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Species Distribution and Abundance in the Lower Nun River, Niger Delta, Nigeria

[1]Martin E. Allison and [2]Daniel Okadi
[1]Department of Fisheries, Niger Delta University Wilberforce Island,
P.M.B 071, Yenagoa Bayelsa State, Nigeria
[2]Department of Fisheries and Aquatic Environment,
Rivers State University of Science and Technology, Port Harcourt, Nigeria

Abstract: The fish of the lower Nun River was sampled for 12 months to determine species distribution (surface and vertical distribution) and abundance using small gill nets of 8, 12 and 15 mm. A total of 11, 156 specimens were caught consisting of 25 species belonging to 14 families. In terms of species diversity, Characidae (16%), Schilbeidae (16%) and Cyprinidae (12%) were the highest. *Parailia pellucida* was the most abundant (71.30%). There was no significant difference in the longitudinal and vertical variation of the species.

Key words: Distribution, abundance, nun river, gill net, Niger Delta, Nigeria

INTRODUCTION

Species distribution is an indication of where fish species occur or are located in the aquatic environment. This consists of the vertical aspect (surface, mid water and bottom) and the horizontal or lateral component such as convex, central and the concave sections across the water body. Species distribution thus provides information on whether the fish species is pelagic, demersal etc., which will further inform the choice of the fishing gear to be used Abundance in this context, refers to the total catch in number or biomass of the species. Information on habitat and abundance, amongst others, are very vital for fisheries development and management.

Fish and fishery products constitute the cheapest sources of animal protein but according to Ndok (1982), they constitute only 40% of the diet of an average Nigerian. Anko and Eyo (2003), reported that Nigeria has vast potentials for fisheries development, being endowed with a maritime area of 46,300 km^2, an Exclusive Economic Zone (EEZ) area of 210,900 km^2 and inland waters of 12.5 million ha. But that in spite of the huge endowment, the current production level of 400,000 metric tons is at a 50% deficit to meet Nigeria's fish need per annum of at least 1.5 million metric tons. Okorie (2003), observed that the bulk of fish production comes from the artisanal sector but because the local production is inadequate to meet our demand, Nigeria imports about 49.5% of fish.

The challenge is to increase domestic fish supply through the development and proper management of the fishery resources of Nigeria. However, many Nigerians are reluctant to engage in artisanal fisheries owing to the unattractive income of artisanal fishers. This could be overcome if the fishers are organized into cooperatives and are given necessary support by Government and even the private sector. This in the long run will, apart from improving the standard of living of the fishers, provide more fish to the population at cheaper prices and also bridge the supply-demand deficit gap.

Inspite of its importance, there is scanty information on the artisanal fisheries of the Nun River. The study will complement available information in the planning, formulation and execution of fisheries policies and programmes especially in the artisanal sector and to serve as future reference in the proper utilization of the fisheries potentials of the Nun River in particular and the inland waters of the Niger Delta in general.

Fishing gear such as cast nets, drift nets and seine nets are commonly used for fishing in most waters, probably due to the fact that these nets greatly influence catches (Ufodike *et al*., 1989). Steinberg (1964) recommended transparent monofilament net material for effective fishing in clear water. These have the characteristics of being invisible to the fish (Kennedy, 1951; Nedelec, 1975).

According to Sanisbury (1975), the factors that determine the choice of fishing gear to be used in a given fishery depend on species being fished, that is, whether pelagic, demersal etc. individual value of the species to the fishers, depth of water and fishing depth, characteristics of the seabed (if gear is to be work in contact with the bottom). Distrib ution and abundance are veritable aspects of fish stock assessment studies.

Corresponding Author: Martin E. Allison, Department of Fisheries, Niger Delta University Wilberforce Island, P.M.B 071, Yenagoa Bayelsa State

According to Sissenwine *et al.* (1979) fish stock assessment evaluates the effect of fishing on a fishery as a basis of fishery management decisions. Allison *et al.* (1997) observed that abundance, to a large extent, is a function of recruitment, which according to Clark (1979) and Bankole (1990), is the major source of variability in fish population.

Land use and other human activities influence species diversity and abundance (Victor and Dickson, 1985; Victor and Ogbeibu, 1985, 1986). Scott (1966) identified over 250 species of fish landed in the Niger Delta. Chindah and Osuamkpe (1994) studied the fish assemblage of the lower Bonny River of the Niger Delta with its adjourning creeks and observed 25 families consisting of 57 species. Alfred-Ockiya (1996) observed 28 families and 41 species in Kolo creek, Rivers State, Nigeria; Lowe-McConnel (1964) observed 44 species on the Rupenninme River. Nwadukwe (1995) observed a total of 23 species from 17 families in 2 habitats in the Lagos Lagoon in which 6 species appeared regularly. Sikoki *et al.* (1998) observed a total of 24 species belonging to 15 families in the Lower Nun River using a fleet of 9 gill nets that ranged from 3/4"-7" mesh sizes. There were differences in number and biomass of fish caught due to gill net selectivity with a sharp decline in larger mesh sizes especially in 4" and 7" mesh net. It was further observed that the highest catch was recorded in the 2" category (19.6%) and the least (1.6%) in the 7" mesh size but were small and generally immature. Sikoki *et al.* (1998) further observed that the catch was generally low, which was attributed to fishing methods, fishing season and industrial activities, causing biological over fishing of the stock in the area.

MATERIALS AND METHODS

Study area: This study was carried out at the lower Nun River around Anyama Ijaw in Bayelsa State (Fig. 1). The sampling area lies between Lat. 4°51'N and 4°54'N; Long. 6°11'E and 6°13'E. The concave bank in the study area is

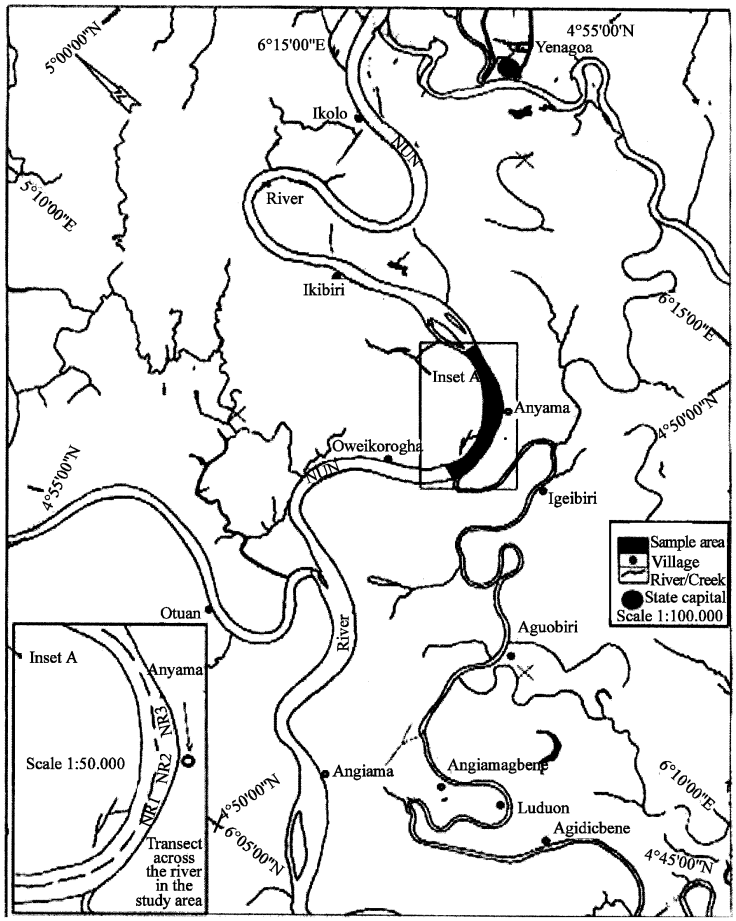

Fig. 1: The lower Nun river, Niger Delta, showing the sample area and sampling stations (NR1-Convex; NR2-Middle; NR3-Concave)

moderately steep sloppy with loamy bottom, while the convex bank is relatively shallow and sandy. The tidal influence is very mild during the dry season. However, a slightly reversed flow occurs during the rising tide at the peak of the dry season but during the flood period there is a swift one directional current in the study area.

Sampling procedure: Sampling was carried out twice a month at 2 weeks interval for 12 calendar months using 3 sets of gill net with stretched mesh sizes of 8, 12 and 15 mm, respectively each measuring 35 mm in length and 3 m in depth with a surface area of 105 m^2. Sampling lasted for 3 h every sampling day. The 3 drift gill nets were operated simultaneously from 3 fishing canoes, by adjusting the float line and the weighted bottom line to keep the net at the desired depth.

Specimens caught during the sampling were preserved in 10% formalin solution and taken to the laboratory for identification. Fish specimens were identified from monographs, descriptions, checklist and keys (Reed *et al*., 1967; Holden and Reed, 1972; Leveque *et al*., 1991; Olasebikan and Raji, 1998).

Distribution and abundance: Sampling was done at the surface i.e., the concave, the central and convex sections of the river, the mid water and bottom to determine the distribution and abundance of fish in the study area. All the specimens were counted to determine species abundance. Abundance score of the species were estimated following the criteria of Allison *et al.* (1997) as follows: 1-50 Rare; 51-100 Few; 101-200 Common; 201-400 Abundant and > 400 Dominant.

Data analysis: Analysis of Variance (ANOVA) was used to test for significant difference of fish caught with the different mesh sized gill nets and distribution. All analysis were carried out through the computer enhanced Microsoft Excel Programme.

RESULTS

Ichthyofauna: A total of 11, 156 specimens from 14 families consisting of 25 species were caught in the lower Nun River during the period of sampling. The highest diversity was observed in characidae (4) Schilbeidae (4) and Cyprinidae (3). The relative abundance of the species are shown on Table 1. Dominant in the catch were *Parailia pellucida* (71.3%), *Pellonula leonensis* (18.41%) and *Odaxothrissa mento* (7.03%), belonging to the families of Schilibeidae and Clupeidae. The species appeared regularly in the study. Common species include

Table 1: Relative abundance of fish caught in the lower Nun River

Family/species	Total catch	Relative abundance (%)	Family (%)	Abundance score
Bagridae			0.82	
Chrysichthys nigrodigitatus	92	0.82		C
Carngidae			0.03	
Caranx latus	3	0.03		R
Characidae			0.13	
Brycinus macrolepidotus	8	0.07		R
Brycinus longipinnis	3	0.03		R
Alestes macrolepidotus	3	0.03		R
Rhabdalestes septentrionalis	1	0.01		R
Clupeidae			25.44	
Odaxothrissa mento	763	7.03		D
Pellonula leonensis	2.050	18.41		D
Distichodontidae			0.04	
Distichodus rostratus	1	0.01		R
Paradistichodus dimidiatus	3	0.03		R
Cyprinidae			0.12	
Barbus callipterus	7	0.06		R
Leptocypris niloticus	6	0.05		R
Labeo coubie	1	0.01		R
Schilbeidae			72.40	
Parailia pellucida	7.955	71.30		D
Eutropius niloticus	115	1.03		D
Eutropius buffei	7	0.06		R
Siluranodon auritus	1	0.01		R
Mormyridae			0.91	
Petrocephalus baneansorgii	97	0.91		D
Gobidae			0.03	
Chonophorus lateristriga	3	0.03		R
Elopidae			0.03	
Elops lacerta	3	0.03		R
Mochokidae			0.03	
Synodontis gambiensis	2	0.02		R
Synodontis nigrita	1	0.01		R
Anabantidae			0.01	
Ctenopoma Kingsleyae	1	0.01		R
Sphyraenadae			0.01	
Sphyraena afra	1	0.01		R
Paeneidae			0.25	
Macrobrachium felicinum	29	0.25		R
Total	11.156	100	100	

R = Rear; C = Common; A = Abundance; D = Dominant

Eutropius niloticus (1.03%) and *Chrysichthys nigrodigitatus* (0.82%). *Petrocephalus bane ansorgii* sp. (0.91%) were observed as few. All other species rarely appeared in the catch during the investigation.

Quantitatively, Schilbeidae (*Paraila pellucida*, *Eutropius niloticus Siluranodon auritus* and *Eutropius buffei*) was the highest (72.4%) followed by Clupeidae (*Pellonulla leonensis* and *Odaxothrissa mento*), which formed 25.44%. Mormyridae (0.91) and Bagridae (0.82) ranked 3rd and 4th, respectively in abundance in the fishery. The least abundance of 0.01% came from *Rhabdalestes septentrionalisn* (Characidae), *Distichodus rostratus* (Distichodontidae), *Silluanodon auritus* (Schilbeidae), *Sphyraena afra* (Sphyraenidae) and *Labeo coubie* (Cyprindae) (0.01%). Others with a relatively low abundance in the catch consisted of Carangidae (0.03%), Gobidae (0.03%), Elopidae (0.03%) and Distichodontidae (0.04%).

Table 2: Lateral distribution of fish species across the lower Nun river

	Concave		Central		Convex			
Family	No.	(%)	No.	(%)	No.	(%)	Total catch	Rel. (%)
Bagridae	13	0.80	11	0.41	68	1.05	92	0.83
Carangidae	0	0	0	0	3	0.05	3	0.03
Characidae	3	0.20	1	0.04	11	0.07	15	0.13
Clupeidae	461	26.70	186	6.94	2.166	32.68	2.813	25.22
Distichodontidae	0	0	0	0	4	0.06	4	0.04
Cyprinidae	2	0.12	3	0.11	9	0.14	14	0.13
Schilbeidae	1.235	71.6	2.470	92.16	4.373	1.87	8.078	72.41
Mormyridae	9	0.52	3	0.01	85	1.28	97	0.90
Gobidae	0	0	0	0	3	0.05	3	0.03
Elopidae	0	0	2	0.07	1	0.02	3	0.03
Mochokidae	3	0.2	0	0	0	0.38	3	0.03
Anabantidae	3	0.20	0	0	1	0.02	1	0.01
Osphyraenidae	0	0	0	0	1	0.02	1	0.01
Paeneidae	0	0	4	0.15	25	0.37	29	0.30
Total	1.726		2.680		6.750		11.156	100.00
Rel. abundance (%)	15.50		24.02		60.08			

Table 3: Vertical distribution of fish in the lower Nun River

	Surface		Mid water		Bottom			
Family	No.	(%)	No.	(%)	No.	(%)	Total catch	Rel. (%)
Bagridae	29	0.70	30	0.84	33	0.99	92	0.83
Carangidae	0	0	3	0.08	0	0	3	0.03
Characidae	1	0.02	11	0.30	3	0.09	15	0.13
Clupeidae	1.915	46.23	826	23.20	72	2.16	293	25.22
Distichodontidae	2	0.10	1	0.03	1	0.03	4	0.04
Cyprinidae	5	0.04	7	0.2	2	0.6	14	0.13
Schilbeidae	2.151	51.93	2.651	74.41	3.151	94.02	8.078	72.40
Mormyridae	14	0.12	20	0.56	63	1.89	97	0.90
Gobidae	0	0.33	3	0.08	0	0	3	0.03
Elopidae	3	0	0	0	0	0	3	0.03
Mochokidae	1	0.07	2	0.06	0	0	3	0.03
Anabantidae	0	0.02	1	0.03	0	0	1	0.01
Sphyraenidae	1	0.02	0	0	0	0	1	0.01
Paeneidae	2	0.48	5	0.14	4	0.12	29	0.30
Total	4.142		3.560		3.330		11.156	100.00
Rel. abundance (%)	37.13		31.91		29.85			

The lateral distribution of the various species is shown in Table 2. All the 14 species occurred in the convex area, which also constituted the highest relative abundance of 60.08%. The concave formed the least abundance of 15.5%, while catches from the central location contributed 24.02%. Table 3 shows the vertical distribution of fish species in the study area with the highest relative abundance of 37.13% observed at the surface. The least of 29.85% occurred at the bottom while the mid water consisted of 31.91% of the total catch. Schilbeidae was more abundant at the bottom (94.02%) followed by mid water (74.41%) while the least of (51.93%) occurred at the surface. On the other hand, Clupeidae was more abundant at the surface (46.23%) followed by mid water (23.2%) with the least relative abundance of 2.16% at the bottom.

DISCUSSION

The Lower Nun River is an estuary of the River Niger thus all the characteristics of River Niger are prevalent in it. The 25 species belonging to 14 families, in the study, indicates good species diversity with the highest diversity in Characidae, Schilbeidae and Cyprinidae. The dominance of *Parailia pellucida*, *Pellonula leonensis* and *Odaxothrssa mento* could be attributed to gear selectivity. The result is similar to Sikoki *et al.* (1998), who encountered 24 species belonging to 16 families in the area. Apart from Schilbeidae and Clupeidae that had small sized sexually mature fish, the fishes caught in this study were small in size and generally immature due to the small mesh sizes of the gill nets used. This is in agreement with Nwadukwe (1995), who observed that smaller mesh sized nets caught small and immature fishes in the Lagos lagoon.

Parailia pellucida was the most abundant species in this study followed by *Pellonula leonensis.* Ezenwaji (2004) also observed similar high abundance in the 2 species though with *Pellonula leonensis* dominating in the lower Anambra river.

This study is in agreement with Sikoki *et al.* (1998) in terms of number of families and species but, varies in the

kind of species. Only 6 families were common in both studies (Bagridae, Characidae, Cyprinidae, Schilbeidae, Mormyridae and Mochokidae). Carngidae, Clupidae, Distichodontidae, Gobidae, Elopidae, Anabantidae, Sphyraenidae and Paeneidae present in this study, were absent in their studies. Citharindae, hepsetidae, Centropimidae, Gymnarcidae, Claridae, Pomadasydae and Osteoglossidae reported in Sikoki *et al.* (1998) were similarly not caught during the sampling. This may be attributed to gear selectivity and fleet size of gill net since they used a fleet of 9 gill nets that ranged from 3/4"-7" mesh sizes. Ufodike *et al.* (1989) reported that gill net technology, catch, period/technique are essential in maximizing fish catches. The relatively low species composition in this study compared with other similar studies with high species richness such as Nwadiaro (1984), Chindah and Osuamkpe (1994), Alfred-Ockiya (1996) and Koutrakis *et al.* (2000) is due to their use of multiple gear, which include seine net, fyke net, cast net, trap/fences, atalla, long lines and hook and lines. Allison *et al.* (1997) had suggested a multiple gear approach as the best way to obtain comprehensive icthyofaunal studies. However, Sikoki *et al.* (1998) attributed the low diversity in the Nun River not only to fishing methods, but fishing season and industrial activities resulting in biological over fishing of the stock. Allison *et al.* (1997) observed that fish assemblage may differ with location even within similar habitats due to variation in abiotic factors. Allison *et al.* (1997) also related poor species diversity to human activities such as dredging and water pollution from petroleum products occasioned by barges, tugs and other river crafts. The impact of human activities on species richness has also been reported by Kone *et al.* (2003) in the Go River (Ivory Coast) and Gratwicke *et al.* (2003) in the Upper Mangame River, Zimbabwe.

More fish were caught in the convex section and the surface. This difference was as a result of the exclusive sampling at these locations between September and October due to high flood level and water velocity.

CONCLUSION

It is worthy to note that this study greatly complements previous studies on species diversity and abundance in the Lower Nun River and further highlights the significance of the use of small mesh size gill nets in fisheries research and has thus made significant contributions to knowledge on the gill net fishery of Lower Nun River.

REFERENCES

Alfred-Ockiya, J.F., 1996. Studies on the Ichthyofauna of Kolo Creek, Rivers State. Niger Delta Biologia, 1 (2): 24-28.

Allison, M.E., U.U. Gabriel, M.B. Inko-Tariah, O.A. Davies and B. Udeme-Naa, 1997. The fish Assemblage of Elechi Creek Rivers State, Nigeria. Niger Delta Biol., 2 (1): 90-96.

Anko, E.O. and A.A. Eyo, 2003. Fisheries development in Nigeria with special rerference to Cross Rivers state. Proceeding of the 16th Annual Conference of Fisheries Society of Nigeria (FISON) Maiduguri, 4th-9th November 2001. In: Eyo, A.A. and E.A. Ajao (Eds.). FISON P.O. Box 2607. Apapa Lagos, pp: 303-311.

Bankole, N.O., 1990. Gill-net monitoring at Tiga and Jakaran reservoir in Kano State. National Institute of Fresh Water Fisheries Research (NIFFR). Annual Report 1990, pp: 39-42.

Chindah, A.C. and Osuamkpe, 1994. The fish Assemblage of the Lower Bonny River, Niger Delta, Nigeria. Afr. J. Ecol., 32: 58-65.

Clark, S.H., 1979. Application of bottom trawl survey. Fisheries, 4 (3): 9-15.

Ezenwaji, H.M.G., 2004. Studies on the Atalla Fishery of the Lower Anambra River. Bio-Res., 2 (1): 82-90. http://www.ajol.info/viewarticle.php?id=181&layout=abstact.

Gratwicke, B., B.E. Marshall and T. Nhiwatiwa, 2003. The distribution and relative abundance of stream fishes in the upper Management River, Zimbabwe, in relation to land use, pollution and exotic predators. Afr. J. Aqua. Sci., 28 (1): 25-34.

Holden, M. and W. Reed, 1972. West African Freshwater fish Longman Group Ltd. London, pp: 36. ISBN: 0-582-60426-5.

Kennedy, W.A., 1951. The relationship of fishing effect of gill nets to the interval between lifts. J. Fish. Res. Board Can., 8: 264-274.

Kone, T., G.G. Teugels, V. Douba, G. Goorebi and E.P. Kouamelan, 2003. First data on the inventory and the distribution of the ichthtyofauna of a small African Western Coast Basin: River Go Ivory Coast. Cybium, Intl. Newspaper of Ichthyology, 27 (2).

Koutrakis, E.T., A.K. Kokkinakis, E.A. Elftheriadis and M.D. Argyropolou, 2000. Seasonal changes in distribution and abundance of fish fauna in the 2 estuarine systems of Strymonikkos gulf (Macedonia, Greece). Bel. J. Zool., pp: 42.

Leveque, C., D. Pangy and G.G. Teugel, 1991. Annotated Checklist of the freshwater fishes of the Nilo-Sudan River Basins in Africa. Rev. Hydrobiol. Trop., 24 (2): 131-154.

Lowe-McConnel, R.H., 1964. Fish communities in tropical freshwaters. Longman Limited, London, pp: 340.

Ndok, O.J., 1982. Proceedings of the 2nd annual Conference of the Fisheries Society of Nigeria. (FISON) Kainji Lake Research Institute, New Bussa, pp: 295.

Nedelec, C., 1975. Catalogue of small scale fishing gear Fishing New Book Ltd, England.

Nedham, J.J.G. and P.R. Nedham, 1962. A Guide to Study of Fresh Water Biology. 5th Edn. Holden-Day Inc. Oakland, pp: 108.

Nwadiaro, C.S., 1984. Ichthyofauna of Lake Oguta, a shallow lake in South-Eastern Nigeria. Arch. Hydrobiol., 115: 463-475.

Nwadukwe, F.O., 1995. Species abundance and seasonal variations in catch from 2 Mangrove Habitats in the Lagos Lagoon. Environ. Ecol., 13 (1): 121-128.

Okorie, P.U., 2003. Nigeria fisheries at a time of Economic paradigm shift. Proceeding of the 18th Annual Conference of the Fisheries Society of Nigeria (FISON), Owerri, 8th-12th December, 2003. FISON P.O. Box 2607, Apapa Lagos, Nigeria, pp: 12-21.

Olasebikan, B.D. and A. Raji, 1998. Field guide to Nigerian Freshwater Fishes. Federal College of Freshwater Fisheries Technology New Bussa, Nigeria, pp: 47. ISBN: 34-760-0-0-9.

Reed, W., J. Buchard, A.J. Hopson and I. Yaro, 1967. Fish and fisheries of Northern Nigeria. 1st Edn. Min. Agric. N. Nig., pp: 226.

Sanisbury, J.E., 1975. Commercial Fishing Methods. 2nd Edn. Survey, Fishing New Books Ltd, pp: 11-68.

Scott, J.S., 1966. Report of the Fisheries of the Niger Delta special Area. Niger Delta Development Board, pp: 109.

Sikoki, F.D. A.I. Hart and J.F.N. Abowei, 1998. Gill Net Selectivity and Fish Abundance in the Lower Nun River, Bayelsa State, Nigeria. J. Applied Sci. Environ. Mgt., 1 (1): 14-19.

Sissenwine, M.P., B.E. Brown and J. Breman-Hoskins, 1979. Brief history and the state of the arts of fish production models and some applications of fisheries of the North-Eastern United States. In: Climate and Fisheries Workshoop. Centre for Ocean Management studies University of Rhodes Island, pp: 25-28.

Steinberg, R., 1964. Monofilament gillnets in fresh water experiment and practice. Modern fishing gear of the world. FOA fishing gear congress. Fishing News Book Ltd London, pp: 11-115.

Ufodike, E.B.C., A.D. Anthony and G.S. Abda, 1989. Studies on the influence of Gill net technology and Diurnal variations on fish cataches in Ouree Resservoir Miango Plateau State. J. Aquat. Sci., 4: 17-19.

Victor, R. and A.E. Ogbeibu, 1986. Recolonisation in Macrobenthic invertebrates in a Nigeria stream after pesticide treatment and associated disruption. Environ. Pollution (Series A), 41: 125-137.

Victor, R. and A.E. Ogbeibu, 1985. Stream flowing through farm lands in Southern Nigeria. Environ. Pollution (Series A), 38: 99-107.

Victor, R. and D.T. Dickson, 1985. Macrobenthic invertebrates of a perturbed stream in Southern Nigeria. Environ. Pollution (Series A), 38: 99-107.