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WOMEN SHELLFISHERS AND FOOD SECURITY PROJECT

PARTICIPATORY ASSESSMENT OF SHELLFISHERIES IN THE ESTUARINE AND MANGROVE ECOSYSTEMS OF **CÔTE D'IVOIRE**

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Cover image: Shellfish stakeholders of Grand Lahou locality (Western part of Ivorian coastline).

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CCM	Centre for Coastal Management
CRC	Coastal Resources Center
UCC	University of Cape Coast
URI	University of Rhode Island
USAID	United States Agency for International Development

Executive Summary

Basic Contextual Information	
Country	Côte d'Ivoire
Total land area	322,463 km^2
Population	25.72 million (2019)
Percentage population living in/near the coast	36%
Gross Domestic Product (GDP)	43.01 billion USD (2018)
Human Development Index Rank	0.516 (165 out of 189)
Length of coastline	590 km
Fish consumption (as a percent of animal protein)	38.7%
Anemia prevalence	63% among under-five children 52.9% among women of reproductive age (15-49)
Estimated mangrove cover	5,792 ha (2016)
Estimated estuarine and mangrove ecosystem-based shellfish harvesters	544
Estimated women shellfish harvesters (percent)	381 (70%)
Estimated direct household shellfish beneficiaries	4,305
Estimated percentage of shellfish harvesters at all nodes of the value chain (vertical integration)	90%
No. of coastal systems with mangrove-based shellfishing	-
Shellfish management regulations	Law No. 2016-554

Mangrove management regulations	-
Coastal ecosystems with shellfisheries identified as Ramsar sites	Parc National D'azagny (19,400 ha) Grand Bassam (40,210 ha) Iles Ehitile-Essouman (27,274 ha) N'ganda (14,402 ha)

Source: Chuku et al. 2020, Global Mangrove Watch, Ramsar Sites Information Service (RSIS)

The USAID Women Shellfishers and Food Security Project is an initiative of the University of Rhode Island, funded by USAID. Opportunity may exist to replicate and expand shellfish livelihoods based in mangrove ecosystems, which can provide a cheap source of protein and micronutrients to coastal dwellers across West African coastal countries. This country assessment is aimed at gathering data on the scale and scope of shellfisheries and shellfish-based livelihoods associated with mangrove and estuarine ecosystems in Côte d'Ivoire, as well as increasing awareness and identifying key stakeholders. The assessment employs a focused methodology of collecting data on the stakeholders, the shellfish exploited and the habitats these animals colonize.

A total of 25 shellfish resource users out of an estimated 544 shellfishers present in Côte d'Ivoire and 30 non-resource user stakeholders participated in the assessment. Women dominate the shellfishing sector in Côte d'Ivoire. The total number of shellfish harvesters present per site visited was estimated to be approximately 25 with a composition of 90% women and 10% men. An estimated 4,305 persons are direct household shellfisheries beneficiaries based on the findings of this study.

Women are vertically integrated throughout the entire shellfish value chain in Côte d'Ivoire, operating as harvesters, processors, marketers, and consumers. In fact, the only role of men exists in the assistance of women in harvesting activities, namely through transportation. Women harvesters report that if they acquired motorized canoes to reach distant harvest areas, they would eliminate all reliance on men. This vertical integration implies that value chain improvements at any node can directly benefit women harvesters and thus creates an opportunity to incentivize behavior change for sustainable resource management.

There are currently no regulations or customary provisions to control the quantity or sizes of shellfish harvested in Côte d'Ivoire. However, incidences of local management via informal organization exist, such as in Sassandra where women shellfishers have formed a brigade to monitor and manage their mangrove habitat.

Côte d'Ivoire hosts a substantial amount of wetland area with active shellfishing activity that are designated either as protected or as areas of international importance, including four Ramsar sites covering a total area of over 100,000 hectares. Thus, there are clear and impressive potential benefits of effective co-management for both the protection of critical habitat and sustained and improved livelihoods of women shellfishers.

Recommendations based on the findings of this study are as follows:

- Shellfish actors should be educated on the ecological services provided by shellfish and mangrove systems, and on promoting sustainable utilization of the resources. This could include specific training in the sustainable exploitation of shellfish and effective protection of associated mangrove habitat.
- Where possible, degraded mangrove ecosystems should be rehabilitated and protected against any form of exploitation, and a cartography of the Ivorian coast should be established, highlighting the mangrove ecosystems.
- Shellfish actors should be assisted with soft loans and protective gear (i.e. diving apparatus, shucking gloves, waders etc.) to enhance their businesses.
- Better means and techniques of sustainable conservation should be taught to women actors to avoid accelerated sales at low prices; this means that shellfish resource users should be equipped with skills in value addition to generate higher income, extend the shelf life of the product, and possibly penetrate high-value markets.
- Where possible and in collaborative co-management with shellfishing communities, existing laws and other prefectural decrees should be applied in their entirety.

1. Introduction

Côte d'Ivoire is a coastal country in West Africa, bordering the Atlantic Ocean. Its maritime façade, located in the south of the country, is part of the Gulf of Guinea (Figure 1). The country's coastal zone is located between 4°30' N, 5°30' N, and 7°30' W, 2°25' W (Tano et al., 2018). The Ivorian coastline is 590 km long and is one of the longest in West Africa (Hardman-Mountford et al., 2000). The coastline is bounded on the west by the Cap de Palmas and on the east by the Three Points (Lemasson and Rebert, 1973; Le Loeuff and Marchal, 1993). Two-thirds of the coast is composed of sandy beaches, interrupted by mangrove ecosystems, lagoons, the Bandama River at Grand Lahou (at 5°8' N, 5°1' W°) and the Comoe River at Bassam (at 5°12' N, 3°44' W°) (Tano et al., 2018). According to Anoh and Pottier (2018), the coastline of Côte d'Ivoire, which represents only 7% of the total area of the country, concentrates over 30% of the national population. This strong human presence corresponds with a significant food need. In coastal areas, food from aquatic environments contributes significantly to the nutrition of the population living there.

It is recognized that women play a crucial role in food security through their involvement across sectors in Côte d'Ivoire and this is also true of shellfishing activities. Key species for shellfish harvest include *Tympanotonus fuscatus* (called locally Kossrôgbô), *Mytilus edulis* (mussel) and *Ostrea edulis* (oyster). Women dominate the shellfishing sector in Côte d'Ivoire. However, the shellfish harvest is not exclusively linked to women, with some localities where men actively contribute to the harvesting of shellfish while women carry out all stages of processing through to marketing.

With fish catches consistently decreasing (Belhabib and Pauly 2010), it is important to encourage the sustainable harvesting of shellfish as an additional livelihood that can improve the standard of living of women, reducing poverty and contributing to food security in this population. Climate change is also affecting the frequency and intensity of rainfall, with consequences for the productivity of other food sectors in Côte d'Ivoire (e.g., cassava, banana and other food crops). In response to these difficulties, shellfish harvesting, and marketing are becoming major issues in coastal communities despite a lack of formal organization of women shellfishers in some areas.

The current study assesses the scale and scope of shellfisheries and shellfish-based livelihoods connected with mangrove systems and coastal water bodies in Côte d'Ivoire through a participatory approach. The main objectives were the identification of key stakeholders and assessment of the scale and scope of existing shellfisheries and shellfish-based livelihoods in mangrove systems or related water bodies. This study complements a literature review covering shellfisheries in each of the 11 coastal West Africa countries from Senegal to Nigeria (Chuku et al. 2020). The specific objectives were to:

a. Identify types of mangrove/estuarine ecosystem-based shellfisheries, by species and location.
b. Estimate catch per day/month/season, fishing calendar, seasonality of shellfisheries and harvesting methods, processing, and trading of shellfishes.
c. Estimate revenue generated from mangrove/estuarine ecosystem-based shellfisheries.
d. Determine the challenges and health-related conditions associated with the consumption of shellfishes.

e. Assess mangrove exploitation, its uses, gender attributes in its harvest, condition, and protection status.
f. Determine the governance/management regimes as applied to shellfisheries and mangrove systems.
g. Determine the effect of climate risks on the livelihoods and food security of women who depend on coastal mangrove and estuarine systems.

2. Methodology

2.1. Study Sites

Figure 1 illustrates the coastal portion of Côte d'Ivoire. This coastline is divided into (1): the western zone from Tabou to Abidjan, and (2): the eastern zone from Abidjan to Assinie. The field survey was conducted according to this subdivision of the Ivorian coastline and results will be presented with a likewise distinction. With two interviewers (NGO IMPACTUM) assigned to the western and four interviewers assigned to the eastern portion, eight shellfishing communities were sampled (Table 1). Over the two zones, participants fell into the category of either resource user, NGO, academia/research, or government official.

Table 1: Shellfishing communities sampled.

Zone	Sampling Area
Western Zone	Tabou
	San-Pedro
	Sassandra
	Fresco
	Grand-Lahou
	Jacqueville
Eastern Zone	Grand-Bassam
	Assinie

2.2. Field survey/data collection

Field surveys were conducted in February, March, and April 2021 during which the various actors involved in shellfish harvesting and marketing were interviewed using a standardized questionnaire. This survey instrument is available in the regional summary report (Chuku et al, 2021). Key contacts from IMPACTUM (http://impactum.africa) were engaged to facilitate interviews based on their local

expertise of sampling area communities with the aim of improving the reliability and credibility of the responses to interview questions.

Following the administration of interviews, meeting sessions were organized for more in-depth focus group discussions with stakeholders in each coastal portion. Focus groups included the engagement of 11 supply users' groups to facilitate open discussions and solicit information on shellfisheries within group members' communities. Figures 2 illustrates some of the meetings.

Lastly, four key informant interviews were used to solicit shellfishery information from government and civil society actors (NGOs and traditional authorities). The intent of key informant interviews was to collect information from topical experts ranging from civil society actors to traditional authorities such as private and NGO employees, researchers/academics, and government officials.

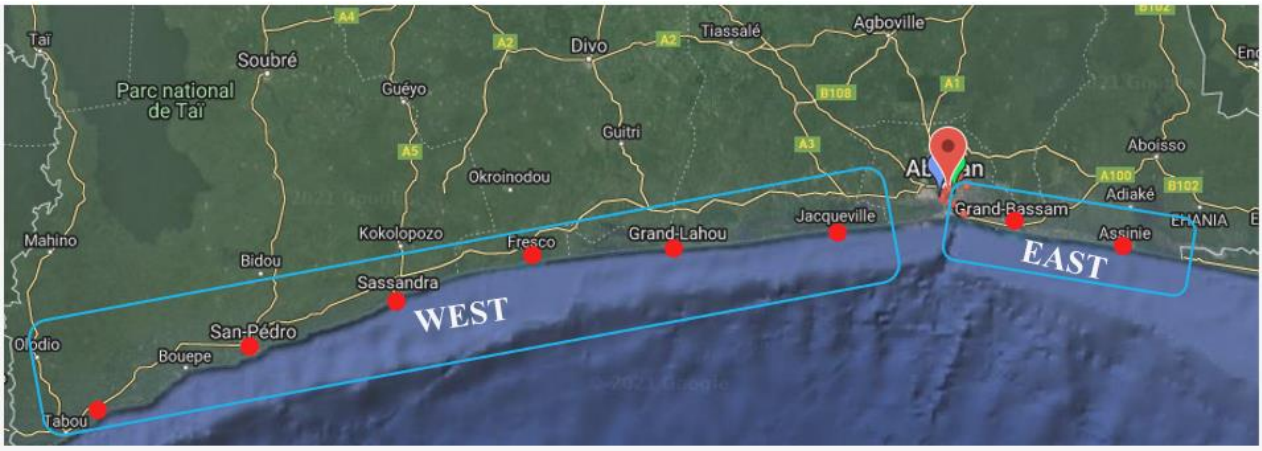

Figure 1: Coastal sampling zone of Côte d'Ivoire (red circles indicate participating communities).

Figure 2: Shellfish stakeholders of (top left) Tabou locality (Western part of Ivorian coastline), (top right) Grand Lahou locality (Western part of Ivorian coastline), (bottom left) Assinie Maffia (Eastern part of Ivorian coastline), and (bottom right) Babianhia Village: Assouindé km 9 (Eastern part of Ivorian coastline).

2.3. Summarized background data

2.3.1. Background data of resource users

A total of 25 resource users participated in field surveys. Basic demographics of these individual are presented in Table 2. Most of the interviewees were women, generally living in precarious situations, married with an average of six children, two of whom were young. These women typically contributed to the financing of household expenses. In the Eastern zone of the Ivorian Coast, the age range of participants varied from one site to another and was between 25 and 60 years for men and 25 and 50 years for women. In the Western zone, ages of shellfishers ranged from 16 to 60 years for men and 16 to 50 years for women. This is important to note because women 15-49 years are considered as women of reproductive age, an important target age group for health and nutrition initiatives. Across the entire response pool, 70% of participants were women and 30% were men. Overall, participants came from large families with an average of 6 people per household. Women outnumber men in the household on average.

2.3.2. Background data of non-resource users (government, academia, traditional authority, and NGOs)

A total of 30 non-resource users (academic/researcher, private/NGO/CSO, or government official) participated in the assessment. Basic demographics of these participants are summarized in Table 1. According to participating non-resource users, the majority of government actors are between 30 and 55 years old. The number of people in their households varies between 2 and 5 for both genders. Most government actors consume oysters once a week, with only the availability limiting the frequency

of consumption. Some reported the belief that the shellfish are collected in the water (57%), while others (28%) report that their reproduction and growth environment is the mangrove ecosystem. The rest (15%) reported not knowing where the oysters they buy in the market come from. All non-resource user participants ranked oysters first on the basis of meat preference. These government actors mostly buy the form already processed and ready for consumption.

Table 2: Demographics of field survey participants.

Total Number of Participants			55
Resource Users	Total		25
	Sex	Female	17
		Male	8
	Category	Harvester	18
		Consumer	7
	Age Range		25-77
	Women of Reproductive Age (15-49)		60%
	Average Household Size		6
Non-Resource Users	Total		30
	Sex	Female	16
		Male	16
	Category	Academia/Research	9
		Government	6
		Private/NGO/CSO	15

3. Status of shellfisheries

3.1. Shellfish exploitation

3.1.1. Estimated number of shellfishers

Official information on the number of shellfish harvesters in Côte d'Ivoire is largely not available. In this participatory assessment, the resource users indicated the number of shellfishers in their communities and/or harvesting areas. Conservative estimates are made with the assumption that each respondent represents exclusively one harvesting area/community to moderately compensate for the

shellfish harvesting sites not visited, while averaging obvious duplications for communities with large numbers. The estimates provided in this report represent a combination of information gleaned from available literature sources deemed reasonable from the perspective of ground experience in the women-led shellfisheries sector as well as estimates from the participatory assessment conducted.

An estimated 544 persons, the vast majority of which are females, are engaged in shellfisheries livelihoods in Côte d'Ivoire. An estimated 4,305 persons are direct household shellfisheries beneficiaries based on an average household size of 8.

3.1.2. Insights on gender in shellfish exploitation

The number of shellfish harvesters per site visited was around 25 with an average of 90% women. Women are involved in almost all stages of shellfish farming. From harvesting to marketing, through processing, they dominate the sector with representation of 90% (harvesting), 100% (processing) and 100% (marketing). In most of the areas sampled, the only node of the shellfish value chain that involves males to any significant degree is harvesting. As far as consumption is concerned, it can be said that all categories are involved. All demographic groups (men, women and children) are reported to consume shellfish, though the cooking of shellfish is done exclusively by women.

The men are involved in the shellfish harvesting to the extent that they transport the women in canoes to distant harvesting sites. The predominance of one gender in the harvesting of one species or another cannot be generalized because of the substantial involvement of men in collection being linked to the distance from the harvesting site. Distances to harvest sites dictate the participation of men, namely though transport of women harvesters in canoes which are paddled by men.

In Assinie Mafia in particular, oyster harvesting is carried out 100% by women. This is in contrast to the western coastal zone where, as described above, men use dugout canoes to transport women sometimes over long distances to reach the oyster harvesting sites. Mussels are mainly found at the edge of brackish waters, which facilitates harvesting by women without the intervention of men. There is a general consensus among coastal women in Côte d'Ivoire that if they acquired motorized dugout canoes (pirogues), the involvement of men in collecting would be greatly reduced. One participant stated that, "With these motorized pirogues, we would be able to get to the shellfish collection sites without difficulty and also without having to rely on men.".

3.1.3. Shellfishing as a primary occupation

Across the Ivorian coast, shellfishing is not the primary activity for either men or women. Men are primarily involved in non-shellfish fishing and farming, while women are involved in non-shellfish fish processing and marketing, and occasionally in market gardening. Shellfishing activities are considered a secondary source of livelihood for both genders.

3.1.4. The shellfish value chain

Survey participants reported being heavily involved in the collection, processing and retailing of shellfish in local markets. As stated in a previous section, women are dominant throughout the entire shellfish value chain in Côte d'Ivoire, from harvest to sale and as consumers. If it is the same women harvesters who are also processing and selling, this indicates a highly vertically integrated value chain and implies

that value chain improvements at any node can directly benefit women harvesters, creating an opportunity to incentivize behavior change for sustainable resource management.

Most of the women report marketing their products in local markets, and rarely distinguish between the capital invested and the gain after the shellfish are sold. This reality seems to stem from the fact that money generated from the sale of shellfish is typically used immediately by women sellers to make purchases for meals at the very same markets. Thus, there is no true revenue. It should be noted that while most shellfish are reported to be sold on the local market, some participants stated that they have buyers outside the Ivorian borders, mainly in Ghana and Liberia.

All households surveyed reported consuming shellfish on a daily to weekly basis. This indicates shellfish as a primary source of protein for these coastal communities. Regarding health problems related to the consumption of shellfish, the majority of interviewees stated that over-consumption of shellfish by an individual can lead to diarrhea and other digestive problems.

3.1.5. Species harvested

Across the Ivorian coastline, periwinkles (locally called *Kossrôgbô*), mussels and oysters are the main species present in the water bodies. Figures 3 and 4 show the primary shellfish species harvested in the western and eastern coastal zones, respectively. In the case of the eastern zone sampling sites, shellfish were only able to be categorized by broad taxonomic classification (i.e., mussels, oysters, periwinkles), whereas the western zone was able to report classification down to the true species level.

Figure 3: Shellfishes harvested in Western zone of coastal area of Côte d'Ivoire: (A) Mussels, (B) oysters and (C) Periwinkles (also D).

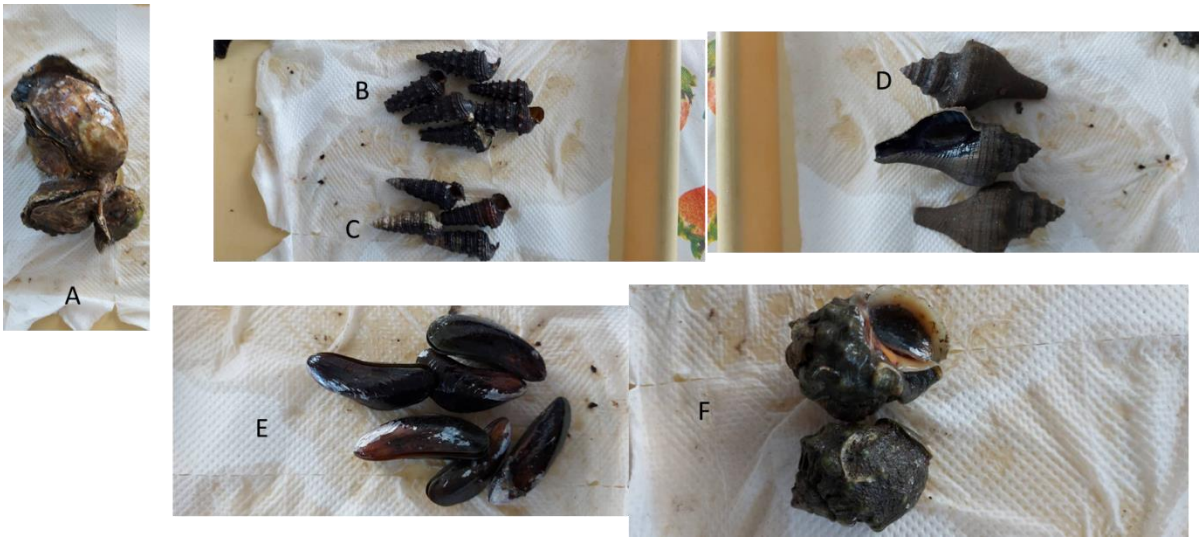

Figure 4: Shellfishes harvested in Eastern zone of coastal area of Côte d'Ivoire A: Crassostrea tulipa, B-C: Tympanotonus fuscatus (B = in brackish environment; C = in marine environment), D: Puligina morio; E: Perna perna; F: Laniste varicose.

3.1.6. Harvesting methods

Shellfish harvesting is generally done by hand, but this does not exclude the use of nets. The harvest itself is very tedious, as it is done with the bare hand and sometimes in slightly deep water. The actors generally do not have adequate equipment (motorized dugout canoes, gloves, boots, machetes, etc.) to be more efficient and to avoid injuries to the hand.

3.1.7. Harvest volumes and value

The quantities of shellfish catches vary from one site to another. Many stakeholders do not count or weigh their harvests as a standard practice, which presented difficulties in obtaining estimates of quantities of shellfish caught in the different areas visited as this is a foreign concept to participants. However, through assumptions of standard units of catch amounts such as the equipment used (e.g., boxes, bags, canoes), the approximate daily catch for periwinkles (*Tympanotonus fuscatus)* in coastal lagoons was estimated at 50 kilograms, and 25-35 kilograms weekly for mussels and oysters during favorable seasons. All sales in the village for local consumption are measured in small boxes. On the

other hand, *T. fuscatus* (periwinkle) is sold in 50 kg bags in the markets of big cities. On the side of Assinie Maffia, some European customers buy by canoe (the full canoe without any prior treatment).

3.1.8. Seasonality of harvests

In Côte d'Ivoire, shellfishing is a seasonal activity that runs approximately from June to December.

3.2. Mangrove Ecosystem

Mangrove ecosystems in Côte d'Ivoire are deteriorating due to overexploitation, deforestation, land reclamation, and the effects of climate change. According to Global Mangrove Watch, the current extent of mangrove forest in Côte d'Ivoire is approximately 5,792 hectares and has decreased by approximately 500 hectares in the last three decades, though recent research has suggested far more severe degradation (Ouattara and Cecchi, 2021). Mangroves now occupy a small and extremely threatened area along the Ivorian coastline due to exponential population growth on the coastal fringe. Shellfish species are harvested in these habitats of both ecological and economic interest. Based on the sentiments from participants in the field, existing mangrove ecosystems are thought to be possible to conserve through awareness and training of actors at the local level on the benefits provided by these ecosystems.

Some communities reported using mangroves as firewood or building materials, but this is far less common than it once was due to both men and women abandoning the practice. In fact, women shellfishers in Sassandra have formed a brigade to monitor and manage the mangroves. A local NGO working in this area has taken on the task of strengthening their capacities to better play this role.

In terms of ground truthing the extent of mangrove ecosystems, field surveys reported mangroves in 10 out of 16 localities visited during questionnaire administration. Most of the localities visited state that they used to exploit mangroves in the past as firewood but that they no longer do so. Communities acknowledge that mangroves contribute to the reproduction and harvesting of molluscs. In most cases, the health of the mangrove vegetation is believed to be in moderate state. It is therefore important to maintain this state by encouraging and equipping coastal communities to conserve these habitats of high ecological interest.

3.3. Governance/Management Regimes

The Law N° 2016-554 of July 26, 2016 covering regulation of fishing and aquaculture was passed by the National Assembly of Côte d'Ivoire. This Law deals in its Title II with the fishing component. In Article 5 of this title, it is written that the right to fish in continental waters and waters under Ivorian jurisdiction belongs to the State, which may grant it or authorize its exercise by natural or legal persons of Ivorian or foreign nationality. Also, in its Article 6, this Law affirms that the indigenous populations living along the continental waters and the maritime waters under Ivorian jurisdiction have a customary right of use over them. It also states in Article 7 that the exercise of customary use rights or subsistence fishing is free and unrestricted, subject to the respect of conservation measures and sustainable

fisheries management. Through field surveys and meetings with government authorities (fisheries services, water, and forestry agents) it was discovered that in each department there is a prefectural decree that prohibits the cutting of mangroves, as well as decrees that regulate fishing activities in general. With regard to shellfish harvesting, there are currently no regulations or customary provisions to control the quantity or sizes harvested.

It was the consensus among government participants in this assessment that laws written for the protection of mangroves suffer from ineffective application. They raised concerns about destructive, negative feedback loops where once damaged, the coastal waters around mangrove habitat warm up and become inappropriate for the growth of the new mangrove. The protection of these habitats of ecological interest is considered fundamental.

Côte d'Ivoire hosts several wetland sites with active shellfishing activity that are designated as areas of international importance (Ramsar sites; https://rsis.ramsar.org/about). The Ehotilé Islands National Park is part of the Ramsar site of the Ehotilé-Essouman Islands since October 18, 2005. It consists of a group of six islands located at the mouth of the Aby lagoon on the coast. It covers an area of 550 ha of land. Also, the Nganda Nganda Ramsar site was designated as an Area of International Importance/Ramsar site on 18 October 2005 (27,274 ha). In the same year (2005), the Ramsar site of Grand Bassam was designated as a Wetland of International Importance/Ramsar site on October 18 (40 210 ha). Of the three national parks on the Ivorian coast, the Azagny National Park, in the lagoon area of Grand-Lahou, is the only protected site.

3.4. Climate Risk Mitigation

Through numerous meetings with stakeholders in various localities, it was found that warming waters and the alternation of long dry seasons and heavy rains are the main climatic factors that cause the seasonality of shellfish harvesting.

Considering a strategy to mitigate the climate impacts on shellfish activities means restoring degraded mangrove habitats, training, and sensitizing stakeholders on the role that these ecosystems play in the availability of shellfish and fish. In addition to these orientations, the effective application of laws and decrees should be monitored in the field, for a proven protection of these habitats of capital interest. It is opportune that all actors know that consuming mangrove wood means releasing into the atmosphere a considerable quantity of CO_2, which will contribute to the destruction of the ozone layer. They should also know that destroying an area of mangroves is preventing these chlorophyllous plants from playing their role of carbon sink, through the absorption of atmospheric carbon dioxide.

4. Conclusion and Recommendations

4.1. Conclusion

At the end of this field survey phase, it is clear that shellfisheries livelihoods are an important reality in Côte d'Ivoire. Shellfishing activity takes place in the estuarine zone, as well as on the ocean shores.

This sector and its associated value chain are dominated by women. The men are mainly involved in the shellfish harvesting by transporting the women in canoes to the harvesting sites. In terms of the processing and marketing of shellfish, women are the only actors. The women have little knowledge on shellfish conservation techniques making it difficult for them to sell their catches. Many stakeholders have limited management knowledge of the resource they exploit as well as the importance of the mangrove ecosystems to shellfish, but some community groups have shown capacity for effective co-management practices (e.g., mangrove monitoring by a women shellfish organization in Sassandra. Prefectural measures exist for the protection of mangroves but are not applied due to the lack of recurrent control in the field. In terms of fisheries management, the Department of Aquaculture and Fisheries (DAF), a subsection of the Ministry of Animal Production and Fishery Resources, ensures the control of fishing gear, the monitoring of production and the quality of catches, but no formal regulation or customary provision of shellfish harvesting is applied currently in Côte d'Ivoire.

Shellfish are highly perishable, presenting challenges for product preservation up the value chain. The acquisition of new preservation techniques would allow shellfishery women to avoid selling their products quickly at low prices. By associating these technologies to new markets with good yields, through a better protection and rehabilitation of the indispensable ecosystems, women shellfishers could obtain greater financial opportunities, reducing poverty and increasing family well-being.

4.2. Recommendations

It is therefore recommended that:

1. Shellfish actors should be educated on the ecological services provided by shellfish and mangrove systems, and on promoting sustainable utilization of the resources. This could include specific training in the sustainable exploitation of shellfish and effective protection of associated mangrove habitat.
2. Where possible, degraded mangrove ecosystems should be rehabilitated and protected against any form of exploitation, and a cartography of the Ivorian coast should be established, highlighting the mangrove ecosystems.
3. Shellfish actors should be assisted with soft loans and protective gear (i.e. diving apparatus, shucking gloves, waders etc.) to enhance their businesses.
4. Better means and techniques of sustainable conservation should be taught to women actors to avoid accelerated sales at low prices; this means that shellfish resource users should be equipped with skills in value addition to generate higher income, extend the shelf life of the product, and possibly penetrate high-value markets.
5. Where possible and in collaborative co-management with shellfishing communities, existing laws and other prefectural decrees should be applied in their entirety.

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