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Impact of Logging and Fish Smoking on Mangroves in Management Units 5 and 7 in Sangareya - Dubréka (Guinea)

Boubacar Cissoko[1], Cellou Kante[2], Aissata Camara[3], Ansoumane Sakouvogui[4]
[1]Department of Laboratory Techniques, Higher Institute of Technology of Mamou, Guinea
[2,4]Energy Department, Higher Institute of Technology of Mamou, Guinea
[3]Environmental Management Department, University Center of N'Zérékoré, Guinea

Abstract *- The purpose of this study is to assess the impact of logging and fish smoking in Management Units 5 and 7 in Sangaréya Bay. To achieve this objective, we have adopted the questionnaire survey method. The investigation allowed us to identify 357 loggers, including 201 loggers, 57 log splitters, 53 traders and 46 shipowners. These forest species are landed in 4 wood harbors (Dixinn, Kaporo, Sonfonia and Dubréka center). The traditional fish smoking is done on three sites (Solonyiré, Bambé Kaki and Woyenkhori 2) using two types of smokers Fut cut (short smoking room) 59 and Mirador (long smoking room) 38, for a total of 97 in the area. These anthropogenic activities generate a withdrawal of 628 m^3 of Wood for 10 months. This illustrative study shows increasing pressure on the mangrove forest in management units 5 and 7 of Sangareya bay in Dubréka.*

Keywords *– Incidence; Exploitation; Fish; Mangrove and Sangareya Bay.*

I. INTRODUCTION

Mangrove ecosystems are of great ecological, economic and cultural interest. They combine productivity with the diversity of niches, making them fairly suitable habitats for species. In Guinea, the bay of Sangaréya, which is home to the largest forest in the coastal zone, is heavily exploited for the supply of firewood for households, construction and many other activities in the city of Conakry and its peripheries [1].

Indeed, the demographic explosion experienced by the coastal areas of developing countries, especially in the mangrove areas, has resulted in the multiplication of traditional farming areas such as logging and fish smoking, which are damaging to the mangrove forest and risk leading to its disappearance if arrangements are not made in time. Nearly 3 billion people live within 60 km of the coast and two-thirds of the cities populated by more than 2.5 million inhabitants are located near estuaries. Consequently, all anthropogenic activities carried out in these environments contribute to the disruption of the normal functioning of these ecosystems [2].

In West Africa, the coastal zone would therefore be in shortage of firewood and a part of the population seems to refuel with charcoal from other regions, for example Tambacounda. This shortage of firewood in certain areas of the continental assembly would also explain the increase in pressure on mangrove wood. In fact, dead mangrove wood (Rhizophora spp.) Offers an excellent cooking wood which is the main, if not the only, used by the populations living on the islands, [3].

West African mangroves represent 13 percent of mangrove forests worldwide and cover more than 2.4 million hectares in 19 countries (Angola, Benin, Cameroon, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mauritania, Nigeria, Republic of Sao Tome and Principe, Senegal, Sierra Leone and Togo). Nigeria and Guinea-Bissau are two of the richest mangrove countries in the world. West African mangroves provide or contribute to a wide range of environmental, economic and social goods and services. Despite these important roles, mangroves currently experience a deforestation rate of 1.7 percent per year [4].

About 14 percent of the region's mangroves are found in protected areas and constitute a complex ecosystem with diverse interdependent biodiversity. Mangroves provide essential habitat and food sources for plants and animals, including many species of fish, birds, molluscs, crustaceans and other invertebrates. They provide crucial spawning grounds for coastal, marine and aquatic and terrestrial species. Mangroves play a vital role in the coastal fisheries of West Africa, which contribute $ 400 million to the regional economy [5].

Livelihoods and communities depend on mangroves for firewood for drying fish, logs and other building materials, as well as non-timber forest products such as snails, honey, oysters, crabs and traditional medicines [6].

Mangroves also play an essential role in climate change mitigation and adaptation. Ecosystem services related to climate change mitigation and adaptation include; carbon sequestration at rates higher than terrestrial forest systems, a buffer zone against bank erosion, protection against extreme climatic events through the absorption and dispersion of the rising tides, and groundwater recharge. Although estimates vary, many scientific studies indicate that mangroves are among the most important carbon sinks on the planet and that they sequester higher amounts of carbon than terrestrial forest ecosystems [6].

Mangrove logging is an income-generating activity for coastal populations. This activity is purely male. Samples are taken on the seafront in islands difficult to reach on foot. The operators use large capacity dinghies or dhows. They work in teams and stay in mangroves for a week or ten days at most. Cutting mangrove wood is very hard work.

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In the Republic of Guinea, the intensive exploitation of mangrove wood results from the fact that it is the fuel used by 94.5% of households in Maritime Guinea for domestic needs. The consumption of mangrove wood for domestic use in coastal rural areas was estimated in the Mangrove Master Plan (SDAM) at 152,000 tonnes per year in 1987. This volume, which is certainly far below the current volume of given the strong demographic growth that has prevailed on the coastal zone for 30 years, has been calculated based on an average level of consumption equal to 2.2 kg/day/ person, or about 800 kg/person/year [7].

In urban areas, these wood resources are also highly valued. They are used in the production of bread (bread oven) in the daily cooking of food (firewood) and in the construction of buildings (service wood). Also, for smoking fish in wharves, etc. (FAO 2005). Wood is supplied from the timber ports located in Conakry and also by road. In 1987 it was estimated that 20% of the city's fuelwood consumption came from mangroves, or about 54,000 t/year [7].

Several areas of the coast have high ecological value and biological wealth that are still preserved. This wealth provides a certain number of ecosystem goods and services, which in particular benefit neighboring communities by contributing to the maintenance and renewal of natural resources, particularly fishery resources. The Guinean State has decreed the classification of two protected areas at Tristao and Alcatraz. Various other marine and coastal areas have ecological values that are still existing and relatively well preserved, such as in the coastal prefectures of Boké (Rio Kapachez), Boffa (Rio Pongo), Dubréka (Konkouré delta) and Forécariah (Forécariah estuary and the Méllacoré) [8].

Mangrove forests are under strong anthropogenic pressure, causing a regression rate of 2.5% per year. In 1965, the area of the Guinean mangrove covered 350000 ha and today it covers only 296300 ha according to [9].

However, until the last world war, mangrove forests were considered as a reserve of arable land for the development of rice cultivation. It was only in 1986 that they were recognized as forests and, for several years, they have been considered as an ecosystem, whose natural balance conditions forest productivity, soil fertility, management and enrichment coastal waters [10].

Between 1993 and 1998, however, Sangaréya Bay was reforested with Rhizophora sp. and Avicennia sp., for production and protection purposes. In management units 5 and 7 of Sangareya bay in Dubréka, the mangrove forests provide fuel, building materials, food, fodder, medicines, fibers, work for thousands of people. This exploitation is today the covetousness of many Guineans who make service wood, firewood, a certain number of species are particularly concerned by these removals (Rhizophora, Avicennia). It is practiced in an anarchic way (each user cuts what he needs where he wants and when he wants) [11].

Likewise in units 5 and 7, fish smoking is very popular and is carried out exclusively by women. Smoking is the main means available to coastal communities for the conservation of fish in the medium and long term. Thus, the development of fish smoking is strongly correlated with that of fishing activities. Smoking is carried out according to a traditional technique which relies on the slow combustion of wood, in order to release an intense and prolonged heat which allows the dehydration of the fish. The fish imbibe the antiseptic substances contained in the smoke, which give them an appreciable taste.

For this activity, 90% of the needs for fumed wood are taken from the mangrove. However, these data are not up-to-date since they date from 1987. As smoking is a very wood-consuming activity, it creates localized pressures on forest resources near smoking sites. Short smokers (was trimmed) use on average 2.85 kg per kg of fish and long smokehouses (Mirador) use 3.10 kg per kg of fish. The consumption of wood at this rate risks accelerating the disappearance of the woody capital of the mangrove [12].

To ensure rational management of this ecosystem, the bay of Sangaréya (Dubréka) has been subdivided into 18 portions called management units. Among them, management units 5 and 7 were strictly reserved. The observation of the state of these places during our first field visit led us to pay particular attention to the whole but also and above all to the reserved areas. In view of this situation and to make our contribution to the sustainable management of these mangrove ecosystems, we have proposed to carry out research on the impact of logging and fish smoking on mangrove in developments N°5 and 7 of Sangareya bay (Dubréka).

Hence, the main objective pursued in this study is the characterization of certain anthropogenic activities (logging and fish smoking) at the level of these units in order to determine their impact on the forest.

II. Material and Method

A. Material

a. Presentation of Sangareya bay

The bay of Sangaréya between 9° and 10° North latitude and 13° and 14° West longitude, it is an estuarine complex which receives the liquid and solid flows of several rivers, the most important of which are the Konkouré in the North, Soumba in the East and Sonfonia in the South-East. These rivers except the Soumba have a regular hydrographic regime, although in the dry season there is a considerable drop in the level of water in their basins.

It is home to important plains and 38000 ha mangrove forest formations. Sangareya bay, recognized as a wetland by the Ramsar convention since March 18, 1993, is located between the prefectures of Boffa, Dubréka, the municipalities of Ratoma, Dixinn and Kaloum. It is located 50 km from national N^{o}2 (Conakry-Dubréka). The façade of Sangareya Bay, which opens onto the Atlantic Ocean, is made up of a long strip of coastal plain. It has a population of 23480 in habitants per km^2. The map of Sangaréya bay is presented in Fig. 1 [13].

The mangrove ecosystem of Sangareya Bay encloses a tree vegetation made up of red and white mangroves (Rhizophora, Avicennia, Laguncularia and conocarpus erectus). The main woody species encountered are: Rhizophora racemosa G.F. Mey., Rhizophora harrisonii Lech., And Rhizophora mangle L [10]. The mangrove of Sangareya bay contains a varied

abundant fauna. The avifauna is abundant in number but has few species. The most important are: Egretta garzetta, Phalacrocorax africanus, Pelicans oncrotus, Ardea, cinirera, Scopus, ombrette.

The ichthyological fauna is very abundant in species, the area serves as a spawning ground for fish, including 34 species of fish distributed in 19 families. The best represented families are those of sciaenidae, Aridae, Clupeidae, Mugilidae, Lomadasydae, Carangidae, Polinemidae, Cynoglossidae and Trichiuridae.

The mammals represented by some species like Phacochoeurus, Aethiocus, Hyppopotamus amphibius and Trichelus Senegalensis (Manatee). The population of Sangareya Bay is gradually increasing. Women represent 51.3% of the workforce, with 172241 inhabitants in 2011. The main activities of this population are logging and smoking fish [13].

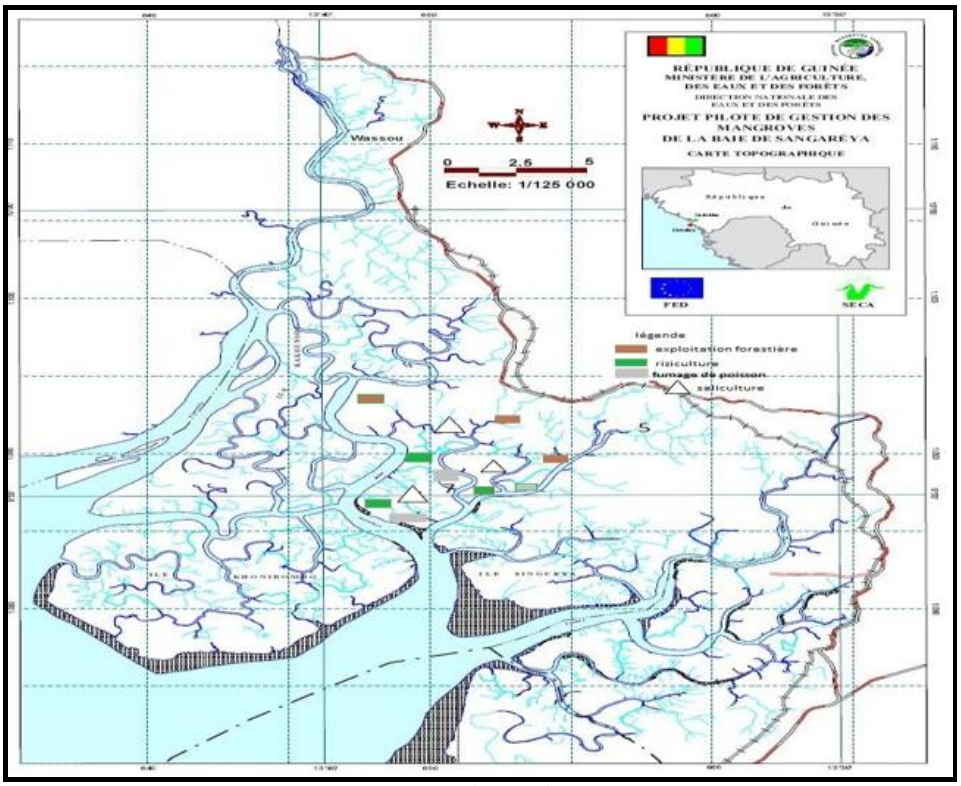

Fig. 1. Map of Sangaréya bay

b. Equipment used

The equipment used for this research is as follows: Pair of binoculars (biodiversity observation), Motorized boat (displacement), Map of the bay (orientation during displacement), GPS (determination of the areas of the points to introduce them into the maps), Camera (taking photos of activities), Dictaphone (recording of interviews), Weighing scale (Determination of the quantity of wood for smoking) and Brochure of identification key (identification of fauna and avifauna).

B. Method

The methodological approach of this research is based on the following points: documentary research, contacting local authorities and the actors involved, surveys, analysis and processing of the data collected. This research took place from March 20 to December 30, 2017, on units number 5 and 7 among the 18 units built in the bay of Sangaréya because of their reserved nature and the degradation of the environment due to anthropogenic activities. The sites of Wayinkhori 2, Bambékaké, Solonyiré were chosen in certain villages such as (Gbantama, Minguiyah, Bagueyah, Tenyah, Dentèforè and Boneyah) of the Rural Municipality of Khorira, Prefecture of Dubréka. A survey sheet was developed for each activity listed in the field. The questionnaires were sent to heads of households of producer groups chosen at random from each site. Some questionnaires are:

a. For logging

When do you do this activity? The name of your home port? How many people for the crew? Means of transport? Cutting places? What types of forest species? Nature of cut wood? Do you realize the disaster you are causing to the mangrove forests? What is the content of your boat? The frequency of the cut? The categories of wood sold in your wharves? The selling prices according to the categories of wood?

b. For smoking fish

When do you do this activity? On which sites do you smoke? What species of fish do you smoke? When are you doing this activity? What types of smokehouses do you use? What kind of cutting do you do in the search for wood? What are your means of travel? What are your means of transport

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for the markets? What are the Fish Sale Prices? How is the income from the sale of fish managed in the family?
Assessment of the quantities of wood for each activity

c. Lumbering

The average quantity of wood per boat is calculated by equation 1.

$$Q_{mb/em} = C_B \times \sum_{i=1}^{n} T_i \quad (1)$$

With : Qmb/em : Average quantity of wood per boat in (m^3); C_B : Capacity of a boat in (m^3) ; T_i (i=1 to n) : Number of wood transports carried out by type of boat.

d. Smoking fish

The average quantities of wood used for smoking fish by the muradore smokehouse and pruned (short or long) techniques are calculated by equation 2.

$$Q_{mb/fu} = Q_{pf} \times Q_{bm/p} \quad (2)$$

Or : Qmb/fu: Average quantity of wood used for smoking in (kg or in m^3); Qpf: Quantity of poisons to smoke in (kg); $Q_{mb}/_{p}$: Average quantity of wood required for smoking 1 kg. The images in Figures 2, 3, 4, 5 and 6 show certain wharves or wood harbors and fish smoking sites.

Fig. 2. Landing or wood port

Fig. 3. Exploded wood (energy wood)

Fig. 4. Smoking on a size

Fig. 5. Wood for smoking

Fig. 6. Smoked fish

III. Results and Discussions

A. Results

This research allowed us to have the results relating to : the operational structure by type of forest operator (Shipowners, Loggers, Woodsplitters and Tradesmen) according to the timber ports (Dixinn, Kaporo, Sonfonia and Dubréka center); the quantities of wood removed from the area during the study period; the smoking sites or camps and the number of smokehouses according to the types of short smokehouse (Fut Taillé) and long smokehouse (Mirador). These results are shown in Tables 1, 2 and 3.

For a good interpretation and discussion of the results obtained, we have illustrated them by the figures in diagrams 7, 8, 9 and 10.

TABLE I. Logging

No	Wood ports	Types of operators				Total
		Ship owners	Lumberjacks	Splitters	Trader	
1	Dixinn	12	108	17	15	152
2	Kaporo	15	45	10	18	88
3	Sonfonia	10	30	12	14	66
4	Dubreka center	9	18	18	6	51
Total		46	201	57	53	357

TABLE II. Quantity of wood taken from the area during the study period

No	Wood ports	Boat capacity (m^3)	Number of samples	Quantities of wood removed (m^3)
1	Dixinn	16	12	192
2	Kaporo	8	22	176
3	Sonfonia	8	28	224
4	Dubréka Center	4	9	36
Total			71	628

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TABLE III. Fish smoking camps

No	Site	Number of camps	Types of smokehouses		Total smoking rooms
			Short smoker (Was cut)	Long smoker (Viewpoint)	
1	Solonyire	1	7	12	19
2	Bambe kaki	1	40	20	60
3	Woyenkhori 2	1	12	6	18
Total		3	59	38	97

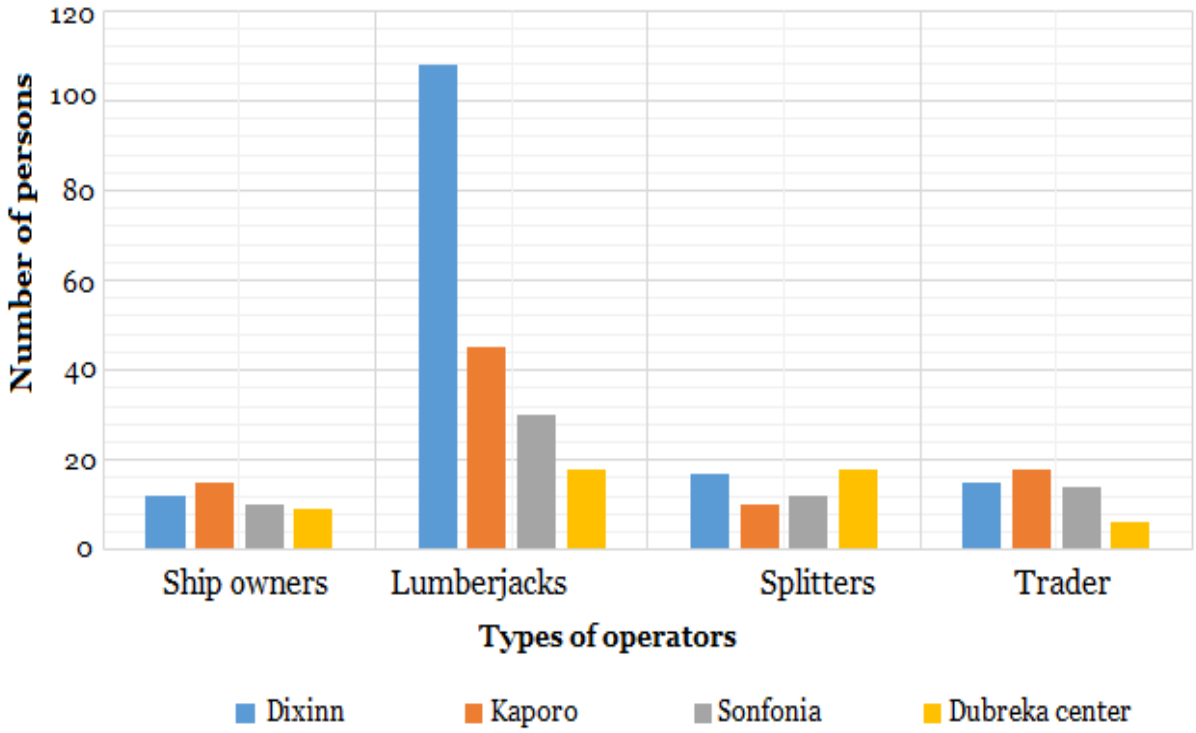

Fig. 7. Operational structure by type of forest operator

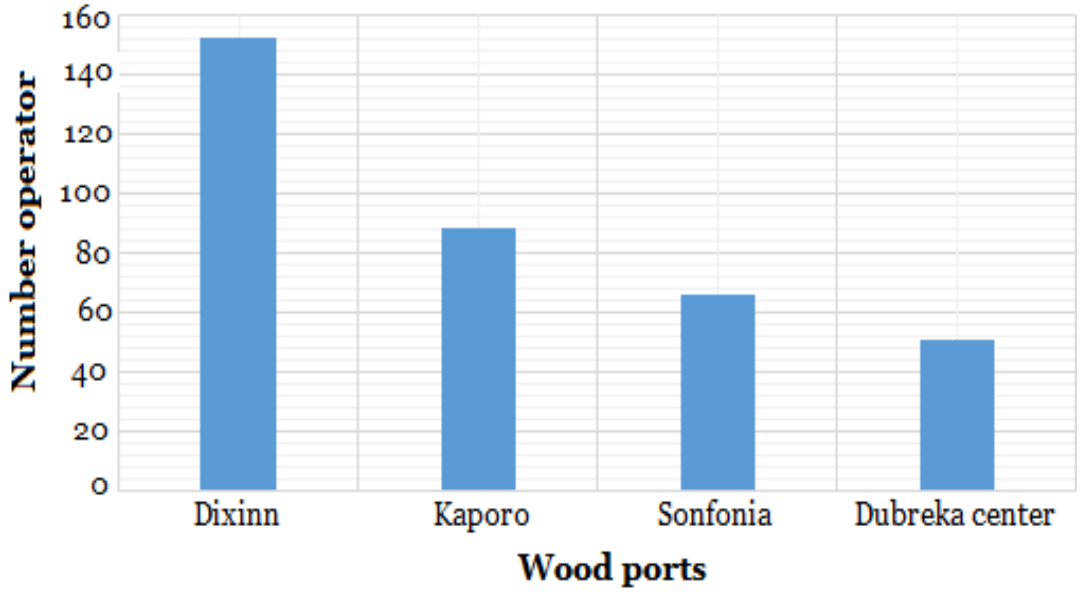

Fig. 8. Number of operators per log port

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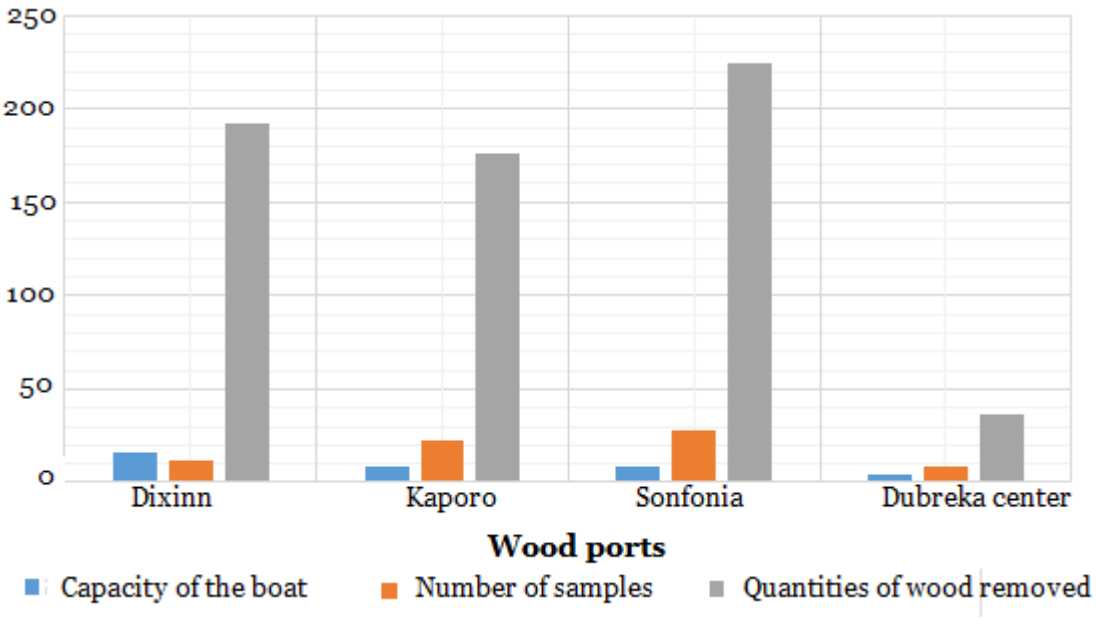

Fig. 9. Capacity of the boat, number of samples and quantities of wood removed

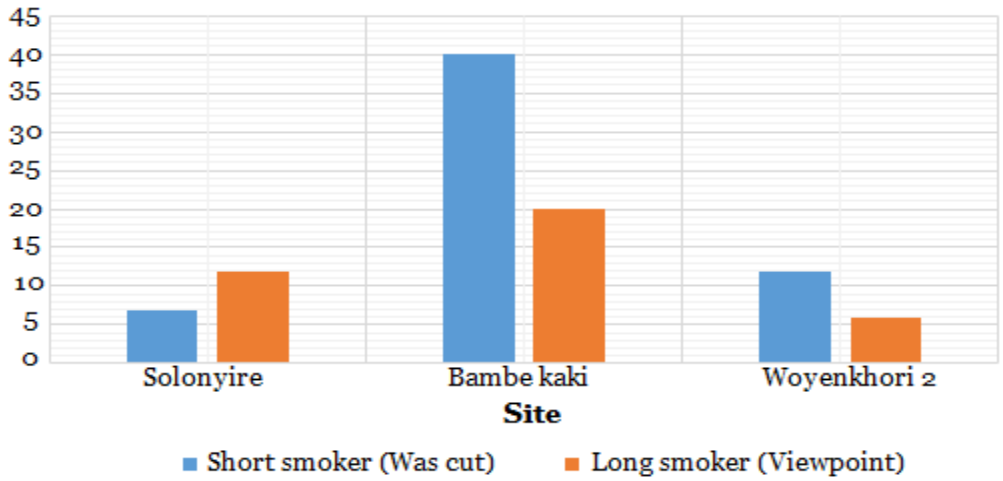

Fig. 10. Number of smokehouses per site

B. Discussions

The diagram in Figure 7 shows that, the loggers (201 people) are the most loggers of the mangrove in management units N° 5 and 7 of Sangareya bay, with a maximum of 108 people who unload wood in the port of Dixinn, followed respectively by 45, 30 and 18 people who disembark respectively in the wood ports of Kaporo, Sonfonia and Dubréka center. The lumberjacks are followed respectively by the Splitters (57 people), the Traders (53 people) and the Shipowners (46 people).

The diagram in Figure 8 shows that, out of a total of 97 smokehouses, the short types (Fut cut) are the most used, with a total of (59 smokehouses), the maximum of which is installed in the Bambé Kaki site (40 smokehouses). There are (38) long smokehouses (Mirador), so the maximum is installed in the Bambé Kaki site (20 smokehouses).

The result of these various anthropogenic activities is an abusive forestry exploitation of the mangroves of units No. 5 and 7 in Sangareya bay, that is to say 628 m3 of wood evaluated during the study period. This quantity of wood is unevenly landed in the various wood harbors (Figure 9), namely: Sonfonia (224 m^3), Dixinn (192 m^3), Kaporo (176 m^3) and Dubréka center (36 m^3).

This assessment of the quantity of wood cut which is a function of the increase in demography, shows the presence of a strong deforestation which causes the disappearance of habitats, biodiversity as well as the sterilization of soils. In the long run, this will lead to the loss of all the services rendered by this area reserved for humanity. These results corroborate with those of others [14] [15] [16].

Although the data on the area occupied by the mangrove are incomplete and lack consistency, the various sources agree, however, that the area of the mangrove is shrinking from year to wear due to exploitation uncontrolled and

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growing human. This ecosystem is also the first to experience the direct and indirect effects of sea level rise.

IV. CONCLUSION

Several anthropogenic activities are identified in management units N°5 and N°7 including: logging, fish smoking, rice growing and saliculture. This research focused on two activities (logging and smoking fish). The other activities will be the subject of another study.

The results obtained reveal the urgency of the conservation and protection of this reserved area in the mangrove of Sangaréya bay, which is a natural buffer between the sea and the continent and is sensitive to the overexploitation of wood and wildlife resources. It has scientific, cultural, educational and tourist value. Thus, the exploitation of mangroves on the Guinean coast deserves special attention from all partners in the field and the government.

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