

Length frequency and the distributions of billfishes (Xiphiidae and Istiophoridae) from Indonesian tuna longline observer data

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Abstract

Billfishes are the one of the important byproduct for Indonesian tuna longline fishermen. The objective of this study is to describe length frequency and the distributions of billfishes in Indonesia. Data collections were taken by observer on 83 longline vessels in Benoa Port, Bali, Indonesia from 2005 to 2012. Lower-jaw fork length (LJFL) was used to measure the length of the fish. The results showed that six species of billfishes were caught by longline vessels i.e.: 973 swordfish (*X. gladius*) range: 50-280 cm; mean±SE: 128±1.48 cm, 94 sailfish (*I. platypterus*) range: 98-259 cm; mean±SE: 165±3.51 cm, 252 shortbill spearfish (*T. angustirostris*) range: 82-221 cm; mean±SE: 151±1.05 cm, 222 blue marlin (*M. mazara*) range: 110-298 cm; mean±SE: 192±2.39 cm, 310 black marlin (*I. indica*) range: 60-307 cm; mean±SE: 184±1.92 cm and 109 striped marlin (*K. audax*) range: 69-270 cm; mean±SE: 177±3.23 cm. The latitudinal and longitudinal range distributions of six billfishes were range from 0°65' to 33°66' S and from 76°00' to 131°47' E. The majority of billfishes were caught with range from 10°00' to 20°00' S and from 110°00' to 120°00' E. Further study is needed on the biological aspects of billfishes to support their management policy in Indonesia.

Keywords: Byproduct, lower-jaw fork length, length frequency distributions.

Introduction

A billfish fishery in Indonesia is very important and in recent years the total production reached 95,652 Tonnes from 2004 to 2010 (DGCF, 2011). The production of a number of billfish catches from the total fishing vessels in the Indian Ocean. Nevertheless, there are some issues about this billfish fishery, especially information about production billfish obtained from small-scale fisheries in Indonesia (Mahiswara and Prisantoso, 2009).

Information about biological aspects and fishery status of billfish fisheries in Indonesia is still insufficient due to lack of data. Therefore, in 2003, Indonesian Fisheries Department, with the support from ACIAR Australia and IOTC (through

OFCE), established the fisheries monitoring program at fishing port in Jakarta, Cilacap (Central Java) and Benoa (Bali). Information recorded includes the species, number, length and weight of fish which are the target species and bycatch, especially billfishes (Widodo et al., 2009).

Billfishes are classified into two families: Xiphiidae (swordfish, *Xiphias*) and Istiophoridae. Previously, Istiophoridae consists of three genera (*Istiophorus*, *Tetrapturus* and *Makaira*) (Nakamura, 1985). Phylogenetic analyses revealed that family Istiophoridae consists of five genera: blue marlin (*Makaira*), sailfish (*Istiophorus*), black marlin (*Istiompax*), striped and white marlin (*Kajikia*) and four spearfish (*Tetrapturus*) (Collette, 2006).

The aim of this study was to examine some biological characteristics of the species in Indian Ocean. Regarding this objective, this study investigated the length frequency and the distributions of billfishes in Indonesia.

Methods

This study conducted from August 2005 to November 2012 on 83 commercial tuna longline vessels with days per trip from 3 weeks to about 3 months. All fishing vessels were based in Port of Benoa, Bali, Indonesia. Data covers species identification, measuring lower-jaw fork length (cm) and position. Data collection was taken by scientific observer during fishing operation in Indian Ocean. Data analyses using Microsoft office excel with descriptive analysis.

Results and discussion

There were six species of billfishes, from the total of 12 species of billfishes, caught in Indonesia i.e.: swordfish (*Xiphias gladius*), sailfish (*Istiophorus platypterus*), shortbill spearfish (*Tetrapturus angustirostris*), blue marlin (*Makaira mazara*), black marlin (*Istiompax indica*) and striped marlin (*Kajikia audax*). The total of Indonesian billfishes production caught in Indian Ocean was fluctuated from 2001 to 2010. The highest production was swordfish with more than 3,000 tonnes in 2003 then drop steeply to around 2,000 in 2005. The second highest production was sailfish with nearly 3,000 tonnes in 2004 and

fall significantly to about 2,000 tonnes a year later. The production of blue marlin and black marlin reach the peak in 2003 with around 1,800 and 1,500 respectively. For all these four species, the productions were relatively stable from 2008 to 2010 with around 1,200 tonnes. The lowest productions were striped marlin and shortbill spearfish with less than 500 tonnes. Specifically for shortbill spearfish, the production was closed to zero (FISHSTAT-FAO, 2012).

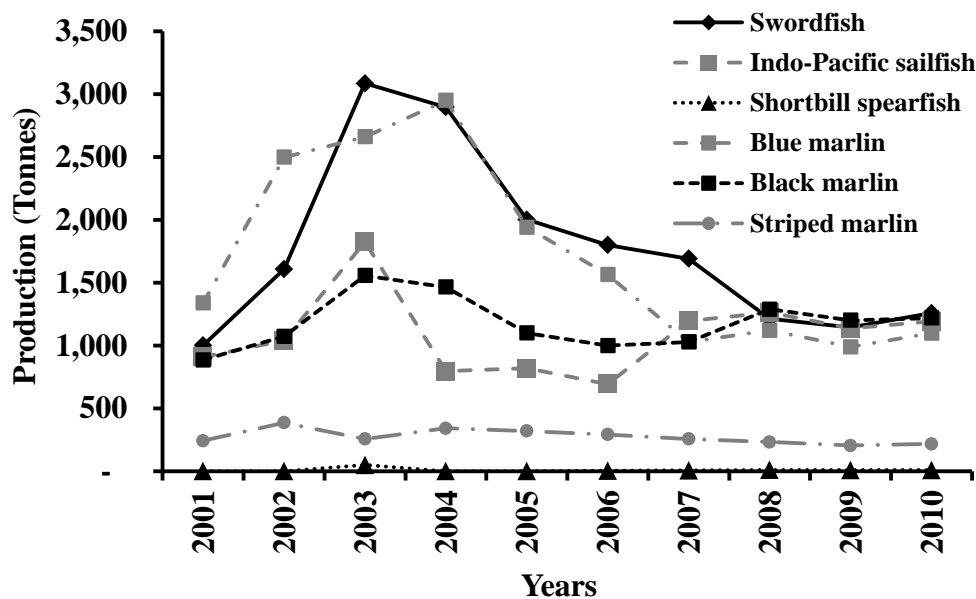


Figure 1. Indonesian billfishes production caught in Indian Ocean from 2001 to 2010. (FISHSTAT-FAO, 2012).

The catch composition of Indonesian tuna longline fishing vessels in Indian Ocean from 2005 to 2012 was dominated by tunas (four species) with 52.61% from total catch. Billfishes and sharks caught 6.30% and 5.62% from total catch, respectively. The rest of the composition was other fishes (others) with 35.48% from total catch. These other fishes consist of: pomfret fish, oilfish, escolar, moonfish, wahoo etc. Total of 23 species included in other fishes caught by tuna longline fishing vessels (Figure 2).

Billfishes catch were dominated by swordfish with nearly 50% of the total billfishes catch. The second biggest billfishes catch was black marlin with 15% followed by shortbill spearfish, blue marlin, striped marlin and sailfish with 12%, 11%, 5% and 4%, respectively.

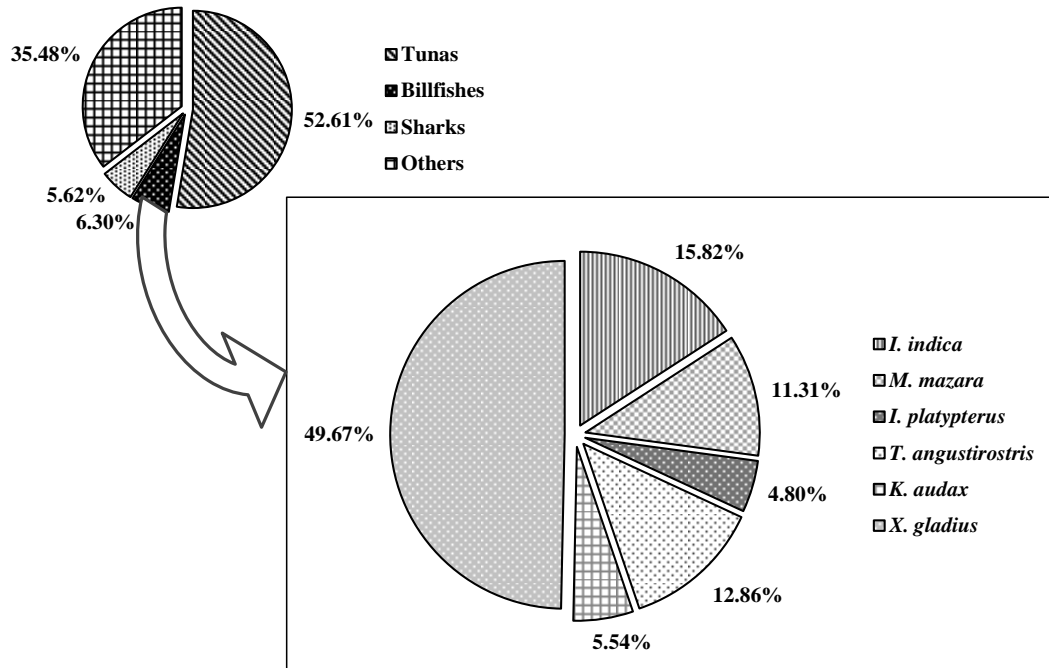


Figure 2. Catch composition from Indonesia tuna longline fishing vessels in Indian Ocean from 2005 – 2012.

The mainly habitat of billfishes are warm waters, but they also often migrate to tropical waters and cold waters to find food during summer and return to warm waters to spawning (Nakamura, 1985). The latitudinal and longitudinal range distributions of six billfishes were range from 0°65' to 33°66' S and from 76°00' to 131°47' E. Swordfish (*X. gladius*) range from 0°65' to 33°66' S and from 76°00' to 130°82' E. Based on data from commercial longline fishing vessels catches, the latitudinal range of this species in Indian Ocean extends from 25° N to 45° S (FAO-FIGIS, 2005). Sailfish (*I. platypterus*) range from 1°33' to 22°40' S and from 77°86' to 126°79' E. Its latitudinal range in Indian Ocean is 45° S in the western Indian Ocean and 35° in the eastern Indian Ocean (FAO-FIGIS, 2005). Shortbill spearfish (*T. angustirostris*) range from 1°03' to 33°14' S and from 76°00' to 118°39' E. Blue marlin (*M. mazara*) range from 0°83' to 32°63' S and from 76°50' to 125°96' E. Black marlin (*I. indica*) range from 1°77' to 29°45' S and from 77°78' to 131°47' E. Striped marlin (*K. audax*) range from 2°02' to 32°24' S and from 76°04' to 128°19' E. The latitudinal range for this species in Indian Ocean is the same with sailfish which is 45° S in the western Indian Ocean

and 35° in the eastern Indian Ocean (FAO-FIGIS, 2005). Overall, the majority of billfishes were caught with range from 10°00' to 20°00' S and from 110°00' to 120°00' E (Figure 3).

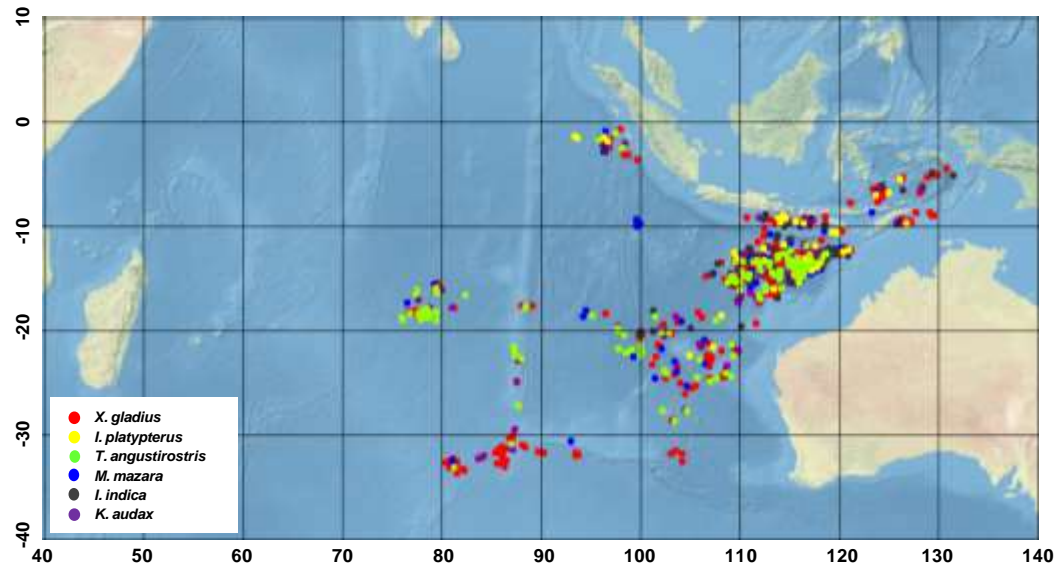


Figure 3. Billfishes distributions caught by Indonesian fishing vessels in Indian Ocean.

A total of 1,959 billfishes measured by observer onboard consist of: 973 swordfish (*X. gladius*) range: 50-280 cm; mean±SE: 128±1.48 cm, 94 sailfish (*I. platypterus*) range: 98-259 cm; mean±SE: 165±3.51 cm, 252 shortbill spearfish (*T. angustirostris*) range: 82-221 cm; mean±SE: 151±1.05 cm, 222 blue marlin (*M. mazara*) range: 110-298 cm; mean±SE: 192±2.39 cm, 310 black marlin (*I. indica*) range: 60-307 cm; mean±SE: 184±1.92 cm and 109 striped marlin (*K. audax*) range: 69-270 cm; mean±SE: 177±3.23 cm (Figure 4).

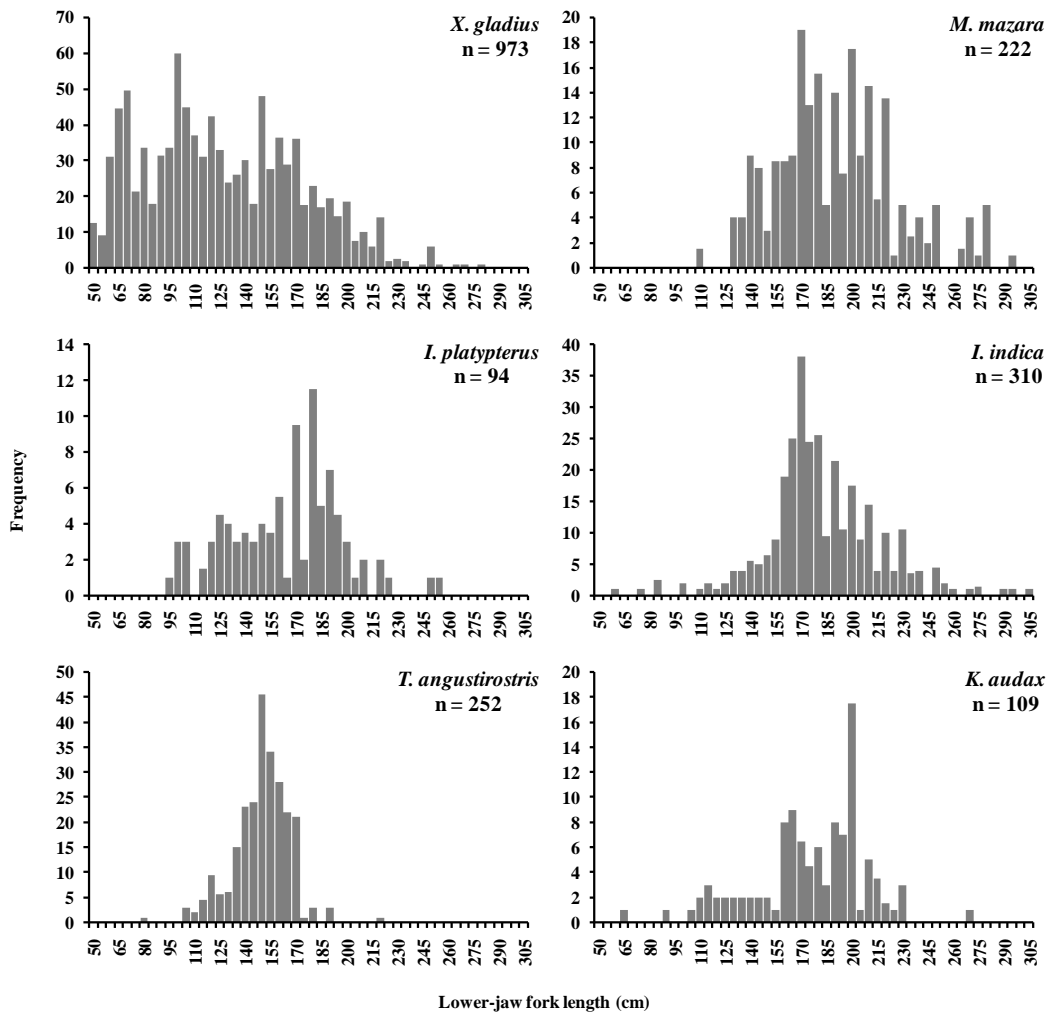


Figure 4. Length frequency of six billfishes pooled into groups with 5 cm length intervals.

One important thing to note on fisheries management in Indonesia is a data collection of species landed at the port. The fisheries data collection, in order to improve statistical tuna fisheries in Indonesia, is to provide better understanding of the fishery to support appropriate management policies. Moreover, this activity also aims to meet the obligations as a member of Regional Fisheries Management Organization (RFMO) to report the data of the tuna and tuna-like species (including billfishes) fishery production to the Indian Ocean Tuna Commission (IOTC).

Fisheries monitoring program was established in the three major port in Indonesia (Jakarta, Cilacap-Central Java and Benoa-Bali) in mid-2002. The

objectives of this program were to record catches by tuna longline fishing vessels operating in the Indian Ocean. In 2005, additional activity was conducted for onboard catch monitoring through observer program. These program were collaboration between the Research Institute for Marine Fisheries – Research Centre for Fisheries Management and Conservation (RIMF-RCFMC) with CSIRO Marine and Atmospheric Research (CMAR), Australia's Department of Agriculture of Fisheries and Forestry (DAFF), Australian Centre for International Agricultural Research (ACIAR), Indian Ocean Tuna Commission (IOTC) and the Overseas Fisheries Cooperation Foundation of Japan (OFCF) (Proctor et al., 2003). Since 2011, the monitoring activity was authorized to the Research Institute for Tuna Fisheries (RITF) Benoa as an institution that focuses on the study of tuna and tuna-like (including billfishes) fishery in the Indian Ocean.

Conclusions

There were six species of billfishes caught in Indonesia i.e.: swordfish (*X. gladius*), sailfish (*I. platypterus*), shortbill spearfish (*T. angustirostris*), blue marlin (*M. mazara*), black marlin (*I. indica*) and striped marlin (*K. audax*). The majority of billfishes were caught with range from 10°00' to 20°00' S and from 110°00' to 120°00' E. Swordfish (*X. gladius*) was dominating the catch of billfishes caught by Indonesian tuna longline fishing vessels by nearly 50% from total billfishes catch with lower-jaw fork range: 50-280 cm; mean±SE: 128±1.48 cm. Further study should be conducted on the biological aspects and the stock status of billfishes. This important information is needed to support management policy of billfishes fishery in Indonesia.

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