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Blue Economy and the Fisheries Sector in Nigeria: Analysis of the Performance of Capture and Aquaculture Fisheries to Fish Production and Implication on Economic Growth

John O. Esin (Ph.D)[1], Evans U.F[2], Affiong, I. Ndekhedehe[3]

[1]Department of Hydrology and Water Resources Management

[2]Maritime Academy of Nigeria, Oron, Akwa Ibom State, Directorate of Research and Strategy

[3]Department of Maritime Transport and Business Studies,Maritime Academy of Nigeria, Oron, Akwa Ibom State

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ABSTRACT

The study investigated the exploitation of marine fisheries/aquaculture sector of the Blue Economy in Nigeria with the aim of identifying the performance of both capture and aquaculture fisheries production and their contribution to economic growth in terms of the total domestic annual fish production and the trend of annual fish demand and domestic production in Nigeria using secondary data. Descriptive and Multiple Regression statistical techniques were employed in the data analysis. The trend analysis results indicate that aquaculture production contributes more than capture fisheries to Nigeria's GDP as the r^2=0.447 for aquaculture production is greater than the r^2=0.089 for capture fisheries, indicating that aquaculture production is more significant and has more prospect of contributing to the country's GDP than capture fisheries. The results affirm aquaculture as a fast growing subsector, growing at an Average Annual Growth Rate (AAGR) of 6.67% compared to the 4.19% for capture fisheries. The Regression B-value of 1.195 for capture fisheries indicates that an increase in capture fisheries production will results to about 0.31 unit increase in GDP while an increase in aquaculture production by same value will results to 0.95 unit increase in GDP, which confirms the findings. The study concludes that the potential of the fisheries sector in Nigeria is not fully exploited and has limited the ability of Nigeria to unlock the economic benefits offered by the sector, with severe implications on the nation's overall economic growth and development. The need for the government and stakeholders in the marine sector to finance deep sea fishing through investment in modern fishing vessels and appropriate gear and fish harvesting facilities such as processing and storage and transportation/docking is suggested.

Keywords: Blue Economy, Fisheries Sector, Performance, Capture and Aquaculture, Economic Growth.

INTRODUCTION

The Blue economy concept incorporates a sustainable use of ocean resources for economic advancement and improved wellbeing and considers aquatic resources as a new opportunity that promotes economic growth and improves livelihoods (Esin, 2024; Esin and Zelibe 2024; Cohen et al., 2018). The concept was introduced by United Nations Conference on Sustainable Development in the year 2012 (UN, 2016). The idea merges all economic activities around exploration of water resources (ocean, rivers, lake, seas, etc.). Blue economy involves the use of water bodies - sea, river, ocean, lake and its resources for the purpose of sustainable economic growth while green economy is concerned with how to reduce carbon emissions and environmental risks or hazards in order to achieve sustainable economic development. It is the work of Pauli (2010) entitled 'blue economy' that significantly projected the essence and the need to further explore the concept of blue economy. In his explanation, Pauli presented a model for supply of low cost product, job creation at local level with respect to the disruption of environment.

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Blue economy sub-sector such as fisheries, aquaculture, marine and coastal tourism have been adopted to stimulate food security, decent livelihoods and economy in a number of coastal developing countries, with the aim of progressively incorporating it with other vital economic sectors (Ababouch, 2015). Esin (2024) noted that in spite of the weighty contributions of the marine fisheries/aquaculture sector of the blue economy to development of national economies in Africa and Nigeria in particular, its potential is yet to be fully realized. Validating this position, Odongkara, Abila, and Luomba (2009) and Esin and Zelibe (2024) noted that aquatic resources are not adequately monitored, understood and valued in the context of national development agendas in Africa.

Nigeria is a maritime state where nine (9) of the thirty-six (36) states of the federation have a shoreline in the Atlantic Ocean. The coastal states of Nigeria (Ogun, Lagos, Ondo, Edo, Delta, Bayelsa, Rivers, Akwa Ibom, and Cross Rivers States) are located in the southern part of the country. This indicates that Nigeria is blessed with abundant water resources that are realistically rich in fishery resources, which makes fisheries a potentially important sector in the nation's economic growth. The Nigerian fishing industry consists of three principal subsectors – viz-a-viz; the artisanal, industrial and aquaculture. As opined by Aliu and Atolagbe (1998), Nigeria's annual production of fish is approximately 0.7 million, however, studies have shown that a greater percent of the 0.7 million metric tons produced locally is from the captured fisheries (coastal and inland).

The capture fisheries are predominantly dominated by the artisanal fish farmers (coastal and inland) and a negligible contribution from industrial vessels and trawlers which essentially are coastal fishers. The offshore tuna fisheries, coastal demersal fish and shrimp fisheries congregated into marine industrial fisheries, frequently operate between the country's territorial limit (30 nautical miles) and the exclusive economic zone (EEZ) (200 nautical miles) with tuna and shrimps as their target fish species. The coastal, brackish water or estuarine and artisanal pelagic fish bonga shad and *Sardinella* fishers classified into marine artisanal fisheries, generally operate within the 5 nautical miles non-trawling zone. The targeted fish species are small pelagic, *Sardinella spp*. and *Ethmalosa spp*. such as croakers (*Pseudotolithus spp.*), grunts *(Brachydeuterus spp*.), various soles, catfish (*Arius spp*.), and shrimps (*Penaeus spp*.), Sciaenidae (*Croakers Ariidae* (Catfish): *Arius latiscutatus* (Günther), *Haemulidae* (Grunters), *Cynoglossidae* (Tongue Sole): *Polynemidae* (Threadfins): *Carangidae* (Jack fish): *Sphyraenidae* (Barracudas): *Sphyraenabarracuda, Sphyraena afra, Sphyraena guachancho, Clupeidae: Sardinella spp*. amongst others. Other fish species produced in Nigeria include Torpedo-shaped catfishes (*Clarias spp*.). Tilapias (*hemichromis/oreochromis.spp*), Smoked fishes, Torpedo-shaped catfishes (*heterobranchus.spp*), African carps (*cyprinidae*), Marine fishes (*osteichthyes*) Elephantsnout (*mormyridae, gnathonems spp*.), Nile/Niger perch (*lates niloticus*), Bonga shad (*ethmalosa fimbriata*), Torpedo-shaped catfishes (*clarias lazera*) and Bonytongue fishes (*heterotis spp*.).

The inland capture fisheries in Nigeria are dominated by artisanal fisheries with the fish production usually carried within the inland freshwater and brackish water bodies which are contained within 320 nautical miles (667km). The inland water bodies is classified into 11 River Basin Development Authorities (RBDAs) viz-a-viz: Sokoto-Rima Basin, Hadejia-Jema' Basin, Lake Chad Basin, Upper Benue Basin, Lower Benue Basin, Cross River Basin, Anambra-Imo Basin, Niger Basin, Niger Delta Basin, Benin-Owena Basin and Ogun-Oshun Basin (Food and Agriculture Organization (FAO), 1982). The major fish species harvested are: Alestidae (*Alestes baremoze*), *Alestidae Alestes* (dentex), Nothobranchiidae (*Aphyosemion bitaeniatum*); Poeciliidae Poeciliidae (*Aplocheilichthys (Aplocheilichthys normani*); *norman*i); Cichlidae (*Astatotilapia bloyeti*); Carcharhinidae (Carcharhinus leucas); and Citharinidae (*Citharinus citharus citharus*) amongst others.

The contribution of the fisheries sector to individuals and the economy of several developed and developing countries cannot be understated as fish accounts for over 60% of the world's supply of protein, mostly in developing economies. In Nigeria, fisheries, constitutes a vital subsector as it contributes about 3.00–5.00% to the agriculture share of the Gross Domestic Product (GDP) and generation of foreign exchange through exports. Fish are important sources of protein in the food intake of Nigerians asides being a major source of employment generation to many coastal households. This is because over 820 million people throughout the world are valued to depend on fish for all or part of their income (FAO, 2022), while WorldFish (2022) report on Nigeria, testified that 1,477,651 people were engaged in the fisheries and aquaculture sector of the country. The industrial fisheries sector that involves the use of trawlers for fishing and shrimping currently employs about 9000 Nigerians; though

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the actual number of people engaged in the fishery sector in Nigeria cannot be ascertained due to the lack of all-inclusive data.

The fisheries sector contributed 1.16 per cent to the national GDP in 2021 and 0.47 per cent in 2022. The nation's marine food systems' contribution to the GDP increased from 0.5 per cent in 2013 to 4.5 per cent in 2021. Over 1.48 million individuals are reportedly engaged in the fisheries sector in Nigeria. In 2016, 653,000 Nigerians were engaged in inland fisheries, with women constituting 21 per cent of them. FAO (2020) reported that employment in the primary capture fisheries and aquaculture sector production in Nigeria has remained comparatively stable since 1995 and was estimated at 59.5 million in 2018. Nigeria's blue economy thus remains one of the country's anchor sub-sectors, with maritime trade contributing 1.6 per cent and fisheries contributing 3-5 per cent to the GDP. Over 70 per cent of Nigeria's total domestic fish supply originates from artisanal or small-scale fishers from coastal areas, creeks and lagoons, inland rivers, and lakes. Industrial fishing contributes the least (1%) while Inland capture fisheries account for 45 per cent of total capture fisheries in Nigeria. While Nigeria aquaculture subsector has witness a significant growth; from small pond subsistent to commercialize and improved technologies such as water recirculating system (WRS) asides gradually moving from fresh water aquaculture to embracing aquaculture in salt and brackish water (marine culture) for the purpose of fish production, inland capture fisheries are in decline attributable in part to environmental pollution and maritime security challenges. Aquaculture has been identified as the fastest growth rate among the fishing sectors in Nigeria contributing to the total domestic fish production which rose from 6% in 2003 to 20% in 2014 with the most commonly cultured species being *Clarias and Heterobranchus spp.* (catfish), *Tilapia spp.* (Tilapia), and *Heterotis niloticus* (Slap water). The decline in inland capture fisheries can be attributable in part to environmental pollution and maritime security challenges. For example, the extensive dams built across Nigeria have caused an estimated loss of between 85,000t and 130,000t of annual fish production. Most of the "lost" fish production can be regained if water resources are effectively managed. There is also an opportunity to increase fish production from large and medium-sized reservoirs by exploiting the under-utilized open-water pelagic zone of these water bodies. This can be achieved by undertaking a preliminary national survey of reservoirs to identify those waters suitable for stocking with indigenous planktivorous clupeids (sardines). The marine coastal fisheries of Nigeria owe their productiveness to the enormous beneficial effect of the huge Niger Delta which brings nutrients into the area, creating a nursery ground and breeding area for large stocks of finfish and crustaceans. A recent survey indicated that coastal production, both artisanal and commercial, are around 200,000 tons of fish and up to 10,000 tons of shrimp while actual production could rise to 50%.

Federal Department of Fisheries (FDF) (2018) estimated the fish demand for Nigeria in 2018 at 3.61 million metric tons making the nation the largest consumer of fish products in Africa which is due to its large population of over 210 million. This is responsible for the reliance on importation of fish to meet her ever growing demand. This affirmed FAO report that Nigeria is a net importer of fishery products with an estimated total fish imports projected at about $1.2 billion and exports valued at $284,390 million in 2013. Concerted efforts have been made to implement policies and programs to reduce the gap between fish demand and supply in Nigeria. One of the results of the policies is the positive growth recorded in the aquaculture fishery sector which has grown from 21,700 tones recoded in 1999 to 325550 tons in 2020. This feat has made Nigeria the largest aquaculture producer in Sub-Saharan Africa and this prominence is gradually increasing at average growth of 20,000mt of cultured fish in Nigeria per year. World Bank (2017) reiterated that, blue economy is capable of influencing exchange rate, enhance economic development, and reduce poverty, increase equality, marine energy, fisheries and marine technology. In spite of the significant growth in the marine fisheries sub-sector to effectively bridge the gap between fish demand and fish supply in Nigeria and in opening up opportunities of the blue economy in enhancing economic growth in the country, gaps abound in knowledge on the subject matter, especially on the performance of capture and aquaculture fisheries to fish production in Nigeria and its possible implication on economic growth. This study is, therefore, designed to fill this knowledge gap.

Data Sources

The study utilized secondary data obtained from the Food and Agriculture Organization (FAO), the Nigerian Bureau of Statistics, Nigeria Federal Ministry of Agriculture, scientific research articles and grey literature derived from peer reviewed journals, periodicals and government gazettes. Available online database using the keywords such as 'Nigerian fisheries resources', 'Fish exportation and importation', Fisheries and GDP,

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'Commercial Fisheries', 'Aquaculture', 'Inland and Marine fisheries', 'Population growth', and Per capita fish demand' was employed in accessing the information used in the study. The data generated were analyzed using both descriptive and inferential statistical techniques. The descriptive technique involves the use of arithmetic mean, simple percentages, tables, charts/figures etc. in presenting the data while the Multiple Regression Analysis was employed in establishing the contribution of capture fisheries and aquaculture production to the Gross Domestic Product (GDP) of the country.

The Multiple Regression Analysis is hypothetically expressed as:

$Y = A+B_1X_1+B_2X_2+B_3X_3+B_4X_4+B_5X_5\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..X_{14}+e$

Where:

Y= The dependent variable (GDP)

X= Independent variables

X_1= Total capture fisheries

X_2=Total aquaculture production

A= The regression constant

e= Error term that captures the effect of all other variables not included in the equation.

b= The multiple regression plane

RESULTS AND DISCUSSION

Data on capture fisheries production (metric tons) from 1961 to 2019 on the one hand and 2015 to 2020 on the other hand are presented in figures 1 and 2 respectively.

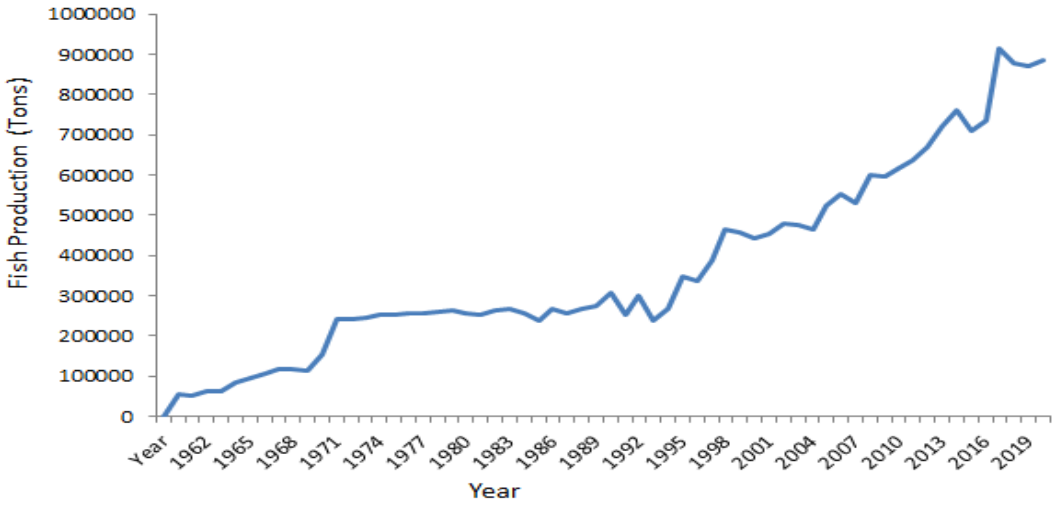

Fig 1: Capture fisheries production (metric tons) in Nigeria (1961-2019)

Source: FAO (2021) Fishery and Aquaculture Statistics – Yearbook 2021.

Capture fisheries production measures the volume of fish catches landed by a country for all commercial, industrial, recreational and subsistence purposes. Data in figure 1 indicates that fish capture statistics increases at a relatively steady rate between 1961 and 2019. The value for Capture fisheries production (metric tons) in Nigeria was 878,155 as of 2018. As the graph below shows, over the past 58 years this indicator reached a maximum value of 916,284 in 2017 and a minimum value of 52,837 in 1961.

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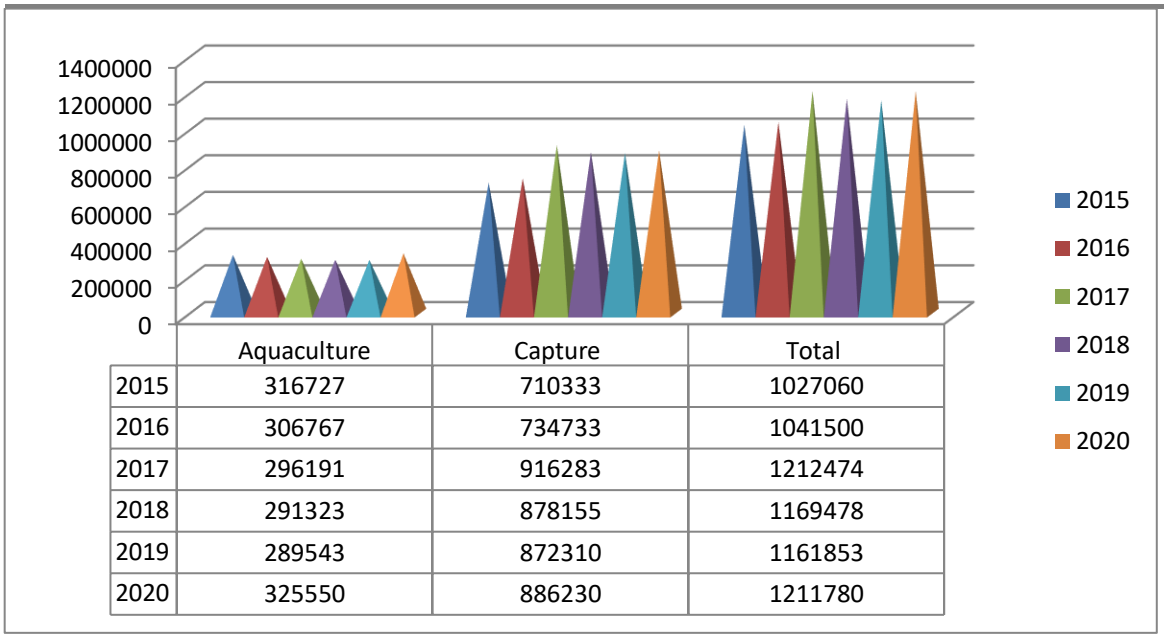

	Aquaculture	Capture	Total
2015	316727	710333	1027060
2016	306767	734733	1041500
2017	296191	916283	1212474
2018	291323	878155	1169478
2019	289543	872310	1161853
2020	325550	886230	1211780

Fig 2: Total Capture and Aquaculture Production in Nigeria (tons) 2015-2020

Source: Directorate of Agriculture and Rural Development (DARD) -ECOWAS Commission, (2020); FAO, (2021)

It is reveal in Fig. 1 that between 2015 and 2020, 6,824,145 tons of fish was produced by the fishery sectors in Nigeria with the highest tons of fish (1,212,474) produced in 2017. This comprises of 17.67% of the total tons of fish produced within the years under investigation. The second-highest (1,211,780) tons of fish was produced in 2020 with the least production recorded in 2015. It is adduced in Fig. 1 that the marine fishery/aquaculture sector of Nigeria fare better in 2017 and 2020 respectively. Total aquaculture produced in Nigeria declined from 316,727 tons in 2015 through 2016 -2018 to 289,543 tons in 2019.

Essentially, Fig. 1 shows that a total 1,826,101 tons of fish was produced from the aquaculture sector with the highest tons of 32, 5550 fish produced in 2020. Compared to the aquaculture sector, the total ton of fish capture between 2015-2020 was 41,198,89 tons with the highest capture being in 2017 which records 916,283 tons and a steady decline from 878,155 tons in 2018 through 872,310 tons in 2018 to considerable increase of 886,230 tons in 2020. Fig. 1 further indicates that the total fish capture was 2,293,788 in excess of the total tons of fish produced from the aquaculture sector. As seen in Fig.1 when compared with fish production from the other sectors – artisanal and aquaculture, industrial fishing contributed only 4%.

The total production of fish from the aquaculture subsector begins to decline after 2015. In 2015, aquaculture production was 316,727 metric tons but declines to 289, 543 metric tons in 2019, and steadily increased to 325,550 tons in the 2020 while the capture fisheries production begins to decline after 2017. When these figures are compared to the population growth of 181,137,450 in 2015 and 201,042,520 in 2019, a great disparity exists between growth in fish production and population growth. The decline in fish production from the aquaculture's subsector is very alarming as the country needs more fish production from the aquaculture subsector to strengthen the capture fishes in order to be able to cope with the increasing demand of the national fish need of its population.

The deficits in the fish production in Nigeria, has a direct impact on the per capita fish supply of the country. According to FAO (2020) and WorldFish, (2018), while the per capita fish consumption in the world have been on the rise since 1984, the per capita fish consumption in Nigeria have been unstable and began to shrink in 2011. In 2011, the per capita fish consumption in the world was 18.9 Kg, with that of Nigeria being 15.2 Kg while the per capita consumption of fish and fishery products for the world increased to 20.5 Kg in 2018, that of Nigeria reduced to 13 Kg.

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The fish production from Inland waters, Marine and aquaculture were almost equal in 2015 and 2016 while the highest production from the aquaculture sector was recorded in 2015. The highest production for Inland waters and Marine were recorded in 2017. The estimated annual average per capita fish consumption for Nigeria is 13 Kg (Saweda, et al, 2020; FAO, 2021), although the Directorate of Agriculture and Rural Development – ECOWAS Commission, (2020) reported a lower estimate of 8.33 Kg. Fish remains an important dietary element for Nigeria, especially in the southern part of the country where fish is highly valued and one of the cheapest sources of animal protein available to many Nigerians (FAO, 2021). The fishery sector accounted for 1.09% of the national GDP in 2020 and 0.97% in the Q3 of 2021 (NBS, 2021).

Table1: Overall Status of Fish Production and Consumption in Nigeria

Year			**1000 MT**				**1000**	**Kg**
	Aquaculture	Capture	Total Production	Exports	Imports	Consumption	Population	Consumption per capita
2008	143.21	601.37	744.58	0.69	1042.40	1786.29	150269.62	11.89
2009	152.80	598.21	751.01	0.20	1108.63	1859.43	154324.93	12.05
2010	200.54	616.98	817.52	0.30	1330.69	2147.91	158503.20	13.55
2011	221.13	635.49	856.61	22.42	1589.40	2423.60	162805.08	14.89
2012	253.90	668.75	922.65	9.27	1083.21	1996.59	167228.79	11.94
2013	278.71	721.36	1000.06	63.57	868.04	1804.53	171765.82	10.51
2014	313.23	759.83	1073.06	0.04	991.02	2064.04	176404.93	11.70
2015	316.73	710.33	1027.06	3.05	866.98	1890.98	181137.45	10.44
2016	306.77	734.73	1041.50	0.00	593.71	1635.21	185960.24	8.79
2017	296.19	916.28	1212.47	0.00	466.93	1679.40	190873.24	8.80
2018	291.32	878.16	1169.48	0.00	582.39	1751.87	195874.68	8.94
2019	327.10	872.31	1199.41	0.01	484.28	1683.68	201042.52	8.37
2020	325.55	886.23	1211.78	0.07	506.14	1717.84	206310.94	8.33
2021	341.53	922.86	1264.39	0.28	478.72	1742.84	211705.77	8.23
2022	341.74	945.73	1287.47	0.57	484.32	1771.21	217235.37	8.15
2023	342.74	980.45	1323.19	0.63	472.19	1794.75	222902.50	8.05
2024	344.90	1011.08	1355.98	0.44	475.56	1831.10	228713.57	8.01
2025	352.86	1046.98	1399.84	0.26	472.53	1872.11	234671.68	7.98

Source: World Bank (2018)

The breakdown of data in Table 1 in relation to fish value chain in Nigeria shows the trends of fish and aquaculture sector production in the country. Table 1 reveals that while both capture and aquaculture fish production and consumption are increasing, there is a considerable decrease for both exports and imports. Table 1 further reveals a production growth from 744,580 tons to 1,169,480 tons between 2008-2018. This signifies an annual average growth rate of 4.19%. Nevertheless, capture fisheries have grown significantly over the years,

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but less than aquaculture production which according to World Bank (2018) report is a fast growing sector with an Average Annual Growth Rate (AAGR) of 6.67% over the same period. It is evident in Table 1 that domestic fisheries production is not adequate to meet the fisheries demand in the country.

Table 1 shows that the total average fisheries consumption between 2008-2018 far exceeds the domestic supply as it varied from 1,786,290 tons to 1,751,870 tons. Similarly imports drastically declined in 2013 and 2015 while significant growth in production was not sustained in order to meet up with the same level of consumption. Accordingly, consumption per capita shrank by 2.55% from 11.89 kg in 2008 to 10.4 kg in 2015 and 8.94 kg in 2018 respectively.

Nonetheless, the decline in imports made it possible to expand the rate of self-sufficiency in fish production, which varied from 31% to 71% of demand in years 2008-2018. Basically, imports for fisheries originated mainly from Senegal (86%), and Benin (12%) while Extra-ECOWAS were dominated by the Netherlands (24%), Faroe Islands (11%), Chile (11%), Japan (8%), and Mauritania (6%) thereby indicating a trade deficit.

Table 3: Percentage Tons of fish produced in Nigeria 2015-2020

Year	Contribution	%
2020	1211780	18
2019	1199410	17
2018	1169480	17
2017	1212470	18
2016	10411500	15
2015	1027060	15
Total	**16231700**	**100**

Source: DARD ECOWAS Commission (2020)

Table 3 shows the highest production of fish in Nigeria was in 2017 with total fish production of 1,212,470 after which the total fish produced declines to 1,169,480 in 2018 and subsequently increased from 1,199,410 in 2019 to 1,211,780 in 2020. It could therefore be adduced from Table 3 that the total fish production in Nigeria was at its highest in 2017 with considerable increase in 2020.

Table 4: Fish supply-demand and population projection for Nigeria (2010-2025)

Year	Projected Population (million)	Projected Fish Demand (Mt)	Projected Domestic Fish Production (Mt)	Projected Fish Importation (Mt)	Projected Total Fish Consumption	% Fish Supply Gap Deficit
2010	158,503,200	3,020,000	817,520	1,330,690	2,147,910	28.88
2011	162,805,080	3,110,000	856,610	1,589,400	2,423,600	22.07
2012	167,228,790	3,211,000	922,650	1,083,210	1,996,590	37.80
2013	171,765,820	3,320,000	1,000,060	868,040	1,804,530	45.65
2014	176,404,930	3,420,000	1,073,060	991.02	2,064,040	39.65

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2015	181,137,450	3,280,000	1,027,060	866,980	1,890,980	42.35
2016	185,960,240	3,380,000	1,041,500	593,710	1,635,210	51.62
2017	190,873,240	3,490,000	1,212,470	466,930	1,679,400	51.88
2018	195,874,680	3,610,000	1,169,480	582,390	1,751,870	51.47
2019	201,042,520	3,730,000	1,199,410	484,280	1,683,680	54.86
2020	206,310,940	206,310,940	1,211,780	506,140	1,717,840	55.38
2021	211,705,770	3,970,000	1,264,390	478,720	1,742,840	56.10
2022	217,235,370	4,100,000	1,287,470	484,320	1,771,210	56.80
2023	222,902,500	4,230,000	1,323,190	472,190	1,794,750	57.57
2024	228,713,570	4,370,000	1,355,980	475,560	1,831,100	58.10
2025	234,671,680	4,510,000	1,399,840	472,530	1,872,110	58.49

Sources: (FDF, 2018; DARD-ECOWAS Commission, 2020)

Table 4 indicates that the total projected domestic fish production in Nigeria is less than the projected fish demand while the total projected fish import is greater than the projected total fish consumption with a considerable fish supply gap deficit. For instance, while the projected population of Nigeria is 228,713,570, the projected fish demand is 4,370,000 with a projected domestic fish production of 1,355,980. Again Table further reveals that while the projected fish importation in 2024 is 475,560 the projected total fish consumption is 1,831,100 with a percentage fish supply gap of 58.10%. The obvious implication being that the total fish production in Nigeria is less than the total fish demand and consumption which accounts for the high level of total fish importation with significant fish supply gap/deficit, which portrays the fact that the marine fishery/aquaculture sector of the blue economy in Nigeria is grossly under-developed. This validates the assertion by Towers, (2014) that Nigeria produces about 600,000 tons of fish annually from aquaculture and capture fisheries, with a fish supply deficit of about 900,000 million tons and, Akinsorotan et al., (2019) who reported a shortfall of about 1.3 million tons in Nigeria's fish supply chain. The crack or deficit in Nigeria's fish supply chain is sourced through massive imports of capture fisheries mainly mackerel, herring, horse mackerel, croaker, and blue whiting from Europe, Latin America, and Asian countries.

As noted by Dauada (2021), the Nigeria's imports for fish supply increased from $480.2million through $789.74million to $1.27billion between 2019 and 2020 resulting in a 38 per cent increase in the importation of fish and fishery products into the Country. Similarly, Dauda (2021) identified the top 5 suppliers of fish and fish products to Nigeria in 2020 to include Russia ($253.6 million), Netherlands ($212.02 million), Chile ($138.7million), Iceland ($100.2 million), and Norway ($92.3 million) while the top suppliers of fish and fish products to Nigeria in Africa in 2020 was Mauritania with a supply worth of $53.3million. The statistics in Table 3 points to the fact that the total value of fish imports into Nigeria keeps increasing and could be attributed to the increasing growth rate of the Nigerian population at the expense of the under exploitation of the opportunities offered by the fishery sector and the need to meet up with the country's present per capita fish demand of 13.3 Kg (Tables 3 and 4).

Again, Table 3 further indicated that Nigeria spends huge amount of income on fish importation which means that the marine fishery/aquaculture sector of the country is not fully harnessed to meet the fish demands and consumption needs of the teeming population. This has palpable implications on the development of the marine fisheries/aquaculture sector of Nigerian blue economy.

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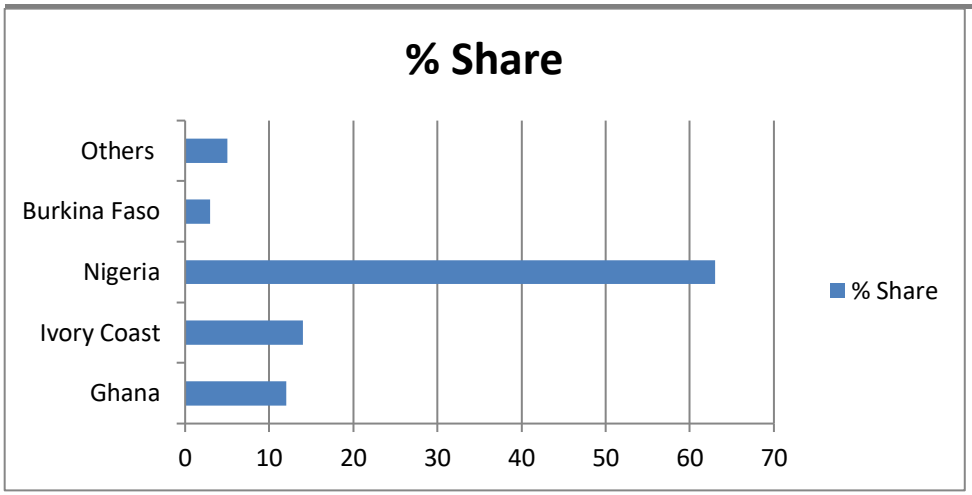

Fig.3: ECOWAS Region share of total fish imports from the continent of the world in 2020

Source: DARD-ECOWAS Commission, (2020)

It is evident in Fig. 3 that Nigeria accounted for majority (63%) of the total value of fish and fishery products imported into the West Africa Region. This means that Nigeria is the leading importers of fish and fishery products in West Africa in 2020, followed by Ivory Coast (14%), Ghana (12%), Burkina Faso and Benin with 3% each. With respect to the export of fish and fishery products from the West Africa Region to other parts of the world (Fig. 4), Nigeria contributed merely 3% of the total exports from the region with Senegal- the leading exporter contributing 74%, trailed by Cape Verde (7%), and Ghana (6%), with Sierra Leone contributing 4% ahead of Nigeria. This also portends that Nigeria which happened to be the leading importer of fish and fishery products in the region contributes insignificantly (3%) to the total export of fish and fishery products from the West African region. This has severe consequence on the socio-economic development of the country.

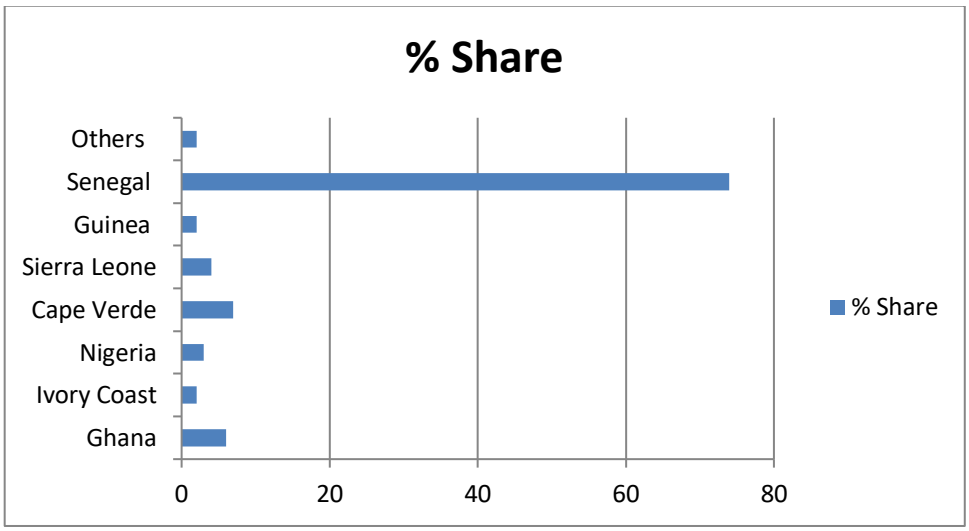

Fig.4: ECOWAS Region share of total fish exports to the continents of the world in 2020

Source: DARD-ECOWAS Commission, (2020)

According to FAO (2020) the global inland production of fisheries and fishery products was valued at 12.02 million tons in 2018, with Africa contributing about 3.0 million tons which makes Africa a major importer and not an exporter. Available data (FAO, 2020) indicated that Uganda displaced Nigeria as the leading inland capture producer country in Africa in 2018, by producing 440,000 tons of inland fish capture compared to the 390,000 tons produced by Nigeria. Arising from the fish supply deficit in Nigeria (Table 3), Nigeria spent huge amount on fish importation. Estimate by Dauada, (2021) indicated that in 2010, Nigeria expended ₦97 billion ($642,384,105) on fish and fish products importation at the exchange rate of $1 to ₦151 (FMARD, 2011), the value increased to ₦125 billion ($625,000,000) per annum on the importation of 1.90 million metric tons of fish

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in 2015 (Agbo, 2015). Again, the import value of fish and fishery products into Nigeria was estimated at $1.27 billion in 2020, while the value of the importation was ₦500 between January to November 2021.

Contributions of Marine Fisheries/Aquaculture Exploitation to Economic Growth (GDP)

The results of the Multiple Regression analysis was employed to estimate the contribution of capture fisheries and aquaculture production to the Gross Domestic Product (GDP) of Nigeria. The result of the analysis is presented hereunder.

Table 5: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
CF	15	530420	916283	699156.00	114524.213
GDP	15	208.30	546.70	382.5867	99.49374
AQF	15	84578	316727	233028.53	81252.861
Valid N (listwise)					

Source: Authors Data Analysis (2024)

The descriptive statistics provide an overview of the key variables examined in the study, highlighting the general trends in capture fishery, and aquaculture fishery production in relation to their contributions to GDP. The descriptive statistics derived in Table 5 shows that the distribution of aquaculture production with mean of 233028.53 and Standard Deviation of 81252.861 was not as precise as that of capture fisheries with mean of 699156.00 and Standard Deviation of 114524.213. This signifies that the distribution of capture fisheries is relatively uniform while that of aquaculture had significant level of variation suggesting a moderate contribution of aquaculture to GDP.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.966[a]	.933	.915	1.307	.933	50.986	3	11	.000

a. Predictors: (Constant), GDP, CF, AQF

Table7:

			ANOVA Coefficient			
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	261.215	3	87.072	50.986	.000[b]
	Residual	18.785	11	1.708		
	Total	280.000	14			

a. Dependent Variable: Year

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Table 8: Unstandardized Coefficien Standardized Coefficients

Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	20001.027	3.218		621.800	.000
	CF	1.195E-5	.000	.306	2.014	.069
	AQF	5.226E-5	.000	.950	4.937	.000
	GDP	.022	.005	.498	4.202	.001

a. Dependent Variable: Year

Table 9: Summary of Contribution of Capture and Aquaculture Fisheries to GDP

Parameter	Significant Variables	
	X_1(CF)	X_2(AQF)
R	.906	.996
R2	.933	.933
R2 Change	.933	.933
B	1.195	1.195
Beta	.306	.950
T	2.014	4.937
Sig. T	.069	4.937
F	50.986	50.986
Sig. F	.000	.000

Source: Authors' Data Analysis (2024). *Note: Table 9 is culled from Tables 6-8.*

It is evident in Table 9 that both capture fisheries and aquaculture production is significant contributor to the GDP of Nigeria. While capture fisheries contributes about 90% variation to the GDP of the country, aquaculture production significantly contributes 99% variation in the country's GDP. This means that aquaculture production is more important contributor to the nation's GDP than capture fisheries. The magnitude and indication of influence of these variables (capture fisheries and aquaculture production) is shown by their beta and B values. The indication is that a unit increase in both capture fisheries and aquaculture production will result in 1.195 increases in GDP. Furthermore, the B value of 1.195 for capture fisheries indicates that a unit increase in capture fisheries production will lead to about 30.6% increase in GDP while a unit increases in aquaculture production by 1.195 will results to 95% increase in GDP. The relationship between the contribution of capture fisheries and aquaculture production to the nation's GDP is significant as F=50.986 for both capture fisheries and aquaculture production is greater than the significant F (.000). The trend analysis of the respective contributions of both capture fisheries and aquaculture production to GDP is presented in Figures 5 and 6.

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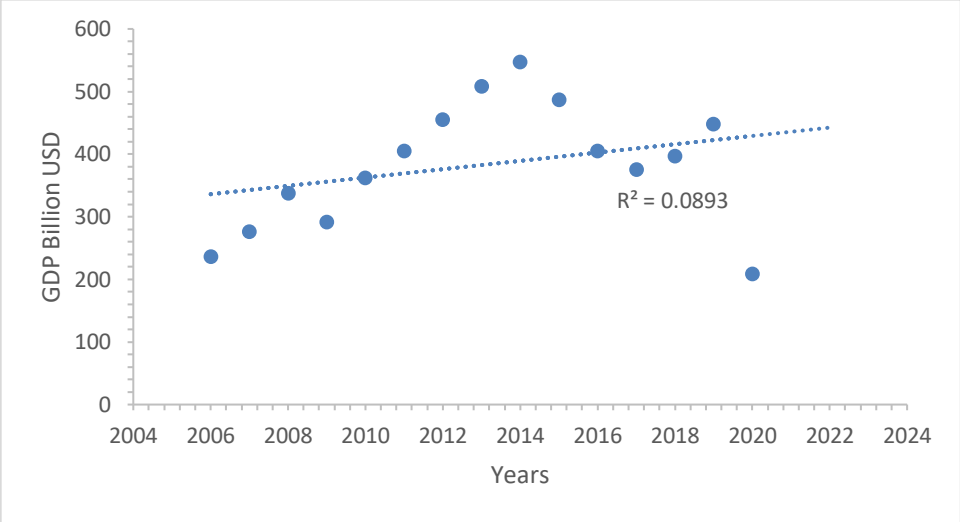

Fig.5: Trend analysis of capture fisheries contribution to GDP

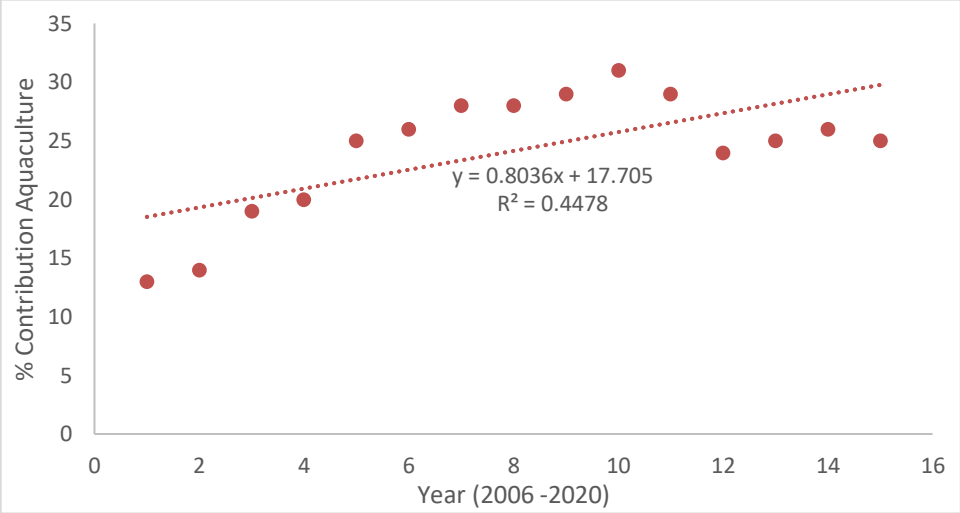

Fig.6: Trend analysis of aquaculture production contribution to GDP

The result of the trend analysis in figure 5 indicates that 8.9% variation in the GDP of Nigeria can be traced to the contribution of the capture fisheries subsector. Similarly, Figure 6 indicates that 44.7% variation in the GDP of Nigeria can be traced to the contribution of the aquaculture subsector of the Blue Economy. The analysis indicates that aquaculture production is more significant and has more prospect of contributing to the country's GDP compared to capture fisheries. This result confirms the World Bank (2018) position that capture fisheries have grown significantly over the years, but less than aquaculture production which is a fast growing sector with an Average Annual Growth Rate (AAGR) of 6.67% over the same period. Despite its shorelines advantages, Nigeria has not fully utilized fisheries resources potential. This accounts for why the country is considered a net importer of fishery products which may possibly reflect the fact that other sectors might be growing much faster than the fisheries sector, even though it is also true that a large amount of catch is consumed before going to formal markets, and thus cannot adequately be reflected in official GDP statistics. The inability of Nigeria to fully exploit its fisheries potentials probably accounts for the country being the world's fourth-largest importer of fish and fishery products in terms of volume (5.4% of global imports) after China, Japan, and the US, and 23rd in value terms or 0.8% (Trademap, 2018). This further corroborates findings by Esin (2024) and (Mbukwa et al., 2019) that most fishers are unable to access deep water resources in the exclusive economic zone (EEZ) because of low capacity in terms of vessel size and technology, such as limited range of the traditional vessels, with 90% being propelled by sails, paddles and long poles, and limited range of the continental shelf. This accounts why the majority of the fisher-folks are artisanal fishers generally restricted to shallow water fishing primarily along coral reefs, mangrove creeks, sea grass beds, and sand banks where fish species associated with these habitats are limited. Only a few fishermen with sophisticated licensed industrial vessels carried out fishing

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in Nigeria's Exclusive Economic Zone (EEZ). This has obvious implications for the development of the marine fisheries sector of the country's Blue Economy. It is evident that domestic fisheries production is not adequate to meet the fisheries demand in the country (Table 1). The pattern and trends of capture fisheries and aquaculture production is illustrated in the periodogram in Fig.5.

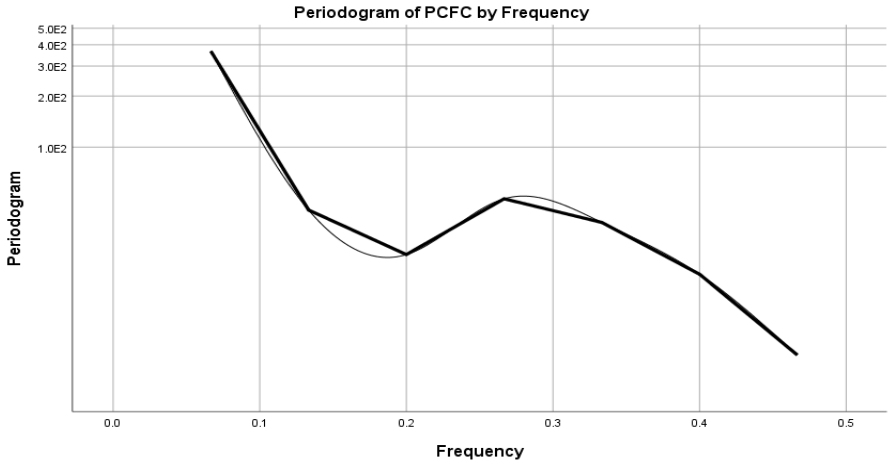

Fig. 5: Trend analysis of capture fisheries in Nigeria

It can be visualized in Fig.5 that there is a sharp fluctuation in capture fisheries and aquaculture production in Nigeria. The can be adduced from the periodogram that both capture fisheries and aquaculture production experience sharp decline. The result of the data analysis has shown that inland capture fisheries are in the decline which could be upturned if environmental and maritime security challenges are thoroughly tackled. The decline in capture fisheries could result from the widespread dams built across the country which have caused projected loss of between 85,000t and 130,000t of annual fish production. The decline in the "lost" fish production can be regained by effective utilization and management of water resources. There abound opportunity to intensification fish production from large and medium-sized reservoirs by developing the under-utilized open-water pelagic zone of these water bodies. This can be achieved by undertaking a preliminary national survey of reservoirs to identify those waters suitable for stocking with indigenous *planktivorous clupeids* (sardines). The marine coastal fisheries of Nigeria owe their productiveness to the enormous beneficial effect of the huge Niger Delta which brings nutrients into the area, creating a nursery ground and breeding area for large stocks of finfish and crustaceans. Official statistics of coastal production, both artisanal and commercial, are around 200,000 tons of fish and up to 10,000 tons of shrimp. Actual production may be up to 50% higher, as reported in a recent survey.

Concluding Remarks

It is clear the fisheries economy of Nigeria is one of the strategic sectors of the blue economy but is quite often snubbed while importance is given to oil exploitation, shipping, and other marine related extractive activities which have negatively impacted the biological aspect of the blue economy. The study has shown that the marine fishery/aquaculture sub-sector of Nigeria's blue economy is grossly under-utilized in spite of the enormous potential offered by the subsector. The fact remains that the fishery sector can significantly broadened the foreign exchange earnings of the country when fully developed. The study concludes that investing in these sectors could help the country diversify and generates huge revenue asides creating more employment opportunities for the teeming youths than currently exists and reduce the absolute reliance on oil and gas for its economic growth.

RECOMMENDATIONS

The study recommends thus:

i) There is need for the government and critical stakeholders in the fishery sector to play significant role both in managing capture fisheries to prevent stock depletion and in regulating the development of aquaculture to ensure

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that it is both environmentally sustainable and pro-poor. Under such conditions, fisheries and aquaculture can realize their potential as an important and growing source of economic development in rural areas.

ii) There is need for the government to harness the massive economy potential provided by the fisheries sector. In doing this, the government and policymakers have responsibilities to develop the fisheries sector by providing the needed conducive environment, fishing gear, processing and storage facilities and financial assistance to those engaged in the fisheries sector.

iii) Improved governance for the development of the blue economy. This is essential for the sustainable use of oceans, seas and marine resources, for the conservation of biodiversity, for improving human well-being and for the resilience of ecosystems.

iii) Investment in, and use of the best available science, data, and technology is critical. The use of science, data and technology is vital to support governance reforms and formulate management decisions in relation to fishery capturing.

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