

# Sustainability in life below water: managing the exploitation of Nigerian shellfish resources

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## ABSTRACT

Sustainable Development Goal 14 aims to increase the protection and sustainable management of coastal ecosystems and their resources while addressing threats such as pollution and ocean acidification. Nigeria as a nation with a coastline of approximately 853km facing the Atlantic Ocean is on one hand, at the mercy of the ocean but, on the other hand, the custodian of its resources. These resources like shellfishes sustain us today, and without them future generations will suffer, this is why there is a law against the destructive fishing practices, illegal, unreported and unregulated fishing activities. This article highlights the few priority areas and sustainability challenges for Nigerian shellfish resources as coastal lagoons are fully exploited and increase in harvest of shellfish resources from the lagoons is unlikely. It was noted that despite the availability of regulations, noncompliance by fisher folks has not helped in managing the exploitations. It is therefore recommended that officials need to work with those responsible for social policies, such as employment and other relevant policies, to make sure that the overall government policy direction is coherent and consistent. Also, giving coastal communities access to resources and allowing those access privileges to be traded can help in sustainable management of shellfish resources.

**Keywords:** *Crustacean, Mollusc, Sustainable development, Ocean resources, Nigeria.*

## INTRODUCTION

The Sustainable Development Goals (SDGs) provide multiple opportunities for coastal and marine areas by addressing coastal poverty, prioritizing conservation and explicitly recognising climate change (Friess *et al.*, 2019). Coastal and marine environments are relevant to most SDGs, but are explicitly considered under SDG 14, Life below Water: Conserve and sustainably use the oceans, seas and marine resources for sustainable development. SDG 14 aims to increase the protection and sustainable management of coastal and marine ecosystems and their resources while addressing threats such as pollution, coastal habitat destruction and ocean acidification. National policymakers have been criticized for not prioritizing SDG 14 to the same degree as other SDGs (Custer *et al.*, 2018). However, SDG 14 was a particular focus at the 2017 High Level Political

Forum on Sustainable Development, where 17 out of 43 countries explicitly stated in their Voluntary National Reviews how they were working towards SDG 14 (UN DESA, 2017).

The coastal and marine focus of SDG 14 means that it may have impacts on production of shellfish resources. As much as forty (40) percent of the ocean is heavily affected by pollution, depleted fisheries, loss of coastal habitats and other human activities (Neumann *et al.*, 2015), the impacts of SDG 14 on sustainability of coastal shellfish resources discussed here are also expected to impact the more than 3 million Nigerians who depend on marine and coastal biodiversity for their livelihoods. The objective of this paper is therefore to offer an insight into the exploitation of shellfish resources for sustainable development in Nigeria.

## GLOBAL PRODUCTION OF SHELLFISH

Shellfish is a major component of our global aquatic food supply which includes the molluscs, crustaceans and echinoderms (Moruf and Adekoya, 2018). Crustaceans are invertebrates with segmented bodies, protected by hard shells made of chitin, and include shrimp, lobster, crayfish, crab, and krill. Molluscs are invertebrates with soft bodies, divided into foot and visceral section. They are subdivided into bivalves, cephalopods, and gastropods. The commercially important bivalves are mussels, oysters, clams, and scallops, while cephalopods include squid, cuttlefish, and octopus. The gastropod group contains abalone, sea snail, cockle, and whelks, among others. Echinoderms are not as frequently harvested for food as molluscs and crustaceans, but sea urchin is quite popular in many parts of the world. It is estimated that the ocean is inhabited by more than 1000 species of crustaceans, 50000 species of molluscs, besides 13000 species of finfish (Nybakken, 2001).

Shellfishes are also ideal species to culture because of their low position in the food chain. More importantly shellfish culture is practically a “green” and sustainable industry. This is due to the act of mollusc feeding (biofiltering) which improves water quality by removing particulates (organic matter, nutrients, silts, bacteria, virus etc.) in the water column thus making it an effective way to counter eutrophication (Shunway *et al.*, 2003). The shellfish industry offers great potential to the country in terms of providing food for the people, increasing the income of small-scale fishermen faced with dwindling catches, providing livelihood for people in coastal areas as well as exchange earnings from export of shellfish (Norhana *et al.*, 2011). It is a valuable sub-sector of the fisheries sector, with potentials for local production and export of shellfish products.

According to the State of World Fisheries and Aquaculture, published by the United Nation’s Food and Agriculture Organization (FAO), in 2014, an amount of 167.2 million metric tons (MMT) of seafood was globally available, with landings of shrimp, American lobsters, and cephalopods at 3.5, 0.16, and 4.3 MMT, respectively (FAO, 2016). In recent times, the seafood industry is facing challenges such as concerns about sustainability, slow stagnation of capture fisheries, rising consumer demand, and overall safety of the products. The landing of shrimp, one of the major shellfish commodities, has been stable since 2012 (FAO, 2016). American lobster (*Homarus americanus*) and Norway lobster (*Nephrops norvegicus*) have accounted for more than 60% of world lobster availability, the former reaching a record catch of 160000 tons in 2014. Cephalopods are fast-growing short-lived shellfish; squid is the main component of the cephalopods, followed by cuttlefish, and octopus (Venugopal and Gopakumar 2017; Lawal-Are *et al.* 2018). Since 2008, catches of cuttlefishes and octopuses have remained relatively stable at 300000 and 350000 tons respectively (Venugopal and Gopakumar, 2017). The Pacific oyster (*Crassostrea gigas*) is an

invasive species most fecund of all oysters while the eastern oyster (*Crassostrea virginica*) is moving progressively toward overfishing (FAO 2016).

Aquaculture production of shellfish has been very limited in West Africa with only Senegal producing Eighty (80) tonnes of the mangrove oyster in 2016 (Gallup *et al.*, 2020). The production of shellfish through aquaculture in African region is limited compared with the historical production in Asia, and modern production in Europe and even Latin America (Gjedrem *et al.*, 2012). Except in a few countries, such as Benin, Ghana, and Mauritius, where the attachment of the people to capture fisheries probably enabled them to evolve traditional forms of aquaculture and management (in acadjas, whedos and barochois etc.), aquaculture is not a tradition in most African countries (Alabi, 2010). In developing a viable shellfish culture industry, Nigeria has several advantages including its possession of an extensive coastline with different coastal features such as beaches and mudflats.

### **THE NIGERIAN COASTAL ZONE**

The Nigerian coastline lies on the West Coast of Africa between Latitude 4°10' to 6°20'N and Longitude 2°45' to 8°32'E; covering approximately 853 km, from the Seme border in Badagry to Ikang in Cross River State (from West to East) and gently descending into the Atlantic Ocean. Under the Article 57 of U.N Convention on the Law of the Sea (UNCLOS) as ratified in 1994, Nigeria claimed 200 nautical miles as its Exclusive Economic Zone (EEZ), where it has exclusive rights to the exploration and exploitation of all natural resources, in concert with the provisions of the UN Convention on the Law of the Sea. The coastline defines the coastal zone, which is the transition zone between land and water. It is a fragile and biodiverse ecological setting that provides the platform for interaction between terrestrial and aquatic life.

The topography of the Southern Nigerian landscape is low lying, with elevations ranging from 2 to 4 m above mean sea level. It stretches inland to a distance of about 15 km in Lagos to about 150 km in the Niger Delta and about 25 km east of the Niger Delta (Adeaga, 2014). The coastline stretches for about 853km comprising inshore waters, coastal lagoons, estuaries and mangrove, characterised by periodic tidal variations and ranges along water channels and the differences depend on the hydrological properties and slopes of the various channels (Zabbey *et al.*, 2019). The most commercially important living resources are fin and shellfishes including shrimps, predominantly penaeid shrimps. Fishing is a major activity especially in the coastal areas where important shellfish resources are obtained.

### **NIGERIAN SHELLFISH RESOURCES**

According to the Fisheries Statistics of Nigeria, the estimated potential yield for shellfishes is 51,760 metric tonnes, while the most produced shellfishes are the shrimps and the prawns (FDF, 2007). Nigeria has an important shrimp trawling industry harvesting mainly pink shrimp (*Farfantepenaeus notialis*); although reliable production data is scarce while historical data reports landings of between 10,000 and 15,000 metric tonnes annually (FDF, 2007). Discrepancies are usually accounted for by illegal at-sea sales that go unreported. According to Zabbey (2006), a total of 173 licensed vessels are trawling for shrimp in Nigeria. Overall production of fin and shellfish increased from 1995 to 2006 and slightly decreased subsequently due to problem of militants and piracy in marine waters (Olaoye and Ojebiyi, 2018). However, basic data may not be available to judge if the resources are exploited sustainably and scientifically. At least the coastal prawn fisheries are under the heavy pressure of fishing activities (Nakazawa *et al.*, 2013).

The pink shrimp (*Farfantepenaeus notialis*) has been the dominant target and supportive species in Nigeria (Alabi, 2010). Prior to the end of the 20th century, *F. notialis* fishery was quite lucrative, resulting in bumper harvest by trawlers. Perhaps, the licensing of vessels without ensuring that trawl owners respect the state of existing stocks culminated in the collapse in *F. Notialis* fishery which resulted in the winding or withdrawal of some trawlers from Nigeria around 2000; then, industrial shrimping was no longer profitable as before but thanks to the sudden emergence of *Peneaus monodon*, an alien species which has revived or prevented industrial shrimp operations from total collapse in Nigeria (Jimoh and Lemomu, 2010). The economically important shellfish resources in Nigerian inshore and offshore waters are shown in Table 1

**Table 1: Economically important shellfish resources in Nigerian Coastal waters**

Crustaceans	Moluscs
<b>Shrimps</b>	<b>Bivalves</b>
Pink shrimp ( <i>Farfantepenaeus notialis</i> , Pérez Farfante 1967)	Mangrove oyster ( <i>Crassostrea gasar</i> , Adanson, 1757)
Guinea shrimp ( <i>Holthuispenaeopsis atlantica</i> , Balss 1914)	West African Clam ( <i>Galatea paradoxa</i> , Born, 1778)
Red deep-water shrimp ( <i>Parapeneaus longirostris</i> , Lucas 1846)	Ark clams ( <i>Anadara senilis</i> , Linnaeus, 1758)
Stripped or tiger shrimp ( <i>Penaeus monodon</i> , Fabricius 1978)	Blue mussel ( <i>Mytilus edulis</i> , Linnaeus, 1758)
	Cockles ( <i>Cardium costatum</i> , Linnaeus, 1758)
<b>Prawns</b>	Donacid clams ( <i>Egeria radiata</i> , Larmack, 1804)
Estuarine prawn ( <i>Nematopalaemon hastatus</i> , Aurivillius 1898)	
African river prawn ( <i>Macrobrachium vollenhovenii</i> , Herklots 1851)	<b>Gastropods</b>
Brackish water prawn ( <i>Macrobrachium macrobrachion</i> , Herklots 1851)	Edible periwinkle ( <i>Tympanotamus fuscatus</i> , Linnaeus, 1758).
Gabon Shrimp ( <i>Atyagabonensis</i> , Giebel 1875)	Periwinkle( <i>Pachymelina aurita</i> , Linnaeus, 1758)
<b>Lobsters</b>	Murid snail ( <i>Thais haemastoma</i> )
Spiny lobsters (Royal Spiny Lobster, <i>Panulirus regius</i> , De Brito Capello, 1864)	Other snails like <i>Biomphalaria pfeifferi</i> , <i>Biomphalaria globosus</i> and <i>Lymnaea natalensis</i>
Locust lobsters ( <i>Thenus orientalis</i> , Lund, 1793)	
<b>Crabs</b>	
Swimming crabs ( <i>Callinectes amnicola</i> , De Rochebrune, 1883 and <i>Portunus validus</i> , Herklots, 1851)	
Deep sea crabs ( <i>Chaceonatopus</i> , Manning & Holthuis, 1989)	
Land-based crabs ( <i>Cardiosoma armatum</i> Gecarcinidae, <i>Sesarmahuzardi</i> and <i>Goniopsispelii</i> Grapsidae and <i>Ocypoda africana</i> Ocypopidae).	

## SUSTAINABILITY CHALLENGES FOR EXPLOITATION OF NIGERIAN SHELLFISH RESOURCES

### Environmental challenges

- The changes in the physical aspects such as temperature, and the biological aspects such as species competing for the same food supply, mean that many influences on the number of shellfish available in a given year are outside of human control, and thereby difficult to