ANIFS 2024

SUSTAINABLE FISHERIES AND AQUACULTURE PRODUCTION

FOR ENHANCING LIVELIHOOD IN NIGERIAN ECONOMIC DEVELOPMENT

PROCEEDINGS OF THE FIFTH CONFERENCE OF ASSOCIATION OF NIGERIAN FISHERIES SCIENTISTS

9TH – 11TH JULY, 2024

UNIVERSITY OF LAGOS,
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EDITORS

Nwanna, L. C.; Ajani , E. K.; Omitoyin, B. O.; Magawata, I.; Ayoola, S. O.; Orisasona, O.; Kareem, O. K and Abubakar, M. Y.

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Prof. Nwanna, L. C.,
Department of Fisheries and Aquaculture Technology,
Federal University of Technology, Akure

Prof. Ajani, E. K.
Department of Aquaculture and Fish Management,
University of Ibadan, Ibadan

Prof. Omitoyin, B. O.
Department of Aquaculture and Fish Management,
University of Ibadan, Ibadan

Prof. Magawata, I.
Department of Fisheries and Aquaculture,
Usmanu Danfodiyo University Sokoto

Prof. Ayoola, S. O.
Department of Marine Sciences,
University of Lagos, Lagos

Dr. Orisasona, O.
Department of Animal Science,
Obafemi Awolowo University, Ile-Ife

Dr. Kareem, O. K.
Department of Aquaculture and Fish Management,
University of Ibadan, Ibadan

Dr. Abubakar, M. Y.
Department of Fisheries and Aquaculture,
Usmanu Danfodiyo University, Sokoto

Moontelloni
Media & Publishing
Ibadan, Nigeria

34 Farayola Layout,
Bodija,
Ibadan.

0906 120 2654
0706 204 7492
moontelloni.mp@gmail.com

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ASSOCIATION OF NIGERIAN FISHERIES SCIENTISTS (ANIFS)
Department of Aquaculture and Fisheries Management,
Faculty of Renewable Natural Resources,
University of Ibadan, Ibadan, Nigeria.
E-mail: anifsconference@gmail.com *Website:* https://www.anifs.org.ng
Contacts: +234 (80)23250460, +234 (80)68939835,
+234 (81)09765433, +234 (81)37844490

Welcome Address by the President of the Association of Nigerian Fisheries Scientists (JANIFS), Professor Bamidele O. Omitoyin at the Fifth Annual National Conference Held at the University of Lagos, Akoka, Lagos, Nigeria from 9th to 11th July, 2024

His Excellency, The Executive Governor of Lagos State, Babajide Sanwo-Olu
The Honourable Minister, Federal Ministry of Marine and Blue Economy, —His Excellency, Adegboyega Oyetola
The Vice Chancellor, University of Lagos—Professor Folasade Ogunsola, FAS, OON
The Permanent Secretary, Federal Ministry of Marine and Blue Economy—Mr. Oloruntola Olufemi
The Honourable Commissioner, Lagos State Ministry of Agriculture—Ms. Abisola Olusanya
The Keynote Speaker, Prof. Abiodun Sule, the Executive Director of NIOMR
The Provost, Federal College of Fisheries and Marine Technology, Victoria Island, Lagos—Dr. Chucks Onuoha
WorldFish Office Nigeria—Dr. Sunil Siriwarden
The Royal Mother of the Day, Olori Tobi Phillips—Ogunwusi, the wife and representative of Kabiyesi Ooni of Ife Oba Adeyeye Eniitan Ogunwusi, Ojaja II
Dean, Faculty of Science, University of Lagos—Prof. Elijah Oyedola Oyeyemi
Head, Department of Marine Sciences—Prof. Aderolu Ademola Zaid
Members of the National Executive Council of ANIFS
The Chairman and members of the LOC,
Distinguished members of ANIFS.
Distinguished members of the Fisheries and Aquaculture Business Community
Distinguished Ladies and Gentlemen,
Distinguished Gentlewomen and Men of the Press.

Distinguished guests, ladies and gentlemen, I welcome you to the 5th Annual Conference of the Association of Nigerian Fisheries Scientists. We are honoured to host this event at the University of Lagos, Akoka, from July 9-11, 2024, with the theme "Sustainable Fisheries and Aquaculture Production for Enhancing Livelihood in Nigeria's Economic Development." The Association is a non-governmental, non-political, and non-profit-making body of scientists in the Fisheries and Aquaculture discipline, registered as a corporate body by the Corporate Affairs Commission, Abuja, Nigeria. The mission of the Association is to nurture a body of scientists and professionals committed to the advancements of fisheries and aquaculture research, development, and community service for the benefit of Nigerians and humanity.

The Association has laudable objectives, among which are to enhance capacities and best global standards for fisheries research and development, advance training and capacity building, promote a bond of professionalism among members and other stakeholders, and advise government at all levels on policy focus and good governance for the development of the fisheries and aquaculture sector in Nigeria. Nigeria's fisheries and aquaculture sectors play a crucial role in the country's economy, contributing to food security, employment, and foreign exchange earnings. Current production is about 1.1 million metric tonnes while the demand is about 3.6 million metric tonnes, leaving a deficit of about 2.5 million metric tonnes. However, to ensure the long-term sustainability of the fisheries resources, we must address the challenges facing the industry and explore innovative solutions. We are encouraged by the growing recognition of the "blue economy" concept in Nigeria, which emphasises the sustainable use of marine and aquatic resources for economic development. The establishment of the Ministry of Marine and Blue Economy by President Ahmed Bola Tinubu, GCFR, is a welcome and strategic move that will help Nigeria tap into its rich aquatic resources as part of the national economic framework. This will help diversify Nigeria's economy away from its heavy dependence on oil exports and provide opportunities to develop the sector to meet our national fish food supply.

This conference provides a platform for fisheries scientists, policymakers, and industry stakeholders to come together and discuss strategies for sustainable fisheries and aquaculture production in Nigeria. We have an impressive lineup of speakers and panellists who will share their expertise and insights on topics ranging from blue growth concepts, gender-inclusive value chains, and climate change adaptation to fisheries and aquaculture, co-management, coastal and marine resources management, aquaculture technologies, pollution issues, fish hatchery, and seed production. We will also have a section at this conference to engage stakeholders on the challenges currently facing the aquaculture and fisheries sector in the country and brainstorm on the way forward. This conference will further provide a platform to train and mentor our colleagues on grant writing and the method of data analysis in order to improve scholarship.

As the President of the Association of Nigerian Fisheries Scientists, I am excited to see the continued growth and development of our organisation. Over the past few years, our members have made significant contributions to advancing research and knowledge in the field of fisheries and aquaculture. We have secured several prestigious grants and awards, which have enabled us to expand our research capabilities and engage in impactful projects. During this conference, we will also have the opportunity to strengthen our partnerships with various stakeholders in the fisheries and aquaculture sector. These collaborations are crucial for fostering interdisciplinary cooperation and driving the sustainable development of the fisheries and aquaculture sector. I encourage all participants to actively engage in the discussions, share their experiences, and explore new ideas that can help us achieve our goal of sustainable fisheries and aquaculture production in Nigeria. Together, we can work towards enhancing livelihoods, ensuring food security, and contributing to the country's economic development.

I appreciate our host institution, the University of Lagos, under the able leadership of our amiable Vice Chancellor, Professor Folasade Ogunsola (FAS, OON), for her support in ensuring that this conference is held. Thank you, Ma, for your hospitality, kind gestures, and support to ANIFS. This encouragement demonstrates your passion for scholarship and the belief that sustainable fisheries and aquaculture production can indeed enhance livelihood and Nigeria's economic development.

We deeply appreciate all our sponsors and stakeholders for their unwavering support and invaluable contributions to this conference. Your steadfast commitment has provided an opportunity for the dissemination of scholarly research, underscoring the indispensable partnership between the town and gown.

The efforts and sacrifices of members of the Local Organising Committee (LOC) under the chairmanship of Professor Adesola Osibona with the strong support of all the LOC members are highly appreciated.

Finally, I thank the women and men of the press for covering this programme. Thank you all for being here, and I wish everyone a productive and insightful deliberation at this conference.

KEYNOTE ADDRESS:

SUSTAINABLE FISHERIES AND AQUACULTURE PRODUCTION FOR ENHANCED LIVELIHOOD IN NIGERIA ECONOMIC DEVELOPMENT

by
PROF. (CAPT.) ABIODUN SULE
Executive Director,
Nigerian Institute for Oceanography and Marine Research (NIOMR)

INTRODUCTION

The fish food contributed by the fisheries offers much opportunity for improvement and success, which can be highly rewarding. Although 70% of the earth's surface is covered by water only 17% of our food comes from the sea.

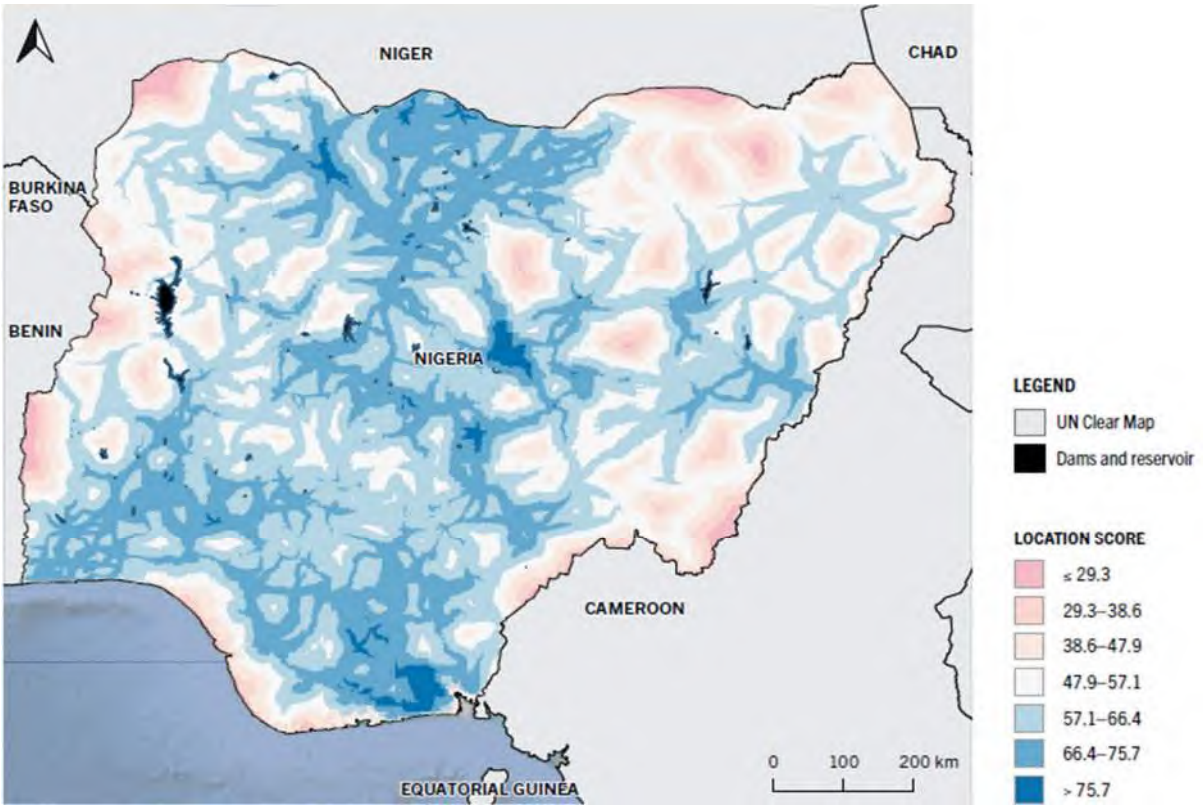
Over the years there has been in developing countries a gathering momentum of interest and hope for increase in fish production to curb the impending nutritional problems heightened by population boom and other extraneous factors. In the early years man could not understand fish because they lived under water but could understand his terrestrial cohabitants because they were visible to him. With the advent of modern ways to catch fish in the wild and scientific breakthroughs in culture the dynamics of fisheries has taken a turn for the better. It could be agreed that one of the things needed in every home either rich or poor, is good quality food that is cheap and proteinaceous. To satisfy our protein need therefore the availability and affordability of fish and fishery products and their development must be made a necessity. In the case of culture fisheries, the fish stock are grown in controlled water encampments which can be manipulated, prepared and fish are fed from extraneous sources.

There are two major ways to boost fishery production levels and supplement protein availability. These include efficient management of the capture fisheries and aquaculture/culture fisheries. According to FAO 2024, about half of the world's seafood per year is produced by aquaculture, and a substantial portion of the world's total aquaculture production occurs in the countries of Southeast Asia, especially led by China and India. Global aquaculture production has quadrupled over the past 20 years. With wild fish stocks approaching their biological limits and the world's appetite for cultured fish continuing to grow, it is expected to double over the next 15 years. The world population is presently over 8 billion, with a projection of about a 25% increase in the next 30 years, which will make the world population 9.9 billion by 2050 (World Population Prospects 2022).

Nigeria, the 6th most populated country globally with a population of 229 million people, makes up 2.78% of the global population. The fishery sector is 1.09% of the national GDP in 2020 and 0.97% in Q3 of 2021. The DARDECOWAS Commission report 2020 on the Nigeria fishery sectors shows that between 2015 and 2020, 6,861,700 tonnes of fish had been produced (DARD-ECOWAS Commission, 2020).

Our rivers, streams and ponds are blessed with fishes which are known to breed successfully under natural conditions. The large and small ponds found all over the country are great reservoirs of fish if carefully managed. (Fig. 1) It is now very obvious that if we want to satisfy our demand for fish, the industry has to undergo a revolution; the artisanal fisheries have to be modernised to further bolster the 74.09% of Nigeria's total domestic fish production from mainly coastal, inshore, creeks of the Niger Delta, lagoons, inland rivers, and lakes. This would bring into focus the many advantages of the fisheries sub-sector, which include the following: a contribution to the economy, creating employment, and earning foreign exchange for any one nation that embarks on a commercial scale of this viable fish venture.

Fig 1: Water bodies in Nigeria



FISH AS A SOURCE OF FOOD

In line with the reduction of food insecurity and increasing income from rural dwellers, the USAID (2011) proposed several steps, such as:

- boosting aquacultural science and technology;
- securing property rights and ensuring financial access;
- improving human capital and health through education;
- preventing conflict and encouraging good governance as well as transparency in public places. (Oyase and Jemerigbe, 2016);
- All of which can hinder fish as a source of food in Nigeria;

- Fish is also known to be rich in oils, with water constituting about 80%, other essential mineral requirements like protein 15-20%, minerals 1-2%, and other constituents about 1% that the body needs for strong and healthy growth;
- fish is a renewable resource if carefully exploited and cultured; it can be utilised to meet part of the nation's protein requirements and help in the fight against food insecurity.
- There is a rider here that this all-important resource, if not sustainably managed, will be an albatross that will collapse the fortunes of this all-viable industry.

Table 1: Fish as a source of food (Capture- Marine Environment)

Family	**Species**
Ariommatidae	*Ariomma bondi* (Fowler, 1930)
Antennariidae	*Antennarius striatus* (Shaw and Nodder, 1794)
Ariidae	*Ariomma bondi* (Fowler, 1930) *Antennarius striatus* (Shaw and Nodder, 1794) *Carlarius gigas* (Boulenger, 1911) Arius gigas *Carlarius latiscutatus* (Günther, 1864) Arius latiscutatus Carlarius parkii (Günther, 1864) Arius parkii
Balistidae	*Abalistes stellatus* (Lacepède, 1798) *Balistes capriscus* (Gmelin, 1789)
Batrachoididae	*Batrachoides liberiensis* (Steindachner, 1867)
Bothidae	*Citharichthys stampflii* (Steindachner, 1894)
Carangidae	*Alectis alexandrina* (Geoffroy Saint-Hilaire, 1817) Alectis alexandrinus *Caranx hippos* (Linnaeus, 1766) *Chloroscombrus chrysurus* (Linnaeus, 1776) *Decapterus macarellus* (Cuvier in Cuvier and Valenciennes, 1833) *Decapterus punctatus* (Cuvier, 1829) *Caranx crysos* (Mitchill, 1815) *Caranx fischeri* (Smith-Vaniz and Carpenter, 2007) *Chloroscombrus chrysurus* (Linnaeus, 1776) *Selene dorsalis* (Gill, 1862)
Clupeidae	*Sardinella aurita* (Valenciennes, 1847) *Sardinella lemuru* (Bleeker, 1853) *Sardinella maderensis* (Lowe, 1838)
Cynoglossidae	*Cynoglossus browni* (Chabanaud, 1949) *Cynoglossus cadenati (*Chabanaud, 1947)

	Cynoglossus canariensis (Steindachner, 1882) *Cynoglossus senegalensis* (Kaup, 1858) *Cynoglossus monodi* (Chabanaud, 1949)
Drepanidae	*Drepane africana* (Osorio, 1892)
Elopidae	*Elops lacerta* (Valenciennes, 1847)
Ephippidae	*Chaetodipterus lippie* (Steindachner, 1895) *Ephippus goreensis* (Cuvier, 1831) (Chaetodipterus goreensis)
Gerreidae	*Eucinostomus melanopterus* (Bleeker, 1863
Haemulidae	*Brachydeuterus auritus* (Valenciennes, 1832) *Pomadasys jubelini* (Cuvier, 1830) *Pomadasys perotaei* (Cuvier, 1830) Pomadasys peroteti

Table 2: Capture Fish species from Freshwater

SN	Scientific Name	Common Name	Local Name
1	*Protopterus annectens* (Owen, 1883)	African lungfish	Mainono, Zuala
2	*Polypterus ansorgii* (Boulenger, 1910)	Guinea bichir	Gwando
3	*Heterotis niloticus* (Cuvier, 1829)	African arowana	Bali
4	*Mormyrus rume* (Valenciennnes, 1846)	Trunkfish	Milligi, Bulun
5	*Mormyrus macrophthalmus* (Günther, 1866)	Trunkfish	Milligi, Bulun
6	*Mormyrus hasselquisti* (Valenciennes, 1846)	Trunkfish	Milligi, Sawanya
7	*Mormyrops anguilloides* (Linnaeus, 1758)	Trunkfish	Milligi
8	*Gymnarchus niloticus* (Cuvier, 1829)	Frank fish	Dan- Sarki, Yawni
9	*Hepsetus odoe* (Bloch, 1794)	African pike	Zagundumi, Sagei
10	*Hydrocynus brevis* (Günther, 1864)	Characin	Zawai, Jagajaga
11	*Citharinus latus* (Muller & Troschel, 1845)	Moonfish	Falia
12	*Citharinus citharus* (Geoffrey Saint-Hilaire, 1809)	Moonfish	Falia
13	*Labeo coubie* (Rüppell, 1832)	African Carp	Dumi
14	*Bagrus docmak* (Forsskål, 1775)	Silver Catfish	Ragon ruwa
15	*Bagrus filamentosus* (Pellegrin, 1924)	Silver Catfish	Ragon ruwa
16	*Bagrus bajad* (Rüppell, 1829)	Silver Catfish	Ragon ruwa
17	*Auchenoglanis biscutatus* (Geoffrey Saint-Hilaire, 1808)	Catfish	Buro
18	*Auchenoglanis occidentalis* (Valenciennes, 1840)	Catfish	Buro

Table 3:

FISH AS A SOURCE OF FOOD(CULTURE)

19	*Parailia pellucida* (Boulenger, 1901)	Catfish	Maigashi, Ariya
20	*Clarias gariepinus* (Burchell, 1822)	African Catfish	Tarwada
21	*Heterobranchus longifilis* (Valenciennes, 1840)	African Catfish	Tarwada
22	*Heterobranchus bidorsalis* (Geoffrey Saint-Hilaire,1809)	African Catfish	Tarwada
23	*Malapterurus electricus* (Gmelin, 1789)	Electrical Catfish	Mijiriya
24	*Synodontis budgetti* (Boulenger, 1911)	Catfish	Kurungu
25	*Synodontis clarias* (Linne, 1758)	Catfish	Kurungu
26	*Synodontis eupterus* (Boulenger, 1901)	Catfish	Kurungu
27	*Synodontis schall* (Bloch & Schneider, 1801)	Catfish	Kurungu
28	*Synodontis courteti* (Pellegrin, 1906)	Catfish	Kurungu
29	*Lates niloticus* (Linne, 1762)	Nile perch	Giwan ruwa
30	*Parachanna obscura* (Günther, 1861)	Snakehead	Tufi, Dunu
31	*Hemichromis bimaculatus* (Gill, 1862)	Jewelfish	Kulkula
32	*Tilapia zilli* (Gervais, 1848)	Red- belly Tilapia	*Gargaza*
33	*Tilapia nilotica* (Linne, 1758)	Nile Tilapia	Gargaza
34	*Kribia kribensis* (Boulenger, 1907)	Killifish	Brabra
35	*Kribia nana* (Boulenger, 1901)	Killifish	Brabra
36	*Dageichthys lakdoensis* (Staunch & Blanc, 1964)	Killifish	Chichiyawa
37	*Tetraodon lineatus* (Linne, 1758)	Puffer fish	Talibombom

THE ISSUE OF SUSTAINABILITY

The term sustainability has long been used by resource managers with reference to the maximum harvesting of fisheries consistent with the maintenance of constantly renewable stock. Sustainability is the steady state of when what is being used or harvested is carefully replaced. It has also been described by some in terms of carrying capacity and the maximum population size that the environment can contain on a continuing basis.

Sustainable fisheries and aquaculture require an integrated fisheries management system, which requires strong policy and implementation, which will not only cover a permanent audit system but also monitoring, control, and surveillance nationwide and beyond.

We say and beyond because it is pertinent to understudy peer performance measurements. As we gather here today as scientists, it is a known fact that Nigeria's total fish production is estimated at 1.123 million metric tonnes, to which marine catches contributed 36 percent, inland waters catch contributed 33 percent, and aquaculture 31 percent.

In 2021, the Nigerian Ministry of Agriculture and Rural Development put the fish demand of the country at 3.6 million metric tonnes, of which the country only meets about 31.19% and depends on importation to meet up the huge gap of about 68.80%. This has led to the issues of IUU and people going to the nearest country to import our own fish into the country. We all know that sustainability is continuity and requires collective efforts from the government and all other stakeholders. Consequently, we need to address this gap also by knowing how many aquaculture farms we have in this country so that we can close out the difference.

Sustainability can also be met with various constraints, which could be socioeconomic, managerial, cultural, and technical.

THE PROBLEM OF MANAGEMENT

The management of fish resources is a continuous exercise, and even the developed countries have not been able to conduct the management of their fisheries without problems. Therefore, it is important to note that for fisheries development plans to be realistic, there would be a clear understanding and appraisal of the nature and availability of the resources, their potentials, and the rate at which the resources could be exploited on a sustainable basis. The problems of effective management are the most difficult under tropical conditions because there are many interacting factors, such as a greater variety of fish species, changing climatic and oceanographic conditions, the level of exploitation by fishermen, the impact of industrial activities, and the sociopolitical and economic pressures on the market system. These factors tend to be more extreme than in the older established fisheries of the world. The government, therefore, must, as a matter of urgency, have a detailed framework of its fisheries subsector and marshal out a long-term plan of action that is all-encompassing and realistic. Therefore, effective management should entail monitoring, surveillance, and control of our water resources in order to eliminate drastic declines in our catch per unit effort and total landings in the artisanal subsector, which is the highest source of landings for domestic production.

In the aquaculture sector, there must be a committed effort in interventions by the government, the private sector, and other stakeholders in ensuring the establishment of ponds, the manning of the ponds scientifically, visitation, the collection of relevant data, improved farm management, the availability of improved scientific methods of farming, and the availability of improved and affordable input for the sustained survival of the business process in all the 774 local government areas in Nigeria.

A wide range of data sets must be accessed and analysed for improved service delivery, and regular incentives must be provided to the farmers, including, but not limited to, free farm checks by the ministry through its extension workers, infrastructure support, access to new and emerging markets, tax incentives, proper funding with access to credit, and an insurance program.

HIGHLIGHTS ON THE VARIOUS SECTORS OF THE FISHERY INDUSTRY: PROBLEMS AND SOLUTIONS

- **Overfishing** due to a high number of shrimping vessels (smaller mesh size 44 mm to 50 mm)
- Establishment of a **5-nautical-mile Non-Trawling Zone** (Breeding grounds) for industrial trawlers
- Reduction in **overall size** of the **trawl nets**
- Introduction of **Bycatch Reduction Device (BRD)**
- Introduction of **Turtle Excluder Device (TED)**
- Introduction of **Vessel Monitoring System (VMS)**
- The **formulation and enforcement** of government legislation and policy bordering on **site location** and **acquisition** for the purpose of grow-out ponds.
- Avoidance of **conflict** with other **land users**, **environmentalists,** and **human rights** groups.
- Development of **management protocol** for broad stock/feed production.
- Development of **feeding techniques**, **frequencies and maintenance rations.**
- In dealing with complex ecosystems **adequate water quality management protocols** must be determined.
- **Capacity building** and training of personnel to **manage the enterprise** is of utmost importance.

FISHERIES CRIMES

Illegal fishing and associated criminal activities also known as fisheries crimes undermine the sustainability of marine fisheries resources and threaten the economic, social and political stability of coastal communities, especially in Nigeria where small scale or artisanal fishermen depend on sustainable near shore fisheries for their source of revenue and survival. Fisheries crimes encompass

more than solely illegal, unregulated and unreported fishing IUU, which is defined under several international agreements.

There are various concepts that are common in fisheries crimes such as: surveillance avoidance, Transshipment, Abuse of vessel registries, Licensing abuses and Interaction with artisanal vessels and sister ships etc.

Vessels engaged in illegal fishing employ different techniques to avoid surveillance and detection by law enforcement. These include interfering with electronic monitoring systems and intentionally obscuring vessel markings and identity. These techniques make it difficult for law enforcement to monitor, identify and prosecute illegal activity by fishing vessel operators. The Address Verification System (AVS) and Vessel Monitoring Systems (VMS) enable authorities to monitor the location of fishing vessels but both systems can be manipulated to evade detection.

Automatic identification system (AIS) is a collision avoidance tool which transmits a vessel position on radio frequencies intended for bridge-to-bridge radio communications. Unlike VMS, AIS is not intended for enforcement of fisheries regulation, with a few exceptions like the European union community-controlled system. This is a term used when two vessels meet and pass cargo between themselves. Refrigerated cargo can carry several types of bulk frozen products, but many specialize in fishery products transshipped directly from fishing vessels.

FISHERIES CRIMES (Abuse of vessel registry)

Under international maritime law, all merchant vessels must be registered to and documented by a country. The country of registration, commonly referred to as the flag state, assumes primary responsibility and accepts to exercise regulatory control over the actions of the vessels in its waters and on the high seas. The vessel is bound by the laws of the flag state towards their vessels and vice versa, which are defined by the United Nations Convention on the Laws of the Seas (UNCLOS). The responsibilities of the flag states vis-à-vis their vessels include regular inspection, certification of equipment and crew, and issuance of safety and environmental security documentation. The flag states designate some vessels as fishing vessels, making them subject to additional health and safety conditions (UNCLOS, Article 94).
The following are examples of registry abuses practiced worldwide in relation to fishing vessels and particularly relevant to Nigerian coastal states:

Regulation of fishing vessels with no prior provenance verifications as to registration, owner, operator, or activity history, or (Regional Fisheries Management Organisation) RMFO IUU listed status. Registries and licensing authorities that do not cooperate with or are unresponsive to verification requests from other states for routine checks or investigations of possible illegality. Operating under multiple identities and flags and changing flags at sea is prohibited by UNCLOS, Article 92, to avoid detection by law enforcement agencies of illegal activities. Use of flags of convenience registration to states other than the nationality of the vessel's owner for the purpose of avoiding the regulations of the beneficial owner countries and effectively making any violation of crimes difficult to prosecute in criminal or civil courts.

FISHERIES CRIMES (License abuses)

The lack of transparency creates an environment that encourages and facilitates the abuse of fishing license regimes in coastal states. Most African countries do not publish lists of vessels with valid licenses, and dissemination of information is rarely of sufficient quality or timely to allow for effective use by other vessels, such as from the artisanal sector or transiting merchant vessels that may provide sightings of suspect vessels.

FISHERIES CRIMES (Interaction with Artisanal Vessels)

There is significant interaction between small scale fishermen using canoes and industrial vessels. This creates a classic fisheries management problem were different fishing gear types want access to the same fishing grounds, unauthorized transshipment of catches. The conflict is usually between mobile gear (trawlers) and static gear (nets and traps) or low impact methods such as handline bait fishing.

CONCLUSION

Fish is an important source of protein and other essential nutrients required in the human diet. An increase in fish production will not only make available more fish for the ever-increasing population of Nigeria but will also ensure that the price is within the reach of the average Nigerian. The coastal states and federal governments should take bold steps in increasing fish operations by increasing the fishermen's incentives for their production and subsidies on all fishing equipment. Efforts must be made to invest in this sector to invest in manpower development, scientific research must be at the front burner, and constant stakeholder engagement and interaction for improved service delivery must be sustained.

In conclusion, it can be deduced that the fisheries sector, if sustained at an optimum level, putting into consideration increased production of the capture, culture, and industrial fishery with a base of resource management, will propel this sector positively.

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