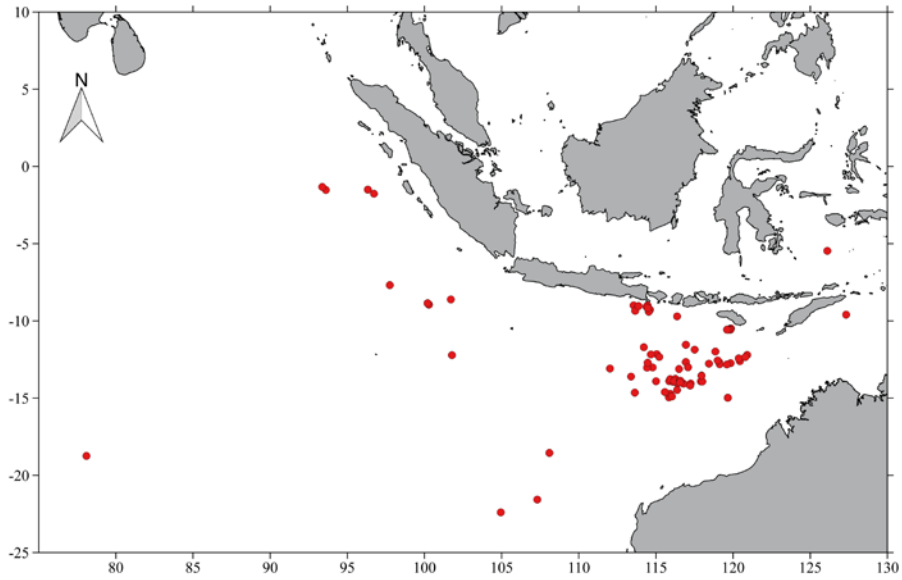
5. Acknowledgement

Figure 1. Known fishing ground for Indo-Pacific sailfish caught by Indonesian longliners from 2005-2014.
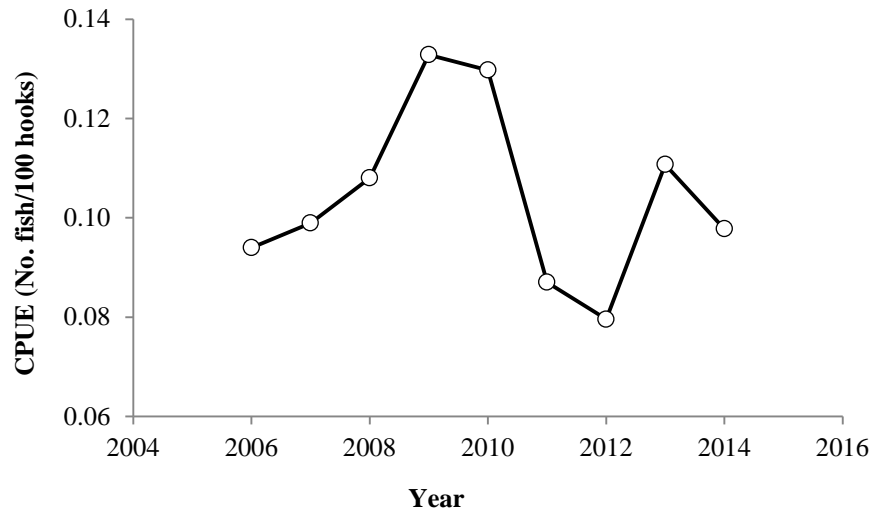

Figure 2. Annual average CPUE for Indo-Pacific sailfish caught by Indonesian longliners from 2005-2014.
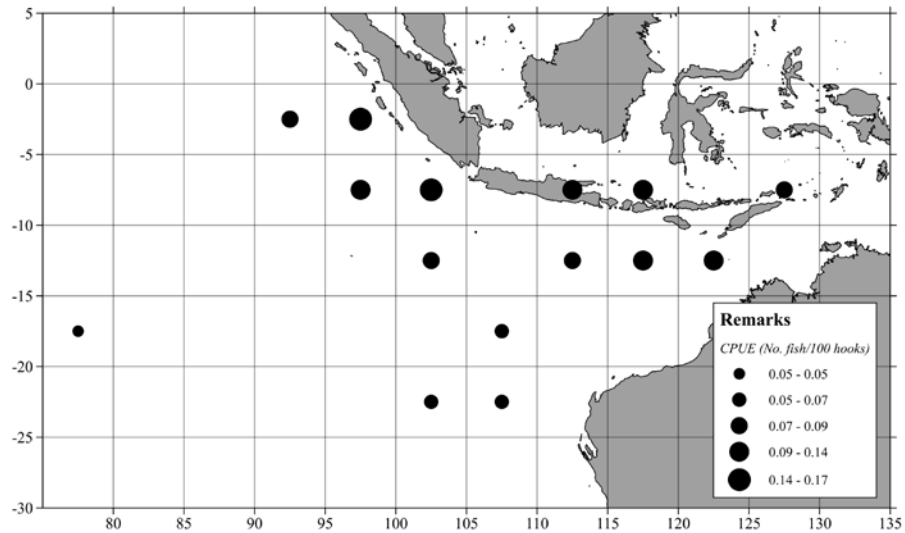
Figure 3. CPUE distribution (below) for Indo-Pacific sailfish caught by Indonesian longliners from 2005-2014 (note: no catch reported on 2005).
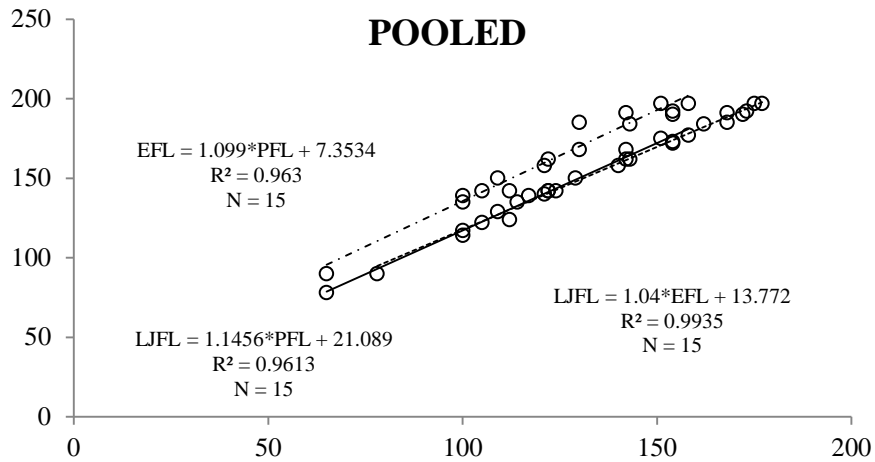

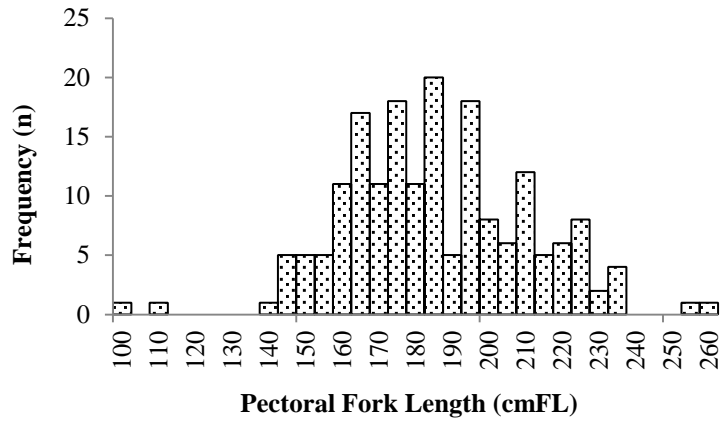**Figure 4.** Morphometric relationship for Indo-Pacific sailfish caught by Indonesian longliners from 2005-2014.

Figure 5. Length frequency distribution for Indo-Pacific sailfish caught by Indonesian longliners from 2005-2014.
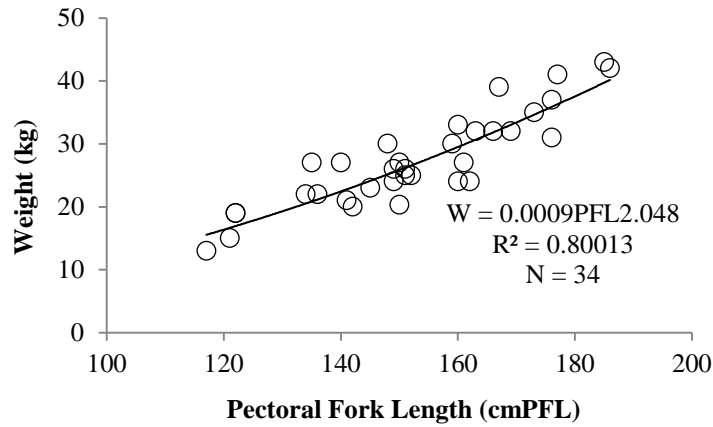

Figure 6. Length-weight relationship for Indo-Pacific sailfish caught by Indonesian longliners from 2005-2014.