Catch of billfishes by Malaysian tuna longliners in the southwestern Indian Ocean.

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ABSTRACT

A total of 5 Malaysian tuna longliners began to fish for albacore in the vicinity of southern Madagascar since the 3rd quarter of 2011. Total catch of billfishes (which comprised of marlin and swordfish) in 2014 showed a significance increase to 118.56 tons from only 53.78 tons in 2013. The sudden increased was recorded for swordfish from only 22.4 tons in 2013 to 93.14 tons in 2014, an increased of over 300%. The catches of marlin showed a decreased by 19.28% in 2014 compared to 2013. Peak landing periods can be observed for both species which does not coincide with peak fishing periods.

Keywords: Marlin, Swordfish, tuna longliner, Indian Ocean, Billfishes

Introduction

There are five Malaysian tuna longline vessels operating in the Indian Ocean since 2011. These vessels fished for tuna in waters around southern Madagascar (Map 1). The main species caught are Albacore, Yellowfin tuna, big eye tuna; while billfishes such as Black marlin and sailfish are also caught in small amounts.The purpose of this paper is to examine the catch of billfish by the five Malaysian tuna longline vessels in the last three years.

Billfish or sailfish are comprised of two families, Xiphiidae and Isotiophoridae which include three genera with eight identified species (Collete et al., 2006). These two families of billfish are well known as pelagic fish (Fierstine, 1997) in open ocean. Due to their pelagic swimming behavior, billfish prey on other pelagic fish as their food. Billfish mostly prey on herrings, sardines, shads, smaller mackerels and tuna. Teleosts are common prey for billfish regardless of the distribution of billfish in the ocean (Vaske Jr et al., 2011). Oceanic fast swimming billfishes have large surface areas of gill lamellae that help in gas transfer because it use ram ventilation to pass water through their gill (Wegner et al., 2010). Highly migratory in tropical and temperate waters world-wide (IOTC, 2011), billfish also exhibit sexual dimorphism in maximal size, growth rates, and age at maturity; females reach larger sizes, grow more rapidly, and mature later than males.

The geographical distributions of billfish are broad, ranging from latitudes 50^oN to 50^oS with temperature ranging from 15^oC – 30^oC (Bernard et al., 2013). The distribution of billfish tallies with their migration pattern and prey distribution because their diet consist mostly of migratory species (Vaske Jr et al., 2004). In the Indo-Pacific region,billfish are most likely to be found in tropical and sub tropical waters although they may also be occasionally found in temperate waters during their pursuit of prey. This oceanic fish swim near to the sea surface above the thermocline and avoid swimming near to shore and close to land masses (Vaske Jr et al., 2011).

World demand on billfish are mostly in temperate and tropical countries, such as Japan, because the good quality of flesh can be use to prepare sashimi (Nakamura, 1985). The good quality of the flesh is long-lasting when refrigerated and frozen. In tropical and subtropical region, billfish fishing is common in recreational and leisure fishing by sport fishing enthusiasts (Alio, 2010). Long-line fishing of billfish is the frequently used method to catch billfish although they are also occasionally caught as by-catch by trawlers and seiners (Venizelos et al., 2001). Usage of C-hook in long line fishing of billfish, as shown by Prince et al. (2002), helps to avoid damage to billfish in catch-and-release recreational fishing.

The status of billfish in the Eastern Pacific Ocean can be considered as of lesser concern in their information retrieving process. However, the landings of billfish are generally increasing annually in the Indian Ocean (Lan et al. 2015). Estimation of billfish in the Indian Ocean ranged from 70-80% of the fish population (Lan et al. 2015). In the study by Lan et al. (2015), the total catch of swordfish as tallied with the fishing effort, indicate that more than 75% of swordfish were caught in the northwest and southwest of the Indian ocean. The reason is due to environmental variables differences between both regions (Lan et al., 2015).

Material and Methods

The billfish catch data and fishing locations presented in this paper were obtained from logbooks submitted weekly via email to the Department of Fisheries, Malaysia (DOFM). Data reporting is a condition for licensing Malaysian-flagged tuna fishing vessels. Although there is an onboard observer deployed on the Malaysian-flagged tuna carrier vessel, in accordance to IOTC requirement, no obervers are yet deployed on fishing vessels. Thus, the catch data reported are rather general in nature and not detailed. Since the catches are landed in foreign ports, DOFM is unable to verify the catches due to financial and logistical constraints. The Black Marlin catches reported may include other marlin species, since it may not be probable that other marlin species were not caught. Therefore caution should be exercised when reviewing this data and related analysis.

Fishing operation

A total of 5 tuna longliners have been registered by Malaysia, ie. Malaysian-flagged, and are fishing in waters off Madagascar and southwards since the 3rd quarter of 2011. The primary target of these vessels is Albacore and all catches are landed in Mauritius.

All the Malaysian vessels operate tuna longlines off the eastern coast of Madagascar, Lat S 10^0 to S 25^0 from January to March and from October to December, for each of the three years they were deployed. For the other months, these vessels operate off southern Madagascar until Lat S 35^0. Based on the vessels deployment, longlining activities were carried out at the southern-most fishing area of Lat S 35^0 during the month of May for each year.

A total of 3,000 hooks were used for each fishing operation by each tuna longliner. Immersion time is between 8 to 10 hours for each operation. Generally, fishing efforts were reduced in March and September since 2012. However, fishing effort appears to be more stable in 2014 compared to the two preceeding years.

Annual Landings of billfish

The annual landings in metric tons of billfish by the Malaysian longliners are shown below. Data for the year 2011 is not shown here since fishing operations commenced in the last quarter of that year.

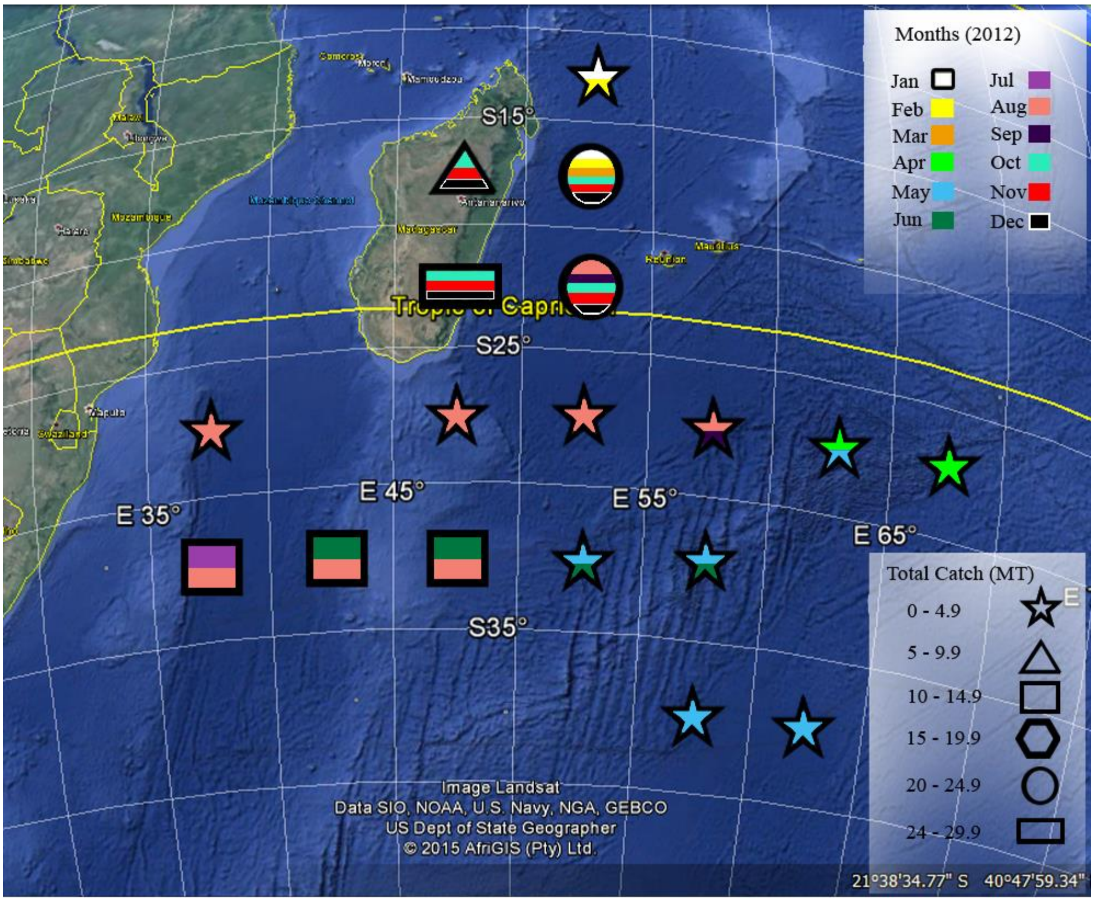
Year/Species	Black Marlin	Swordfish
2012	20.57	23.01
2013	31.49	22.30
2014	25.42	93.14

The annual landings of Black Marlin ranged from 20.57 tonnes to 31.49 tonnes, with a 19% decrease in 2014. The landings of Swordfish in 2014, however, was more than 4-fold over that of 2013, showing an increase of more than 300%. This increase in Swordfish landings greatly influenced the increase in billfish landings for that year, from 53.78 tonnes in 2013 to 118.56 tonnes.

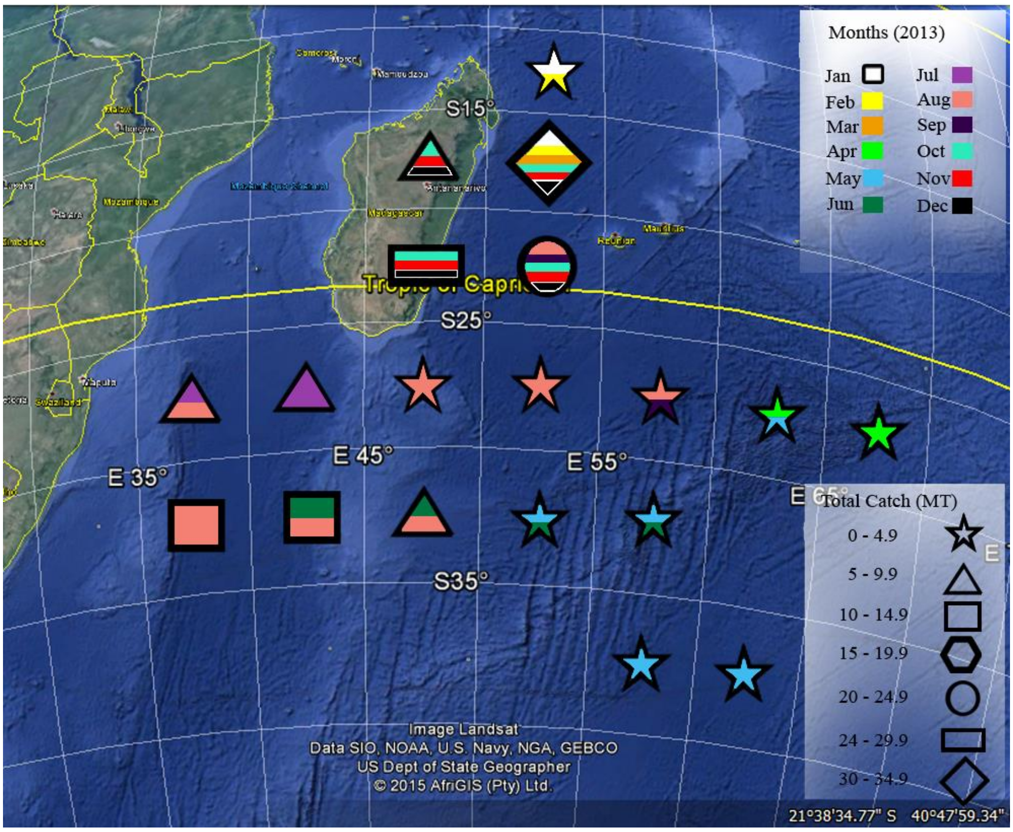
The proportion of billfish in the total catch is shown in the table below. The low percentage of billfish in the total catch shows that they are not the main target of the tuna longliners.

Year/Species	Billfish	Total catch	% of Billfish
2012	43.58	744.97	5.85
2013	53.78	1,241.68	4.33
2014	118.56	1,045.89	11.34

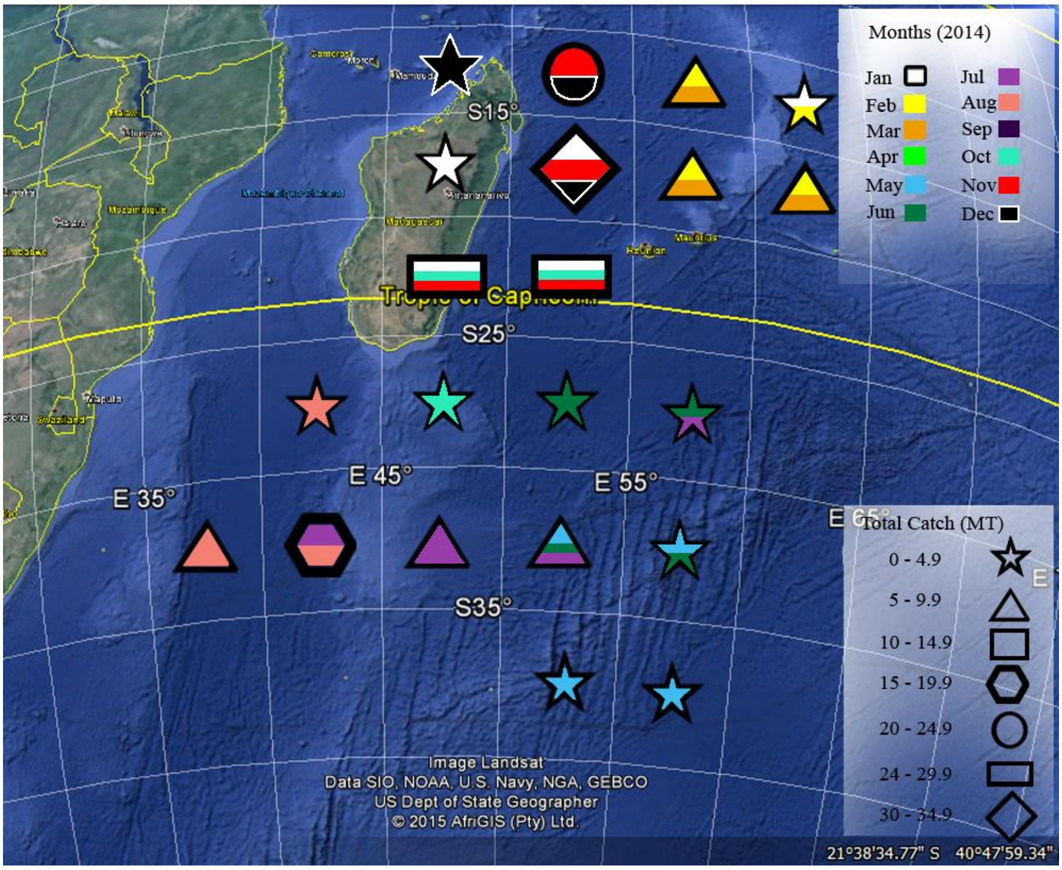
Maps showing the locations of fishing and quantities of billfish caught, by year, are shown below.



Map 1: Distribution of total catch of Billfish by 5° x 5° grid in 2012



Map 2: Distribution of total catch of Billfish by 5^o x 5^o grid in 2013



Map 3: Distribution of total catch of Billfish by 5^o x 5^o grid in 2014

Since there are only three years of data available for the annual landings, no detailed analysis will be carried out. More detailed data should be available for meaningful inter-annual variations to be analysed.

Mean Monthly Landings of Billfish and Fishing Effort

Figure 1 shows the mean monthly landings (+1 sd) of billfish by Malaysian tuna longliners in the Indian Ocean from 2012 to 2014. It also shows the fishing areas by month.

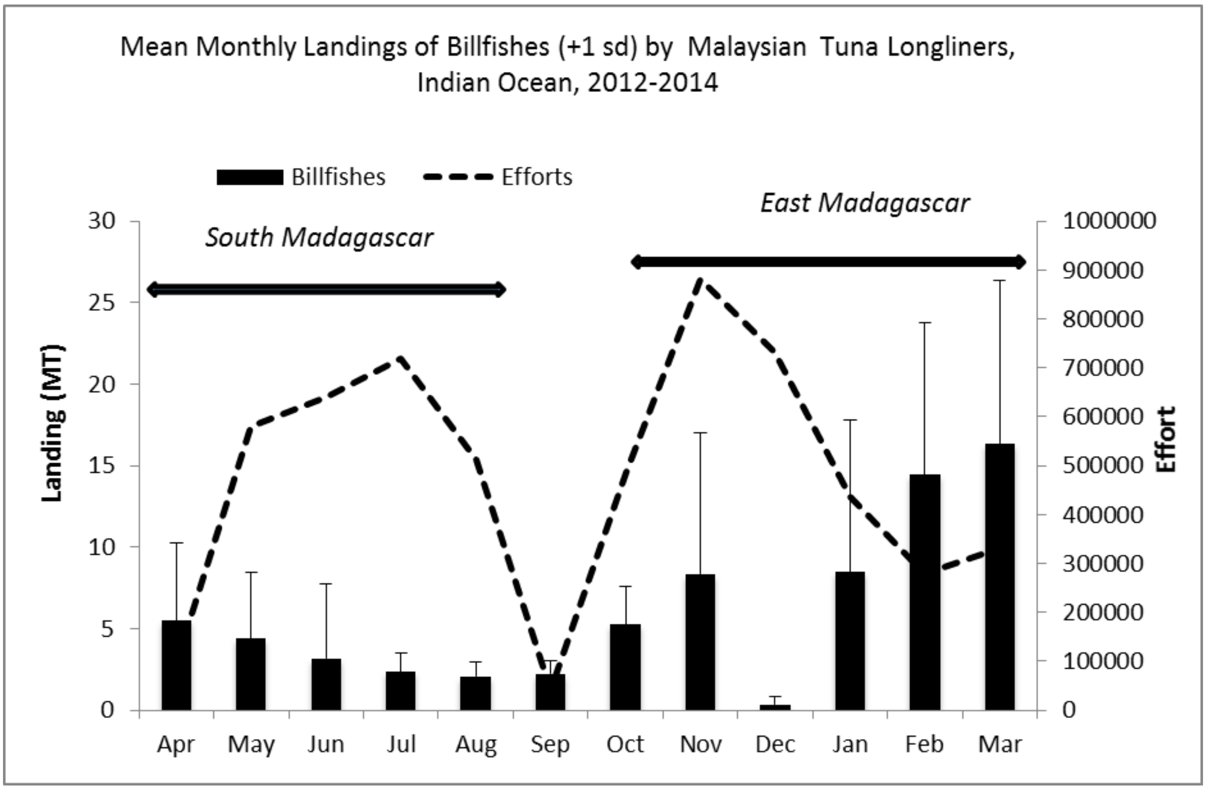


Figure 1: Mean Monthly Landings of Billfishes and Fishing Effort by Malaysian Tuna Longliners, Indian Ocean, 2012-2014.

It appears that there two peaks of fishing activities, namely from May to August and from October to January. However, these peaks are not reflected in the mean monthly landings of billfish, whose landings appear to peak in February and March. The relatively high standard deviations for these two months indicate that there is substantial inter-annual variations in the landings, although this may not be conclusive with only 3 years of data available.

These differences in peaks, between fishing effort and landings can be expected since the longliners were not targeting billfishes. Thus, fishing effort is focussed on the main target species, namely Albacore, with billfishes probably constituting an important by-catch. Although billfish are not the primary target of longliners, their landing patterns do indicate their availability in the fishing areas.

Peak landing periods for the two billfishes, namely Black Marlin and Swordfish, do not coincide with each other. Black Marlin catches appear to peak from February to May, although they are present in each month's catch. The comparatively lower standard deviation suggest there are less inter-annual variations in their catches vis-à-vis Swordfish.

Swordfish catches appear to peak from November to March, with the exception of December when their catch was almost negligible. The high standard deviation for the months when their landings are also higher suggest great inter-annual variations in their catches.

The degree of monthly standard deviation for both species can provide indicators whether their availability in the fishing areas can be effectively predicted. High standard deviations will suggest that it may be difficult to make predictions with great certainty.

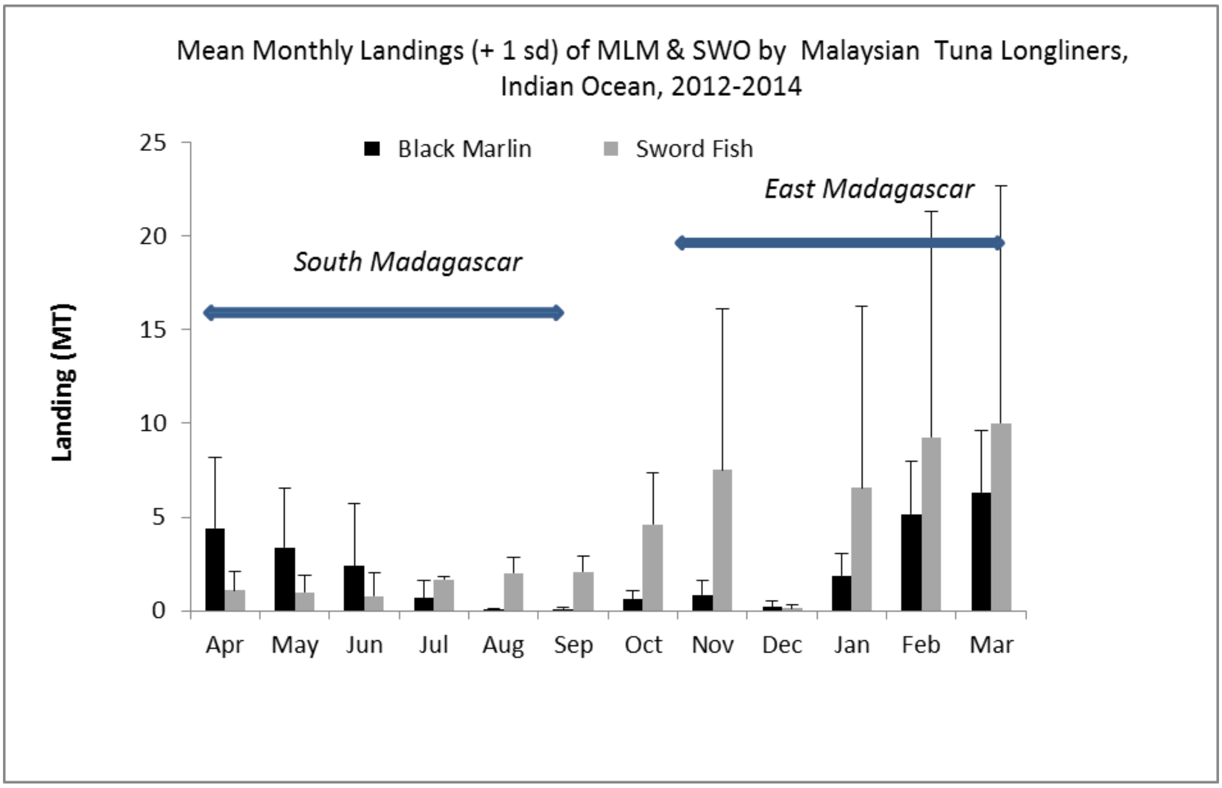
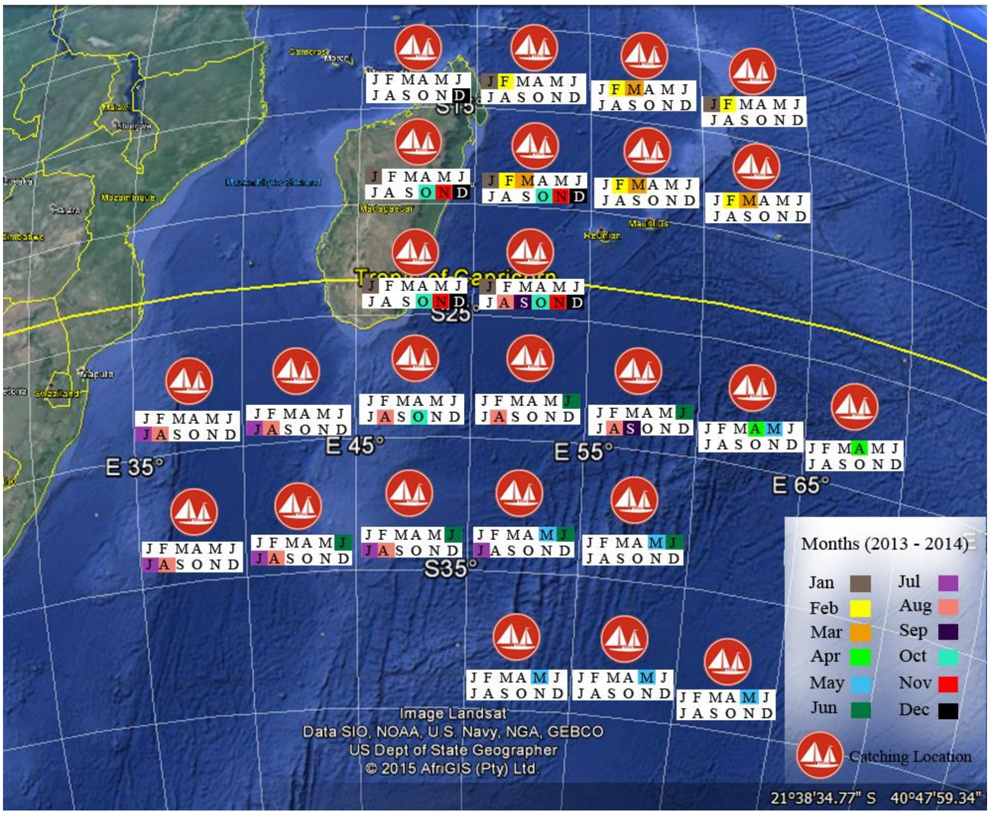
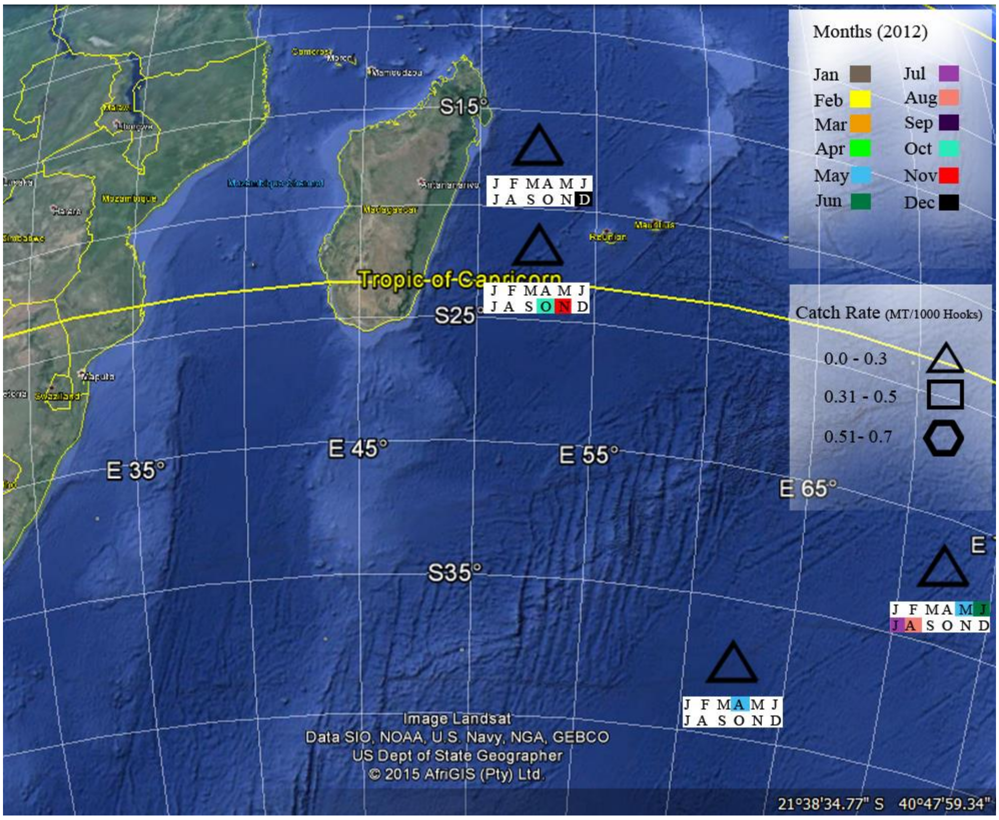


Figure 2: Mean Monthly Landings of Black Marlin and Swordfish by Malaysian Tuna Longliners, Indian Ocean, 2012-2014.

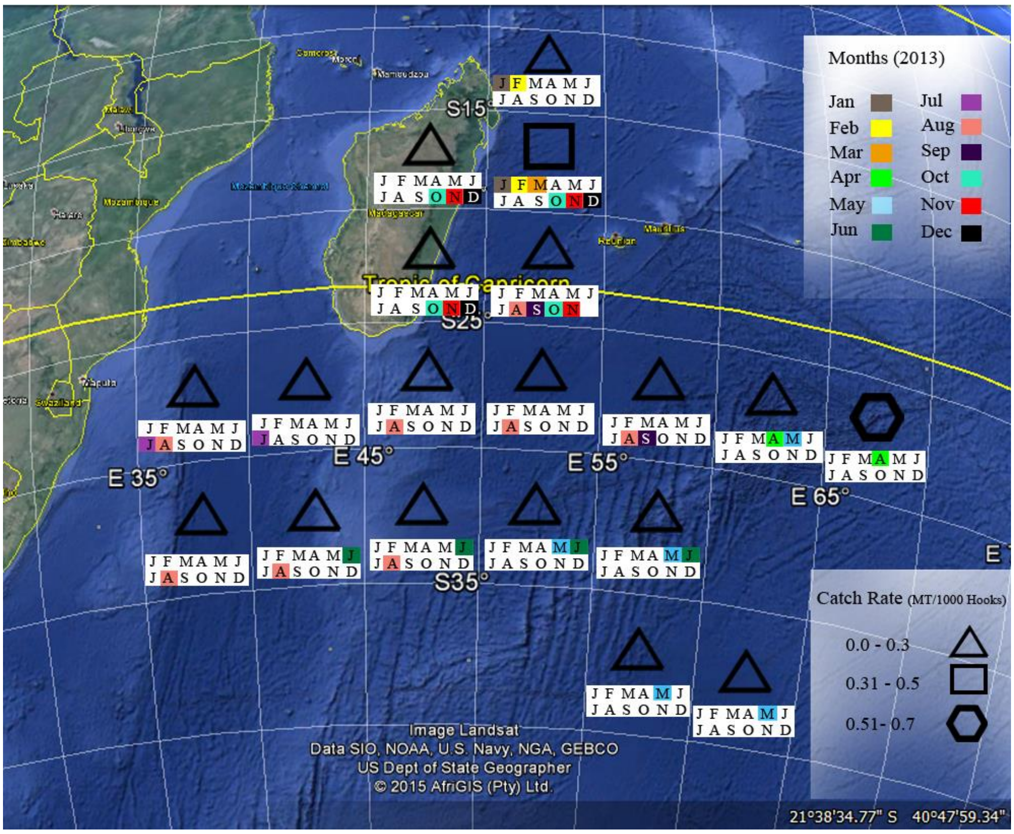
Maps showing monthly catching locations and the monthly catch rates are shown below.



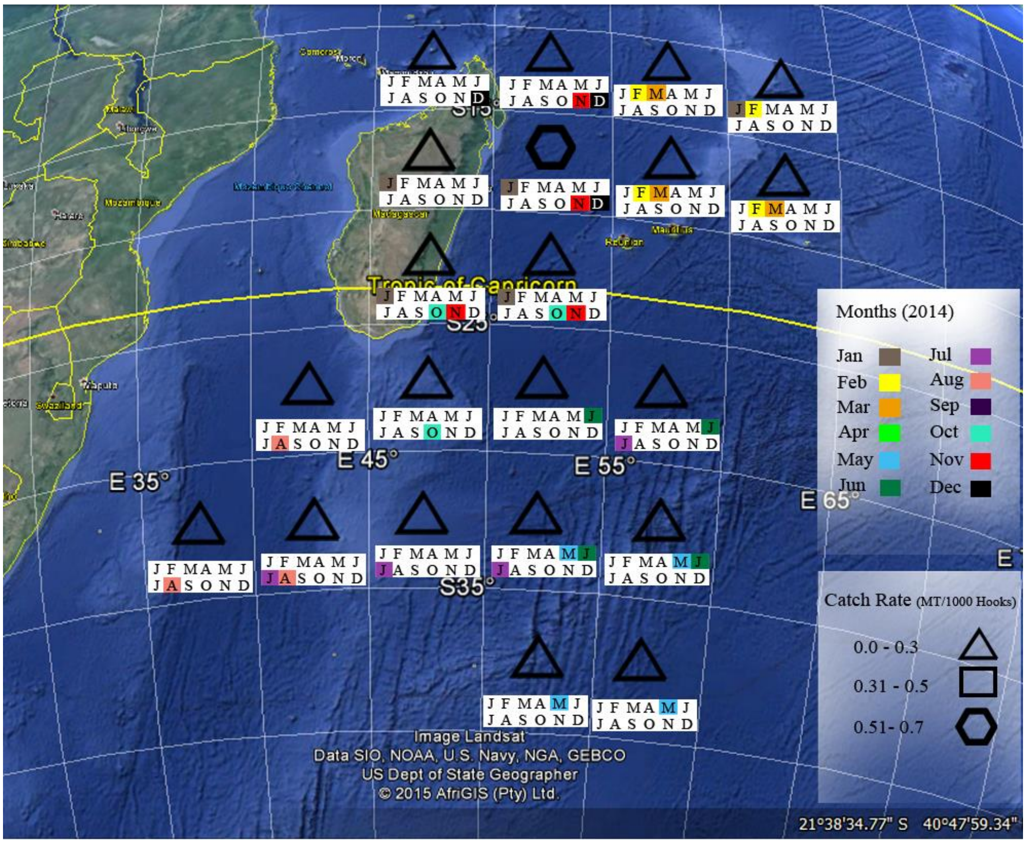
Map 4: Catching locations of Billfish by month for the years 2013-2014



Map 5: Monthly catch rates of Billfish and their locations for the year 2012



Map 6: Monthly catch rates of Billfish and their locations for the year 2013



Map 7: Monthly catch rates of Billfish and their locations for the year 2014

It can be seen that fishing are focussed to the east and south of Madagascar.

Discussion

Since Malaysia's current involvement in the tuna fisheries in the Indian Ocean is relatively new, there are still a number of IOTC requirements that are not complied with yet. One of these is the deployment of observers on board fishing vessels. DOFM is currently addressing these issues and the level of compliance with IOTC resolutions have increased recently. Currently there is no functioning landing port for tuna caught in the Indian Ocean. Thus, tuna caught by Malaysian flagged vessels are landed in ports outside of Malaysia. Currently, there is plan to have a properly functioning port for this purpose on the west coast of peninsular Malaysia. When this is available, tuna catches can be landed there making it possible for DOFM to collect biological data from the fish landed.

Although billfishes are not the primary target of tuna longliners, a substantial quantity are being landed. The demand for these fishes will make them an attractive by-catch, since their value is relatively high. As shown above, there are peak periods of billfish landings, although these may not coincide with peak fishing periods targeting Albacore. These peaks, however, do indicate the peak availability of these fishes in some parts of the southern Indian Ocean, which may be in line with their migration pattern. Further understanding of their biology, growth, life cycle, location preferences, interaction with environmental parameters, etc., in the southern part of the Indian Ocean will require more data, including oceanographic parameters. However, the small numbers of billfishes caught may be a hindrance to obtaining further information on these fishes.

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