ARTISANAL FISHERIES ECONOMIC VIABILITY OF A CREEK EAST OF THE NIGER DELTA NIGERIA

Edoghotu, A.J.

Department of Biology, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, NIGERIA

*Corresponding author (email): azibodiedoghotu@gmail.com

Abstract
A survey on the economic viability of Kugbo Creek fisheries in East of the Niger Delta, Nigeria was carried out in 9 stations of 3 distinct zones (fresh, brackish water, and intermedium) of the creek biweekly, for 24 months. The study was based on the frame survey method and complete census technique, on fisher folks in 3 fishing communities and 13 settlements of the creek. Fishing gears and methods identified in the fisheries were gill nets, impounding nets, line hooks, set hooks, springing hook traps, fence traps, local angling hooks, local traps, and indigenous fish ponds. Fishers operating in the creek were estimated at 2898 individuals with 1208 canoe units. Pick fish catch was 44383 individuals per day with an estimated biomass of 9,148,321g, yielding ₦102,433,750.00 ($512,168.75) in dry months at the cost of ₦11,000.00 ($55.00) per measure that was approximately 1Kg of fish at ₦200 to $1. The most common and efficient fishing method in the fisheries was the indigenous fish pond method which is peculiar to fishing in the area. The highest catch contribution was also with the indigenous fish ponds, with a mean yield of ₦33,591 ($167.96) per pond per day. The fisheries potential of the creek was confirmed very viable and was recommended for further development. Enforcement of policies by regulating authorities to check obnoxious fishing practice will enhance sustainability.

Keywords: Food scarcity, fisheries potential, Niger Delta, indigenous fish ponds, fish harvest, income, fishing gears.

Introduction
Food scarcity is one of the major global crises faced by the human race on the face of the earth in recent times. United Nations (UN) estimate of the world's population was 9.244 billion in July 2014 (United Nations, 2017). In Nigeria, the population was 178.52 million in 2014 (National Bureau of Statistics, Nigeria, 2015) and was high, relative to other African countries; precisely the 7th highest in the world, with the worsening economy. The present leadership in Nigeria had taught about improving the economy with emphasis on agriculture, which includes fisheries. It is worth stating, however, that captured fisheries or fishing in the coastal and inland waters or natural water bodies, have a greater potential of improving the economy, due to their vast operational area and high yield (Koehn & Weigers, 2019; Lancker et al., 2019). With the enhanced catch, huge positive contributions that will accelerate this dream achievement will be recorded. The fact that an economy grows faster when production cost is low is undisputable. Agriculture to an extent is the salvaging venture to such a developing economy as that of Nigeria (Dietrich & Schmerzech, 2019). Indigenous fish production from natural aquatic ecosystems of seas, rivers, creeks, lakes, and lagoons provides about 90% of total fish production in Nigeria. These fish resources can be further enhanced if regulatory policies that encourage good fishing culture, monitoring, and proper management of environmental conditions of these systems are in place and enforced (Chilaka et al., 2014; Aminu et al., 2017; Christine et al., 2019; Zenello et al., 2019).

Challenges in this sector are enormous, the majority of which stem from underdevelopment. The biggest in recent times is fish habitat degradation and destruction resulting from pollution of the water bodies. Most of the problems are anthropogenic. Often industrialists, for instance, are concerned with the profit they make by the end of production without paying attention to what happens to the environment they are operating in. To achieve maximum contribution of this sector to the economy and reduce food scarcity, proper management of capture fishery resources is necessary.

The challenges of poor fishing methods, inadequate fishing facilities, overfishing, and lack of implementation of regulatory policies in the sector need urgent attention to check excesses or monitor water and environmental quality resulting from pollution. These had often resulted in either fish mortality or habitat destruction or both. Aside from natural causes, a great proportion of fish mortality is ecosystem-based under man's influence. Hence, if checked, captured fish production shall be enormous to boost the nation's economy (Ayinla, 2012). This study, therefore, attempts to evaluate the benefits in terms of economic potentials of capture fisheries, with the Kugbo Creek as a case study. The study is hoped to provide information that will encourage further research work and enforcement of policies that shall lead to the improvement of capture fisheries to harness the utilization of its huge fisheries resources potential towards global economic development of the world's developing nation's economy with these natural resources as the case of Nigeria.

Materials and Methods
The Creek is located between latitude $4^o\,40'$ N and $4^o\,49'$ N and longitude $6^o\,20'$ E and $6^o\,35'$ E. Its length is about 175km while the width range is 22m to 91m (Rivers State Ministry of Lands and Survey, 1977; Edoghotu & Hart 2014a, 2014b). Frame survey of fishing communities of the study area was carried out with the complete census technique of Bankole et. al., (1994). In the survey, landing sites, the fishermen population, number of canoes, types of fishing gears, and methods used for fishing by the local fishermen were identified and enumerated. Other information needed during the survey was collected either by direct observation or oral interview. The number of canoes was obtained by direct count. Fish landing figures were estimated directly. The fishermen do not weigh their fish catch but estimate them after smoking, quantify them in cards, empty salt bags, and local baskets if considerable quantities were caught. These units of fish were then weighed and an estimate of the weight of fish landed was obtained where the fisherfolk could give an estimate of the number of fish caught at various seasons with various gears. Figures were supplemented and crosschecked by obtaining the fisherman's earnings. Having obtained figures for the prices which the fishermen got for various fishes; the weight was deduced. The local fishermen sell their measure of fish which was approximated at 1 Kg for ₦11,000.00 ($55.00) at ₦200 to $1.00. The latter technique was used where estimates of baskets or the local measures could not be obtained. Direct information was obtained from buying and sales prices as a short market survey were carried out. Fishermen were checked by taking records of their names and locations, to avoid repetition of an interview on someone previously interviewed and by using as much local information on local earnings to minimize the source of error such as;
-   Overestimation of fishermen that may result from migration from one area to another.
-   Inefficiency in fish landing due to difficulty in obtaining an accurate estimate of earning which in turn can only be approximately equated to the weight of fish landed.
-   Inaccuracy in estimation in productivity of certain gears and in addition is complicated by the fact that fisherfolk may use more than one type of gear, depending on local conditions which are unpredictable.

Results and Discussion
The total estimated number of fishermen in the fishery was 2898 with total canoe units of 1208. These were distributed in the 3 major fishing towns and 13 fishing settlements of the creek. The distribution of fishermen and canoes among communities ranged from 46 to 682 fishermen and 22 to 327 canoes per community.

Daily mean catch of the fisheries showed 9148321g biomass of fish amounting to ₦102,433,750.00 ($512,168.75). Range of daily income per fisher community was ₦1,704,120.00 ($8,520.60) to ₦8,922,365.00 ($44,611.83). Similarly, daily mean earnings per fisherman ranged from ₦2,245.55 ($11.23) to ₦135,453.25 ($277.27). Fishing gears and methods identified during the survey were: gill nets, impounding nets, line hooks, set hooks, springing hook traps, fence traps, local angling hooks, local traps, and indigenous fish ponds. The range of daily production and yield of the various gears was 7310g to 6807289g biomass yielding ₦176,182.01 ($882.41) to ₦6,665,211.20 ($33,326.06) ranging from local angling hooks to indigenous fish ponds, respectively. The highest contribution of indigenous fish ponds yielded 63.4% biomass and 65.7% financial contribution. Amount earned ranged from ₦11,978.28 ($59.89) to ₦184,369.76 ($921.85) per canoe per day. This also had its highest yield from indigenous fish ponds. Mean daily catch range of the various fishing communities and settlements was ₦1,704,120.60 ($8,520.60) to ₦8,922,365.00 ($44,611.83). Both biomass and number of fish caught in the Kugbo Creek varied seasonally with the dry season having a higher number of 28141fish representing 63.4% of total catch and biomass of 6097739.2g representing 65.7% of the total biomass.

The daily estimated yield of the fisheries per fisherman was relatively high. This high yield was from indigenous fish ponds which yielded as high as 65.7%, suggesting the high efficiency of this fishing method relative to others used in the system. The total fisher population of 2898 and 1208 canoes in this fishery, with an average daily yield of 44,385 individual finfish and 9148321g weight with an estimated financial yield during the study period of ₦102,431, 400.00 ($512,168.75), was appreciably high. Yields per fishing community such as the Amuruto community were of similar high values. Emago with the highest fisher population of 682 and 327 canoes had its financial output estimated at ₦8,922,365.00 ($44,611.83). This had 3195.9g weight yielding ₦130,082.65 ($650.41) and 6665.3g with an estimated income of ₦140,321.61 ($701.60) per canoe unit and day.

However, fishing communities with a lower fisher population such as Ogbaru with 46 fishers and 22 canoe units had a yield of 135192g with an estimated income of ₦1,704,120.00 ($8,520.60). This had a yield of 29,389.0g with the value of ₦37,046.09 ($180.23) per fisherman per day which correspond to 6,1l45.1g weight at ₦77,460 ($387.30) per canoe unit per day. 1t was therefore obvious that the higher the fishing pressure the higher the yield. Though the maximum sustainable yield (MSY) of the fisheries had not been determined, as it was not in the scope of this study, fishing pressure should be checked for sustainability. The Indigenous fish ponds method was seen to be the highest contributing or yielding method accounting for 65.7% of total financial yield due to factors such as numerical size, low fishing frequency, and simulation to resemble the natural habitat. Hence, this resulted in a high harvest of 6807289g biomass estimated at ₦135,453.25 ($677.27) per fisherman per day and ₦184,369.76 ($921.85) per canoe per day. Impounding nets with the lowest yield were due to the few pond traps in the fishery. Others had low yields relative to the indigenous fish ponds due to either their few numbers in the fishery or gear inefficiency.

Table 1: Estimated vital production parameters of the exploited finfish.

Estimated fisher Population	2898
Number of canoes	1208
Total catch biomass (kg) per day	9148.3
Mean catch biomass per boat (kg)	7.6
Mean catch biomass per boat per year	3.8
Total catch biomass per year (ton)	4.6
Total area sampled (km^2)	172
Total catch biomass per (tons/km^2)	0.1
Range of daily biomass per gear(kg)	7.31 – 6,807.29

Table 2: Financial yield estimated for the exploited finfish per day.

Description	Amount	
	₦	USD($)
Dollar rate	200	1
Mean daily catch for 9148321g	102,433,750.00	512,168.75
Range of daily income per fisher community	1,704,120.00-8,922,365.00	8,520.60-44,611.83
Range of daily income per fisherman	2,245.55-135,453.25	11.23-277.27
Range of daily income per gear type	176,182.01- 6,665,211.20	882.41-33,326.06
Range of daily earning per canoe	11,978.28- 184,369.76	59.89 - 921.85
Range of daily earning per canoe	11,978.28- 184,369.76	59.89 - 921.85

Conclusion

The study had elucidated further the huge potentials of artisanal pond/capture fisheries towards economic development of developing countries. Artisanal pond/capture fishery has been demonstrated in this study to be economically viable and will contribute immensely to the development of national economy, therefore it should be encouraged.

Acknowledgment

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