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The Estuarine and Mangrove Ecosystem-Based Shellfisheries of West Africa

Spotlighting Women-Led Fisheries Livelihoods



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Cover image: An illustration of women-led shellfisheries in West Africa depicting the process of harvesting, types of species and the presence of mangroves

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TABLE OF CONTENTS

	<u>Page</u>
Detailed Partner Contact Information.....	ii
TABLE OF CONTENTS.....	iii
LIST OF TABLES.....	v
LIST OF FIGURES.....	v
ACRONYMS.....	vii
Executive Summary.....	2
About USAID Women Shellfishers and Food Security Project.....	6
1. Purpose and Scope of the Participatory Assessment of Shellfisheries in West Africa.....	7
2. Regional Overview of Shellfisheries in West Africa.....	8
2.1. Background.....	8
2.2. The coast and geographical coverage of estuarine and mangrove ecosystem-based shellfisheries in the sub-Region.....	10
2.3. Shellfish exploitation.....	12
2.3.1 Estimated number of shellfishers.....	12
2.3.2 Insights on gender in shellfish exploitation.....	15
2.3.3 Shellfishing as primary occupation.....	17
2.3.4 Shellfishers' supplementary livelihoods.....	19
2.3.5 The shellfish value chain.....	20
2.3.6 Species harvested.....	22
2.3.7 Harvesting methods.....	24
2.3.8 Harvest volumes and value.....	26
2.3.9 Seasonality of harvests.....	28
2.4. Mangrove ecosystems as support for shellfisheries.....	29
2.5. Shellfisheries and Mangrove Ecosystems Governance Regimes.....	33
2.6. Improving Shellfisheries Livelihoods of Women.....	36
3. CONCLUSIONS.....	39
REFERENCES CITED.....	43

APPENDICES..... 45

APPENDIX 1: Number of shellfishers at some shellfish harvesting localities (ecosystems and communities) in the various countries..... 45

APPENDIX 2: Detailed presentation of shellfishers' involvement along the shellfisheries value chain..... 48

APPENDIX 3: Estimation of volume and value of shellfisheries harvested by women in West Africa..... 50

APPENDIX 4: Questionnaire used for the assessment..... 51

APPENDIX 5: Hectares of coastal ecosystems with shellfisheries identified as Ramsar sites for conservation 59

LIST OF TABLES

Table 1: Gender dominance of shellfish harvesters along the value chain of different shellfisheries along the West African coast.....	16
Table 2: Shellfish species identified along the coast of West Africa from Senegal to Nigeria. The top five most common shellfish species are highlighted orange.....	22
Table 3: Maximum daily, monthly, and seasonal harvest quantities for the most important women-led shellfisheries in Ghana.....	26
Table 4: Organized shellfisheries groups, their countries of activity and legal status.....	34

LIST OF FIGURES

Figure 1: West Africa Shellfisheries.....	1
Figure 2: Prevalence of anemia in women of reproductive age (SOURCE: Ritchie and Roser, 2017). 9	
Figure 3: Distribution of shellfish harvesting locations along the coast of West Africa.	11
Figure 4: Length of coastline (left) and mangrove cover (right) for the 11 countries from Senegal to Nigeria (Global Mangrove Watch https://globalmangrovewatch.org).....	12
Figure 5: Total estimated number of shellfishers in the coastal countries of West Africa.	14
Figure 6: Gender disaggregation of shellfishery resource users for each country (top) and for all countries combined (bottom [n = 277])......	15
Figure 7: Women, with the support of their children, get ready to convey their day's catch of oysters from the bank of the Narkwa Lagoon to their homes in Ghana.....	17
Figure 8: Various scenes from the Densu Estuary where (A) the oyster bed is exposed at low tide. (B) An oyster picker harvests oysters by hand into a canoe at high tide. (C) Women and their children harvesting oysters from an oyster bed and being placed into buckets and pans at low tide. (Source: Chuku, 2019).....	18
Figure 9: Gender breakdown of shellfish harvesters as a primary occupation.....	19
Figure 10: Resource users' involvement in the shellfisheries value chain in West Africa.....	20
Figure 11: Shellfish consumption rate in coastal areas of West Africa.....	21

Figure 12: Common shellfish species harvested along the coast of West Africa; The West African mangrove oyster (<i>Crassostrea tulipa</i>), periwinkles (<i>Tympanotonus fuscatus</i>), bloody cockle (<i>Senilia senilis</i>), whelks (<i>Pugilina morio</i>), razor clams (<i>Tagelus adansonii</i>), freshwater/Volta clam (<i>Galatea paradoxa</i>), shrimps (Penaeids) and the brown mussel (<i>Perna perna</i>).....	24
Figure 13: Specialized portable axe for harvesting oysters from mangrove roots.....	24
Figure 14: Women in Ghana often harvest oysters from the bank of the estuary by wading through and picking with hands and placing into pans and canoes.	25
Figure 15: Heaps of empty oyster shells at the Lamin harvesting area of the Tanbi Wetlands, The Gambia.....	27
Figure 16: Presence of mangrove ecosystems near shellfish harvesting locations (left) and the exploitation of mangroves in these areas (right) [n = 277].	30
Figure 17: Mangroves (top left) that provide critical habitats for oysters (top right) are harvested (bottom) and traded for various purposes at the shellfish harvesting sites.....	30
Figure 18: The use of brush parks (patches of brown areas in the water) for “Akadja”/ “Atidza” fishing in the Densu Delta, Ghana.....	31
Figure 19: Mangrove exploitation by gender [n = 277].	31
Figure 20: Health of mangrove vegetation within the catchment of shellfish harvesting areas as perceived by shellfishers [n = 277].	32
Figure 21: Processing of oysters: parboiling (left), shucking (middle) and extracted meat/flesh (right).	33
Figure 22: Shellfish harvester demonstrates the wearing of improvised foot gear used for harvesting oysters.....	36
Figure 23: Processing and packaging of oysters.....	37
Figure 24: The five domains and associated indicators used in the Women’s Agricultural Empowerment Index (WAEI).....	42

ACRONYMS

ACECoR	Africa Centre of Excellence in Coastal Resilience
CCM	Centre for Coastal Management
CLPA	Conseils Locaux de Pêche Artisanale (Local Artisanal Fishery Councils)
CRC	Coastal Resources Center
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
HDI	Human Development Index
ICRAF	World Agroforestry
MPA	Marine Protected Area
NGOS	Non-Governmental Organizations
REDD	Reducing Emissions from Deforestation and forest Degradation
TRY	TRY Oyster Women's Association
UCC	University of Cape Coast
UG	University of Ghana
UNESCO	United Nations Educational, Scientific and Cultural Organization
URI	University of Rhode Island
USAID	United States Agency for International Development
USD	United States Dollars

West Africa Shellfisheries

1.5 Million+ Ha

Mangrove Areas as
Potential Shellfishing Sites

Estuarine and mangrove ecosystem-based
Shellfish harvesters
in 11 coastal West African countries from Senegal to Nigeria

54,000+

79%

Shellfish harvesters are **WOMEN**

Direct household
shellfisheries beneficiaries

565,000+

300,000+ MT

Shellfish harvest volume by **WOMEN**
harvesters are potentially unreported annually

Value of **WOMEN** Shellfisheries
potentially undocumented annually

USD 300 Million+

Dominant Shellfish Species



Mangrove Oysters



Periwinkles



Bloody Cockles

Figure 1: West Africa Shellfisheries.

Executive Summary

This report presents findings from a participatory assessment of the shellfisheries conducted under the Women Shellfishers and Food Security Project funded by the United States Agency for International Development (USAID). The assessment was conducted in 11 coastal West African countries: Senegal, The Gambia, Guinea Bissau, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Togo, Benin, and Nigeria. The findings are presented in two main sections. Section 1 describes the purpose and scope of the assessment and Section 2 presents the regional overview of shellfisheries in West Africa. The report covers key data gaps identified in an initial literature review conducted prior to this study including estimated mangrove cover, presence of women shellfishers, and number of women shellfishers. Detailed country reports were also produced as part of this activity and are compiled in separate documents.

This report brings to the fore, for the first time, a regional perspective of estuarine and mangrove ecosystem-based shellfisheries, a small-scale fisheries sector that has long been overlooked. All 11 sub-Saharan West African countries assessed were found to have active shellfisheries interspersed along their combined 4,472 km coastline. For each country, there were at least four major sites practicing shellfish harvesting and trade. This indicates the potential for future efforts for scale-up through direct investments, research, and capacity building, as well as the development of value chains within this industry. The description of shellfisheries reveals the intensity of shellfisheries livelihoods across the West African coast. It documents that the shellfisheries sector presents an opportunity to scale up the enhancement of livelihood opportunities, especially for women, and an opportunity to scale and strengthen the contribution of shellfisheries to food and nutritional security and sustainable natural resource management across the sub-Region. Two of the region's most mangrove-rich countries, Nigeria, and Guinea Bissau, occur within the zone of this assessment.

The insights on the gender dynamics in shellfish harvest and trade provided in this report indicate a dominance of women in the shellfisheries livelihoods that occur in the estuarine and mangrove ecosystems of most coastal communities in West Africa, with 79% of shellfishers and value chain actors being women. Among the 11 countries studied, men's participation in shellfisheries was highest in Nigeria where the fishing of crustaceans formed an important component of the artisanal fishery, dominated by males. Nonetheless, the regional overview reveals near total dominance of women along the entire value chain of the bivalve and gastropod shellfisheries, while women also play significant processing and marketing roles in the crustacean and cephalopod shellfisheries.

Most of the women shellfishers are involved in the sector as a primary form of occupation and chief source of livelihood and income for their households. However, in most instances, the women were engaged in supplementary livelihood activities to augment their income, especially in the lean seasons for shellfisheries. Empowering these women to enhance their shellfishing livelihoods is, therefore, an important opportunity that could increase their net income and their economic, social, and nutritional wellbeing. Men who were involved in shellfisheries largely considered it a secondary occupation to

their main livelihoods. Their role in the shellfishery was mainly to provide support and was complimentary to the role of the women shellfish harvesters. The total number of people involved directly in shellfish harvesting across the sub-Region is estimated conservatively at more than 54,000 individuals and about 565,695 are estimated to be directly dependent on the resource as members of the households of shellfish harvesters.

The high consumption of shellfish among resource users in this study also gives an indication of the importance of shellfish in the diets and nutrition of coastal dwellers in West Africa and an opportunity to leverage shellfish for food and nutrition security of the people of coastal West Africa. Most (87%) of the resource users engaged in this study consume shellfish either on a daily or weekly basis. In addition, the involvement of women at multiple nodes of the existing but potentially not fully developed shellfish value chain – harvesting, processing, marketing, and transportation, including consumption – shows how strongly they take ownership of the sector and how vertically integrated the existing value chain is. Vertical integration increases the opportunity for women harvesters to benefit from improvements at any node in the value chain. This increases the incentive to take the often-difficult measures necessary to harvest the resource sustainably. Vertical integration of the value chain controlled by harvesters themselves, reduces the risk of external capture of benefits and promotes longer-term sustainable resource management that can incentivize local people involved in the exploitation of the resource.

Although a wide range of shellfish species comprising 17 species of molluscs, 11 species of crustaceans, and a few unidentified groups of gastropods, crustaceans and cephalopods were found to be of economic importance, the West African mangrove oyster (*Crassostrea tulipa*), periwinkles (*Tympanotonus fuscatus*), the bloody cockle (*Senilia senilis*), the whelks (*Pugilina morio*) and the razor clams (*Tagelus adansonii*) were the most common harvested shellfish species among the West African countries. The presence of pearl oysters (*Pinctada spp.*) in West Africa is also documented for the first time with presence in The Gambia and Senegal.

The challenge faced in this study in a number of countries was the inability to adequately estimate the volume and value of shellfish harvested due to reasons of non-standardized methods for estimating catch and sales of shellfish. Highly variable sizes of pans, trays, cups, cans, etc., are employed by the harvesters with no measure of weights and no record of sales, making it difficult to deduce estimates of volume and value of the shellfisheries. Regional production figures were deduced from the few countries with reasonably quantified volumes and value in this assessment. It was estimated that 301,191 MT of shellfish are harvested from the estuarine and mangrove ecosystems of West Africa annually by women, with a potentially unrealized value of about USD 331 million. These estimates are very important to provide insight on the economics of the sector and require further investigation based on species, harvest areas, and gender in all countries of West Africa.

The seasonality of harvests was found to be site (ecosystem) and species-specific, with no clear general pattern at the sub-regional scale. The availability of thriving populations of the shellfish is the strongest

determinant of yields. Where shellfish populations abound and the pressure is relatively low, harvesting occurs all year round, e.g., the periwinkle fisheries of the Amissano estuary, Densu delta, and Volta estuary in Ghana. The immense habitat and nutritional ecosystem services provided by mangrove ecosystems enjoins the need for their protection and sustainable exploitation. Although the region's mangrove ecosystems are perceived to be generally healthy, and some are designated for conservation as national parks and Ramsar sites (e.g., Saloum delta in Senegal, the Tanbi wetlands in The Gambia, the Cacheu River mangrove park in Guinea-Bissau, the Densu delta in Ghana, and the coast of Benin), they are under threat. Areas of degradation require urgent attention for conservation and restoration efforts to improve the productivity of shellfisheries.

The general non-existence of formal laws specific to the regulation of shellfisheries activities within the estuarine and mangrove ecosystems of West Africa calls for efforts to formulate and implement policies on use rights and co-management. It is, however, notable that the women-led shellfisheries of West Africa have seen successful examples of rights-based co-management plans developed and implemented by the resource users themselves with high voluntary compliance and institutionalized in legal and policy documents. These cases are the [cockle and oyster co-management plan for the Tanbi Wetlands National Park in The Gambia](#) and the [co-management plan for the Densu delta oyster fishery in Ghana](#). In the absence of formal laws, traditional norms and customs as well as local organized shellfisheries groups play an important role in the regulation of shellfish harvests. These are largely community-based groups, mostly of women shellfish harvesters, that operate in silos within their respective catchments of shellfishing sites. One such group with national coordination is the TRY Oyster Women's Association of The Gambia which coordinates about 15 satellite formalized community-based women shellfisher groups within the Tanbi wetlands.

The current outlook of shellfisheries in the sub-Region documented in this report demonstrates a compelling opportunity for strategic efforts and investments to improve the sector as it provides critical livelihoods support for tens of thousands of vulnerable women and their households along the coast of West Africa and a promising win-win entry point for improved management of approximately 1.5 million hectares of associated vulnerable coastal mangrove and estuarine ecosystems and ecosystem services. This is because the value of shellfisheries contributing to livelihoods is ultimately reflected in the range of its products and services that are strongly linked to broader ecosystem functioning. The point needs to be underscored that the decline in mangrove and estuarine systems as a result of human disturbances could adversely impact the systems' ability to continue providing goods and services of value to users. There is a need to ensure sustainable ecosystem-based management principles are implemented to improve upon sustainable production practices. This will consequently stimulate a broader market base for shellfisheries products that incentivizes rational use of shellfish and ecosystem resources. The enabling conditions for resource user led rights-based co-management governance frameworks in women dominated shellfisheries vary across the region. Nine of the 11 countries have shellfisher groups organized at the village level or beyond, including one country with an association at the national level. In most of the countries, some of the coastal ecosystems in the public domain where there are shellfisheries have been prioritized

locally, nationally, and internationally for management and conservation as Ramsar sites totaling more than 600,000 hectares. At the same time, communities and ecosystems in countries like Nigeria, where fewer women's shellfisher groups are organized and ecosystems associated with coastal shellfisheries are not among those identified for conservation as Ramsar sites, might benefit most from strategic investment in shellfisheries co-management approaches that rely more on community-led initiatives than on government capacity and action.

Data on the ecology, biology, aquaculture/mariculture, economics, and other relevant information to inform decision-making for sustainable shellfish management and value chain improvements in the sub-region is limited and hinders effective decision-making for needed future advancements in the sector. A comprehensive program of action research involving shellfishers and value chain actors can serve as the foundation for effective co-management planning, governance, and decision-making processes while also providing critical information necessary to harness the full potential of shellfisheries and their coastal ecosystems, expand markets, and improve value of shellfish through business models for the various species.

Opportunities/Enabling Conditions

- Strong vertical integration of the shellfish value chain with women harvesters themselves dominant at every node. This increases the potential for value chain improvements at any node to incentivize sustainable harvest and ecosystem stewardship by women harvesters.
- More than 495,000 hectares of coastal ecosystems already prioritized for conservation as Ramsar sites. This Convention on Wetlands is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
- More than 30 women shellfisher groups organized at community, ecosystem, and national levels.

About USAID Women Shellfishers and Food Security Project

The Women Shellfishers and Food Security Project is a co-creation of the University of Rhode Island (URI) and partners from West Africa – the University of Cape Coast in Ghana (UCC), the University of Ghana (UG), TRY Oyster Women’s Association in The Gambia (TRY), and World Agroforestry (ICRAF). This project seeks to address the need for greater attention to food security for women shellfishers and their families while improving biodiversity conservation of the ecosystems on which their livelihoods depend. More robust models, tools, approaches, and processes are needed to enable and promote these sustainable food systems and natural resource management in coastal West Africa. The project will strengthen the evidence base, increase awareness, and equip stakeholders to adapt and apply successful approaches in areas of high potential for replication and scale-up in the eleven coastal West African countries from Senegal to Nigeria. It will draw on successful cases of a rights-based, ecosystem-based, participatory co-management approach to shellfish management by women in mangrove ecosystems in The Gambia and Ghana developed with USAID assistance. Knowledge and experience generated through the project will open up opportunities for improvement and broader application of these promising approaches in West Africa through these key project components:

1) *Conduct the first-ever participatory regional assessment of the situation, unmet needs, and promising approaches to shellfish co-management led by women across the eleven countries and review and determine the scope and scale of the potential sectoral and cross-sectoral benefits.*

2) *Elaborate and test elements of models based on existing approaches through site-based research in The Gambia and Ghana to strengthen the evidence base for successful elements of the model.* The project will conduct six technical studies covering the field research to document linkages in a Theory of Change and conceptual results chain between women’s shellfish co-management and livelihoods, mangrove conservation, and nutrition. It will examine existing elements in the approach that are not well documented, and that could enhance the approach if they are better understood. It will document both sectoral and cross-sectoral findings.

3) *Foster a community of practice around the development and dissemination of a toolkit on a rights-based, ecosystem-based, participatory co-management of shellfish by women in mangrove ecosystems in West Africa with and for community, national, and regional level stakeholders.* The toolkit will integrate findings from the participatory regional assessment and site-based research. Building on these activities, the toolkit development and dissemination will build a community of practice and provide capacity development support of 37 stakeholder institutions in West Africa. It will provide the first practical guide for the design and implementation of women’s shellfish co-management in West Africa, supported by a network of practice, among other elements such as policy briefs and case studies.

1. Purpose and Scope of the Participatory Assessment of Shellfisheries in West Africa

The purpose of the regional information gathering and stakeholder engagement effort is to assess and document the status and significance of estuarine and mangrove ecosystem-based women's shellfisheries livelihoods across coastal West Africa. The Participatory Regional Assessment and stakeholder engagement will inform development of a toolkit, identify opportunities, and create a community of practice for uptake and application of the toolkit. The activity addresses the need for greater attention to food security for women shellfishers and their families while improving biodiversity conservation of the ecosystems on which their livelihoods depend.

Despite the existing practices in shellfisheries and local knowledge and experiences providing evidence of a significant population of women (often aided by their children) that harvest shellfish in shallow intertidal and mangrove areas, there are very limited data available to support the effective management of these livelihoods. As a result, the regional scale and scope of existing shellfisheries and shellfish-based livelihoods in the Region, which are closely linked to mangrove ecosystems and are potentially an effective entry point for mangrove conservation, is largely unknown. A recent global assessment of fishing intensity in mangrove areas (zu Ermgassen et al., 2020) concluded that regionally fishing intensity was greatest throughout Asia, and to a lesser extent in West and Central Africa. However, at the national level in countries with ≥ 10 sq. km. of mangroves, Ghana had the highest predicted median mangrove fishing intensity (8 thousand fisher days/sq. km./year). Neither the distinction between shellfisheries, bivalve fishing, and other forms of fishing, nor the breakdown by gender of the fisherfolks were reported in this study.

The regional information on coastal shellfisheries and mangroves is undocumented in a number of thematic areas. These include total hectares and health of mangroves, threats to mangrove ecosystems, protected status, governance and management arrangements, legal and policy enabling environment, and the socio-economic context regarding livelihood support for women and ecosystem services provided by these systems. In addition, the impacts of food fish livelihoods on these ecosystems are not well understood.

The state of knowledge varies widely in the 11 countries. The absence of annual catch and culture statistics of important bivalves such as oysters and cockles found within mangrove and estuarine systems from official data sources for many coastal West African countries makes it impossible to value the contribution to national Gross Domestic Product (GDP). A consolidated region-wide perspective is needed to draw the attention of governments of the region, the Economic Community of West African States (ECOWAS), and stakeholders at all levels to the nearly unrecognized but potentially significant livelihood of vulnerable groups in coastal areas. Thus, more robust models, tools, approaches, and processes are needed to enable and promote these sustainable food systems for natural resource management in coastal West Africa.

Per the scope of work for the USAID Women Shellfishers and Food Security Project, the UCC coordinated the participatory regional assessment of the shellfisheries in 11 coastal West African countries from Senegal to Nigeria using local academic, government and shellfish community contacts and leveraging the institutional linkages of URI, UCC, UG, ICRAF, and TRY, to collaborate within the sub-Region.

Key outputs of the assessment:

- A consolidated region-wide perspective of the scale and scope of existing shellfisheries and shellfish-based livelihoods occurring in the region's mangrove ecosystems.
- Information on the status of estuarine fisheries, their management/governance, and women's shellfishing livelihoods
- Gaps in information identified and suggestions for ways those gaps could be filled, for instance, through better data gathering by fisheries departments or in collaboration with harvesters.
- Case studies on promising approaches, as well as unmet needs, and potential opportunities for sectoral and cross-sectoral benefits.
- Information for USAID on potential targets that could be delivered for USAID standard Agriculture, Biodiversity, Gender, and Nutrition outcomes indicators in each of the countries and region-wide if approaches were scaled up.

2. Regional Overview of Shellfisheries in West Africa

2.1. Background

Fish and fisheries resources continue to be a critical component of global food production and nutrition, providing livelihoods for many. In Africa marine and inland fisheries have been at the fore of production volumes, receiving the most attention to the neglect of other important fisheries, especially of those that occur within such critical coastal ecosystems/habitats as lagoons, estuaries, and mangroves. The West Africa region referred to in this assessment comprises 11 continental coastal countries of the Economic Community of West African States (ECOWAS) where coastal shellfisheries are noted to provide livelihood, income, and nutrition, and are of conservation value for the natural habitats, mangrove vegetation, and swamps from which the food species are derived. These ecosystems fall within the intertidal zones of most coastlines and have characteristically shallow areas, thus accessible to women.

Fisheries resources contribute up to 80% of animal protein in coastal countries of West Africa, and about \$400 million annually to the regional economy. These are, however, countries that record human development indices that are very low ranking compared to other nations and have some of the highest rates of anemia prevalence among women of reproductive age in the world (Figure 2).

Prevalence of anemia in women of reproductive age, 2016

Prevalence of anemia in women of reproductive age (aged 15–49), measured as the percentage of women with a hemoglobin level less than 110 grams per liter at sea level.

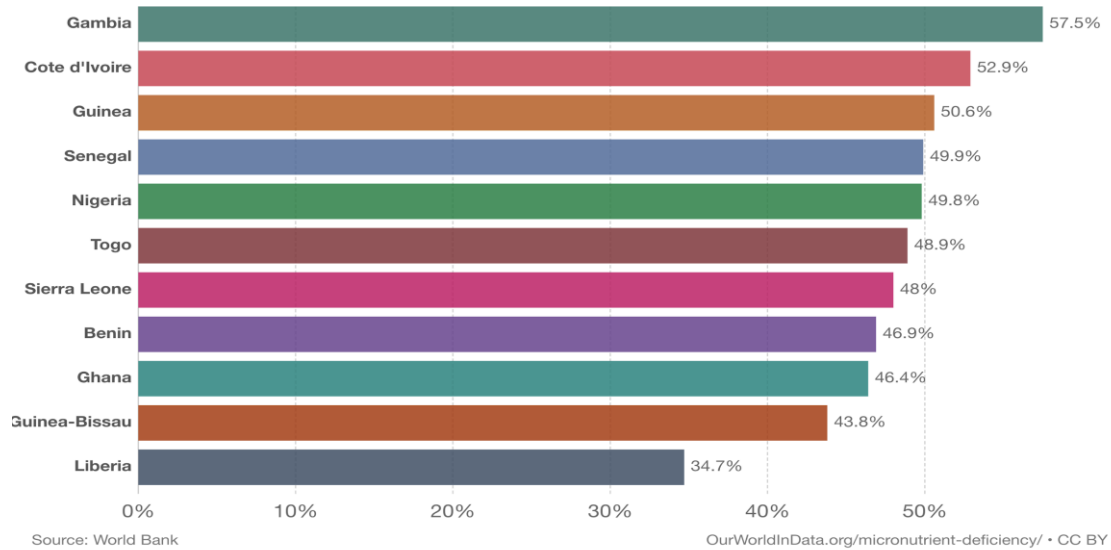


Figure 2: Prevalence of anemia in women of reproductive age (SOURCE: Ritchie and Roser, 2017).

Shellfisheries, especially of molluscs and bivalves such as oysters, clams and periwinkles that are collected in the shallow intertidal areas of coastal ecosystems, provide critical livelihood and nutritional support for the women and their children in coastal estuarine communities. Among the shellfish types harvested in coastal ecosystems closely associated with mangroves, women are observed to overwhelmingly dominate the harvesting of oysters and generally feature prominently in the fisheries of bivalves and some gastropods. The literature search, however, yielded very scanty detail on the shellfishing livelihoods of women within lagoonal/estuarine mangrove ecosystems in the coastal countries of West Africa.

Prior to this study, women were observed in selected communities in Senegal, The Gambia, and Ghana to be the main exploiters of shellfish in these ecosystems abounding along the West African coast. To elucidate the scope and scale of shellfisheries in West Africa, the USAID Women Shellfishers and Food Security Project conducted a participatory assessment of the shellfisheries of 11 coastal countries from Senegal to Nigeria in consultation with the resource users, government, academia, NGOs and local authorities. Annual catch and culture statistics of important bivalves such as oysters, cockles, clams, and some gastropods, including periwinkles, that are found within mangrove and estuarine systems, are not available from FAO's FishStat-J database for many coastal West African countries. Where information is available, they are not up to date. For instance, there are gaps for Senegal and The Gambia for aquaculture production, and for Sierra Leone for capture production. Information about the climate risks to coastal mangrove ecosystems in West Africa with regards to the impact of rainfall on shellfish growth rates, abundance, habitat extent, etc., was not available for most of the coastal West African countries under consideration.

In order to contribute to addressing this dearth of information availability, seven priority information gaps have been identified in a [literature review](#) conducted on all countries of this assessment. This participatory regional assessment and other activities of the Women Shellfishers and Food Security project, such as the site-based in-depth research activities in Ghana and The Gambia, are intended to harness as much information as possible in the gap areas.

2.2. The coast and geographical coverage of estuarine and mangrove ecosystem-based shellfisheries in the sub-Region

The participatory assessment conducted in 11 coastal countries revealed that shellfisheries activities are interspersed along the entire stretch of the West African coast, with a vibrant informal enterprise in all 11 countries: Senegal, The Gambia, Guinea Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, and Nigeria. There is evidence of some appreciable levels of estuarine and mangrove ecosystem-based shellfisheries activity in many of West Africa's coastal communities. In many others, there are accounts of historically existing populations of some shellfish, especially bivalves, that have been decimated. Although the causes are not fully understood by the members of these coastal communities, the degradation of shellfisheries is suspected to be attributable in some places to the siltation of estuaries resulting from upstream gold and sand mining activities. In some instances, historically thriving populations of oysters, which community members used to access and harvest with ease, had disappeared with only a few small-sized oysters currently observed on mangrove roots. The numerous empty oyster shells seen on the bottom of shallow areas of some lagoons and estuaries, but not accounted for by any form of shell-dumping, are indicative of mass mortalities caused by long periods of freshwater influx or hyper-salinity.

For each of the 11 countries, there are a minimum of four major locations, including communities and ecosystems, that have active shellfisheries connected to estuaries, lagoons, and mangroves. Figure 3 shows shellfish locations identified along the coast of West Africa, depicting the region-wide spread of the sector.

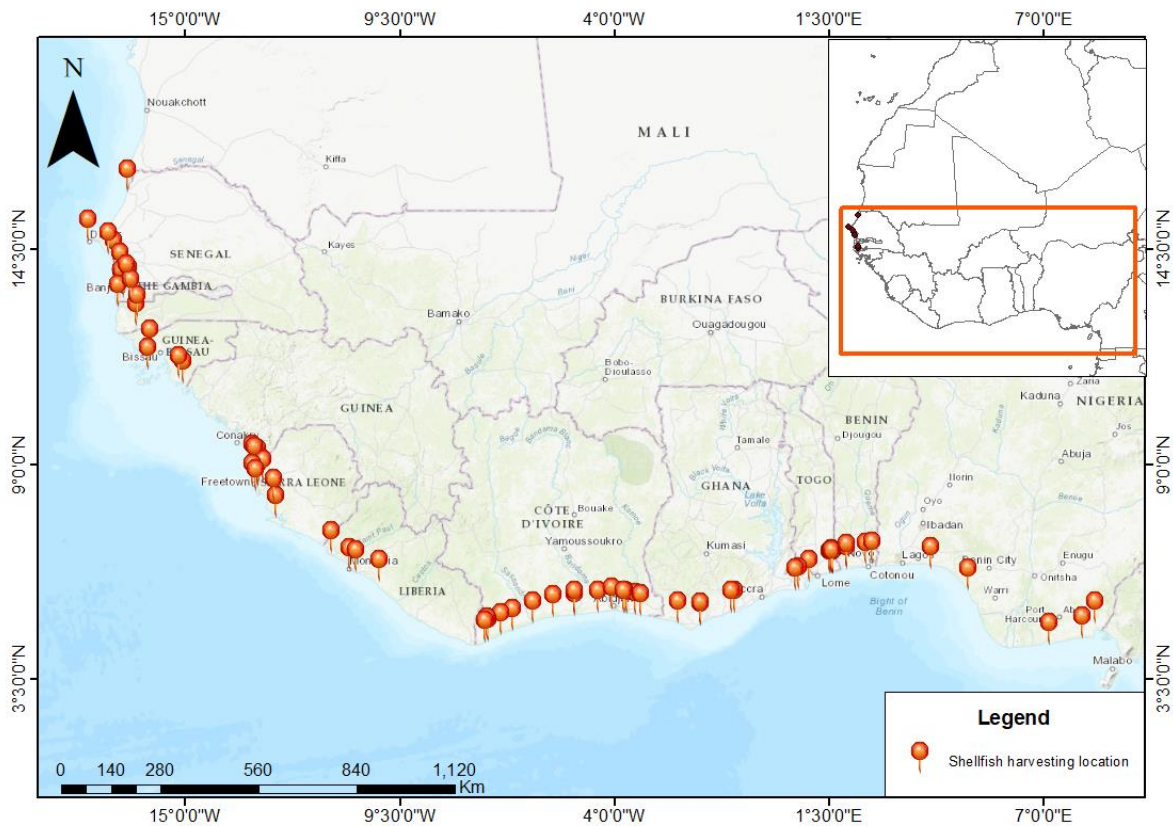


Figure 3: Distribution of shellfish harvesting locations along the coast of West Africa.

Notable among the shellfish harvesting areas in West Africa is the Saloum Delta, which as a UNESCO world heritage site (2011), a biosphere reserve (1981), and designated as a wetland of international importance under the Ramsar Convention provides enormous shellfish livelihood opportunities for women. In Casamance, Senegal, oyster harvesting, processing, and marketing occurs in all villages within the Casamance river estuary or Lower Casamance, notably in the islands of Blis-Karone, Boulouf, and Bandial. The Tanbi wetlands from which many near-by communities derive their food and livelihoods in The Gambia, and the Densu Delta, Narkwa lagoon and the Volta estuary in Ghana are also critical ecosystems that provide food and serve as habitats, breeding, and nursery areas for marine species, including important food fish such as sardinella and mullets. The Coastal Lagoon of Benin is another ecosystem that houses important shellfish species exploited for food and income by coastal households. Sections of the Niger Delta and the Calabar River Estuary are also exploited for shellfish for food.

The coastlines of the countries as well as the expanse of their estuarine and mangrove ecosystems (Figure 4) provide suitable locations and flourishing habitats that support many different shellfish species. In some countries, shellfisheries occur in communities surrounding large nearshore sheltered bays, deltas and wetlands that sometimes extend deeply inland but with marine or brackish

characteristics, for example from Senegal, through The Gambia to Guinea Bissau. The entire coast of Togo is a protected area and serves as a source of oysters used as food by women shellfish harvesters and their households. These systems usually have marine characteristics. Some countries also have classic brackish water estuaries constantly fed by running rivers. These estuarine areas where the rivers meet the sea provide suitable habitats for mangroves and shellfish species of both marine and freshwater origin. The coastline of Ghana, for instance, has several river estuaries with many shellfish species harvested by women, especially oysters. Lagoons, similar to the Coastal Lagoon of Benin, are scattered across the coast and also provide the needed habitat for shellfish to thrive. The extent of harvesting of shellfish may be determined in part by the presence of estuaries, lagoons, and mangrove wetlands.

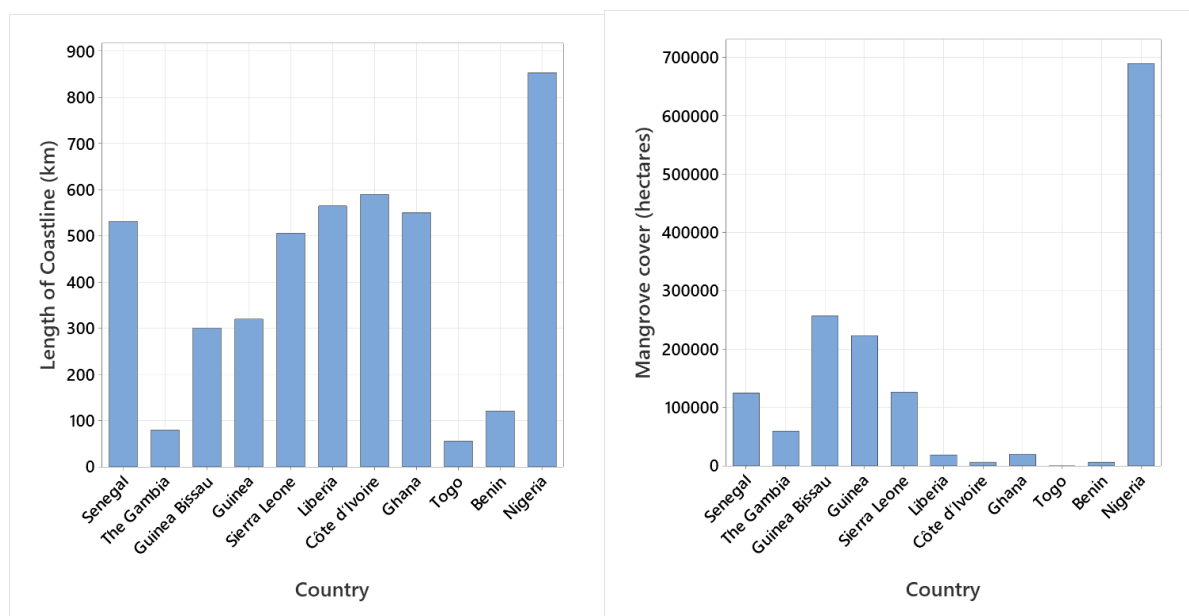


Figure 4: Length of coastline (left) and mangrove cover (right) for the 11 countries from Senegal to Nigeria (Global Mangrove Watch <https://globalmangrovetwatch.org>).

2.3. Shellfish exploitation

2.3.1 Estimated number of shellfishers

Information on the number of shellfish harvesters across the sub-Region is largely not available, where available sparse and sometimes based on unrealistic assumptions for certain locations. An earlier attempt to estimate women shellfisheries, mainly oyster fisheries, constructed estimates premised on two assumptions, first by assuming the number of oyster harvesters to be equal to the number of artisanal fishers and secondly on the assumption that oyster harvester households equaled the number of fishing households (Ottaviani 2020) albeit with a note of caution (Ottaviani 2020). The enormity of artisanal fisheries in the sub-Region vis-a-vis the observed scale of women shellfisheries makes it impractical on consideration of relativity to go by the values deduced based on these assumptions.

For example, the said study by Ottaviani (2020) estimated the number of oyster harvesters in Senegal, Guinea-Bissau, Guinea, and The Gambia to be 16,069, 7,300, 7,800, and 3,200, using the reported number of artisanal fishers as a proxy, which is likely an overestimation. 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 54,778 persons (Figure 5), the majority of which are females, are engaged in shellfisheries livelihoods across the 11 countries of this assessment. Nigeria had approximately 39,340 shellfishers (highest in the study) amounting to about 78 shellfishers in each of the approximately 500 communities interspersed across the coast. Senegal, Ghana, and The Gambia each had estimates of over 2,000 shellfishers based on interactions with the resource users in this assessment. Guinea-Bissau, Sierra Leone, Côte d'Ivoire, Togo, and Benin each had less than 1000 shellfish harvesters. Household members of these shellfishers averaged nine individuals, with Ghana having the least and The Gambia having the most household members approximated at seven and 13 respectively. Based on these household sizes per country, it is further estimated that some 565,695 people are directly dependent on shellfish resources of the estuarine and mangrove ecosystems of the West African coast (Figure 5).

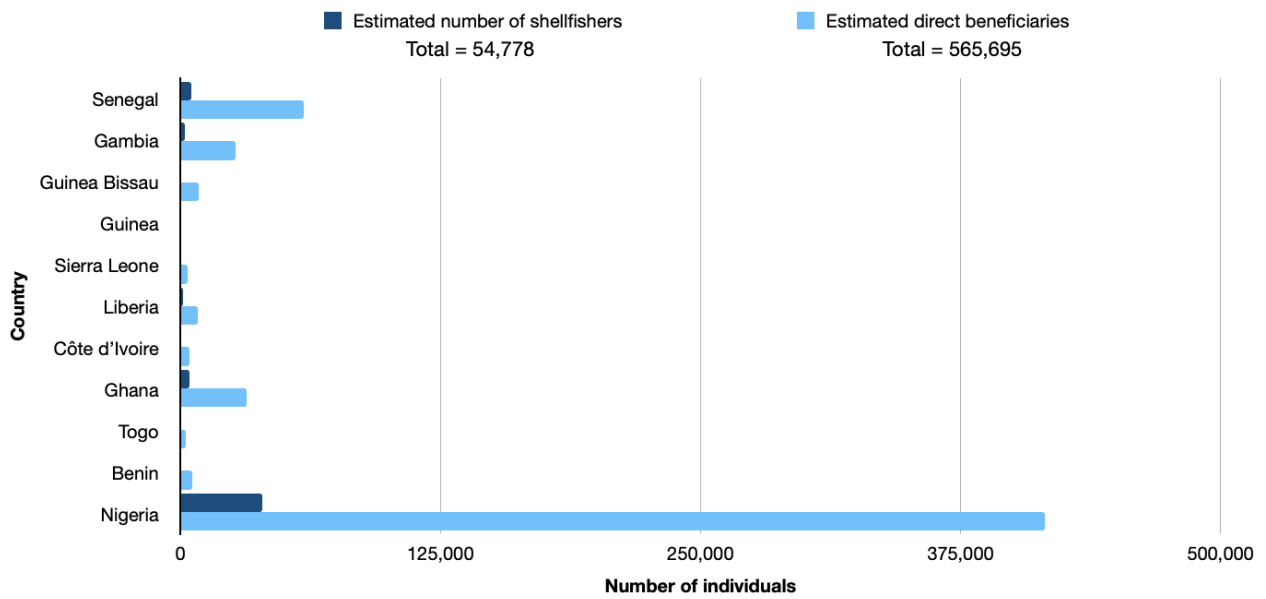
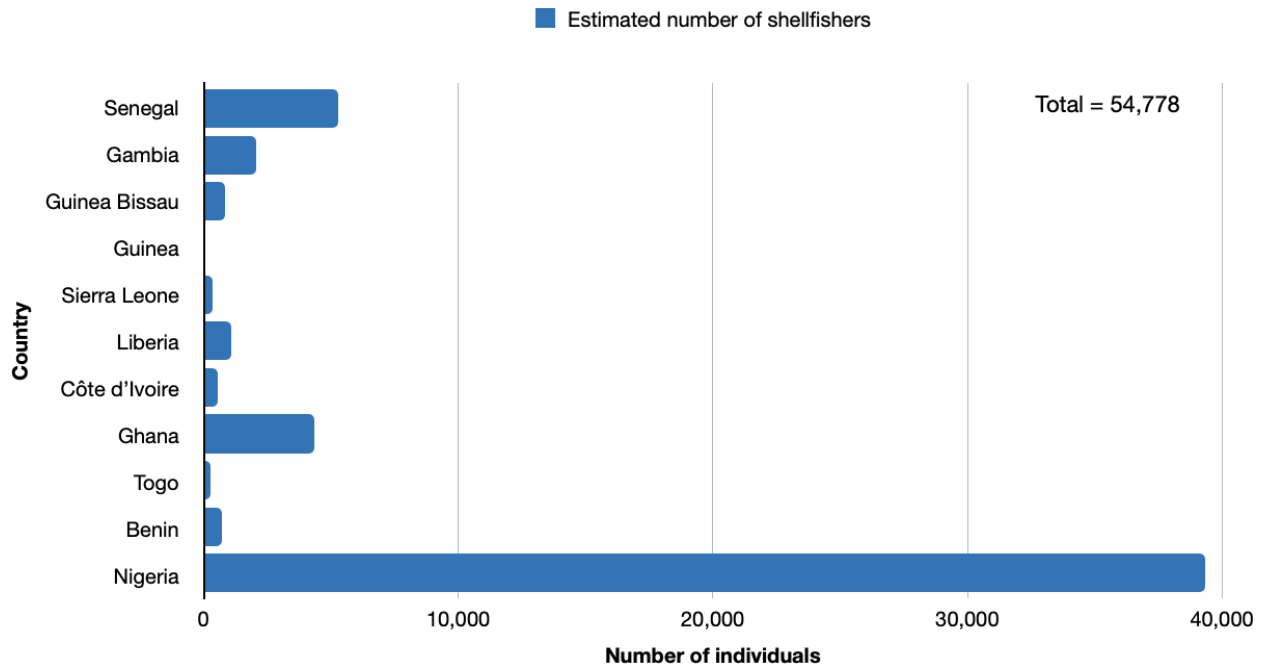


Figure 5: Total estimated number of shellfishers in the coastal countries of West Africa.

2.3.2 Insights on gender in shellfish exploitation

The assessment revealed women as the dominant users of the estuarine and mangrove ecosystem-based shellfisheries resources of West Africa (Figure 6), which comprises the fisheries of bivalves and gastropods including oysters, mussels, clams, and periwinkles, among others. In each of the countries of this assessment, women constituted more than 60% of shellfishers identified. Women's involvement, as key resource users, was highest in Senegal and Guinea Bissau. Relatively high participation of women in shellfisheries was also observed in The Gambia, Ghana, and Benin. Men had an appreciable participation in Sierra Leone, Liberia, Ivory Coast, Togo, and Nigeria with Nigeria having the most participation from men. Overall, across the sub-Region, close to 80% of the shellfishers identified and engaged in this assessment were female.

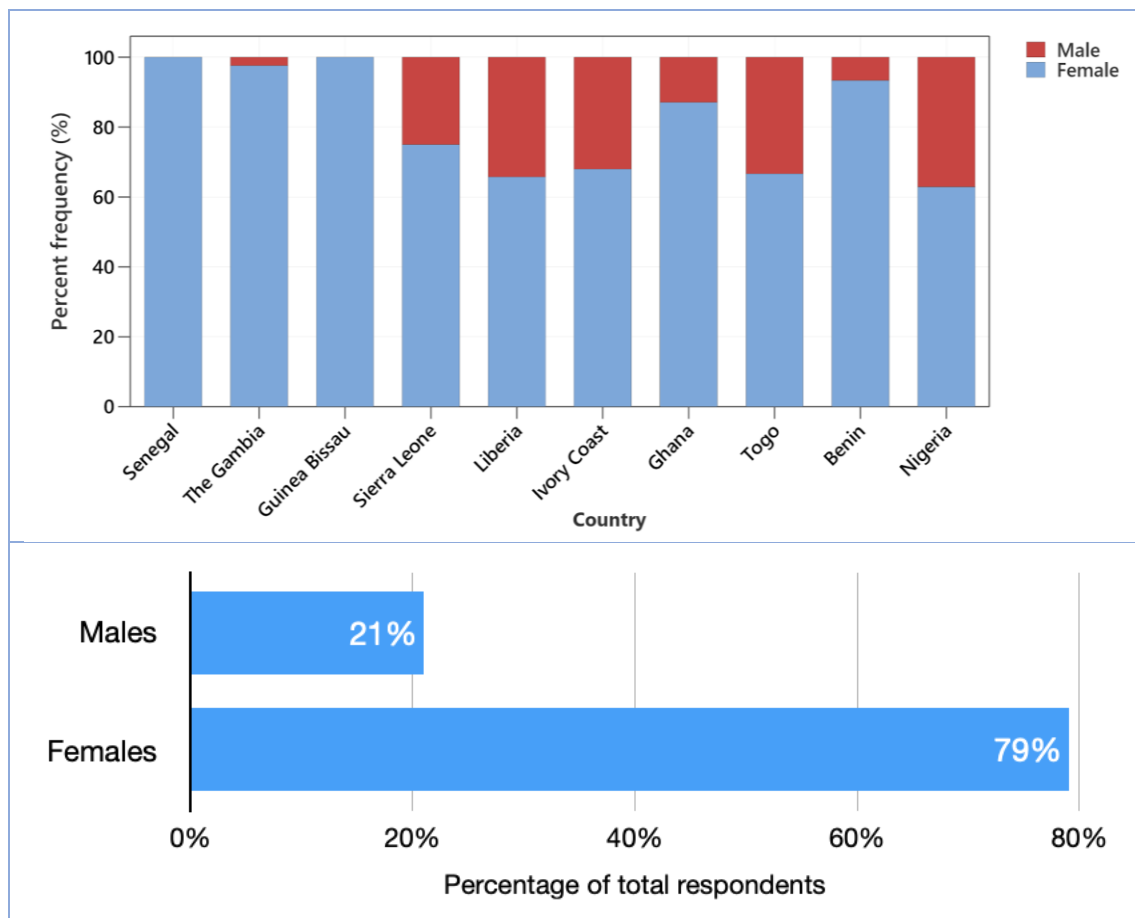


Figure 6: Gender disaggregation of shellfishery resource users for each country (top) and for all countries combined (bottom [$n = 277$]).

There was some further differentiation of the gender of harvesters based on species harvested (Table 1). Countries that had some appreciable representation of men in the estuarine and mangrove-based shellfisheries were also countries that had vibrant crab and shrimp fisheries in addition to other species, e.g., lobsters and squids/octopus (possibly cuttlefish). This indicates that women are mostly involved in the harvest of bivalves and gastropods that frequent the shallow reaches and banks of the estuaries

and lagoons, which are the main harvesting areas. Most shellfish harvesting areas fall within the intertidal zones of coastal areas. These are generally shallow areas near the mouths of estuaries and in lagoons usually measuring less than 1m but can go up to 2-3 m deep. In a few locations including the River Gambia, the estuarine systems with fringing mangroves from which shellfish harvests are done can be as deep as 10 m below the surface. The shallow areas are heavily patronized by women shellfishers. The moderately deep harvesting grounds (2-3 m) are exploited by the relatively few men involved in shellfish harvesting. Although men support with transportation and rowing of canoes to distant harvesting grounds and the deep areas, the women in the Bullock region in The Gambia often row their own boats on the up to 10 m deep creeks.

Table 1: Gender dominance of shellfish harvesters along the value chain of different shellfisheries along the West African coast.

Shellfish group/fishery	Dominant gender at different nodes of the value chain			
	Harvesting	Processing	Marketing	Transportation (during harvest)
Bivalves	Females	Females	Females	Females
Gastropods	Females	Females	Females	Females
Crustaceans	Males	Females	Females	Males
Cephalopods	Males	Females	Females	Males

(NOTE: Gender dominance is determined by more than 60% participation by a particular gender.)

Countries with appreciable participation of men in the shellfisheries saw the involvement of men in the provision of transportation support for the women harvesters to and from their harvesting grounds and in a few instances, assisting as carriers of the harvests to various locations. This support is, however, minimal. There are notable exceptions to this general gendered pattern of harvesting roles and species specialization. For example, in the Volta River clam fishery in Ghana, men are the main harvesters as this is done on boats and using hookah gear to exploit clam populations in the river. Men also engage in other activities especially in the capture-based aquaculture “ranching”: of the Volta clam (*Galatea paradoxa*) within the estuary to meet particular market size demands. This form of open water aquaculture ranching is practiced where men gather wild clams and transplant them to localized areas within the estuary and allow them to fatten over a few months before harvesting for sale. Often these transplant beds are marked and viewed as de-facto exclusive harvesting rights to those who mark and transplant the smaller clams into the area. The men are also reported to be involved in fuelwood harvesting for the processing of shellfish. Women are involved in processing and selling of the clams. It should also be noted that children, usually assisting their parents or mothers, both boys and girls, are sometimes involved in the fishery as well (Figure 7).



Figure 7: Women, with the support of their children, get ready to convey their day's catch of oysters from the bank of the Narkwa Lagoon to their homes in Ghana.

2.3.3 Shellfishing as primary occupation

For many along the coast of West Africa, shellfisheries serve as an important source of income providing primary livelihoods for women especially (Figures 8 and 9). The upper panel of Figure 9 details the country-specific relevance of shellfisheries as a primary occupation for men and the lower panel depicts that of women. Figure 9 indicates that women, who form the majority of direct beneficiaries of shellfish resources, engage in shellfisheries activities as their primary occupation to a greater extent than men.



Figure 8: Various scenes from the Densu Estuary where (A) the oyster bed is exposed at low tide. (B) An oyster picker harvests oysters by hand into a canoe at high tide. (C) Women and their children harvesting oysters from an oyster bed and being placed into buckets and pans at low tide. (Source: Chuku, 2019).

In Senegal, The Gambia, Sierra Leone, Liberia, Ghana and Nigeria, a majority of women identify shellfishing as a primary occupation. Small percentages of women in Guinea Bissau, Ivory Coast and Benin stated it was a primary occupation and none stated it as a primary livelihood in Togo. A high percentage of men identified shellfishing as a primary occupation in Nigeria and Liberia and smaller percentages in Ghana, Sierra Leone, and The Gambia. No men identified it as a primary occupation in Togo, Benin, Guinea Bissau, and Senegal. The large participation of men is often species specific. For example, the species diversity of the Nigerian coastal ecosystems offers a vibrant fishery of crustaceans, mainly the shrimps/prawns and lobsters (crayfish) as well as crabs that are mainly exploited by men, while the women exploit the bivalves and gastropods, including mangrove oysters, periwinkles, and clams. In Ghana, men dominate harvesting of the *Vola* clam, whereas women dominate harvests of oysters and gastropods in other estuaries and lagoons.

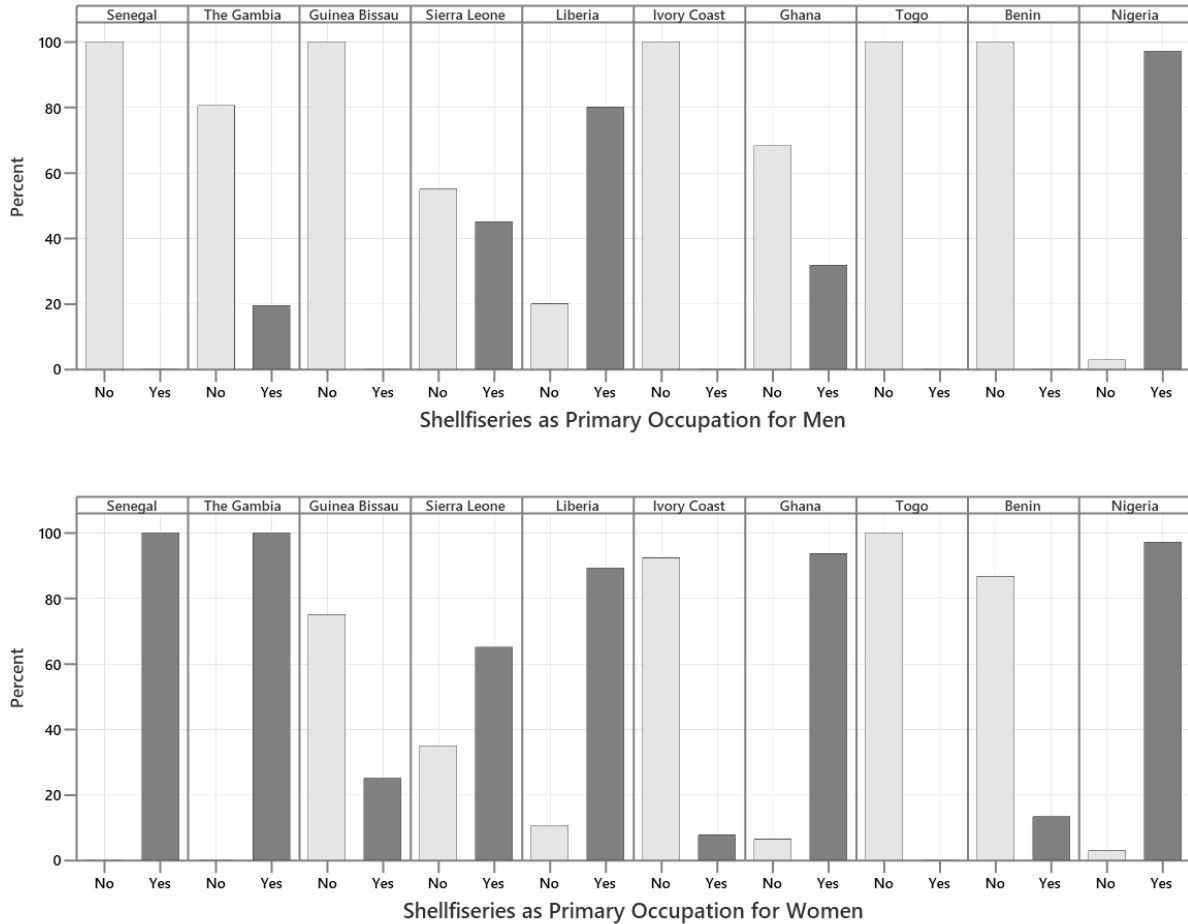


Figure 9: Gender breakdown of shellfish harvesters as a primary occupation.

2.3.4 Shellfishers' supplementary livelihoods

Where shellfisheries are a primary occupation, shellfishers are usually engaged in other supporting livelihoods. These are usually production oriented, or services provided to others within the communities for additional income. Petty trading is the most common activity employed as a secondary livelihood by women shellfishers. In addition, a number of them, and especially in The Gambia, engage in farming and horticulture of vegetables for subsistence and for sale. Others undertake laundry services. Fish trading and fish offloading from canoes as well as basket fishing and sometimes capture-based culture of clams in shallow waters are some activities done by the women in Ghana. Fish processing and marketing are common second jobs for women shellfishers across the West African coast. Wood cutting, mat weaving, fuelwood hewing and trade, and palm wine tapping are examples of forest-based activities engaged in as supplementary livelihoods by women shellfishers. Some of the women do Batik making and sewing, and in Senegal, processing of forest products into local juices is common. Mat making, catching crab, salt processing, fishing, coconut selling, soya cheese cooking, clothes selling, trading of firewood and goods, sale of fishery products are common in Togo.

The men are usually engaged in couture, art, masonry, carpentry, and welding for Senegal, and in other countries they are mainly fishers and farmers. In the Volta estuary in Ghana, men dominate the capture-based aquaculture practice in the clam fishery (Section 2.3.2).

2.3.5 The shellfish value chain

Shellfisheries activities in local communities along the coast of West Africa involve harvesting, processing, retailing/marketing, transportation, consumption, and other very limited activities. These make the key nodes of the value chain of shellfisheries, especially of those that occur in estuarine and mangrove ecosystems. Figure 10 depicts the involvement of actors at the various nodes of the shellfish value chain. There is a very high consumption level for shellfish among coastal inhabitants who interact with the resource above any of the other key activities in the value chain. This indicates the importance of shellfish in the diets of households where shellfisheries are a source of livelihood.

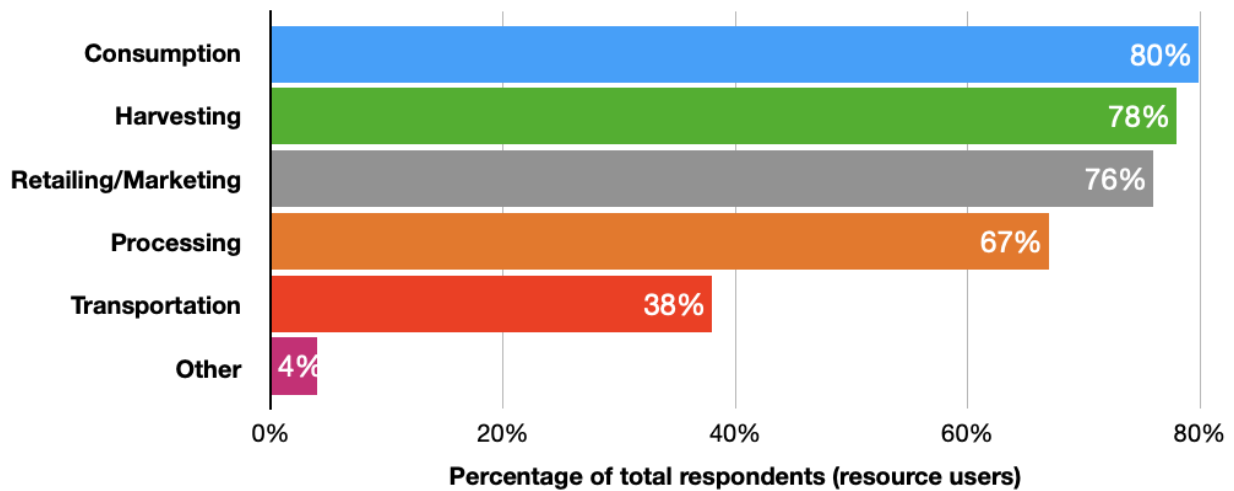
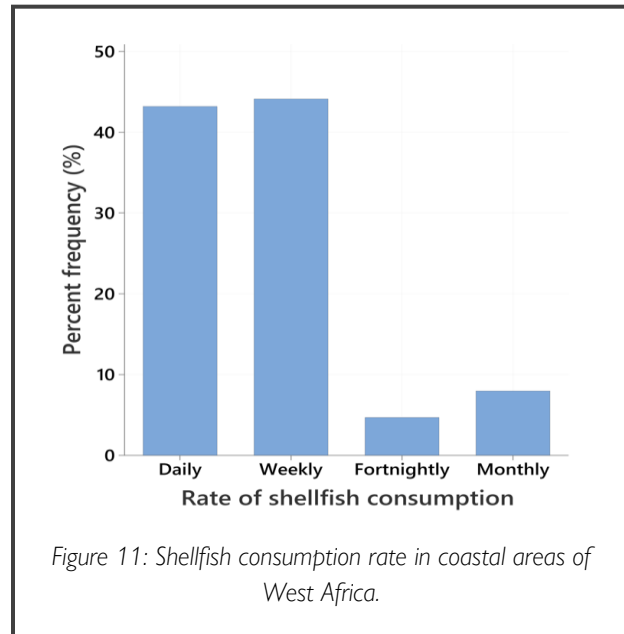


Figure 10: Resource users' involvement in the shellfisheries value chain in West Africa.

Among the 217 shellfish resource users interviewed in this survey, there were a vast majority of about 87% who included shellfish as part of their regular diets with about half of them consuming shellfish daily (Figure 11). A few others would consume shellfish when available or as desired.

The next most important shellfisheries activities following consumption are harvesting, retailing/marketing, processing, transportation, and others, in that order. Of the 217 actors engaged in all countries, only 6.2% were involved in just one node along the value chain; this was either exclusive consumption (0.48%), harvesting (5.24%) or processing (0.48%) of shellfish. The majority of resource users were involved in multiple activities. The highest percentage of multiple-node involvement in the value chain was those who combined harvesting, transportation, processing, retailing/marketing, and consumption, representing 29% of the actors engaged in this assessment. The inclusion of transportation in this combination suggests that many shellfish harvesters either harvest from distant locations from their processing sites or convey their produce to distant markets for marketing.



The second largest group in the value chain, that is 17% of resource users surveyed, combined harvesting, processing, retailing/marketing, and consumption without transportation. This group usually reside close to harvesting locations and would normally process their shellfish on-site or carry them in their homes for processing and consumption or sales. About 8% of the resource users, though involved in harvesting, do not engage in processing but will consume shellfish prepared either in their household or purchased from the market. It is instructive also to highlight that along the shellfish value chain, about 5% of resource users across the sub-Region are exclusively involved in harvesting. These could be persons who assist large harvesters and get paid some commission for the work done as a complement to their other livelihoods activities.

In addition, the involvement of women at multiple nodes of the shellfish value chain – harvesting, processing, marketing, and transportation, including consumption – shows how strongly they take ownership of the sector and how vertically integrated the value chain is. Vertical integration increases the opportunity for women harvesters to benefit from improvements at any node in the value chain. This increases the incentive to take the often-difficult measures necessary to harvest the resource sustainably. Vertical integration of a value chain controlled by harvesters reduces the risk of external capture of benefits disconnected from longer term sustainable resource management that can incentivize rapid overexploitation of the resource. Irrespective of the dominance of women in the shellfisheries of West Africa, men are often cited as the main transporters, being involved mainly in the rowing of canoes to transport women to and from their harvesting locations. Many women shellfish harvesters, however, have the capability to paddle themselves on their harvesting voyage but are not canoe owners in many instances, thus the involvement of men, who are canoe owners, in the

transportation node of the shellfish value chain. While men participate in transportation, they occasionally occupy a unique niche as identified in the clam fishery in Ghana, where men are the main harvesters and engage in other activities especially in the capture-based transplanting and aquaculture ranching of clams. This and other activities including rack culture of oysters, shell trade, use of shells for designs and decorations and participation in the governance of the resource by women fall within the “Other” node in Figure 10. Only 4 % of resource users are involved in the other activities.

Shell processing is another activity found to be a derived economic venture but without direct involvement of shellfishers. In Togo, there are five shell processing units located in the Prefecture of Lakes: three in the city of Anèho, one in the village of Zalivé, and one in the village of Kéta Assoukopé (the largest of the five). The large production unit has a daily production capacity of 5 tons while the capacity of smaller units is 2 tons per day. These shell processing units are, however, producing at about half of their capacity due to low demand. The main customers of these units are feed mills, companies dealing in animal feed ingredients and large poultry producers.

2.3.6 Species harvested

A total of 17 species of molluscs, 11 species of crustaceans, and a few unidentified groups of gastropods, crustaceans and cephalopods were found to be of economic importance and of livelihoods potential to shellfish resource users along the coast of West Africa (Table 2). The most dominant species of shellfish found in the estuarine and mangrove ecosystems are mainly the molluscs, which belong to the second largest phylum of invertebrate animals. The sub-groups frequently harvested for food and livelihoods are the bivalves and gastropods. Bivalves are double half-shelled organisms. Gastropods are soft-bodied foot-bearing organisms, commonly snails. The common bivalves include the West African mangrove oyster (*Crassostrea tulipa*, Lamarck 1819), the West African bloody cockle (*Senilia senilis*, Linnaeus 1758) and the freshwater clam (a.k.a. Volta clam) (*Galatea paradoxa*). Others are the brown mussels (*Perna perna*) and the razor clams (*Tagelus adansonii*). Ghana, Nigeria, Senegal, and Sierra Leone harvested more than nine different shellfish species whereas Guinea Bissau, Liberia, Ivory Coast, The Gambia, and Guinea had five or less (see Table 2)

Table 2: Shellfish species identified along the coast of West Africa from Senegal to Nigeria. The top five most common shellfish species are highlighted orange.

Species	Country										
	Senegal	The Gambia	Guinea Bissau	Guinea	Sierra Leone	Liberia	Ivory Coast	Ghana	Togo	Benin	Nigeria
<i>Bivalves (oysters, cockles, clams, mussels)</i>											
<i>Crassostrea tulipa</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Senilia senilis</i>	✓	✓			✓			✓	✓	✓	✓
<i>Galatea paradoxa</i>					✓			✓			✓
<i>Tagelus adansonii</i>	✓		✓			✓			✓		
<i>Pinctada spp</i>	✓	✓									
<i>Perna spp</i>							✓	✓			

<i>Mytilus spp</i>	✓										
<i>Gastropods (snails, periwinkles)</i>											
<i>Snail (Unspecified)</i>					✓						
<i>Nerita senegalensis</i>											✓
<i>Pugilina morio</i>	✓	✓					✓	✓			✓
<i>Cymbium spp</i>	✓										
<i>Littorina littorea</i>											
<i>Laniste varicose</i>							✓			✓	
<i>Achatina achatina</i>										✓	
<i>Tympanotonus fuscatus</i>	✓				✓	✓	✓	✓	✓	✓	✓
<i>Pachymelania aurita</i>									✓		✓
<i>Bolinus cornutus</i>	✓										
<i>Stramonita haemastoma</i>									✓		
<i>Crabs</i>											
<i>Crab (Unspecified)</i>					✓	✓					
<i>Cardisoma armatum</i>								✓		✓	
<i>Uca tangeri</i>								✓			
<i>Callinectes amnicola</i>								✓			✓
<i>Callinectes sapidus</i>		✓									
<i>Callinectes sp</i>										✓	
<i>Shrimps/Prawns</i>											
<i>Shrimp (Unspecified)</i>					✓	✓					
<i>Peneus notialis</i>											✓
<i>Penaeus monodon</i>								✓			
<i>Penaeus spp</i>										✓	
<i>Parapenaeopsis atlantica</i>								✓			✓
<i>Macbrachium spp.</i>										✓	✓
<i>Lobsters</i>					✓						
<i>Squid</i>					✓						
<i>Octopus</i>					✓						
Total No. of shellfish species	9	5	2	1	9	5	5	11	6	9	10

The mangrove oyster was the most widely distributed commercially important shellfish found in the estuarine and mangrove ecosystems of the West African coast, with a presence in all 11 countries. The second most important shellfish species in terms of geographical distribution was the gastropod *Tympanotonus fuscatus*, a periwinkle, with significant exploitation in seven of the 11 countries. The whelk, *Pugilina morio*, followed with presence in five countries namely Senegal, The Gambia, Côte d'Ivoire, Ghana, and Nigeria. The West African bloody cockle, *S. senilis*, was the next with presence in four countries including Ghana, Guinea, Sierra Leone, and The Gambia. Images of the most dominant shellfish species across the region are shown in Figure 12, but the order of importance by harvest varies among the various localities/communities within each country. Across a majority of locations, the mangrove oysters and periwinkles are at the top. An important oyster species that is reported to be harvested by some women in the North bank of the Gambia river mouth and also has some

thriving populations in Senegal, is the pearl oyster (*Pinctada* spp.) – some women have extracted marble-like substances (pearls) from these oysters.

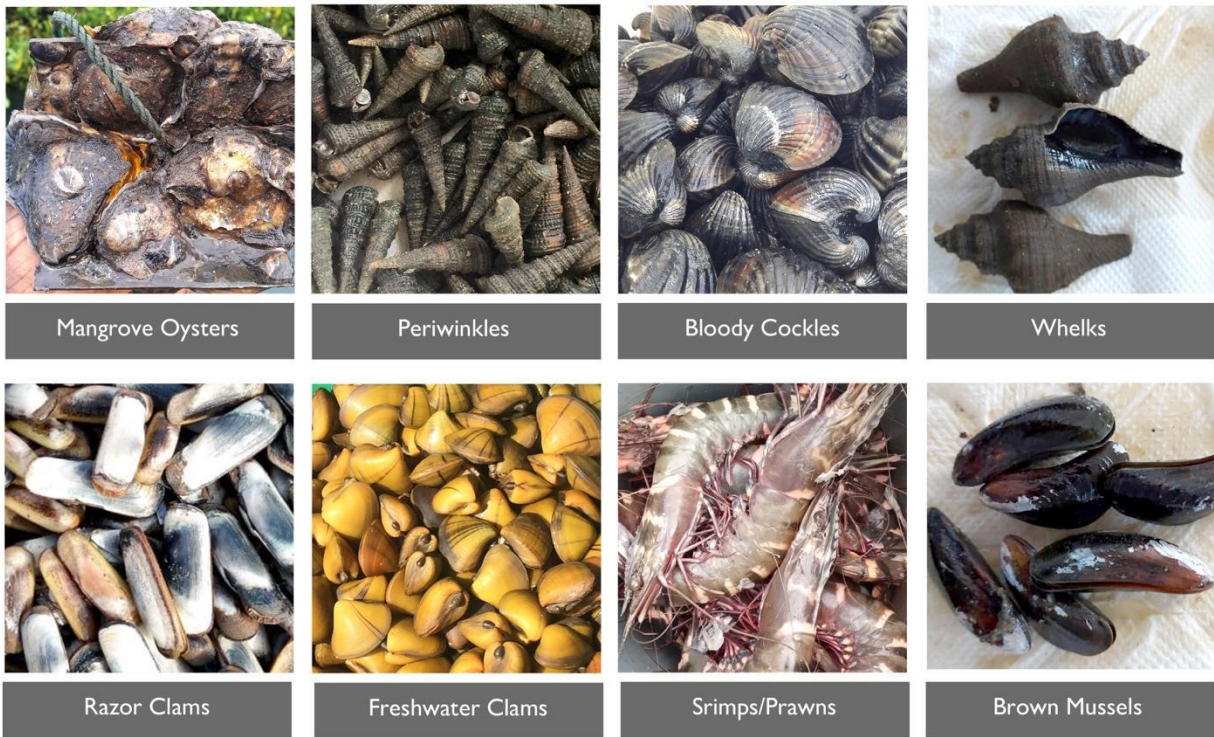


Figure 12: Common shellfish species harvested along the coast of West Africa; The West African mangrove oyster (*Crassostrea tulipa*), periwinkles (*Tympanotonus fuscatus*), bloody cockle (*Senilia senilis*), whelks (*Pugilina morio*), razor clams (*Tagelus adansonii*), freshwater/Volta clam (*Galatea paradoxa*), shrimps (*Penaeids*) and the brown mussel (*Perna perna*).

2.3.7 Harvesting methods

Several low-end and crude technologies are employed by the women and the men in the harvesting of shellfish. Often, shellfish harvesters would enter the shallow waters of estuaries with their bare feet to extract shellfish from the mangrove vegetation that houses the desired species. The journey to some harvesting areas like those in The Gambia cannot be trekked, thus accessed with motorized and non-motorized canoes, and harvesting done while aboard the canoes. Where oysters are harvested from the mangrove roots, the stilt roots are either severed together with the oysters or the oysters are detached from the roots with the bare hands, a machete, or a specially fabricated small portable axe (Figure 13) as seen in The Gambia. In some fisheries such as the clam



Figure 13: Specialized portable axe for harvesting oysters from mangrove roots.

and cockle fisheries, where species are sedentary and inhabit the floor of the river/estuary, harvesters usually use their feet as “fish-finders” while performing a wiggly dance and wading through the water with their feet to locate colonies of the species, then subsequently collecting them with hands when successful. In moderately deep harvesting areas, the feet and toes are used to pick the shellfish from the floor and pass them on to the hand, then transfer them into harvesting containers or canoes (Figure 14). In Ghana and elsewhere, there are oyster beds on the bottom substrate and not directly associated with or attached to mangrove roots.



Figure 14: Women in Ghana often harvest oysters from the bank of the estuary by wading through and picking with hands and placing into pans and canoes.

Harvesting areas of about 2 m in depth, mainly bivalves on the bottom substrate are mainly exploited by men. Generally, they employ diving techniques with no special apparel in collecting shellfish from such depths. This is common for the clam fishery of the Volta estuary and the oyster fishery of the Densu delta, both in Ghana. In addition to the clams and cockles, there are oysters, whelks, periwinkles, and crabs are harvested by handpicking in shallow water by women who wear improvised foot

protection gear to avoid injury. This foot gear is usually made of old clothing such as severed trouser trunks, worn on the feet and tied firmly for wading during under-water harvesting at high water levels. There are reports of men in the Volta clam fishery using motorized air compressors with a hose (hookah) to supply air and a hauling net to aid the diving for collection of clams. Furthermore, men deploy traps with bait in the exploitation of crabs (e.g., *C. armatum*) and use of seine nets for shrimp.

2.3.8 Harvest volumes and value

There is currently no standardized method nor the existence of fisheries officers responsible for estimating the catch volumes and pricing of shellfish harvested from the estuarine and mangrove ecosystems in the countries of West Africa, making attempts in this study to construct the catch volumes and value for most countries very challenging and almost impossible. The local metrics of measurements, viz pans, trays, buckets, baskets, tins, and cans further exacerbate the challenge of extrapolating the volumes within the context of this region-wide assessment of shellfisheries. Nonetheless, data were drawn from selected countries including The Gambia, Ghana, and Nigeria where reasonably reliable data were obtained in this assessment to provide conservative estimates for volume and value of production at the regional scale. A case in point, where this attempt was satisfactorily successful was in Ghana from which the discussion on shellfish harvest volumes and value is drawn in this report. A detailed analysis is presented in a separate Ghana country report.

Data from eight shellfish harvesting localities in Ghana show that the periwinkles (*T. fuscatus*), whelks (*P. morio*), cockles (*S. senilis*) and crabs (*C. armatum*) were lesser in kilograms of harvest quantities (shell-on) compared to the oysters (*C. tulipa*) and clams (*G. paradoxa*). These six were the most harvested species across the harvesting locations in Ghana. The clam had the highest production volume for daily, monthly, and seasonal yields. A summary of the daily, monthly, and annual season harvest quantities for the most harvested shellfish by women in Ghana is presented in Table 3. The Narkwa lagoon oyster fishery had similar but slightly higher production volume than that of the Densu delta.

Table 3: Maximum daily, monthly, and seasonal harvest quantities for the most important women-led shellfisheries in Ghana.

Shellfish species	Harvesting location	Harvest quantities (kg/harvester)		
		Per day	Per month	Per annual season
Oysters (<i>C. tulipa</i>)	Narkwa lagoon	116	1,939	10,859
Clams (<i>G. paradoxa</i>)	Volta estuary	320	5,120	40,960
Cockles (<i>S. senilis</i>)	All locations	< 10	< 100	< 500
Periwinkles (<i>T. fuscatus</i>)	All locations	< 10	< 100	< 500
Whelks (<i>P. morio</i>)	All locations	< 10	< 100	< 500
Crabs (<i>C. armatum</i>)	All locations	< 10	< 100	< 500

Across the region, in The Gambia, large yields are found in the Lamin area of the Tanbi wetlands where huge heaps of oyster shells were observed in June 2021 (Figure 15). In the Ghana Volta river clam fishery, the average daily catch per fishing canoe was 130 kg of clams, with an annual harvest of 7,700 MT worth 4,620,408 GHS (approximately \$1=5GHS) (Adjei-Boateng, 2012). The estimate in this study indicates about 40,960 kg/harvester/season catch of the Volta clam. The oyster fishery of the Densu delta has been valued at USD 65,558.96 for a production of 294,840 kg in 2017 (Osei et al., 2020).



Figure 15: Heaps of empty oyster shells at the Lamin harvesting area of the Tanbi Wetlands, The Gambia.

The oyster (*C. tulipa*), which is the most common shellfish species across countries, is the lowest priced across the sites assessed in Ghana, ranging from USD 0.10 per kg to USD 0.40 per kg of live (whole) oysters. A previous study in Ghana (Asare et al., 2019) estimated the value of oysters at USD 1.07 for 15 kg live weight, approximately USD 0.1 per kg, similar to the lower end of value range found in this assessment. In The Gambia, a cup equivalent to 63 g of oyster meat is sold at about USD 1.00 – details are provided in a separate country report. This weight of the meat translates to about 0.5 kg of live weight (of unshucked oysters) using the regression equation [$Whole\ Weight\ (g) = 2.114 + 8.033\ Wet\ Meat\ W\ (g)$] derived from data on shell morphometrics in a parallel study under the Women Shellfishers and Food Security Project. Thus, the value of 1 kg of unshucked oysters is estimated at about USD 2.00 in The Gambia. The reported prices for oysters in Nigeria were USD 0.10/kg, USD 0.30/kg, and USD 0.90/kg in the Ondo, Akwa Ibom, and Cross Rivers States, respectively. The disparity between the value of oysters in The Gambia and those of Ghana and Nigeria is due to value addition, i.e., time and energy spent to extract meat from the shell, as well as its popularity and higher reverence in The Gambia where the harvest season usually coincides with Ramadan festivities when the oyster meat is in high demand. Production estimates from the other countries are not available or able to be made during this assessment. No information is available on potential bivalve yields and variation among coastal habitat types (e.g., estuary versus lagoon, and bottom sediment

versus mangrove roots). An estimate was made by assuming all shellfish harvesters deal in oysters, then using the average catch per harvester per annual season from the Narkwa Lagoon, Ghana, and the average per kg price from The Gambia, Ghana, and Nigeria (USD 1.10) as bases for projecting the regional production for women harvesters by volume and value (Appendix 3). It was estimated that 301,191 MT of shellfish are harvested from the estuarine and mangrove ecosystems of West Africa by women, with a potentially unrealized value of about USD 331 million annually.

2.3.9 Seasonality of harvests

The harvesting of shellfish across the sub-Region is seasonal for some species and year-round for other species. Species with little or no movement capability at the adult stage tend to be characterized by a clear seasonality in their harvesting. The sessile and gregarious mangrove oyster is heavily affected by the yearly climatic oscillations in precipitation, which gives rise to the dry and rainy seasons, and to a large extent controls the water quality in most harvesting areas. Reduced salinities are not favorable for the survival and growth of the oysters, thus, harvesting areas that are classic estuaries experience mass mortalities during periods of prolonged rainfall because of the influx of riverine water from inland sources. This is worse in estuaries that have their populations of sessile shellfish on the bottom sediment. It appears that this occurrence dictates the harvesting pattern of shellfishers who harvest from such ecosystems, in that, the harvesting season is generally active during the dry season, i.e., periods of low or no rains. Nonetheless, in these ecosystems, harvesting is intensified at the onset of the rainy season as harvesters are guided by the fore knowledge of mass mortalities associated with the rainy season, which could lead to a wastage of their food and loss of income. This itself institutes some sort of automatic closure for the fishery until the heavy rains subside, a few months into the dry season.

Seasonality of harvests was found to be site (ecosystem) and species-specific. No clear general pattern was identified across the region as seasons differ from country to country. Above all, the availability of thriving populations of the shellfish is the strongest determinant of yields. Where shellfish populations abound and the pressure is relatively low, harvesting occurs all year round, e.g., the periwinkle fisheries of the Amissano estuary, Densu delta, and Volta estuary. Therefore, where shellfish populations are noted to be declining due to increasing harvesting pressure, harvesting is in some cases controlled by the enactment of local laws that can be formalized at the national level, for the enforcement of closures for seasons and areas. Management measures such as these have been instituted through participatory, rights-based co-management approaches in a few instances in The Gambia and Ghana. Otherwise, the seasonal harvesting and closures are informal traditional codes of practice, or if not initiated at all expose the resource to over-exploitation.

The first such co-management plan was instituted for the cockle and oyster fishery of the Tanbi special management area in The Gambia, in 2012. This succeeded to a large extent in regulating access to shellfish harvesting areas at certain periods of the year (an 8-month closure in the Tanbi case) and provided use rights to the TRY Oyster Women's Association comprised of local harvesters in the

communities surrounding the estuary. These lessons have been transferred to the Densu delta oyster shellfishery where a co-management plan is also currently in place with a 5-month annual closure and use rights provided to a duly registered association.

2.4. Mangrove ecosystems as support for shellfisheries

Mangrove ecosystems were present in over 90% of the locations where shellfishers harvest their shellfish (Figure 16). These mangroves are the primary habitats for the oysters found along the coast of West Africa, thus their common name, “West African mangrove oyster”. This critical ecosystem provides the favorable areas with high nutrients and adequate shelter for many marine species including the shellfish exploited for food and livelihoods on the coast of West Africa. Their ecosystem services supporting the shellfishery include erosion prevention and other ecosystem services. However, community members exploit mangrove trees for several purposes. More than 60% of the shellfishers surveyed in this study attested to active exploitation of mangrove products within their harvesting sites by community members (Figure 16; see also Figure 17). It was, however, evident that shellfish harvesters were not the main harvesters of the mangrove vegetation and were not key actors in the trade of mangroves. They mainly use mangroves to support their shellfish business.

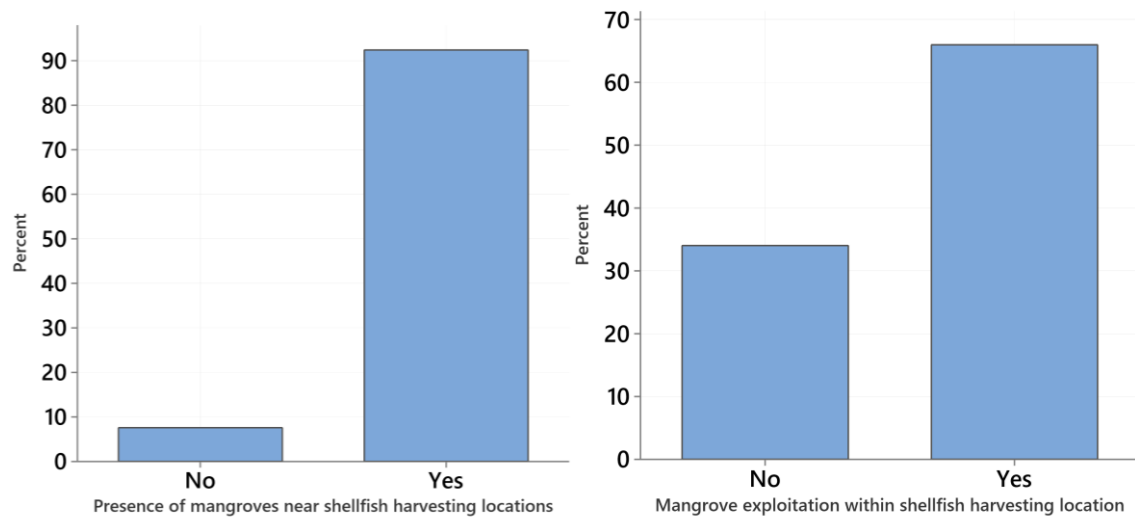


Figure 16: Presence of mangrove ecosystems near shellfish harvesting locations (left) and the exploitation of mangroves in these areas (right) [n = 277].



Figure 17: Mangroves (top left) that provide critical habitats for oysters (top right) are harvested (bottom) and traded for various purposes at the shellfish harvesting sites.

Shellfishers would ordinarily use mangroves as fuelwood for processing (cooking and smoking) their shellfish and to construct houses and sheds for their activities as well as for fencing their households. Some men use the mangrove roots for the construction of traps for harvesting crabs. Others also use the mangroves in the construction of brush parks in what is locally called “Akadja” or “Atidza” fishing in Ghana and a similar technique in Benin; where tree branches (mainly of mangroves) are bundled in localized areas in the estuary to create micro-habitats (Figure 18) that lure fish in for shelter and food, left for about a month. The fishers then round these areas up with their nets and harvest the trapped fish by first removing all tree branches to be reused for another cycle. In some communities, there is no better wood for the construction of local footbridges than the mangroves. It is believed that the mangrove is strong and can withstand the turbulent estuarine conditions for a longer period than other wood. Some shellfishers indicated that mangroves were harvested and the leaves used in brewing herbal concoctions traditionally believed to provide relief from bodily pains.



Figure 18: The use of brush parks (patches of brown areas in the water) for “Akadja”/ “Atidza” fishing in the Densu Delta, Ghana.

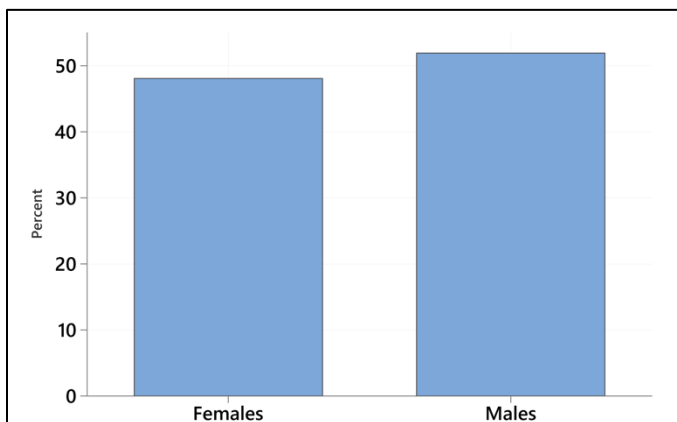


Figure 19: Mangrove exploitation by gender [n = 277].

Unlike the shellfisheries where there is clear segregation in harvesting by gender, there was no gender difference when it comes to harvesting of mangroves. Men and women participate almost equally in the exploitation of the resource (Figure 19). These are not the shellfish harvesters but other community members, and perhaps some shellfishers as well.

With regard to the increasing extent at which mangroves are being harvested in the

various shellfisheries locations, the shellfishers engaged in this assessment generally (about 50% of shellfishers) were of the opinion that mangrove vegetation was moderately healthy, while more than 30% deemed the mangrove vegetation of their harvesting locations to be of a very good (high) health status (Figure 20). This indicates a positive outlook for women shellfisheries as healthy mangrove ecosystems support healthy estuarine fisheries, including habitat for many shellfish species, including the oyster which is one of the most important species for the women. However, some mangroves are perceived to be of low health, and this is a concern. For reference, the Women Shellfishers and Food Security project Literature Review Table 1 provides a summary of the attributes of mangrove conditions in general by country in West Africa based on data from Global Mangrove Watch.

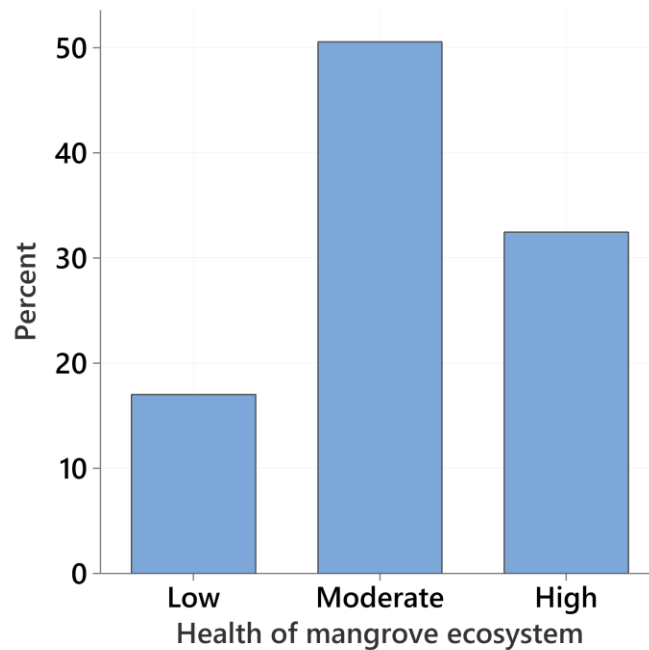


Figure 20: Health of mangrove vegetation within the catchment of shellfish harvesting areas as perceived by shellfishers [n = 277].

Shellfish consumption is perceived to be safe by the shellfish resource users as they reported very minimal health-related issues with eating them. A number of shellfish harvesters believe that the processing methods employed help eliminate any impurities or pathogens that are likely to cause disease. For easy shucking of bivalves, some shellfishers parboil large quantities (Figure 21) in the shell with little or no water. In other places, the bivalves are shucked fresh and washed thoroughly to get rid of grit. In both instances, the meat is extracted after shucking and further cooked or fried for stew or used for kebab. There were, however, some concerns of stomach upsets and diarrhea experienced when shellfish are not well cooked before consumption or from excessive consumption. If well cooked, typical health risks from pathogens such as fecal coliforms or other bacteria and viruses can be avoided.



Figure 21: Processing of oysters: parboiling (left), shucking (middle) and extracted meat/flesh (right).

2.5. Shellfisheries and Mangrove Ecosystems Governance Regimes

In the majority of shellfish harvesting locations surveyed, there are either no specialized formal laws and legislation for the regulation of the shellfisheries and mangrove systems or resource users were not aware of them. The shellfisheries in these areas are to a large extent in the public domain and open and accessible to all at all times. Community-led management policies and plans were the most cited governance regimes especially in Ghana and The Gambia. These are the cockle and oyster co-management plan for governing these fisheries and regulating harvesting in the Tanbi Wetlands National Park in The Gambia and a similar co-management plan for the Densu delta oyster fishery in Ghana. These plans, which have been formally approved by government and reference fisheries and other existing laws and regulations, specify harvesting seasons and minimum sizes as well as formalize the exclusive use-rights of shellfish resource users through their legally recognized associations in specific ecosystems. Some semi-formal laws also exist that prohibit some fishing practices considered destructive of mangrove ecosystems and consequently the shellfisheries of these areas as in the case of “Akadja” or “Atidza” fishing.

Estuarine and mangrove shellfishery locations that fall within the confines of zones designated as Ramsar-sites and Biosphere Reserves are protected and prioritized for conservation by the Ramsar Convention. Across the region, there are more than 495,000 hectares of coastal Ramsar sites with shellfisheries (see Appendix 5), aligning investment in improved shellfisheries management with existing national and international commitments. Mangroves are further protected by forestry and environmental protection laws. However, with respect to shellfisheries in these estuarine and mangrove ecosystems and wetlands, the gazetted co-management plans of Ghana and The Gambia were the only nationally recognized regulations identified in the whole of West Africa. Laws cited by shellfishers were general fisheries laws that did not necessarily focus on bivalve, gastropod, crustacean

and cephalopod shellfisheries. Some fisheries laws, like that of The Gambia and the Fisheries Act of Benin, provide for the potential delegation of fisheries management to community stakeholders. Where there are strong co-management arrangements, e.g., Ghana and The Gambia, there are active and organized shellfisheries groups (see Table 4) who are the main drivers of these management regimes. The organizational development and capacity of such groups is strengthened through the co-management process. In the case of the Densu, the establishment and legal registration of the Densu Oyster Pickers Association (DOPA) was a result of the co-management planning process. There are many other shellfisher groups in the region (see Table 4) that can provide an entry point for scaling-up of shellfishing use rights and co-management plans as seen in successful use in The Gambia and Ghana. The Gambia was found to have the highest number of formalized community-based women's groups, followed by Senegal and Côte d'Ivoire. TRY Oyster Women's Association is the only national women shellfishers association with membership from satellite formalized women's groups in different communities/villages.

Table 4: Organized shellfisheries groups, their countries of activity and legal status.

No.	Organized Shellfisheries Groups	Country	Legal Status
1	Union locale de Falia	Senegal	Formalized/Registered
2	Local Federation of Economic Interest Groups/Fédération locale des Groupements d'intérêts économiques (FELOGIE) de Niodior	Senegal	Formalized/Registered
3	FELOGIE de Dionewar	Senegal	Formalized/Registered
4	Federation locale des femmes du Njombatto	Senegal	Formalized/Registered
5	Groupement des femmes cueilleuses de Ziguinchor	Senegal	Formalized/Registered
6	TRY Oyster Women's Association and community groups	The Gambia	Formalized/Registered Delegated co-management entity
7	Lamin Nganyabola Kafo	The Gambia	Formalized/Registered
8	Fajikunda Women Oyster Association	The Gambia	Formalized/Registered
9	Kamalo Women Oyster Kafo	The Gambia	Formalized/Registered
10	Old Jeshwang Oyster Women Association	The Gambia	Formalized/Registered
11	Kuloyaa Oyster Harvesters Kafo	The Gambia	Formalized/Registered
12	Lamin Nganyabola Kafo	The Gambia	Formalized/Registered
13	Berending women Oyster Association	The Gambia	Formalized/Registered
14	Kartong Women oyster Harvesters Association	The Gambia	Formalized/Registered
15	Fass Jom	The Gambia	Formalized/Registered
16	Bulock Oyster Women Ass.	The Gambia	Formalized/Registered
17	Naafi	Guinea Bissau	Formalized/Registered
18	Associação de Mindjeres Bideiras de Oystrade Ilha de Formosa	Guinea Bissau	Informal
19	Quitapesca	Guinea Bissau	Formalized/Registered
20	Grap Go Fenam Social club	Sierra Leone	Informal

No.	Organized Shellfisheries Groups	Country	Legal Status
21	Women in Development	Sierra Leone	Informal
22	Gbomgboma Association	Sierra Leone	Informal
23	Tewo Association	Sierra Leone	Informal
24	Liberia Fishermen Association (LFA), Marshall City	Liberia	Formalized/Registered
25	SCOOPS-COMTFRES	Côte d'Ivoire	Formalized/Registered
26	Association ETCHON of Lahou-Kpanda	Côte d'Ivoire	Formalized/Registered
27	KOBADIA	Côte d'Ivoire	Formalized/Registered
28	Batcha de NERO Boupé	Côte d'Ivoire	Formalized/Registered
29	Densu Oyster Pickers Association (DOPA)	Ghana	Formalized/Registered. Delegated co-management entity
30	Agorpo Clam Fishers and Processors Association	Ghana	Formalized/Registered
31	Kpomkpo Clam Women Association	Ghana	Informal
32	Association of Women oyster Harvesters of Benin	Benin	Formalized/Registered
33	Otchananmi Association of women shellfishers	Benin	Informal
34	Ibo Town Women Oyster Association	Nigeria	Formalized/Registered

There are some customary laws such as the “cut one, plant three” regulation in some locations in Sierra Leone, used to protect mangrove ecosystems. Shellfish are also not exploited during periods of customary rites usually preceding traditional festivals as seen in the Densu delta in Ghana where there is a ban on all forms of fishing including shellfisheries for about a month before the “*Homowo*” festival – a traditional festival that signifies the end of hunger by people of the Ga tribe. At many coastal shellfish harvesting locations across the sub-region, there are fishing holidays with historical antecedent of being days for the gods, thus, all activities are prohibited in all coastal ecosystems. In addition to this, there is also a no-fishing day as well in some communities. In a few communities, certain locations within the wetlands and estuarine/mangrove areas are designated as sanctuaries where only traditional authorities are allowed to enter to perform traditional rites and rituals. These are traditional norms that institute measures similar to fishing closed seasons (holidays) and no take zones essential for regulating exploitation levels. Some other gender-centric norms prohibit menstruating females and lactating mothers (for about three months after childbirth) from entering the coastal ecosystems, which are also believed by the shellfishers to regulate shellfisheries.

Increasing population pressure, especially in coastal zones, unrestricted use of common pool resources (as is the case for open access fisheries), cultural changes, and technological advances threaten the effectiveness of traditional norms and respect of traditional laws. Co-management planning processes can strive to integrate the local ecological knowledge and social capital that are the foundations for traditional systems of natural resource management with scientific knowledge and evidence-based decision making.

2.6. Improving Shellfisheries Livelihoods of Women

Shellfishers perceived that the exploitation and trade of shellfish was a daunting task to undertake and one that is time-consuming under the current working conditions for many of them. Many resource users have no apparel and equipment made specially for exploiting shellfish. For instance, shellfishers usually wade through the shallow waters with their bare feet or at best by donning improvised foot gear made of old trouser trunks which are cut and tied to the leg to avoid injury (Figure 22). There is a need to mobilize support and introduce mechanized processes where possible along the post-harvest value chain to reduce the excessive reliance on manpower in the sector. This has the potential to improve production by the women in the event of a scale-up of their shellfisheries. In Nigeria, 98% of the respondents suggested that modern storage and processing facilities are critical interventions that need urgent attention.

Enhancing production through sustainable fishing practices is an urgent need which can be motivated by governance systems like participatory, rights-based co-management approaches that incentivize voluntary compliance. These approaches stimulate better decisions on sustainable management measures and help to integrate evidence into management decision-making. There is also the need to work on improving relevant and accessible evidence for this purpose.



Figure 22: Shellfish harvester demonstrates the wearing of improvised foot gear used for harvesting oysters.

The possibility for venturing into the aquaculture of shellfish species of commercial value such as oysters and other bivalves is also worth considering as these species can be cultured with low environmental risk and potential environmental and economic benefits. The bivalves, oysters, clams, and cockles are extractive species and do not depend on supplementary feeds or the conversion of mangroves to ponds for their aquaculture. Aquaculture of the crustaceans identified in this study, e.g. the shrimps and prawns, should be subjected to careful biological and environmental considerations, focusing on the development of native species and technologies that are non-destructive to critical coastal habitats. This is because aquaculture of shrimps and prawns, although well developed, is generally associated with comparatively high risk to coastal wetlands and mangrove ecosystems in favor of short-term economic gains. The information base on the biology, ecology, and culture potential of bivalves and other shellfish species within West Africa's coastal ecosystems is, however, very inadequate. Thus, investments in a systematically designed research and development program with an emphasis on the sustainable aquaculture of shellfish species would be the best approach. Advances in shellfish aquaculture and successful efforts to sustainably enhance production volumes have the potential to make shellfish available all year round and stimulate consumption more broadly beyond the local communities where they are harvested.

Commensurate with enhancing production should be efforts to improve the processing and marketing of shellfish through the development of diverse recipes using indigenous ingredients and further introducing these into hotels and restaurants across the sub-region as a major step in promoting the shellfish species for their nutritional benefits and food security. In Senegal, there is some level of processing and packaging of oysters into various forms (Figure 23); dried, powdered, marinated, and bottled.



Figure 23: Processing and packaging of oysters.

While doing this, a coherent communication for awareness creation on the nutritional and health benefits of the shellfish species will be a major selling point and would require relevant actions to be taken. It is also important to maintain very good sanitary conditions within the harvesting areas and ensure pollution control to make consumption safe. A major complaint was the presence of sand in some shellfish due to improper processing.

Value addition can create more demand for the product and must be balanced with harvest control measures to ensure sustainability of the resource and that increased demand does not lead to over harvesting. The impact of value chain improvements on patterns of consumption of shellfish, which have high nutritional value, by harvesters, harvester households, and local communities in favor of commercialization of the product to distant markets should be considered. In addition, the risk of value chain improvements displacing vulnerable women harvesters as the dominant actors at each node of the value chain must be factored into any strategy for developing shellfish value chains for higher value markets. If women harvesters are displaced from processing and marketing without maintaining their control and negotiating power throughout the value chain, the current opportunity to incentivize sustainable resource management through direct benefits realized at the harvester level from value chain improvements at other nodes may be diminished.

Overarching these issues is the need to empower West Africa's women shellfishers through continuous education and involvement in shellfish research and development and governance processes. It is evident that women are capable of driving sustainability efforts when they are incentivized through capacity development and use-rights to invest-in and benefit from responsible resource management.

3. CONCLUSIONS

In conclusion, the outcome of the participatory assessment of shellfisheries along the coast of West Africa as presented in this report brings to the fore, for the first time, the regional perspective of a sector that has long been overlooked. The findings indicate the potential for future efforts in relation to opportunities for scale-up through direct investments, research, and capacity building. The report covers key data gaps identified in an initial literature review conducted prior to this study. A summary of the key findings are as follows:

1. The geographical coverage of shellfisheries spanning 11 countries in West Africa, from Senegal in the west to Nigeria in the east, reveals the presence of shellfisheries in all 11 countries and an intensity of shellfisheries livelihoods across the sub-region. This is important for the shellfisheries sector as it presents an important win-win opportunity for scaling up management of the sector for the enhancement of livelihood opportunities with a focus on women, but also for men, food and nutrition security, natural resources management, climate change adaptation and mitigation, and resilience across the sub-Region.
2. The total number of people involved directly in shellfish harvesting across the sub-Region is estimated conservatively at 54,778 and about 565,695 estimated to be directly dependent on the resource as members of the households of shellfish harvesters. There are approximately 1.5 million hectares of associated coastal mangrove ecosystems. Ranking of countries by estimated number of shellfishers from largest to smallest is as follows: Nigeria, Senegal, Ghana, The Gambia, Liberia, Guinea Bissau, Benin, Côte d'Ivoire, Sierra Leone, Togo, Guinea. Some smaller countries like The Gambia and Benin have significant opportunities relative to their size. Based on hectares of mangroves the ranking from largest to smallest is Nigeria, Guinea Bissau, Guinea, Senegal, Sierra Leone, The Gambia, Ghana, Liberia, Côte d'Ivoire, Benin, Togo.
3. The gender dynamics in shellfish harvest and trade indicates a strong dominance of women (79%) in the shellfisheries that occur in the estuarine and mangrove ecosystems of most coastal communities in West Africa. Among the 11 countries of this assessment, men's participation in shellfisheries was highest in Nigeria where the fishing of crustaceans formed an important artisanal fishery dominated by males. Nonetheless, the regional overview reveals a dominance of women harvesters along the entire value chain of the bivalve and gastropod shellfisheries, while women also play significant processing and marketing roles in the crustacean and cephalopod shellfisheries.
4. Most of the women shellfishers were involved in the sector as their primary occupation and chief source of livelihood and income for their households. However, in most instances, the women were also engaged in other supplementary livelihood activities to augment their income, especially in the lean shellfishing seasons. This presents an avenue for empowering these women to enhance their shellfisheries livelihoods. Men who were involved in

shellfisheries largely considered it a secondary livelihood to their main occupations. Their role was mainly providing support and complimentary to the women shellfish harvesters.

5. A conservative estimate of 301,191 MT of shellfish are harvested from the estuarine and mangrove ecosystems of West Africa per year by women, with a potentially unrealized value of about USD 331 million annually. The estimate assumes that all shellfish harvesters deal in oysters and uses the catch per harvester per season data from the Narkwa Lagoon, Ghana, and the per kg price of The Gambia as the basis for the projection. There is a need for more accurate estimates on potential bivalve yields and variation among coastal habitat types (e.g., estuary versus lagoon, and bottom sediment versus mangrove roots).
6. The challenge faced in this study across countries was the lack of official data and the inability to more rigorously estimate the volume and value of shellfish harvested across the west African coast due to reasons of non-standardized methods for estimating catch and sales of shellfish. Highly variable sizes of pans, trays, cups, cans, etc., are employed by the harvesters with no measure of weights and no record of sales, making it impractical to deduce accurate estimates of volume and value of the shellfisheries. These estimates are very important to understanding the economics of the sector, hence, require further investigation based on species, harvest areas and gender in all countries of West Africa.
7. The high consumption of shellfish among resource users in this study indicates the importance of shellfish in the diets and nutrition of coastal dwellers in West Africa and an opportunity to leverage shellfish for food and nutrition security of the people of coastal West Africa. Most (87%) of the resource users engaged in this study consume shellfish either on a daily or weekly basis.
8. The involvement of women at multiple nodes of the shellfish value chain – harvesting, processing, marketing, and transportation, including consumption – shows how strongly they take ownership of the sector. This type of vertical integration increases the opportunity for women harvesters to benefit from improvements at any node in the value chain and increases the incentive to take the often-difficult measures necessary to harvest the resource sustainably. Vertical integration of the value chain controlled by harvesters reduces the risk of external capture of benefits disconnected from longer term sustainable resource management that can incentivize rapid overexploitation of the resource.
9. Although a wide range of shellfish species comprising 17 species of molluscs, 11 species of crustaceans, and a few unidentified groups of gastropods, crustaceans and cephalopods were found to be of economic importance, the West African mangrove oyster (*Crassostrea tulipa*), periwinkles (*Tympanotonus fuscatus*), the blood cockle (*Senilia senilis*), the whelks (*Pugilina morio*) and the razor clams (*Tagelus adansonii*) were the most commonly harvested shellfish species among the West African countries. The Volta clam (*Galatea paradoxa*) shellfishery in

Ghana was estimated to be of very high value. The presence of pearl oysters (*Pinctada* spp.) in West Africa is also documented for the first time with presence in The Gambia and Senegal.

10. The seasonality of harvests was found to be site (ecosystem)- and species-specific, with no clear general pattern across the board at the sub-regional scale as seasons differ from west to east along the coast of West Africa. The availability of thriving populations of shellfish is the strongest determinant of yields. Where shellfish populations abound and the pressure is relatively low, harvesting occurs all year round, e.g., the periwinkle fisheries of the Amissano estuary, Densu delta and Volta estuary in Ghana.
11. The immense habitat and nutritional ecosystem services, among other ecosystem services, provided by mangrove ecosystems enjoins the need for their protection and sustainable exploitation. Although these mangrove ecosystems are perceived to be generally healthy and many are designated for conservation and protection, they are under threat. Areas of mass degradation require urgent attention for conservation and restoration efforts to improve the productivity of shellfisheries.
12. The general non-existence of formal laws specific to the regulation of shellfisheries activities within the estuarine and mangrove ecosystems of West Africa calls for efforts towards the formulation of policies on participatory governance frameworks, use rights and co-management. It is notable that women-led shellfisheries of West Africa have seen successful rights-based co-management plans and policy championed by the resource users themselves with high voluntary compliance in cases from the cockle and oyster co-management plan for the Tanbi Wetlands National Park in The Gambia and the co-management plan for the Densu delta oyster fishery in Ghana. In the absence of formal laws, traditional norms and customs have played an important role in the regulation of shellfish harvests. More than 30 women shellfisher groups organized at community, ecosystem, and national levels, and more than 495,000 hectares of coastal Ramsar sites with shellfisheries across the sub-region are some of the initial enabling conditions for improved shellfisheries governance.

The current outlook of shellfisheries in the sub-Region documented in this report demonstrates a compelling opportunity for strategic efforts and investments to improve the sector as it provides critical livelihoods support for tens of thousands of vulnerable women and their households along the coast of West Africa and a promising win-win entry point for improved management of as much as 1.5 million hectares of associated vulnerable coastal mangrove and estuarine ecosystems and ecosystem services. There is a need to ensure and improve sustainable production and consequently stimulate a broader market base for shellfish products that incentivizes rational use of shellfish and ecosystem resources. The enabling conditions for resource user led, rights-based co-management governance frameworks in women dominated shellfisheries vary across the region but are present to some degree in all the 11 coastal countries from Senegal to Nigeria and can be leveraged to address all the Domains of the Women's Empowerment in Agriculture Index (Figure 24).

Domain	Indicators
Production	Input in productive decisions
	Autonomy in production
Resources	Ownership of assets
	Purchase, sale, or transfer of assets
	Access to and decisions on credit
Income	Control over use of income
Leadership	Group member
	Speaking in public
Time	Workload
	Leisure

Figure 24: The five domains and associated indicators used in the Women's Agricultural Empowerment Index (WAEI).

(SOURCE: The Women's Empowerment in Agriculture Index).

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APPENDICES

APPENDIX 1: Number of shellfishers at some shellfish harvesting localities (ecosystems and communities) in the various countries

Country	Shellfishing Ecosystem/Community	Approx. number of shellfishers
Senegal	Falia (Kaal konan)	182
Senegal	Niodior (Coco)	675
Senegal	Dionewar (Sare projet)	493
Senegal	Soucouta	83
Senegal	NIAGUISS	125
The Gambia	Lamin (TWNP)	50
The Gambia	Fajikunda (TWNP)	57
The Gambia	Saro (Wencho) (TWNP)	200
The Gambia	Ganaw	200
The Gambia	Old Jeshwang (TWNP)	70
The Gambia	Ibo Town (TWNP)	45
The Gambia	Bullock	50
The Gambia	Berending	15
The Gambia	Kartong	50
The Gambia	Kubuneh (TWNP)	33
The Gambia	Gibanack	15
The Gambia	Kuloro (TWNP)	7
Guinea Bissau	Joao Landim/Rio Mansoa	168
Guinea Bissau	Fulacunda/Estuario de Rio Grande de Buba	90
Guinea Bissau	Ilhsa de Formosa / Zona insular	109
Guinea Bissau	Cafine / Rio Cacine	469
Sierra Leone	sea	40
Sierra Leone	sand bank (rivers)	24
Sierra Leone	Konakridee/Scarcies River Estuary/Continental shelf area/rivers and tributaries	17
Sierra Leone	King Jimmy	15
Sierra Leone	Sierra Leone River Estuary mangroves	17
Sierra Leone	Sandagbu wami	10
Sierra Leone	Continental shelf area	25
Sierra Leone	Freetown river estuary	10
Sierra Leone	Estuary	20
Sierra Leone	Rivers	25
Sierra Leone	Nyadehun, Tangehun	18
Sierra Leone	Mbawalihun, Mosandor	10
Sierra Leone	Hanging site	15
Sierra Leone	Bay bay River	30
Sierra Leone	Pamronkor	9

Liberia	Junk River, Marshall City	53
Liberia	Benson River	50
Liberia	Farmington River, Marshall city	20
Liberia	Du River	30
Liberia	Mechkin River	15
Liberia	St. John River, (Beagboh, Bucnannan	162
Liberia	Lake Piso, Ground Cape Mount county	20
Liberia	Du River, Larkpazee Zoo, Monrovia	8
Liberia	Meserrado River, Parko Isand, monrovia	17
Liberia	Marfah River, Grass Field, Ground Cape Mount county	20
Ivory Coast	Behind Lekpeu	18
Ivory Coast	DODOSOKOPO	15
Ivory Coast	Légrékou	20
Ivory Coast	TAWOUESSOU	300
Ivory Coast	Grandes-endemies	3
Ivory Coast	NERO	50
Ivory Coast	Fleuve sassandra (Trogblor)	15
Ivory Coast	DOUGBO	25
Ivory Coast	AZURITTI VILLAGE	50
Ivory Coast	Aby Lagoon near Babihania	38
Ivory Coast	Lgune Aby bordering Assinie Mafia	10
Ghana	Amisano lagoon	100
Ghana	Narkwa/Narkwa lagoon	60
Ghana	Amanfulkuma/ Whin estuary	170
Ghana	Amanzule/Amanzule estuary	250
Ghana	Azuleloanu/ Amanzule estuary	200
Ghana	Anyanui (Volta Estuary)	10
Ghana	Torkortsi (Tunu, Volta Estuary)	10
Ghana	Amu/ Keta Lagoon	100
Ghana	Kpomkpo/Volta River Estuary	250
Ghana	Densu Delta	300
Togo	lagoon of Aneho (Togolese lagoon system) in city of Aneho	23
Togo	Lake Togo (togolese lagoon system)	76
Togo	Lake Boko (togolese lagoon system)	7
Togo	Lake Togo (togolese lagoon system) in the village of Zalive	76
Benin	Lake Aheme	30
Benin	Lake Nokoue	60
Benin	Coastal lagoon	110
Nigeria	Ogogoro Coast of the Atlantic Ocean	1000
Nigeria	Ogheye coast of the Atlantic Ocean, Delta State	500

Nigeria	Bonny Island, Atlantic Ocean	500
Nigeria	Ago Eri, Bonny Island coast of the Atlantic Ocean	1000
Nigeria	Bonny Island coast of the Atlantic Ocean	1000
Nigeria	Ibeno Coast of the Atlantic Ocean	4000
Nigeria	Calabar River	200

APPENDIX 2: Detailed presentation of shellfishers' involvement along the shellfisheries value chain

Shellfishers' involvement along the value chain	Count	Percent
Harvesting Transportation Processing Retailing/Marketing Consumption	60	28.57
Harvesting Processing Retailing/Marketing Consumption	35	16.67
Processing Retailing/Marketing Consumption	20	9.52
Harvesting Consumption	16	7.62
Harvesting Retailing/Marketing Consumption	13	6.19
Harvesting	11	5.24
Retailing/Marketing Consumption	7	3.33
Harvesting Transportation Processing Retailing/Marketing Consumption Other (specify)	6	2.86
Harvesting Processing Consumption	4	1.9
Harvesting Processing	3	1.43
Harvesting Processing Retailing/Marketing	3	1.43
Harvesting Retailing/Marketing	3	1.43
Harvesting Transportation Consumption	3	1.43
Harvesting Transportation Retailing/Marketing Consumption	3	1.43
Processing Retailing/Marketing	3	1.43
Retailing/Marketing	3	1.43
Harvesting Transportation Processing Retailing/Marketing	2	0.95
Transportation Processing Retailing/Marketing	2	0.95
Transportation Processing Retailing/Marketing Consumption	2	0.95
Consumption	1	0.48
Harvesting Other (specify)	1	0.48
Harvesting Processing Consumption Other (specify)	1	0.48
Harvesting Processing Other (specify)	1	0.48
Harvesting Transportation	1	0.48
Harvesting Transportation Processing	1	0.48
Harvesting Transportation Processing Consumption	1	0.48
Harvesting Transportation Retailing/Marketing	1	0.48

Processing	1	0.48
Processing Consumption	1	0.48
Transportation Retailing/Marketing	1	0.48
Total	210	100%

APPENDIX 3: Estimation of volume and value of shellfisheries harvested by women in West Africa

Catch (kg)/ harvester/year	Number of women shellfishers	Total catch (kg)/year	Total catch (MT)/year	Value of shellfisheries (USD)/year
6,960	43,275	301,191,355	301,191.36	331,310,490.72

Assumes:

1. Women harvesters = 79% of the total estimated 54,778 shellfishers.
2. All shellfishers are oyster harvesters. NB: Oysters are among the least-priced shellfish in the coastal communities of West Africa
3. Average catch/harvester/annual season for oysters from the Narkwa Lagoon, Ghana.
4. Oyster value average from The Gambia, Ghana, and Nigeria [USD 1.10/kg]

APPENDIX 4: Questionnaire used for the assessment

USAID Women Shellfishers and Food Security Project Survey Instrument for Resource Users

Country: _____

I - Background Information

1. Name of Respondent: _____
2. Age of respondent: _____
3. Respondent's sex: _____
4. Stakeholder category (indicate all that apply)
 - a. Harvester
 - b. Processor
 - c. Consumer
 - d. Trader
 - e. Other (specify): _____
5. How many people are in your household? _____
6. How many of your household are males/females?
 - a. Males []
 - b. Females []
7. Does your household consume shellfish?
 - a. Yes []
 - b. No []
8. If Yes for 7, How often do you and your household consume shellfish?
 - a. Daily
 - b. Weekly
 - c. Fortnightly
 - d. Monthly

II - Shellfisheries

9. Select the activities along shellfisheries value chain that you are involved in. Indicate all that apply
 - a. Harvesting []
 - b. Culture []
 - c. Transportation []
 - d. Processing []
 - e. Retailing/Marketing []
 - f. Consumption []
 - g. Other (specify): _____

10. Where (name of waterbody) do you harvest shellfish from?

11. What is the approximate number of shellfish harvesters in the waterbody/shellfishing area?

12. How many of them are;
- Males: _____
 - Females: _____
13. What are the age groups of oyster harvesters in the waterbody/shellfishing area?
- Males: _____
 - Females: _____
14. Is shellfish harvesting the primary occupation of the shellfish harvesters in the community/waterbody/shellfishing area?
- Males: Yes [] No []
 - Females: Yes [] No []
15. If your answer to 14 is **Yes**, are the harvesters engaged in other livelihood options? Please specify secondary and tertiary livelihood options for shellfish harvesters (*E.g., processing; farming; sewing; artistry; carpentry; etc.*)

Gender	Secondary livelihood	Tertiary livelihood
Males		
Females		

16. If your answer to 14 is **No**, what is the primary livelihood in your community?

Gender	Primary livelihood
Males	
Females	

17. What are the shellfish species/types exploited from the water body (estuary/lagoon) or mangrove ecosystem in your community/country [*Provision is made for up to 5 species per system for 10 water bodies/mangrove ecosystems. Please include more water body/mangrove ecosystems and species if required*]

Name of water body/mangrove ecosystem 1:			
	Common name (local)	Common name (English)	Scientific Name
1			
2			

3			
4			
	Name of water body/mangrove ecosystem 2:		
	Common name (local)	Common name (English)	Scientific Name
1			
2			
3			
4			
	Name of water body/mangrove ecosystem 3:		
	Common name (local)	Common name (English)	Scientific Name
1			
2			
3			
4			
	Name of water body/mangrove ecosystem 4:		
	Common name (local)	Common name (English)	Scientific Name
1			
2			
3			
4			
5			
	Name of water body/mangrove ecosystem 5:		
	Common name (local)	Common name (English)	Scientific Name
1			
2			
3			
4			
5			

18. What is the specific habitat(s) of the shellfish species mentioned in 17? (Examples: *sandy substratum*; *sandy-mud substratum*; *water column*; *mangrove roots*)

Species name	Habitat(s)

19. Rank the first three species of shellfish in order of importance in terms of harvesting in your community

- a. First: _____
- b. Second: _____
- c. Third: _____

20. What is the approximate catch per day/month/harvest season? [In Kg or other unit of measurement such as a tin, can, pail; indicate the corresponding approximate weight of unit of measure]

- a. First species: _____
- b. Second species: _____
- c. Third species: _____
- d. Other species: _____

21. What methods are employed in harvesting shellfish in your community? [Indicate whether there are any specialized equipment/ tools used for harvesting the shellfish]

Shellfish name	Method of harvesting	Gender of harvesters (Male/ Female)

22. What are the roles of men and women in the shellfishing in the community/waterbody/shellfishing area? Please explain.

Men:

Women:

23. Does the withdrawal of men's support affect harvesting in any way? Please explain.

24. Indicate whether the harvesting of specific shellfish is **yearlong** or **seasonal** in your community. Please specify the harvest season/months if harvesting is seasonal and how often you harvest shellfish.

Shellfish name	Yearlong/Seasonal	Harvest months (if seasonal)	Frequency of harvest

25. How much do you earn from selling one Kg/pale/pan/tray/bowl of shellfish? (Convert prices into USD for data input and reporting)

Shellfish name	Price per Kg/pale/pan/tray/bowl (approximate the Kg equivalent of pale/pan/tray/bowl)	How many Kg/pale/pan/tray/bowl per day?	Sales per month

26. How are shellfish processed/prepared for consumption/sale in your community?

Shellfish name	Use (consumption/sale)	Method of preparation/processing

27. In what type of markets do you sell your shellfish? [Tick all that apply]

- a. I do not sell (consumption by self and household) []
- b. Local community markets []
- c. More distant and/or larger markets []
- d. Middlemen []
- e. Hotels and restaurants []

28. What are other uses of the meat and shells of shellfish in your community?

Shellfish name	Meat	Shell

29. What are some challenges with the consumption shellfish in your community?

30. Are there any health-related conditions associated with the consumption of shellfish in your community? Please name and describe these conditions.

III - Mangrove ecosystem

31. Are there mangroves near or within the water bodies where shellfish are harvested in your community?

- a. Yes []
- b. No []

32. If Yes, are these mangroves exploited in your community?

- a. Yes []
- b. No []

33. What are some uses of mangroves in your community?

- a. _____
- b. _____
- c. _____
- d. _____

34. How do mangroves support the shellfisheries in your community at various segments of the value chain?

- a. Harvesting: _____
- b. Transportation: _____
- c. Processing: _____
- d. Retailing/Marketing: _____
- e. Consumption: _____

35. Do shellfishers earn direct income from trading in mangroves? Please explain.

36. Mangrove exploitation in your community is dominated by;

- a. Males []
- b. Females []

37. How would you describe the condition/health of the mangrove vegetation located where you harvest oysters in your community?

- a. Low []
- b. Moderate []
- c. High []

IV - Governance/Management Regimes

38. Are there any formal laws/regulations currently available and applied to these specific shellfisheries and mangrove systems? Please list

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

39. Are there any traditional practices/customs and bye-laws currently applied to these specific shellfisheries and mangrove systems? Please list

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

40. What can be done to improve shellfisheries livelihoods of women in your community?

41. Do organized groups help in the management and conservation of the shellfisheries and mangrove systems. Please explain

42. Do you belong to any organized group of shellfish stakeholders?

- a. Yes []
- b. No []

43. Are you a member of any organized group of shellfishers? [Yes] [No]

44. If Yes to 43, what form of group?

- a. Formalized/registered
- b. Informal

45. If Yes to 43, provide name of group/association.

V – Climate Risk Management

46. What is the major climatic factor that causes seasonality of shellfisheries in your community?
(e.g., rainfall, drought, sea level rise, etc.)

47. Do the shellfisheries and mangrove livelihoods affect climate in any way? Please explain.

APPENDIX 5: Hectares of coastal ecosystems with shellfisheries identified as Ramsar sites for conservation

Protected Shellfisheries Areas		
Country	Ramsar Site (with Shellfisheries)	Area (Ha)
Senegal	Parc national du Delta du Saloum	73,000
Gambia	Tanbi Wetland Complex	6,304
Guinea Bissau	Parc Naturel des Mangroves du Fleuve Cacheu (PNTC)	88,615
Guinea Bissau	Archipel Bolama-Bijagós (1,046,950 ha total marine and islands)	relevant area not available
Sierra Leone	Sierra Leone River Estuary	29,500
Liberia	Mesurado Wetlands	6,760
Liberia	Lake Piso	76,091
Côte d'Ivoire	Grand Bassam	40,210
Côte d'Ivoire	Iles Ehotilé-Essouman	27,274
Côte d'Ivoire	Parc national d'Azagny	19,400
Côte d'Ivoire	N'ganda	14,402
Ghana	Densu Delta	5,893
Ghana	Keta Lagoon Complex	101,022
Togo	Entire Coast (shellfish in these limited areas)	100
Benin	Entire Coast (shellfish in these limited areas)	6,600
	TOTAL	495,171

<https://rsis.ramsar.org/ris/1631>