REPOBLIKAN'I MADAGASIKARA

Fitiavana – Tanindrazana – Fandrosoana

Few knowledge on Firgate tuna *(Auxis thazard, Lacepede, 1800)* resource in the Madagascar EEZ

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Abstract

By combining information on the nominal catch estimated on the species under IOTC of artisanal fisheries and sampling done by the USTA of by-products by purse seiners landings in the Port of Antsiranana, an analysis was made on the resource Frigate tuna (*Auxis thazard*, Lacepede, 1800).

The change in nominal catch neritic tuna artisanal fisheries, including Frigate tuna, has been deducted from the IOTC data. The spatiotemporal distribution of the purse seine catch was extracted from the catch and effort data, also, available on the IOTC website. And distribution of the size frequency of Frigate tuna of purse seiners landing is calculated from sample data made at the Port of Antsiranana.

At least, seven (07) species of neritic tuna are caught by trolling in Madagascar and are about 6,000 of the 14 000 metric tons in 2011. Narrow-barred Spanish Mackerel (*Scomberomerus commerson*) predominates in the catch in this fishery and Kawakawa (*Euthynnus affinis*), Longtail tuna (*Thunnus tonggol*) and Frigate tuna (*Auxis thazard*) are moderately caught.

Industrial purse seine fishing catch Frigate tuna, usually, occurs between January to June in the Mozambique Channel and most of catches is made between March and May each year. The average of the individual sizes of Frigate tuna from byproducts purse seiners sampling exceeds 41 cm. This average size is much higher than the Frigate tuna size at maturity. However, the size at recruitment is well below than the size at maturity.

1. Introduction

In Madagascar, tuna resources are mainly exploited by foreign industrial fleets under the Memorandum of Understanding between the Malagasy government and foreign vessel owners. Longline and purse seine are the main fishing gear used. Some fishing techniques used by the artisanal fishery also catch tuna resources in Madagascar water, but very little is known about this fishery. In 2011, the IOTC estimated nominal catch on the fisheries for the species under its mandate, including the catch of artisanal fisheries.

The harbor of Antsiranana is a large fishing harbor at which purse seiners can land their product. The PFOI is a tuna cannery located in Antsiranana, receiving the products landed. The landings of the purse seiners in Antsiranana harbor are followed by the USTA since 2011.

Several species of neritic tuna found in the species composition of the artisanal fisheries catch estimated by the IOTC. For the monitoring in the Harbor of Antsiranana, Frigate tuna is one of the identified species sampled from the by-products landed by purse seiners.

The objective of this study is to observe the quality and the quantity of Frigate tuna fishing in the Madagascar waters. Indeed, the combination of nominal catch data from artisanal fisheries in Madagascar estimated by the IOTC in 2011 and the samples measured of purse seiners landing at the Harbor of Antsiranana has been made. Such study could contribute to the improvement of scientific knowledge about the Frigate tuna resource in the Madagascar waters and the whole Mozambique Channel.

2. Materials and methods

The study was done in Madagascar's EEZ. The Frigate tuna is one of the neritic tuna species caught by artisanal fishing for trolling fishing and industrial purse seine. The following figure (Figure 01) shows a picture of Frigate tuna.

Figure 1: Photo of Frigate Tuna (Auxis thazard, Lacepede, 1800)

2.1. Catch and effort data

Catch and effort data are available to the IOTC website (http://iotc.org/data/datasets) in text format (CSV). This data contains the catch by weight and / or number of tuna and related species extrapolated to catch and total nominal efforts per month, per species and gear. The maximum spatial aggregation should be 1 ° x1 ° for seining.

2.2. Nominal catch data

A study was made by IOTC in 2011 to estimate the nominal catches of species covered by the IOTC by artisanal fisheries in Madagascar. These data were used to show the different species of neritic tunas caught by artisanal fisheries in Madagascar.

2.3. Byproducts of landing data

The method of data collection was described by RAHOMBANJANAHARY D. in 2012. This collection of data carried out by two non-permanent employees hired by the USTA. The surveys include, initially, to carry out sampling on unlandings and transhipments, i e, they take about 200 fish, pre-sorted by the dockers, per day per boat. Then, an investigator identifies each fish before carrying out its measurement, while the other records information in a form. Note that during the fishing season, the number of vessels that make operations in the harbor is 0 to 8. In addition, to achieve such investigation, two investigators are not enough especially when the number of operations at the harbor is greater than four. This is already a limit and may well affect the quality of our results. The second step is to explore the information associated with the quantitative evaluation of by-products landed by each boat. For this, a suitable form was designed to follow the dockers' speed movement, the net carriage (Estimated to contain 800 Kg of fish), and cages (either 1,200 or 1,400 Kg). Thus, a coded categorization for each type of landing, called "conditioning" was done in the form. The species and size are also coded for making easy and getting been fast the data collection.

All information collected will be entered in an Excel file, copy of the form. These filled files are, then, classified in the data warehouse before serving as a source for the database. Finally, the scientist makes sure to aggregate all the forms in a single database ready for any kind of process.

2.4. Data processing

2.4.1. Nominal catch of artisanal fisheries in Madagascar

An operation was performed on the Excel software to present the results to the total catch in the first and species of neritic tuna after.

2.4.2. The spatiotemporal distribution

2.4.2.1. The spatial distribution

The spatial distribution of the purse seine catches for the period from 2011 to 2013 is presented on a map produced by the R software from catch and effort data in the IOTC database. As these data are aggregated to 1 ° square without considering the boundary of the country's EEZ, the ArcGIS software was used to try to reduce the bias in the allocation of catches to Madagascar's EEZ as follows:

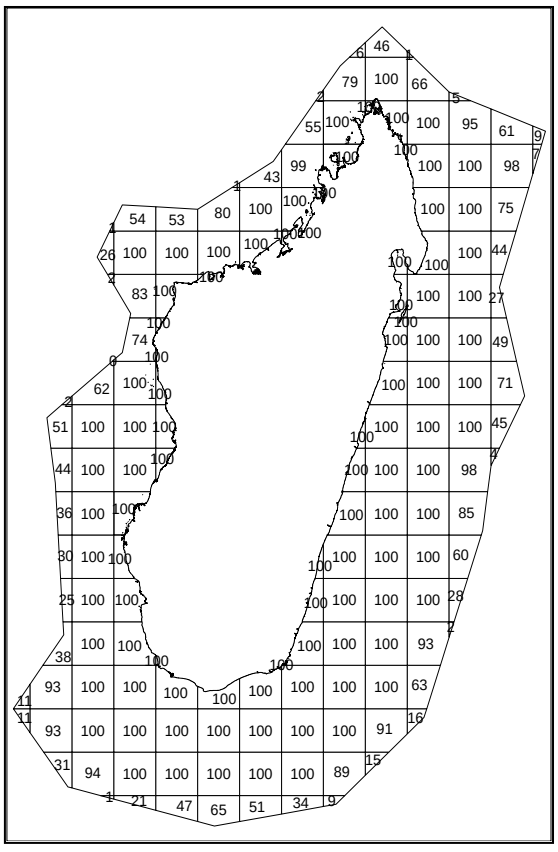

Figure 2 : Percentage value portions of the square used to estimate catches allocated to Madagascar's EEZ

The map in Figure 02 shows the percentage value of each square assigned to Madagascar's EEZ. The estimation method of catches in the EEZ of Madagascar from the IOTC database taken by squares of 1 ° x1 ° is done as follows:

Estimated catch = square catch i x % of the square area i in the EEZ / 100.

The number in each square of 1 ° x1 ° indicates the percentage of the catch allocated to the EEZ, prorated to the percentage in the EEZ.

2.4.2.2. Temporal distribution

The temporal distribution of landing by-products at the harbor of Antsiranana was extracted from the USTA database.

2.4.3. Distribution of Frigate tuna size frequency

The average length of sampled individuals are taken for each species of tuna that consists by-products including Frigate tuna. And as it is the subject of this study, the data on this species were extracted to observe their evolution over the period of the study.

3. Results

3.1. Nominal catch of artisanal fisheries in Madagascar

The graph in Figure 3 shows the capture changes to tuna and similar species by weight according to the IOTC database. The catch of fishing for tuna and similar species is composed of several migratory species.

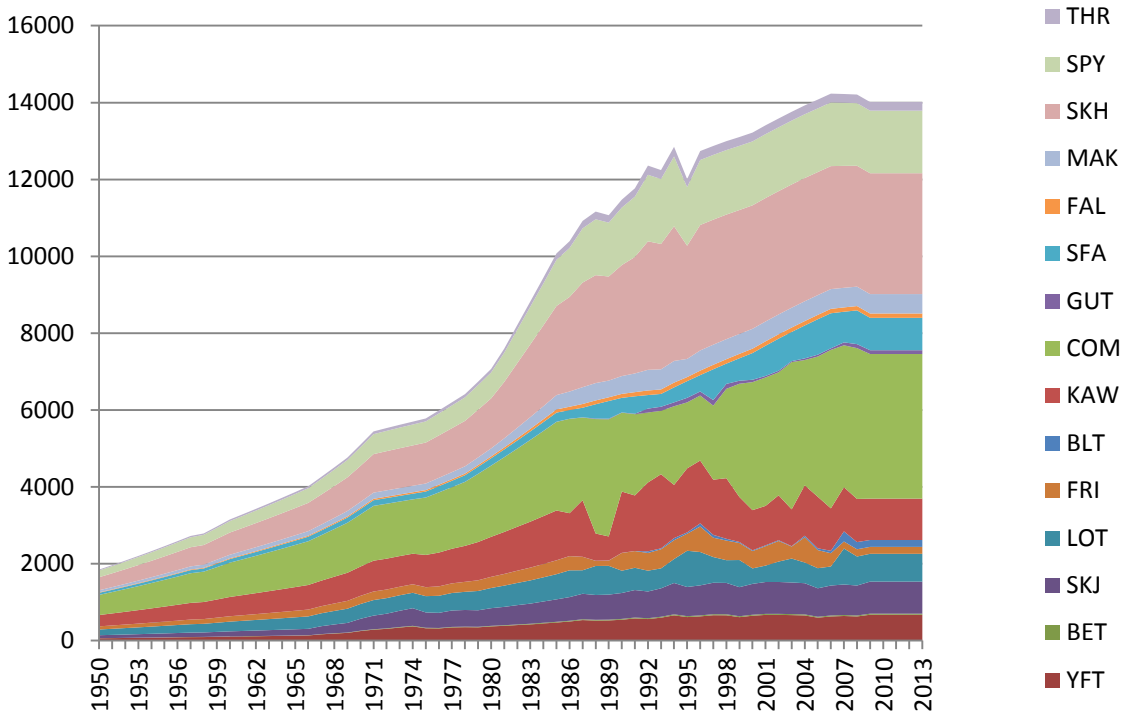

Figure 3 : Evolution of the nominal catch of artisanal fisheries in Madagascar

The Madagascar artisanal fishing estimated of the IOTC shows that before the 80s, the catch rises likely corresponding to fishermen population growth. From the 80s, the annual increase in catch volume is becoming stronger. From the mid 90s, the catch increase is attenuated. The current catch volume is the turn of 14,000 metric tons, fully caught by trolling. Neritic tuna species are among the catches and to better observe their evolution, a figure (Figure 4) is presented below.

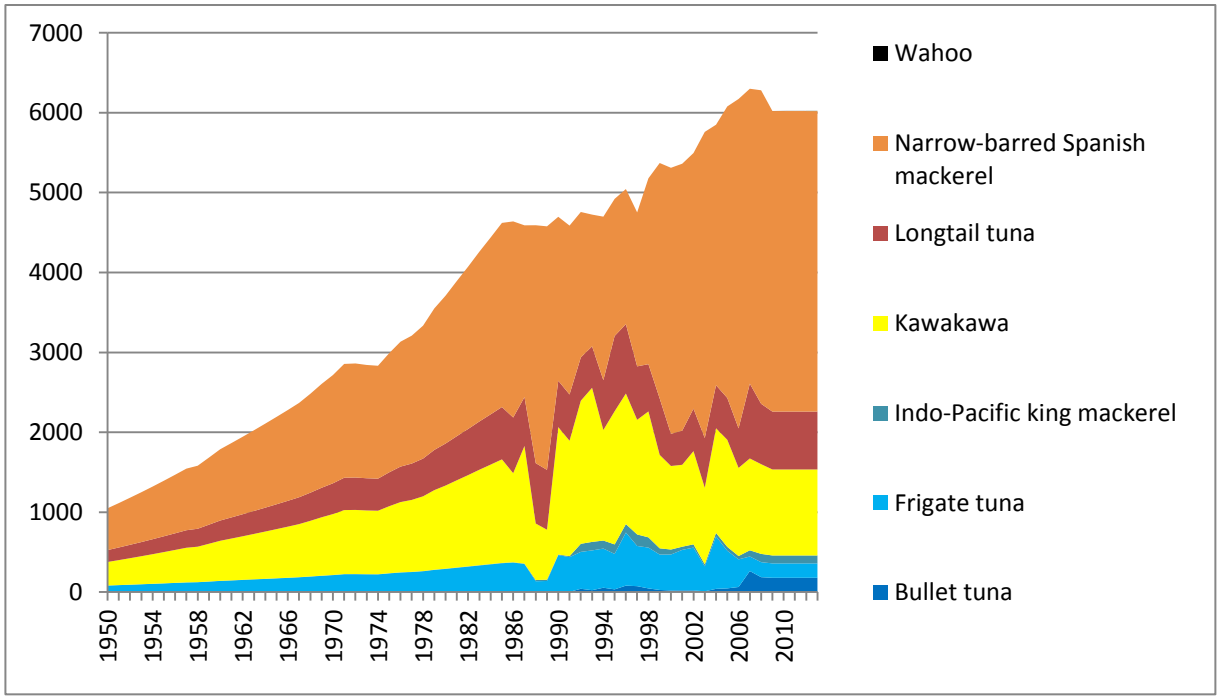

Figure 4 : Evolution of neritic tuna nominal catch by artisanal fisheries in Madagascar

There are about 7 neritic tuna species are caught by artisanal fisheries such as Madagascar (Wahoo, Narrow-barred Spanish mackerel, Longtail tuna, Kawakawa, Indo-Pacific King mackerel, Bullet tuna and Frigate tuna). The weight caught in 2011 is estimated at around 6,000 metric tons of the total catch of about 14,000 metric tons. Narrow-barred Spanish mackerel is dominant in the capture followed by Kawakawa. Longtail tuna and Frigate tuna are moderately present in the catch. The other species are poorly captured.

3.2. Spatial distribution of the purse seine catch

The spatial distribution of purse seine catches is shown in the map in the following figure (Figure 05) between the period 2011 to 2013.

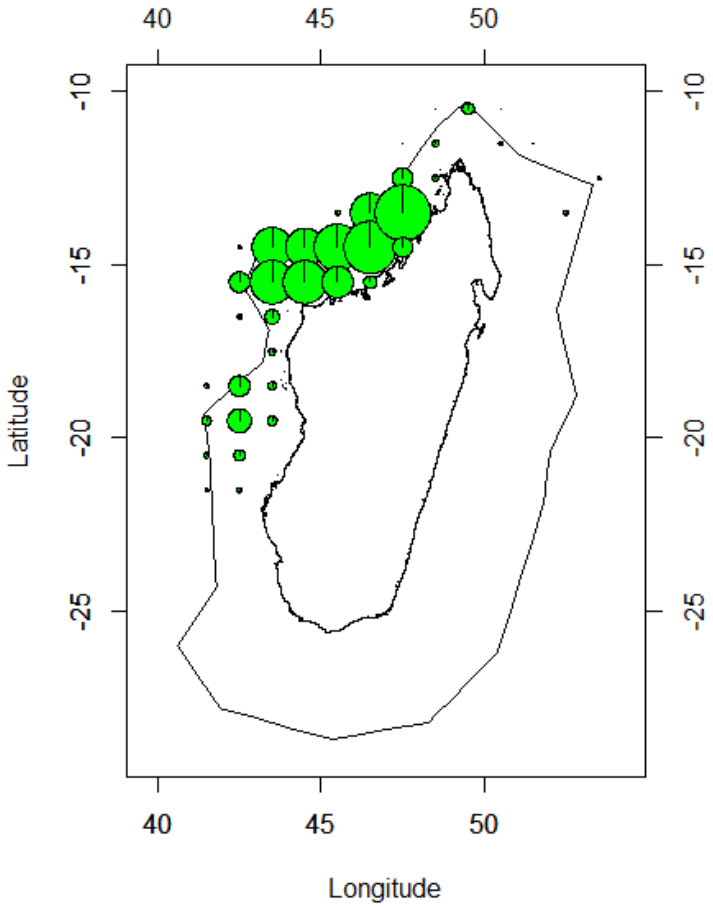

Figure 5 : Map of the spatial distribution of the purse seine catches in the EEZ of Madagascar between the period 2011 and 2013

This map gives information about the fishing area frequented by purse seiners in the waters of Madagascar. The seine fishing by foreign purse seiners in the waters of Madagascar is localized in the northwestern part of the EEZ. The boundaries of the popular fishing area by seiners observed vary around latitude 20 ° S and rarely below. Seiners hardly frequent the East side of Madagascar.

3.3. Frigate tuna size frequency distribution landed by purse seiners

The series of charts of the following figure shows the size frequency distribution (LF in cm) of the Frigate tuna landed by purse seiners.

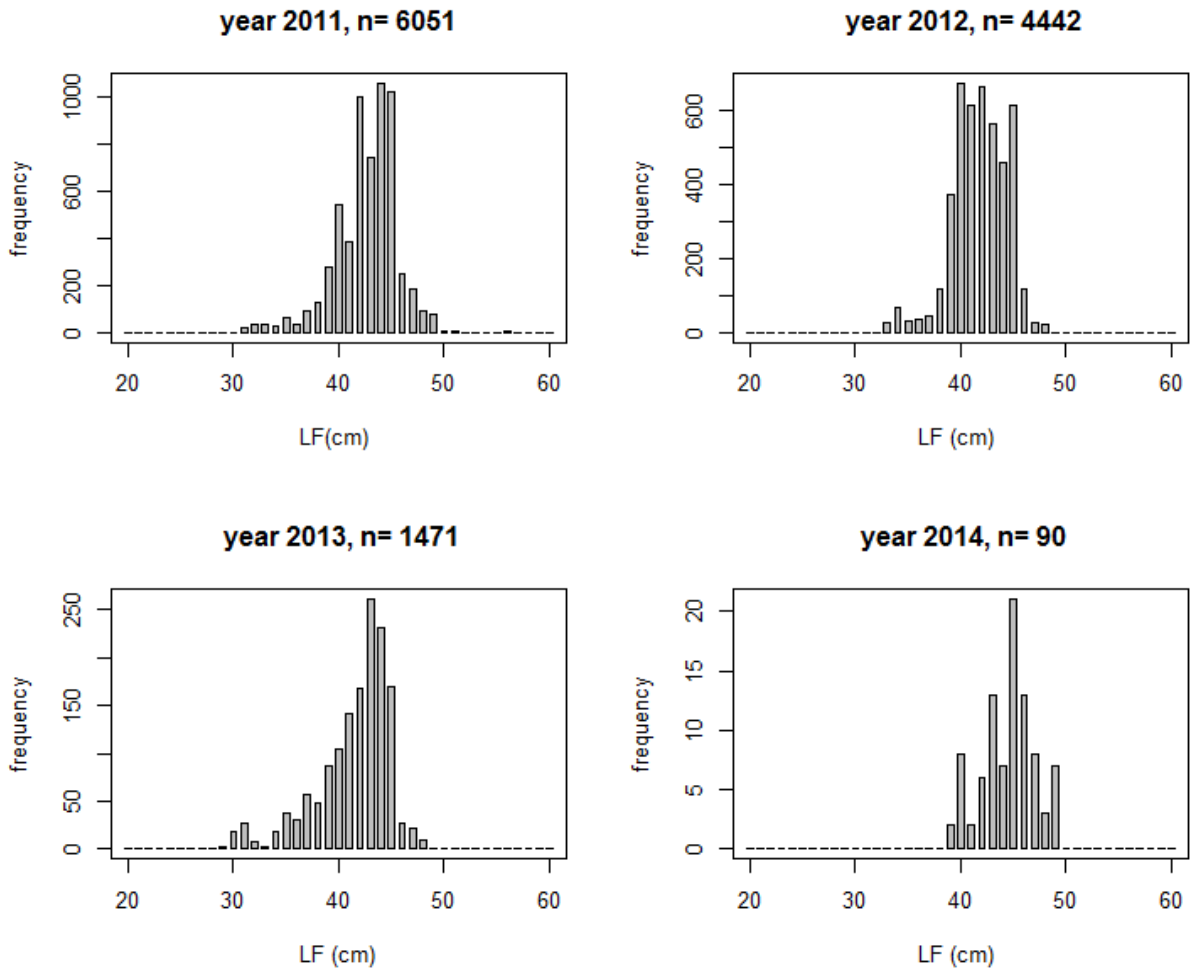

Figure 6 : Frigate tuna size frequency distribution landed by purse seiners

The frequency of the Frigate tuna size measured at the harbor of Antsiranana is usually between 40 cm and 50 cm. However, some individuals have size less than 30 cm (in 2013). The average size Frigate tuna are 42.6822, 41.78276, 41.42216, 44.5cm for the years 2011, 2012, 2013 and 2014.

4. Discussion

The purse seine landings season at the harbor of Antsiranana corresponds essentially to the fishing season for purse seiners in the Mozambique Channel in which Madagascar's EEZ particularly the North West part is used frequently. This season focuses generally between February and June, but the great part of the catch is realizing between March and May of each year. No studies have been done on the spatio-temporal distribution of artisanal trolling fishing in Madagascar and even less on the sampling of catches. The Frigate tuna appears in the catch composition of this fishery, which also appeared in the by-products landed by purse seiners.

It is obvious that the characteristics of the industrial purse seine and the artisanal trolling fishing are different especially in terms of fishing area and gear selectivity. The seine is a non-selective gear and purse seiners are operating in a more far area from the coast. For cons, the trolling fishing occurs near the coast and the gear is more or less selective.

Sampling of purse seiners catches were used to estimate the average size frequency of Frigate tuna landed for the fishing operation carried out in the Mozambique Channel. The average of size frequency estimated during the observation period is greater than 41 cm if sexual maturity is reached at about 29 cm fork length in Japanese waters and 35 cm around Hawai (COLLETTE and NAUEN 1983). However, the age of recruitment can drop to less 29 cm for purse seiners. The situation of the artisanal fishing remains unclear.

The status of Frigate tuna in the Indian Ocean is still uncertain. The only indicators known to date are caught in 2012, which is 83.108 metric tons for an annual average catch of between 2008 to 2012 to 90.678 metric tons according to Annex VIII of the final report of the WPTN04 (2014).

5. Conclusions and recommendations

Madagascar Artisanal trolling catches of several neritic tuna species as estimated by the IOTC in 2011. This shows that the neritic tuna resources have a significant importance in the catch in fisheries resources in Madagascar. However, no publication on this fishery on a scientific basis has been made so far. Samplings made by the USTA on the landing of purse seiners is a good beginning for this domain. However, it is desirable that the Madagascar administration makes effort to conduct research programs for scientific knowledge on the state of neritic tuna resources in the Madagascar waters.

6. References

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