

## Comparison of low and high production years of neritic tuna in Comoros from 2011 to 2017

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### Abstract:

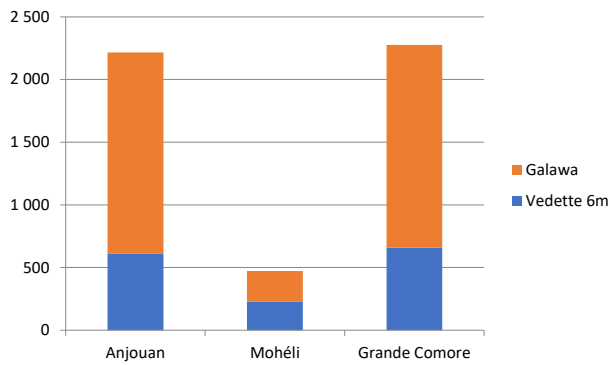
Neritic tuna data from Comorian fisheries represents a weak part of the annual total catch but really helps to local consumption in term of product variability and market. Its production represents almost 3% of annual total production of these six last years. Neritic tuna catches constitute the fourth important component of fishery harvest behind small pelagic, tuna like and tropical tuna. The main specie caught is Kawakawa (*Euthynnus affinis*), followed by Bullet tuna (*Auxis rochei*). The Frigate tuna (*Auxis thazard*) and the Longtail tuna (*Thunnus tonggol*) are not often caught. The Indo-Pacific king mackerel (*Scomberomorus guttatus*) and Narrow-barred Spanish mackerel (*Scomberomorus commerson*) are extremely rare. All these neritic tunas are mainly caught by trolling line or hook and line using fibber glass small boat or wooden pirogue. The main fishing gear is depending on the habit of the Comorian Island you are. A comparison of low and high seasonally production shows that these last 3 years are low productive than the first four years of this interval from 2011 to 2017.

**Keys words:** neritic tuna, effort, strata, seasons

### BACKGROUND

Actual Comorian EEZ is about 160,000 km<sup>2</sup> with 427 km of coast line (Youssouf et Naji, 2007). According to the volcanic origin of Comoros, the continental shelf is limited with some variation by island. Anjouan and Grande-Comore Islands have reduced continental shelf than Mohéli. The wide of this continental shelf is not exceeding 2 nautical miles (Breuil, 2018). As well as we leave from the coast for a few hundred meters, the deep is quickly exceeding 100 m (Bosc, 2016). The total area of this continental shelf is not exceeding 900 km<sup>2</sup>. This fine thickness of the continental shelf is one of the reasons of the orientation of the main Comorian fishery to pelagic component instead of demersal. The Comorian EEZ has an important zone for tuna fishery based in the Mozambique Channel.

The capacity of artisanal fishery is limited. According to the census of (DGRH, 2014), the total fishery fleet is 5,006 units which composed by 1,500 units of fibber glass boat of 6 meters, 40 fibber glass boat of 9 meters, and 3,466 of pirogues. The 9 meters fibber glass boat is in another category called semi-industrial fleet. The main effort of fisheries is based in Anjouan and Grande-Comore (Figure 1) (Breuil, 2018).



**Figure 1: repartition of fishing small boats by Island (fibber glass boat (6 m long) and wooden pirogue (Galawa), fishery census of DGRH, 2014).**

In the territorial water, we have all tuna species present in the Indian Ocean region. Comorian fishery is almost artisanal (Oirdi, 2002). For Comorian economy, Fishery is one of quick growth sector. The potential fishing capacity is estimated about 33,000 tons per year which composed by 3,000 tons for demersal, 10,000 tons for coastal pelagic resources and 20,000 tons for oceanic pelagic fishery (Youssouf et Naji, 2007). While the main component of fishery is pelagic, it is linked with a strong seasonality. The period of North monsoon (Kashkazi) when it is hot and humid is from November to April. The period of South monsoon (kusi) when it is cold and drayed, is from May to October. In the period of “kashkazi”, even fish are very far from the coast, but sea conditions are favourable for fishery and catchability is high. Otherwise, in “Kusi”, fishes are near the coast but, south monsoon is strong, more waves, the sea conditions are not favourable for fishery and there is less and less catches of pelagic fishes (Breuil 2018). The annual total catch is around 16,000 tons with some small variability between years.

For tuna and tuna like fishery, operations are based on trolling line in open free school or deep hand line applied around FADs. In this fishery context FADs are well experimented and well known to improve catchability of tuna and tuna like in artisanal fishery. Actually only anchored FADs are used out of continental shelf.

Effort data have collected since 2011 and the dataset available at National Fisheries Directorate (DGRH) are expressed in number of fishing days. Those data should be taken with prudence because the 6 m small boat can have two fishing tide per day especially in period of North monsoon (Kashkazi) when catchability is maximal. For 6 m fibber glass boats, effort has increased up to 24% in 2015 compared to the average observed from 2011 to 2015. According to evolution by Island, effort is more raising in Anjouan Island (+38%) and Mohéli (+63%) than in Grande-Comore where the effort raising is about +2% (Breuil, 2018). Concerning the wooden pirogue, effort has generally increased at 21% with a special increase in Grande-Comore.

The main objective of this paper is to compare neritic tuna catches from 2012, 2013, 2014 against those from 2015, 2016 and 2017 and then check reasons of this big variation from these both period of data collection.

## **MATERIAL AND METHODS**

### **Zone of study**

The zone of study is the national level. Data are collected over the three Islands of Grande-Comore, Anjouan and Mohéli. There is a national statistical data collection service based at national fisheries department.

### **Strata of collection data**

The collected data are stratified by 7 strata distributed as follow:

In Grande-Comore, data collection is organized by two strata one in the coastal Nord and the Southern part. For Anjouan island, there are three strata which one is in the South-Western side, another one in the North and the last one in the Eastern part of the Island. Mohéli island has only two strata for data collection, one in the Northern part and the other one in the Southern part.

### **Data collectors**

Eleven data samplers are assigned to collect all data in the whole country. Their repartition is as follow: five are based in Grande-Comore, four in Anjouan and two data sampler for Mohéli.

### **Fishing boat**

According to the fishery census of 2014, the total fishing fleet is 5006 small boat which 30% are motorised. There are six types of small boats named locally as follow: GAP (Wooden pirogue without engine), GAF (pirogue with net as fishing gear), Fedawa I (FD1) (wooden pirogue with engine), Fedawa II (FD2), G18 (6 m fibber glass boat with engine), JAK (komacat and Japawa, respectively local 9 m fibber glass boat with two outboard engine and Japanese model 9 m fibber glass boat formatted as local pirogue with inboard engine).

### **Fishing gears**

Next to these categories of boat there are seven (7) types of fishing gears using with it: PAL (Hook and line: vertical line), TRA (Hook and line: trolling line), PAN (Hook and line: vertical line operated at night with light), PNL (Hook and line: vertical line operated at night without light), FIL (small senne or net), CAS (trap), LIG (Hook and line for small pelagic). There are some fishing gears which are not implicated for neritic tuna fishery.

### **Data collected**

The collection system is organized by strata and in each strata there is primary site which is sampled regularly and secondary site which is sampled once a week. In this way the whole coastal villages are implicated in the data collection system. For each landing site all categories of fishing boat are sampled for different fishing gears.

All species of neritic tuna found in the Indian Ocean are also found in Comorian water: there are Bullet tuna (*Auxis rochei*), Frigate tuna (*Auxis thazard*), Kawakawa (*Euthynnus affinis*), Longtail tuna (*Thunnus tonggol*), Indo-Pacific king mackerel (*Scomberomorus guttatus*) and Narrow-barred Spanish mackerel (*Scomberomorus commerson*).

These are the species which its situation will be compared from two different period.

## RESULTS

### Total catch for neritic tuna in Comoros

The data collection system is updated on 2011 when the system is launched until now is running. From these seven years data collection, neritic tuna catches represent almost 3% of national total catch. Catch evolution shows a variation from 2011, 2012, 2013 and 2014 which are respectively 200, 350, 375 and 169 tons of neritic tuna per year. That was the maximal catches for these seven years period. The rest of the period is very low catches under 100 tons (Figure 2a). **Error! Reference source not found.**

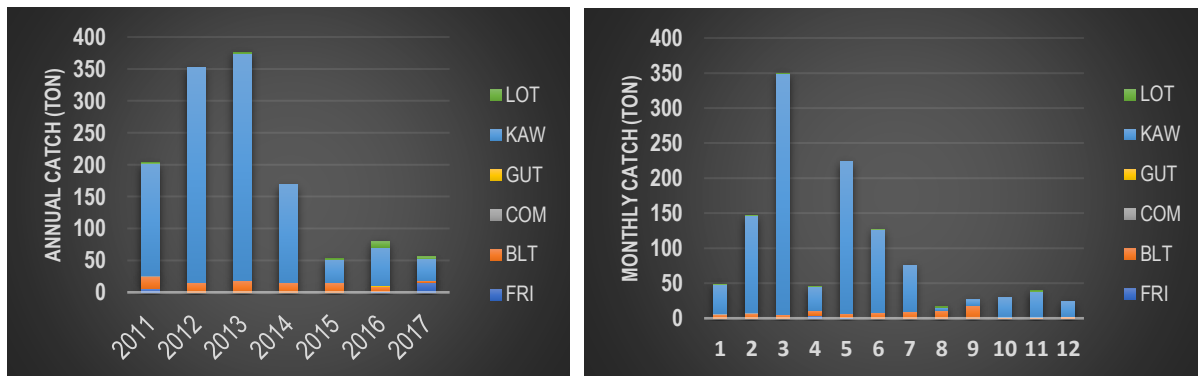


Figure 2: a) left: Evolution of total catch of neritic tuna by specie in Comoros from 2011 to 2017, b) right: seasonally distribution of neritic tuna in Comoros from 2011 to 2017

We consider that 2011 is the first year of data collection after more than seventeen (17) years without data sampling. So that should be not enough experience for the system running. In fact, we based the analysis from 2012 to 2017 thinking that period is quite enough experience of any implicated body in the statistic system. From these six years period we remark that neritic tuna is present all over the year particularly the Kawakawa (*Euthynnus affinis*) which is distributed on all seasons except on August and September is very rare (Figure 2b) and replaced by Bullet tuna (*Auxis rochei*). Neritic tuna is the fourth important component of Comorian fisheries incomes.

### Catch distribution by Island

The distribution by island during these six years period, shows that in Moheli the quantity of neritic tuna catches is very high than the in other two islands with the dominance of Kawakawa (Figure 3b). According to that graph, the main part of neritic tuna catches is from Moheli for these six years period while the national total catch tendency is almost same for Moheli total catch.

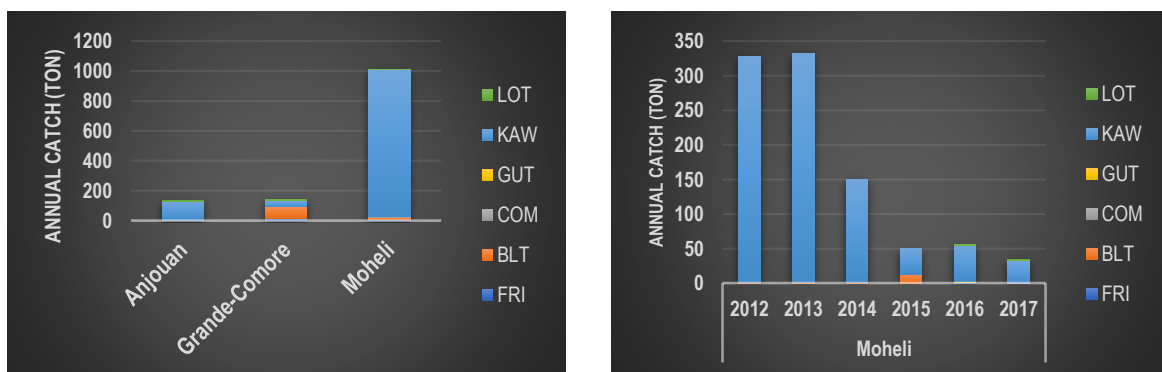


Figure 3: a) left: distribution of neritic tuna by Island from 2012 to 2017, b) right: distribution of neritic tuna in Mohéli from 2012 to 2017

In term of specific diversity, Anjouan (Figure 4b) and Moheli (Figure 3b) have the all six neritic tuna species available in Comoros with dominance of Kawakawa (*Euthynnus affinis*), but Grande-Comore has only five species without Narrow-barred Spanish mackerel (*Scomberomorus commerson*) and the major specie is the bullet tuna (*Auxis rochei*) (Figure 4a).

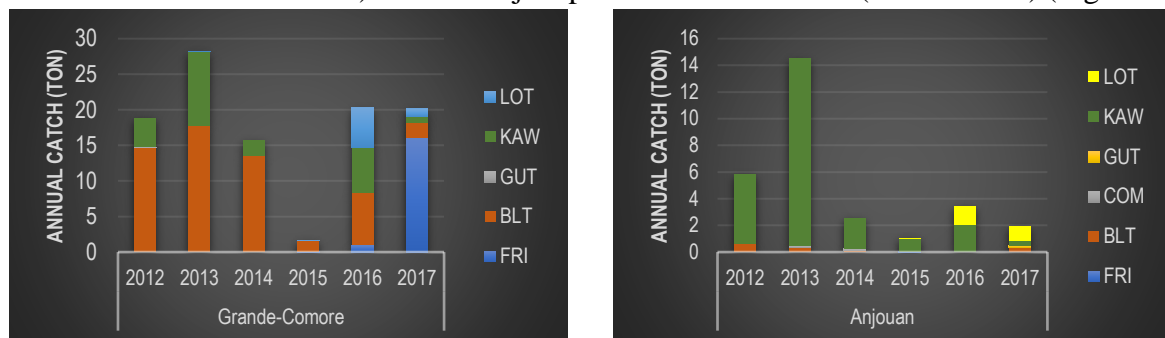


Figure 4: a) left: evolution of annual neritic tuna catches from 2012 to 2017 in Grande-Comore, b) right: evolution of annual neritic tuna catches from 2012 to 2017 in Anjouan.

### Fishing effort

Fishing effort is determined in this case as the number of fishing trip of the whole Category of boat for defined period. Fishing effort is presented in **Error! Reference source not found.5**, as the average of number of trip from different categories of boat.

From 2012 to 2017, the average of fishing effort shows that the main fishing power is made by only two categories of boat which are pirogue in Grande-Comore and Anjouan (Figure 5b) and also 6 m fibber glass boat (G18) particularly in Moheli (Figure 5a**Error! Reference source not found.**).

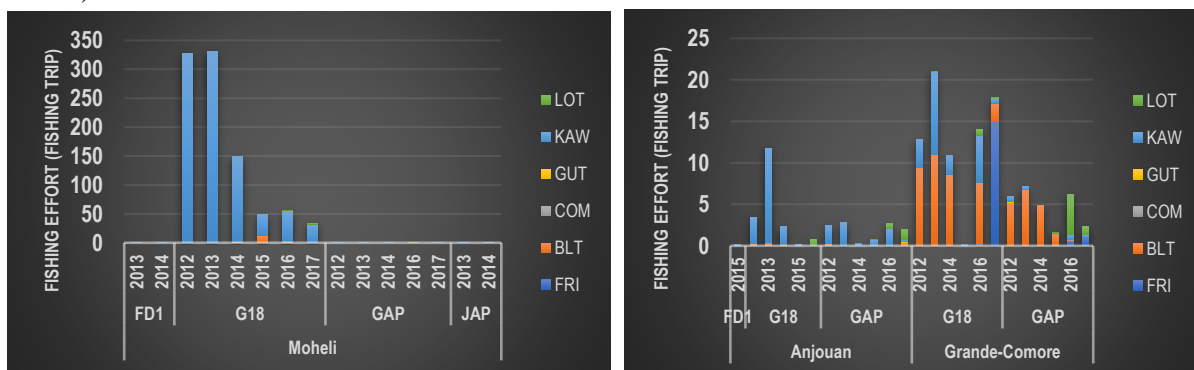


Figure 5: a) left: fishing effort per category of boat from 2012 to 2017 in Moheli, b) right: fishing effort per category of boat from 2012 to 2017 in Moheli and Grande-Comore. FD1: pirogue with engine, GAP: wooden pirogue, G18: fiber glass boat with outboard engine, JAP: fiber glass boat 9 m long.

This fishing effort are not made for only targeting neritic tuna. Fishers target all pelagic species and tuna while it is an artisanal fishery.

During these two years 2012 and 2013, the fishing effort was at the maximum. This fishing effort has the same tendency with the catches of neritic tuna in this period.

The category of fishing boat used principally is the six meters fibber glass in Moheli, then the pirogue is used in neritic tuna fishing in second position in Grande-Comore and Anjouan. Pirogue makes more effort but fibber glass boat fish more quantity.

## DISCUSSIONS

Throughout the difference of catch level between the beginning and the end of these six years period, we can distinguish two major parties of three years each one. The first one shows very high catch level (Figure 6a) and the second is low catch (Figure 6b).

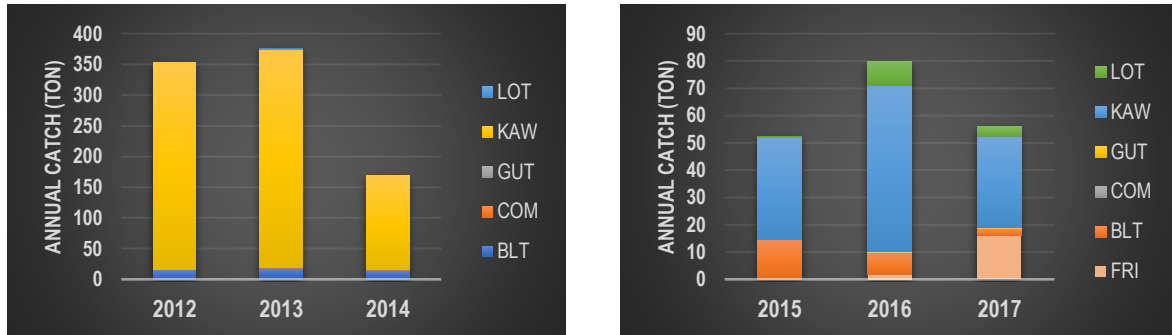


Figure 6: a) left: annual catch of neritic tuna from 2012 to 2014 in Comoros, b) right: annual catch of neritic tuna from 2015 to 2017 in Comoros

In term of seasonality and distribution of catches, a comparison of one year from high-level catch and one year of low-level catch has been made. By this paper, Moheli is taken as the picture of the catch tendency of neritic tuna in Comoros.

Within this comparison, it appeared that neritic diversity is full in Moheli but not in a same year. Those six species of neritic tuna are caught in Moheli in different years.

Furthermore, during 2012, monthly catch level is around 5 to 100 tons and only kawakawa and bullet tuna are seen at landing site (Figure 7a). In 2015, monthly catch level is around 2 to 13 tons for only the same both species of neritic tuna caught (Figure 7b).

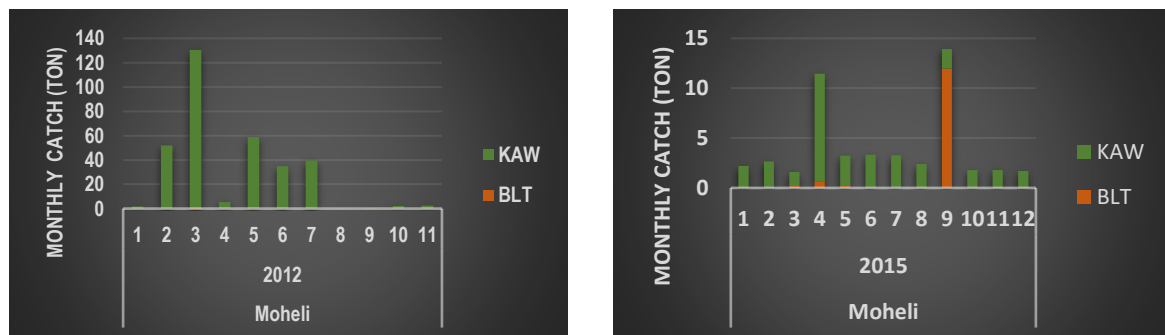


Figure 7: a) left: monthly distribution of neritic tuna in Moheli for 2012, b) right: monthly distribution of neritic tuna during 2015 in Moheli.

That seems a big difference from tendency of 100 tons maximum to 13 maximum, it is almost 87% difference that is significant.

It is very pronounced and should be explained by an environment event. While in the region there was not a known environment event from 2015 up to now which can affect the fisheries, we check another reason.

The statistic system is started on 2011 after longtime in standby. The first time the system running was the first test of all element of system, sampling method, quality of sampler, period and strata. After four years of running of the statistic system, an evaluation has been made and

some improvements are operated to the sampling level in the field. The correction has impacted the data system in reducing the level.

## **CONCLUSION**

Neritic tuna constitutes an important component of commercial species in Comorian local market. The catchability of its species is made both by wooden pirogue and by six meters fibber glass boat.

After our analysis, we constate that the difference of tendency between 2012, 2013, 2014 and 2015, 2016, 2017 is not documented. The one explanation is a sampling approach method. That improvement of the statistic system has impacted it and produce more data before than nowadays. That is the cause of the big difference of catches between these two periods.

All the six species of neritic tuna are available in Comorian water but its distribution by island depends on the characteristic of the fishery, in term of habitat, gear, season and the fishing capacity of the Island.

## **ACKNOWLEDGMENT**

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