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Impact of Dredging on the Fisheries of Igbedi Creek, Upper Nun River, Niger Delta, Nigeria

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Abstract: *The impact of dredging on the fisheries of Igbedi Creek, upper Nun River, Niger Delta was investigated from June 2009 to May 2011. Two locations – Ogobiri (Dredged) and Agoro-Gbene (Un-dredged) were studied. A total of 26,988 specimens representing 22 species belonging to 13 families were caught at Ogobiri (Dredged) Location; while a total of 33,275 representing 28 species belonging to 16 families were caught at Agoro-Gbene (Un-dredged) Location during the sampling period. There was a decrease in the number of fish species recovered in the undredged from 28 to only 22 in the dredged area. Fish from the dredged area exhibited negative allometric growth with length exponent (b) ranging from 0.911 ± 0.04 (Brycinus macrolepidotus). The only exception was Schulbe uranoscopus,* *which exhibited isometric growth with length exponent "b" = 3.027 ± 0.03. In the undredged location, three species, exhibited isometic growth (Synodontis batensodath (b = 3.095 ± 0-07); Schilbe uranoscopus (b = 3.097 ± 0.03) and Distichodus faciatus (b = 3.021 ± 0.11). The other species exhibited negative.allometric growth with length exponents ranging from 0.777 ± 0.004 to 2.560 ± 0.04 with the exception of Hepsetus odoe which exhibited positive allometic growth (b = 3.412 ± 0.07). Correlation coefficients between length and weight "r" ranged from 0.739 (Eleoties senegalensis) to 0.978 (Schulbe mystus) in the dredged; and between 0.447 (Polypterus ansorgi) to 0.994 (synodontis membranoceous) in the undredged locations. Student's t-test values at 95% level showed significant differences in condition factor between the two areas. These results are clear indications that dredging significantly affected the fisheries of the creek.*

I. Introduction

Dredging is a process that involves the excavation of water beds to remove sediments, pollutants, shellfish and other materials. The methods and machinery used in dredging vary widely. Most dredging is done by ships that tow a dredge along the water bed. Self standing dredges and dredge pumping stations are used for routine tasks. A dredge, which is the catch all term for the different types of machinery that perform dredging, can cut away sediment, scoop materials out like a back hoe or suction them through a large pipe to be deposited into a ship.

The effects of dredging on aquatic organisms have been a source of environmental concern for several decades. One category of concern that has frequently arisen in connection with projects involving dredging for navigational purposes deals with mortality of fish and shellfish entrained during the dredging process (Reine and Clark, 1998).

Dredging and related activities could disrupt fisheries and/or damage spawning grounds which may also have deleterious impacts on key fishery resources and, to some extent, the fishing industry (Ault *et al.*, 1998; Gebhards, 1973).

Specifically, appropriately designed studies to address dredging impacts are very limited and the lack of relevant data continues to foster controversy on dredging impact assessments. Until adequate data are available, quantifying biological responses to the potential dredging-induced impacts must unfortunately remain subjective (Clark, 1979). Furthermore, for decades the effects of dredging on aquatic resources have been an issue of increasing environmental concern. However, very little work has been done to detect the effects of dredging at population-level of mobile epi-benthic macro-invertebrates and dermal fishes (Ault *et al.*, 1998).

This research is intended to access the level of impact of dredging operations on the fisheries of Igbedi Creek, upper Nun River. It is intended to stress that in dredging operations particular attention should be paid to the reduction of the vulnerability of the environment and those species of organisms (fisheries in this case) most vulnerable to the risks associated with such operations. Basically, this research looked at some aspects of the fisheries of Igbedi Creek, upper Nun River in a Dredged site as compared to an Un-dredged site.
The objectives of the research are:

- To assess the fish species distribution in the Dredged and Un-dredged sites.

- To assess the Length and Weight relationship of the fish species in the Dredged and Un-dredged sites and determine Fish Assemblage; Catch Composition; Relative Abundance and Condition factor.
- Compare the data obtained in the Dredged and Un-dredged site and determine the possible impact of dredging on fisheries of Igbedi Creek, upper Nun River.

The study is expected to reveal the impact on the ecosystem as direct consequences of dredging operations in Igbedi Creek, upper Nun River using fish as an indicator. Fisheries impact is a significant conclusion for environmental and ecological change in aquatic systems (Karr, 1981).

II. Methodology

[1]Study Area

The study was carried out in Igbedi Creek, a tributary of the Upper Nun River in the Niger Delta located between latitude 5^0N01^1 and $6^0 17^1$E. The stretch of the river is a long and wide meander whose outer concave bank is relatively shallow with sandy point bars (Abowei, 2000). The depth and width of the river vary slightly at different points (Sikoki *et. al.,* 1998). The minimum and maximum widths are 200 and 250 meters respectively. The river is subjected to tidal influence in the dry season. Water flows rapidly in one direction during the flood (May – October). At the peak of the dry season, the direction of flow is slightly reversed by the rising tide. At full tide the flow is almost stagnant.

[2]Field Study & Collection of Samples

Two communities were chosen as sample communities for this study. These are: Ogobiri (Dredged Location), in the Sagbama Local Government Area (SALGA) i.e. the community where the dredging is taking place, and Agoro-Gbene (Un-dredged Location), also in Sagbama Local Government Area (SALGA) which is a community that is relatively undisturbed. Both communities are located along the igbedi creek, upper Nun River and are both predominantly fishing communities.

For the purpose of this study, the selected dredged and non-dredged sites were divided into stations: Ogobiri – OGO_1DA=Dredged Area, $OGO_{I\&2}$DS=Downstream, $OGO_{1\&2}$US=Upstream; Agoro-gbene – AGO_1DS=Downstream, AGO_1MD=Midstream, AGO_1US=Upstream.

Collection of Fish Samples

Sampling was carried out forth nightly between June 2009 and May 2011 using gillnets, long lines, traps and stakes. The researcher fished for himself and also employed the services of fishers for sampling. Catches were isolated and conveyed in thermos cool boxes to the laboratory on each sampling day. Fish specimens were identified using monographs, descriptions, checklists and keys (Daget, 1954; Boseman, 1963; Reed *et. al.,* 1967; Holden and Reed, 1972; Poll, 1974; Whyte, 1975; Jiri, 1976; Reed & Sydenham, 1978; Otobo, 1981; Alfred Ockiya, 1983; Whitehead, 1984; Loveque *et al.,* 1991.

Total length and weight of fish specimens were measured to the nearest centimetre and grammes respectively, to obtain data for length-weight relationship. The total length (TL) of the fish was measured from the tip of mouth to the caudal fin using meter rule calibrated in centimetre. Fish samples were measured to the nearest centimetre. The weight of each fish was obtained after draining water from the buccal cavity and blot drying samples with a piece of clean hand towel. Weighing was done with a tabletop weighing balance to the nearest gram.

Length – Weight Relationship

The relationship between the length (L) and weight (W) of the various fish species were expressed by the exponential equation (Pauly, 1983):

$$W=aL^b \qquad \text{(Eqn. 1)}$$

Where

W=Weight of fish in (g)

L= Total Lenght of fish in (cm)

a= Constant (intercept)

b= The Length exponent (Slope)

The “a” and “b” values were obtained from a linear regression of the length and weight of fish. The correlation (r) that is the degree of association between the length and weight was computed from the linear regression analysis.

Condition Factor

The condition factor (K) of the experimental fish was estimated from the relationship:

$$K=100W/L^3 \qquad \text{(Eqn. 2)}$$

Where;

K= Condition Factor
W= Weight of Fish (g)
L= Length of Fish (cm)

[3]Analysis of Experimental Data

The following statistical tools were used to analyzed the data obtained – Regression and Correlation Analysis (RECA) for linear regression of length and weight of fish, Microsoft Excel (2010) for computation of means and standard deviation; Statistical Package for Social Sciences (SPSS) and FISAT (Gayando and Pauly, 1997) for descriptive statistics, length-weight relationship and condition factor of fish.

III. Results And Discussion

A total of 26,988 specimens representing 22 species belonging to 13 families were caught at Ogobiri (Dredged) Location; while a total of 33,275 representing 28 species belonging to 16 families were caught at Agoro-Gbene (Un-dredged) Location during the sampling period. A total of 60,263 specimens were obtained from both locations. In Ogobiri Location, *Polydactylus quadrifilis* was the most abundant in biomass (85.73Kg) accounting for 8.6% of the total weight of fish specimens caught. *Schilbe uranoscopus* was the most numerous (2021) accounting for 7.5% of the total number of fish specimens caught. In Agoro-Gbene location, *Distichodus brevipinnis* had the highest biomass (206.76Kg) accounting for 9.5% of the total weight of fish specimens caught. *Schilbe uranoscopus* was the most numerous (2245) accounting for 6.8% of the total number of fish specimens caught. The fish species with the least percentage composition in biomass in Ogobiri location was *Petrocephalus bovei* (7.60Kg) accounting for 0.8% of the total weight of fish specimens caught; and Agoro-Gbene location it was *Parallia pellucida* (7.66Kg) accounting for 0.4% of the total weight of fish specimens caught. In Ogobiri location, *Hepsetus odoe* was the least numerous (1012) accounting for 3.8% of the total number of fish specimens caught; while in Agoro-Gbene location, *Cynoglossus senegalensis* was the least numerous (828) accounting for 2.5% of the total number of fish specimens caught. Tables 3 & 4 show fish species caught and their composition in Ogobiri (Dredged) & Agoro-Gbene (Un-dredged) locations (June 2009 – May 2011). The result of the respective percentage composition in number and total weight of fish caught in the various locations showed that the following: Ogobiri (Dredged) location - 26,988 (44.8%); 1000.57 (31.5%) and Agoro-Gbene Un-dredged) location - 33,275 (55.2%); 2175.51 (68.5%). This study revealed that Agoro-Gbene location recorded the highest values both in total number and weight of 55.2% and 68.5% respectively. This may be attributed to the relatively better environmental condition in Agoro-Gbene (Un-dredged) location as revealed by this investigation when compared to Ogobiri (Dredged) location, which may be a direct consequence of the dredging in this location. The values obtained in Agoro-Gbene (Un-dredged) location are significantly higher ($p<0.05$) than those obtained in Ogobiri (Dredged) location.

Table 1: Fish Species caught and their Composition in Ogobiri (Dredged) Location (June 2009 – May 2011)

Family/Species	No. of Specimens	% No. of Specimen	Weight (Kg) of Specimens	% Weight of Specimens
CHARACIDAE				
Brycinus nurse	1121	4.2	31.66	3.2
Brycinus macrolepidotus	1025	3.8	79.92	8.0
Hydrocynus brevis	1227	4.6	74.77	7.5
Alestes baremose	1048	3.9	33.36	3.3
MONOCHOKIDAE				
Synodontis batensoda	1145	4.2	30.24	3.0
Synodontis membranaceous	1211	4.5	18.20	
BAGRIDAE				
Chrysichthys furcatus	1204	4.5	69.70	7.0
Clarotes laticeps	1196	4.4	45.00	4.5
POLYNEMIDAE				
Polydactylus quadrifilis	1186	4.4	85.73	8.6
CLUPEIDAE				
Odaxothrissa mento	1144	4.2	14.60	1.5
CYNOGLOSSIDAE				
Cynoglossus senegalensis	1258	4.7	57.54	5.8
CYPRINIDAE				
Labeo coubie	1232	4.6	62.89	6.3
Labeo senegalensis	1286	4.8	57.90	5.8
MORMYRIDAE				
Gnathonemus abadii	1210	4.5	36.77	3.7
Petrocephalus bovei	1036	3.8	7.60	0.8
DISTICHODONTIDAE				
Distichodus brevipinnis	1188	4.4	73.85	7.4
SCHILBEIDAE				
Schilbe uranoscopus	2021	7.5	28.41	2.8
Schilbe mystus	1813	6.7	28.09	2.8
Parallia pellucida	1234	4.6	11.20	1.1
CITHARINIDAE				
Citharinus citherus	1204	4.5	69.70	7.0
HEPSETIDAE				
Hepsetus odoe	1012	3.8	62.05	6.2
ELEOTRIDAE				
Eleotris senegalensis	1052	3.9	21.39	2.1
	26,988	**100**	**1000.57**	**100**

Table 2: Fish Species caught and their Composition in Agoro-Gbene (Un-dredged Location) Location (June 2009 – May 2011)

Family/Species	No. of Specimens	% No. of Specimen	Weight (Kg) of Specimens	% Weight o Specimens
CHARACIDAE				
Brycinus nurse	1227	3.7	88.10	4.1
Brycinus macroleidotus	1133	3.4	124.88	5.7
Hydrocynus brevis	1185	3.6	112.06	5.2
Alestes baremose	1192	3.6	70.65	3.3
MONOCHOKIDAE				
Synodontis batensoda	1271	3.8	45.61	2.1
Synodontis membranaceous	1103	3.3	63.22	2.9
BAGRIDAE				2.8
Chrysichthys furcatus	1013	3.0	61.48	
Clarotes laticeps	1032	3.1	65.69	3.0
POLYNEMIDAE				
Poydactyluss quadrifilis	1032	3.1	94.16	4.3
CLUPEIDAE				
Odaxothrissa mento	1031	3.1	20.46	0.9
CYNOGLOSSIDAE				
Cynoglossus senegalensis	828	2.5	98.53	4.5
CYPRINIDAE				
Labeo coubie	1099	3.3	115.41	5.3
Labeo senegalensis	1223	3.7	144.01	6.6
MORMYRIDAE				
Gnathonemus abadii	1113	3.4	87.11	4.0
Petrocephalus bovei	1012	3.3	9.35	0.4
DISTICHODONTIDAE				
Distichodus brevipinnis	1006	3.0	206.76	9.5
Distichodus engycephalus	1188	3.8	75.92	3.5
SCHILBEIDAE				
Schilbe uranoscopus	2245	6.8	23.49	1.1
Schilbe mystus	1927	5.8	43.99	2.0
Parallia pellucida	1273	3.8	7.66	0.4
CITHARINIDAE				
Citharinus citherus	1054	3.2	145.67	6.7
HEPSETIDAE				
Hepsetus odoe	1195	3.6	139.84	6.4
ELEOTRIDAE				
Eleotris senegalensis	1003	3.0	27.56	1.3
CICHLIDAE				
Hemichromis faciatus	1203	3.6	39.36	1.8
POLYPTERIDAE				
Polypterus ansorgii	1239	3.7	156.70	7.2
NOTOPTERIDAE				
Papyrocranus afer	1121	3.4	51.24	2.4
Xenomystus nigri	1109	3.3	56.60	2.6
	33,275	**100**	**2175.51**	**100**

The LWR was determined following a Log – Log transformation. The Exponential Equation, Degree of Association (r), Coefficient of Determination (r^2) and significance of Correlation of the Length – Weight relationship for the various fish species in both locations are shown in Tables 3 & 4 respectively.. The regression trend indicated that in Ogobiri (Dredged) Location, all fish species exhibited negative allometric weight growth with length exponent (b) ranging from 0.911±0.01 (*Polydactylus quadrifilis*) to 2.709±0.04 (*Brycinus macrolepidotus*) except *Schilbe uranoscopus*, which exhibited an isometric weight growth with length exponent "b" = 3.027±.03; while in Agoro-Gbene (Un-dredged) location, *Synodontis batensoda* (b=3.095±0.07), *Schilbe uranoscopus* (b=3.097±0.03) and *Distichodus fasciatus* (b=3.021±0.11) exhibited isometric growth; others exhibited negative allometric growth with length exponent (b) ranging from 0.777±0.004 (*Synodoontis membranaceous*) to 2.560±0.04 (*Synoontis nigrita*) except *Hepsetus odoe* which exhibited positive allometric growth (b=3.412±a0.07).The correlation coefficients "r" ranged from 0.739 (*Eleotris senegalensis*) to 0.978 (*Schilbe mystus*) in Ogobiri location and 0.447 (*Polypterus ansorgii*) to 0.994 (*Synodontis membranaceous*) in Agoro-Gbene location.

The length exponent (b) ranging from 0.911 – 3.027 representing 22 fish species in Ogobiri location and 0.777 – 3.097 representing 28 fish species in Agoro-Gbene location recorded in this study is not in agreement with (b) values ranging from 2.73 – 3.03 recorded by Hart and Abowei (2007) for 10 fish species in the Lower Nun River; (b) ranging from 2.790 – 3.210 recorded by Fafioye and Oluajo (2005) for 5 fish species in Epe Lagoon, Nigeria; (b) ranging from 2.012 – 2.991recorded by Kumolu-Johnson and Ndimele (2010) for 21 fish species in Ologe Lagoon, Lagos; (b) ranging from 2.719 – 3.580 recorded by Abowei and George (2009) for 5 fish species from Nkoro River, Niger Delta. The correlation coefficient (r) which is the degree of association between length and weight ranging from 0.546 – 0.956 in Ogobiri location and 0.336 – 0.988 in Agoro-Gbene location is in agreement with 0.951 – 0.996 recorded by Hart and Abowei (2007) for 10 fish species in the Lower Nun River. The result from this study shows that in Ogobiri (Dredged) location, the rate of increase in body length is not proportional to the rate of increase in body weight in almost all the fish species except *Shilbe uranoscopus*; whereas in Agoro-Gbene (Un-dredged) location, the rate of increase in body length is proportional to the rate of increase in body weight in some of the fish species.

Table 3: Length – Weight Regression Equation, Correlation Coefficient (r), Coefficient of Determination (r^2) and Significance of Correlation for Various Fish Species in Ogobiri Location

Fish Species	Regression Equation	r	r²	Significance of Correlation
Brycinus nurse	LogW=0.028+2.648LogL	0.940	0.884	P<0.05; t=92.41, df=1119
Brycinus macrolepidotus	LogW=0.024+2.708 LogL	0.894	0.799	P<0.05; t=63.77, df=1023
Syndontis balensoda	LogW=0.034+2.567 LogL	0.865	0.747	P<0.05; t=58.11, df=1141
Syndontis membranaceaus	LogW=0.078+2.105 LogL	0.716	0.838	P<0.05; t=39.23, df=1209
Chrysichthys furcatus	LogW=0.067+2.183 LogL	0.946	0.895	P<0.05; t=98.44, df=1139
Polydactylus quadrifilis	LogW=0.817+0.911 LogL	0.935	0.874	P<0.05; t=90.78, df=1184
Odaxothrissa mento	LogW=0.285+1.643 LogL	0.953	0.908	P<0.05; t=106.03, df=1142
Parallia pelucida	LogW=0.052+2.245 LogL	0.848	0.720	P<0.05; t=56.23, df=1232
Cynoglossus senegalensis	LogW=0.506+0.954 LogL	0.950	0.902	P<0.05; t=107.73, df=1256
Hydrocynus brevis	LogW=0.018+2.160 LogL	0.825	0.681	P<0.05; t=51.12, df=1225
Labeo coubie	LogW=0.038+2.580 LogL	0.967	0.935	P<0.05; t=133.01, df=1230
Labeo senegalensis	LogW=0.718+1.802 LogL	0.952	0.907	P<0.05; t=111.89, df=1284
Gnathonemus abadii	LogW=0.022+2.616 LogL	0.915	0.837	P<0.05; t=78.75, df=1208
Distichodus brevipinnis	LogW=0.041+2.601 LogL	0.972	0.945	P<0.05; t=142.69, df=1186
Schilbe uranoscopus	LogW=0.070+3.027 LogL	0.918	0.842	P<0.05; t=103.78, df=2019
Schilbe mystus	LogW=0.032+2.426 LogL	0.978	0.956	P<0.05; t=198.98, df=1811
Citharinus citherus	LogW=0.024v1.983 LogL	0.780	0.609	P<0.05; t=43.25, df=1202
Hepsetus odoe	LogW=0.521+1.632 LogL	0.935	0.874	P<0.05; t=83.60, df=1010
Clarotes laticeps	LogW=0.606+2.346 LogL	0.863	0.746	P<0.05; t=59.16, df=1194
Alestes baremose	LogW=0.357+1.621 LogL	0.933	0.870	P<0.05; t=83.53, df=1046
Petrocephalus bovei	LogW=0.644+1.165 LogL	0.933	0.870	P<0.05; t=83.08, df=1034
Eleotris senegalensis	LogW=0.328+1.011 LogL	0.739	0.546	P<0.05; t=35.51, df=1050

Table 4: Length – Weight Regression Equation, Correlation Coefficient (r), Coefficient of Determination (r^2) and Significance of Correlation for Various Fish Species in Agoro - Gbene Location

Fish Species	Regression Equation	r	r²	Significance of Correlation
Brycinus nurse	LogW=0.285+1.406LogL	0.975	0.951	P<0.05; t=154.78, df=1225
Brycinus macrolepidotus	LogW=0.233+1.554LogL	0.939	0.881	P<0.05; t=91.45, df=1131
Syndontis batensoda	LogW=0.020+2.895 LogL	0.765	0.585	P<0.05; t=86.41, df=1269
Syndontis membranaceaus	LogW=0.374+ 1.156LogL	0.994	0.988	P<0.05; t=101.82, df=1101
Chrysichthys furcatus	LogW=0.261+ 1.997LogL	0.986	0.972	P<0.05; t=125.31, df=1011
Synodontis nigri	LogW=0.046+ 2.560LogL	0.888	0.789	P<0.05; t=67.39, df=1216
Polydactylus quadrifilis	LogW=0.040+ 0.770LogL	0.984	0.968	P<0.05; t=131.42, df=1030
Odaxothrissa mento	LogW=0.466+1.573LogL	0.991	0.981	P<0.05; t=136.08, df=1029
Parallia pelucida	LogW=0.582+ 1.266LogL	0.988	0.977	P<0.05; t=94.12, df=1271
Cynoglossus senegalensis	LogW=0.580+1.097LogL	0.992	0.985	P<0.05; t=231.58, df=826
Hydrocynus brevis	LogW=0.054+ 1.943LogL	0.965	0.931	P<0.05; t=126.92, df=1183
Labeo coubie	LogW=0.033+ 1.623LogL	0.986	0.972	P<0.05; t=195.80, df=1097
Labeo senegalensis	LogW=0.711+ 1.844LogL	0.937	0.879	P<0.05; t=94.08, df=1221
Gnathonemus abadii	LogW=0.227+ 1.392LogL	0.976	0.952	P<0.05; t=148.49, df=1111
Distichodus brevipinnis	LogW=0.103+ 1.839LogL	0.982	0.964	P<0.05; t=163.13, df=1004
Schilbe uranoscopus	LogW=0.008+ 3.077LogL	0.915	0.833	P<0.05; t=107.75, df=2243
Schilbe mystus	LogW=0.131+ 2.045LogL	0.931	0.867	P<0.05; t=207.48, df=1925
Citharinus citherus	LogW=0.741+ 1.880LogL	0.933	0.871	P<0.05; t=68.52, df=1052
Hepsetus odoe	LogW=0.002+ 3.412LogL	0.820	0.673	P<0.05; t=101.72, df=1193
Clarotes laticeps	LogW=0.178+ 2.208LogL	0.940	0.883	P<0.05; t=84.01, df=1030
Alestes baremose	LogW=0.281+ 1.965LogL	0.961	0.923	P<0.05; t=118.42, df=1190
Petrocephalus bovei	LogW=0.162+ 0.884LogL	0.981	0.963	P<0.05; t=162.23, df=1010
Eleotris senegalensis	LogW=0.112+ 2.355LogL	0.962	0.926	P<0.05; t=111.52., df=1001
Distochodus engycephalus	LogW=0.330+ 1.830LogL	0.702	0.492	P<0.05; t=33.92, df=1186
Hemichromus fasciatus	LogW=0.027+ 3.021LogL	0.622	0.387	P<0.05; t=27.56, df=1201
Polypterus ansorgii	LogW=0.262+ 1.842LogL	0.447	0.200	P<0.05; t=17.59, df=1237
Papyrocranus afer	LogW=0.083+ 1.308LogL	0.984	0.968	P<0.05; t=184.32, df=1119
Xenomystus nigri	LogW=0.466+ 1.071LogL	0.336	0.113	P<0.05; t=11.87, df=1107

The mean Condition Factor of the various fish species in this study ranged from 0.10 – 2.24 in Ogobiri (Dredged) location for 22 fish species and 0.58 – 5.64 in Agoro-Gbene (Undredged) location for 28 fish species. For most species in the present study, condition factor values were higher than the 0.917 – 0.985 recorded by Abowei and George (2009) for 5 fish species from Nkoro River, Niger Delta; 0.92 – 0.98 recorded by Hart and Abowei (2007) for 10 fish species in the Lower Nun River; 0.64 – 1.99 recorded by Fafioye and Oluajo (2005) for 5 fish species in Epe Lagoon, Nigeria; 0.12 – 16.29 recorded by Kumolu-Johnson and Ndimele (2010) for 21 fish species in Ologe Lagoon, Lagos. The values obtained for mean Condition Factor and monthly Condition Factor for the various fish species in Agoro-Gbene (Un-dredged) location were significantly higher (p<0.05) than values obtained for Ogobiri (Dredged) location. The statistical analysis of twenty two (22) representative organisms occurring in both locations clearly shows this trend. The mean Condition Factor of the various fish species in Ogobiri (Dredged) location were lesser than those values (2.9 – 4.8) documented by Bagenal and Tesch (1978) for mature fresh water fish. This suggests that the condition of Igbedi creek, upper Nun River around Ogobiri location in comparison to other fresh water bodies is unfavorable to fishes irrespective of season. The results of the Physico-Chemical characteristics of water and sediment samples from this location further confirm this assertion. Water and sediment quality impact can have adverse effect on fisheries resources (Seiyaboh, et. al., (2007). From the results obtained in this study, we can conclude that the fish species in Agoro-Gbene were relatively in a better condition than those in Ogobiri location. This might not be unconnected with the dredging operation in Ogobiri location.

IV. Conclusion

The results indicate that the fish species in the Un-dredged location were generally in a better condition than those in the Dredged location. From the above information, it is concluded that there has been an impact of dredging on the fisheries of Igbedi Creek, Upper Nun River.

Table 5: Condition Factor of Various Fish Species in Ogobiri (June 2009 – May 2011)

Fish Species	Total No.	Min.	Max.	Mean ± S.E
Brycinus nurse	1121	0.47	3.45	1.19 ± 0.01
Brycinus macrolepidotus	1025	0.12	4.10	1.13 ± 0.02
Syndontis batensoda	1143	0.28	4.44	1.16 ± 0.01
Syndontis membranaceaus	1211	0.30	1.77	0.86 ± 0.01
Chrysichthys furcatus	1141	0.19	3.53	0.88 ± 0.02
Polydactylus quadrifilis	1186	0.72	5.42	2.24 ± 0.03
Odaxothrissa mento	1144	0.63	1.80	1.19 ± 0.01
Parallia pelucida	1234	0.36	1.78	1.21 ± 0.01
Cynoglossus senegalensis	1258	0.23	2.11	0.81 ± 0.01
Hydrocynus brevis	1227	0.14	1.75	0.65 ± 0.01
Labeo coubie	1232	0.60	2.29	1.25 ± 0.01
Labeo senegalensis	1286	0.55	4.09	1.47 ± 0.03
Gnathonemus abadii	1210	0.11	2.05	0.84 ± 0.01
Distichodus brevipinnis	1188	0.88	2.00	1.38 ± 0.01
Schilbe uranoscopus	2021	0.15	1.67	0.79 ± 0.01
Schilbe mystus	1813	0.39	1.28	0.71 ± 0.004
Citharinus citherus	1204	0.30	4.11	1.41 ± 0.01
Hepsetus odoe	1012	0.63	2.96	1.21 ± 0.02
Clarotes laticeps	1196	0.46	9.51	1.10 ± 0.02
Alestes baremose	1048	0.00	0.34	0.10 ± 0.003
Petrocephalus bovei	1036	0.62	3.38	1.50 ± 0.02
Eleotris senegalensis	1052	0.76	7.83	2.73 ± 0.05

Table 6 : Condition Factor of Various Fish Species in Agoro-Gbene (June 2009 – May 2011)

Fish Species	Total No.	Min.	Max.	Mean ± S.E
Brycinus nurse	1227	1.30	5.82	3.03±0.04
Brycinus macrolepidotus	1133	1.22	8.38	4.03 ± 0.06
Syndontis batensoda	1271	0.77	2.62	1.57 ± 0.02
Syndontis membranaceaus	1103	0.43	4.71	1.79 ± 0.04
Chrysichthys furcatus	1013	0.73	4.37	2.17 ± 0.93
Synodontis nigrita	1218	0.23	2.30	1.53±0.01
Polydactylus quadrifilis	1032	0.81	6.88	3.07 ± 0.06
Odaxothrissa mento	1031	0.93	2.37	1.61 ± 0.01
Parallia pelucida	1273	1.00	3.90	2.01 ± 0.03
Cynoglossus senegalensis	828	0.51	3.52	1.68 ± 0.03
Hydrocynus brevis	1185	2.33	5.82	3.22 ± 0.03
Labeo coubie	1232	0.60	2.29	1.25 ± 0.01
Labeo senegalensis	1286	0.55	4.09	147 ± 0.03
Gnathonemus abadii	1113	0.43	4.56	2.35 ± 0.04
Distichodus brevipinnis	1006	2.79	8.96	5.64 ± 0.05
Schilbe uranoscopus	2245	0.15	1.98	0.81 ± 0.01
Schilbe mystus	1927	0.37	2.34	1.02 ± 0.01
Citharinus citherus	1054	1.50	5.16	2.55 ± 0.02
Hepsetus odoe	1012	0.63	2.96	1.21 ± 0.02
Clarotes laticeps	1032	0.61	2.68	2.18 ± 0.01
Alestes baremose	1192	0.39	2.53	1.70 ± 0.01
Petrocephalus bovei	1012	0.90	4.98	1.95 ± 0.03
Eleotris senegalensis	1003	1.52	4.59	2.59 ± 0.48
Distochodus engycephalus	1188	0.19	2.87	1.26±0.01
Hemichromis faciatus	1203	1.08	3.98	2.34±0.02
Polypterus ansorgii	1239	0.29	0.91	0.58±0.003
Papyrocraus afer	1121	0.52	2.45	1.11±0.02
Xenomystus nigri	1109	1.00	3.47	1.24±0.45

KEY: Min. = Minimum, Max. = Maximum, S. E. = Standard Error

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