

A Heavy Blow

More than the COVID-19 pandemic itself, the lockdowns to prevent its spread have harder hit Nigeria's unorganized small-scale fishers

The COVID-19 pandemic has fundamentally struck all facets of life in affected countries and the small-scale fisheries (SSF) of Nigeria are no exception. The pandemic has hit the country's small fishers both directly and indirectly. Small operators are the bulk of Nigeria's fisheries sector. They account for 70 per cent of the domestic fish production, and sustain the livelihoods of millions of people in one way or another; the dependence on local fish species for economic and food security is evidently large. SSF provides an accessible, cheap and rich source of protein and essential micronutrients to the rural population. Their impact on social, economic and cultural spheres is immense.

Yet many fishing communities face social, economic, and political marginalization. The reasons are not far to seek. The contribution of SSF to the gross domestic product (GDP) is obscured by poor environmental, social and economic data on the sector. As a consequence, policymakers seldom understand the SSF sector and its worth is grossly under-valued in the national economy.

Nigeria's informal economy, as in most developing countries, has reeled under COVID-19. While the low number of infection cases and deaths relative to developed countries is cause for some relief, the stark reality of fragile healthcare systems raises grave concerns over capacities to deal with the a steep increase in infections. To curb the looming pandemic, the Nigerian government announced a two-week lockdown from 30 March; it eventually stretched to five weeks in Abuja, the administrative centre, Lagos, the economic centre, and the adjoining Ogun State. These states had the highest incidence of COVID-19 in the country

and were most vulnerable to localized infection.

Other emergency steps included the closing of airports for international and domestic flights, and a ban on inter-state movement, social association, and non-essential economic and leisure activities. Several states adopted partial to full lockdowns. As a sequel to the emergency measures, fish and fish products were included in the list of essential commodities. Movement of food and agriculture produce, including that from fisheries, was allowed. Markets of essential commodities were permitted to operate for a few hours on specific days of the week.

The most dire impact on the food security and livelihoods on fishing communities, however, is not from

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the pandemic itself but from the total lockdown. Its effects on the sustenance and well-being of vulnerable households and local economies dependent on local fisheries are far-reaching. The existing social and economic inequalities are under imminent risk of widening, increasing marginalization of the vulnerable.

Helpless situation

Pa Moses Y Ashade, a prominent fisherman from Badagry in Lagos, shed light on the seemingly helpless situation of the sector. The septuagenarian has decades of experience of fishing in brackish waters, traversing the sea often beyond the Nigerian shore; besides he

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Construction of a planked canoe at Ikosi-Agbowa fishing community, Lagos. Small-scale fishers and fish processors continue to operate during the pandemic but their incomes and profits have declined because of the loss of customers.

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is a former treasurer of the Lagos State Fishermen Co-operative Society. He expressed his disappointment with the “lack of recognition of the sector and the preference for organized aquaculture and industrial fisheries”. He noted the SSF “plays an integral role in the nation’s food system by providing access to affordable fish to the ordinary people, at affordable prices that the organized players cannot offer”.

Fishers and fisheries-based co-operatives lack organizational capacities, he said. The absence of strong leadership to steer an apex organization of SSF at the national level has rendered the sector voiceless, devoid of the power to lobby for helpful policies. Referring to the presence of a federation platform that includes fish farmers, fishermen and other stakeholders, Pa Moses held that the contribution of the SSF sector is yet to be recognized.

Temi, a university graduate, saw opportunity in the smoked fish-supply chain. He assists his mother, Madam Ganiat Olorode, a middle-aged fish trader and processor in the Ikosi-Agbowa lagoon community in Lagos. She owns not fewer than five fishing canoes, and

has four permanent fishermen and contract fishermen working for her. Sharing his experience, Temi said the global pandemic has affected fishing communities in unprecedented ways. “The lockdowns and social-distancing protocols dealt a heavy blow to the communities, as both supplies of fish chain and inputs were disrupted. Supplies of netting materials and spare parts were badly affected and there were spikes in their prices,” he said.

Small-scale fishers and fish processors continue to operate but their income and profits have declined because of the loss of clientele. “Only a few fishermen are inclined to fish, leaving the women, who are more into processing, a limited supply of fish to smoke/dry and sell,” Temi said. The lockdown and movement restrictions also prevented clients from patronising fish vendors. Both fishers and processors lack capacity for long-term storage, and depend on fish traders from distant locations. “The only sets of clients accessible to fishing communities are women in their immediate neighbourhood or proximal communities,” Temi said. In

urban markets, traders bought fish at relatively high prices from fishers at landing sites. Some fish sales such as the sale of crayfish and silver catfish was particularly high at the onset of the lockdown due to the season.

Women in the SSF value chain multi-task and are the pillars of their households. The pandemic has threatened their emotional, economic and physical well-being. They rely mostly on social capital to access fish as processors or traders. In the hierarchical female-centric fish supply chains, women like Madam Ganiat do not feel the pinch, unlike other categories of fish traders down the ladder. The conventional fish traders depend on road transportation, which is inadequate and does not optimally service the needs of the populace. During the lockdown, there were fewer fleets of commercial vehicles and these operated below carrying capacities due to the government directives of maintaining 2 m of social distance. This drove up the transportation fares, adding to the overall prices of fish. Transporters and fish traders, particularly those plying inter-state, were often harassed by overzealous enforcement agents.

At the home front, the women faced a double burden as care-givers and wives; children not going to school meant the minors needed more attention. Women worried more about food insecurity while still facing headlong numerous household chores. While access to fish was not a serious issue, access to other staple foodstuffs posed a challenge due to low purchasing power; the exceptions were fishing households engaged in agricultural activities to augment food access, directly or indirectly.

Hand to mouth

The worst affected are the fish vendors down the ladder. Prior to the pandemic, these women and their households lived on a meagre income, and were unlikely to have savings of any type, living hand to mouth. They are the most vulnerable and frequently face domestic violence.

In response to the economic hardship, the Federal Government rolled out some relief measures. Against the backdrop of an estimated 90 mn

indigent Nigerians, it is perceived that only a fragment would benefit from the distribution of food packages and cash transfers. Many people in the informal sector lack bank accounts and other requirements to access targeted credit facility for vulnerable households. Furthermore, the Emergency Economic Stimulus Bill lacks a provision for individuals/employees in the informal sector. Even if implemented properly, it will exclude small-scale fishers because most are not captured in the taxpayers scheme; this implies livelihood losses in the event of a prolonged pandemic.

At the state level, some part-time fishers benefitted from soft loans during the planting season, coinciding with COVID-19, for crops like cassava and plantain. Although targeted at residents to prevent panic-buying and to provide access to food supplies during the restriction period, the temporary markets set up provided alternative avenues for fishers and farmers to sell their produce. Co-operatives could at best only provide thrift savings for members. At the onset of the lockdowns, they were also mandated to issue identity cards to members to allow unhindered movement of their goods.

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Pa Ashade and Temi insist the sector needs more government support at all levels. Pa Ashade said both men and women in SSF are have suffered particularly due to the pandemic. With nostalgia, he identified the 1980s as the most memorable years for the SSF, the period during which the Federal Government implemented several projects with technical assistance from the United Nations Development Programme (UNDP) and the Food and Agriculture Organization of the United Nations (FAO). These helped upgrade rural fisheries and improve the living conditions of fishers. The state government of Lagos provided support to men and women in the sector.

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A fish processor's kitchen in Ikosi-Agbowa fishing community, Lagos. Both fishers and processors lack capacity for long-term storage, and depend on fish traders from distant locations.

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Temi is optimistic about the fishing business picking up after the pandemic. He would like to see the Federal Government address challenges of empowerment with modern fishing equipment, access to finance, and linkage to the international market for the sector. He sought greater involvement and a proactive approach from fishing organizations to protect the interest of members and the market against unforeseen drawbacks.

As the lockdowns gradually ease up, the return to normalcy will be slow because the pandemic is persistent. The fate of SSF in the post-pandemic era depends on current coping mechanisms. One can only hope that the resilience of men and women in the sector will pull them through this turbulent period. 3

For more

<https://www.plaas.org.za/african-small-scale-fisheries-in-the-time-of-covid-19-a-nigerian-perspective/>

African small-scale fisheries in the time of Covid-19: Voices from the continent – A Nigerian perspective

<https://fish.cgiar.org/news-and-updates/news/fish-and-aquatic-food-systems-covid-19-updates-nigeria>

WorldFish COVID-19 Updates: Nigeria

<https://fish.cgiar.org/news-and-updates/news/worldfish-discussed-covid-19-impacts-nigerian-aquaculture-community>

WorldFish discussed COVID-19 impacts with Nigerian aquaculture community

Together against Pirates

Sea piracy and armed sea robbery are major constraints to capture fisheries in the waters of Nigeria

Nigeria lies between latitudes 4°16'–13°52' N and longitudes 2° 96'–14° 37' E. It is bordered by the Republic of Benin to the west, Niger to the north, Cameroon to the east and the Atlantic Ocean to the south. It has a coastline of 853 km. In 1978, Nigeria declared its 200-nautical-miles exclusive economic zone (EEZ), which covers an area of 210,900 sq km over which it has sovereign rights for the purpose of exploiting, conserving and managing its fisheries resources. Nigeria is also endowed

and social well-being of the nation as well as to the maintenance of the livelihoods of fishermen and future generations.

The fisheries within the Nigerian territorial waters and its EEZ can be broadly classified as follows :

(a) brackishwater or estuarine small-scale artisanal canoe fishery in lagoons, creeks and estuaries;

(b) coastal artisanal canoe fishery within the five-nautical-mile non-trawling zone, mainly with gillnets, which targets pelagic species as well as sharks and sail fishes in deeper waters; and

(c) industrial coastal inshore fishery, made up mainly of trawlers targeting demersal fish and shrimps usually up to 50 m depth. Deep-water fisheries resources with high economic potential, including tuna and drifffish (*Arioma*) species, have remained largely unexploited by the local fleet.

The population of fishermen in Nigeria has been estimated at about 1.2 mn; there are about 6 mn employed in the sector, including processors, marketers and other ancillary workers.

Landing sites

Many coastal towns, villages, communities or settlements adjacent to the Atlantic Ocean provide natural landing beaches/sites (on the waterfronts), scattered along the entire coastline, which are used by small-scale artisanal fishermen, who have consistently contributed between 81.4 and 89.6 per cent of the 0.6 mn tonnes of annual fish production.

The Nigerian Trawler Owners Association (NITOA), an umbrella organization of all the fishing

with a large number of brackishwater bodies, including estuaries, creeks and lagoons.

Fishing has been a major source of very rich animal protein/nutrients, direct and indirect employment and wealth creation as well as immense economic benefits to Nigeria. Fish forms a key ingredient in global menus, and Nigeria, with a population currently estimated at 140 mn, is the largest consumer of fish and fishery products in Africa. Shrimps have now become an important and valuable export commodity in Nigeria, where oil and gas, with the current daily production of 2.4 mn barrels, contribute about 90 per cent of the foreign-currency earnings of the country.

Therefore, it is very important to ensure the sustainable contribution of fisheries to the nutritional, economic

Nigeria, with a population currently estimated at 140 mn, is Africa's largest consumer of fish and fishery products.

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Table 1: Pirate attacks on trawlers in Nigerian coastal waters and their outcome

Year	2003	2004	2005	2006	2007	2008	2009	2010
No. of vessels	10	11	38	91	107	95	105	115
No. of deaths recorded	0	0	0	2	6	9	13	15

Source: FDF & NITOA (Pers. Comm.)

companies, operated 153 Nigerian-flagged registered vessels in 2011 (down from 221 vessels in 2001), and contributed between 4.3 and nine per cent of the local fish production.

However, fishing operations by small-scale artisanal and industrial fishermen, as well as research activities in the coastal waters, are being hampered by incessant armed robbery or pirate attacks in the coastal waters of Nigeria, leading to the maiming of captains, fishermen and crew as well as loss of lives and equipment. Pirates have forcefully deprived small-scale artisanal fishermen of their outboard engines, often inflicting bodily harm.

In recent years, piracy has been a major threat to fishing trawlers. However, of late, the ferocity and frequency of pirate attacks have grown out of proportion and beyond the realms of reason. Fishing grounds from Calabar to Lekki are no longer safe or accessible to fishing vessels, both during the day and at night. The NITOA president once asked in desperation: "How productive can you be if you always have to look over your shoulder?"

According to the *Sunday Punch* of 27 February 2011, a Maritime Watchdog Group confirmed the 853 km coastline of Nigeria as the most dangerous in the world because of the sporadic increase in the number of pirate attacks. Reports obtained from Federal Department of Fisheries (FDF) and NITOA indicate that pirate attacks on fishing vessels increased from 10 in 2003 to 115 in 2010 (see Table 1). The frequency of deaths from the attacks increased tremendously from two in 2006 to 15 in 2009. There were about 50 pirate attacks on fishing vessels in January 2011. Of those, 20 occurred in one week during which 10 crew members were killed.

This trend has continued unabated to date.

The adverse effects of pirate attacks on the fishing operators include the following:

- maiming and loss of lives and materials;
- payment of huge compensation to the families of the deceased crew by the fishing companies;
- rendering fishing grounds unsafe and inaccessible, resulting in low catches;
- loss of the outboard engines of artisanal fishermen, and irreplaceable damage to the assets on board trawlers; and
- negative psychological impacts on fishermen and technical crew and sailors.

The fishing industry has high capital outlay on vessels, nets, trawl gear, accessories, jetties, cold storage and processing facilities, workshops and slipways worth more than 150 bn naira (approx. US\$1 mn). It also has an effective market distribution network

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Fishing operations of small-scale and industrial fishermen in Nigeria are being hampered by pirate attacks

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Fishing provides direct and indirect employment to over six million people in Nigeria, including fishermen who are affected by pirate attacks

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and provides direct and indirect employment to over six million, including fishermen, crew, net makers, processors, marketers and others. The industry earns large amounts of foreign exchange, mainly through shrimp exports worth US\$50-60 mn annually (see Table 2). The industry, however, is now on the verge of total collapse as crew members no longer wish to sail.

The operators continue to incur huge financial losses as a result of these pirate attacks.

Competent hands are now moving to the oil industry where they are better assured of safety. In addition, it has become very risky for scientists to conduct research like resource surveys in the inshore coastal waters or board fishing vessels as observers. Placement of students for at-sea, on-board experience, skills acquisition and capacity building for the fishing industry has also been put in abeyance. The situation is more worrisome because of the multi-purpose fisheries and oceanographic research vessel that has been approved by the federal government for acquisition by the

Nigerian Institute for Oceanography and Marine Research (NIOMR). All these prospects, including commercial exploitation of tuna and other pelagic resources in the Nigerian EEZ (dominated by skipjack tuna, which is estimated to have an annual potential yield of 10,000 tonnes) are likely to be jeopardized by continuing sea piracy.

In a nutshell, there is a tremendous cost in terms of economic value from disruption of fishing activities and loss of lives as well as from the hampering of the collection of invaluable research data and information required for sustainable fisheries development.

Stakeholders

The problem of sea piracy should be solved through multi-dimensional and concerted efforts from all stakeholders, including the Nigerian navy, air force, army, marine police, NIOMR, FDF, NITOA, the Nigerian Maritime Administration and Safety Agency (NIMASA), customs and immigration services as well as the artisanal fishermen themselves.

Table 2: Quantity and value of shrimp/prawn exported between 2000-2011

Year	Quantity (Tonnes)	Value (US\$)
2000	6,303.25	39,495,886.22
2001	6,694.21	48,820,467.00
2002	7,372.54	54,053,120.00
2003	6,900.00	48,215,030.00
2004	7,316.16	52,706,370.00
2005	7,179.27	53,379,750.00
2006	7,736.22	46,804,100.00
2007	5,136.67	38,311,320.00
2008	4,694.17	38,207,610.10
2009	4,321.42	38,167,336.24
2010	4,082.95	37,800,022.38
2011	4,390.52	47,843,932.60

Source: FDF, 2007 and 2011. (Pers. Comm.)

At mid-sea, large volumes of shrimp bycatch are bought off the trawlers by canoe fishermen. Proceeds from such transactions, worth millions of naira, which are kept on board the trawlers, have been figured to attract the pirates. It is recommended that sales of bycatch at sea should be prohibited.

Vessel monitoring system (VMS) or other cost-effective communication technology that is compatible with existing technology within the sub-region, should be adopted after due consultations. Harmonization of the fisheries laws and regulations in the sub-region is long overdue and should be undertaken on a priority basis to bring about a uniform regime of application and enforcement. Alternative employment generation for the youth should be explored.

The construction of the proposed east-west coastal road, spanning all the eight coastal States, is long overdue and should be completed fast in order to open up the area and permit access from the hinterland to prevent the unhindered movement of pirates in and out of the coastal waters.

Vigilante groups should be encouraged to be formed in coastal communities.

Recently, the Nigerian navy imported *NNS Thunder* from the US to boost its fleet capability. The March 2012 workshop organized by

the Africa Partnership Station (APS), involving a joint exercise (code named 'Obangame', which is a Cameroonian word meaning 'togetherness') on the fundamentals of policing and fighting sea piracy in the Gulf of Guinea, by the US Navy, in collaboration with Nigeria, Ghana, Cameroon, Sao-Tome and Principe and observers from the Caribbean, is most welcome.

In addition, joint operations of NIMASA and the Nigerian navy are being revamped through the acquisition of platforms and associated electronic surveillance systems through federal government-approved public-private partnership (PPP) arrangements. Under the auspices of NIMASA, a draft sea piracy bill is being prepared with inputs from all stakeholders.

It is hoped that all these efforts and recommendations will bring about a drastic reduction or elimination of armed sea robbery/piracy in the West Africa sub-region. ❏

For more



www.gaf.mil.gh/index.php?option=com_content&view=article&id=147:ghana-nigeria-navies-to-combat-sea-piracy-in-the-sub-regional-waters&catid=13:headlines&Itemid=34
Ghana, Nigeria Navies to Combat Sea Piracy in the Sub-regional Waters

nimasa.gov.ng/
Nigerian Maritime Administration and Safety Agency

www.niomr.org/
Nigerian Institute for Oceanography and Marine Research

Sheltering the fish

The construction of fish shelters is a traditional technique to enhance fish production in Nigeria

With an estimated population of 129 million in July 2002, Nigeria is Africa's largest consumer of fish and fish products. It has a coastline of 853 km, bordering the Gulf of Guinea. It is also richly endowed with large water bodies, including rivers, lakes, reservoirs, creeks, lagoons and estuaries, which have a total surface area of about 12.50 million hectares.

Fish aggregating devices or fish shelters, as they are called in Nigeria, have been recognized as one of the potent techniques for significant increases in productivity and stock size. Refined and environmentally friendly fish shelters can increase fish production in shallow water bodies so as to meet the shortfall in fish demand. Fish shelters account for over 35 per cent of the total fish produced in the Lagos Lagoon, which, at 208 sq km, is the largest of the lagoon systems in the West African subregion.

Fish shelters that create artificial habitats are used nationwide, with various degrees of intensity. Three main groups of fish shelters have been identified:

- brush parks constructed with plant parts in both fresh and brackish water bodies. The plants used include mangrove plants (*Rhizophora racemosa* and *Avicennia* sp.) or other shrubs as well as fronds of oil palm (*Elaeis guineensis*) that are staked in shallow (1-5 m depth) and relatively calm waters. Worn-out automobile tyres and weighted plastic or polyvinyl chloride (PVC) pipes can also be added to provide crevices for fish to hide.
- floating aquatic weeds, consisting mainly of luxuriant water

hyacinth (*Eichhornia crassipes*) and duck weed (*Pistia stratiotes*), are also staked and stationed in one place and prevented from drifting with the tide or current.

- floating logs that form mats of shelters, mainly in fresh and brackish water systems in the rain forest region, where they are transported from one location to the other.

An overview of fish shelters worldwide shows that there are no general rules for the design and construction of the refined shelters. However, some major principles should be seriously taken into consideration to optimize productivity.

Considerations for design and placement of materials should cover various aspects, including the following: (a) the amount of materials used; (b) the area/volume covered; (c) the vertical relief, which is important in deep waters, and the complexity of the structures in relation to the spatial arrangement, number of chambers, spaces and crevices for fish prey to hide from predators; and (d) the texture and composition of materials and their capability of withstanding decay, rot or rust in the aquatic environment.

The structures are meant to provide shade and shelter from strong currents, hiding places for prey from predators, firm substrate for attachment of sessile life forms like *Crassostrea gasar*, source of food such as plankton, algae, invertebrates and small herbivores, and also spawning or breeding and nursery area.

Categorization

Fish behaviour and orientation can be categorized according to the stimuli provided, as follows: (a) rheotaxy—



orientation with respect to the current direction; (b) geotaxy—orientation with respect to the beach or the coast or the shoreline (c) thigmotaxy—physical contact with the structure; (d) phototaxy—response to light; (e) chemotaxy—response to olfactory stimulus; and (f) hydro-acoustics—auditory response to sound in water.

The area around the structures where fish species aggregate and are caught is referred to as the 'enhanced fishing zone'. It ranges between a few meters to about 100 m. The zone may not be symmetrical around the installation because fish tend to congregate either up or down current in response to availability of food or any of the stimuli indicated above.

The structures can be harvested partially or completely. Gillnets, traps, hand-lines, and longlines can be used for partial harvest of the structures. Cast-nets can also be operated superficially to capture fish in some of the shelters. The encircling gillnet and the seine-net can be used for total harvesting. The net is used to encircle the structures and all the debris within the shelter are removed.

It has been observed that fish shelters produce more fish (by weight) than the open waters, which contain more fish diversity. In the brush parks in the Lagos Lagoon, for instance, a few fish species,

including tilapia (*Sarotherodon melanotheron*), catfish (*Chrysichthys nigrodigitatus*) and mullets (*Liza* spp.) constitute the main fish composition. As much as 8 tonnes of fish per hectare per year has been recorded in some fish shelters. The amount of fish caught correlates positively with the size of the shelter, the density of materials and the duration of installation.

The management measures needed to maintain optimal fish production should include:

- unravelled polypropylene rope streamers, which are synthetic materials attached to promote the growth of juvenile fish. These are colonized quickly by algae and invertebrates, which serve as food for the fish.
- the use of streamers and other rot- and rust-free materials, such as worn-out tyres, which minimize water pollution.
- the minimized use of plant materials so as to prevent deforestation and erosion of the mangrove area as well as the destruction of the spawning and nursery grounds of some of the economically important fish species.

- building, at a time, a pair of shelters, one for fishing and the other for habitat improvement to induce fish recruitment. Flags with different colours can be placed to easily distinguish the different shelters.
- allowing fish shelters, especially brush parks, to lie fallow for a period of time (say, three to four months) to allow for better growth of fish.
- the continuation of fisheries laws and regulations to prevent, for example, destructive fishing.
- communal or joint ownership of brush parks to minimize conflicts arising from multiple ownership claims.
- regulations to limit the number (or area) of fish shelters, so as to prevent stress on the resources and avoid conflicts with other users of the aquatic environment.

It is imperative that major modifications should involve the use of environmentally friendly materials such as synthetic netting and plastics to replace the plant parts, especially the mangroves that are used for the construction of fish shelters. This should help reduce the destruction of the mangrove belt, which serves as the nursery and breeding grounds of commercially important fish species. The construction of fish cages and pen enclosures in relatively shallow and expansive water bodies should also be encouraged. Materials for the construction of cages and pen enclosures that have been tested and proven to be efficient elsewhere, especially in tropical waters, should be identified and utilized.

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Hook, line and sinker

The small-scale fisheries sector in Nigeria is characterized by wide variety of fishing gear

Nigeria is situated on the west coast of Africa between longitudes 2° 29' and 14° 37' east and latitudes 4° 16' and 13° 52' north of the equator. It is endowed with large bodies of marine, brackish and freshwater systems.

Nigeria has a coastline of about 583 km, which borders the Atlantic Ocean in the Gulf of Guinea, a maritime area of 46,000 sq km up to 200-m depth and an exclusive economic zone (EEZ) of 210,910 sq km. The narrow continental shelf, which is about 15 km wide in the west and 27.8 km wide in the east, covers an area of about 41,000 sq km.

The brackish water systems, including creeks, estuaries and lagoons, represent about 0.48 mn hectares (ha). The shallow maritime area covers 2.67 mn ha up to 50 m depth, within which many of the coastal small-scale artisanal fishermen operate.

The freshwater bodies include the rivers Niger and Benue, natural lakes like Chad, and manmade lakes like Kanji, Jiga and Bakokori, as well as reservoirs and flood plains. The total area of inland water bodies has been estimated at about 12 mn ha. The small-scale artisanal fishery sector remains the backbone of fish production in Nigeria, contributing a minimum of 70 per cent of the total fish production in the last decade. In 2000, a total of 101,101 fishing units operated by 283,292 fishermen produced 325,100 tonnes of fish.

The artisanal fisheries can be categorized into: (a) the brackish water or estuarine canoe fishery operating in lagoons, creeks and estuaries; (b) the coastal canoe fishery operating usually within 5 nautical miles of the coastline, which is a non-trawling zone statutorily reserved for small-scale fisheries. (Motorization allows some of

the operators to venture farther into the sea, up to 50-m depth.); (c) the freshwater canoe fisheries in lakes, major rivers and their tributaries, and streams.

The mono-hull wooden canoes include dugout canoes (3–7 m in length), planked canoes (4–12.5 m), and planked dugout or half-dugout canoes. The latter are dugout canoes built up with planks on the sides in order to increase the hull size and include the large Ghana canoes (16–18.5 m long), which are motorized with 40 hp outboard engines. The other wooden canoes are largely nonmotorized.

Apart from full-time fishermen, there are part-time fishers who engage in other activities such as farming. Thousands of Nigerian fisherfolk migrate seasonally from their villages to other fishing communities or settlements, both within and outside the country, including Cameroon and Gabon. Fisherfolk from other countries, like Ghana and Republic of Benin, have migrated and settled in a few coastal village since the early 19th Century. Fishermen migrations also occur in inland waters.

The artisanal fisherman's main wealth is in the fishing gear, which show a lot of variations from one location to the other. The many and various fishing gear types which are used or employed by the small-scale artisanal fishermen in Nigeria are highlighted below.

Wall of netting

The large or massive *watsa* net with, small mesh (10–50 mm), has enough length (500–1,000 m) and depth (up to 50 m) to surround the shoal/school of fish from all sides and from below. It is usually fitted with purse-rings and purse-lines to facilitate pursing/closing the bottom of the net. An impenetrable wall of netting is

allowed to sink rapidly around a shoal of fish, after which the bottom edge is closed.

The net is operated by a crew of 12-16 fishermen on board the large Ghana canoe to catch pelagic/surface or midwater fish species such as the *bonga* (*Ethmalosa fimbriata*) and sardines (*Sardinella aurita* and *S. maderensis*) in fairly deep coastal waters up to 75 m. The bottom of the net is closed, making sure it does not get entangled on the seabed, and the fish scooped bit by bit onto the deck of the boat.

This is perhaps the most efficient gear type. The net surrounds large quantities of pelagic fish, and the landings constitute high-grade quality fish suitable for canning. The gear's efficiency depends on the size of the net, the size of the fish shoal, the swimming speed of the fish, and the speed of the motorized canoe used during the fishing operation. Selectivity is very low (almost nil) as no fish is allowed to escape. Though the fishermen have the option to select the desired fish size and release juvenile, young and immature fish, that is rarely done.

A huge capital investment is required for nets and procurement of the large Ghana canoe. Great professional skills are also required for making nets and fishing operations. The purse-seine net is one of the most complicated nets to operate at sea because of its huge size. Many Ghanaian fishermen and a few Nigerians operate the *watsa* small-scale purse-seine nets in the coastal waters of Nigeria to catch *bonga* and sardines (called *sawa*).

The beach seine net is designed with two long wings and a cod end fitted at the centre or on one side of the wings. The head line ranges between a few metres (say, 200 m) to about 1 km or more in length. The net is operated in shallow waters (5-25 m depth) and very close to the shore or beach. It is designed with enough depth such that the bottom/lead line touches the sea bed, in order to prevent fish from escaping underneath. It is set in a semicircle in the water and manually pulled or dragged with the aid of the towing rope attached to each of the wings. In the process, the cod end is

gradually drawn close to the shore and is finally hauled out of water on to the beach.

Coastal beach seine nets are set during the day only. They are also operated from wooden canoes 9-12 m in length. In over 70 per cent of the operations, no outboard engine is used. The net targets mainly the demersal fish species, including croakers (*Pseudotolithus* spp.), sole (*Cynoglossus* spp.), jackfish (*Caranx* spp.), shiny nose (*Galeoides decadactylus*), barracuda (*Sphyraena* spp.), moonfish (*Selene dorsalis*) and grunters (*Pomadour jubelini*). Beach seine nets without bags (50-120 m long and 3-8 m deep) are operated from the beach or on board the canoe midwater or within a relatively calm body of water such as a lagoon, creek, estuary, lake or any other water reservoir.

While many live fish specimens are caught, a few are in a semicomatose or unconscious state, and some are dead either due to entanglement in the mesh of the wings or crushed by the weight of fish herded into the cod end. The efficiency of operations depends on the mesh size of the net and the size of the water body.

Lift-nets are rectangular or circular implements which are lifted vertically out of the water from a submerged position to catch fish or crab that get attracted above the net. The water is strained in the process.

The rectangular *atalla* lift-net is usually constructed with a 10-25 mm mesh size. It is highly selective for the pelagic fish *Pellonula ionensiis* in rivers and lakes.

The circular crab gear (called *garawa*), which is baited with fish or chicken parts, is used extensively in the lagoons, creeks and estuaries. In some areas the crab gear is made of small conical bags to improve catching efficiency.

Varying mesh size

Cast-nets are conical falling nets with lead weights attached at regular intervals along the perimeter of the cone. The netting material is monofilament or multifilament nylon with twine thickness and mesh sizes varying between 12 mm and 100 mm. For each net used in streams, rivers with shallow depths and in the Lagos lagoon, the total stretched height of

the cone varies between 3 m and 6 m. However, in estuaries and rivers with deeper waters (over 9 m), the cone height varies between 5 m and 8 m. A typical cast-net has a retrieving line of 4-10 m in length and is attached to the apical portion. In some cast-nets, the lead line is tucked underneath and attached at intervals to the inner side of the net to form pockets for trapping fish.

For a good fishing operation, the physique of the fisherman has to match the size of the cast-net. The net is thrown on sighting a shoal of fish in such a way that it opens and unfolds to cover the greatest possible area of the water surface. Simultaneously, the net is allowed to sink to the bottom of the water, trapping some of the fish species and catching others in the pockets. The net is left in that position for three to five minutes before it is gently, but skillfully, drawn into the canoe with the retrieving line.

Cast-nets are also used by fishermen who wade in shallow waters of 0.5-1.2 m depth. Group cast-netting is also practised in the Lagos lagoon mainly by the migrant Beninois fishermen. Eight to 15 canoes, each manned by at least two men, form a circle. The nets are cast simultaneously in either a clockwise or anticlockwise direction. In a few instances, two lines of fishermen face each other and cast their nets into the area between them, starting

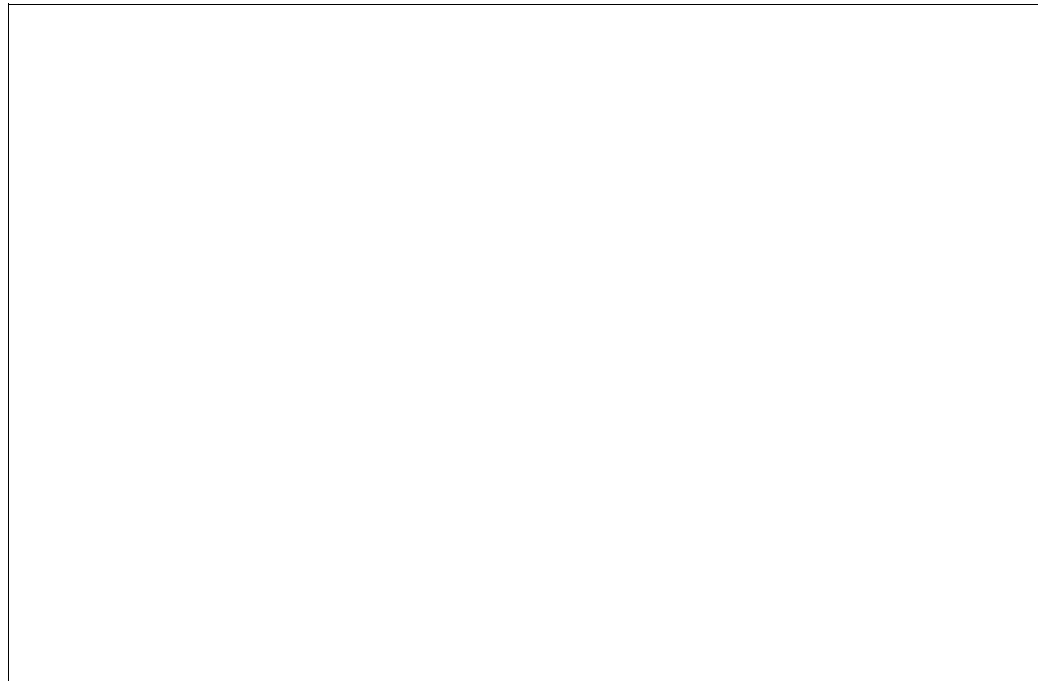
from one end to the other. In such an operation, the catches are shared equally among the fishermen.

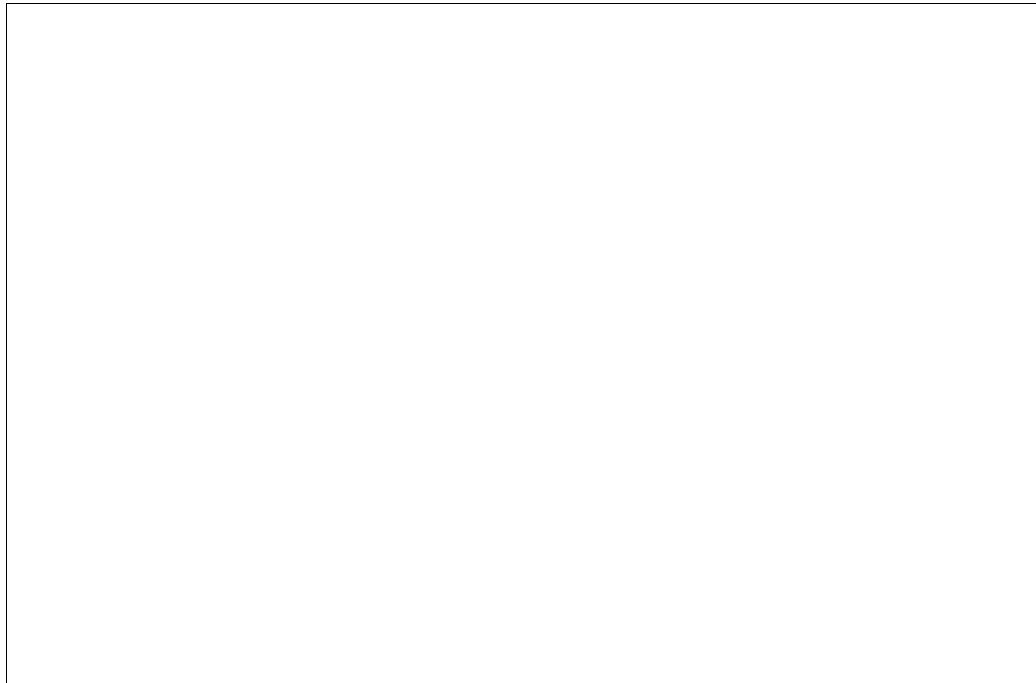
Another type of gear is the conical net thrown/operated from the shore/canoe to cover an area of the water surface and allowed to sink and close in on the fish. The symmetrical net is constructed with either rectangular panels or a big rectangular panel is joined diagonally to form a cone.

The efficiency of this gear depends on (i) the size/area and volume of the net, which should match the physique of the fisherman; (ii) whether the design incorporates pockets or not; and (iii) the sinking speed of the net. The falling gear are often used both intensively and extensively in calm waters for a rapid sampling of the fish population.

Gill-nets constitute the most abundant small-scale fishing gear in Nigeria. They include the monofilament and multifilament set gill-nets for demersal fish species in the coastal waters or inland water bodies; drift gill-nets for sardines and *bonga* and shark, as well as the encircling gill-nets for sardines and *bonga*. (Trammel nets, which belong to the group, are rare; not only are they not sustainable but they are also costly.)

Traps occur in various shapes and forms—pot-like, rectangular or





cylindrical basket cages made of bamboo, netting material, cane or wire gauze.

The *gura* trap made of synthetic netting material is cylindrical in shape. However, its lower surface is wider than the upper surface. Each trap is provided with a mouth opening or entrance (with or without a non-return valve) and chamber(s) for fish collection, irrespective of the shape or the design or the material used in the construction.

Catch efficiency depends on the size, mouth opening, bait type and leaching time, tidal current and other factors. Such gear retains the high quality of fish caught. The pots or the closely knit basket traps do not allow small fish to escape.

The stow-net is a conical bag made of multifilament nylon netting used in the sea, estuaries and lagoons to catch shrimp and small fish as well as brackish water eel (*Ophichthus ophis*). It is known as *nkoto* (in Kalabari), *esik* (in Ibibio), *asuwe* (in Yoruba) and *asu* (in Itsekiri).

The trap has a rectangular mouth that tapers to the bag. The netting material surrounding the mouth has a bigger stretched mesh size (100 mm), with thicker twine. The netting material and stretched meshes are progressively reduced in size towards the bag, which has 3–10 mm mesh sizes and are made of R300 tex twine thickness.

A very big stow-net, 30.5 m long with a mouth opening 15 m wide and 4 m high, has been observed. The gear is fixed against the tide by means of anchors or stakes. When anchors are used, the gear is inspected once a day for shrimp caught, since the mouth and body of the gear are automatically reversed with the changes of tide. However, when stakes are used, the trap has to be harvested just at the change of tide, and the mouth of gear manually reversed. Occasionally, the smaller size of this gear can be towed by two fishers either wading in the shallow (1.5-m deep) water or operating from two canoes. The stow-net is operated throughout the year but the best fishing season is between November-December and April-May.

At sea, the *nkoto* filter net is attached to a motorized plank canoe (7–11 m long and 1.7 m wide) and towed by a 8–15 hp outboard engine. The operation of the filter net in the nearshore coastal water conflicts with other small-scale fishing gear, which are damaged. Commercial fish species, including shiny nose, are also greatly impaired.

Barrier nets

The barrier-net, in its simplest form, is a fence of bamboo and palm fronds erected across the channel connecting the swamp with the river at high tide, in order to cordon off the fish. At low tide, the fish are stranded and picked up by hand or

collected in a basket from the mud. V-shape fences also form barriers across rivers, streams or creeks and are fitted with one large *iganna* trap at the centre of the narrow opening for collecting the fish.

In hook-and-line fishing, a hook is fixed to a line only or to a line attached to a pole. Many hooks fixed to many secondary lines (snoods) are attached to the main line. The longlines include the set longlines and the drifting longlines, which are used in the coastal waters, rivers, lakes and creeks.

Efficiency depends on size (hooks vary in size and are numbered from 1 to 20, with No. 20 being the smallest), quantity and shape of bait (artificial lure or natural bait), soak time and other factors. A positive correlation obtains between hook and fish size.

Efficiency is also highly associated with the feeding pattern of the fish and the type of food as well as seasonal and diurnal variations in feeding behaviour. Hooking without bait also occurs when the fish get hooked by their scales, gills, fins or other appendages. Hausa fishermen use unbaited bottom-set *marimari* or *mamari* longlines to catch soft and scaleless fish such as *Clarias* spp.

Spears are used mostly in rivers and creeks for killing, wounding or grappling with fish. They have metallic heads and are used extensively at night with torches, flares and hunters' carbide lamps to catch large fishes, such as *Lates niloticus*, *Gymnarchus* sp. and *Chrysichthys nigrodigitatus*. In some cases, spears, matchets and axes are used along with other types of fishing gear, such as lines, gill-nets and traps. They are used throughout the year but mostly in the dry season between November and April.

The other miscellaneous fishing gear and methods used in Nigeria include scoop-nets used to scoop up mechanically stunned fish; gathering by hand; using chemicals and ichthyotoxic plant poisons; and using hand grenades/bombs and locally made dynamites, which are generally prohibited in Nigeria. The latter may result in accidental loss of lives, while the former taint the fish and contaminate the water bodies. In both cases, the fish,

including juvenile, immature specimens, are killed.

The artisanal fishing gear types with small meshes (25–45 mm) catch juvenile immature fish and thereby inflict a great toll on the populations of commercial fish like the catfish (*Chrysichthys nigrodigitatus*). A minimum of 50-mm mesh size is thereby recommended in order to mitigate against overexploitation of the resources.

Some of the gear types are used throughout the year, while others are seasonal. The gear performance and efficiency are influenced by environmental factors, including tidal current and the lunar cycle, as well as the behaviour of the target species.

The fishing practices or operational methods in the sector tend to be labour-intensive, with low technological applications or minimal mechanical assistance. The canoes are mainly non-motorized. The total investment in fishing gear, canoe and other accessories is generally low, compared to the industrial sector. In other words, the small-scale fishery sector is characterized by low capital outlay and low operational costs, with variable and low fishing productivity, which generates low revenues.

The high costs of some fishing inputs, lack of subsidy or credit facilities plus high interest rates have had a negative impact on the sector.

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