



## Artisanal fisheries characteristics of the fresh water reaches of lower Nun River, Niger Delta, Nigeria.

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**ABSTRACT:** A frame survey of fishing communities was carried out, employing the complete census technique, to assess the artisanal fisheries characteristics of the fresh water reaches of lower nun river for a period of two year. Eleven Community lie along the stretch of the study area. The total number of 4718 fishers with 1645 canoe units employing various fishing gear resulted to a fishers density of 3 fishers per canoe unit. A total of 29 fin fish families were recorded. Seasonally occurring fresh water crustacean. *Attya gaboneensis* and *palacemon paucidens* were present. *Etheria elliptica*, an oyster was also present. A specie of fresh water clam, *Galacea Paradoxa* from the family Donacidae was present. *Trichechus senegalensis* (Manatee) was occasionally captured by local hunter during the flood period. *Hippopotamus amphibious* (Hippopotamus) was reported from isolated places but they were rare. A specie of Otta, *Lutra maculicollis* was present. Three species of crocodiles, *Crocodylus niloticus* *Crocodylus cataphractus* (Alligator) and *Osteolaemus tetraspis* were also present. The Nile monitor, *Veranus niloticus* and the aquatic snake, *Anoscopus* sp. And three species of water turtle, *Kimxy erosa*, *Pelumedusa* sp and *Peliosus* sp were also present. The commonest fishing method employed was local fishponds (50.8%) and the least was gill nets (1.6%). Drift net caught the highest fish (8.01kg) per gear, while local fishponds was the least 0.25 kg. The annual catch per canoe was recorded for local fishponds (167. 84kg), while the lowest was assorted traps (14.7kg). Drift net recorded the highest annual for local fishponds. The mean biomass of 25.04 of fish catch of 20.2kg per fisher and the lowest value (4.53kg) was recorded per boat, total catch of 37903. 6kg, annual producing estimate of 434.81 tonnes, standing struck of 2.27 km<sup>2</sup> and of twenty two million, seven hundred and forty two thousand one hundred and sixty naira (N22742160) was estimated. The reduced annual income per fisher in the study was four thousand, eight hundred and twenty naira, thirty kobo. There is therefore the, urgent need for effective management of the Nun river fisheries, to improve on the living standard of the people. @JASEM

Fisheries play a very significant role in the national economy (Sikoki and Otobotekere 1999). Fish and fish products provide over 10kg of protein per capita per annum, an equivalent of 40% of all animal protein consumed in the country (Sikoki and Otobotekere 1999). Apart from being cheap source of highly nutritive protein, it also contains other essential nutrients required by the body. The fisheries sub-sector is also a high foreign exchange earner generating about 20 million dollars annually through the export of shrimps alone and providing direct and secondary employment to more than one million Nigerians.

Despite the contributions made by the fisheries sub-sector, the demand for fish is yet to be met. It was reported that the per capita consumption of fish was 8.45kg in 1980 and 5.38kg in 1994, whereas the estimated per capita requirement was put at 9.29 and 10.33 for 1980 and 1984 respectively. Thus, the estimated per capita consumption deficit increased from 0.87kg in 1980 to 4.95kg in 1984 (Sikoki and Otobotekere 1999). The food and agricultural organization recommended that the minimum intake per person should be 65gm/day of which 35 gm should come from animal source. In Nigeria, per capita intake of protein is only 51.7gm and only 4.0gms are of animal origin; a sharp contrast with situation in developed countries where the figures are 90gms and 65mgs respectively.

These identified inadequacies, in the supply of animal protein in the diet of Nigerians has brought about increased effort to boost animal production. These efforts are particularly directed at fish

production, regarded as a cheap source of protein. During 1973, the Nigerian cattle, sheep and goat industry was heavily affected by the sahel drought. The Nun river is a one of the most important river systems in the Niger Delta providing nursery and breeding grounds for a large variety of fish (IEOD, 1995). Many industrial and agricultural projects including the Nun river flow station, Diobu creek flows station (SPDC) and the Peremabiri rice project are situated along the river stretch. Fishing is carried out indiscriminately with various traditional and modern fishing gear (Sikoki *et al*; 1998). Fishing in the river is intensified and the catch per unit effort is low. Consequent upon speeding industrialization and other human activities, the river is fast becoming degraded.

Accurate fisheries statistics in the river; and its adjoining flood plains is vital for the formulation of a sound fisheries management programme in the lower Nun river and similar water bodies. But, this is completely lacking. A part from Scott, 1966; Reed *et al*, 1967; Otobo, 1991; Ssentengo and Welcome (1988) FAO, 1994; Otobo, 1993, Ita and Medahili, 1997 and; Sikoki and Otobotekere, 1999; Otobotekere and Sikoki, 1999; there are no reliable data on the aquatic macrofauna, fisheries characteristics and its economic analysis from the lower Nun river. This is essential for formulation of development plan in the fishing industry. This paper therefore provides information on the organization and production characteristics of artisanal fisheries in the lower Nun river.

## MATERIALS AND METHODS

### Study Area

The study was carried out in the fresh water reaches of the lower Nun river. The Nun river is one of the numerous low and rivers in the Niger Delta. The Niger Delta basin covers all the land between latitude  $4^{\circ} 14' \text{ N}$  and  $5^{\circ} 35' \text{ N}$  and longitude  $5^{\circ} 26' \text{ E}$  and  $7^{\circ} 37' \text{ E}$ . It extends along the coast from the rivers basin in the west of Bonny river with characteristic extensive interconnection of creeks. It is the most important damage feature of the Niger Delta Basin river system with about 2% of the surface area of Nigeria. The annual rainfall of the Niger Delta ranges from 2000mm – 3000mm per year (Abowei, 2000). The dry season lasts for four months (November- February) with occasional rainfall.

The lower Nun river is situated between latitude  $5^{\circ} 01'$  and  $6^{\circ} 17' \text{ E}$ . The stretch of the river is a long and wide meander whose outer concave bank is relatively shallow with sandy point bars (Otobor, 1993, 1995). The depth and width of the river varied slightly at different points (Sikoki et al, 1998). The minimum and maximum widths are 200 and 250 meters respectively.

During the flood, the flood plains are connected with the river. The flood plains provide nursery and breeding grounds for a large variety of fish. Many fish species find it difficult to survive due to the low oxygen level found in such water bodies and return to the main river during draw down. Others adapted to these conditions remain in the flood plains and find shelter in the local fishponds.

The river is subject to tidal influence in the dry season. Water flows rapidly in one direction during the flood (May to October). At the peak of the dry season, the direction of flow is lightly reversed by the rising tide. At full tide, the flow is almost stagnant. The riparian vegetation is composed of a tree canopy made up of *Raphia hokeri*, *nitrogena* sp; *Costus after*, *Bambosa vulgonis*, *Alchornia cordifolia*, *Alstonia boonei*, *Antodesima* sp and submerged macrophytes which include, *Utricularia* sp, *Nyphea lotus*, *Lemna* sp, *Salvinia* sp, *Cytosperima senegalensis*, *Ludwiga erecta*, *cyclosorus* sp, *Commelia* sp and *Hyponea* sp (Sikoki et al, 1998).

### Data Collection

A frame survey of fishing communities was carried out employing the complete census technique (Bankole et al, 1994) during the survey, existing landing sites, number of fishers, number of canoe units, types of fishing gear and available aquatic milluscs, mammal and reptiles were enumerated. Fish specimens were obtained from fishers using gill nets, longlines, traps, stakes and local fishponds. Fish families were identified using monographs, descriptions checklist and keys

(Daget, 1954, Boeseman, 1963 Reed et al; 1967; Holden and Reed 1972; Poll, 1974; Whyte, 1975; Jiri, 1976, Reed and Sydenhan, 1978, Otobo, 1981, Alfred-Ockya, 1983; Whitehead, 1984 and Loveque et al, 1991).

The basic information was obtained by direct observation and questioning. The number of fishers, canoe units and fishing gear were obtained by direct count. Fishing nets were also counted and estimated by counting drying poles and racks. These estimates were confirmed by direct questioning of the inhabitants of the community. Fish landing figures were obtained indirectly. Catches from fishers were estimated after smoking, where, considerable quantities were caught.

These units were weighed and an estimate of the weight of fish landed was obtained. The figures were supplemented cross-checked by obtaining estimates of the fishers earning and having obtained figures for the prices, fishers got for various fish, the weight was deduced. The dry weights obtained were converted to wet weights by a conversion factor of 2.5 to each dry weight (Scott 1966). An average cost of N600 per kilogramme of fish was obtained by direct information from a market survey. This price was used as basis for economic analysis. Direct information obtained from the buying and sale of fish; pricing and short market surveys were also carried out. An estimate of standing stock of fish was made, using the formulae by Henderson and Welcome (1974) as:

$$S = B/A \quad (1)$$

Which expresses the basic interrelationship between annual catch in wet weight, standing stock size (B) and area covered (A).

## RESULT

**Fisheries characteristics:** Eleven communities lie on the stretch of the fresh water reaches of the lower Nun River (Table 1). Ikolo had the highest number of fishers (584) with 123 canoe units and a total monetary value of one million eight hundred and sixty three thousand naira (₦1863000). Ekowe had the least number of fishers (294) with 153 canoe units and total value of one million, nine hundred and fifteen thousand five hundred and sixty naira (₦1915560). The respective figures for other communities: Yeneka, Ikibiri, Anyama, Oweikorogha, Peremabiri, Angiama, Oporoma, Onyoma and Nengiama are also presented in Table 1. The total number of fishers operating in the area was 4718. A total of 1645 canoe units were recorded. The numbers of fishers in the various communities are also given in Table 1.

Table 1: Fish landing estimates of communities in the lower Nun river

Communities in study area	Canoe unit	Fishers	Total Value N	Catch, dry wt (kg)	Catch, wet wt (kg)	Averages			
						Annual earning N Per fisher	Per Canoe	Annual (wt. Kg) Per fisher	Per canoe unit
Yeneka	172	392	2417178	1611.45	4028.63	6116.27	12589.47	10.28	23.42
Ikolo	123	584	1863000	1242.00	3105.00	3190.07	15146.34	5.32	25.24
Ikibiri	185	493	2172480	1448.32	3620.80	4406.65	11743.14	7.34	19.57
Anyianma	78	430	2253858	1502.57	3756.43	5241.53	2889.52	8.94	48.16
Oweikorgha	97	534	1820010	1213.34	3033.35	3351.77	18763.07	5.59	31.27
Angiama	143	536	1849980	1233.32	3083.30	3451.56	12986.92	5.75	21.56
Oporoma	140	328	2022810	1508.54	3371.35	6167.10	14448.64	11.50	26.94
Onyonma	149	304	2168928	1445.95	3614.88	7134.63	14556.56	11.84	24.26
Nengiama	188	431	1920138	1280.09	3200.23	4455.08	10213.50	7.43	17.02
Ekowe	153	294	1915560	1277.04	3192.6	6515.51	12520.00	10.86	20.87
Peremabiri	217	392	2098218	1398.81	3497.03	5352.60	9669.21	8.92	16.12
Total	1645	4781	5567952	15,161.43	9279.92	1180.15	33847.73	8.03	23.04

A total of 29 fish families were recorded in the study during the study period: Begridae, Carangidae, Characidae, Clariidae, Centropomidae, Cichlidae, Citharinidae, Cynoglossidae, Cyprinidae, Cyprinidae, Clupeidae, Distichodontidae, Elopidae, Gymnarcidae, Hepsetidae, Mochokidae, Mormyridae, Mugilidae, Osteoglossidae, Polynemidae, Pomadasyidae, Schilbeidae, Sphyraenidae, Protopteridae, Polypteridae, Pantodontidae, Notopteridae, Melapteruridae, Mastecembelidae, Tetraodontidae and the Elasmobranch (*Potamotrygon gorovensis*). In addition, seasonally occurring fresh water crustaceans: *Atya gaboneensis* and *Palaemon paucidens* were present. *Etheria elliptica*, an oyster was also present in the study area. They occurred in rocky beds near the lowest water level. Many people eat the flesh and during the dry season, smoked mussels were commonly seen in riverside market places. Large middens of empty shells were frequently found near old village sites.

A species of fresh water clam, *Galacea paradoxa* belonging to the family Donacidae was also present. Though it was not so numerous as the spiny oysters, it also serves as a source of protein. *Trichechus senegalensis* (Manatee) was occasionally captured by, local hunters during the rainy season (flood period). Hippopotamus amphibious (Hippopotamus) have also been reported occasionally from isolated places but they seem to be very rare. A species of Otter (*Lutra maculicollis*) was reported to be present. They were nuisance to fishers using gill nets and asserted traps as they capture fish and destroy the net or traps. Three species of crocodiles; *Crocodylus niloticus*, *Crocodylus cataphractus* (*Aligata*) and *Osteoleaemus tetraspis* were also present. The Nile monitor, *Varanus niloticus* and the aquatic snake, *Anoscopus sp* was present. Three species of water turtle: *Kimxys erosa*, *Pelumedusa sp* and *Peliosus sp* were found in the study area.

**Fishing gear/methods:** The commonest fishing method used in the study area was local fish pond. This seems to be a form of local aquacultural method that is yet defined. Local fishponds constituted 50.8% of the total harvest. The ponds were dug in the dry season to a depth of 3 metres in the flood plains. The bark/carcass of raphia palm or wood containing large openings are arranged diagonally inside the pond. During the flood, fish of different species are trapped inside the pond. Between December and February, the pond is dewatered and the fish totally harvested. The number of fishers required to harvest a pond depended on the size of the pond. Similar to local fishponds, were back swamps. These are at the river bank which, are stocked naturally by the adjoining river during full tide. The mode of harvest is the same as in local fishponds. Hook and line was also in general use constituting 19.2% of the total fishing gear used. Longline carrying up to 100 hooks baited with garri, white ants, red soaps or earthworms, were set for about three hours. The line with a single hook could be attached to a slender bamboo stick baited and set as in long lines. They are mainly effective for capture of catfishes. Mari – Mari were used in swamps and rivers, but particularly in the latter during the dry season, when some places become a seemingly impassible maze and tangled of these lines. The design of mari – mari varies according to the size of hook used, but are set without bait, they are usually operated from canoe.

Assorted traps, fish shelters and fishing spears constituted 18.6% of the total fishing gear. These are set in the flood plains, canals or river shores with or without bait. It was used mainly for the capture of fresh water shrimps, *Clarias spp*, *Polyterus spp* and *Erpetoichthys calabaricus*. Fishing stakes and other traps constituted 6.5% The stakes varied from well-constructed straight or V-shaped fences leading to heart shaped enclosures of woven mats, brush wood or small stakes to simple brush wood fences. The screen is made with raffia

strips. The manatee traps were also fairly common, where sud grasses occurred. This trap is a box-like structure of strong stakes driven into the sand against the bank of the river. The side of the trap towards the river had a sliding gate arrangement which is held open by a trigger to which is attached a bundle of grass. A manatee could be killed with spears as they grazed on sud grass. The trigger technique was also used in wide spread trigger hook fishery.

Gill net constituted 1.6% of the total fishing gear. The gill nets were 20 – 100 metres in length and about 3 metres in breadth. The mesh size ranged from 10.0mm to 100mm. Although small wooden floats could be used, the nets were usually floated by calabashes which were tied at intervals to the headlines by lines of varying lengths. Gill net

captures all fish except fry and fingerlings. The drift net was not commonly used. It is similar to the gill net but is usually set in the shallow areas of the sand banks. Two canoes were always involved in its operation.

From the various fishing gears/methods employed in the study area, drift net caught the highest (8.01kg) of fish per gear. The least value was recorded in local fishponds. The highest annual catch per canoe unit (167.84kg) was recorded in local fishponds while the lowest (14.71kg) was recorded in assorted traps. Drift net recorded the highest annual catch of 20.24kg per fisher and the lowest value (4.53kg) was recorded for local fishponds (Table 2).

Table 2: Gear specifics and fish landing estimates for the lower in Nun river

Gear	Total		Fishers	Value N	Catch dry Wt kg	Catch wet kg	Average				Annual catch (wet wt kg)	
	Canoe units	No. of gear					Annual earning (N)				Per canoe unit	Per gear
Cast net	254	831	381	324621.00	2164.14	5410.35	8520.24	12780.35	3906.39	14.20	21.30	6.51
Drift gill net	267	645	255	3098028.00	2065.31	5163.38	12149.13	11603.10	4803.14	2024	19.33	8.01
Set gill net	219	772	323	3044430.00	2029.62	5074.05	9425.48	13901.51	3943.56	15.00	23.17	6.07
Hook and line	381	9092	1111	3503808.00	2335.87	5839.68	3153.74	9196.35	385.37	5.26	15.32	0.64
Assorted traps	347	8780	933	3062806.00	2041.87	5104.68	3282.75	8826.53	348.84	5.47	14.71	0.58
Local fish ponds	37	24,003	1372	3726138.00	2040.53	5101.33	8923.61	21862.84	1016.88	4.53	167.84	1.65
Stakes/fences	140	3010	343	3060789.00	2040.53	5101.33	8923.61	21862.84	1016.88	14.87	36.44	1.65
Total	1645	47213	4718	22742160.00	15,161.43	37903.6	4820.30	13825.02	481.69	8.03	23.04	0.80

From the results of the average annual earning and annual catch, the total amount of twenty-two million, seven hundred and forty-two thousand, one hundred and sixty naira (N22, 742, 160.00) was estimated. The highest amount of three million, seven hundred and twenty six thousand, one hundred and thirty eight naira (N3,726, 138.00) was estimated for local fish ponds. This accounted for 16.38% of the total amount estimated. The least amount of three million, forty four thousand, four hundred and thirty thousand naira (N3,044430.00 ) was estimated for gill net, which accounted for only 13.38% of the total estimate.

The highest annual earning per fisher of one hundred and twenty one thousand, forty-nine naira thirteen kobo (N12149.13) was estimated for drift net, while the least annual earning of two thousand, seven hundred and fifteen naira, eighty four kobo (N2715.84) was estimated for local fish ponds. Cast net, gill net, hook and line, assorted traps and stakes recorded eight thousand, five hundred and twenty naira, twenty four kobo (N8520.24), nine thousand four hundred and twenty five naira, fourty eight kobo (N9425. 48), three thousand, two hundred and eighty two naira, seventy five kobo (N3282.75) and eight thousand, nine hundred and

twenty three naira, sixty one kobo (N8923.61) respectively.

Local fish ponds had the highest estimate for the annual earning per canoe unit of one million, seven hundred and six naira, fourty four kobo (N100706.44), while the least annual earning per canoe unit of eight thousand, eight hundred and twenty six naira, fifty three kobo (N8826.53) was estimated for assorted traps. Estimates of fish catch and yield potential are presented in Table 3. The total catch in wet weight was 37903. 6kg of fish. This resulted to an annual production of 454.81 metric tones and a standing stock of 2.27<sup>-2</sup>.

Table 3: estimated production parameters of exploited fish in the lower Nun river

S/NO	Parameters	Figures
1.	Number of canoes	1645
2.	Total catch (kg)	37903.6
3.	Mean catch per boat (kg)	23.04
4.	Mean catch per boat month	23.04
5.	Mean catch per boat per year	276.48
6.	Total catch per year	454.81
7.	Total area	2000km <sup>2</sup>
8.	Total catch per km <sup>2</sup>	2.27

## DISCUSSION

From the study, 29 fish families were records. This was higher than fifteen families recorded by Sikoki *et al*, 1998 from the same water body. The difference could be attributed to the sampling method. Sikoki *et al*; (1998) used gill net of various mesh sizes while, this study used various fishing gears. The physical environment of the fresh water reaches of the lower Nun river may be diverse enough to support more species. Low diversity is a function of low productivity, which has been a common feature of small fresh water rivers (Welcome, 1979).

The total number of 4,718 fishers with 1,645 boats employing various fishing gear/method gave an average of 3 fishers per boat. The average of 3 fishers per boat observed in this study compared favourably with the 3 fishers per boat reported by Moses, (1980) and Sikoki and Hart, (1999) in the Calcemco beach Calabar and Brass river respectively. Variations in number of fishers and fishing gear/method employed in different study areas could be attributed to over-estimation of the number of fishers as a result of migration of fishers from one area to another and inaccuracy in estimation of productivity of certain gears and in addition, is complicated by the fact that a fisher may use than one type of gear depending on local conditions which are unpredictable.

The mean total biomass of 23.04 of fish per boat, total catch of 37903.6kg, annual production estimate of 434.81 tonnes and an estimated standing stock of  $2.27\text{km}^{-2}$  from this study also varied from the results obtained from other studies. Scott (1966) reported that rivers, lakes and swamps of the Niger Delta produced about 2,000 tonnes of fish per year. Moses (1981) estimated a mean annual catch of 4,791 tonnes from the cross river over a period of twelve years. Sikoki and Hart (1999) in the Brass river, estimated the total biomass of 160.20 of fish per boat, total catch of 254,554kg, annual production of 610.93 tonnes, estimated mean catch per boat of 384.90kg and a standing stock of  $1.19\text{km}^{-2}$ .

The variation in the total estimate values of the lower Nun river from else where could be attributed to differences in fishing and industrial activities in the different rivers. The reason for the low estimates in the Nun river could be as a result of high mortality of both juveniles and brood stock of various fish species as a result of predatory activities which is typical of the study area. A similar remark was made by, Ssentengo *et al* (1986). Satia, 1990 also noted the controversy surrounding fish production statistics. In the lower Nun River, much of the problem hampering the acquisition of reasonably accurate fisheries statistics and resource appraisal appear to stem mainly from lack of, or inadequate investment and

lack of trained personnel to handle data collection. From the total catch in biomass of 37903.6kg of fish, N22742160 was projected. However with a total of 4, 718 fishers operating in the study area, the reduced income per head was N482030. Scott (1966) estimated a total income of twenty thousand, eight hundred and sixty nine pounds (three million two hundred and fifty five thousands, five hundred and sixty four naira) for the Nun river. Sikoki and Hart (1999) estimated a total income of N38496 per boat for 1587 boats and per fisher income of N12,832 in the Brass river.

The variation in the average income per fisher could be attributed to the productivity of the study area. The Nun river is a fresh water body with relatively low productivity while the Brass river is an estuary (brackish water) which opens up to the Atlantic ocean hence the higher productivity of the Brass river. The low estimated income per fisher in the Nun river explains the living standard of people in the lower Nun river. The fisher density of three persons per square kilometer was low compared to the fisher density of nine (9) persons per square kilometer reported by Sikoki and Hart (1999) in the Brass river. Henderson and Welcome (1974), recommended a density of two (2) fishers per square kilometer. This would give a safe fisher population of 4,000 fishers for the entire area in order to check over-exploitation of the stock in the lower Nun river. These results are sufficient for providing a basis for developmental plans in the Nun river.

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