REPOBLIKAN'NY MADAGASIKARA

FITIAVANA-TANINDRAZANA-FANDROSOANA

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MINISTERE DES RESSOURCES HALIEUTIQUES ET DE LA PECHE

UNITE STATISTIQUE THONIERE D'ANTSIRANANA (USTA)

Implementation of the monitoring system for small-scale and artisanal fisheries of pelagic fishes in north regions of Madagascar

14TH WORKING PARTY ON DATA COLLECTION AND STATISTICS

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ABSTRACT

In the framework to improve the fishery statistics in Madagascar, the Ministry of Fisheries, through the Unité Statistique Thonière d'Antsiranana, initiated in 2015 a monitoring system for small-scale and artisanal fisheries of pelagic fish in northern Madagascar with two pilot villages. Since 2016, Monitoring has been expanded in other villages where network of investigators have been established in the various potential fishing areas. At each catch landings, an investigator collects tuna catch data and other catches, and also performs sampling. The date of landing, the time at sea, fishing zone, the weight and total number of individuals landed are recorded; and measurements of tuna and tuna like species are conducted.

According to the catch monitoring since the pilot phase in 2015, it can be seen that the tuna season in the northern waters of Madagascar is from June to October. In 2016, catches from small-scale fisheries in these two pilot villages reached 102 tons, including 59 tons of tuna and 43 tons of other catches. The tuna average catch is estimated at 5.3 tons per month. In 2017, total catches in the North of Madagascar reached 3 704 tons including 80 tons of tuna and 4 tons of swordfish from 192 692 landings. Indeed, tuna represents only 2% of total catch for these villages because small-scale and artisanal fishermen still face a challenge, which is the lack of appropriate equipment for catching tuna and tuna like species. In addition, capacity-building for data collectors is still essential to improve the quality of data collected from small-scale and artisanal fisheries.

1. Introduction:

Madagascar is a big island located in the southwest of the Indian Ocean and east of the Mozambique Canal. With it's 5. 000 km of coastline, the fishing sector is one of the sources country's main economic. Tuna fishering alone represents 81 percent of national currency. According to the available statistics, the annual production of tuna in the Malagasy area is estimated at 15 000 tons/year (average 2015 - 2017) and represents about 3% of the catch in the Indian Ocean. Fishing is the most important activity in the coastal cities of Madagascar.

In Madagascar, industrial fishing is carried off the coast mainly by foreign senneurs and palangrier, and by national fleets. Artisanal fisheries and small-scale exploit pelagic species (tuna and tuna like species); and sometimes the nocturnal benthic species. The production of artisanal and small scale is generally destinated to supply the local market and contribute to the food resource of the population in proteins.

For decades, there has been no systematic effort to collect scientific data from any category of fisheries in the Malagasy waters; especially artisanal fisherie and small-scale. Indeed, the geographical extension and complexity of these fisheries, that do not primarily target on IOTC species, associated with the limitations of financial for the implementation of the sampling system, were alleged to be the main causes affecting the effectiveness of data collection.

To improve the statistics of Fishing in Madagascar, the Ministry of Fisheries, through the Unité Statistique Thonière d'Antsiranana, initiated in 2015 a monitoring systems for small-scale and artisanal fisherie of pelagic fish in northern Madagascar with two (2) pilot villages, Ramena and Ambodivahibe. The following year, the follow-up was extended to other villages where network of investigators were established in the various sites of potential landings.

In the present paper, we will give an overview of the development of the data collection system in northern Madagascar. A big step to establish a specific program to improve the level of national data collection and to improve the report provides to IOTC.

2. Material and methods :
2.1. Study area :

The choice of the site depends on its importance in the production of tuna and tuna like-species. To reach the choice of sites, it is necessary to collect information on the productivity of the fishing village from the regional fishing services or other responsible. Then, the proposed villages are raided to carry out preliminary investigations. In investigations, informations are collected, such as the number of active fishermen in the village, the number of vessels, information on fishing gear and techniques, the composition and seasonality of tuna capture, the product marketing circuit, …

In 2015, 2 sites were chosen in the proximity of the city of Diégo-Suarez to initiate the program to collect data from the artisanal fisherie and the small-scale.
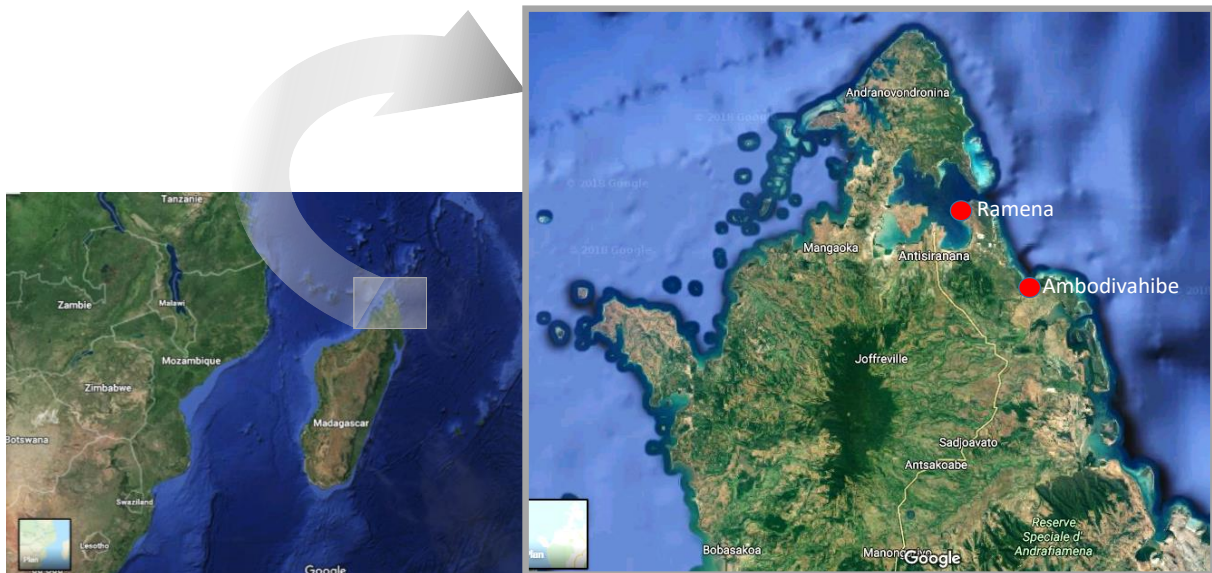

Figure 1 : 2 sites pilot initiated in 2015

From 2016, many sites are added to increase sampling coverage on major landings in northern Madagascar. 19 sites were identified, spread across four regions north of Madagascar, including 7 sites in the Boeny region, 1 in the Sofia region, 1 in the Analanjirofo region, and 9 others in the Diana region.
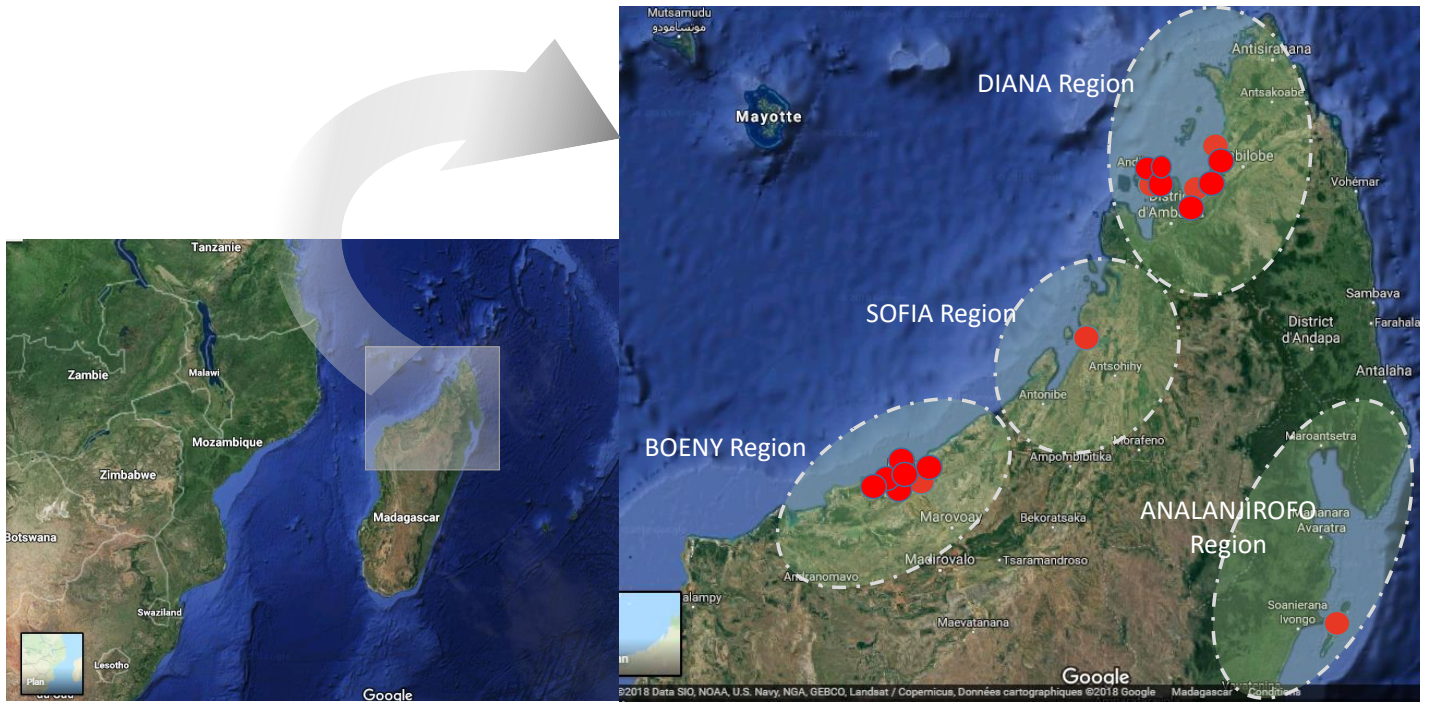
Figure 2 : others sites added from 2016

The number of sites chosen varies according to the region as identified the sites during the preliminary investigation and according to the importance of production of tuna and related species.

2.2. Catch landings :

In order to collect data, investigators are recruited to perform a periodic sampling. The investigator chosen may be a fisherman's wife, a member of the fisherman's association, a fisherman's child or a part of the village community, to facilitate his introduction to fishermen and his free access to the production and sampling. It collects information on fishing capture and effort, and performs sampling of size frequency at landing. Indeed, the date of landing, the time at sea, the fishing area, the composition and weight of the capture, the number and size of the sampled individuals (in the number of 5 or 20 depending on the capture), the gears used and the number of crews in the same boat are recorded. The data registration forms are presented in table 1 and figure 3. Note that before being active, investigators are trained on the methodology adopted for the landing follow-up.

Table 1 : Monitoring for small-scale form

Date	Heure de départ	Heure d'arrivée	Zone de pêche	Espèce	Poids	Nombre	Taille	Nombre d'équipage	Engins	Poids total

FICHE DE CAPTURE DE PECHE ARTISANALE NOSY-BE

BATEAU	DATE et HEURE DE DEPART	DATE et HEURE D'ARRIVEE	NOMBRE D'EQUIPAGE	ZONE DE PECHE	ESPECES	POIDS (kg)	NOMBRE	TAILLE (cm)	POIDS TOTAL (Kg)

Figure 3 : Monitoring for artisanal fisherie form

3. Results and discussion :
3.1 Results of preliminary investigations :

Prior to the establishment of network of investigators, preliminary investigations were conducted on the proposed sites, to know the importance of each site in the tuna production. Focus groups are carried out with the fishermen's associations, the village leader and the other community members of the village (CLB, VOI, etc.). Preliminary investigations have been conducted in 29 fishing villages in 8 districts, Antsiranana II, Ambilobe, Ambanja, Nosy-Be, Analalava, Sainte-Marie, Majunga I and Majunga II (cf. Table 2).

Information is collected on:

-The number of boats in each village

-The number of fishermen

-The tuna catch season (generaly mackerel tuna) from June to October

-The type of boat: small boat with engine or without engine

-Fishing gear used: longline, net, line, harpoon gun

-and the product price which varies from 3,000 ar to 5,000 ar per kilo, depending on the state of the road.

Figure 4 : Types of boat of small-scale and atisanal fisherie

(a), (c) : boat without engine ; (b) : boat with outboard engine

A total of 19 landing sites were selected for the implementation of the small-scale fisheries and artisanal fisheries data collection programme in northern Madagascar in 2017.

Table 2 : Number of pilot sites for data collection

Region	District	Number of sites proposed	Number of sites selected	Number of investigators
Sofia	Analalava	4	2	4
Diana	Ambanja	5	3	6
Diana	Ambilobe	5	2	4
Boeny	Majunga I, II	7	7	14
Diana	Nosy-Be	5	4	4
Analanjirofo	Sainte-Marie	3	1	1
Total		**29**	**19**	**33**

3.2   Data collection of small-scale and artisanal fisherie :

Investigators collect two types of information, information about the craft and the fishing gear used, and the information on the captured species.

Figure 5 : Landing for small-scale and artisanal fisheries

Figure 6 : Sample individual of tuna and tuna like-species

3.2.1. Capture and effort of small-scale fisherie in the Diana region:

In the Diana region, the total capture is 3080 tons, comes from 148 280 landings. The estimated average CPUE is 18 kg/pirogue. Figure 7 represents the distribution of capture per district sampled in each village. The district of Ambilobe has the largest capture recorded, followed by Nosy-Be. Similarly to the CPUE for each district, Ambilobe has largest value, and the district of Diégo-Suarez the lowest value.
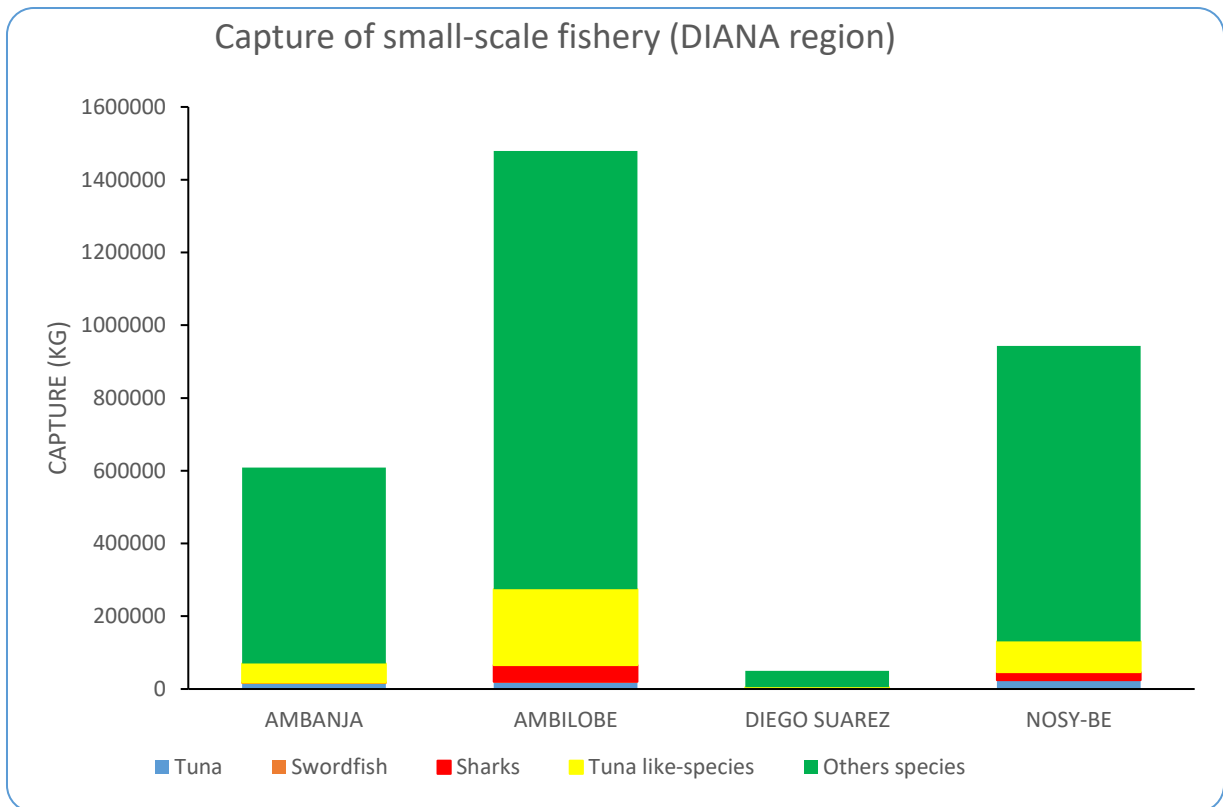
Figure 7 : Capture of small-scale in Diana Region
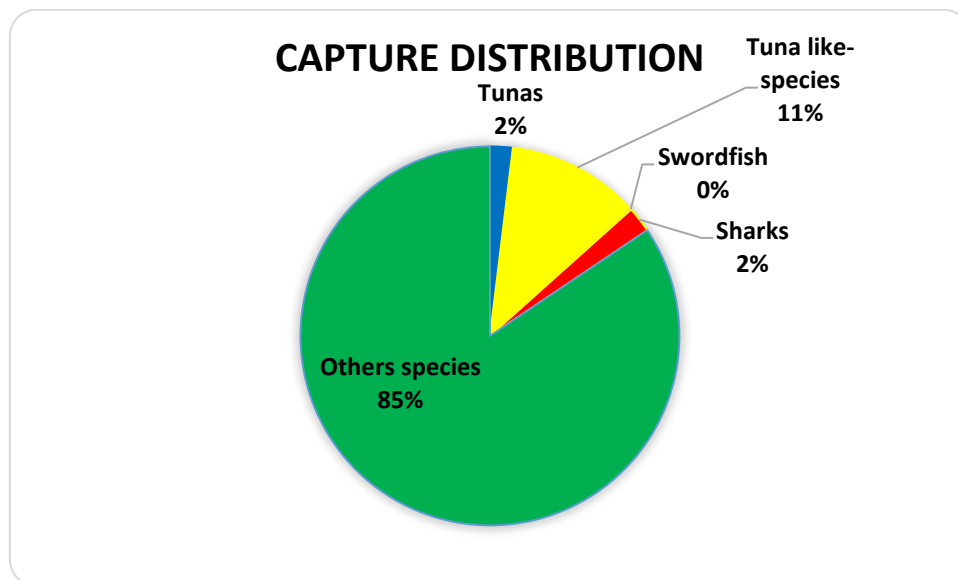
Figure 8 : Capture distribution in Diana region

The capture in the Diana region is dominated by the other species (85%), pelagic and recurrent fish. Thonids and species related to tuna are only 15 percent; including 2 percent of tuna, 11 percent tuna like-species and 2 percent shark. The capture of tuna and tuna like-species is 462 tons.

<p align="center">**Table 3** : Diana region CPUE summary</p>

	CPUE (kg/boat)
AMBILOBE	26
AMBANJA	21
NOSY-BE	17
DIEGO SUAREZ	10

3.2.2. Capture and effort of small-scale fisherie in the other region (Sofia, Boeny, Analanjirofo) in 2017 :
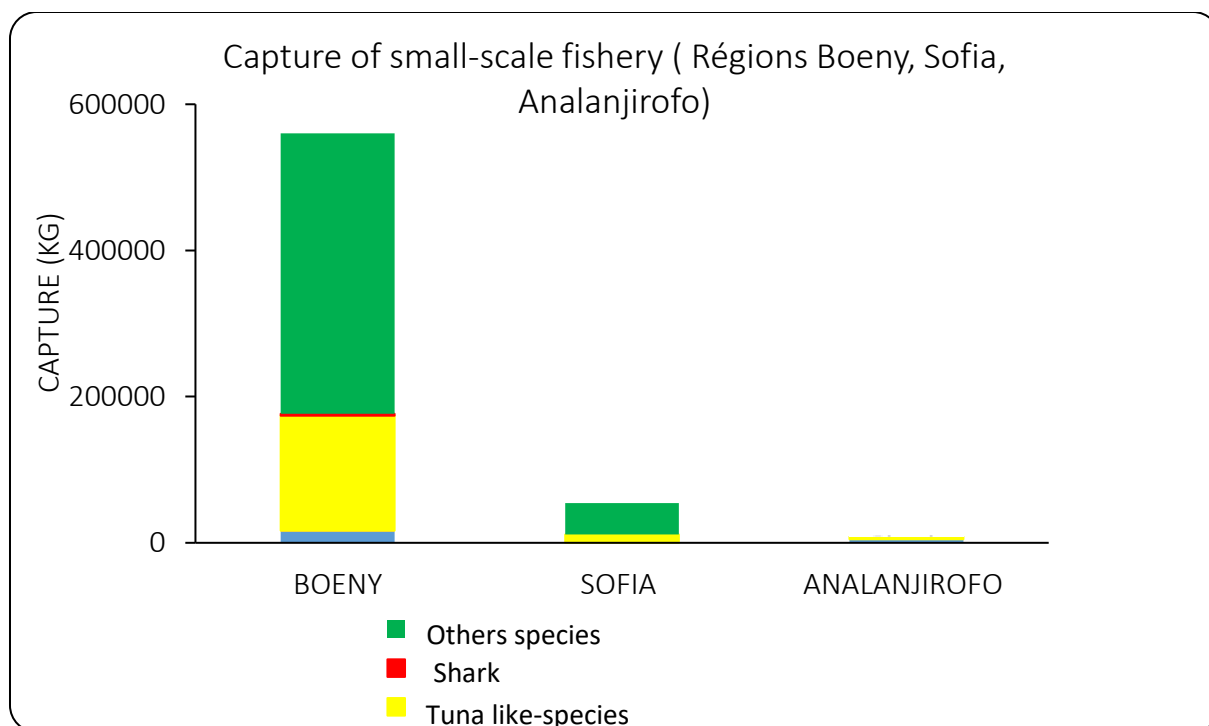

Figure 9 : Capture of small-scale fisherie in 2017 (Region Sofia, Boeny, Analanjirofo)

For the other regions, the total recorded capture is 624 tons obtained from 44 412 landings. The average CPUE is about 15 kg/boat. The region Boeny marks the largest capture value and the region Analanjirofo the lowest catch. This can be explained by the number of intervention sites in each region. Indeed, the Boeny region has more intervention sites (7 sites) and Analanjirofo only one site in 2017. As for the CPUE by each region, the Sofia region has the highest value in the CPUE, which is the order of 17 kg/boat, and the region Boeny and Analanjirofo have the same value (14 kg/boat).
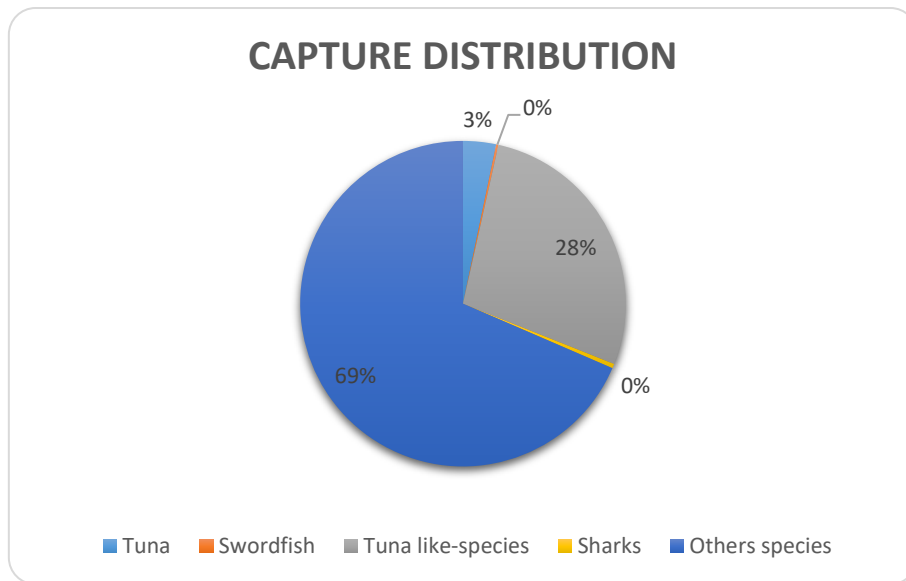
Figure 10 : Capture distribution of the regions Sofia, Boeny, and Analanjirofo

Tuna and tuna like-species are about 30 percent of the Boeny, Sofia, and the Analanjirofo region. The other species represent 69 percent, which is the order of 427 tons; and the 3-ton shark is a small percentage.

Table 4 : Capture distribution (%)

Region	Tunas	Swordfish	Tuna like species	Shark	Others species
BOENY	3	0	28	1	68
SOFIA	0	0	21	0	79
ANALANJIROFO	53	0	38	0	9

In the region of Analanjirofo, the capture of tuna and tuna like-species is the total of the catch, which is 91% of the total capture. But for the Boeny region and Sofia, it is 32% and 21%. Capture is more meaningful in the Analanjirofo region than in the other regions.

3.2.3. Capture of artisanal fishery in 2017 (Nosy-Be) :
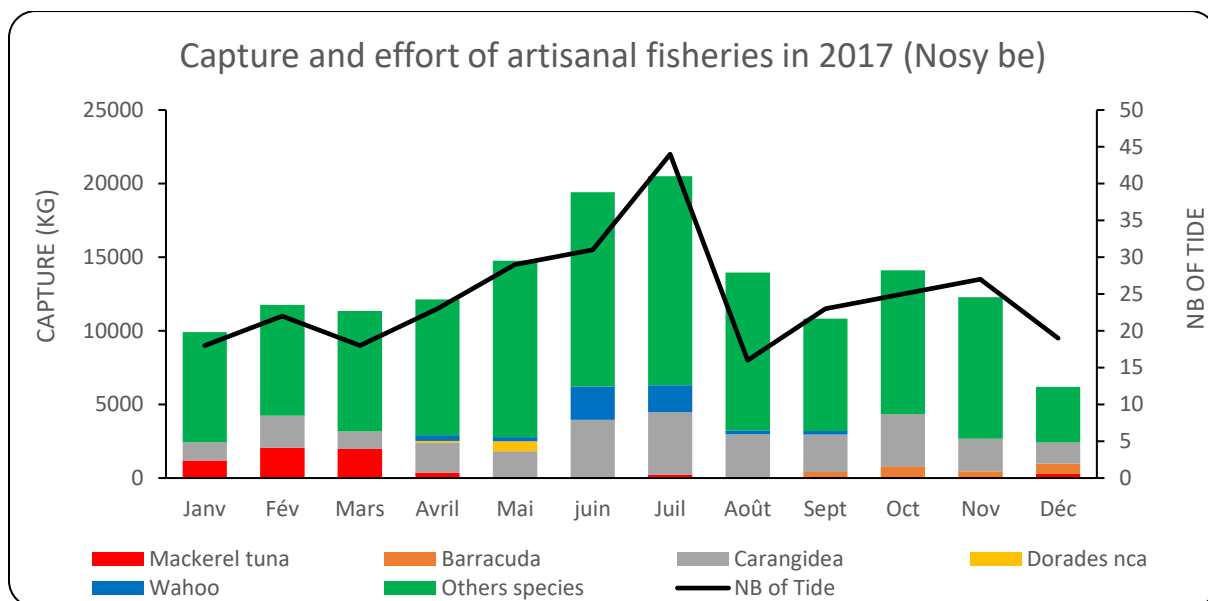

Figure 11 : Capture and effort of atisanal fishery 2017 in Nosy-Be

The total capture of the artisanal fishing of Nosy-Be is 157 tons from 295 landings. Capture is maximum in the month of June and July (figure 11), and lower in December. The estimated average CPUE is 532 kg/tide.
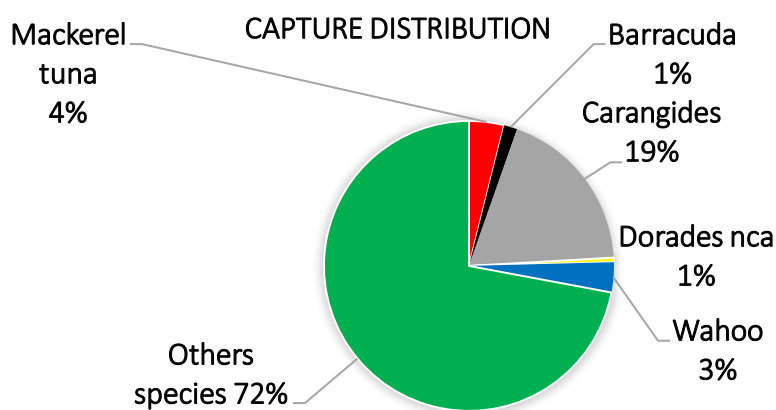

Figure 12 : Capture distribution of artisanal fishery 2017

The capture of tuna and the species is 28% of the annual catch, 44 tons of the total capture. The other species, 72 percent, are 113 tons.

Table 5 : Artisanal fishery summary

Tunas	Tuna like-species	Others species	**TOTAL (T)**	NB of tide	CPUE (kg/tide)	Period
6	38	113	**157**	295	532	January - December

Table 6 : Small-scale fishery summary

		CAPTURE (T)						CPUE (kg/boat)	Period
		Tuna	Tuna like-species	Swordfish	Sharks	Other species	**TOTAL**		
DIANA	AMBILOBE	18	208	2	46	1 205	1 479	26	
	AMBANJA	17	53	0	0	538	609	21	
	NOSY BE	24	85	0	22	812	943	17	Jan-Dec
	ANTSIRANANA	0	5	0		45	50	10	
Total DIANA		59	350	3	68	2 600	**3 080**	21	
BOENY		15	157	1	3	384	**560**	14	
SOFIA		0	11	0	0	43	**54**	17	Aug-Dec
ANALANJIROFO		5	4	0	0	1	**9**	14	
TOTAL		**80**	**522**	**4**	**71**	**3 028**	**3 704**		

The results obtained for the small-scale fisheries in the area of Diana and the artisanal fisheries, is recorded during the period of January 2017 in December 2017. As for the data of the small-scale fishery in Boeny region, Sofia and Analanjirofo are obtained during the period of the month from August 2017 to December 2017. This is explained by geographic extension of Madagascar, which combines logistical and financial limitations, hinders the establishment of network of investigators. The setting up of the investigators took place in the second half of the year 2017.

3.3   Database : USTA's application

USTA has developed software to store and process data from any fisheries category (Industrial, Small-scale and artisanal fisheries) in the Madagascar area. It is an application that can store seinners logs, offshore floats and palangriers both international and national. The software facilitates the treatment of the data from the artisanal fishery and small-scale fishery, which is not always easy to achieve.
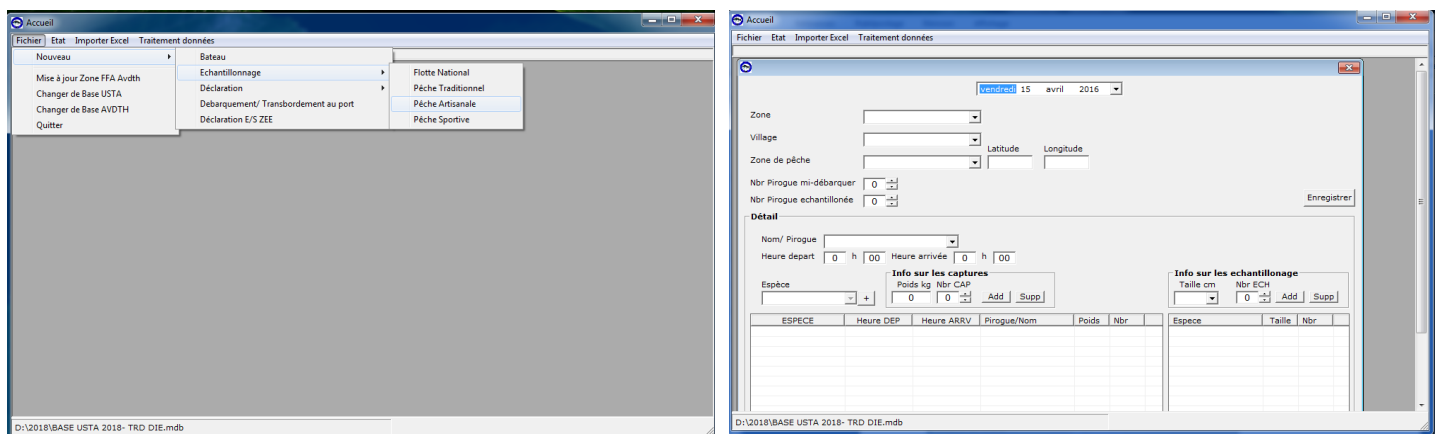

Figure 13 : Software interface of USTA application

Currently, the technicians of the USTA work on improving data collection by introducing the USTA application into a tablet to facilitate the collection of data and the return of this data.

4. Conclusion :

The Malagasy Fisheries Ministry initiated the program for the collection of the data for the artisanal and small-scale fisheries in 2015. A network of investigators has since been established, which will cover the pilot sites of the northern part of Madagascar. Preliminary investigations have identified these sites, and recruited investigators to collect the data.

The results showed that the capture of the small-scale fishery is estimated at 3080 tons per year in the Diana region, and 3704 in the three regions (Boeny, Sofia and Analanjirofo) from 192,692 landings. The CPUE varies 15 kg/boat to 18 kg/boat, and that the district of Ambilobe has the most CPUE (26 kg/boat). The capture of tuna and related species is 15% to 30% of the catch in general. But the Analanjirofo region has a high percentage, almost the total catch, or about 91%. The capture of the artisanal fishing of Nosy-Be is 157 tons in 2017, and the tuna and tuna-like species are 28%, or 44 tonnes of the year 2017.

Finally, to store, process and sort these data, USTA has implemented software. A software that can process all data from different categories of fishing. And soon, this application will be introduced in tablets to facilitate collection of data, which will be stored in the database of the USTA.