

# Economic Impact of Decrease in the Volume of Catch of Fisheries Products: Case of Small-Scale Maritime Fishing Households in the Analalava District

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## ABSTRACT

In certain localities, small - scale fishing occupy an important place in the economic life of the populations. The volume of catches of fishing products has continued to decrease over the past five years and several factors or phenomena constitutes the cause. This research consists of highlighting the real effects of the drop in catch volumes in the economic field. A socio-economic survey was carried out among fishing households in the urban commune of Analalava , rural commune of Ambarijeby and Antonibe. The approach, both qualitative and quantitative, was limited to documentary research, observation, interviews and questionnaire surveys of small fishermen, fishmongers and collectors. The information obtained was processed statistically, including, among other things, the analysis of speeches and the analysis of the socio-economic characteristics of fishing households. The results of the investigations showed a gradual decline in fishing activity and its economic profitability. Among men, income and savings from fishing fell by around 50 to 70%. For women, this drop is around 80 to 95%. The decline in fishing activity has led to a reduction in the security of others and homes, the fragility of fishing communities, loss of jobs for those who benefit from fishing and the vulnerability of women and children are accentuated.

**Keywords:** Small- scale fishing, impact, decline, socio-economic, savings

## Famintinana

Any amin'ny toerana sasany, ny jono madinika day half past toerana lehibe eo amin'ny fiainan'ny mponina . Nihena hatrany ny habetsahan'ny Vocabulary azo tamin'ny jono tattoo anatin'ny dim taona ary anton - javatra na tranga maro no manhating izany. Ity fikarohana ity dia ahitana ny fanasongadinana ny hold Vocabulary ny fihenana'ny habetsahan'ny trondro eo amin'ny sehatry ny toekarena . Nisy ny fanadihadiana ara- tsosialy sy ara- toekarena natao tamin'ireo tokantrano mpanjono ao amin'ny kaominina and- drenivohitra Analalava, kaominina ambanivohitra Ambarijeby ary Antonibe . Ny fomba fiasa , na hatsarany na habetsahany , dia voafetra ho amin'ny fikarohana fanadihadiana , fandinihana, dinidinika ary fanadihadiana momba ny mpanjono madinika , mpivarotra trondro ary mpanangona . Ny vaovao azo day nokarakaraina tamin'ny statistics , statistics ny famakafakana ny lahateny sy ny famakafakana ny toetra ara- tsosialy sy ara- toekarena eo amin'ny tokantrano mpanjono . Ny Vocabulary ny fanadihadiana day nahitana fihenana tsikelikely ny asa jono sy ny tombony ara- toekarena . Teo amin'ny lehilahy day nidina manodidina ny 50 hatramin'ny 70% eo ho eo and fly noon sy ny tahiry azo avy amin'ny jono . Ho an'ny vehivavy, manodidina ny 80 ka hatramin'ny 95% io fidinana io . Ny fihenana'ny asa fanjonoana dia nitarika ho amin'ny fihenana'ny fiarovana ny hafa sy ny tokantrano , ny fahamaroan'ny vondrom - piarahamonina mpanjono , ny fahaverezan'ny asa ho an'ireo izay misitraka ny jono ary ny faharefoan'ny vehivavy sy ny ankizy .

Teny fanalahidy : jono madinika , fiatraikany , fihenana , aratsosialy sy ara- toekarena, fitsitsiana

## INTRODUCTION

Fisheries are an important source of food for humanity, providing employment and economic benefits to those who engage in them. The global marine catch totalled 81.2 million tonnes in 2017 and 79.3 million tonnes in 2019, representing a decline of almost two million tonnes (FAO, 2020). The little one fishing maritime, through services ecosystemic rendered to households fishermen, is a factor significant contribution to poverty reduction in the areas where she is considered as first source of livelihood (Martin et al. 2013). According to FAO statistics (2020), small-scale fisheries support more than 100 million people worldwide, but most small-scale fishers are becoming poorer year by year and 95% of the catch comes from developing countries, 90% of which is consumed by themselves (Bartley et al. 2015). Although small-scale offshore and coastal fisheries play an important role in the rural economy, more than 70% of small-scale fishers live in extreme poverty, surviving on less than \$1 per day (UNDP 2015, Horning 2013). Fish in particular is one of the important resources in the Sofia region and contributes to the income of several thousand households. In recent years, there has been a decline in catches, a harvest of small (immature) fish following poor practices leading to the scarcity of some previously important species in catches. This decline in catch creates economic instability for fishermen and food security for populations in the region. From the above, the analysis of the impacts of the decline in catch of fishery products on the study area remains unclear and without a thorough study while fishing households in the region are becoming poorer day by day. The main objective of this article is to understand the economic impacts of the decline in catch on fishing households. The research was carried out in the District of Analalava, **Sofia Region**.<sup>1</sup>

## MATERIALS AND METHODS

The research was carried out in the District of Analalava, Sofia Region, Madagascar. These intervention areas are particularly located at the geographical coordinates 19°25'60" S and 47°21'0". More precisely in the *fokontany* of Befintina, Ambalahonko, Anjialava, Fongony and in the Rural Commune of Antonibe, more particularly in the *fokontany* of Ampasibe, Komazara, Antsanifera and the rural commune of Ambarijeby especially in the *fokontany* of Ampasindava and Ambolitsily. The choice of our research site is located in these nine (9) *fokontany* and they were justified by their potential in fishery resources. The choice of individuals within these samples was made randomly. Interviews were first conducted with local officials such as the Mayor of the rural commune, the Fokontany Presidents, the heads of fishermen's associations and in order to identify the actors of small-scale fishing in the region. 197 fishermen including 147 men and 50 women were randomly selected for surveys and observations. The fishermen were distributed in the three communes, 83 in the urban commune of Analalava, 57 in the rural commune of Antonibe and 57 in the rural commune of Ambarijeby. 10 fishmongers, 05 local collectors were also the subject of the survey. The method of analysis in this communication to participant observation and to the realization of directive or more or less open interviews is essential. Before starting the field research, several reference works in sociology and economics were consulted to assimilate the necessary knowledge around the subject. In order to obtain objective and relevant information, field trips took place in May 2019, April 2022; October 2023. Note that participant observation is an inductive approach which consisted of observing the realities on the ground. The interview made it possible to collect some ideas and exchange thoughts with **traditional marine fishermen**<sup>2</sup> and they provided very useful information and their expectations with more precision. The surveys concerned the economic impact of the drop in catches, including the collection of information concerning the volume of catches, the income of fishing households, socio-economic characteristics, economic profitability of the activity, and the savings situation of fishing households. The information obtained will be analyzed and processed in Excel.

## RESULTS

Among the fishermen studied on table (1), 65.48% are adult men, 9.14% are men over 55 years old and

<sup>1</sup>**Sofia Region** is one of the 24 regions of Madagascar, located in the northwestern part of the country. It is part of the **Mahajanga Province** and its capital is **Antsohihy**.

<sup>2</sup>**Traditional marine fishermen** play a vital role in the economy and food security of coastal communities in Madagascar and other parts of the world.

25.38% are women. The surveys show the existence of more and more single-parent households headed by women. Among the women fishermen, 85% of them are separated, widowed or single. In addition, customary marriage which constituted the completed form of the socialization process of the members of society has gradually disappeared in favor of free unions. More than 50% to 60% of fishermen are uneducated, 25% to 30% on average complete primary school, 10% to 15% complete secondary school. The main activity is fishing, their spouse sometimes takes care of livestock or other activities such as trade. Fishing equipment is often in poor condition and more than 80% are non-members of the association especially adult women and men. Average number of children in charge for fishing households is 4 or 5 children.

In light of Table 2, old men generally use the pot or crab trap to target shrimp and crabs; adult men use the net or practice line fishing and target large fish. Women use the " *sihitry* " or cast net to target chevaque or " *varilava* ". Fishing is essentially based on three main types of fishing gear (the mosquito net, the line or net and the pot). With regard to the mosquito net, a fishing unit is made up of an average of two or four people while the other fishing gear uses an average of 1 or 2 people per fishing unit. It should also be noted that the number of people per fishing unit directly affects the size of the canoe. Fishing nets differ significantly in length from 50 m to 100 m on average. Regarding the number of fishing trips per week, it appears that 5.3 days is the weekly average without distinguishing the fishing gear. During a fishing trip, a net, depending on whether it is active or passive, can be cast one or more times. Sleeping nets are generally placed only once during a fishing day with the exception of monofilament nets, while active nets are cast several times. For all fishing techniques, activities begin around 4 to 5 a.m., an average of 8 hours of fishing are generally completed during a 24-hour cycle and with an average of 5.3 trips during a week. Therefore, a unit of fishing effort performs an average of 42.4 hours of work per week and 196.6 hours per month.

According to the interview results, fishing activities are higher in March, April followed by August and November with a high season designation according to the fishermen and catches become sporadic the rest of the year. The analysis of Table 3 indicates that the fishing catch in 2019, on average during high season in the urban commune of Analalava is 27.5 kg against 35.4 kg for the rural commune of Ambarijeby and 41.2 kg for the rural commune of Antonibe . For the low season, 23.5 for the urban commune of Analalava , 29.7 for the rural commune of Ambarijeby and 34.5 for the rural commune of Antonibe . In 2023, the results are largely different, the catch deteriorates, in the urban commune of Analalava during high season, 13.5 kg against 19.2 kg for rural commune of Ambarijeby and 21.3 kg for rural commune of Antonibe . For the low season, 9.2 kg for the urban commune of Analalava , 13.4 kg for the rural commune of Ambarijeby and 17.8 kg for the rural commune of Antonibe . The percentage of the decrease from 2019 to 2023 is 48.32% for high season against 54.71% for low season.

Analysis of Table 4, during the good catch period, the fish caught are sold at a price around 4,000 Ar to 6,000 Ar per kg. It is in the rural commune of Antonibe and Ambarijeby that they are generally sold at a lower price. When fish becomes scarce (drop in catch), the price increases, especially in the city of Analalava . Some fished products are sold at a low price even in the low season such as chevaque and Varilava and sometimes shrimp are sold cheaply. Despite the large variation in catches per fishing unit (fishing team), fishery products remain the main food in the Analalava region . After collection, a fisherman distributes their product on average as follows: 10% of the collection is intended for the house , 70% is sold to the fishmonger and 20% is dried. This means that 90% of the collection is intended for sale which constitutes their income. Comparing the average individual income of fishermen according to the fishing gear used shows a significant difference. The analysis of Figure 1 shows that the income of adult men is much higher compared to old men and women fishermen. The analysis shows the decreasing trend of income for each social category. If we compare from 2019 to 2023, the income decline can reach less than 110%. The average individual income obtained by the crew in good times in 2023 is 459,000 Ar per month for adult men, 312,000 Ar for Old Men and 119,000 Ar for women. The causes of the decrease in catch are attributed according to most fishermen to the migration of fishermen (65.6%), the emergence of bad fishing gear and techniques (24.4%), and (10%) to the non-application of fishing regulations resulting in the occupation of spawning areas, the destruction of habitats, the fishing of immature fish , **illegal fishing** <sup>3</sup>.

<sup>3</sup>**Illegal, unreported and unregulated (IUU) fishing** poses a major threat to the sustainability of fisheries resources and the economy of fishing-dependent communities.

In Table 5, the expenses in a household in the study area are generally food, family business, health and education of children, repair of equipment. Among men there are what are called trivial expenses such as alcohol, women ... Taking responsibility within a household is not the same, for example men contribute 30% to 40% on food while women contribute 90% of their income on food. Men prefer to spend their income on trivial expenses, i.e. 30% to 40% of their income. Social and family affairs and education and health at around 10% to 15%. Repair of equipment is imperative as a fixed household expense at around 20% to 30%. For Figure 2, Despite their age and fishing technique used, old men save much more than adult men and women. There is a clear deterioration on the histogram concerning the savings of fishermen. In 2019 an old man can save on average up to 67,600 Ar per month against 31,200 Ar in 2023. For adult men, in 2019 save approximately 45,560 Ar per month against 18,760 Ar per month in 2023. Women save less.

Table 6 shows the economic profitability of fishermen according to their social categories, the income after deduction of variable charges, fixed charges and other charges, the old men can record 13,600 Ar per month on average, clearly positive. The adult man can provide 7,870 Ar of result. For women the result is in deficit - 6,930 Ar per month or in shortfall.

Figure 3 shows the variation in the average number for the three municipalities studied of direct and indirect fishing jobs. A sharp decrease in the number of direct and indirect fishing jobs was noted. In 2019 there were 60 fishmongers in the three municipalities, in 2023 there were only 17. Fishing gear repairers decreased to 35 in 2019 compared to 21 in 2023. Most of the small hotels had to close, as there were 34 in 2019 compared to 16 in 2023.

**Table 1: Socio-economic characteristics of fishermen**

Category	1	2	3
<b>Name</b>	Old Fisherman Man	Adult Man Fishermen	Fisherwomen
<b>Staff (Number) 197</b>	18	129	50
<b>Workforce (%) 100%</b>	9.14%	65.48%	25.38%
<b>Marital status</b>	(140) Cohabitation / 57 (Separated, widowed, single)		
<b>Education level of head of household</b>	55% Uneducated, 25% complete primary/10% complete secondary	45% Uneducated, 30% completed primary/10% completed secondary	65% Uneducated, 25% complete primary/10% complete secondary
<b>Main activities of the head of household</b>	Fisherman	Fisherman	Fisherman
<b>Secondary activities of the head of household</b>	Daily	Breeder / Growers	Shops
<b>Activities of the spouse</b>	Fisherman/trade	Fisherman / Breeder	Fisherman / Trade
<b>fishing equipment and materials</b>	Average majority , and bad for some households	Majority means	Average majority, and bad for some households
<b>Association Members</b>	20% non-members, 80% members	75% non-members, 25% members	35% non-members, 65% members
<b>Number of Dependent Children</b>	4 to 7 Children	3 to 5 Children	4 to 7 Children
<b>Standard of living</b>	Pretty good	Average	Bad

Source: Author, April 2024

**Table 2: Distribution of fishermen/fishing techniques used and targeted product**

Social Category	Machines used	Target product	Fishing frequencies	Time of a capture	Number of team members
Old Man	Crab trap or trap ( Treko )	Crabs, shrimps	5 days / week	6h /day	2
Adult man	Net [20mm- 30mm] ; Line and hook	Fish in general, shrimp, lobster	5 to 6 Days / Weeks	10h/day	2 or 4
Women	Mosquito net, Sparrowhawk ( Sihitry	Chevaqune , Eel ( Varilava )	5 days / week	8h/day	2 or 4

Source : Auteur, Avril 2024

**Table 3: Quantity of catch in kg/day in average high/low season from 2019 to 2023**

	2019		2020		2021		2022		2023		Percentage of the decrease from 2019 to 2023	
	H/S	B/S	H/S	B/S	H/S	B/S	H/S	B/S	H/S	B/S	H/S	B/S
Analalava city center	27.5	23.5	24.5	20.5	21	17	18.5	14	13.5	9	50.91%	61.70%
Ambarijeby	35	29.5	31.5	26	28	23.5	23	17	19	13	45.71%	55.93%
Antonibe	41	34.5	37	31.5	33	28.5	26	22.5	21.5	17	47.56%	50.72%

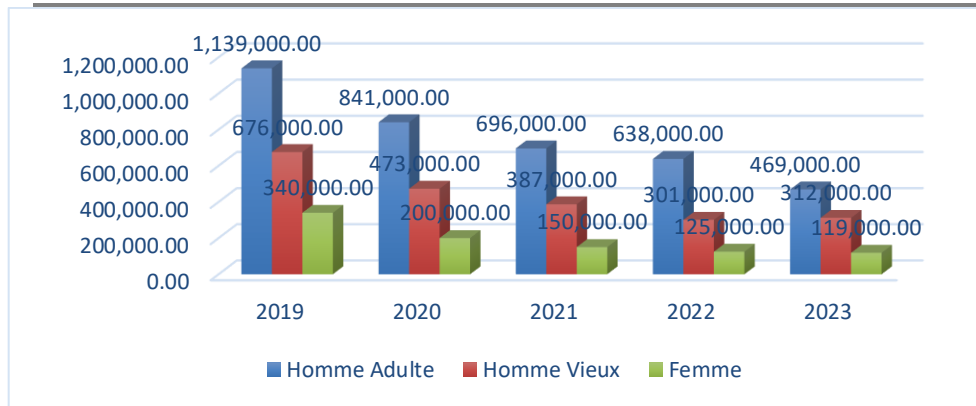
Source: Author, April 2024

**Table 4: Price in Ariary /kg of the types of species captured**

Species Captured	Analalava Municipality	Urban	Ambarijeby commune	rural	Rural Antonibe	municipality
Crabs	4,500.00		3,500.00		3,500.00	
Shrimp	6,000.00		4,000.00		4,000.00	
Lobsters	12,000.00		8,000.00		8,000.00	
Tridents	5,000.00		3,500.00		3,500.00	
Captain	4,000.00		3,000.00		3,000.00	
Sardine	3,000.00		2,500.00		2,500.00	
Eel ( Varilava )	1,500.00		1,500.00		1,500.00	
Kikon , Eel	10,000.00		8,000.00		8,000.00	
Horse	1,500.00		1,500.00		1,500.00	

Author, April 2024





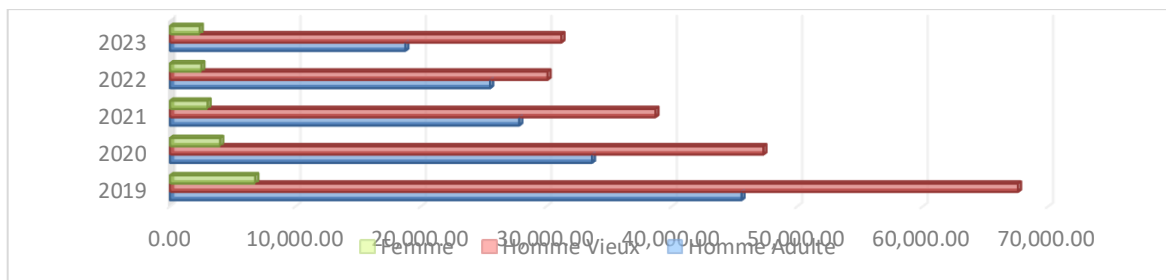
**Figure 1: Average monthly income of fishermen from 2019 to 2023**

Source: Author, April 2024

**Table 5: Distribution of expenditure in percentage according to the social categories of fishermen**

Types of Expenses	old man	Adult man	Women
Food	40%	35%	90%
Social or Family Affairs	10%	5%	5%
Education and Health	5%	5%	2%
Fishing equipment repair	20%	20%	3%
Unproductive Charges	25%	35%	0%
Total	100%	100%	100%

Source: Author, April 2024



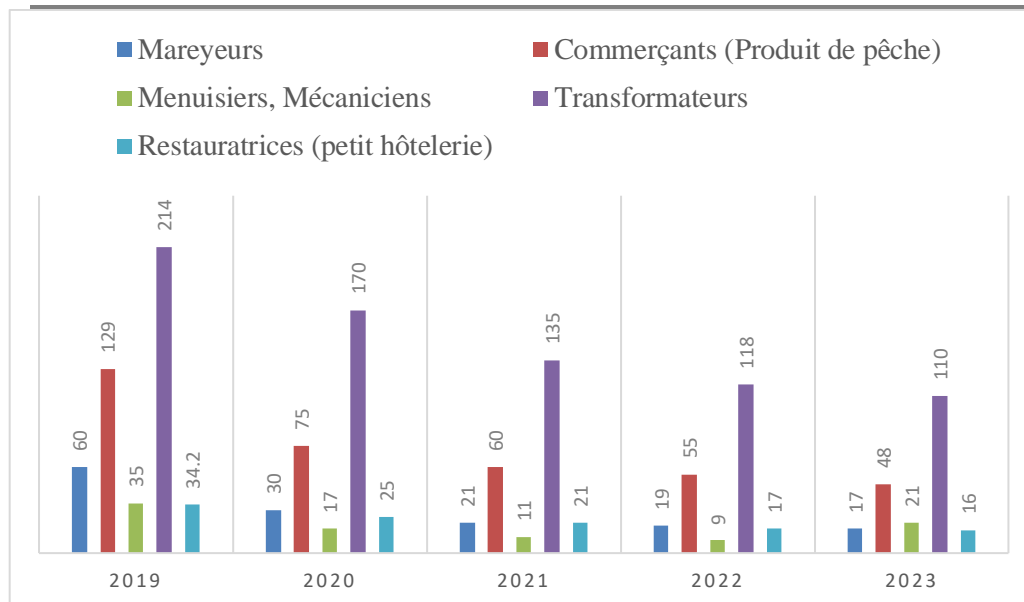
**Figure 2: Distribution of savings according to the social categories of fishermen**

Source: Author, April 2024

**Table 6: Economic profitability of fishermen according to their social categories**

	Old Man	Adult man	Women
Monthly Income	312,000.00	469,000.00	119,000.00
Variable charge	124,800.00	187,600.00	47,600.00
Fixed Charge	80,000.00	100,000.00	70,000.00
Other charges	93,600.00	173,530.00	8,330.00
Result	13,600.00	7,870.00	-6,930.00

Source: Author, April 2024



**Figure 3: Deterioration of the number of direct and indirect jobs from small-scale maritime fishing activity (2019-2023)**

Sources: Authors, April 2024

## DISCUSSION

The fishing sector offers considerable economic benefits to the population of the Analalava region . Fishing is generally practiced by males (74.62%) because this activity requires physical strength, but women hold a considerable place in this sector with 25.38%. The level of education is relatively low, especially female fishermen with 65% being uneducated. The level of education influences the vulnerability of fishing households, less vulnerable households are often headed by chiefs with a certain level of education, but paradoxically vulnerable households are headed by the uneducated, which means that fishing is practiced by people with a low level of education and this result is consistent with that of (Cécile F. et Al 2019) on the state of traditional maritime fishing in the Menabe region . As for fishing gear, fishermen use mosquito nets, nets, lines and hooks as well as boxes, the cast net or the " *sihitry* " <sup>4</sup> and trap crabs. The majority of fishermen prefer to use mosquito nets in order to have a lot of fish. Mosquito nets are used for illegal fishing and the latter associated with other nets with active techniques such as beach seine destroys biodiversity and ecosystems. It is demonstrated by other researchers that mosquito nets are generally less selective and have negative consequences on aquatic coastal habitats (Hounsounou et al.2013) and this can lead to overfishing and therefore to the vicious cycle of poverty of fishermen (CRHOB, 2004; Hounsounou , 2011). There is a periodic variability in catches per unit of fishing effort (CPUE), but during the good period (March, April, August and November), they are good 85.3 kg per week on average are recorded for adult men, 65.8 kg for old men and 50.7 kg per week for women. The so-called selective gears have a generally lower CPUE. On the other hand, the Seine (not very selective gear) have a very high CPUE. However, the small mesh nets (rather considered selective) have a CPUE close to mosquito nets. The large mesh nets are classified as a not very selective gear even if the maximum CPUE obtained by this type of net is similar to that of other gillnets (Laroche, Menabe 2014). On average, a fisherman reports for self-consumption either 1 or 2 kg per day fished, the fishermen take for their personal, family or extended family food. A certain monthly variation exists which generally follows the seasonal variation of the total quantity fished, except for April where the total quantity decreases while the self-consumed quantity is the highest. Over the past five years (2019-2020-2021-2022-2023), there has been a significant deterioration in the volume of catch per fishing unit in the region and this deterioration leads to a drop in income for fishermen. The suspension of fishing activities causes significant losses for various stakeholders in the sector, such as fishermen, fishmongers and collectors. The price of fishery products has fallen to a quarter of the normal price in certain rural communes. Market prices for all

<sup>4</sup> **Sihitry** : Traditional fishing gear, manufactured locally and adapted to local resources, allows fishermen to live in harmony with their marine environment.

seafood products varied depending on the site and throughout the study period. Large fish species such as " *kikon and Angoy* " and scombroids were generally very expensive and the same with lobsters. Smaller fish species such as " *sabonty , karapapaka* " are good markets. It should be noted that shrimp and dried " *patsa* " ( *Patsa - Eurythraeus Acetes* ) also weighs significantly in the income of fishing households. Some fishermen in October 2021 confided that " *since March 2020, we no longer generate any profit and we sell our products at a loss. As we cannot exhaust them, we are forced to sell them at a ridiculous price, i.e. 10 units at only 2,000 Ariary . We are now forced to salt and dry about half of our products which are quickly perishable* " However, the decrease in catch volume influences household income and this observation is consistent with the study carried out by Weber J. (2015). The existence of unproductive expenses (alcohol and sexual entertainment) among men accentuates their financial and economic problem and constitutes a main source of impoverishment, affirmed Cecile F (2019) . Income can no longer cover daily expenses such as education, health, social and family affairs. As for women, most of their income comes from the sale of fish (90.7%) and is intended for food. Households headed by a woman would thus be poorer than households headed by a man, and this is due to the multiple constraints weighing on women, in particular the difficulties for them to access productive resources (Retired & Mbezi 2012) . The majority of women fishermen are single-parent households (households headed by women). The study we conducted records an economic profitability (- 6,930 Ar) per month on average, which means an absence of savings and the existence of debts to friends each month. Her debts often accumulate and she can no longer find the means to repay them. This situation results in a feminization of poverty; which increases the vulnerability of women and children (Palmer and Sinclair 2017). Most small-scale fishermen in the region spend much more than they receive due to poor management. It is therefore clear that small-scale fishermen in these regions are swimming in poverty; this observation is consistent with the study carried out in southwest Madagascar by (Harding, Coûteaux et al. 2019). Employment data seem to be the most difficult to obtain and the most approximate. With regard to small-scale fishermen, two categories are generally distinguished. Small-scale fishermen earning more than 90% of their annual income from fishing are counted as "professional fishermen"; the others are called "occasional fishermen". In the district of Analalava . In the counting of direct jobs, traders (fishmongers and retailers), processors and restaurateurs are also included. Among the indirect jobs in the fishing sector, are included those related to the manufacture and maintenance of canoes: carpenters, mechanics, etc., those related to the manufacture of fishing tools (net sheets, cages for crustaceans, etc.) and those related to the manufacture of processing equipment (in particular for smoking, salting and drying). In all jobs related to fishing, whether direct or indirect, a sharp decrease has been noted, due to covid 19 as well as the current scarcity of resources. This observation is consistent with the study by (FAO, West Africa, 2021). The fishing sector creates jobs and wealth for residents; it also makes a significant direct contribution to the municipal budget. They correspond to the "value added tax" or "patent", "commercial tax", "municipal tax" While many of our taxpayers are no longer active, this situation constitutes a budget deficit at the municipal level.

## CONCLUSION

The decline in fishery resources and the degradation of marine habitats is a concern shared by all stakeholders, from traditional fishermen to NGOs, the State, and various national and international research institutes. The analysis of the results obtained at the end of this study allows us to conclude that fishing activities concern more men than women and most fishermen have a low level of education not exceeding primary school. Some gear, particularly prohibited ones, continue to be used illegally, such as mosquito nets. The catch per Fishing Effort Unit (CPUE) varies according to the social categories of fishermen on the one hand, and fishing gear and techniques on the other. The data collected show significant decreases in the capture of fishery resources and this decrease has harmful effects on the population. Most small-scale fishermen in the region live in isolated areas, far from urban centers and the products are not highly valued and the prices charged remain relatively low. The income of fishermen can no longer cover daily expenses while it constitutes the main source of household income. Women fishermen are the most affected and they are made vulnerable and weakened by many factors and challenges on a daily basis. Without forgetting that the social integration of women into the economic activity of the region, the fishing sector offers many opportunities such as trade, processing, catering, etc. The development of small-scale fishing makes it possible to constitute permanent or supplementary income for the most deprived categories of the population and its deterioration in catch volumes leads to a total loss for the coastal population. The impact of this deterioration of fishing on the



economy is enormous and especially with regard to public revenue, jobs and income generated, beneficiary populations as well as repercussions also at the level of the municipality.

## Thanks

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